Time-domains as the foundation for classical mechanics, the relativity of moving objects, and the known field forces, presenting the case for a unified field theory

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Abstract: Presented here is an empirical time-domain basis for classical mechanics and the associated derivation of c (where at c time=0) as a constant for the unique and independent references of non-zero mass bodies in relative motion. Here, general relativity shall be analysed and those energy requirements which lead to the cosmological constant problem and associated requirement for dark energy. To resolve the cosmological constant problem a new basis for the causality of mass and gravity as a new over-arching temporal scheme of cause-effect shall be presented as one that upholds the time-domain datum reference of physical phenomena of time-now, explaining why physical phenomena is associated exclusively to the time-now time-domain. Here also shall be derived the basis for the equivalence principle and associated conservation of momentum principle. In this process of derivation shall be presented a solution to the ”proton radius puzzle” also forming the basis for cosmic ray (solar wind) generation. Upon all of such shall be derived the known field forces with their empirical basis revealed, presenting the case for a unified field theory.

Keywords: temporal mechanics; classical mechanics; time-domain; general relativity; gravity; equivalence principle; action principle; electron degeneracy; Lagrangian; proton charge radius; proton radius puzzle; cosmic rays; gravitational lensing; strong nuclear force; weak nuclear force; unified field theory

1. Introduction

Here is proposed a model for time using the hypothetical time-domains of *time-before* and *time-after* central to the datum-reference of *time-now*, a time-equation that when applied to Pythagorean algebraic (Euclidean) space gives rise to a temporal wave function as the descriptive basis for electromagnetism as both a particle and wave limited at c where at c time=0, a temporal wave function conditioned by π ensuing a process that derives the correct values for G, α, and h, equations that correctly describe the energies required for a non-zero mass's motion in a gravitational field and why objects of different masses move at the same rate (velocity) in a gravitational field.

The need for this proposal shall be demonstrated with an analysis of Einstein's account of *spacetime* theory, and relativity theory's inability to properly and most thoroughly account for the concept of time and the associated phenomena of causality for a non-zero mass object in a gravitational field, in the case there the causality of gravity and then how gravity is meant to move masses both in terms of the rate of motion of different masses and yet more importantly their required energies.

In introducing the proposed *axiom* of time, having highlighted the deficiencies of *spacetime* theory, the new model for time will be forwarded by first examining the basic idea of a *time-domain* and associated *action principle* in the known physical phenomenal datum-reference of *time-now*. A summary of the papers central to the proposed new model for time shall be then presented [1-39] in extending the findings of paper 39 [39] regarding gravity, presenting the case for a new description of relativity in fully accommodating for the classical mechanical descriptions of momentum and force, here as *timespace* relativity theory, detailing an actual mathematical basis for how objects of different masses move at the same velocity in the same gravitational field, fundamentally addressing the query first made by Galileo half a millennia ago, here though having derived G, α, and h, together with the known metrics of the sun [39]. Upon such, the known field forces will be demonstrated in this new Temporal Mechanics derivation of the fundamental constants, following which an analysis of all the idiosyncrasies and peculiarities of time for light (time-dilation, time-contraction, gravitational red shift, gravitational lensing) will be presented.

This paper accordingly shall be structured as follows:

1. Introduction
2. Perception, time, space, and their relationship to physical theories
3. The problem with General Relativity
4. Temporal Mechanics
5. Temporal relativity
6. The temporal field forces
7. Temporal anomalies with motion and gravity
8. Conclusion

Here, the idea of time-domains is proposed to be the foundation for a temporal wave function (as a time-equation applied to space) representing a *timespace field*, presenting the basis for a *unified field theory* given what it is able to derive precisely with mathematics, and how compatible such is with accepted data of physical phenomena.

2. Perception, time, space, and their relationship to physical theories

The fundamental premise of Temporal Mechanics is in accepting that the only way to construct a clear description of the physical world is to understand what it takes in the first place to develop a "*clear description*" of the physical world, namely the clarity of our recognition and understanding of temporal and spatial perception, and how that can be then mathematicised and then scaled to known phenomena.

Simply, Temporal Mechanics considers that it is not possible to construct a clear world view of physical phenomena without first addressing the fundamentals of our perception ability, and thus here in aiming for a physical world view such is considered only possible via a process of acknowledging what is perceptively possible from our human reference ability for the dimensions of time and space. Such of course may appear as a type of "humanistic" if not "rational" approach, yet such is not an ideological or metaphysical view, rather a placing of the condition on our human ability of perception *first*.

It is considered here that any fundamental properties of a world view (and thence physical model) would be dependent on our demonstrable perception ability with time and space. In other words, the view here is that the fundamental equations of physical phenomena cannot be *fundamental* without making them fundamental *as related to a specific axiom of our ability to perceive time and space*, namely by allowing certain fundamental and consistent traits of our humanistic-rational temporal and spatial perception abilities to be mathematized to thence form the basis of a mathematical analysis of physical phenomena.

The *primary* theoretic focus of choice here for human phenomenal awareness is *time*; space is basic enough if indeed space can be considered as a 3-d vacuum in the datum reference of *time-now*, yet what determines phenomena in space and the dynamic there is proposed to be relevant to the mechanics of time, and fundamentally so, and yet more importantly, the interoperation of time with the other dimensional considerations of space, namely 1-d space, 2-d space, and 3-d space.

In short, the discipline of physics is ideally about what is realistic and achievable, and so the same should be said about the concepts of time and space, of their dimensions, namely the dimensions of time and space being achievable and realistic in unambiguously mathematizing our temporal perception ability of them. Presented here is the case for a rational and thorough account of time and its relationship to physics theory via mathematics.

2.1 What is "time"?

Time in physics is defined by its measurement, namely as what a clock measures. In classical (non-relativistic) physics, it is a scalar quantity, and, like length, mass, and charge, it is usually described as a fundamental quantity. Here with Temporal Mechanics such is no different, except that here the idea of "time-domains" are used to formulate a time-equation that when applied to Pythagorean algebraic (Euclidean) space (1-d, 2-d, and 3-d) leads to the development of a temporal wave function that (by its condition of needing to prescribe π) defines an atomic locale and associated physical phenomenal attributes.

Time can be empirical, or emergent, but the emergence of anything is a process of time itself, thus time must be an absolutely empirical thing. The question is *how*.

Time with Temporal Mechanics is merely acknowledged to be a fundamental reference associated to not just space yet our perception ability (along with our perception ability of space), a perception ability of course endowed with the accompanying structural phenomena of particles, particle qualities, and field forces. How our temporal ability of perception is proposed to be mathematicised is per the *time-domains* of *time-before* and *time-after* proposed to circumscribe the datum-reference time-domain of *time-now*.

Indeed, time is change, yet the question is how can that change be scaled. Time can also equate to zero in the case of time at the speed of light, at c, yet how can that be scaled with other contexts of *change*?

Temporal Mechanics has found that physical phenomena can be derived by applying the time-equation to space in generating a temporal wave function and thence a *timespace* locale as the atom.

In short, there are many ideas on time, yet the basic feature of time presented here is the idea of three time-domains, namely *time-before*, *time-now*, and *time-after*, thoroughly explained throughout each of the papers [1-39], to be further discussed nonetheless here.

2.2 What is "space"?

According to contemporary physics, space is the boundless three-dimensional extent in which objects and events have relative position and direction.

In classical physics, physical space is most commonly conceived as three linear dimensions.

In modern physics (care of Einstein's General Relativity), space is considered with time as a four-dimensional continuum known as *spacetime*, namely the 3-dimensions of space and 1-dimension of time.

The concept of space nonetheless is unanimously considered to be of fundamental importance to understanding the physical universe.

"Space" according to Temporal Mechanics is a purely mathematical construction associated to "time"; "space" according to Temporal Mechanics takes genesis from labelling the two features of the time-equation, φ and $\frac{-1}{\varphi}$, as 1-d "lines" in space, and then applying Pythagorean algebra to those lines to convene the extra dimensions of space, namely 2-d space, and 3-d space.

In fact, if it were not for the time-domains and thence time-equation, space would be nothing, completely nothing, a pure void, *dimensionless*. Yet it is the principle of using *the golden ratio features of the time-equation* to present themselves each as a 1-d scalar for space, as presented in paper 2, pages 3-14, figures 1-13 ([2]: p3-14, fig1-13), to then construct the 2-d and 3-d features of space, that is proposed to make the idea of space *as space*.

The hidden benefit here of making space purely a mathematical construction for time is that in designating 3-d space to the datum reference of *time-now* then the mathematics of the time-equation and those conditions in deriving 3-d space *would event* mathematically what is logically perceived *in time*. Such has been the entire process of Temporal Mechanics, namely, to derived time-based phenomena using a $temporal\ calculus$ (time applied to space) approach. Simply, time applied to space dimensionally creates a "transformational precedent" for temporal events in space, a type of *timespace transformation calculus*, or as Temporal Mechanics regards as a $temporal\ calculus$ [20-29].

In short, Temporal Mechanics makes no assumptions for space, nor time. The only assumption that could be considered an assumption is that we as human have a conscious ability of time and space in a certain manner that can be *mathematized*.

3. The problem with General Relativity

Temporal Mechanics has found the key problem with Einstein's General Relativity theory is in it not properly explaining what Galileo himself questioned, *namely how objects of different masses (and in Galileo's case the swinging of a pendulum) fall at the same rate*, suggesting that there must exist a fundamental disparity between mass and gravity and/or that gravity is a type of universal field force affecting different masses *equally*. How did Einstein explain or not explain such?

