Temporal Mechanics, and the derivation of an electron degeneracy neutrino, Gravity constant (G), fine structure constant (α), Planck constant (h), and the phenomenal values of Sol (temperature, radius, luminosity, and corona)

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Abstract: Presented here is an axiom for time that underwrites a time-equation leading to the development of a temporal wave function for space, deriving the atomic locale and associated fundamental atomic descriptors of the fine structure constant (α), Planck's constant (h), and gravitational constant (G), as per the derivation of an "electron degeneracy neutrino", all using a formalism of logic called Temporal Mechanics. Through this process it is then possible to derive the phenomenal metrics of the sun (temperature, radius, luminosity, and corona). Via all of such a case is presented for a new theoretic approach for cosmology theory.

Keywords: temporal mechanics; temporal calculus; time-equation; electron degeneracy; gravity constant; fine structure constant; Planck constant: luminosity; corona

1. Introduction

As blinding as the sun's light is to our naked eyes, our mind nonetheless has the capability to understand the sun's structure through examining the structures its shines upon, whether through lenses, filters, or as reflected light. Here, Temporal Mechanics derives the temperature, spatial metric, and luminosity of the sun, Sol, from a proposed axiom of time and associated time-equation and application to Pythagorean space, all in using the known Bohr radius scale of the atom (a^0) and electron charge value (e_c), all without the assistance of lenses, filters, or reflected light.

Data exists currently for the spatial scale and temperature of the sun, all based on measurements of the sun through lenses, filters, and reflected light (spectrographic studies). Here, that data will be derived from first principles, *ab initio*, from an axiom of time that has derived in its previous papers [1-38] the spatial scale of the atom, the spatial scales of its particles, their field qualities, the temperatures scales in play there, and then how they can derive the fine structure constant α of the atom, Planck's constant h, yet more fundamentally so, the basis of G, all per the derivation of an "electron degeneracy neutrino".

The temperature, spatial metric, and luminosity of the sun as derivations from first principles ideally can work as an *ab initio* for a finer if not more complete understanding of cosmology, as much as the sun and its illumination forms the basis of all cosmological scales and associated parallax measurements of the stars according to contemporary theory; for a theory to derive the spatial metrics and temperature scales of the atom and associated vacuum of space, to then derive the spatial scale and associated temperature and luminosity values of the sun, is to consider such to represent a key to understanding the spatial scale and associated mechanisms of cosmology, if not aetiology of the stars, and what that actually then means.

Fundamentally here by this process shall be delivered a formula for G and a mathematical derivation of the fine structure constant α and Planck's constant h based on a new descriptive mechanism for time and space as *timespace*, much in same way Einstein aimed to deliver a theory of the curvature of *spacetime* as gravity, yet here in not requiring the use of inertial variables, yet the conditional interoperation of time and space itself as the codex itself for a quantum unit, a codex that is able to successfully account for the lightest known particle, the neutrino, thus providing a solution to the "Yang-Mills existence and mass gap" problem.

Of primary importance in the derivation process of the scales of the sun shall be first presented the derivation of an elementary particle (electron degeneracy neutrino) base value for G, the process of logic involved in the derivation of the maximum mass of a system of time and space, a value accounted for to be just 0.37% greater than the known observed and calculated value of the sun ([36]: p24-25), and thus presumably a maximum mass of this solar system as what that is observed and calculated to be. The question there in that derivation naturally became, "how does the sun exist the way it does, with the radius it has, and associated temperature and luminosity scales?". Those questions shall be answered here in this paper with those accurate derivations.

Ultimately, the purpose of these accurate derivations is to present the case for a new foundation for cosmology theory. The thinking here is that the theory that correctly derives the spatial metrics of the atom and its particles (proton radius r_p and electron radius r_e in regard to the known Bohr radius a^0), thence the fine structure constant α, Planck's constant h, and the gravitational constant G, together with then deriving the known phenomenal values of the sun (core temperature, radius, surface temperature, surface luminosity, corona size, corona temperature), and thence the spatial scales of this solar system (Oort cloud, Heliopause, and Bow shock), should thence be able to derive the nature of the stars themselves.

To be covered here as chapters in this paper is as follows:

2. Basic issues in modern physics

Physics is a knowledge of nature which requires a certain fundamental basis, an *a priori* of conditions, acting as a vanguard of logic for all operation and testing to account for thenceforth. One common thread in physics, the key *a priori*, is the idea of *inertia* and how it is related via the equivalence principle to the idea of gravity, namely inertial mass being equivalent to gravitational mass, forming the basis for the process in play of explaining the phenomena of the stars, mainly to explain the redshift effect of light with that specific phenomenon of the stars using the mathematical idea of inertia-momentum, together with accounting for the nature of light and associated phenomenal energy characteristics of space. How well has all of such gone? To answer that question is to break each of these facets up in discussion of them.

2.1 A priori

The definition of *a priori* according to Merriam-Webster [39]:

> *A priori, Latin for "from **the former**", is traditionally contrasted with a posteriori. The term usually describes lines of reasoning or arguments that proceed from the general to the particular, or from causes to effects. Whereas a posteriori knowledge is knowledge based solely on experience or personal observation, a priori knowledge is knowledge that comes from the power of reasoning based on self-evident truths.*

An *a priori* is a “starting point”, a fundamental basis of logic considered as self-evident, and the current *a priori* in physics are the basic ideas of force, momentum, and inertia, as per Newton’s *Philosophiæ Naturalis Principia Mathematica* [40]. Although Newton’s work with gravity has been

superseded by Einstein's General Relativity theory, the core *a priori* of Newton's work, namely mass and inertia, form the DNA of physics logic.

2.2 *Inertia*

Inertia comes from the Latin word, *iners*, meaning idle, sluggish, and yet it is the feature itself given to the reference of "mass". Inertia is considered as a quantitative property of physical systems. Isaac Newton defined inertia as his first law in his *Philosophiæ Naturalis Principia Mathematica* [40], which states:

> *The vis insita, or innate force of matter, is a power of resisting by which every body, as much as in it lies, endeavours to preserve its present state, whether it be of rest or of moving uniformly forward in a straight line.*

The term "inertia" is more properly understood as shorthand for "the principle of inertia" as described by Newton in his First Law of Motion:

> *an object not subject to any net external force moves at a constant velocity.*

Inertia is simply defined as the resistance of any physical object to any change in its velocity. This includes changes to the object's speed or direction of motion. Thus, the clear implication of this definition is the tendency of an object to move in a straight line at a constant speed unless otherwise acted upon by a force. The principle of inertia is in fact a fundamental principle of classical physics still in use to describe the motion of objects and how they are affected by external structures and forces.

2.3 The equivalence principle: inertial mass and gravitational mass

In physics theory, specifically General Relativity, the equivalence principle is the equivalence of gravitational mass and inertial mass. The issue here though of the equivalence principle is in it brining equality between inertial mass with gravitational mass, and thus by that process endowing gravitational mass with a "reactionary" process as much as "inertia" is a reactionary process. This issue of considering gravitational mass as inertial mass as being also reactionary is resolved in General Relativity in making gravity *a consequence of the uneven distribution of mass*. In what though? *Spacetime*? What is *spacetime*?

2.4 General relativity

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:

Figure 1

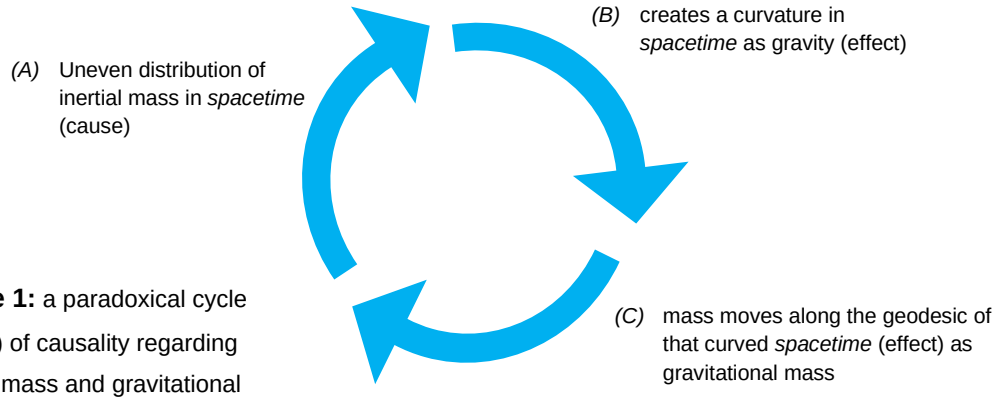


Figure 1: a paradoxical cycle (C)>(A) of causality regarding inertial mass and gravitational mass.

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), which essentially otherwise is a type of Penrose stairs scenario [41] of cause and effect, as per the following image [42], image 1:

Image 1

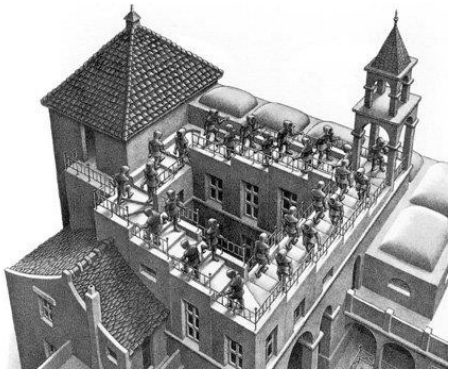


Image 1: a painting by M. C. Escher, “Ascending and Descending” showing the natural absurdity that exists here regarding the staircase [42].

The priority of description for Einstein was therefore to somehow find a way of creating a precedent of non-inertial (non-reactive) mass to then derive *gravity* as a *curvature* of *spacetime*.

Curved *spacetime* represents:

- a feature of fixing non-inertial transformations to satisfy the principle of relativity from special (inertial frames of reference) to general (non-inertial) accounts to give mass this grace from being tagged as gravitational (inertial) (reactive) mass.

- the idea of acceleration being intrinsic to the idea of the force of gravity itself ***creating*** non-inertial (accelerating) references between bodies.

How that process was executed/explained was, once again, having gravity cause/create non-inertial references between bodies, and thus technically being in breach of its own condition of gravity as a primarily *reactive* thing. Gravity, as per General Relativity, was designed to create the *initial* condition of non-inertial frames of reference *between* mass. The problem with General Relativity therefore is that gravity cannot create or warrant anything if it, gravity, is a result of a cause already that made it happen in the first place, an effect that is then trying *to be a greater cause over* the initial cause (in it trying to make that initial cause *non-inertial*), especially in the context of c being a constant and where at c time=0 (and thus a condition where *cause-effect* loops should *not* exist, as shall be highlighted in section 3).

Gravity therefore as a warping/curvature of *spacetime*, also became a warping of, an inconsistency of, temporal logic, of cause-effect. Simply, although Einstein executed relativity theory correctly with his Special Relativity in explaining how light is a constant at c and that at c time=0, General Relativity with its methodology became twisted with its reasoning of temporal causality, and thus of what an *a priori* in fact **is**.

2.5 General Relativity Cosmology

Resultant of General Relativity became the problem of Einstein's cosmological model, namely the "*cosmological constant problem*", a problem central to the required amount of energy for his theory relating mass to *spacetime* to be upheld, ushering in a series of fixes such as dark matter and dark energy, fixes that have yet to be proven. This was accounted for in paper 28 ([28]: p9-10) as per:

(a) Mass having primacy over *spacetime* (accounted for most basically as the ability of mass frame-dragging *spacetime*).

(b) *Spacetime* having primacy over light (account for as time-dilations with mass).

(c) Light nonetheless behaving as a universal constant as though as space (accounting for the photon as the massless particle travelling at c).

(d) Space metrically expanding in time with light (to account for the redshift effect).

(e) Yet Mass having primacy over *spacetime*, or in other words back to (a), a concept that does not fit well with the abridging ΛCDM model.

(f) If the photon is timeless and mass is the primary theoretic device (as though mass drags *spacetime*, as per *frame-dragging*), then mass can only be a type of primordial event incurring a *temporal* dragging of *space* as *spacetime*.

(g) The big bang event therefore would have had its origins from a super-massive, super-dense, mass structure that presumably underwent a temporal incursion in the form of an explosion where pieces of that singular mass source would have been broken free as the temporal incursions.

(h) The *front* of this expansion (as the redshift data presumes to suggest with Einstein's model), in accelerating (as all the data suggests), also suggests (according to Einstein's Relativity Theory) that, as a type of frame-dragging effect of the metric-expansion of space, there would need to be a massive amount of mass (or energy equivalent) *ahead of* this metrically expanding *spacetime being dragged outwards*, continually, *by this mass or energy*.

As presented there, all of such becomes a theoretic Penrose Stairs [41][42] scenario that has no real consistency, in violation of the very "Principle of Relativity", a patchwork of cause-effect events aimed to accommodate for known observed data nonetheless. For such a Relativity Theory model, the bottom line is time itself being a secondary variable according to the primacy of mass and its relative relationship with other mass being the *cause* of something it is meant to be *affected by* (gravity), essentially effecting *spacetime* and therefore time effecting itself as a notion of space as masses in relative motion, mass being the primary cause of *spacetime*.

The suggestion by Temporal Mechanics regarding gravity is that a different approach is required for its explanation, not an inertial description or one using a process of logic requiring inertia solely in the time-domain of *time-now*.

Temporal Mechanics proposes that the answer for gravity lies in the fundamental nature of temporal logic itself as one that can account for cause-effect events in space without violating itself, deriving both the wave and particle nature of light where c is a constant and time=0 at c, thence deriving the lightest-particle level opening to the concept of *elementary particle gravity*. There, logically, the lightest non-zero mass particle can be the only true fundamental code for gravity in the condition of being more fundamental than light, and in the condition of being a fundamental non-inertial process of *description* in the context of describing a new *spacetime* (termed as *timespace*). From there is proposed a more satisfactory cosmological model deriving the isotropic $CMBR$.

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:

Figure 2

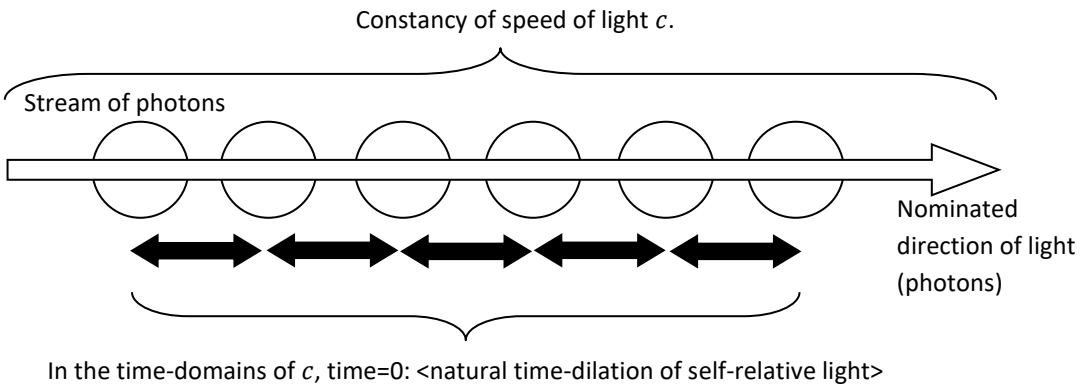


Figure 2: the two fundamental features of light in a vacuum despite relative motion, namely c and how at c time is dilated to the level of time=0.

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:

Figure 3

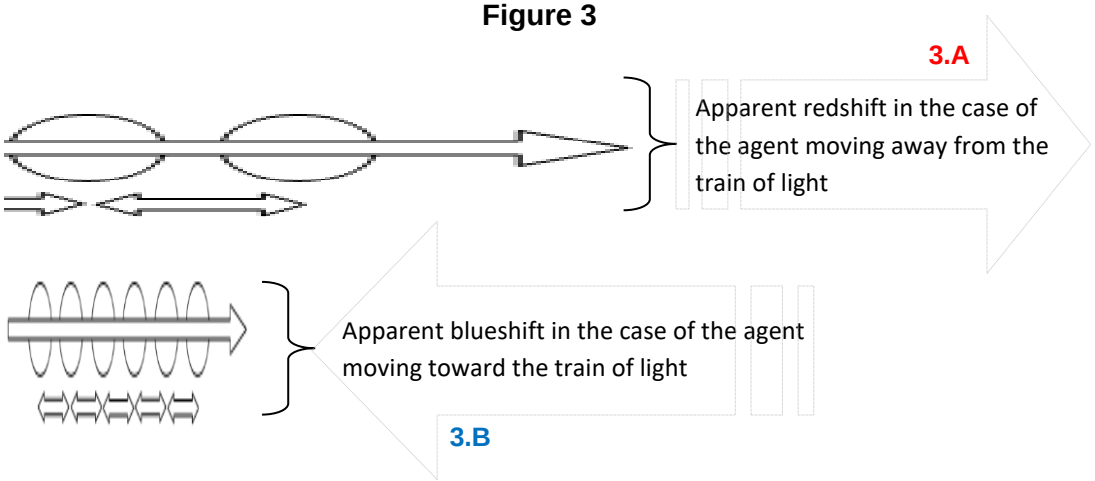


Figure 3: an adaptation from figure 2 brining into consideration an agent reference beyond the light-train and the relative motion effects perceived by the “agent” observer.

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*.

The problem now is how can light *bend* to gravity, namely follow a *spacetime* geodesic, if indeed the relativity of each photon along that path of light has no cause-effect process in play given time=0 at c? In other words, Special and thence General Relativity, specifically General Relativity, has a fundamental flaw with how it tries to explain gravity using an inertial scheme of logic while still trying to resolve the idea of inertia away by using a non-inertial descriptive wording process.

The process of c being a constant and how at c time=0 has been resolved by Temporal Mechanics, to be highlighted in section 3. What though of how the theory of light was explained by Quantum Mechanics in using the inertial mechanics approach?

2.7 Quantum Mechanics

Although Einstein asserted that the acceleration imparted to a body by a gravitational field is independent of the nature (mass) of the body, the idea of mass and its relationship to *spacetime* was left to a new field to pursue, a new field of study though still inheriting the same *a priori* problems Special Relativity conveyed to General Relativity with it's inertial-mass codex of mathematics, the new field of study termed Quantum Mechanics, namely the "photon" model of light.

The issue that became apparent with Quantum Mechanics was in it failing to mathematically account *precisely* for the *wave* feature of light which thence by its absence of mathematical structure created the problem of mathematical uncertainty, and in that context of mathematical uncertainty the particle feature of light became the issue of particle uncertainty and thus "non-locality", highlighted by Bell's Theorem [29].

Simply, the key flaw of Quantum Mechanics is its need to use a "probabilistic" wave function to explain the wave nature of light, in primarily basing the model of light on the particle photon endowed with the qualities of inertia-momentum; the "probabilistic" wave function essentially became a way physics explained the mismatch between the particle and wave natures of light.

