Mathematical Principles of Time and Energy

17th May 2020

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Abstract: This paper presents the equation for time and energy that executes four key attributes of time's flow regarding energy, namely, why time presents itself as unidirectional, why reality presents itself as a time-now phenomenon in between time-before and time-after in unidirectional time, why the laws of thermodynamics appear as they are in time-now, and why there is an "uncertainty" regarding the spatial location of elementary particles in time. This paper employs the equations of time and energy as presented in the lead-up papers by knitting those equations of time and energy together in addressing the four fundamental attributes of time's flow regarding energy, concluding an event-horizon equation for time and energy as a unique mathematics for time separate to that of space, eliminating the reliance on *spacetime* theory as a singular mathematics, delivering space and time as two separate mathematics that can nonetheless be linked, surpassing the incompleteness problem as presented by Gödel, opening the door to a new cosmological model for space and time, all of such in upholding the data of all known physical phenomena in deriving all the relevant physical equations and constants.

Keywords: mathematics**;** time; space; energy; spacetime; Gödel; Hawking; entropy: enthalpy: standard model: special relativity; general relativity; Einstein; quantum mechanics; thermodynamics; uncertainty principle; TOE; big bang; dark matter; dark energy; symmetry; symmetry breaking

1. Introduction

In contemporary physics theory, time and energy are governed by the laws of thermodynamics, as the movement of energy in time and those associated conditions and patterns of energy's movement, movement that is "real" *to* human perception *in* the here and now. However, there is no current mathematical equation that links the flow of time with energy in the context of space, the key reason for this being the definition of time with space as 4-d spacetime, as per general relativity (GR), and energy being granted status with quantum mechanics (QM), as per $E = hf$, leading to the well-accepted impasse between energy (regarding QM) and time (regarding GR). This paper proposes a solution to this impasse, that there does indeed exist an equation for time and energy that is able to explain the four key attributes of times flow regarding energy, namely:

a. Why time presents itself as unidirectional (before>after).
b. Why reality presents itself as time-now in between time-before and time-after in unidirectional time (before>after).
c. Why the laws of thermodynamics appear as they are in time-now.
d. Why there is an inherent uncertainty regarding the spatial location of elementary particles in time.

Any theory of the universe, of space and time, that is unable to properly define those four key attributes of time's flow ***cannot*** be considered as a potential theory. In the absence of a theory of everything (TOE) pertaining to physics, contemporary physics theory explains those four issues with the simple premise of the big bang (BB) theory, an initial event when time began in a unidirectional manner creating a release of energy according to the laws of thermodynamics assumedly in a "now" temporal reality, a theory which when accompanied with spacetime theory leads to the requirement of dark energy (DE) and dark matter (DM), 90% of the observable alleged BB universe that as proposed entities of reality have ***NOT*** been proven to exist locally. The real failure of physics theory, the great backdrop of time-theory with energy-theory, is that the BB theory and associated GR 4-d spacetime and QM modelling requires 10^{122} amount of energy compared to what is found in real terms to actually be a real theory, which is a basic and fundamental problem for physics, determining how physics subsequently invests its wealth looking for DE and DM to support its BB theory. To take an alternative course of theory and research, this paper presents a set of new mathematical equations for the association of time and energy as the mathematics of the flow of time as a flow of energy, as presented in the previous 19 papers [1]-[19], followed-up here in this paper by knitting together the equations of time and energy of those papers, a piecing together of that jigsaw, in addressing the four fundamental attributes of times flow regarding energy, this by first addressing the use and limitation of mathematics to physics (section 2), then how mathematics can be applied to the ideas of time and energy (section 3), and finally how this points to an ultimate event-horizon of time and energy, granting time and energy their quality and associated features with particles-mass and that inherent uncertainty of definition (section 4).