Although Einstein used a concept called the "*equivalence principle*", namely that gravitational mass would equate to inertial mass as per the mathematical equation of $G\frac{m_1 m_2}{d^2} = ma$, there is however a major flaw to his simple use of such a principle, and it has everything to do with "*temporal causality*".

Einstein developed his equations on the principles of momentum-inertia handed down by Sir Isaac Newton, which thence were incorporated into Einstein's Special Relativity theory in accommodating for the known constancy of the speed of light c for any frame of moving reference. To develop gravity though as a theory, Einstein needed to develop the idea of free-fall for a mass in a gravitational field, so Einstein had to somehow dispense of the idea of inertia in that gravitational field to allow for a type of free fall effect for mass, as much as non-inertia is free fall, while still allowing that same mass to have inertial qualities if required when acted upon by another force in that free-fall state, hence his need to factor out inertia in his primary General Relativity equations yet still need to use the idea of the equivalence principle, namely that gravitational mass would equate to inertial mass, as per his simple mathematical notion of $G\frac{m_1 m_2}{d^2} = ma$.

In short, Einstein merely dispensed of the idea of inertia in his General Relativity equations to create a type of mass free-fall scenario for his *spacetime* field of gravity, a groove for that mass, and then used the equivalence principle ($G\frac{m_1 m_2}{d^2} = ma$) to assist in still allowing gravitational mass to equate to inertial mass to create a consistency of velocity for a free-fall event.

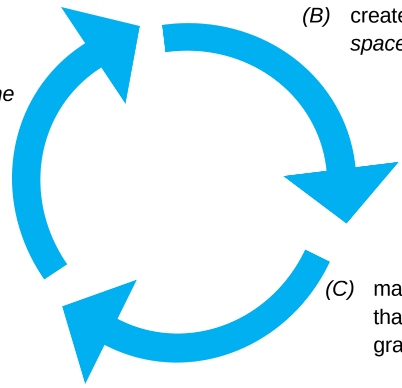
The problem Einstein faced though was not that he explained gravity in the absence of aether, gravity as a curvature of his *spacetime*, yet how mass itself was *related* to his *spacetime*, and how gravity as a curvature of his *spacetime* still needed to remain somehow mass itself, as Galileo realized with bodies of different masses falling at the same rate in the same gravitational field, yet most importantly where the energy came from for gravity to effect mass into motion.

Indeed, Einstein correctly realized that he had to dispense of inertia to explain a free-fall effect of a body in a gravitational field, yet he did not account for the precise mathematical relationship between mass and gravity, between mass and the curvature of his *spacetime*, *in* that free-fall condition of non-inertia *in regard to the energy requirements of gravity there to affect the motion of mass*.

The essence of the problem for Einstein was that his idea of General Relativity created a *causality paradox*, as follows from paper 39 ([39]: p5, fig1):

> *According to General Relativity, mass moves in the curvature of spacetime, yields to spacetime, yet gravity here is the secondary result of the uneven distribution of mass (the uneven distribution of mass causing the curve of spacetime in the first place), thus giving a priori status to spacetime, yet the consequence of spacetime being gravity, or simply as follows, figure 1:*

Paper 39, Figure 1



Paper 39, Figure 1: *a paradoxical cycle (C)>(A) of causality regarding inertial mass and gravitational mass.*

> *Essentially, the end result of this process has an effect on mass (C) abiding by gravity (B), mass though which technically should be the cause itself by its uneven distribution (A) to cause the effect of gravity in spacetime in the first place (B).*

In some way, the fundamental issue Einstein faced in explaining gravity was the equivalence principle, in equating gravitational mass ($G\frac{m_1 m_2}{d^2}$) with inertial mass (ma), namely that he constructed a scheme whereby ***mass*** supposedly creates gravity, and then gravity moves mass, and not only that, gravity moves masses of different mass-values ***at the same velocity***, despite Einstein's General Relativity being developed upon mv, momentum, specifically the energy-momentum-stress tensor, which technically therefore requires different curvatures of his *spacetime* context for different masses to move in respect to one another *with different energy requirements*. How did Einstein mathematically explain the "conservation of momentum and energy", or were they *assumed* properties in play?

Consider figure 1 as an adaptation of figure 1 from paper 39 ([39]: p5, fig1):

Figure 1

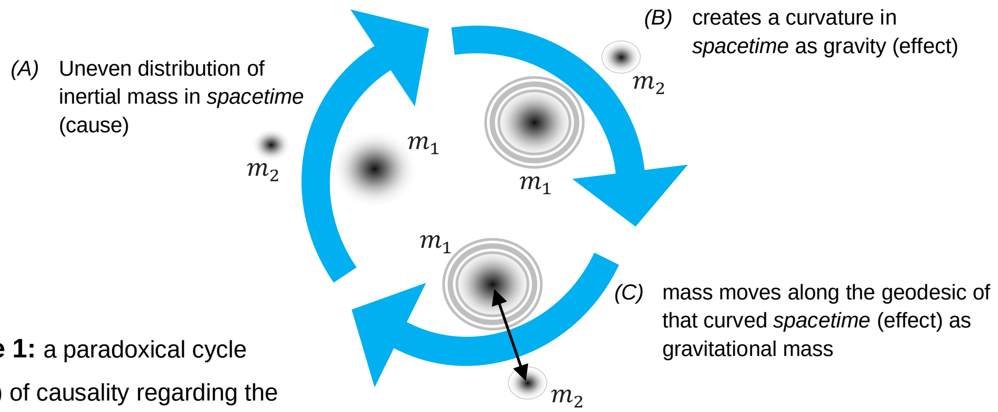


Figure 1: a paradoxical cycle (C)>(A) of causality regarding the energy requirements for gravity.

The presumption here is that these two masses, m_1 and m_2, fall at the same rate toward each other, namely a logical consideration for a *conservation of momentum* principle, as the motions of both objects would be relative to each other (in that the motion of either object could be viewed as stationary), meaning they would both have the same velocity anyway in the context of a *conservation of momentum* principle at play. Yet, energy requirements of each mass would each be unique to their motion based on their unique mass values. The other question of course is "where does the energy come from for the motion of m_1 and m_2 given each are tagged to the idea of an mv-energy tensor?".

The concept of the *conservation of momentum* is not in question here, merely:

(i) where the energy comes from for gravity to move mass after mass brings into effect the gravitational field, bearing in mind General Relativity prescribes m_1 and m_2 to be non-inertial in their free-fall with one another while still using m_1v and m_2v,

(ii) and yet more importantly how that energy is supplied to the different masses according to their unique inertial requirements.

In short, it is the momentum-energy tensor that is the key query here.

To break this down, how did Einstein use energy and momentum in his equations for gravity?

He prescribed those concepts to the idea of a tensor as by the equation $G_{\mu v} + g_{\mu v}\Lambda = \frac{8\pi G}{c^4}T_{\mu v}$, an equation that relates a spacetime geometry to the distribution of mass-energy, momentum, and stress, in determining a metric tensor of spacetime for a given arrangement of stress-energy-momentum in that spacetime. In such a way, Einstein proposed that the inertial trajectories of particles and geodesics in the resulting geometry can then be calculated with the geodesic equation.

The result was problematic:

(iii) there became a need for a vast amount of energy to make all of such work, hence the cosmological constant (Λ) problem, namely an absurdly large value for Λ, a problem though as clear as crystal in seeing the paradoxical way he regarded cause and effect,

(iv) and that Einstein's use of the "conservation of momentum" principle with his equations regarding v and c required bodies approaching c (and yet relative to what?) *to gain mass*.

Above all, General Relativity's primary error was in proposing:

(v) that the position of mass then creates a gravitational potential which then acts back on the mass itself to make the mass move, as though mass warps spacetime which then makes mass move by that warping of spacetime, which is Illogical, as it requires fictitious energy to make the mass move as a result of it being generated by mass (apparently according to General Relativity), namely that the movement of mass would be dependent on the warping of spacetime as gravity which would be dependent on the local mass-event tagged with a momentum-energy tensor, hence Einstein's cosmological constant Λ problem.

Essentially, in light of issues (i)-(v), Einstein broke a cardinal rule in proposing a free energy system if not for the requirement of dark energy (*which has still yet to be discovered*).

Fundamentally, what Einstein didn't achieve mathematically was explaining *why* and *how* the effect of gravity on mass is uniform in the case of different masses and thus in his case causing differing local curvatures of *spacetime* affecting thence what should be different independent motions for the different masses *themselves* (unless of course for the assumed principle of conservation of momentum). Most importantly Einstein failed to explain the energy resource and those different energy requirements for those masses having energy-momentum tensor relationships with spacetime, energy requirements *that come from where*? All of such, in his applying General Relativity to a cosmological model, he *created* the cosmological constant problem*, namely the need for a truly enormous (by a factor of* 10^{121} *compared to the vacuum energy) amount of energy to make gravity effect mass after the fact mass according to his theory creates the curvature of spacetime as gravity in the first place*.

Temporal Mechanics proposes that the only way to resolve that conundrum of causality (v) is to use "*time-domains*" to take the causality loop out of *time-now* for "*gravity and mass*" yet relocate via the employment of other time-domains (namely *time-before* and *time-after*) as a more complete mathematical description, thus *Temporal Mechanics*, namely the proposal of time-domains that can then rectify how the “conservation of momentum” principle can be upheld while allowing an equitable distribution of energy for different masses affected by each other’s gravitational field.

Clearly the question is, “how can such a process be accorded?”.