With Temporal Mechanics though, the wave feature of light is already implicit with its particle feature, thus technically with Temporal Mechanics the uncertainty principle is already accounted for in the construction of the temporal wave function as EM, which thence allows for a more exact understanding of the wave-particle features of light.

2.8 The issue of causality

One thing that is certain regarding all the models currently in play (Classical Mechanics, Special and General Relativity, Quantum Mechanics, and the Standard Model of particles) is that these models cannot explain certain key fundamental cause-effect processes, or in other words, they are lacking in linking properly with each other as theoretic models in not properly accounting for temporal causality:

- Special Relativity is the basis for making mass primary (relativistic mass) yet is unable to account for gravity other than via General Relativity theory which itself leads to huge cosmological discrepancies requiring the fixes of dark energy and dark matter.
- Quantum Mechanics can only *approximate* the position of a mass particle through its probability mathematical functions (Copenhagen Interpretation).
- Bell's Theorem highlights that there can be no hidden local variables in Quantum Mechanics to precisely account for the location of a mass object, other than "non-local" hidden variables.
- Quantum Mechanics is unable to account for the Standard Model of particles and their existence (Yang-Mills Existence and Mass Gap" problem) simply because elementary particles are much smaller than a quantum itself.
- Fundamentally, classical models cannot reason the data that Quantum Mechanics and the Standard Model (of particles) forward despite Quantum Mechanics and the Standard Model relying on the basic classical principle of mass-inertia.
- All of these models are seeking to find and explain dark energy and dark matter, entities used to fix the fundamental mathematical problem created by General Relativity's cosmological constant problem.

With Temporal Mechanics, the quantum is derived from an axiom of time, an axiom of time as associated to a time-equation that when applied to Pythagorean algebraic space derives the quantum wave function as both a wave and particle, and thus a dynamic and unified feature of time with space, *timespace*, leading to the correct derivation of the value for the gravitational constant, G, and the mathematical description of the fine structure constant α, to then the derivation of Planck's constant h, to be then supported by the derivation of the known phenomenal features of the sun and associated spatial scales and associated phenomenal attributes of the solar system, as to be demonstrated in this paper.

3. Temporal Mechanics

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.

3.1 Addressing the idea of 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* 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, 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 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.

In breaking such down as a process of description, the process here has involved presenting the case for a new *a priori* basis for time and space, developing a model of *timespace* (not *spacetime*, as *spacetime* is the space and time theory of General Relativity) as a *dynamic* of time and space via a new route termed *timespace*. Here, time and space are not considered as absolutes, yet a process of each other as a principle of *dynamic time* with an associated *dynamic space* (derived as a dynamic together as *timespace*) to eventuate the idea of energy (as a temporal wave function) with both wave and particle features.

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 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.

In using that temporal wave function and associated non-local time-before time-point system it is possible to derive the atomic locale scales and associated fine structure constant analogue (a value

to be confirmed in this paper) associated to the electron-shell processes of the atom and associated Lamb shift effect and thence associated value for the $CMBR$ temperature and vacuum energy. The difficulty is to derive the gravitational constant G in understanding gravity has a negative energy effect with *timespace* while also being associated to the entropic arrow of time.

The disciplines of inertial physics (classical mechanics, Special Relativity, General Relativity, Quantum Mechanics, and the Standard Model of particles) have all worked well with inertial mechanisms of measurement, yet Temporal Mechanics considers the inertial approach to be flawed in that the inertial approach fails to recognize properly the *finer tuning* of time and space, that dynamic process, that cause-effect process, in inertial physics relaying only the one time-domain of *time-now*, and thence failing to properly recognize a fundamental theoretic basis *for* mass and *thence* inertia in regard to gravity, gravity proposed here to be a feature of time's dynamical flow with space and not an effective or causative force localized to the *time-now* time-domain (as inertia would otherwise propose), as presented in section 2. Further to this, Temporal Mechanics considers the key flaw to Quantum Mechanics is in it relying on the time-domain of *time-now* as a *continuous* time-domain embodying a probabilistic wave function to explain the wave nature of light, whereas in using a more fundamental approach to time as the *time-before*, *time-now*, and *time-after* time-domains can be delivered a temporal wave function that is both a wave and particle describing c and how at c time=0, thence eliminating the need for the probabilistic quality of the current quantum mechanical model of light.

3.2 The Axiom of Time and associated time-equation

Paper 1 of Temporal Mechanics, "*Gravity's Emergence from Electrodynamics*" [1], proposed the idea that our human primary awareness of/as/with time and thence *theoretic utility in explaining phenomena associated to time and space* (a basic process involved in the modelling of theories) requires addressing certain qualities of time, namely time-before t_B (past), time-now t_N (present), and time-after t_A (future). From certain axiomatic constraints of those three temporal parameters was formulated a "time equation" as $t_B + 1 = t_A$ (where $t_A = t_B^2$) presenting the two solutions of the golden ratio, *proposed as a hypothesis*, the hypothesis being that such a time-equation can be applied to Pythagorean algebraic space to thence derive a basic *timespace* atomic locale with known physical phenomenal features to physics.

The axiom itself was formally presented in paper 37 [37]. There, the *primary philosophical axiom* proposal 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 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, was 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 for being a mathematical or physical process?

Universal time is considered as the key physical *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 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 that would imply that all physical processes in *time-now* are equitable, *whenever* they are measured, an idea proposed by Emmy Noether [43].

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, 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*, and that 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.*

3.3 The time-equation and time-points

To further describe this process, the idea of time as time-points in space was developed, given that 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 ([1]: 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*".[44]

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 in space, and this was achieved using the concept of a *speed for transmission* between 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.

Yet what makes the time-equation even more useful if not complex is that the time-equation is forever incomplete, an endless loop, by its "Fibonacci-style (golden ratio) construction, and yet when that endless loop is applied to the idea of space, interesting things start to happen.

Ultimately to note there (from paper 2 [2] where time is applied to space), the concept of time-now *is the datum-reference of reality* which is where everything is defined in the context of time-now=1 ($t_N 1$). Consider figure 4:

Figure 4

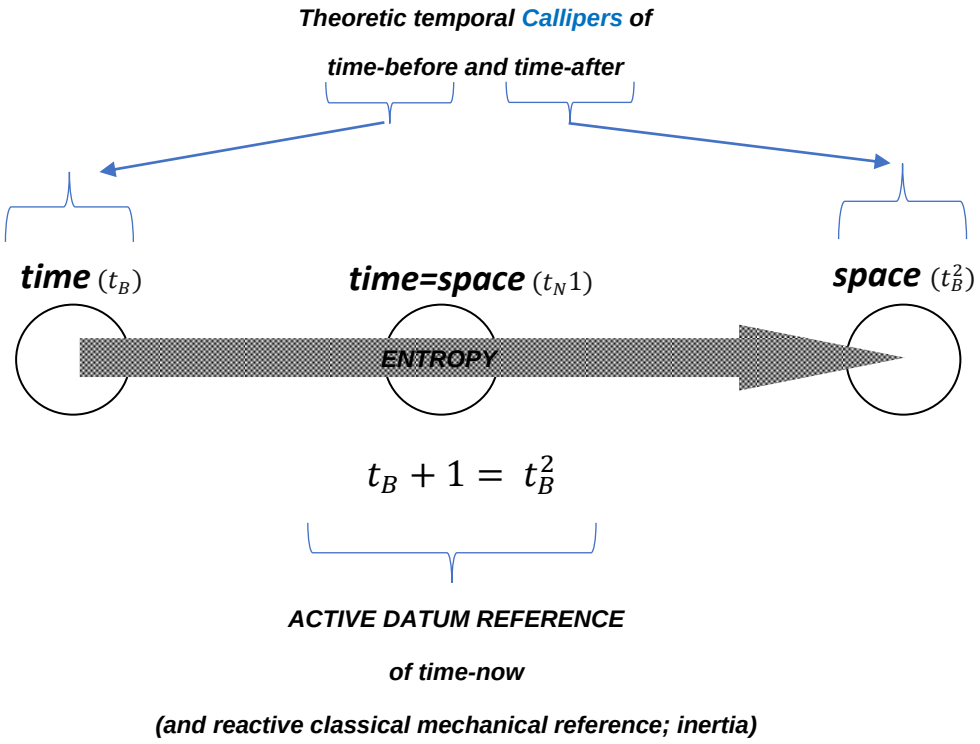


Figure 4: a basic portrayal of time's arrow and associated time-equation as the process of entropy in regard to the proposed time-equation.

Key to the proposal of Temporal Mechanics is that *spacetime* theory (as gravity) leads to violations of *causality* regarding *mass/inertia and gravity with time,* paradoxically presenting the case of *anti-time*, as presented in paper 28 [28], "*Temporal Calculus: Resolving Einstein's Theory of Relativity (Special and General)*", namely the Penrose Stairs scenario of time [41][42]. There, the problem of using inertia became apparent as an aberrant way of appreciating time converse to standard causative time, leading to the notion of "*anti-time*", or more precisely, "*reactive-time*", which as $time = 0$ at c highlights, is *forbidden*.

There, the only way to properly understand causality without falling into the anti-time ruin of a Penrose Stairs [41][42] temporal event of mass/inertia and gravity is to take the idea of time by the horns and make it an axiom as a description that *suits* ***our*** temporal perception ability. As such, Temporal Mechanics upholds the idea that inertia is technically a secondary event, namely "resistance *to* change", a reaction, and thus should ideally not be used to define the *primary* nature of something. The thinking here is that time is the more primary process that instigates inertia as a body resisting fundamental features *consistent with time*.

Thus, the request here is to consider the time-equation as a set of callipers that holds the events of time-now, of the datum reference, within it, as per figure 4. Also consider an *hourglass,* figure 5, as adapted from figure 4:

Figure 5

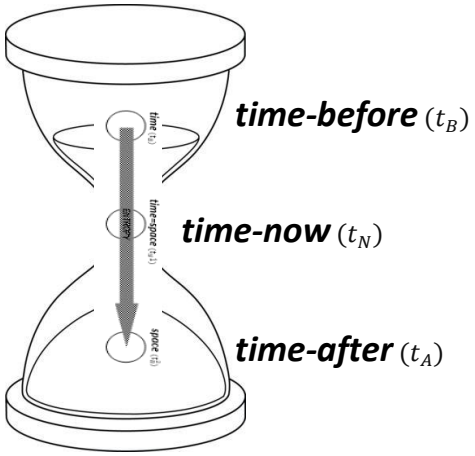


Figure 5: adapting figure 4 to the idea of an hourglass in demonstration of time's flow, the time-equation, and gravity, with the backdrop of the time-domains of *time-before*, *time-now*, and *time-after*.

The time-equation is like an hourglass if one can imagine *time-before* as one glass bulb end, and *time-after* as the other glass bulb end, with the datum reference in between the glass bulbs as *time-now*, with of course a particular mathematical representation. Consider also that an hourglass presents the working of *gravity* (as the sands fall from *time-before* to *time-after*), as does the time-equation; Temporal Mechanics considers the sands of the hourglass first present in the *time-before* glass bulb as non-local time-points, and *time-after* as the bottom empty glass bulb region, and the narrow aperture connecting the two chambers as *time-now*, as $t_N = 1$, the datum reference.

Paper 37 details the specific "axiom of time" [37] and how the time-axiom is related to time's arrow as *entropy*, and how such is related to gravity as per papers 36-37 [36-37], resolving relativity's virtual *anti-time* violations.

Above all, the primary feature for Temporal Mechanics is to explain all events in *time-now* ($t_N = 1$) as a hypothesis, in asking, "can such represent a basic temporal reservoir for the reality of *time-now*, for the datum-reference?". For Temporal Mechanics to derive what it has thus far, as shall be presented in section 3.7, the answer is that it can.

3.4 The principles of simplicity and associated atypical time-before time-point aether

Three fundamental features of Temporal Mechanics regarding the time-equation need to be highlighted as compared to Einstein's spacetime theory and to Quantum Mechanics, namely:

- time is ***not*** an independent reality in Temporal Mechanics,

- time is an axiom with an associated time-equation that then derives space, and thus what we have is *timespace* (not *spacetime*, as *spacetime* has already been named in a certain inertial/anti-time context).
- All the known and founded fundamental tenets of physical phenomena *must be derived* by this new axiom for time (and space).

With Temporal Mechanics, time is neither absolute or continuous per se, yet *Golden Ratio*, namely in the manner the time-domains of *time-now*, *time-before*, and *time-after* being inter-woven as the golden ratio equation with space.

There's a number of layers to the whole process, namely:

- first the axiom of time,
- then the time-equation from the axiom,
- then the time-equation applied to space to thence form the temporal wave function (particle and wave, replacing the probabilistic wave function),
- and thence the atomic locale and temperature scales,
- following which all subatomic and elementary particles being derived according to the Bohr scale,
- leading to the derivation of the fine structure constant α and Planck scale h.

The important feature of the time-domains held by the time-equation is how they (the time-points) and the time-equation relate to Pythagorean algebraic space to then construct the temporal wave function (EM analogue) and associated atomic locale. However the issue is how time *thence* relates to space as a *secondary* continual process of *flow* in the *time-now* time-domain.

"Time" according to Temporal Mechanics requires definitions for each of the different points of reference it can take on, each of the different references of definition. For instance, the idea of a "*temporal aether*" of *time-before* time-points was only realized somewhere deep into the theoretic developments of the theory, yet should be mentioned here as a basic fundamental idea to the time-equation and how the time-equation actually works as a step preceding its involvement with space; the idea of a time-aether as a *time-before* non-local time-aether was considered as a theoretic construct to allow for a continuity of time as time's arrow for any potential event in space. Given it is a *time-before* realm, it is hypothetical, yet still a part of the feature of time's flow and physical phenomena.

To explain this idea of a temporal aether was the associated proposed idea of the *Principles of Simplicity* for time and space, namely that ultimately *everything* in reality can only be described *by* the most basic of terms, and here the fundamental *everything* of time as a potential aetheric field of time-points is the idea of time as a non-local field of *time-before* time-points everywhere in space, and space being as "nothing", no scale, unfathomable, only given scaling by "time", as the following 5 principles aim to demonstrate (A)-(E).

All of such was presented as the time-equation in paper 20 as a $temporal\ calculus$ with space ([20]: p11-18), proposed in paper 30 ([30]: p12-13) as a ***time-space circuitry*** ($\boldsymbol{TS\varphi}$) of *time-before* time-points that become a time-now field of points in space:

(A) Space is an infinite void, a nothing, that when considered alone has no in-built ruler or measurement mechanism to measure its dimensional scope or size, other than time.

(B) Time, or Temporality, is the concept of a uniform *time-now* event *in space* that is preceded by a pre-now (*time-before*) event of time-points and followed by an unknown *time-after* realm; the *time-before* realm in being non-local as an infinite array of infinitesimal time-points in symmetry with one another, a non-locality of time-points (*time-before*) in a uniform field of *time-after* potential time-points via *time-now*, creating an arrow from *time-before* into time-after via a perceptible *local* datum reference *time-now* realm.

(C) A datum frame of reference in the *time-now* realm, namely a *locality*, is what our consciousness naturally assumes, within this entire structure, as how there becomes the idea of a measurement process in space by identifying a network of non-spatial (non-local) time-points to prescribe a locality in space (reference in space), as upheld by the perception-based time-equation (arrow) leading to a mandate for 3-d space.

(D) Energy, the concept of transmission of a time-point datum-reference from one time-point datum-frame of reference to another at a “fixed”/constant speed, is how one datum reference acknowledges another via this transmission of energy, as the arrow of time, as non-local time-point energy transmission at a constant rate (commonly understood as light).

(E) Mass being the result of a time-point pairing, as one time-point joined to another as a new datum reference, as a destructive interference resonance (DIR) energy transmission (folding-over of data-transmission), as a time-point DIR interference producing the idea of a unique locality in space by this interference of time-points, a destruction of non-locality to produce locality, a locality which as mass associates with space to present with the need for itself to represent a uniform drive of spatial homogeneity as thus a general mass-force of attraction as the force of gravity (as shall be explained).

Although paper 1 [1] laid down the fundamental descriptors for time and space along such lines, namely as the time-equation and how that develops the wave function in space, deriving the axes of space, those dimensions ([2]: p3-12), presented in paper 30 ([30]: p12-13) as the 5 principles of simplicity as a type of executive summary of papers 20-29 [20]-[29] in directly solving key known theoretic issues in physics, specifically the Bell’s Theorem (inequality) challenge [29].

With these five fundamental concepts, each unique from the other yet associated with each other, the following points thence need to be observed:

- The mechanics of this entire operation need to focus on how the time-points as non-local references of transmission communicate with each other as a circuitry of time-space, namely points (A)-(C).

- The fundamental concept of all these *time-before* time-points being "non-local" is that such is how they are defined, in not being as a distinct point in space yet time (as an atypical time-point aether), yet according to this definition as an overall potentiality of time-points in regard to space in the form of *time-after* via *time-now*, as a separate entity in general, only made a specific point in regard to space when that "non-locality" is destroyed through a DIR (destructive interference resonance of the temporal wave function) with other time-points, as the $TS\varphi$ prescribes.

- Essentially, the symmetry of the time-points is broken as a type of wave function of non-local time-points (EM), in the formation of mass (EM^{DIR}), as derived in paper 38 ([38]: p22-24).

The process of mass-formation was thence explained in paper 38 upon these bases.

3.5 The temporal wave function, atomic particle (subatomic/elementary) locale

In short, Temporal Mechanics has developed a *spacetime* analogue as *timespace* in creating the required EM-analogous wave function, named *timespace* as technically it is a different process of formulation to that of Einstein as a more correct account of time. By such a process, a more fundamental basis for physical theory is achieved, and thus a more fundamental description for black body radiation, a description that accommodates for time not passing at c.