A clear point that needs mentioning (as with the lead-up papers) is that contemporary mathematics is not in question per-se, namely all the equations for QM, SR, GR, and the standard model; those equations all rely on the idea of time and space sharing a common mathematics that describe ***real-data***. That ***real-data*** is not in question, yet the argument presented here in this paper (as per previous papers [1]-[19]) is central to how a "better" mathematics can be employed to describe that **same** ***real-data***, better than spacetime theory. The proposal here, as with the previous papers, is that a different mathematics is required for time as compared to space. Quite simply, if a theory such as relativity theory is flawed based on its foundations, then it is not possible to argue against that theory using its foundation principles in order to put together a better theory, and in the case here the foundation principles of time and space employed by relativity theory simply cannot be used to manufacture a better theory. To improve upon a flawed theory, one must employ the use of new first principles, and the case proposed here is a new mathematical principle for time.

To challenge therefore the mathematics presented here is to lose sight of how the mathematics are being employed deliberately differently to time as to space. This paper, as with the previous papers [1]-[19], highlights it ***is*** possible to derive ***all*** the known equations and constants thereof for ***real-data*** based on a new equation for time when applied to 3-d space as a separate mathematics to 3-d space. Although the proposed time-algorithm has achieved what it has in the key lead-up 19 papers [1]-[19], there is one more key fundamental feature that needs to be presented, a fundamental feature that ties together ***all*** its attributes, namely describing the temporal association of particles in space and their associated energy characteristics, such in the context of "***uncertainty***", and why such is so. Indeed, it should not be enough for contemporary physics to hitch the idea of *uncertainty* based on the required uncertainty involved in the metrics of an initial BB beginning of time, indeed not. "Uncertainty" here in this paper shall be explained as a normal feature of the relationship between time and space and those separate yet associated mathematical paradigms; as shall be demonstrated, "time" with the appropriate mathematics is the basis for both symmetry and symmetry breaking.

2. What is Mathematics

According to the Merriam-Webster dictionary [20], mathematics described in words is as follows:

Definition of *mathematics*

1: the science of numbers and their operations, interrelations, combinations, generalizations, and abstractions and of space configurations and their structure, measurement, transformations, and generalizations; Algebra, arithmetic, calculus, geometry, and trigonometry are branches of *mathematics*.

To note here is the high weight of importance given to mathematics regarding space and its associated abstractions, transformations, and so on, a highly practical part of the utility of mathematics in physics. In general, mathematics represents the study of a variety of topics, primarily as quantity (number theory),

structure (algebra), space (geometry), and change (mathematical analysis). Mathematics therefore is a fundamental tool for physics in providing space with a geometry, with structure, and with change to that structure according to a number theory, a number theory as a description basis for objects in space and how they undergo change regarding time ***and*** energy. What is not clearly specified by mathematics currently is the idea of time ***with*** energy.

Generally in physics, mathematical patterns based on "real" data are used to formulate new hypotheses; the truth or fallacy of hypotheses are resolved by mathematical and associated experimental proof using that lens of mathematical data accounting. Therefore, when mathematical structures are considered to be good models of real phenomena, mathematical reasoning can provide useful predictions about nature, and the case here that comes to mind is the idea of gravity being a curvature of 4-d spacetime (GR), together with the notions of DM (GR) and DE (QM), mathematical predictions that are ***NOT*** yet proven to be "real", yet based nonetheless on GR (4-d spacetime) and QM (quantum states). For the purpose of this paper and in the context of its previous associated papers, the idea of mathematics in physics is the primary consideration, and to be more specific, the idea of mathematics in regard to energy when applied to the ideas of space, time, and "spacetime", shall be primarily brought to attention.

As presented in the previous paper, the concept of space and the concept of time are ideally considered to be two separate things, not as the one spacetime ([19]: p6-9). The basic reason for this is that the mathematics of the ***one*** spacetime held in the context of the QM energy descriptors leads to the absurd proposals of DE and DM. Hence, throughout the papers, the task has been to measure the separate identities of space and time and their associated separate mathematics, as presented in the previous paper ([19]: p6-9), as a departure from GR and QM, yet with the aim of resolving their differences by approaching the definition of space and time with greater acuity, and the case in point here is addressing the definition of time. As the mathematics of space has been covered for centuries, if not millennia, the task in these papers has needed to account for the unique mathematics of time, and thus has been a departure from the recent use of the mathematics for time as per contemporary physics' 4-d *spacetime*, for the reasons specified. The importance of considering a separate mathematics for time compared to space should not be underestimated, for it almost states that mathematics is not able to calculate "all" of reality as the one equation, as of course the application of mathematics to time would be different to that of space. Gödel himself understood this in his incompleteness theorem [21], namely that mathematics is unable to be complete (as an arithmetic) for a formal axiomatic system (such as for instance space and time). In knowing this, Hawking presented the case that a complete mathematically based theory of space and time could not be reached as per his "Gödel and the End of Physics" (2002) [22].