4. Temporal Mechanics

The focus here is in delivering a more correct if not fundamental account of gravity and the relativity of moving objects in space in accounting for how objects of different masses move at the same velocity in a gravitational field and thus delivering a fundamental mathematical description for the “why” of the *conservation of momentum* principle.

The process Temporal Mechanics takes is to deliver a more thorough foundation than the idea itself of inertia-energy-momentum, to resolve that issue as an *a priori*, in not making inertia-energy-momentum an *a priori*. Here Temporal Mechanics considers approaching the key issue vexing General Relativity theory, namely the issue of time in regard to the temporal causality between mass and gravity, between a non-zero mass object the field force of gravity, and to give “time” *a priori* status.

Here, instead of *looking* for time, instead of deriving time as a *consequence* of relativity, Temporal Mechanics proposes what time is as a model based on our *humanistic* temporal ability, and not our consequential or supernatural ability of time, and then tests that model in asking it to derive known phenomena based on certain basic nominated scales (say the Bohr radius a^0 for space as a scale, and the charge of an electron e_c for the idea of charge), and to then derive the fundamental constants $(G, \alpha,\ h, k_e)$, and to *then* solve the problem of *why* mathematically different masses move at the same speed in the same G field, and to *then* derive *what* those energy restrictions and requirements are without breaking the rulings and principles of the fundamental constants $(G, \alpha,\ h, k_e)$, and of course without inventing concepts like dark energy or dark matter.

4.1 Action (principle)

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, purely.

In short, the idea of the *Lagrangian* is not being disputed for the datum reference of space for *time-now*, as such will be derived in section 5. 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 (1-d, 2-d, 3-d) of space.

4.2 Time-domains

Temporal Mechanics is a body of work proposing "*time*", or rather, the association of time-domains (*time-before*, *time-now*, and *time-after*) to be the ideal primary feature of mathematical analysis of physical phenomena, and *not inertia-momentum-energy* in the *action* of *time-now* alone, as the primary feature of mathematical analysis, instituting specific time-domains (*time-before*, *time-now*, and *time-after*) to space to thence construct the idea of a flow of time in regard to space as *timespace* as a specific time-equation relationship with Pythagorean algebraic space which then derives a temporal wave function, all of such as a process of applying an axiomatic time-equation to Pythagorean algebraic space (1-d, 2-d, 3-d), as outlined in paper 2 ([2]: p3-9). This process is considered superior to the current process of using the *time-now* time-domain for the *Lagrangian* mathematical focus of inertia/mass spatial transformation (Lorentz) analysis alone, given what this new process can derive on an *a priori*, *ab initio*, basis, in comparison to other physical models ([39]: p27-30).

A *time-domain* (or time domain) refers to the analysis of either mathematical functions, physical signals, or a series of data points indexed in time (as a time series), usually applied to the statistical analysis of financial or environmental data with respect to time, whether as a process of analysis of continuous time or at various separate instances in the form of discrete time.

Here Temporal Mechanics proposes a *mathematical-function* and *time-series* approach to the concept of time, namely as a series of data points indexed in time, both as *continuous time* and *discrete time*. How so?

The time-domains of Temporal Mechanics are merely the determination/definition of *time-before*, *time-now*, and *time-after*, constructed together (in association to one another) to create the precedent of a flow of time as a time-equation which when mathematically applied to Pythagorean algebraic space (1-d, 2-d, 3-d) results in the temporal wave function that has both particle and wave features while also describing/deriving c and how at c time=0. Ultimately this time-space grid (*timespace*) results in the general feature of *time-before* (and thus "*non-local*") time-points in space by the mandate of the time-equation applied to Pythagorean algebraic space.

4.3 <u>*The time-axiom and time-equation*</u>

The *primary philosophical axiom* for time was reached in considering that time (as is self-evident to human perception) most simply *as an arrow*, is based on three basic time-domain parameters, namely *time-before*, *time-now*, and *time-after*, where *time-before* is the past, *time-now* is the universal datum-reference of the present, 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, was derived the mathematical axiom, the time-equation.

The time-equation as presented in paper 1 ([1]: p3-4, eq1-6) forms the basis of the phi-quantum (temporal) wave function ($PQWF$) (replacement of the Schrödinger equation) with its already intrinsic transformation spatial play, as presented in paper 2 ([2]: p3-11), and then re-derived via another process in paper 8 ([8]: p2-4):

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's 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.

$$(-t_B)\ +1 = fundamental\, property\ A \qquad \textit{equation 1.}$$

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).

$$\frac{1}{(-t_B)} = fundamental\, property\ B \qquad \textit{equation 2.}$$

Thus, if these two features represent fundamental properties of time, and time itself is a singularity, then <u>fundamental property A</u> must equate to <u>fundamental property B</u> (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.

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 considered as the key theoretic *axiom*, 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 t_N=1 time-domain feature*.

In other words, there is proposed to exist 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 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 that would imply that all physical processes in *time-now* are equitable, *whenever* they are measured, an idea proposed by Emmy Noether [40].

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.*

Consider figure 2 placing the *Lagrangian* in the *time-now* time-domain, highlighting two aspects to analysing time, namely the *Lagrangian* entirely in the *time-now* time-domain, or time extended from *time-before* to *time-after* via *time-now* as per the time-equation $t_B + 1 = t_B^2$:

Figure 2

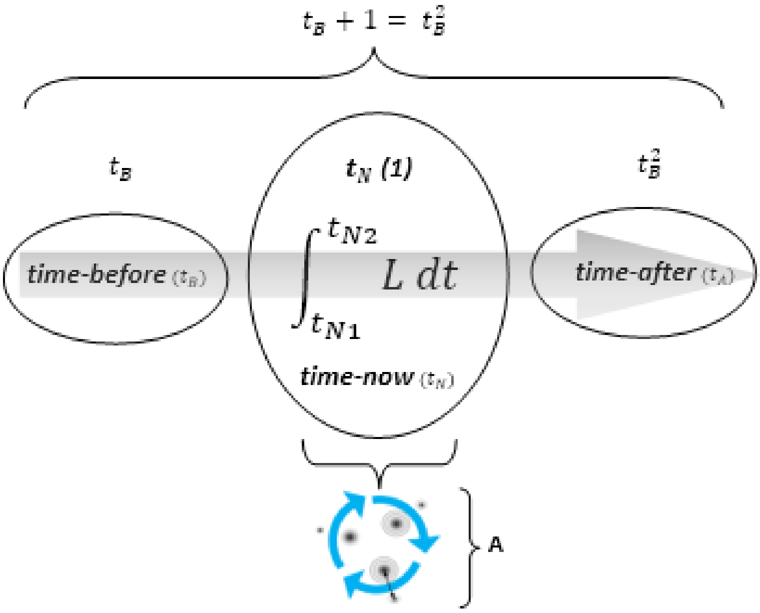


Figure 2: highlighting the current *Lagrangian* locale for time, namely *time-now*, and the over-arching time-equation time-domains of *time-before* and *time-after*, "**A**" highlighting General Relativity's causality problem (figure 1) for the datum reference of *time-now*.

4.4 Applying the time-equation to space: the time clock

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

Consider figure 3 as a basic portrayal of the time-domains integral to the proposed dimensional analysis of space:

Figure 3

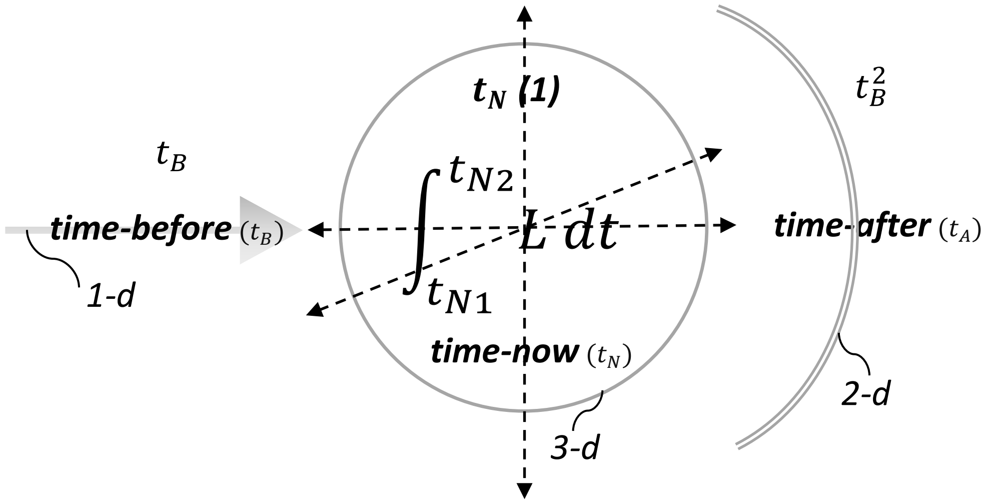
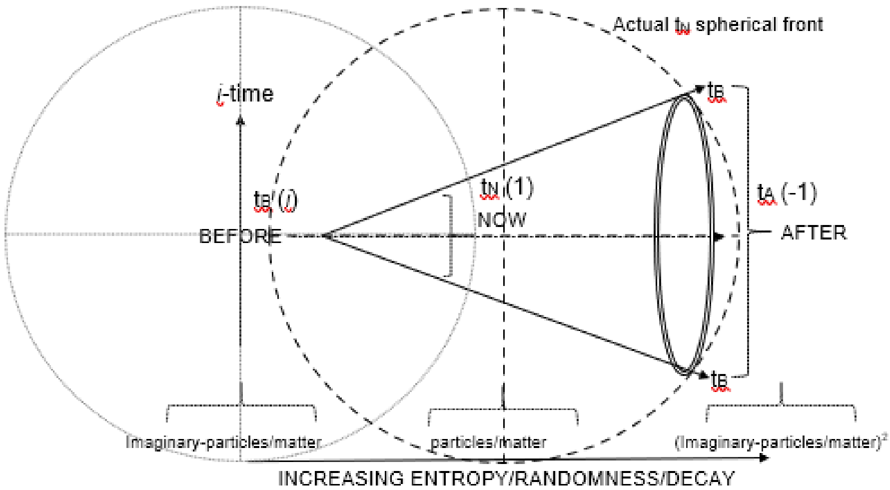