Temporal Mechanics proposes that the basic architecture of *timespace* is the time equation and its association with space, as per paper 2 pages 4-11 ([2]: p4-11),

> *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 wave in space,*

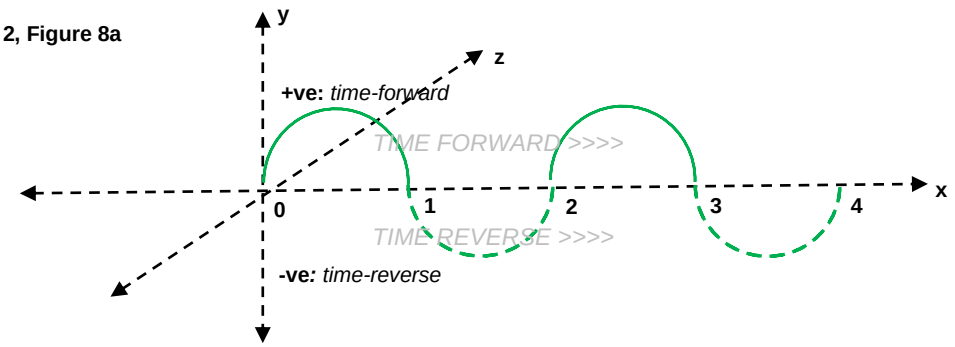
- *this is a time-wave in space with both positive and negative temporal features,*

- *the implication being that time forward is positive and time-reverse is negative (y-axis).*

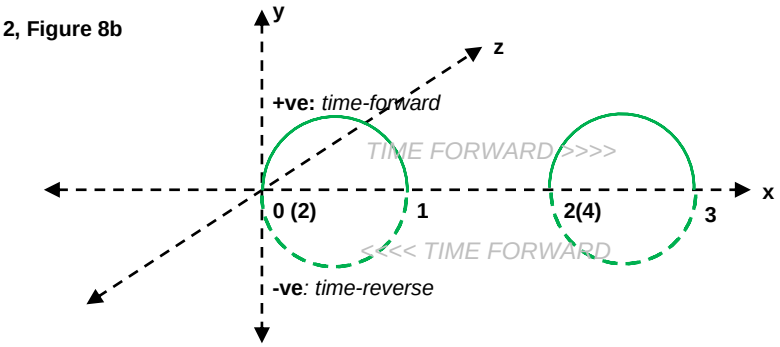
*Although the direction in space may appear to be positive or negative in terms of a reference from "0" on a mathematical grid, space here is space, it is not considered positive or negative, and yet what to note here with this temporal wave function is that the temporal function itself of the time-wave, 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:

Paper 2, Figure 8a



Paper 2, Figure 8b



Paper 2, 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 particle-hopping nature as it would progress along either direction of the x-axis from 0, almost like the light particle-ring is tunnelling as it trains along each direction of the x-axis from 0.

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

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:

- *It is all about the time equation and how we have installed time into space.*
- *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).*

To note is that this is not a standard linear-time wave function expressed according to standard wave function mathematics, as the issue here is that time is both forward *and reverse* (a violation *that is corrected in reversing the spatial direction of that feature of the temporal wave function*) with an overall arrow of time feature, and thus three functions in one, and thus *cannot be described according to standard wave function nomenclature*. It is still a wave function nonetheless, a *temporal* wave function, with specific conditions preventing it from being labelled in the same way as conventional linear-time wave functions.

Contemporary physics defines a wave function, mathematically, as follows:

$$i\hbar\frac{\partial}{\partial t}\Psi(x,t) = \left[-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2} + V(x,t)\right]\Psi(x,t)$$

The issue there is "time", namely that in that expression time is linear (x,t). With Temporal Mechanics though the run of time *is already an equation (t_B+1=t_A)* and so can only be expressed *as a geometry*, a geometry of time being applied to space. Thus, the mathematical description of the temporal wave function, as presented in paper 2 [2], is to explain the actual *scalar* and *vector* representation of the temporal wave function (*there expressed only in one x-axis direction for simplicity*).

Further features (atomic particle locale of subatomic particles, and elementary particles, and their formation) and associated temperature scaling system of the temporal wave function are presented in paper 38, chapters 6-11 ([38]: p14-52) with the associated particle pair production process.

3.6 Microscopic (atomic) temperature scales

The derived temperature scales of the atom and associated temporal wave function dynamics forms the core unique inventive step of Temporal Mechanics, namely how to derive the concept of temperature itself, and thence the temperature scales for black body radiation (Lamb Shift, and CMBR) for the atomic locale, and thence as this paper presents *the sun*.

The derived temperature facility of the temporal wave function owes itself to how the derived temporal wave function is able to best accommodate for its π principle, as described initially in paper 2 whereby such a process a provisional fine structure constant was derived, 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 light 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:

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

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 we shall explain in subsequent papers.

Simply, the fine structure constant ($\frac{1}{137}$) would be indicative of the electromagnetic strength between the subatomic charged particles, and thus the value of $\sim\frac{1}{138}$ would be slightly greater in considering this electromagnetic strength, hence the contemporary calculated value with $\frac{1}{137}$, for the value of $\sim\frac{1}{138}$ is what the theory proposes at first glance.

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

$$\frac{\lambda}{2\pi} = \frac{a^0}{2\pi \cdot 21.8} \; = \frac{a^0}{137} \tag{9}$$

The value of the fine structure constant there was deemed as *provisional*, as the value of $\frac{1}{137}$ is an estimate here, more precisely $\frac{1}{136.973}$ as the value of $\frac{1}{2\pi \cdot 21.8}$. Yet that value suited the equations. The

issue to consider is what theoretic feature is missing to bring $\frac{1}{136.973}$ to the accepted value of $\frac{1}{137.035999}$, a value that shall be derived in section 8.

Nonetheless, Temporal Mechanics via its conditions and associated derivations of the temporal wave function proposes a basic general scale of 22 temporal wave function steps ($22\,EQU$, or rather 22 EM quantum units) for the proposed radius of a basic atom (Bohr radius) a^0 that can be amended as an EQU scale according to what functionality is in play for the temporal wave function, namely a specific compression based on whether an internal atomic functionality or an extra-atomic functionality is in play. This is described in figure 6, there in reducing $22\,EQU$ to the initial $21.8\,EQU$ scale where that initial $0.2\,EQU$ factor lends to a temperature scale:

Figure 6

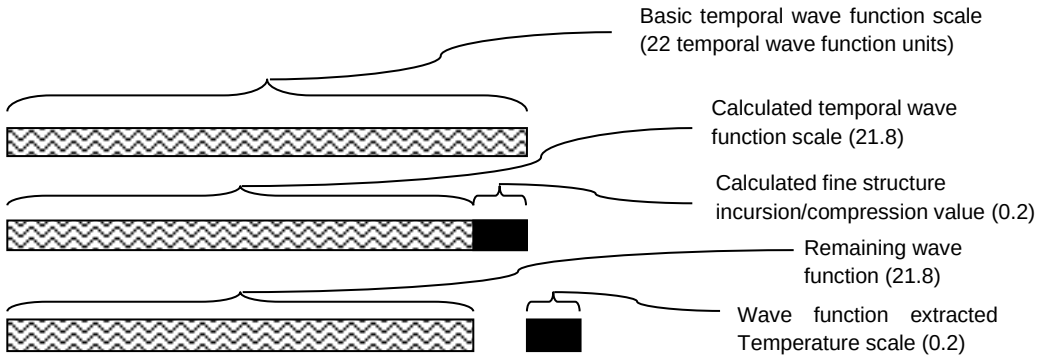


Figure 6: demonstrating the process of the temporal wave function being clipped to accommodate for the provisional fine structure constant estimate and its relevancy thence to the fundamental idea of at an atomic temperature scaling system.

There the idea of the temporal wave function can be reduced to a required scale depending on the facility/functionality of the temporal wave function in play, and the "temperature" scale implicit there is proposed to be that piece of the temporal wave function that is "lost"-*hedged*.

In short, the mass-based (and thus charge) dynamical basis of the atomic-based temporal wave function requires parts of the temporal wave function to be clipped, and so the question is, "where does that clipping go, it has to go somewhere, be accounted for somehow, yet as what?"

The answer for Temporal Mechanics is that the loss of that temporal wave function value represents energy as heat manifesting as a basic temperature value. Nothing could be simpler and more practical as a proposal.

The following figure highlights a number of derived temporal wave function compression scales that act in a temperature context that are in play for the time-space template (TST, atomic locale), figure 7:

Figure 7

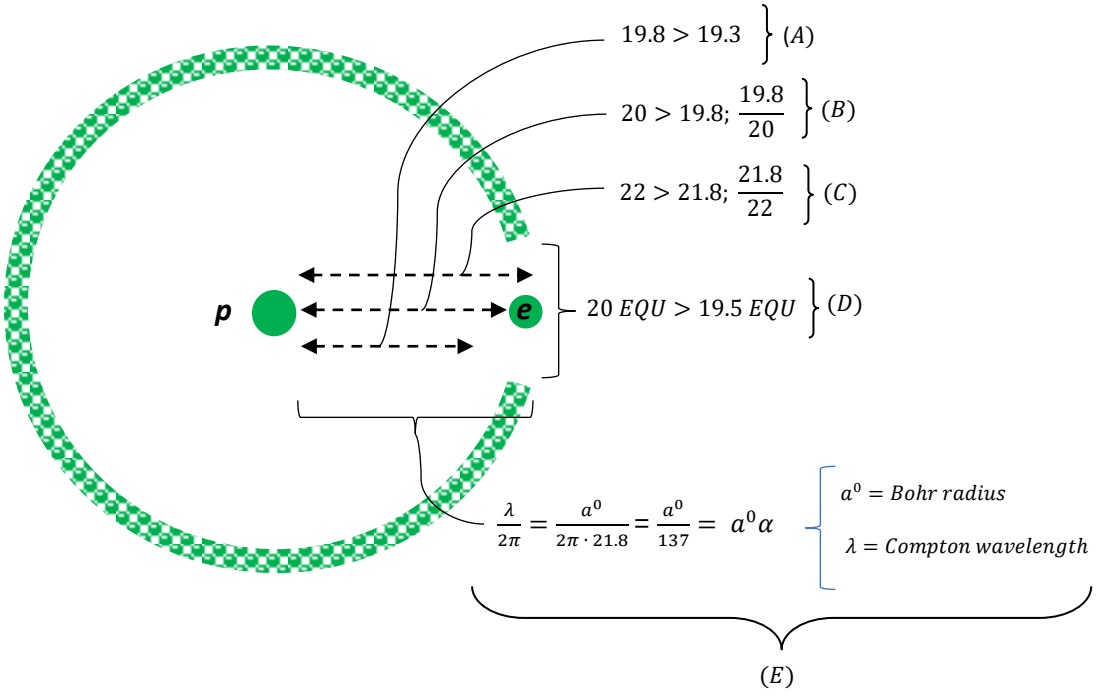
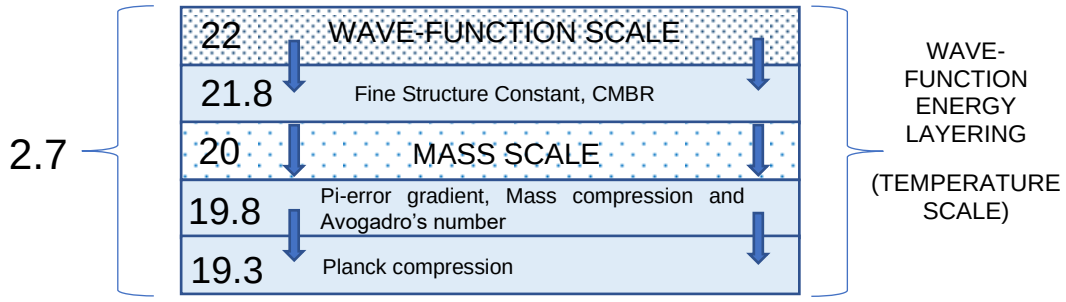


Figure 7: (not *drawn* to scale), highlighting the basic compression scales of the time-space template (atom) and their association to the fine structure constant and temperature scaling system ([14]: p23, fig6); (A) Planck compression scale, (B) basic Bohr radius compression scale, (C) (E) temporal wave function (Compton wavelength) compression scale, (D) π-circumference error scale

Figure 7 highlights how there are a number of features to the atom that translate as a compression/clipping/hedging scale for the temporal wave function (and thence temperature) to accommodate for the fine structure constant value α, provisionally derived in paper 2 ([2]: p15), both for the basic Bohr radius temporal wave function (B), and the MQS (electron shell) temporal wave function (C)(E), and the associated Planck compression scale (A) and the π-circumference error scale (D), all relating to temperature values which as temperature values result in a mathematical relationship with each other, a type of *timespace* buffering effect keeping everything within a certain scale of performance based on basic *timespace* temperature values related primarily to the function of the temporal wave function and its associated particle manifestation dynamics.

Key to note there is the “20” scale used for the Bohr radius (B), and the overall “22” scale (C) used to accommodate for the *magnetised* feature of the π-anomaly for the atomic locale and not the primary electric π-scale, as derived in paper 2 ([2]:p7-14). These compression scales result in the temperature scale for the atom, from an overall magnetised wave function scale of 22, to a Planck compression scale of 19.3 as highlighted in figure 6, paper 14 ([14]: p23, fig6):

Paper 14, Figure 6



This scale was developed in paper 14 to capture the fundamental idea of the Lamb shift effect, specifically the $CMBR\ GHz$ value, the $CMBR$ *temperature* value, and the vacuum energy value. Such was an intentional design to capture such, yet in only using the compression scales of the atom to accommodate the π-anomaly, to then determine how those compression scales relate with one another, namely upon what basic platform, as described above in figure 6 from paper 14 ([14]: p23, fig6). Although there the value of 2.7 is reached as an overall scale, when this overall scaling value is then factored out *beyond* the atom as a measurement of space outside the confines of the atom, the compression scale of $\frac{21.8}{22}$ needs to be removed, and thus a scaling factor of $\frac{21.8}{22}$ applied, thence the actual ***measured*** value of the $CMBR$ results, as per the following from paper 14 ([14]: p25, eq13):

$$2.7 \times \frac{22}{21.8} = 2.725\ (temperature) \qquad (13)$$

The primary issue to note here is that the Lamb shift and $CMBR$, in their both being related to Avogadro's number N_A per that process of derivation in paper 14 ([14]: p22-25), are nonetheless fundamentally related to the electron charge radius r_e as derived in paper 38 ([38]: p37-39) according to those metric compression scales for the atom. In fact, the process of calculating Avogadro's number N_A is to primarily understand how atomic mass as the proton and neutron (and not electron charge, as derived earlier) would relate with the π-anomaly.

Such a basis can be considered as a principle in play for the atomic temperature fuse box around which the temperature scaling system plays out its processes.

In short, the π-anomaly scaling system represents a combination of mathematical relationships to accommodate for all the interlinked atomic phenomenal particle processes, functioning like a mathematical energy and temperature fuse box linking processes associated to the core function of the atom seeking to maintain key baseline processes relevant to π and c, as shall be highlighted in sections 8-9 in the derivation of the fine structure constant α and Planck's constant h.

3.7 The Intended Phenomena Design (IPD)

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 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 investigate reality through trial and error, yet depended on the entire data set of physics knowledge, on testable results, from papers 1 to 37 [1-37].

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

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

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, 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 have been carried nonetheless until sufficient theory can be formulated to then derive those values and equations, as shall be highlighted here in sections 8-9.

Thus far, Temporal Mechanics 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)

- EM coupling constant k_e for the charge force equation ([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)
- Gravity constant G (initial proposal) for the gravitational force equation ([4]: p5, eq1)
- EM constant Q (initial proposal) for the charge force equation ([4]: p5, eq2)
- 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 ([5]: 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 ([14]: p11, eq6-8)
- EM^{DIR} experiment 4 ([17]: p18-22)
- Energy and mass relationship equation (fundamental properties) ([19]: p10-13)
- EM^{DIR} experiment 5 ([19]: p15-18)
- Entropy-enthalpy equation ([20]: pp10, eq2-3)
- 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)

The process here for Temporal Mechanics is to first derive the features of the atom (particles and field forces) and to then derive the phenomenal features of the sun, Sol, and then to have all of such form the basis for cosmology theory, for explaining the nature of the stars.

4. Solar Physics

Solar physics is a branch of astrophysics specializing in the study primarily of the Sun, Sol, and those associated measurements, calling upon all the key disciples in physics, as much as cosmology depends on both the measurements of the sun and associated radiances and theories related to gravity and quantum physics.

Owing to the proximity of the sun though to Earth and that benefit of measurement, solar physics as a discipline of measurement and data aims to be more exact than the study of the stars.

As such, historically the sun in being the centrepiece of not just the sky yet also all physical phenomena became a centrepiece for the idea of time itself, namely how to measure time with solar scales with the sun being the reference marker for all other celestial and Earth based territorial measurements, thence creating the notion of temporal cycles with both earth based (seasons) and celestial (planets and stars) events, leading to a variety of models of reality. Not only just with time was the sun considered essential, yet measuring territorial distance as per solar observations and associated celestial objects (planets and stars) for the purpose of navigation on the surface of Earth. In fact, it could be said that the sun has throughout history formed the basis of our most fundamental understanding of temporal cycles in space on the large scale, setting the stage for our theories of the stars themselves.

It hasn't been until recently in history that physics theory has regarded the sun as only a small spec of infernal plasma material in a far greater universe of space housing other suns as stars. The shift there from a heliocentric understanding of reality, namely the sun as the centre of the known universe, to one of the stars and an associated big bang event, has come through our greater attention to detail with the examination of the stars, as with the aid of telescopes, still nonetheless assuming the stars to be actual suns themselves.

The task here in this paper is to demonstrate the absolute theoretic fine-tuning that can be offered to the sun, fine tuning to the very level of time and space itself, the Planck scale to furthest region of this solar system, the proposed Oort cloud, detailing the why and how of the planets, the

Kuiper cliff, Heliopause, Bow shock, and Oort cloud, and to then in a subsequent paper move on to the phenomena of the stars.

Currently in physics two basic principles regarding the sun are used to form the basic theory of cosmology, namely the Schwarzschild radius formula ($r_s = \frac{2GM}{C^2}$) and the Stefan-Boltzmann law-formula ($J^* = \sigma T^4$), the first being what the minimum radius of a sun would be that has become a black hole, the other being the temperature of the sun (T) as a way to measure its luminosity (J^*), thus forming a certain reference of distance measurement for the stars based on their own luminosity and their associated black-hole reference zones in *presuming* the stars are suns like Sol. The other key important cosmological principle is the $CMBR$, the presumed background radiation from the presumed initial big bang event leading presumably to the creation of all physical phenomena in time and space.

Here in this paper the task is to present the fundamental scale of the sun, namely its mass and radius, and its associated physical attributes of temperature and luminosity. Here it shall be shown that the radiance of the sun can be derived without using the Stefan-Boltzmann constant, yet a more concise and exact relationship bearing particular reference to both the Planck and subatomic scales, Here also it shall be demonstrated that the Schwarzschild radius is not required to measure the minimum radius of a black hole event, as the idea of maximum mass and associated scale of an event horizon will be demonstrated to have already been defined in the calculation of the maximum Sol mass and the process of spatial metric involved there.