Quite simply, if the concepts of space and time are different, as different dimensional entities, different axiomatic foundations, then a different mathematics must apply to both, or rather must be "***applied***" to both, given those unique dimensional characteristics of space and time respectively, and thus an entire mathematics for spacetime will "always" be incomplete, as Gödel proposed [21] and Hawking feared and conceded to [22]. Indeed, if a common mathematics can apply to space and time as one, space and time could only be considered as spacetime through such a mathematics "as the one thing", as *spacetime*, yet the concept of spacetime leads to absurd conclusions, as per the mathematical

proposals and associated real-data metrics for DE and DM, a fact physics deals with by the *hope* in finding DE and DM, blind nonetheless to what Gödel had proposed regarding the limitations of mathematical modelling [21] echoed by Stephen Hawking [22].

In short, mathematics has found its greatest application with the dimension of space in physics, not time, commonly with three dimensional spatial constructs and how they relate with each other over varying plots of time, the focus though being the mathematical patterns of the spatial shapes as *spacetime*. What has been missing in physics theory is the use of mathematics to ***explain time***. And the problem does not rest there, namely the overlooking of the potential mathematics for time and its complacency in blending time to space as 4d-spacetime. The true problem with physics is accounting for, via mathematics, the unidirectionality of time and how such associates with the commonly understood principles of thermodynamics regarding time. The question is *"what" is the mathematics of time associated to both its unidirectionality and the "real" data behaviour of energy systems in time given that the idea of spacetime and mathematics thereof lead to the absurd conclusions of DM and DE, where DE trips over the scales at a factor of 10^{122} of what is found in space*? On this front, the current mathematics of spacetime, the use of mathematics to join space and time, fails in its quest for DM and DE, together with facing the 5 key issues of cosmology theory, namely, as per paper 17 ([17]: p3-4):

> *(I)* The ***Horizon Problem****: photons have the same uniform temperature, regardless of distance, roughly 2.725 degrees Kelvin.*
>
> *(II)* The ***Flatness Problem****: nearly all the evidence collected by cosmologists indicates that the Universe is flat, as though spacetime shows almost no curvature whatsoever, an extremely unlikely thing in the context of a required BB.*
>
> *(III)* The ***Monopole Problem****: the enormous energies that would have been produced by the Big Bang should have created a magnetic particle as a monopole, not a dipole, a unique entity, and yet there is no evidence for it.*
>
> *(IV)* The ***Hubble Constant Problem****: the difference in H_0 determinations has surpassed 5 sigma.*
>
> *(V)* The ***Cosmological Constant Problem****: that the amount of energy required for the BB to have taken place is off the scale compared to the calculated background energy, of an order of 10^{121}.*

Conversely, the papers presented ([1]-[19]) have highlighted that it is possible to generate formulae for all known data relevant to physics using a new algorithm for time, not space, to make ***time*** the primary feature of mathematics, without not considering the associated independent 3-d mathematics for space, while addressing and solving the above 5 issues. Once again, ***the*** key issues to solve, to be presented here, are the reason for the arrow of time and it's association with energy, and why it seems there exists a type of uncertainty between the metrics of time and space when measuring mass in space and its location in time.

3. What is the Mathematics of Time and Energy?

"Time" according to the Merriam-Webster dictionary [23] is defined as:

Definition of *time*

1a: the measured or measurable period during which an action, process, or condition exists or continues: DURATION

b: a nonspatial continuum that is measured in terms of events which succeed one another from past through present to future

Definitions for time, as many exist, all point to today's upheld idea of time being directly related to space as spacetime, yet the proposal here is that such a definition is limited and overlooks the finer structure to a unique and independent time-theory itself, unique and independent from space yet of course related 'to" space as it only can be. The question is, "what is that time-theory" and "how does it relate to space without failing in the same way as spacetime theory?".