Figure 3: Space as the 1-d (time-before, t_B), 2-d (time-after, t_A) and 3-d (time-now, t_N) vacuum that acts as a spatial-scale backdrop for the temporal wave function that primarily requires the time-domains of *time-before*, *time-now*, and *time-after*, despite physical phenomena existing in the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

This concept was first diagrammatically presented in paper 1 as figure 9.3 ([1]: p7, fig 9.3):

Paper 1, Figure 9.3



Once again, the concept of space in paper 1 ([1]: p1-7) was developed mathematically in paper 2 ([2]: p3-7) by applying the golden ratio variables of the time-equation (φ, $\frac{-1}{\varphi}$) as metric values for spatial distance, for 1-d, as lines in space, 1-d lines which when relating via a Pythagorean algebraic manner thence derive the dimensions of space (2-d and 3-d).

What Einstein's General Relativity misses with the idea of space and time therefore (as spacetime) is that his spacetime is stuck in the datum reference of *time-now* trying to resolve issues of causality specific to gravity and mass when such can be resolved mathematically *outside* the datum reference of *time-now* in breaking down the theoretic dimensions of time and space, namely in considering different and unique facets for the dimensions of time and space.

4.5 Demonstrating the time-equation

Temporal Mechanics has found [1-39] 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 nonetheless be considered.

Figure 4

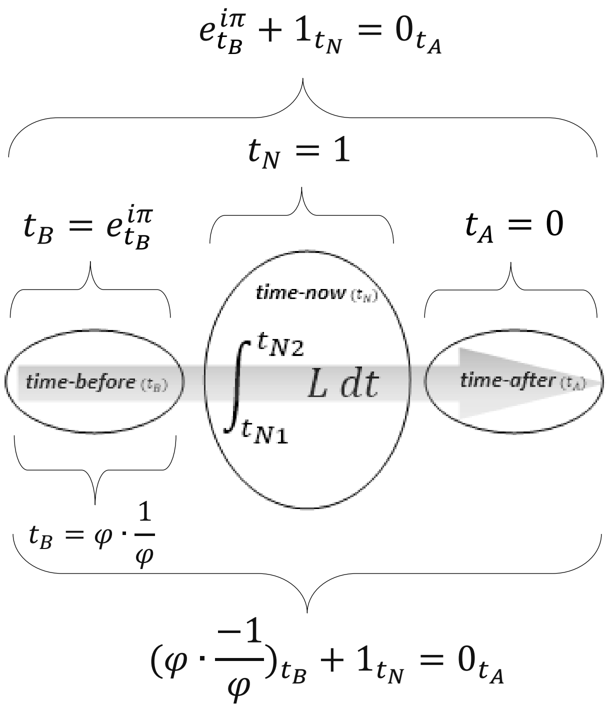


Figure 4: The idea of gravity being a part of an entropic process where $t_A = 0$, and to accommodate for such t_B primarily represents a complete representation of the golden ratio as $\varphi \cdot \frac{-1}{\varphi}$ together with an emergent representation of $e^{i\pi}$.

In figure 4, the process is of describing how physical phenomena is confined to the datum-reference of *time-now*, yet how gravity in that same process came to be represented as 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. This equation was derived to be the following, effecting a steady energy state scenario, a conservation of energy scenario, paper 15 ([15]: p11):

Euler's formula on the surface is analogous to $t_B + t_N = t_A$ where $t_N = 1$ and $t_A = 0$ and $t_B = e^{i\pi}$, as per equation 6:

$$e^{i\pi}_{t_B} + 1_{t_N} = 0_{t_A} \qquad \textit{([15], eq6.)}$$

The idea of $t_A = 0$ is essential to understanding this is a time-equation for "atomic resource-decay", or quite simply, a 0-future. The "e" component of time as t_B is simply represented to a power of π on a complex number plane, as π in a complex number plane. Yet another equation can be employed incorporating the golden ratio value of t_B in the standard φ-algorithm for time, and the only way that equation can be written is by associating "e" with "φ" to equate to "π" in the following standard linear manner as per equation 7:

$$e^2 + \varphi^2 \sim \pi^2 \qquad \text{([15], eq7.)}$$

However, this should be more accurately written in the following manner, as per equation 8:

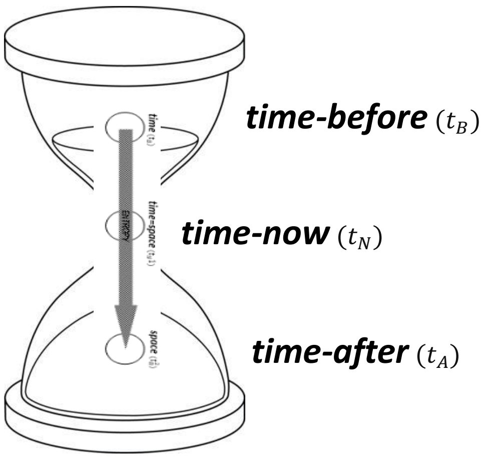
$$e^2 + \varphi^2 \cong \left(\sqrt{\frac{19.8}{20}}\,\pi\right)^2 \qquad \text{([15], eq8.)}$$

Thus, the proposed requirement there is that the energy for gravity to effect mass is funded by the time-equation, or rather the temporal wave function feature of being reduced to naught in order to become mass as per the DIR process ([38]: p17-22) funds the energy requirements of mass being affected by gravity, an energy feature itself that is not and should not be a formulation in the datum reference of *time-now* alone (which is where and why Einstein's General Relativity falls apart), simply because General Relativity employs energy-momentum metric tensors for his *spacetime exclusively in* the datum reference of *time-now* for individual mass icons.

A simple Temporal Mechanics description of the process of gravity was presented in paper 39 ([39]: p16, fig5), here as figure 5:

Figure 5

Figure 5: adapting figure 4 to the simple idea of an hourglass in demonstration of time's flow, as the time-equation in regard to gravity, with the backdrop of the time-domains of *time-before*, *time-now*, and *time-after*.



Greater detail of all the above was presented in paper 39, pages 10-30, sections 3.1.-.3.7, as section headings as follows ([39]: p10-30):

There are seven key features to Temporal Mechanics:

3.1 Addressing the idea of time-domains.

3.2 Proposing an axiom for time and associated time-equation.

3.3 The time-equation as applied to Pythagorean algebraic space to derive the temporal wave function as both a wave and particle.

3.4 A "principle of simplicity" process of construction for the time-points in regard to the time-equation with space.

3.5 The particle atomic locale description for the temporal wave function, and thus a particle-field description.

3.6 The temperature scaling system accounting for the entropic nature of time's flow.

3.7 Abiding by an "intended phenomena design" process.

From that same paper were the derivations of the atomic temperature *plexus* (fuse box), deriving G, α, h, and k_e, together with deriving the phenomenal values of the sun, as the following sections (4.-11.) of paper 39 ([39]: p30-67), section headings as follows:

4. Solar Physics

5. Solar mass

6. The maximum and minimum scale of timespace

7. The electron degeneracy limit and associated temperature scale value

8. "Fine structure constant" scales and metrics

9. Planck scales and metrics

10. Solar scales and metrics

11. The "solar system" cosmological foundation

In paper 39 [39] there are explained the derivations of G, α, h, and thence k_e, all from how the temporal wave function resulted from the mathematical application of the time-equation to Pythagorean algebraic space, and more importantly of the temporal wave function seeking to exact "π", that fundamental requirement at play for the time-equation and its relationship with space.

In short, the time-equation is the idea of a humanistic-rational temporal clock scaled precisely with Pythagorean algebraic (Euclidean) space to the scales of the Bohr radius a^0 and the charge of the electron e_c, in creating a temporal wave function that governs c to be a constant for all moving frames of reference in the datum-reference of *time-now* where time=0 at the speed of c, namely where the temporal wave function as c deliberates the concept of time in the time-domain of *time-now*. There, for the datum-reference of *time-now*, light (EM) is in fact the idea of time and time's dynamical nature (constant for all moving frames of reference and where at c time=0) *as* a universal time clock. Temporal Mechanics merely went further into that by deriving the time-equation and applying that to Pythagorean algebraic space to derive the temporal wave function and all the known phenomenal attributes of light with space.

The next step in this process of derivation is to now move forward to bridging this work to the *Lagrangian* of *time-now*, momentum-energy, and to explain mathematically why and how objects as different masses move at the same rate in a gravitational field and thence how the energy requirement there (for the motion of the masses due to gravity) makes gravity itself manifest and effect mass without requiring the amounts of energy that creates the cosmological constant problem (as became apparent with General Relativity).

Here will now be demonstrated how time (as a basis for energy) and thence space accommodates correctly for objects of different masses in relative motion.