As Temporal Mechanics has found, the Stefan-Boltzmann and Schwarzschild equations only serve as a reference of the sun with the stars in assuming the stars are suns, yet the stars are not being assumed here as anything first *per se*. The process though with Temporal Mechanics is deriving physical phenomena using a time equation applied to Pythagorean space to then derive the EM wave function and atomic locale, to then derive a maximum and minimum limit to particles in time and space (timespace), what that minimum scale level is, and what that maximum scale is, *and to then* derive the features of the sun as exactly as possible as existing between the maximum and minimum proposed scales, matching what is measured of the sun as per the assistance of lenses, filters, or reflected light, and to *then* derive the phenomena of the stars.

In short, here shall be highlighted that the Stefan-Boltzmann equation and Schwarzschild radius pre-suppose that stars can be measured according to a parallel scale with the sun, and that such a process is not being assumed here, yet the luminosity of the sun and the scale of an absolute horizon derived from a $time = space$ equation and associated extra-atomic function of EM should take precedence. With such, in not needing the Schwarzschild radius formula or Stefan-Boltzmann constant and associated equation, a new basis for cosmology theory can be forwarded that delivers more exact scales and metrics known for astrophysical phenomena, deriving the required isotropic $CMBR$ while also resolving the “axis of evil” problem.

5. Solar Mass

Temporal Mechanics provided an estimate for solar mass $M_{\odot}$ ([36]: p25, eq8) by asking the question "what would the maximum mass of an object be in the derived Temporal Mechanics *timespace* reality?". In fact, the question was, "what would be the maximum mass of the non-particle mass landscape of *timespace?*". To understand what this maximum mass would be Temporal Mechanics had to take into consideration how the temporal wave function would collapse under *too much compression*, or rather how gravity as derived by Temporal Mechanics would incur a temporal wave function *collapse* (a temporal wave function *incursion*) in the context of a hypothetical lightest and maximum mass scenario, namely the lower and upper limits of mass in the *timespace* tapestry.

The lightest mass was derived in paper 35 ([35], p 28) as the proposed mass of the neutrino, yet what was not known was the maximum mass. The idea of a temporal wave function collapse was conjectured to represent a break in the temporal wave function of the value of "1" quantum unit ($1\ EQU$) of the temporal wave function, and so in applying that to a scale of distance for the gravity equation, the maximum mass of the proposed *timespace* system could be calculated in having already derived the mass of the neutrino ([35]: p27-28).

The next step to ask was "why would time and space approach a maximum mass value?". It was considered that *it is in the proposed design itself of timespace to approach such a value in order to be complete*, namely to be a complete system in regard to the temporal wave function seeking to fully define π in exhausting all the limits of time and space with mass, mass being the candidate to solve the π problem, as presented in paper 36, pages 22-23 ([36]: p22-23):

> *If, as according to the time-equation, the fundamental character of $time = space$ must be upheld for the time-equation datum reference of $t_N = 1$, then there at that datum reference for space and thus the process of gravity, as the time-equation is proposed to uphold, space must also equate to "1". How so though?*
>
> *For $time = space$ to exist on a fundamental level, Temporal Mechanics proposes:*
>
> - *that there must be the smallest mass limit, say the combined mass of the neutrino given the elementary particle would exist as a lightest particle "set" of 3 in the context of a subatomic particle as proposed in paper 25 ([25]: p40-44), a proposal substantiated by the idea of S_0 being the average of a triple prime-number set (as presented in section 7) and thus in theory a set of 3 neutrino descriptions, as $m_{3\nu}$,*
>
> - *and that this set of 3 neutrinos $m_{3\nu}$ would exist within its parent subatomic particle realm which would form a maximum mass that could influence any subsidiary singular elementary neutrino particle sets, a maximum mass say M_X,*
>
> - *and that the condition for $time = space$ would exist as a fundamental condition for when time is represented by $t_N = 1$,*

- *and therefore to satisfy the condition of $time = space$ while also recognizing $t_N = 1$, then the scale of distance between m_{3v} and M_X would feature this "1" factor for distance, as a factor of an absolute limit of temporal wave function incursion.*

Essentially, it was stated/demonstrated that:

- *electron-positron pair production is the primary feature of particle pair production,*

- *noting how electron charge e_c is intrinsic to the formation of proton and neutron mass ([23]: p22),*

- *and that the elementary particle scale comprises of 3 elementary particles for each parent subatomic particle as proposed in paper 25 ([25]: p40-44).*

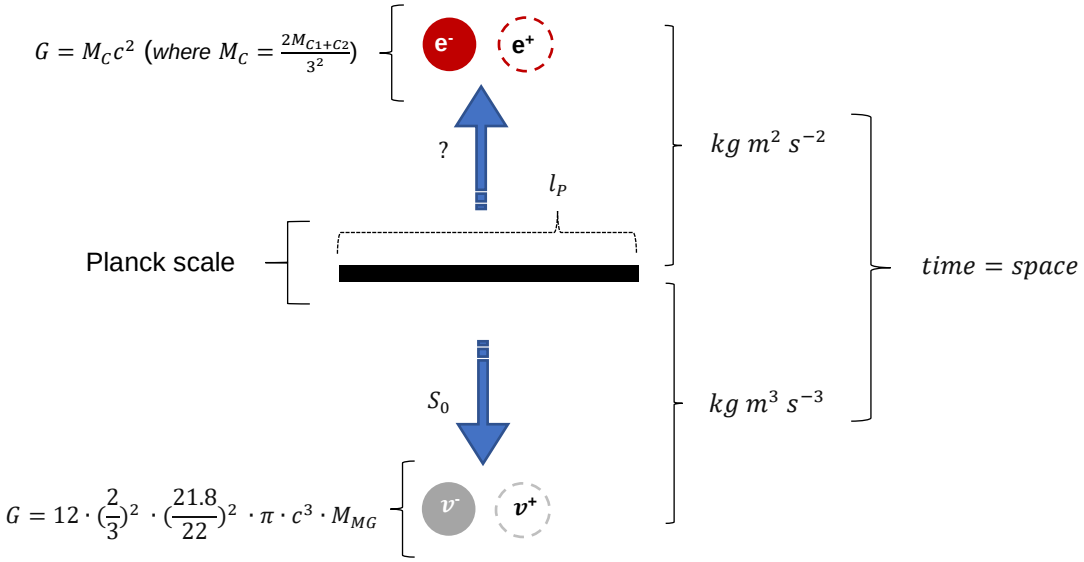
The issue being presented here is that in knowing the gravity equation primarily is derived on the sub-Planck scale, the elementary scale, as per paper 35 ([35]: p28, eq3), namely $G = 12 \cdot (\frac{2}{3})^2 \cdot (\frac{21.8}{22})^2 \cdot \pi \cdot c^3 \cdot m_{MG}$, then at what point would there be a maximum field influence found between the elementary particle level and the subatomic particle level to the point of incurring maximum instability (and thus gravitational compression, and thus also heat) in the status of the temporal wave function otherwise keeping the atom together and functional?

In the process of deriving the mass of the fundamental particles, Temporal Mechanics was able to derive G according to ***two*** different pathways and thence their combined $time = space$ dynamic, namely the construction of *timespace*, as follows:

- Gravity constant G (initial proposal) for the gravitational force equation ([4]: p5, eq1)
- G constant from neutrino mass ([35]: p28-29, eq3)
- $Time = space$ equation ([36]: p19-21, eq3)

Temporal Mechanics, in presenting the case for two equations for the gravitational constant G, was able to consider that the relationship for those two equations for G would be central to *time* equating to *space*, seconds to metres, given the same underlying time-equation was being used to derive both values for G, as per paper 36, figure 3 ([36]: p21, fig3):

Paper 36, Figure 3



Paper 36, figure 3, highlighting the $s\ (seconds) = m\ (metres), time = space$, feature of the equations for G.

The proposal thence was to formulate a third equation for G based on the premise of *time* equating to *space*, as $timespace$ (and not Einstein's *spacetime*) where *time* and *space* would equalize as $time = space$.

For $time = space$ to exist on a fundamental level, Temporal Mechanics proposed:

- that there must be the smallest mass limit, say the combined mass of the neutrino given the elementary particle would exist as a lightest particle "set" of 3 in the context of a subatomic particle as proposed in paper 25 ([25]: p40-44), a proposal substantiated by the idea of S_0 being the average of a triple prime-number set (as presented in section 7) and thus in theory a set of 3 neutrino descriptions, as m_{3v},

- and that this set of 3 neutrinos m_{3v} would exist within its parent subatomic particle *realm* which would form a maximum mass that could influence any subsidiary singular elementary neutrino particle sets, a maximum mass say M_X,

- and that the condition for $time = space$ would exist as a fundamental condition for when time is represented by $t_N = 1$,

- and therefore to satisfy the condition of $time = space$ while also recognizing $t_N = 1$, then the *scale* of distance between m_{3v} and M_X would feature this "1" factor for distance, as a factor of an absolute limit of temporal wave function *incursion*.

The issue being presented there was that in knowing the gravity equation primarily *was derived on the sub-Planck scale, the elementary scale*, as per paper 35 ([35]: p28, eq3), namely $G = 12 \cdot (\frac{2}{3})^2 \cdot (\frac{21.8}{22})^2 \cdot \pi \cdot c^3 \cdot M_{MG}$, then at what point would there be a maximum field influence found between the elementary particle level and the subatomic particle level to the point of incurring *maximum instability (and thus gravitational compression, and thus also heat)* in the status of the temporal wave function otherwise keeping the atom together and functional?

The question was, "what would represent a *maximum*, *an incursion level event*, for the temporal wave function?". Here is how the idea of the Schwarzschild radius was superseded, here not considering the idea of a radius, yet actually calculating *what the maximum mass of a structure could be* in *timespace* (analogue of *spacetime*).

It was proposed that an incursion of the temporal wave function (phi-quantum wave function, $PQWF$) would represent an overall factor of "1", namely one whole quantum step for a Bohr radius atom.

Simply, to lose that "1" amount for the temporal wave function in the process of gravitational temporal wave function compression is considered to be catastrophic.

Therefore, in considering the classical Newtonian equation of gravitational force as F_{3vX} for masses m_{3v} (lightest mass) and M_X (heaviest mass), as $F_{3vX} = G\frac{m_{3v}M_X}{d^2}$, the question now is, "what is the value of d, namely the distance between the heaviest mass (M_X) and the lightest mass (m_{3v}) despite $time = space$ where distance would seemingly equate to "1"?

It was considered that the value of d must consider the four following concepts:

- Firstly, that the metric of distance here is as the metric of time (as per $time = space$), and thus if time must represent the value of $t_N = 1$ for the temporal wave function, then distance must represent the value of 1 (namely, the scale of compression being proposed for this maximum level incursion for $time = space$).

- Secondly, it must be considered that this proposed "1" incursion *is for the atomic scale wave function*, and therefore is for a factor of the temporal wave function *steps* ([2]: p15), steps which then needs to be factored with the value of π for each wave function step, as here distance is being calculated in equality with the wave function as the atomic *radius*, and thus in its basic uncompressed state as 22π (as the task here is to calculate the new compression).

- Thirdly, a doubling of the 22π factor, as a measure of the overall *atomic diameter* of the proposed time-space template atomic limit being compressed by an overall scale of "1" (as the incursion).

- Thus fourthly, this atomic wave function using the compression scale of 22 must be brought in ½ a wave function step, 0.5 for each radius, as a value of "1" as a *maximum* allowable incursion of the atomic diameter, and thus as an atomic diameter on this level (a double radius) a complete *incursion/compression* value of $d = 1$, as the proposed maximum incursion here, thus revealing a scale compression of 21.5, namely $\underline{22 - 0.5 = 21.5}$.

Therefore, the following equation applied for d as d_{3vX}, namely the proposed distance between m_{3v} and M_X, as an atomic radius where the condition of $time = space$ exists for $t_N = 1$:

$$d_{3vX} = 2 \cdot 21.5 \cdot \pi = 135.088 \quad (1.)$$

Therefore, it was proposed that the classical equation for gravity for the smallest mass as m_{3v} and greatest mass as M_X would be as follows:

$$F_{3vX} = G\frac{m_{3v}M_X}{(2 \cdot 21.5 \cdot \pi)^2} \quad (2.)$$

Such was considered as an equation for $time = space$ in the context of $t_N = 1$, and so the value of d as d_{3vX} would follow suit. To visualize this is to consider the value of 135.088 represents a scale of measuring the condition of $time = space$ for the time-equation as a theoretic $time = space$ measure of distance between a neutrino and a supermassive subatomic particle structure and how such would represent a systematic breaking-point causing (presumably) systematic collapse of the temporal wave function and thus time and space.

The idea there though was to derive the value of M_X, namely maximum subatomic mass given the mass of the neutrino has been derived, so the next issue there was to address the value of F_{3vX}. The approach there was to consider what the energy value would be for $time = space$, namely by applying the equation $energy = force \cdot distance$.

The value of F_{3vX} is easier to resolve in considering what the maximum distance m_{3v} and M_X are limited to in encountering one another, such as a value of allowable energy.

Quite simply, the distance m_{3v} and M_X could move would be $\frac{d_{3vX}}{2}$, namely ½ the distance of d_{3vX}, logically in their approaching one another at the same rate despite their difference in mass.

The energy limit there was proposed to be a measure of the gravitational constant G yet ***per*** c, as an absolute consideration for the energy for gravity, noting that there c is being used as a scaling process, a *constant*, needing to be factored in with G on this absolute level of consideration (namely, maximum and minimum mass). Thus the following equation applied for force, here as equation 3:

$$F_{3vX} \cdot \frac{d_{3vX}}{2} = \frac{G}{c} \quad (3.)$$

This then proposed the value of F_{3vX} to be as follows, equation 74:

$$F_{3vX} = \frac{2G}{c \cdot d_{3vX}} \quad (4.)$$

Therefore, in applying equation 3, and in using the value for M_{MG} as $1.5055 \cdot 10^{-37} kg$ from paper 35 ([35]: p28), and thus a value of $4.5165 \cdot 10^{-37} kg$ for m_{3v}, then the following resulted for M_X:

$$M_X = \frac{(2 \cdot 21.5 \cdot \pi)}{m_{3v}} \cdot \frac{2}{c} = 1.9954 \cdot 10^{30} \text{ kg} \quad (5.)$$

This value was considered to represent the *maximum* value of mass on an accumulated subatomic scale that can exist in regard to the *minimum* elementary particle scale (triple neutrino, m_{3v}), a different concept if not more precise than the Schwarzschild radius, as it represents a scale from a maximum mass to a minimum mass, and not a theoretic maximum mass alone.

There was one key missing feature to this maximum mass value, namely *over what general expanse of space* would this maximum mass represent?

6. The maximum and minimum scale of *timespace*

It is important to note that the Planck length l_P was an *assumed* value in paper 35 ([35]: p27-28) in calculating the mass of the neutrino-antineutrino, and also paper 36 section 6 in deriving the mass of the electron-positron ([36]: p14-17), both derivations utilizing a Planck length *accomplice* in the form of a proposed spatial factor S_0. The Planck length l_P thus had yet to be formally derived by Temporal Mechanics.

To derive the Planck length l_P was to consider how it would be relevant to a *minimum* microscopic scale, and how that *minimum* microscopic scale can be used in $a\ time = space$ equation relating to the derived *maximum* macroscopic scale.

How was the maximum scale established? The Oort cloud scale was derived in paper 13 as the temporal analogue for extra-atomic light governed by the proposed extra-atomic principle of $E = f$ for light, thence deriving the maximum distance light would travel in space from an atomic $E = hf$ level to an extra-atomic $E = f$ level, the value of r_O as the distance of Sol to the Oort cloud, as per the following ([13]: p9-10):

> *To address this matter of the propagation of light, there are issues presented in paper 11 ([11]: p12) regarding the proposed nature of the redshift effect in line with a spherical propagation of light. For, in*

upholding the notion of the spherical advancement of light as a wave, as per figure 1, it becomes obvious that if the idea proposed in paper 11 ([11]: p12) of a natural redshift were upheld as a process of pure energy loss in the form of the redshift effect, there would be a ***disproportionate*** *natural redshift of light, in that as the energy per surface area of an advancing wavefront becomes less the larger the surface area wavefront becomes, given energy must be conserved, and thus with a fall in energy there must be a fall in frequency, and thus increase in wavelength; the redshift effect, the "true" redshift effect would be quite large.*

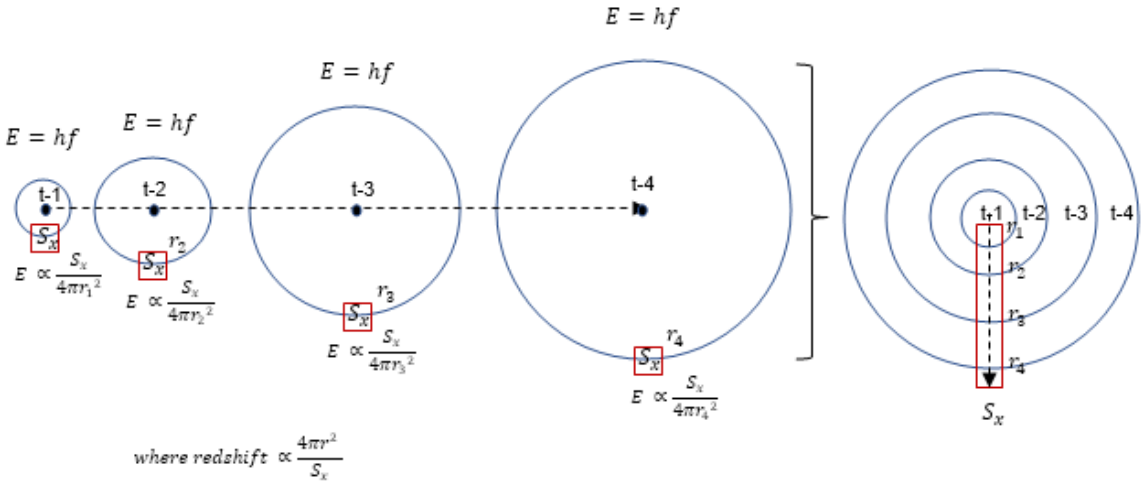


Figure 1: spherical wavefront of light as a constant $E = hf$ progression whereby as the surface area of the wavefront increases a constant region of surface area S_x on that advancing wavefront would represent a decreasing level of energy; the question is, "is this a part of the redshift effect, namely $E = hf$?".