5. Temporal relativity

Here Temporal Mechanics will demonstrate how it supports the known "action" (principle) equations (energy-momentum) for time by defining how bodies can be related in motion relative to one another in the datum reference solely of *time-now*, as what the ***Lagrangian*** system achieves, yet via a broader if not more precise understanding of time and space in not incurring the same energy-momentum conditions and associated problems of General Relativity.

The key question here is, "*what gives gravity energy to make mass move, and not only that, what makes objects of different masses move at the same rate in a gravitational field*?"

The idea here is not to assume the concept of "conservation of momentum", yet to derive *why* that principle *exists*.

As presented in section 4.5, essentially gravity is proposed to be given its energy in an overall context of what is prescribed by an incursion of the temporal wave function, basically as a "destructive interference resonance" (DIR) of the temporal wave function. Simply, when the energy of the temporal wave function gives itself to mass through a DIR, *or other incursion process, namely the electron degeneracy process* ([39]: p41-46), it also creates a gravity effect based predominantly on the energy of the temporal wave function giving to mass. The electron degeneracy process was demonstrated in paper 39 deriving the G constant directly associated to the mass of the lightest particle, the neutrino, as equation 20 page 44 ([39]: p44, eq10):

One equation for G to consider in this incursion context is based on equation 14, as equation 20 in using the incursion value of $M_{MG} = 1.50127 \cdot 10^{-37} kg$:

$$G = \frac{33\, M_{MG}\, c^3}{2} = 6.6743 \cdot 10^{-11}\, kg\, m^3\, s^{-3} \qquad \text{([39], eq20.)}$$

Here therefore gravity is defined <u>most accurately</u>, as a more perfect number presentation, in the context of a temporal wave function collapse-incursion event using the value of $G = \frac{33\, M_{MG}\, c^3}{2} = 6.6743 \cdot 10^{-11}\, kg\, m^3\, s^{-3}$ where $M_{MG} = 1.50127 \cdot 10^{-37} kg$

The clear concept here is that Gravity relies <u>on a number of key features</u> in either a standard (non-incursion) or non-standard (incursion) situation. It is as though gravity acts as a type of system buffer effect to keep all of the timespace physical phenomena in check with the requirements of the temporal *wave function, yet more to this, <u>that both G and c are firmly held constants for the vacuum of space</u> despite potential incursions of subatomic particle breakdown to the elementary particle level.*

This as an <u>electron incursion value for gravity</u> would appear to be the correct value for gravity, as a fundamental value representative of a proposed temporal wave function collapse and thus in theory an integral incursion event scenario for mass formation (as per the proposed "destructive interference resonance" process (DIR) for mass-formation detailed in paper 38 [38]).

The proposal here is to examine more closely this equation, namely $G = \frac{33\, M_{MG}\, c^3}{2}$, and ask how it can relate to a feature of inertial mass, here proposed to be described as $F = ma$, and what can be revealed in doing such.

5.1 <u>*Introducing classical mechanics*</u>

One of the key equations of classical mechanics is Newton's equation of force, equation 4:

$$F = ma \tag{4.}$$

Here, force equates with the inertial mass of an object and the acceleration of that object subject to the force required to make it move. The equation can also be written as follows:

$$F = mv \cdot \frac{1}{t} = \frac{p}{t} \tag{5.}$$

Here is introduced the idea of *rate of change* ($\frac{1}{t}$) *of momentum* (p).

Instead of using the notion of rate of change in time, let us consider the distance in space upon a backdrop of a c-scaling system, namely that c *per the distance an object moves* equates to $\frac{1}{t}$, as per the following equation:

$$F = mv \cdot \frac{c}{d} \tag{6.}$$

Such is proposed as the case for inertial mass.

The next step to consider here is how this can relate with an equation for gravity, namely in taking two masses, say m_1 and m_2 separated by a distance d. Equation 6 above thence becomes as equations 7 and 8:

$$F_{m_1} = \frac{m_1 vc}{d} \tag{7.}$$

$$F_{m_2} = \frac{m_2 vc}{d} \tag{8.}$$

Note, v would ideally be the relative velocity of masses m_1 and m_2 as a constant value for the time-domain of *time-now*, as a standard (as shall be explained ahead).

The overall force for m_1 and m_2, say $F_{m_1 m_2}$ would equate to the following, equation 9:

$$F_{m_1 m_2} = \frac{m_1 m_2 v^2 c^2}{d^2} \tag{9.}$$

In understanding from classical mechanics that $F = G\frac{m_1 m_2}{d^2}$, then in applying this to equation 9, we have the following:

$$G = v^2 c^2 \tag{10.}$$

What does this mean? It simply means that as both G and c are constants, the velocity v between two non-zero mass objects m_1 and m_2 would also need to be a constant *in the context of a gravitational field*. Such is what the conservation of energy and conservation of momentum principles have aimed to uphold, here though presented mathematically.

To note here is that the value of v here is a constant as a *baseline standard*. *Although other increments of velocity may exist* ***within the time domain of time-now*** for the masses m_1 and m_2 in relative motion, this increment here for v considers the overall time-equation and thus time-domains of *time-before*, *time-now*, and *time-after* with specific focus on *time-now* regarding the gravitational constant G. In short, v is proposed to be a baseline standard for the *relative velocity* of masses m_1 and m_2 *that the gravitational field* ***recognizes***.

Thus, let this value of v be termed v_G and thus equation 10 becomes $G = {v_G}^2 c^2$.

The interesting feature to ask here though is that in knowing the values for G and c as derived by Temporal Mechanics, then what is the actual value of this baseline relative velocity standard v_G and furthermore what significance does that value have?

The value of v_G can be calculated as follows from equation 10, here as equation 11:

$$v_G = \frac{\sqrt{G}}{C} = 27.23 \cdot 10^{-15}\, ms^{-1} \tag{11.}$$

This value would appear to represent a vastly slow increment, yet relating to what exactly? And what happens to the actual relative velocity v between masses m_1 and m_2?

Here the proposal is that the value v_G relates to the time-domain of *time-now* where $t_N = 1$.

The actual relative velocity of the masses m_1 and m_2 as v is proposed to be the *overall* relative velocity, yet v_G here is the velocity *conditional with* G and c, and thus the gravitational energy for masses m_1 and m_2 in relative motion is conditional to their masses and only a set portion of velocity v_G.

Thus, if time=1 here in this equation (as per the condition of $t_N = 1$), naturally this value represents $27.23 \cdot 10^{-15}\ m$, as a scale of distance-length.

What does this value of distance-length bear reference to for each *time-now* increment of time as $t_N = 1$?

We need to bear in mind how the Temporal Mechanics consideration for G for the time-domain of *time-now* was derived, namely as $G = \frac{33\ M_{MG}\ c^3}{2}$, namely *in the event of an electron degeneracy scenario* dropping to a neutrino particle level, as the entire emphasis of paper 39 [39] presented. What was also presented there was the aetiology of the free proton and the derivation of the fine structure constant α and Planck's constant h, specifically how the proton was made available for new processes beyond the fine structure constant requirement, yet processes in line with $E = hf$, as presented on page 58 ([39]: p58):

> *Essentially, the Planck scale* h *represents an equitable loss and gain of the electron radius* r_e *and proton radius* r_p *("B", figure 12), which seems logical and practical, yet the fine structure scale* α *would seem to actually lose the radius of the proton ("A", figure 12) without re-gain. What therefore happens with that proton radius* r_p *loss? Simply, the loss of the proton is considered to represent how the sun is in fact powered and give off cosmic radiation, and not via the electron degeneracy incursion process per se. The further proposal is that this proton loss sets the precedent for cosmic ray formation at the sun, namely protons liberated* ***at*** *a* c*-scaled value (as a velocity close to that of* c*, to be detailed in a subsequent paper). Essentially, cosmic rays are proposed to be a fundamental process of* α*.*

The proposal here therefore is that the value of $v_G = 27.23 \cdot 10^{-15}\ m$ is related to the *proton* in the context of this G-derivation electron degeneracy limit. Yet what *nature* of the proton?

In the context of the electron degeneracy process here, the proposal is that $27.23 \cdot 10^{-15}\ m$ is related to the *electric-limit* component of the *proton* as a measure of distance and thus presumably its *charge radius*.

According to paper 2 ([2]: p19-20), the *electric atomic coupling limit* component of the atomic locale as the electron feature is associated to a 32.7 scale in regard to c, namely:

> *If we consider equation 14 (*$k_e = \frac{3 \cdot 19.8 \cdot 22 \cdot c}{2 \cdot 21.8}$*) and replace all the atomic scales there with just the one* 21.8 *scaling factor, as a proposed upper-level electric atomic coupling* ***limit****, we arrive at the following:*
>
> $$k_{e`} = \frac{3 \cdot 2 \cdot 21.8 \cdot c}{4} = 32.7c \qquad ([2]: eq16)$$
>
> *What would this value of* $k_{e`}$ *represent? It is, as the scaling factor suggests, a scaling "****limit****" value for a coupling constant, and thus presumably relevant to how the electrons would be limited in the atom as per the electron shells. In giving the value 32.7 phenomenal significance, the proposal is that there would be on this electron shell emergent level only a maximum of "32" full orientations for each*

electron shell level if indeed the proton and neutron must remain fixed as mass entities undertaking a strong force of association ([1]; p12).