To note is that ***as*** *the spherical wavefront of light moves in time,* ***as*** r_1 *extends to* r_2*, to* r_3*, to* r_4*, the surface area of the wavefront would increase by a factor of* $4\pi {r_1}^2$*,* $4\pi {r_2}^2$*,* $4\pi {r_3}^2$*, and then* $4\pi {r_4}^2$*. Yet for a fixed surface area slit of light along channel aperture* S_X*, the light from* t_1 *to* t_4 *has undergone a decrease in energy, from* $E \propto \frac{S_x}{4\pi {r_1}^2}$ *to* $E \propto \frac{S_x}{4\pi {r_4}^2}$*, and this decrease in energy given* $E = hf$ *would "****presumably****" be constant for each spherical progression, would need to incur a "decrease" in frequency, in* f*, for that* S_x *reference on the spherical wavefront. This presents an obvious problem though, in that a redshift of* $1 + z = 12$ *would accord to the following equation:*

$$\frac{4\pi {r_2}^2}{s_x} - \frac{4\pi {r_1}^2}{s_x} = 12 = 1 + z \qquad \textit{([13], eq1)}$$

If r_1 *is set at the value of "1" as a basic standard, the equation then becomes:*

$$4\pi {r_2}^2 - 4\pi = 12 s_x \qquad \textit{([13], eq2)}$$

$$r_2{}^2 - 1 = \frac{3}{\pi} s_x \qquad \textit{([13], eq3)}$$

$$r_2 = \sqrt{\frac{3}{\pi} s_x + 1} \qquad \textit{([13], eq4)}$$

Obviously, the wavefunction of light beyond the atom would not need to move very far to r_2 if s_x is a very small number, as it needs to be, to incur a proposed redshift of "$z + 1 = 12$", and thus $z11$. So clearly an important issue is missing from this process of reasoning, namely that $E = hf$ ***does not deploy well*** *outside of the atomic reference, and so there must be a reason for that*

It therefore became necessary to propose a new formula for extra-atomic light and its propagation through the vacuum, ultimately to a scale of $E = f$, which resulted in the following ([13]: p11):

Logically therefore, as light propagates through space, the ***ultimate*** *feature to be reached would be $E = f$, as $E = \frac{1}{\varphi}$ (the electrical feature of the golden ratio equation for time) where $h = 1$. The paper Phi-Quantum Wave-function Crystal Dynamics [4] was essentially a description of quantum mechanics and associated Standard Model as applied to the golden ratio equation for time. The suggestion here upon that basis is that quantum mechanics only applies to the atom, not the behaviour of light through space, as the idea here is that "h" needs to be "variable" beyond the atom. Let us therefore use the new Planck equation for light beyond the atom as follows:*

$$E = \mathrm{h_x f} \qquad \textit{([13], eq5)}$$

Here with equation 5, E is still the energy of light, yet "h" is no longer fixed, yet variable as h_x from the standard value of $h = 6.626 \cdot 10^{-34}\ Cm^{-2}s^2$ to a value of "1", as per beyond then atom and this as light through space. The question now therefore is, "how far does light have to travel to have "h" become a value of "1"? We need simply apply the concept of the propagation of light according to a spherical wavefront, of $4\pi r^2$ (as per fig1) with the aim of finding a factor of that spherical wavelength that matches the Planck constant, h, as an inverse relationship, to incur $h_x = 1$, as per the following equation:

$$4\pi r^2 = \frac{1}{\mathrm{h}} \qquad \textit{([13], eq6)}$$

And thus given $h = 6.626 \cdot 10^{-34}\ Cm^{-2}s^2$:

$$\mathrm{r} = 1.1 \cdot 10^{16}\ \mathrm{m} \qquad \textit{([13], eq7)}$$

Given an astronomical unit is $1.495\,978\,707 \times 10^{11}\ m$, then:

$$\mathrm{r} = 73{,}500\ \mathrm{au} \qquad \textit{([13], eq8)}$$

To test that process of $E = f$ and that associated "largest metric scale of space" was to then apply the $time = space$ condition in suggesting that the spatial minimum (say d_{min}) and maximum (say D_{max}) would together be directly equitable to the "energy" of that space as a feature of *time*, here as a

value of vacuum permittivity ε_0 and vacuum permeability μ_0, an EM and thus temporal wave function feature of space, here as per equation 6:

$$\varepsilon_0 \cdot \mu_0 \ (time^2) = \ d_{min} \cdot D_{max} \ (space^2) \tag{6.}$$

The EM microscopic length for space d_{min} was proposed to rely on two key conditions:

- The Planck length l_P (and thus a factor of l_P), a value to be calculated.
- A required upscaled EM factor of 10 for l_P, a factor as proposed in the derivation of the electron mass m_e, namely in accounting for the most basic temporal wave function scale (and thus a factor of $10l_P$).

The EM macroscopic length for space D_{max} was proposed to rely on two key conditions:

- The value of r_O, derived by Temporal Mechanics to be $1.09589 \cdot 10^{16}\ m$ ([13]: p11).
- A factor of π, given the whole intent of the temporal wave function is to define π, and thus ultimately a circumference of a circle is sought on the largest possible macroscopic scale, namely the Oort cloud circumference, and thus an overall factor of $2\pi r_O$.

Equation 6 therefore became as equation 7:

$$\varepsilon_0 \cdot \mu_0 \ = \ 10\, l_P \cdot 2\pi r_O \tag{7.}$$

Thus the value for the Planck length l_P was calculated as follows, here as equation 8:

$$l_P = \frac{\varepsilon_0 \cdot \mu_0}{10 \cdot 2\pi r_O} = 1.6159 \cdot 10^{-35} m \tag{8.}$$

This value holds a 0.02% error to the current calculated Planck length l_P of $1.616 \cdot 10^{-35} m$ (to be discussed in the following section), essentially nonetheless confirming through the reasoning the upper spatial scale value for space.

By proxy therefore, the maximum mass of the system was taken to be the mass of the solar system, from and including the sun to the Oort cloud.

A new issue had developed though, for if the mass of the sun was derived in a context of an absolute mass incursion event scenario, yet that absolute limit would represent the maximum distance of *timespace* (proposed as r_O, from the sun to the Oort cloud), why therefore would the sun be the

radius it is observed to be, and why does reality manifest as a solar system (planets and so on) the way it does from the sun to the Oort cloud region?

That's the question here, namely what is the radius of the sun r_s, can it be calculated *ab initio*, and so too what is its maximum temperature of the sun and associated surface luminosity (Jm^{-2}), can they be calculated *ab initio*, and are there other features in play that can be derived *ab initio* regarding the space between the sun and the Oort cloud perimeter? Essentially, what shall be answered here is the question of "what is the basis for the sun releasing energy, and what are the mechanics behind that energy release, and what are its energy-temperature and spatial scales *ab initio* with that process".

Technically, it will be shown why the sun releases energy, what those scales of performance are, and most importantly why its radius is what it is.

In short, the paradox here is that there is proposed to exist a maximum mass for all of *timespace*, and this value is proposed to represent the entire mass of the solar system calculated in paper 36 as the value of $1.9954 \cdot 10^{30}$ kg ([36]: p25, eq33), where the sun weighing in at $1.995 \cdot 10^{30}$ kg was considered to represent ~99.7% of that overall maximum mass value. The question therefore is, "what defines the spatial metric scale of the sun, namely how is it that we do not live in an overall plasma field the size of the solar system as calculated to be the maximum scale of reality, and indeed therefore what are the stars if not for perhaps being a holographic representation of atomic phenomena magnified on the very enclosing wall itself of the proposed $E = f$ *black expanse*, as detailed in paper 33 ([33]: p14-17)?

To note is that Temporal Mechanics has already derived the distance to Oort cloud, the Heliosphere, and Bow shock ([32]: p16-17), in using the c-scale of *timespace* from the Oort cloud distance level, yet what is to be now derived is why there is a sun the radius it is at and the *luminosity* it is at from the "centre" of this overall maximum mass scheme of *timespace*, and thence (reserved for a subsequent paper) why there are planets and why there is the phenomena of the stars and why do the stars appear as they do, namely in appearing as suns themselves, and a terribly vast number of them at that.

7. The electron degeneracy limit and associated temperature scale value

To understand the size of the sun requires the inclusion of several as-yet considered fundamental metrics and associated phenomena.

Here shall be explained the "electron degeneracy limit" and the effect it has on the *timespace* temperature scaling system presented in section 3.

Specifically, here will be asked, "how does the electron figure into the calculation of the *maximum limit* for mass, namely what happens to an electron by its theorized destruction (incursion event)?". The destruction of the proton, as shall be evident, is considered relevant to powering Sol, yet it is the electron that needs particular focus, as shall be now highlighted.

In considering equation 3 from section 5, namely $F_{3vX} \cdot \frac{d_{3vX}}{2} = \frac{G}{c}$, essentially there is presented a $time = space$ distance relationship d_{3vX} *analogous to* an atomic radius, and thus here the idea of the electromagnetic coupling force of the atom can be considered, and what that maximum "incursion" value would represent.

In taking equation 3, $F_{3vX} \cdot \frac{d_{3vX}}{2} = \frac{G}{c}$ therefore as a maximum energy read for the electron, this becomes:

$$F_{3vX} \cdot d_{3vX} = \frac{2G}{c} \tag{9.}$$

Regarding the electron as a maximum energy E_e, such would represent the following equation:

$$E_e = \frac{2G}{c} \tag{10.}$$

Temporal Mechanics has proposed though that the energy of an electron is directly proportional to its charge, e_c in proposing the provisional Planck equation in paper 3 ([3]: p3, eq1) as $E = (\frac{19.3}{c})^2 \cdot e_c \cdot f$. Thus consider the following equation:

$$E_e = \frac{2G}{c} = e_c \cdot "K" \tag{11.}$$

The value of this energy component "K" is thus given by the following equation:

$$"K" = \frac{2G}{c \cdot e_c} = 2.78 \tag{12.}$$

Thus, equation 13:

$$E_e = 2.78 \cdot e_c \tag{13.}$$

This value of 2.78 is considered as a maximum incursion factor which shall prove to be integral in calculating the core temperature value of *timespace*, of the sun, Sol (to be presented in section 10).

Another feature to note from equation 12 is that the following is in order for a new equation of G, equation 14:

$$G = 1.39 \cdot c \cdot e_c \tag{14.}$$

Ultimately this equation speaks of an *electron degeneracy limit for gravity* at the maximum allowable mass for $timespace$, here though incorporating e_c *at that* proposed limit. The issue of interest here though is how the electron would break down at the point of collapse.

Temporal Mechanics proposes that three conditions would be at play there, namely:

- the upper-level electric atomic coupling limit of 32.7, as per equation 16 of paper 2 ([2]: p20, eq16) which defines the number of states an electron can exist within,

- the mass gap value of $m_{MG} = 1.5055 \cdot 10^{-37} kg$ ([35], p28) which is proposed to represent a basic factor the value the electron would collapse to, here as the value of the lightest particle, the neutrino,

- and the atomic scaling value of $\frac{21.8}{22}$, yet here as a value of $(\frac{21.8}{22})^{-1}$ (given this is not electron formation, yet the inverse process, and thus the implicit compression scale of $\frac{21.8}{22}$ needs to be factored out), and thus a factor of $\frac{22}{21.8}$

The proposal is that the mass the electron would collapse to, as m_{ex}, would represent a basic feature of a new lightest particle scenario, as per the following, equation 15:

$$m_{ex} = 32.7 \cdot \frac{22}{21.8} \cdot M_{MG} = 33\, M_{MG} \tag{15.}$$

In testing this proposal, in taking equation 10, namely $E_e = \frac{2G}{c}$, and then combining this with the known equation of $e = m \cdot c^2$ as derived by Temporal Mechanics in paper 14 ([14]: p26, eq18), then the following equation results in proposing $E_e = m_{ex} \cdot c^2$, equation 16:

$$m_{ex} = \frac{2G}{c^3} = 4.9542 \cdot 10^{-36} = 33 \cdot (1.50127 \cdot 10^{-37} kg) \tag{16.}$$

Essentially, M_{MG} as $1.50127 \cdot 10^{-37} kg$ would be another representation for the mass of the neutrino.

Although in paper 35 the value of $M_{MG} = 1.5055 \cdot 10^{-37} kg$ was an averaged value, here the proposal is for the electron to degenerate to a factor of $M_{MG} = 1.5055 \cdot 10^{-37} kg$.

In *further test* of this idea and associated value, in paper 24 ([24]: p25-26) the following was proposed for the energy of an electron as e_e:

From paper 23, equation 5 ([23] p30, eq5):	$\varepsilon_0 = \frac{1}{4\pi} \times \frac{1}{Q_C \cdot c^2} = \frac{1}{4\pi \cdot k_e}$
From paper 23, equation 7 ([23]: p30, eq7):	$\varepsilon_0 = \frac{1}{\mu_0 \cdot c^2}$
Then, from paper 14, eq 18 ([14]: p26, eq18):	$e = m \cdot c^2.$
Therefore, the following applies:	$e_e = \frac{m_e}{\varepsilon_0 \cdot \mu_0}$

Here, e_e is proposed as the energy of the electron as E_e, where $e_e = \frac{m_e}{\varepsilon_0 \cdot \mu_0}$.

Therefore, in applying that equation, equation 1 paper 24 ([24]: p26, eq1) to equation 13, namely $E_e = 2.78 \cdot e_c$, in considering $e_e = E_e$, the following becomes apparent, equation 17:

$$2.78 \cdot e_c = \frac{m_e}{\varepsilon_0 \cdot \mu_0} \tag{17.}$$

The proposal here is that the value for m_{ex} for this electron incursion event (electron limit) here *should be* the same value as what is calculated above, namely as $m_{ex} = 33 \cdot (1.50127 \cdot 10^{-37} kg)$, thus as the following, equation 18:

$$m_{ex} = 2.78 \cdot e_c \cdot \varepsilon_0 \cdot \mu_0 \tag{18.}$$

The result of this equation is the value $4.9558 \cdot 10^{-36}$ as compared to $4.9542 \cdot 10^{-36}$ for equation 16.

Another equation for G to consider is based on equation 18, here as equation 19:

$$G = 1.39 \cdot e_c \cdot \varepsilon_0 \cdot \mu_0 \cdot c^3 \tag{19.}$$

Essentially, the equations are entirely consistent across the board of physical phenomena that are at play here as derived using the time-equation.

If this value for m_{ex} can be accepted, it suggests that indeed the electron as a subatomic particle can in theory break down to an elementary particle scale, here of course with the required inclusion of the atomic electric coupling limit as derived in paper 2 [2], essential to the electron shell structure (MQS) as per paper 30 [30].

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

$$G = \frac{33\, M_{MG}\, c^3}{2} = 6.6743 \cdot 10^{-11}\ kg\ m^3\ s^{-3} \tag{20.}$$

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]).

Therefore, the *non-incursion* value for gravity ([35]: p29, eq3), namely $G = 12 \cdot (\frac{2}{3})^2 \cdot (\frac{21.8}{22})^2 \cdot \pi \cdot c^3 \cdot M_{MG} = 6.67355 \cdot 10^{-11}\ kg\ m^3\ s^{-3}$, needs closer inspection with how it would furnish the value of $M_{MG} = 1.50127 \cdot 10^{-37} kg$ as technically such would be the more correct value, and the only thing to consider with that non-incursion equation is a new compression value for "21.8" as say a^I, as per equation 21:

$$G = 12 \cdot (\frac{2}{3})^2 \cdot (\frac{a^I}{22})^2 \cdot \pi \cdot c^3 \cdot M_{MG} = 6.6743 \cdot 10^{-11}\ kg\ m^3\ s^{-3} \quad (21.)$$

Here, "21.8", say a^T, needs to be amended to represent a new value a^I to accommodate for a more correct value for G.

In short, the process here of deriving G required the key following point:

- a formulation of an equation using the combined units of $kg\ m^2\ s^{-2} = kg\ m^3\ s^{-3}$ ([36], p21, fig3) as a true *timespace* theory where $time = space$.

Furthermore, the derivation of G here underpins the nature of light, in that it represents:

- a step beneath the level of the temporal wave function (quantum) itself, making thus EM *subject* to this effect of this field force of $timespace$.

Here therefore is a description for gravity that exists in the context of a $timespace$ incursion, and thus exists on another level to *timespace*, yet being a feature of it nonetheless. As what? As a π-construct, or as Einstein tried to explain, as a *curvature*. Here though the curvature of *timespace* as by Gravity essentially *is the purpose of mass*, namely to resolve the π-anomaly of the temporal wave function, and in resolving it, it warps (creates an incursion of) the temporal wave function, most basically as what would be represented as an equivalence between gravity *and a circular-curved centripetal force*.

Simply, if gravity is derived here to be fundamentally related to something beyond the quantum scale, namely to the elementary particle scale (electron degeneracy neutrino), then how indeed is gravitational mass related to inertial mass if technically G here represents something that is already the result of another process, namely an electron and associated temporal wave function (EM) *degeneracy*, and not the result of acting against a force applied to it, noting that the temporal wave function is the fabric of *timespace* itself, time and space as one, as the temporal wave function? The proposal here is that the inertial mechanism of derivation is not required, has been superseded, by this new process of *timespace* formulation.

In other words, gravity is upheld despite the elementary particle mass-level in play here, mass being a result of the temporal wave function DIR effect, yet gravity existing on a different level, a more fundamental level.

All of this therefore points to the notion that *the acceleration of masses of different values is the same in the same G field simply because G in effecting acceleration as a force is implicit to a level that represents a mass-incursion event, an absolute limit anyway.*

Explained here also a solution for the "Yang Mills existence and mass gap problem" in demonstrating why there is a degeneracy limit to electrons and the associated temporal wave function, and what the derived mass gap from that degeneracy is, namely the mass of a neutrino.

To note is what has not been used here, namely the equivalency principle, of equating gravitational mass with inertial mass, and for good reason, as highlighted in section 2 of this paper.

Gravitational mass therefore is ideally *not* expressed as inertial mass, as inertial mass is resistance to change, yet the process of G as derived here is an absolute, namely not a resistance to change yet something far more fundamental.

The other feature to note is that electrons are derived to be next to impossible to destruct unless set upon by the condition of an incursion event, and thus electrons would, according to contemporary scientific research methodology, appear to be elementary particles with no other fundamental constituents. Such though would not seem to be the case as per the theoretic findings here, strictly by definition.

Recent theories have highlighted the possibility of an extra class of neutrinos as per the findings of *The Liquid Scintillator Neutrino Detector (LSND)* [45] and associated research studies [46][47]. The mathematical results here of Temporal Mechanics presents the case for a new class of neutrinos related to an electron degeneracy process to be both elusive and paradoxical (in the context of an incursion event), a process nonetheless fundamental to accounting for a most fundamental account of G.

8. "Fine structure constant" scales and metrics

The *temperature-scaled* fine structure constant as provisionally derived in paper 2 ([2]: p15, eq9) now needs to be further refined.

The derivation of the provisional fine structure constant in paper 2 brought into effect the idea of $\frac{1}{2\pi \cdot 21.8}$, where $a^T = 21.8$ and thus say $\alpha_T = \frac{1}{2\pi \cdot a^T}$, a value of $\frac{1}{136.973}$, "21.8" proposed here as a^T being the key feature of temporal wave function hedging-clipping ($22 > 21.8$) to satisfy the *temperature* scaling system, and thus essentially is a *temperature fine structure factor*, α_T, not therefore *solely* serving what the fine structure constant is known for, namely that which quantifies the strength of the electromagnetic interaction between elementary charged particles as related to the elementary charge e

denoting the strength of the coupling of an elementary charged particle with the EM field, as known commonly by the formula $4\pi\varepsilon_0\hbar c\alpha = e^2$, an α value of $\frac{1}{137.035999}$.

Here, with Temporal mechanics, the electron degeneracy (incursion) process would more than likely appear to *tweak* the *temperature* fine structure factor, that value of $\alpha_T = \frac{1}{136.973}$, and the thinking is the *electron degeneracy* (incursion) fine structure factor, say α_I (namely $\frac{1}{2\pi a^I.} = \alpha_I$) coupled with the temperature fine structure (α_T) factor would result in the known value for the fine structure constant, namely perhaps by the following:

$$\sqrt{\alpha_T \cdot \alpha_I} = \alpha \tag{22.}$$

Indeed, perhaps another equation would be suited depending on the derivation of the electron degeneracy (incursion) fine structure factor α_I, yet the proposal here is that the two fine structure factors would represent a type of ratio together that would result in the known features and value of the fine structure constant α.

8.1 <u>The baseline G equation</u>

To understand the electron degeneracy *incursion* fine structure factor α_I, proposed here is an amalgamation of the two key equations for gravity (equations 20 and 21) and to consider the type of compression at play in equating the standard (non-incursion) gravity equation, namely $G = 12 \cdot (\frac{2}{3})^2 \cdot (\frac{a^T}{22})^2 \cdot \pi \cdot c^3 \cdot M_{MG} = 6.67355 \cdot 10^{-11}\, kg\, m^3\, s^{-3}$, and the incursion gravity equation, namely $G = \frac{33\, M_{MG}\, c^3}{2} = 6.6743 \cdot 10^{-11}\, kg\, m^3\, s^{-3}$, and to determine the incursion at play in making the standard (non-incursion) G value equate with the incursion value of G.

Once again, in the non-incursion equation (equation 20), the temperature fine structure factor a^T is the 21.8 value which when factored with 2π becomes the reciprocal of the proposed temperature fine structure factor α_T, that fine structure a value of $\alpha_T = \frac{1}{2\pi \cdot a^T} = \frac{1}{136.973}$, as $\alpha_T = \frac{1}{2\pi a^T.}$

The first step here therefore is to remove the "21.8" (a^T) factor from the non-incursion equation and then ask what the new factor there as a^I would be in equating the two equations (non-incursion and incursion) in ensuring that M_{MG} is a consistent value for both non-incursion and incursion events as $M_{MG} = 1.50127 \cdot 10^{-37} kg$, here in bringing equations 20 and 21 together as equation 23:

$$12 \cdot (\frac{2}{3})^2 \cdot (\frac{a^I}{22})^2 \cdot \pi \cdot c^3 \cdot M_{MG} = \frac{33\, M_{MG}\, c^3}{2} \tag{23.}$$

The issue here is determining the value for the new non-incursion temporal wave function compression value a^I in using the value of $M_{MG} = 1.50127 \cdot 10^{-37} kg$ as determined by the more correct G equation of $G = \frac{33\, M_{MG}\, c^3}{2} = 6.6743 \cdot 10^{-11}\, kg\, m^3\, s^{-3}$.

In equating all these features out, the value for a^I is 21.831840642, which as a $\frac{1}{2\pi a^I}$ incursion fine structure factor, represents a value of $\frac{1}{137.1735}$ as α_I. Simply, $\alpha_I = \frac{1}{2\pi a^I}$

The next question to ask is how these two factors, the non-incursion factor of $\frac{1}{136.973}$ (α_T) and the incursion factor of $\frac{1}{137.1735}$ (α_I) would relate with each other.

The guidance here is noting that for the non-incursion equation for G the variables of the equation require a *squared* compression feature, namely $(\frac{21.8}{22})^2$ (see equation 21), and yet here the suggestion is that the incursion fine structure factor α_I represents only *one* compression feature (see equation 15). And so the ratio of the non-incursion to incursion fine structure factors are proposed to be 2:1.

8.2 <u>The provisional "fine structure constant" equation</u>

The overall fine structure constant value therefore is proposed to be the cube root of these three factors as one, as follows, equation 24:

$$\alpha = \sqrt[3]{\alpha_I \alpha_T^2} = \sqrt[3]{\frac{1}{137.1735}\frac{1}{136.973}\frac{1}{136.973}} = \frac{1}{137.039081} \qquad (24.)$$

This value would represent two features, namely the standard temporal wave function (EM) *clamping* effect in the atom with the elementary charged particles, and secondly its *unclamping* (incursion) effect, and thus the <u>*overall*</u> strength of the coupling of an elementary charged particle with the EM field, *presumably* (as shall be highlighted shortly). To note is the derived *unclamping* value of $\frac{1}{137.1735}$ is <u>*lower*</u> than the *clamping* value of $\frac{1}{136.973}$, as it should be, the calculated median here being $\frac{1}{137.039081}$.

Why is this value out from the known fine structure constant value of $\frac{1}{137.035999}$?

What has not been factored in here are the values of the <u>*electron and proton radii*</u>, and thus how they relate to the values of α_I and α_T. Simply, the following has to be considered, as per figure 8:

Figure 8

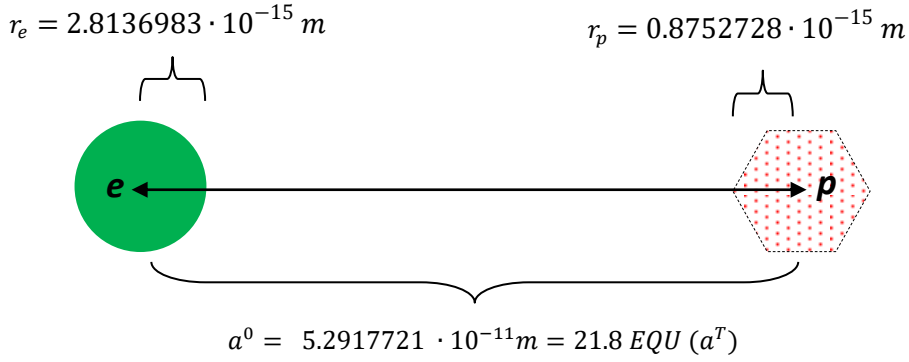


Figure 8: highlighting the $a^0 = \ 5.2917721 \cdot 10^{-11} m = 21.8\, EQU$ scale between the proton and electron, and the derived values ([38]: p37-38) for the radius of the electron ($r_e = 2.8136983 \cdot 10^{-15}\, m$) and radius of proton ($r_p = 0.8752728 \cdot 10^{-15}\, m$).

8.3 α_T amendment (α_{TA}):

The first amendment to consider is what is being *lost* from the standard a^T (namely 21.8) scale. Here both the electron radius r_e and proton radius r_p are proposed to be involved in this incursion-loss process, as a logical consideration for this incursion process.

The electron radius r_e was derived in the previous paper ([38]: p37, eq5) as the value of $2.8136983 \cdot 10^{-15}\, m$, and proton radius r_p derived as $0.8752728 \cdot 10^{-15}\, m$ ([38]: p38, eq7), their combined value as $3.68897 \cdot 10^{-15}\, m$.

Thus, if this radii value is subtracted from the temporal wave function value of the proposed Bohr radius of a^T $(21.8\, EQU)$, then the analogous value of α_T, the 21.8 proposed *a priori* value, is brought down to $21.79848029\, EQU$, say as a^{TA}. Consider figure 9:

Figure 9

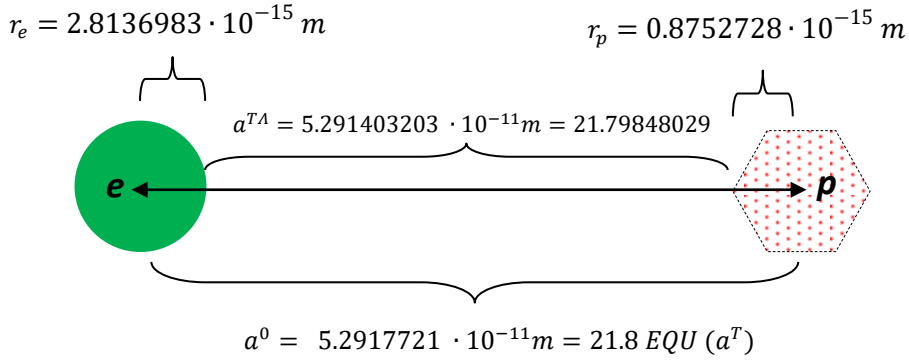


Figure 9: highlighting the new EQU incursion for a^T as $a^{T\Lambda} = 5.291403203 \cdot 10^{-11} m = 21.79848029\ EQU$

Thus in amending the temperature fine structure scale, the following is in order for the amended temperature fine structure constant value as $\alpha_{T\Lambda}$:

$$\alpha_{T\Lambda} = \frac{1}{2\pi a^{T\Lambda}} = \frac{1}{136.96389108} \tag{25.}$$

8.4 *<u>α_I amendment ($\alpha_{I\Lambda}$):</u>*

The second amendment to consider is what is being *gained from* the loss of the electron and proton radii *from* the $a^{T\Lambda}$ scale.

α_I is the idea of having the non-incursion gravity equation *<u>applied to</u>* the incursion gravity equation, and so here we need to consider the incursion scale being supplemented by the electron radius r_e alone and not the proton radius r_p, as technically such is the process, namely the incursion gravity equation $G = \frac{33\, M_{MG}\, c^3}{2} = 6.6743 \cdot 10^{-11}\ kg\, m^3\, s^{-3}$ being based solely on the feature *<u>of the electron</u>* (and thus presumably radius) and not the proton. Also to consider is that the proton radius is not gained here because it is the proton that is fundamentally lost in the incursion process, to of course power Sol. Thus the new EQU incursion scale becomes as $a^{I\Lambda}$, as per figure 10:

Figure 10

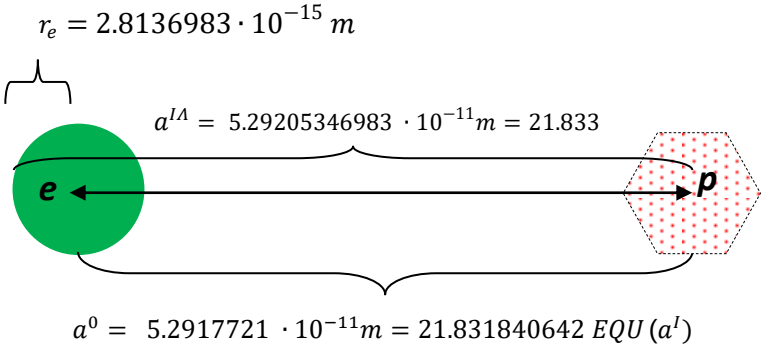


Figure 10: highlighting the new EQU incursion for a^I as $a^{I\Lambda} = 5.29205346983 \cdot 10^{-11} m = 21.833\ EQU$

The new non-incursion Gravity equation compression value of $a^{I\Lambda} = 21.833$ (from equation 24). This results in a new α value, say $\alpha_{I\Lambda}$, of $\frac{1}{137.1808}$, as per equation 26:

$$\alpha_{I\Lambda} = \frac{1}{2\pi a^{I\Lambda}} = \frac{1}{137.1808} \tag{26.}$$

8.5 Fine structure constant equation

Thus in amending equation 24:

$$\alpha = \sqrt[3]{\alpha_{I\Delta}\alpha_{T\Delta}^2} = \sqrt[3]{\frac{1}{137.1808}\frac{1}{136.96389108}\frac{1}{136.96389108}} = \frac{1}{137.036156} \tag{27.}$$

This value compares well to the known value of the fine structure constant, namely $\frac{1}{137.035999}$, an error of ~$1 \cdot 10^{-4}$ % to the current value [48].

To note is that the standard fine structure constant value is a pan-value linking a list of known equations relevant to electric charge, vacuum permittivity and permeability, Planck's constant, and others, and thus an overall pan-phenomena constant relevant to how an elementary charge relates to the EM field (and thus consideration for the electron alone for $\alpha_{I\Lambda}$; here the derivation is based on the non-incursion and incursion G equations and the inter-relationship there between the basic charged elementary particles upon the baseline G equations, suggesting that *this* process here is a unique albeit

generalized result assuming the 2:1 ratio being in play nonetheless in conforming to the known traits and description requirements of the fine structure constant α.

The proposed fine structure constant value α, here as an *ab initio* numerical construction, is a new derivation as the precise ratio of a non-incursion to incursion at 2:1 atomic compression scale signifying an electron and proton radius degeneracy in regard to the non-incursion temporal wave function $\alpha_{T\Lambda}$ and the associated temporal wave function electron radius gain for the incursion scale $\alpha_{I\Lambda}$, such 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, namely denoting the strength of the coupling of an elementary charged particle with the EM field of the atomic locale, moreover here as a baseline description of the electron degeneracy and associated formulation for the equation of gravity, considered as a more complete description of the fine structure constant value α.

In short, to note is that the derivation process here uses the time-domains of *time-before*, *time-now*, and *time-after*, compared to the continuous time-domain of *time-now* as used by contemporary mass-inertia based formulas and associated variables. Simply, the current formulas for the fine structure constant require a value of electric charge "squared", namely e_c^2, simply because of the sole time-domain of *time-now* it operates upon. With Temporal Mechanics, namely in using the time-equation, e_c^2 is not required, as the electric-charge field effect can be explained from a more *a priori* approach for time and space, and that more importantly the e_c field-effect itself is not arbitrated with a *time-now* time-domain alone. The idea of particle based field forces central to the time-domains of *time-before*, *time-now*, and *time-after* (and not solely *time-now*) will be further expanded on in a subsequent paper, as there's a bit here to consider first before making that theoretic step.

9. Planck scales and metrics

There's a third combination of the fine structure constant process that now needs addressing.

The first amendment considered the electron and proton radius loss from the standard non-incursion scale. The second amendment considered a gain of the electron radius on the incursion scale as a basic coupling of an elementary charged particle with the EM field. The third amendment here considers a *total* electron and proton gain for the α_I incursion scale, here as a different way of looking at the fine structure process, a different *timespace* lens of analysis, namely *through the electron-proton radius gain process in the context of a baseline incursion event*.

The proposal here is that the addition of the electron and proton radius degeneracy to the α_I factor represents a new scale as α_h, proposed here to be integral to *the Planck scale*. Although on the one hand there is the fine structure constant scale $\alpha_{T\Lambda}$ representing the electron and proton radius loss compression (and thus energy) and thence incursion scale electron-radius gain $\alpha_{I\Lambda}$, the feature to consider here is what represents the electron and proton radius "gain" as the idea of an electron-proton

atomic locale energy representation of the temporal wave function in the baseline context of an incursion event, and thus presumably the fundamental quality of the temporal wave function for the vacuum of space central to the Bohr radius a^0 atomic locale.

Simply, here one would logically consider that this total electron and proton radius gain would represent the *timespace* feature of how the atom holds itself together as a temporal wave function feature in the backdrop of an overall vacuum of space.

The following was proposed in paper 3 regarding the Planck scale and associated constant:

1. *Establishing the correct time and space granularity for a basic scale of temporal wave function energy*

The equation for the energy of a package of light on the atomic level here is proposed to follow the same rules as presented in the second paper [2], here though by focussing on the relationship between energy and the temporal wave function characteristics of frequency.

For instance, owing to the derived electric and magnetic features of the temporal wave function, "charge" can be considered as the electric feature of the temporal wave function, and can thus be considered as the primary focus of the π-condition for the temporal wave function; charge thus would be an essential ingredient to the temporal wave function, together with the idea of frequency and wavelength, and of course c. Simply, the most basic concept of charge would be considered here to be that of the electron, and thus e_c.

Let therefore the following be suggested if indeed the energy of the temporal wave function E should be proportional to the electrical feature of the wave function e_c and its associated frequency value f:

$$E \propto e_c \cdot f$$

There are though other features of the temporal wave function that need to be considered as presented in paper 2 [2].

For instance, here on the atomic scale for the temporal wave function, we need to consider the wave function of the electric component, a component which has five key features that need paying attention to in regard to its wavelength and thus frequency on the atomic scale:

- *The primary "10-step" feature of the temporal wave function along each direction of the x-axis, and thus 20 temporal wave function steps (therefore a factor of 20).*

- *The fact that this 10-step process is primarily the magnetic wave function feature, with the electric component out of phase with the magnetic component, producing a 0.5 step error (therefore a factor of 19.5).*

- *That there is a spatial compression factor in play ([]: p15-16), leading to an added ~0.2 compression factor on the temporal wave function (therefore an overall factor of 19.3).*

- *That there is an underlying c component to the temporal wave function (<u>therefore an overall factor of</u> $\frac{19.3}{c}$)*

- *That the energy of this temporal wave function must be a feature of t_A, and thus t_B^2, a squared feature of the electrical component of the temporal wave function, simply because here the energy of the temporal wave function is categorised by the magnetic component of t_A as presented in equation 6, paper 2 ([2]: p12, eq6) (<u>therefore an overall factor of</u> $(\frac{19.3}{c})^2$ <u>is required</u>).*

Thus, the following equation would suit:

$$E = (\frac{19.3}{c})^2 \cdot e_c \cdot f \qquad (1)$$

$(\frac{19.3}{c})^2 \cdot e_c$ is by our knowledge of the Planck equation $E = hf$ [2] the value for h, as the value here of approximately $6.639 \cdot 10^{-34}\ Cm^{-2}s^2$, an error of 0.2% to the known value of $6.626 \cdot 10^{-34}\ Cm^{-2}s^2$. In subsequent papers, it will be shown that the maximum temporal wave function compression is a value of $22 - 2.725 = 19.275$ where the value of 2.725 is the derived value of the minimum compression-temperature of space (temperature of the CMBR), and thus a value of 19.275 would need to be used in equation 1, bringing this proposed value of h to $(\frac{19.275}{c})^2 \cdot e_c$, and thus $6.623 \cdot 10^{-34}\ Cm^{-2}s^2$, an error of 0.04% to the known value.