The consideration here is for the "32.7" factor to be intrinsic to the value of "v_G" as an *electric atomic coupling* ***limit*** feature *for the proton* given $k_{e`} = 32.7c$, and thus given $G = {v_G}^2 c^2$ then as a new value for v_G, say v_p where $32.7 v_p = v_G$, then here we would have the following as equation 12:

$$v_p = \frac{v_G}{32.7} = 0.8327 \cdot 10^{-15}\, m \qquad (12.)$$

Thus, in the context of the time-domain of *time-now* as $t_N = 1$ and thus spatial distance we could consider that the proton *charge* (electric) radius r_{p_e} *(as a scaling "**limit**" value for a coupling constant, essentially here as the electron degeneracy limit context)* would represent the following value, equation 13:

$$r_{p_e} = \frac{27.23 \cdot 10^{-15}}{32.7} = 0.8327 \cdot 10^{-15}\, m \qquad (13.)$$

Here therefore the proposal is that this (classical mechanics) *force* feature at play (of momentum and thus inertia) highlights a basic and fundamental spatially scaled status of the proton as its *charge radius limit*, forming the basic anchor for an atom surrounded by an electron, a stabilized proton location, and thus practically a feature of the strong atomic field force (to be discussed in section 6), yet more precisely in the context of an electron degeneracy scenario, as a type of *force* at play, a force prescribing an electron degeneracy event for the case of a free proton scaled at c.

Here therefore is proposed a solution to the *proton radius puzzle* [41][42], namely two values for the proton radius:

- the first value for the proton radius was proposed as the *proton magnetic radius* as derived in paper 38 ([38]: p38-39) as a value of $0.8752728 \cdot 10^{-15}\, m$.
- Here, the *proton charge radius* value is derived as $0.8327 \cdot 10^{-15}\, m$.

To note in this context of derivation is how the mass of the proton was derived, namely from the charge of the electron using a c-scaling system, and thus presumably the mass of the "*free proton*", as per paper 23 ([23]: p22):

- *If particle speed and wavelength are known, distance and time:*
  - *the charge can be calculated as* $e_c = \frac{19.8 \cdot \lambda}{c}$ *([2]: p13, eq11)*
  - *and so too its mass* ***from which the electron as a charge came*** *(in using* $m = \frac{e}{c^2}$ *([2]: p16, eq15) and* $e_c = \frac{e}{c} = fundamental\ property$ *2, eq3):*
    - *thus* m *equates to* $\cong 5.3 * 10^{-28} kg$

- *Factor this by π and the mass of a proton (or neutron) can be calculated.*
  - *Why a factor of π?*
  - *The mass of the electron would have been "per" π, the actual spherical reference it is upon as the time-point cloud (TSG), yet the mass of the central time-point would not be per π and thus the $\underline{5.3 * 10^{-28} kg}$ value needs to be factored with π, giving:*
    - $\underline{\cong\ 1.67 * 10^{-27} kg}$

To note in the derivation process of proton mass, the mass of the proton forms along a different derivation path to that of the neutron, namely given (as it was derived) the neutron has no *charge* aetiology.

Consequently, the proton and neutron have slightly different mass values; the thinking here is that the proton would carry slightly less mass than the neutron, simply because the value of derivation for the *electric* neutrino as presented in paper 25 equation 10 ([25]: p51, eq10) was held at $m_{MG} = \frac{e_c}{c} \cdot \frac{1}{12} \cdot \frac{1}{c} = 1.486 \cdot 10^{-37} kg$, yet the non-electric neutrino value (and thus presumably a neutron neutrino value) was derived at $\sim 1.5152 \cdot 10^{-37} kg$ as per paper 35 equation 2 ([35]: p28, eq2).

As mentioned, another feature to note here is in the context of this electron degeneracy derivation event for $G = \frac{33\, M_{MG}\, c^3}{2}$ the proton would be associated to a "c" scale, and thus presumably the proton travelling at or close to the speed of light itself (c) as a proton charge radius *limit*. Thus, here is proposed to be the reasoning behind the why and how of cosmic rays, of the solar wind, namely how a free proton can step up to a c-scale in an electron degeneracy process.

What would be the maximum speed of this free proton?

Logically, the speed of this free proton would be the value of v from equation 11 subtracted from the limit value of c, say as velocity v_{pc}, as per equations 13-14:

$$v_{pc} = c - v_G \tag{13.}$$

$$v_{pc} = 2.99792458 \cdot 10^8 - 27.23 \cdot 10^{-15} = 299792457.999999999999973\, ms^{-1} \tag{14.}$$

The current maximum recorded speed for cosmic radiation has been found to be at a value of $299792457.99999999999992\, ms^{-1}$ [43], and so the value here (equation 14) is $5.3 \cdot 10^{-14}\, ms^{-1}$ faster, a minor amount, yet given equation 14 is a *derivation ab initio* for this phenomenon and that cosmic rays would slow down slightly in encountering random particles in space, this derived value is worthy of consideration as an upper maximum speed limit for cosmic rays.

Such then puts Einstein's General Relativity proposal of a body becoming massive approaching c into question, as here by this new process of "conservation of momentum" use there is a key "relativistic" implication to the idea of $G = {v_G}^2 c^2$ in that there would always exist a scale for c for each body in relative motion despite their independent *time-now Lagrangian* relative motions and associated velocities. In other words, for any particular body in motion, there is proposed to always be a reference of c with that body's own independent velocity as though taken in the datum reference of $t_N = 1$. The principal feature here is how the idea of momentum, mv, specifically v_G, is being annexed in G as $G = {v_G}^2 c^2$, suggesting that Einstein's relativistic conservation of momentum ruling (having mass become supermassive as it closely approaches c) is *flawed*.

Indeed, the idea of an object approaching the speed of light becoming massive is contrary to the natural phenomena of cosmic rays (solar wind), namely the free proton taken up to the speed of light, derived here as v_{pc}, a known experimental finding. Physics is unable to explain *how* this happens in nature, yet here the Temporal Mechanics proposal offers the condition of how G fundamentally interoperates with mass, as described above, leading to this phenomenon. Fundamentally, to present the argument that something becomes supermassive as it approaches c is counterintuitive to the phenomena of *cosmic rays* and how protons can be taken up to c without becoming supermassive, flagging Einstein's incorrect application of the "conservation of momentum" principle.

In short, the following is proposed to be in play:

(i) Mass emerges a gravitational field as per $G = \frac{33\, M_{MG}\, c^3}{2}$,

(ii) Gravity makes mass move as per $v_G = \frac{\sqrt{G}}{c} = 27.23 \cdot 10^{-15}\; ms^{-1}$.

(iii) Conservation of momentum is held in the mathematical feature of $G = {v_G}^2 c^2$.

(iv) The movement of masses in a G-field is consistent in being scaled with c.

(v) The movement of mass in a gravitational field operates according to the time-domain *time-after* $= 0$, and thus a force of gravity seeking greatest entropy.

With those five conditions the requirement of energy for gravity to affect the movement of mass is accommodated for as a sixth condition:

(vi) in the context already of an electron-degeneracy process where $E_e = 2.78 \cdot e_c$ was derived in paper 39 ([39]: p42, eq13) with E_e as the proposed energy related to the electron degeneracy process, thus eliminating the need for inventing energy (dark energy) and thence eliminating the problem of the cosmological constant anomaly in correctly already deriving the isotropic $CMBR$ feature of *timespace* as presented throughout paper 37 [37].

Essentially, with these six conditions above (i)-(vi), the *time-now* time-domain realm represents a more complete description for gravity than Einstein's General Relativity, in bringing into effect the ideas of inertia, momentum, energy, and thus force, namely in the context of classical mechanics, in order to factor in the requirements for both energy and c without incurring the cosmological constant problem and thus without requiring the idea of dark energy.

6. The temporal field forces

Given the inclusion of “force” here into the Temporal Mechanics formalism of logic, there now exists the opportunity to present a descriptive explanation of the known field forces in this Temporal Mechanics descriptive context, namely electromagnetism, gravity, the strong nuclear force, and the weak nuclear force.

Although two clear forces have become apparent in the manner of electromagnetism and gravity as per the findings of paper 39 chapters 5-9 ([39]: p32-59), here in this paper there appears to be two derived field forces, namely the strong and weak nuclear forces, closely associated to the primary field forces of electromagnetism and gravity. In fact, it appears electromagnetism is the key force from which emerges gravity, and thence the strong and weak nuclear forces.

6.1 Electromagnetism

According to Temporal Mechanics, electromagnetism is essentially the temporal wave function itself, as derived in paper 2 ([2]: p3-14). As a field force, perhaps the best summary paper and associated description to consider is paper 39 chapters 6-9 ([39]: p37-59) regarding the derivation of the fine structure constant α and Planck’s constant h, together with the electrostatic coupling constant k_e.

Simply, the temporal wave function (EM) as a field force is proposed by Temporal Mechanics to be the *primary* field force construct.

A list of the references for the temporal nature of the electromagnetic field force can be tracked as a theoretic Temporal Mechanics aetiology follows:

- EM and G temporal analogue equations of force ([1]: p9-14)
- 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)
- Provisional electrostatic charge force k_e constant ([2]: p13, eq13)
- Provisional Planck equation analogue $E = hf$ ([3]: p3, eq1)
- Linking EM with G ([21]: p14-23)
- Entropy and enthalpy as features of time’s arrow ([37]: p14-18)
- Quasiparticles and phonons ([38], p14-17)
- Fine structure constant derivation ([39]: p39-52)
- Planck constant derivation ([39]: p52-58)
- Electrostatic coupling constant derivation ([39]: p59)

6.2 Gravity

Gravity as also outlined in paper 39 ([39]: p32-37, p41-59) is proposed to be a derivative of the destructive interference resonance (DIR) of the temporal wave function, in fact the result of a DIR of the temporal wave function *or* an incursion event given the process of formulation of the G constant highlighted how this value developed in the context of an electron degeneracy scenario. This paper here though has explained the finer points of the gravity field force effect in the manner of explaining the correct context of the "conservation of momentum" principle.