The known value for the Planck constant was thus assumed as $6.62607 \cdot 10^{-34}\ Js$ without question according to the IPD process of Temporal Mechanics in play. Although the $CMBR$ fix was proposed, yet that fix was not implemented as it had an unsatisfactory error of 0.04% to the known value.

The issue with the above derivation of paper 3 [3] is the how the proposed 2.725 value as the known $CMBR$ would be deducted from the "22" wave function step scale, and thence applied to the equation.

The proposed solution is in using the proton radius r_p incursion as an addition to the electron radius r_e incursion for the $\alpha_{I\Lambda}$ scale resulting in a new temporal wave function degeneracy scale of 21.833362 as a^h where $\alpha_h = \frac{1}{2\pi a^h}$, a new fundamental *timespace* scale itself holding the *entire* atomic locale together (electron and proton), in fact what is proposed to be the *resultant* fundamental *timespace* scale for the atomic locale per se, <u>*the Planck scale*</u>, as per figure 11:

Figure 11

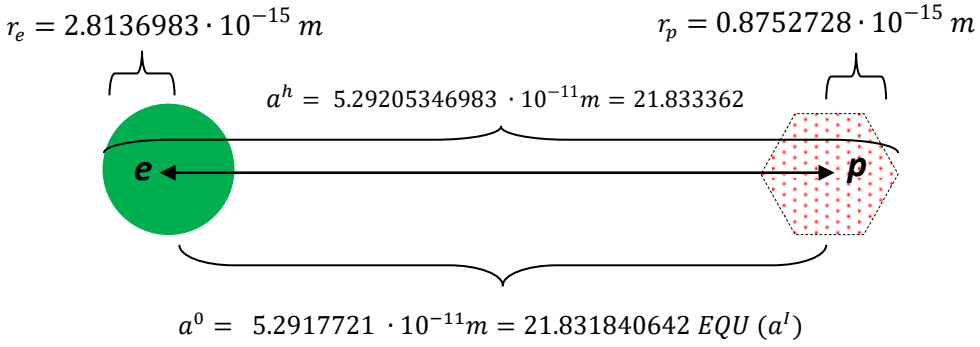


Figure 11: highlighting the new EQU incursion for a^I as $a^h = 5.29205346983 \cdot 10^{-11} m = 21.833362\ EQU$

The new baseline temperature value in using this new value of $a^h = 21.833362$ (figure 11) follows the same process as per equation 13 from paper 14 ([14]: p25, eq13) where the following was proposed for the formulation of the $CMBR$ value:

$$2.7 \times \frac{22}{21.8} = 2.725\ (temperature) \qquad \textit{([14], eq13)}$$

Thus, the new baseline energy equation for this new scaling of *timespace* becomes the following:

$$2.7 \times \frac{22}{a^h} = 2.720607115\ (temperature) \qquad (28.)$$

This value is then subtracted from 22 to give the new temporal wave function resultant scale, here thus at 19.279392885.

In therefore applying this value to the proposed equation for energy and wave function frequency, the following applied from paper 2:

$$E = (\frac{19.3}{c})^2 \cdot e_c \cdot f \qquad \textit{([2], eq1)}$$

Thus here the value of 19.3 is amended to 19.279392885 as the following:

$$E = (\frac{19.279392885}{c})^2 \cdot e_c \cdot f \qquad (29.)$$

The value of h therefore if $E = hf$ and $e_c = 1..602176634 \cdot 10^{-19}\ C$ is the following:

$$h = (\frac{19.279392885}{c})^2 \cdot e_c = 6.62605378 \cdot 10^{-34}\, Js \qquad (30.)$$

The known value for the Planck constant is $6.62607015 \cdot 10^{-34}\, Js$ [49].

Thus, it is considered that the derived Planck constant here is intimately linked to the fine structure constant value, both representing a fundamental energy relationship, and thus here the implication being that the Planck scale is related primarily to the workings of the atomic locale and not necessarily the operation of a temporal wave function beyond the atomic locale, yet only where the fine structure constant (atomic locale) is in play; such has been the proposal of Temporal Mechanics, namely the condition of $E = hf$ is not applicable for EM beyond the atomic locale although EM is given its extra-atomic signature by the atomic locale, a feature to be further discussed in section 11.

The standard spatial scale to note from figures 8-9 is Bohr radius a^0 as the value of $a^0 = 5.2917721 \cdot 10^{-11} m$ which hass been adapted to two different EQU temporal wave function scales, one for the basic non incursion scale of $21.8\, EQU$ and the other for the incursion scale of $21.83184\, EQU$, thus implying that the temporal wave function itself has a temporal expansion (lower EQU value) and squeeze (higher EQU value) in play, as what would be a basic underlying feature of the temporal wave function's nature with the scale of space, of *timespace*, regarding the fine structure constant and the Planck scale, namely the atomic locale.

In therefore being content with the derived value of the Planck constant here, what other features of this scale require mentioning via this derivation process?

The Planck length was derived in paper 36 ([36]: p28, eq11) in assuming the Planck constant and then applying such to an absolute maximum and minimum scale for space and thus a scale within the incursion event, as presented in section 7 equation 8 as the value $l_P = \frac{\varepsilon_0 \cdot \mu_0}{10 \cdot 2\pi r_O} = 1.6159 \cdot 10^{-35} m$. The next thing to consider here is the idea of a *Plank temperature* value itself.

Imagine for instance taking the Planck scale as the Planck length (equation 8) and have applied to it the Boltzmann constant k_B ([37]: p26), as a way to highlight a maximum absolute temperature compression as if as though there was just one scale, a Planck scale, in existence in being compared to an overall uniform maximum scale, with the maximum scale bearing down on the minimum scale. How should this mathematical operation be performed?

First, take the derived Planck length from paper 37 ([37]: p28, eq11) to then calculate Planck time, as per the following equation:

$$t_P = \frac{l_P}{c} = \frac{1.6159 \cdot 10^{-35}}{2.99792458 \cdot 10^8} = 5.39236 \cdot 10^{-44}\, s \qquad (31.)$$

This value ideally needs to be factored by 2π as the issue here is the course of the temporal wave function as a circular function and not line of sight function, hence the following amendment applies for t_P as $t_{P\Delta}$:

$$t_{P\Delta} = \frac{2\pi\, l_P}{c} = \frac{2\pi \cdot 1.6159 \cdot 10^{-35}}{2.99792458 \cdot 10^{8}} = 3.3881197 \cdot 10^{-43}\ s \qquad (32.)$$

As a frequency this represents the reciprocal value, namely $2.951489572 \cdot 10^{42}\ Hz$ and so the energy of this value according to $E = hf$ is the following:

$$E_P = \ 6.62605 \cdot 10^{-34} \cdot 2.951489572 \cdot 10^{42} = \ 1.95567175 \cdot 10^{9}\, J \qquad (33.)$$

The next thing to consider is applying the Boltzmann constant, K_B, which as presented in paper 37 ([37]: p25) needs to be amended for the a^h value here (figure 11). To achieve such, we need to go back to paper 14 ([14]: p25, eq13-15) where the provisional Boltzmann constant was derived and substitute the value of $a^T = 21.8$ for $a^h = 21.833362$ for equations 13-15. Doing such results in the value of $1.3794 \cdot 10^{-23}\ JK^{-1}$ as the new constant value of K_{Bh}. Applying this value to equation 33 will deliver the following temperature value:

$$T_P = \frac{E_P}{k_{Bh}} = \frac{1.95567175 \cdot 10^{9}}{1.3794 \times 10^{-23}} = 1.41776986 \cdot 10^{32}\ K \qquad (34.)$$

This would be the Planck temperature according to Temporal Mechanics, namely the maximum temperature for a *timespace* Planck locale allowable.

From equation 33 can be derived the Planck mass, as follows:

$$m_P = \frac{E_P}{c^2} = \frac{1.95567175 \cdot 10^{9}}{(2.99792458 \cdot 10^{8})^2} = \ 2.1759783 \cdot 10^{-8}\ kg \qquad (35.)$$

Contemporary physics understand this value as the hypothetical black hole mass value whose Schwarzschild radius equals the Planck length, something to be further discussed in the sections ahead).

For Temporal Mechanics, the above Planck equations simply mean that for one Planck scale level there exists a Planck temperature if it can be assumed that the amended Boltzmann constant k_{Bh} being used for this Planck scale (and amended *ab initio*) is being used as a theoretic radius for an absolute relationship with a macroscopic scale of space (given the Boltzmann constant is a particular scale linking the microscopic feature of the atom to the macroscopic). Thus, when the Boltzmann constant is used in this context of the Planck scale value (requiring its amendment) it is like taking the entire macroscopic spatial scale of reality (the proposed distance of sun to the derived Oort cloud distance r_O using the $E = f$ scale) and applying it to just one Planck scale, resulting in an extremely large temperature value, not a true incursion event scenario.

Thus, T_P is not what we're looking for here in establishing what the natural greatest *timespace* temperature is, as the Planck method is the focus of an absolute large scale metric of space in the context of the amended Boltzmann constant k_{Bh} and applying it to an absolute minimum (as the Planck

length l_P) scale (as a process of compression, as the concept of temperature), not a practical and useful value, obviously, as Temporal Mechanics proposes that reality does not perform in such a manner, namely as a macroscopic scale focussing/compressing into a single microscopic Planck scale level. This value ($1.41715344 \cdot 10^{32}\ K$) can of course nonetheless be considered as a theoretic upper limit of temperature for *timespace*.

The question therefore to be asked is "what is the maximum temperature incursion value for the temporal wave function in the context of a maximum mass *timespace* event, and thus the maximum natural *timespace* temperature value (core temperature of the sun)?".

The thinking is that the following scheme would be utilized in measuring the scales of the sun, as much as they are relevant to the fundamental features of the fine structure constant and Planck's constant, as per figure 12:

Figure 12

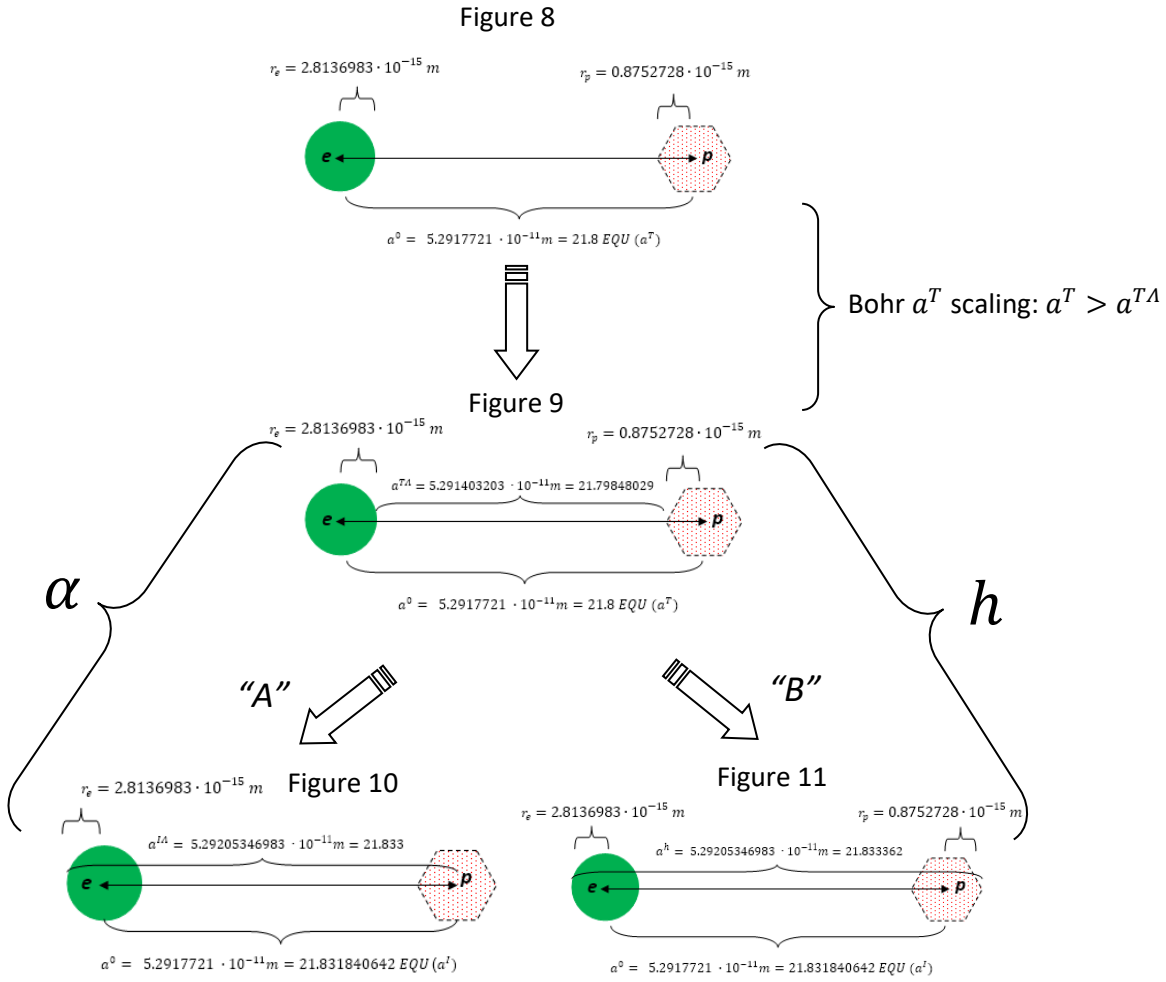


Figure 12: schematic for figures 8-11, highlighting what needs to be considered in formulating the scales for a maximum-mass (solar) event, and the two process at play, "A" and "B".

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). 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, as per $E_p = m_p c^2$, and not via the electron degeneracy incursion process *per se*. The fine structure constant α therefore doesn't take into consideration the feature of the proton radius r_p, only the electron radius r_e, as purely a measure of the electric feature of the atomic locale, a feature that would still highlight nonetheless ultimately the binding concept of a basic charge e_c with an EM field (temporal wave function) as the construction process and associated equations unequivocally demonstrate.

10. Solar scales and metrics

The sun's scales now represents a challenge of balancing what is the known derived maximum mass value of the *timespace* solar system and how the sun as a defined localized construct relates to that value.

The maximum mass of the *timespace* event was derived in paper 36 according to the equation 8 ([36], p25, eq8) $M_X = \frac{(2 \cdot 21.5 \cdot \pi)}{m_{3v}} \cdot \frac{2}{c} = 1.9954 \cdot 10^{30}$ kg, or simply $M_\odot \cong \frac{(4 \cdot 21.5 \cdot \pi)}{c m_{3v}}$, noting that this is an approximate value for the sun's mass in considering the sun is ~99.7% of the mass of the solar system, here the solar system being considered to represent the overall $1.9954 \cdot 10^{30}$ kg value amount.

One thing to note is that the absolute maximum core temperature of the *timespace* system would still represent the core temperature of the sun, logically. Yet the feature of the radius of the sun (and thus its surface area, temperature, and luminosity) is that particular scales need to be put into effect, whether they represent basic temperature scales ($a^T, a^{T\Lambda}$) or incursion scales ($a^I, a^{I\Lambda}$) or the Planck scale (a^P).

10.1 Solar Temperature

Upon what basis does Temporal Mechanics calculate the core temperature of the sun?

The logical thing to consider is that the *core temperature* of the sun would be based on "maximum scales" of *timespace* at play, namely the temperature scaling system of the atom central to *a maximum incursion event* if indeed the sun is the centre-piece of an overall maximum mass event, and thus the core temperature of the sun being related to a maximum incursion event.

Here two key concepts are considered:

- namely the maximum incursion value of 2.78 as per equation 13, namely $E_e = 2.78 \cdot e_c$, and thus $2.78 = \frac{E_e}{e_c}$.

- and that such a compression value would be annexed from the Planck scaled 21.83336 value a^P with the remainder of that scale ($21.83336 - 2.78 = 19.05336$) representing what is left for a general potential mass-incursion temperature event.

Consider figure 13 as an adaptation of figure 6 presented in section 3:

Figure 13

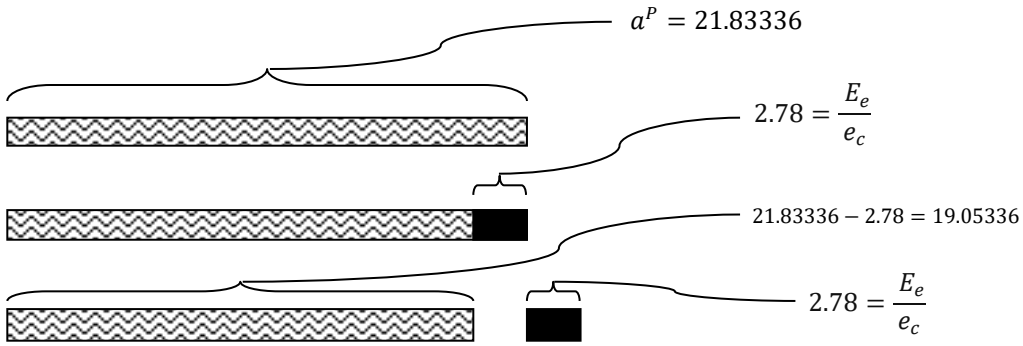


Figure 13: calculating the incursion for the maximum temperature of timespace using the overall Planck scale of $a^P = 21.83336$ and the derived value of $2.78 = \frac{E_e}{e_c}$ from equation 13 to then calculate what is available as a maximum temperature scale, namely $21.83336 - 2.78 = 19.0533$.

The natural consideration here is a *timespace* compression scale, how space and time as *timespace* can be compressed as a way to convey temperature as that compression.

In further expanding on the above two key features are the following:

- Here the idea is to use the 2.78 maximum electron degeneracy compression scale.
- Here that 2.78 value is to be taken from the Planck scaled value of $a^P = 21.83336$, leading to a resultant 19.05336 limit value.
- The idea here is to use the 19.05336 limit value, that scaled Bohr radius temporal wave function length of 19.05336 wave function units, *as what is incurred as a temperature scale itself*,
- This 19.05336 value then is proposed to be used as the idea of a *maximum compression factor* and hence temperature.
- Moreover, according to $time = space$ equation ([36]: p28, eq12-13), c is a *measuring scale* for *timespace*, and so when c as this *timespace* scale has this compression value of 19.05336 applied to it, namely a factor of $\frac{1}{19.05336}$, and thus $\frac{c}{19.05336}$ would represent the

temperature of *timespace* as a compression value in the context of this maximum mass (and associated electron degeneracy limit) value temperature factor of 2.78.