A list of the references for the temporal nature of the gravitational field force can be tracked as a theoretic Temporal Mechanics aetiology as follows:

- EM and G temporal analogue equations of force ([1]: p9-14)
- Provisional gravity constant G for the gravitational force equation ([4]: p5, eq1)
- Negative energy proposal for gravity ([7]: p2-3)
- Linking EM with G ([21]: p14-23)
- Gravity as entropy ([22]: p4-7, p13-17)
- Proton/neutron mass from electron charge ([23]: p22)
- G constant from neutrino mass ([35]: p28-29, eq3)
- Entropy and enthalpy as features of time's arrow ([37]: p14-18)
- Particle pair production ([38], p17-22)
- The derivation of G ([39]: p43)
- The features of gravity central to energy and momentum (section 5)

6.3 Strong Nuclear Force

Temporal Mechanics proposes that the strong nuclear force is a feature of the proton charge radius derivation, namely $G = {v_G}^2 c^2$, that mathematical principle, which is proposed to both anchor the proton, and set its maximum speed limit to v_{pc}, a feature that would have its maximum force strength at or near the proton charge radius value, as it does. Thus, the strong nuclear force is proposed to be intrinsic to the force of gravity, operating though according to an *electric coupling limit* intrinsic to the G constant, as though a type of electrical feature of gravity operating at a distance of $\sim 1Fm$, as derived here in section 5, equations 7-12.

A list of the references for the temporal nature of the strong nuclear field force can be tracked as a theoretic Temporal Mechanics aetiology as follows:

- Particle location derivation from the time-equation ([23]: p12-20)
- Proton/neutron mass from electron charge ([23]: p22)
- Figure highlighting the strong nuclear force ([25]: p43, fig12)

- Proposed proton radius r_p ([38], p24-46)
- α and h features of the proton radius ([39]: p39-58)
- Features of the proton charge radius *force* (section 5)

6.4 Weak Nuclear Force

Temporal Mechanics proposes that the weak nuclear force is central to the neutron *yielding* to the more primary nature of the proton and the proton's relationship to gravity and the strong nuclear force, as thence what would appear to be a natural process of decay of the neutron to a proton and electron. A part of this process would involve, as specified in section 5, the idea of a neutron neutrino degeneracy to a proton neutrino, or rather how the neutrino values that were derived in paper 35 ([35]: p27-28, eq2) are required by gravity to hover around the value of $1.5055 \cdot 10^{-37} kg$, thus highlighting the process of the three types of neutrino *flavors*, the types of neutrinos, and why such happens.

A list of the references for the temporal nature of the weak field force can be tracked as a Temporal Mechanics aetiology as follows:

- Mass gap (Mass of neutrino) ([25]: p51, eq10)
- Figure highlighting the weak nuclear force ([25]: p43, fig12)
- Neutrino-antineutrino mass pair derivation from Planck length ([35]: p27-28, eq2)
- Electron degeneracy neutrino ([39]: p41-43, eq9-16).

The aetiology of these field forces, as presented, primarily as the temporal wave function phenomena and associated degeneracy, is the application itself of the proposed time-equation to Pythagorean algebraic space. Here Temporal Mechanics has derived the types of fundamental field forces, their field strength values and associated constants, and their ranges of spatial activity, all with their associated phenomenal attributes and interlinked nature with each other.

Temporal Mechanics therefore is able to propose a solution to the quest for a "unified field theory" by establishing a time-domain basis for the analysis of physical phenomena, yet more precisely, in applying a time-domain based time-equation to Pythagorean algebraic space, thence developing mathematically the temporal wave function and *then* scaling that temporal wave function to the known metrics of the atom, there in using two key metrics, namely the Bohr radius a^0 and the charge of the electron e_c, to thence label the mathematically derived phenomena accordingly.

7. Temporal anomalies with motion and gravity

The task now is to explain the temporal anomalies of light regarding bodies in motion in the time-domain of *time-now*, and the effect of gravity on light.

The basic doppler issues with light were presented in paper 39, pages 7-9 ([39]: p7-9):

2.6 *"c" as a constant, where time=0 at c.*

One of the key purposes and achievements of Special Relativity was to uphold the constancy of c, the speed of light, and the idea of time-dilation, namely the closer an object gets to c the more time dilates (slows down), ultimately to the point of time=0 at c. How can time=0 at c? Temporal Mechanics has found light is essentially a particle and wave as one, a wave as a train of photons, from one photon placement in space to the next, each photon relative to each other nonetheless as the absolute extreme time-dilation of time=0. The following is a simple figure outlining the time-dilations between photons (self-relative light), figure 2:

Paper 39, Figure 2

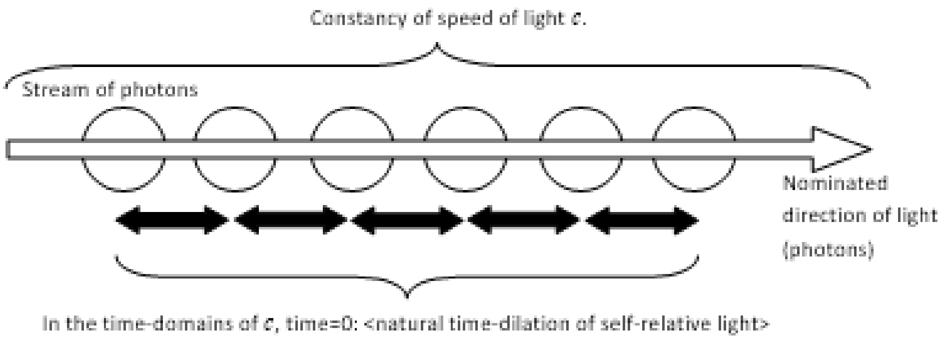


Figure 2: the two fundamental features of light in a vacuum despite relative motion, namely c and how at c time is dilated to the level of time=0.

Doppler shifting is elementary therefore as a time-domain upon c, between photon sequences, still with the fundamental condition of c being a constant and time=0 at c. The following figure, using the same analogy of figure 2, highlights what an observer of figure 2 would see of light whether moving away from the light (3.A) or towards the light (3.B) and thus apparent red or blue shifting, figure 3:

Paper 39, Figure 3

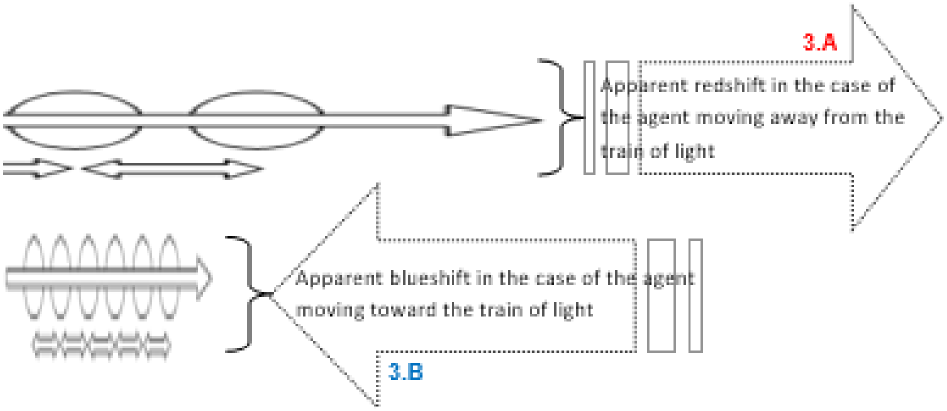


Figure 3: an adaptation from figure 2 brining into consideration an agent reference beyond the light-train and the relative motion effects perceived by the "agent" observer.

Indeed, light is still the same, namely still obeys c *and how at* c *time=0, merely that only the apparent time-domain (from a reference relative to the light), namely the reception of the train of photons, would perceive the accessory time-domain of doppler shifting (and associated temporal dilatation or contractions).*

Doppler essentially abides by each reference of mass existing in a context of c.

The question now is how light can be affected by gravity, as all the data suggests it is, namely given the evidence of the *gravitational red shifting* and *gravitational lensing* of light.

Here, the idea of gravitational lensing, although currently understood in the context of Einstein's theory of General Relativity and associated idea of *spacetime*, is to be considered from a Temporal Mechanics *a priori* basis.

The concept of gravitational lensing according to Temporal Mechanics considers two fundamental concepts, namely the idea of light approaching a zero value as per temporal wave function destructive interference resonance (DIR) process, (see equation 2) and how such is also an emergent expression for gravity (see equation 3).

In short, as light (a temporal wave function) collapses in the context of a maximum temporal wave function incursion event for, as presented in paper 36 ([36]: p22-26), a maximum mass event scenario (taken as a potential black-hole event scenario), the energy of the temporal wave function is conserved into the arena of the G field at play there, to *drive* the energy requirements of that G field, as a "conservation of energy" event, a process which (as presented in section 3) General Relativity finds itself in error with by needing to invent dark energy,

The question here is how light is affected by gravity, *mathematically*. This issue is fundamentally handled by equations 2 and 3, namely equation 2 as the basic initial process of a destructive interference resonance (DIR) of a temporal wave function (light), and as equation 3 proposed as the gravitational feature having emerged from that event as its own unique mathematical representation, equivalent nonetheless, as per equation 15:

$$(\varphi \cdot \frac{1}{\varphi})_{t_B} = e^{i\pi}_{t_B} \tag{15.}$$

Here, $e^{i\pi}_{t_B}$ is considered as the *geodesic* factor that instructs the performance of light as the standard time-equation t_B representation of φ or $\frac{1}{\varphi}$ when applied to Pythagorean algebraic space, as in the context of a gravitational field, and thus ultimately a complex plane circular effect at right angles to the gravitational field gradient strength, and thus a curvature (A) ultimately around the gravitational field strength (B) as follows with figure 6.