Thus the core temperature value of this maximum mass value of the sun (as proposed in paper 36 [36], and as presented here in section 5), is according to the following equation:

$$T_{\odot} = \frac{c}{a^P - \frac{E_e}{e_c}} = 1.573436 \cdot 10^7\ K \qquad (36.)$$

What does this value mean? Logically, in the context of an ultimate atomic collapse, this would represent the most extreme temperature value of this event. This does not mean other extreme values for temperature cannot be accounted for in *timespace* (as demonstrated with the theoretic Planck temperature value T_P), yet that this value is held in the specific context of the electron degeneracy limit.

Thus, the temperature value of $1.5734 \cdot 10^7\ K$ here is proposed as the theoretic core temperature value for the sun, and thus presumably given the sun does not account for this in not collapsing, the value of the core temperature of the sun, a value that compares well with current estimates [50].

To arrive at the surface area temperature of the sun and associated radiance, the radius of the sun r_s needs now needs to be derived.

10.2 Solar photosphere radius

The key factor for determining the radius of the sun r_s is understanding how the basic temporal wave function as a scale of distance relates to the idea of energy and the temporal wave function compression scales at play.

Here, Temporal Mechanics proposes that the energy of the *timespace* system (and thence by derivation the sun) can be considered to represent the equation $e_X = M_X c^2$.

M_X has been calculated as a solar system maximum mass of $1.9954 \cdot 10^{30}\ kg$ ([36]: p25,eq8), noting here the value of M_X is being used and not $M_{\odot}$.

Yet how does M_X relate to the spatial scales of the sun and thence its radius?

On the most basic scale of consideration for this *preliminary-gross* (solar size and not *timespace* size) maximum mass incursion event (sun) that has a *gross* radius value assigned to it as r_X for the sun, four things regarding a spatial dimension are to be considered directly proportional to the energy ($e_X = M_X c^2$) of the sun to be in play:

- A Planck *temporal wave function* factor of $a^P = 21.83336$.
- An applied "incursion event" deduction of $1\ EQU$ from $a^P = 21.83336$, and thus a resultant factor of 20.83336, the thinking here being is that the a^P value would represent the limit of the sun's *radius* <u>*as a factor*</u> and the subtraction of $1\ EQU$ from that value represents the fact that this $a^P = 21.83336$ is in the context of a maximum mass incursion event requiring

thence a maximum incursion of $1\ EQU$ applied to it to demonstrate the limit of compression for this r_s radius value, and thus a resultant scaled value of $(a^P - 1)$.

- An applied surface area factor of a maximum energy radius based on its proposed gross radius r_X as $4\pi r_X^2$.
- An applied volume factor of the sun based on its proposed radius r_X as $\frac{4}{3}\pi r_X^3$.

The following equation is proposed to therefore apply for the sun's energy:

$$e_x = M_x c^2 = \ (a^P - 1)\ \cdot 4\pi r_X^2 \cdot \frac{4}{3}\pi r_X^3 \tag{37.}$$

Therefore the value of r_X can be calculated as follows:

$$r_X = \sqrt[5]{\frac{3M_X c^2}{16\pi^2 \cdot (a^P - 1)}} = 6.96181 \cdot 10^8\ m \tag{38.}$$

The current measured-observed value is $6.9570 \cdot 10^8\ m$ [50]. Note that the actual mass value of the sun would be just under the value of $1.9954 \cdot 10^{30}\ kg$, and so taking the mass of the sun to be $M_\odot = 1.9885 \cdot 10^{30}\ kg$ [50] the new radius for the sun $r_\odot$ becomes $6.92971 \cdot 10^8\ m$ which conforms with known data [50].

The proposal here is that $r_X = \sqrt[5]{\frac{3M_X c^2}{16\pi^2 \cdot (a^P - 1)}} = 6.96181 \cdot 10^8\ m$ is the *coronal radius* and $r_\odot = \sqrt[5]{\frac{3M_\odot c^2}{16\pi^2 \cdot (a^P - 1)}} = 6.92971 \cdot 10^8\ m$ Is the *photosphere radius* ($r_s = r_\odot$).

10.3 Solar photosphere temperature

The solar photosphere temperature is really asking what the temperature of the surface area of the sun would be as $4\pi r_\odot^2$ as a value that would require the sun's core temperature $T_\odot$ to be put in play, proposed here with a "c" scaling factor of $\frac{1}{c}$ and an a^P amended Avogadro constant N_A value (amended for this context), together as the following:

- The core solar temperature $T_\odot = 1.573436 \cdot 10^7\ K$,
- factoring out the "c" scale and thus applying a factor of $\frac{1}{c}$,
- such as applied to a basic a^P *Avogadro scale*, and thus having 19.8 factored out of the standard Avogadro scale N_A to accommodate for this new incursion overall a^P temporal wave function scale, and thus here a factor of $\frac{a^P}{19.8}$ applied,
- all of such per the calculated solar surface area, namely per $4\pi r_\odot^2$ with $r_\odot = 6.9571 \cdot 10^8\ m$

Thus the following is proposed as the surface area (*photosphere*) temperature of the Sun $T_{\odot\Lambda}$:

$$T_{\odot\Lambda} = \frac{T_{\odot}}{c} \cdot \frac{1}{4\pi r_{\odot}^2} \cdot \frac{a^P N_A}{19.8} = 5775\ K \tag{39.}$$

This value matches the current observed-calculated vale of $5774\ K$ [50],

10.4 Solar photosphere luminosity

The next important value to derive is the *luminosity* of the photosphere, namely the amount of energy *released* per unit of time (Js^{-1}).

Here is a new concept of "loss" as energy release, and thus not the use of a^P, yet a^T as the value of $a^T = 21.79848$, noting that a^T as derived in section 9 represents that process of energy-temperature release-loss, here though on the derived scale of the photosphere surface area and photosphere temperature.

Here therefore would need to be directly factored three key elements to account for luminosity:

- the surface area temperature $T_{\odot\Lambda} = 5775\ K$ per Planck time $t_P = 5.39236 \cdot 10^{-44}\ s^{-1}$ as $\frac{T_{\odot\Lambda}}{t_P}$.
- a^T adjusted Boltzmann constant k_B (say k_{Ba^T}), namely removing the microstate compression filter 21.8 and replacing it with $a^T = 21.79848$,
- a^T temporal wave function surface area per wave function length as a concept of radiance as $\frac{surface\ area}{length} = \frac{4\pi(a^T)^2}{a^T}$,

Once again as per the calculation of the Planck temperature T_P in equation 34, although the *provisional* Boltzmann constant k_B was derived in paper 14 ([14]: p25-26, eq13-17) as the value of $1.37 \times 10^{-23}\ J\ K^{-1}$ as according to the $2.7 \times \frac{22}{21.8} = 2.725\ (temperature)$ filter and associated 21.8 scale (paper 14, equations 13-27), here those equations need to be re-adjusted to accommodate for the $a^{T\Lambda} = 21.79848$ scale in replacement of the 21.8 scale, revealing a value of $k_{Ba^{T\Lambda}} = 1.3665 \cdot 10^{-23}\ JK^{-1}$.

Note here also is the concept of *luminosity*, and so the idea of luminosity here is proposed to represent a surface area projection per $a^{T\Lambda}$ scale as $\frac{4\pi(a^{T\Lambda})^2}{a^{T\Lambda}}$, and thus a factor of $4\pi a^{T\Lambda}$.

$$L_{\odot} = \frac{T_{\odot\Lambda}}{t_P} \cdot k_{Ba^{T\Lambda}} \cdot 4\pi a^{T\Lambda} \cdot = 3.825 \cdot 10^{26}\ Js^{-1} \tag{40.}$$

This value compares well to the currently accepted value of $3.828 \cdot 10^{26}\ Js^{-1}$ [50].

10.5 Solar corona temperature and radius

To note is that although the theory here shows that *timespace* organizes the incursion event at the sun, this event nonetheless extends outwards to a proposed *E=f black expanse* scale, as proposed initially in paper 13 ([13]: p11), and then further described in papers 32-24 [32-34]. Of further note therefore is that the temperature of the sun from its core $T_{\odot}$ would also be representative of a feature beyond the sun's actual radius r_s, here proposed as the known corona phenomenon of the sun, such being how the mathematics would work for this process, namely the core temperature $T_{\odot}$ being a type of overall temperature dissipated to the *timespace* system, to the $E = f$ scale. Simply, here it is proposed that the sun would need a corona effect to allow the core temperature of the sun extend beyond the radius of the sun, despite the surface area of the sun having a different temperature value.

The primary extent of this corona was proposed to be at a distance of $r_X = \sqrt[5]{\frac{3M_X c^2}{16\pi^2 \cdot (a^P - 1)}} = 6.96181 \cdot 10^8\ m$ (equation 38).

How though does the core temperature $T_{\odot}$ of the sun radiate?

Here Temporal Mechanics proposes that the radiation of $T_{\odot}$ is *per* a basic EQU circumference scale, and thus a value of $\frac{T_{\odot}}{2\pi \cdot 1EQU} = 2.5042 \cdot 10^6\ K$, as the proposed value of the sun's corona $T_{\dot{\odot}}$, as equation 41:

$$T_{\dot{\odot}} = \frac{T_{\odot}}{2\pi \cdot 1EQU} = 2.5042 \cdot 10^6\ K \qquad (41.)$$

Once again, the coronal radius is considered to represent a primary radius of $r_X = \sqrt[5]{\frac{3M_{\odot} c^2}{16\pi^2 \cdot (a^P - 1)}} = 6.96181 \cdot 10^8\ m$, namely equation 38, that equation based on the *maximum timespace* mass, and thus a distance of $r_X - r_{\odot} = 6.96181 \cdot 10^8 - 6.92971 \cdot 10^8 = 3.21 \cdot 10^6\ m$ from the solar surface, a distance though that would be capable of extending beyond such a level given the core temperature would aim to represent the *entire timespace* dimensional field of space, from the sun to the Oort cloud. Thus, there would exist a type of atmosphere of the sun extending to $3.21 \cdot 10^6\ m$ from its surface with a peak temperature at this distance of $\sim 2.5042 \cdot 10^6\ K$. Solar physics understands this atmosphere as the "*chromosphere*".

11. The "solar system" cosmological foundation

In short, the scales of the sun are proposed through this *ab initio* derivation to rely on the particular temporal wave function scale in play for those dimensional phenomenal events, whether the Planck scale a^P (for radius and associated photosphere temperature) or the energy-release scale $a^{T\Lambda}$

(for luminosity). Here the values are derived in a manner consistent with the phenomena directly at play. Consider figure 14 summarizing these features of the sun:

Figure 14

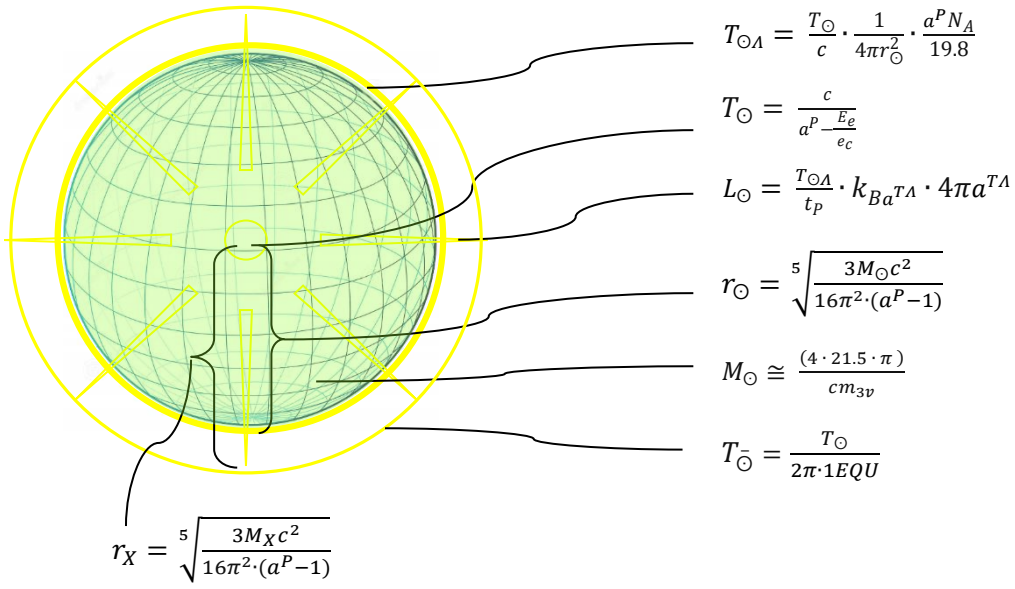


Figure 14: highlighting the phenomenal features of the sun from the derived fine structure constant (α) and Planck (h) values.

Here it is considered the sun should thence ideally form a basis for cosmology. What though has Temporal Mechanics proposed regarding the *scale* of cosmology?

The basic *timespace* equation used, as per paper 37 ([37]: p18-21, fig 3) relied on the notion that beyond the atom light as the EM temporal wave function behaves according to the principle of $E = f$, initially presented in paper 13 ([13]: p11), simply because, as highlighted here in section 9, that the idea of the fine structure constant α and Planck scale h are relevant to the atom in regard to the temporal wave function, and that therefore beyond the atom the constraints of the fine structure constant α and the Planck constant h would no longer be in play. The logical consideration is if the Planck scale is no longer in play outside of the atom, then only the idea of $h = 1$ would, and thus a scale would come into effect for EM beyond the atom, namely $(E = hf) > (E = f)$.

Subsequently, the $E = f$ feature derived the maximum proposed distance from a proposed "centre" point of *timespace*. The limit there was considered, proposed, as a singularity region of $E = f$, where energy equated to time as $E = f$. Note that this value was used to also support the isotropic $CMBR$ as derived in the paper subsequent to its proposal, paper 14 ([14]: p24-25):

Simply, the $E = f$ scaled region in space was considered as the maximum limit for $timespace$, as the Oort cloud distance, the outer limit singularity termed the *Black Expanse* ([33]: p5-8)

From this Outer Oort cloud scale was scaled inward a factor of "c" if indeed time was derived to equate to space *as a scale*, thus making c a type of scaling factor if indeed it is a constant. Note how this same c scaling factor was used to derive the core temperature of the sun in section 10, not a scaling from the perimeter of the $E = f$ limit, yet from the proposed *centre* of the $E = f$ limit, the sun.

Using that scaling system it was possible to derive the distance of the Heliopause to the sun, which in using the $\frac{1}{c}$ scale generates an interesting conclusion in that the core temperature of the sun used the same scale, the suggestion here being that the Heliopause would represent a type of "centre-point", a balancing region (albeit shell structure) for solar phenomena, presumably a solar wind (energy-temperature) stagnation zone.

Consider figure 14 as from paper 34, figure 5 ([34]: p24, fig5), coupled here with figure 14, highlighting those other results of Temporal Mechanics:

Figure 15

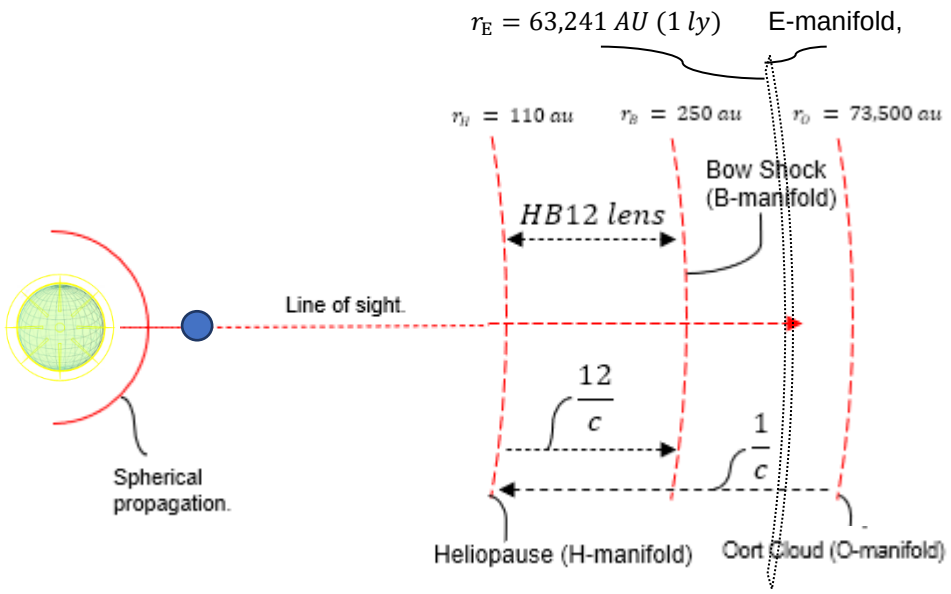


Figure 15: as per based on figure 1, paper 33 ([33]: p9, fig1), and figure 14, calculating the distance of the r_E manifold using the idea of Earth as a solar year (y) reference as one revolution around SOL, calculating this value thence as, based on c, $63{,}241\ A$U.

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], yet of course more can be forwarded regarding the stars in light of the findings here regarding the nature of the sun, to be presented in a subsequent paper. The point here being made is how the formulations presented by Temporal Mechanics represents *a more solid foundation* for the

analysis of stellar phenomena, yet not only analysis of stellar phenomena, yet *ab initio* derivation of stella phenomena, and how incredibly mathematical and descriptive and unexpectedly so such (more likely than not) must be.

12. Conclusion

The key issue with Einstein's mass-gravity inertial and non-inertial play-board scheme is the temporal causality of the gravitational field and mass, namely what causes what. To put gravity and mass above time and space, as Einstein did, causality (temporal events) becomes temporally problematic if not illogical. Giving a temporal wave function priority avoids Einstein's causality paradoxes and allows gravity to be explained from a quantum perspective.

Here Temporal Mechanics has shown the importance of not just the axiom of time, yet the importance of numbers, of the mathematics for the axiom of time. Here, Temporal Mechanics finds space and time are not independent entities alone yet exist together as the fabric itself, the structural quality, of light, EM, as a temporal wave function limited at c where at c time=0, and how such can derive an elementary particle based G value and associated fine structure constant α and Planck scale h descriptive scheme, the most basic if not fundamental constants of all, especially the fine structure constant α being the most basic in the sense that it is a feature of more equations than any other, a riddle solved here, namely the riddle of its *ab initio* numerical description, of its numerical value, its numerical construction, and its numerical application to physical phenomena, a riddle solved in presenting the diagrammatic description itself of the nature of the fine structure constant α and its association to h as a mathematical construction.

Upon this time-axiom and associated time-equation applied to Pythagorean algebraic space has been derived the phenomenal features of the sun, providing an *ab initio* explanation of the *sun* to the *Oort cloud*, of the solar system scale and those basic phenomenal metrics. The next obvious task is to then derive stellar phenomena, $ab\ initio$.

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 [1-35], is available from the following link (Non Open Access):
https://transactions.sendowl.com/products/78257031/AE5EA60A/view

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