Figure 6

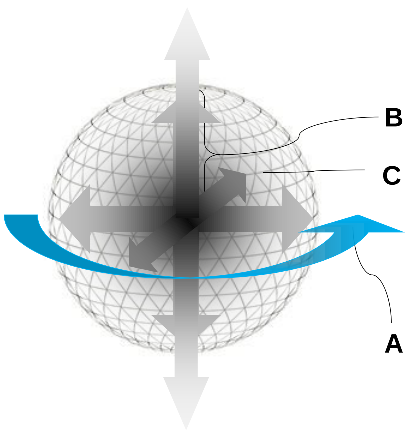


Figure 6: proposing a plane for the temporal wave function (light) as **A** at right angles to the gravitational field strength as **B** (shaded *gradient* here as arrows) on the backdrop of a potential timespace geodesic alignment for light as **C** in the case of a spherical gravitational gradient.

There, the idea of *gravitational red shifting* of light is explained by the geodesic requesting light to travel *more of a distance* than a straight line, as presented by the *curvature* of the geodesic caused by the gravitational field. Note that associated with the phenomenon of the *gravitational red shifting* (stretching of light) would be a *time-dilation* effect at fig6(A).

In the case of light moving directly away from a gravitational field source, the red shifting of that light would be *accumulative* from deep in the gravitational well to outside of it, appearing more gravitationally red shifted outside of the well compared to inside it, despite there being in theory a greater effect of red shifting *deeper* in the well (with that greater gravitational effect), and thus a greater effect for time-dilation deeper in the gravitational well; light leaving the gravitational well would nonetheless still appear more redshifted outside the well if the source of that light is from within the well. These features are highlighted in figure 7:

Figure 7

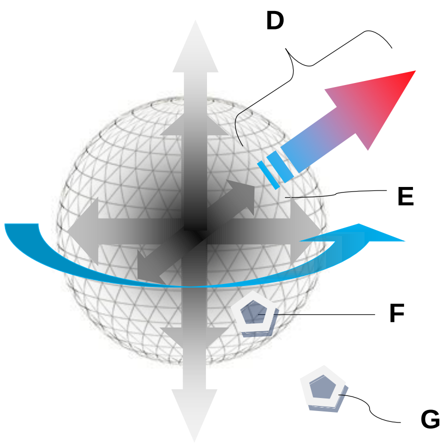


Figure 7: presenting the various effects of light (and temporal effects) and a gravitational field, namely a general red-shifting of light (D) as it leaves a gravitational well (E), a general time-dilation effect inside the gravitational well (F) as opposed to outside it (G).

In a way, it is the $e^{i\pi}_{t_B}$ (equation 3) *effect* that gravity has, as an equation, *on* the temporal wave function equation, reducing the energy and thus frequency of the temporal wave function to an apparent "0" state (as per equation 3, namely $e^{i\pi}_{t_B} + 1_{t_N} = 0_{t_A}$), and thus enhancing/lengthening its wavelength and temporal scale (time-dilation).

In an extreme case of a *mass degeneracy scenario* as according to modern cosmology being characterised by an astrophysical black hole phenomenon, and in the example here as the Quasar phenomenon, Temporal Mechanics proposes the accretion disc of a Quasar would be *illuminated* gas clouds, illuminated though by the path of light as a disc, as per figure 6(A), perpendicular to which ultimately would be a gravitational axis expelling free protons (cosmic radiation) at/near the speed of light, as per figure 6(B). Consider how this is proposed as an intense Quasar, a *blazar*, image 1:

Image 1

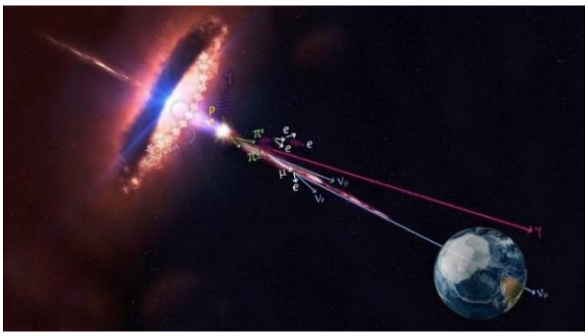


Image 1: in this artistic rendering, a *blazar* (intense Quasar) is accelerating protons that produce *pions*, which then produce neutrinos and gamma rays. (IceCube/NASA) [43].

Such is just one proposed example of this new process of deriving and examining astrophysical phenomena. Given the depth and scope of astrophysics, a subsequent paper shall more broadly address astrophysical phenomena through this Temporal Mechanics lens of theoretic derivation and phenomenal analysis.

In short, in the *time-now* datum reference, time is still the same for each reference, yet within the entire datum reference of a systematic *time-now* event for space, time can then *appear* different in viewing the motion of another object, namely time can appear to be contracted or dilated. The bottom line here is if velocity is a fundamental *constant* for gravity in the *time-now* time-domain as v_G, *then doppler is doppler regarding toward-away motion.* How therefore any atom projects its phenomena is not like a mirror to doppler unless theorizing a reality of a house of mirrors. The exception here is the effect of gravity on light, as highlighted above.

8. Conclusion

The issue in physics today, as this paper presents, is Einstein's General Relativity theory as the basis for cosmology theory, namely the Big Bang model (λCDM) being a specific cosmological model within the framework of General Relativity, which owing to the cosmological constant problem, requires dark energy, dark matter, and of course a big bang, not just to explain the redshift of the stars (beyond this proposed galaxy), yet to make General Relativity *right*.

The proposal here by Temporal Mechanics is the employment of a new and more sound theoretic structure for cosmology, namely to derive the fundamental constants *first* to *then* derive the phenomenal characteristics of the sun, and to *then* derive the phenomenal nature of the stars, as per the proposal in paper 39, chapter 11 ([39]: p65-67), here in this paper nonetheless demonstrating the utility of classical mechanics.

The proposed phenomenal nature of the stars, its proper context of consideration, is reached in paper 39 on page 67 ([39]: p67):

> *Thus, the question is, "what are the stars".*
>
> *The proposal Temporal Mechanics makes for the stars has been presented through papers 32-35 [32-35] in terms of their basic location and fundamental phenomenal characteristics, yet of course here the suggestion is that the idea of "electron-degeneracy" carries with it a process of proton release not only c-scaled at the sun (proposed here as cosmic rays and atomic fuel for the sun), yet more to such, that the process of electron degeneracy itself would represent quite an extravagant process of light (EM) generation, as much as an electron stepping down an energy shell releases a quantum of light, the extreme case of an electron becoming degenerate (extinguished) could only be considered to release an extreme amount of light. Indeed this happens at the sun, namely cosmic rays and EM release, c being scaled from the proposed centre-point of the timespace system, yet the issue with the stars would be the same process yet scaled though within this solar system in being c-scaled from the Oort cloud as presented in papers 32-35 [32-35], and not only c-scaled from the Oort cloud (that barrier with the proposed outer Black Expanse), yet EM released in a different contextual value of E=hf, in a different*

timespace context of E=hf, namely one approaching E=f, as proposed by paper 13 [13], and thus making the usual atomic phenomena of E=hf EM release seem extravagantly large, as the stars appear.

In short, the stars are proposed as a different c-scaling of the same process of the sun, yet on a far grander scale of space, within nonetheless the confines of this solar system in being c-scaled from the Oort cloud barrier. The stars simply would be the particle E=f c-scaled result of the electron-degeneracy performance of light, and all the mathematics of Temporal Mechanics derive the stars to perform as they appear, as the mathematics must, especially in detailing the redshift of light there, as presented through papers 32-35 [32-35].

Thus, it is considered that Temporal Mechanics is a more practical approach to astrophysical phenomena and cosmology theory than the General Relativity based big bang model (λCDM).

Another issue to consider is whether it could be possible to harness the idea of mathematically understanding, and thus perhaps structurally, the generation of cosmic rays (free protons at v_{pc}) for propulsion mechanisms. Such would be entirely possible in the context of an adequate description behind the process as demonstrated on the atomic scale.

A key fundamental conclusion here is that the laws of physics are proposed not to change over time, and therefore contemporary cosmology where the laws change with the big bang must be considered as *flawed*, as proposed in paper 39 ([39]: p67-68) *where* by comparison to the big bang model t*he **three most fundamental constants of physical phenomena** were derived, and then having those three fundamental constants derive the features of the most obvious object to our reality, the **sun***. Such was considered as a process of mathematical proof for known phenomena ***and*** known fundamental constants in complementing each other via the one mathematical formalism.

Yet perhaps the most fundamental conclusion is that consciousness, namely recognizing our conscious ability with time and space, has demonstrated itself to be the central key to understanding reality, the lens through which we can only understand primary mathematical phenomena *as real*. Indeed, Temporal Mechanics is not a theory of consciousness, only what consciousness is proposed to be able to achieve with mathematics by labelling our conscious traits of perception mathematically. Naturally, reality becomes mathematized.

Conflicts of Interest

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

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For ease of search functionality, the complete PDF of Temporal Mechanics containing all its current papers as listed here [1-39], is available from the following link (Non Open Access):
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