The general layman's definition of time is "what a clock measures", as how Einstein initially presented the idea of time in his Special relativity (SR) theory, until it became intertwined with space in his General relativity (GR) theory as a parametric descriptor of *spacetime*. Time is also measured according to the QM model using atomic clocks and those associated fluctuations of energy on the atomic scale. Although most definitions of time point to how the concept of time can be measured, whether by simple parametric (GR) clocks or rather elaborate atomic (QM) clocks, no exclusive definition has been formulated for the concept of time.

There is one rather unassuming definition for time nonetheless, largely unheralded, yet very significant as a concept, and this is the idea of the big bang (BB) which quite neatly albeit mythologically proposes "when" time and space presumably began as per the simple premise that such is what the BB was, namely an event that created a start point in time from when and where energy with space has been rapidly expanding ever since as a process it seems of continual uncertain yet accelerating expansion. How that is not pseudoscience is a mythology in itself, yet it ***is*** the current basic theory of time and energy held by physics theory today, as the best physics can do to explain that proposed model of reality-creation, of the genesis of time, space, energy, and matter, all in the context of "spacetime", of space and time as one, as the one 4-d construct, the curvature of which is proposed to be gravity. Yet coupled with this model is the need to use the features of DM and DE, entities that together form 90% of what "cannot" be found in our local reality, and thus entities currently held in a type of physics-mythology, a "need to find" agenda of things to achieve sooner rather than later.

The previous three papers [17]-[19] have continued the case from their predecessor papers ([1]-[16]) central to a unique definition for time that accommodates precisely for our perceptive ability with time, while also needing to identify in that pan-spectrum of time-capability a basis for the "data" being "real", of remaining true to the "here and now". This was stated in paper 17 ([17]: p24) as follows:

> *In summary, the pre-requisite literary and research work of this paper [1]-[16] employs the use of **all real** data, with the aim of reaching a pan-theory explaining the link between all such data and associated equations.*

in paper 18 ([18]: p8) as follows:

> *Thus physical laws would exist as symmetries in the here and now relevant to space and time-now, yet outside the here and now would exist asymmetries, asymmetries populated by the notions of time-past (time-before) and time-future (time-after), populated by memories/dreams/imaginations, the "unproven", yet still very essential, as indeed the memory (time-before) and forewarning (time-after) components of perception can be nonetheless annexed to **trust** in the distinction between what is real and what is not real.*

and in paper 19 ([19]: p19) as follows:

> *The entire process of cognition here, the writing, the sharing of the data and associated theories, is based on trusting real data, trusting the symmetries of laws, trusting that reality is not playing tricks, that the basics can be understood. Here the trust is being put in the data that has been accumulated throughout the centuries, data that is "real", data not based on assumptions*.

In short, the proposal in all the papers [1]-[19] has been to present an algorithm for time that does justice to the human ability of perception, namely the code of time (time-before > time-now > time-after) that registers to our perception as "real", and that because it registers to our perception in such a way the question became *how* a mathematics can be structured from that registering of time to our perception regarding the reality we perceive in the here and now as "real".

The one thing the papers have not explained is ***why*** time is unidirectional, and ***why*** it seems the second law of thermodynamics is in play the way it is. These two issues can be solved though in piecing together the 19 papers [1]-[19] in considering ***what*** it is that the proposed algorithm for time, the $t_B + 1 = t_A$ equation ([1]: p4) seeks, namely achieving "π", yet more to this, ***why***, and how this then relates to the energy equation ([15]: p11, eq8) of $e^2 + \varphi^2 \cong \left(\sqrt{\frac{19.8}{20}}\,\pi\right)^2$, while upholding the idea that the geometry of 3-d space, those physical laws, the basic ideals of physics, inertia, thermodynamics, and so on, are not in question, only that using a blunt instrument like inertia to define space and time as spacetime ***is*** in question, as the results it gives are far from realistic and more suited to a purely animated reality, as presented in the previous paper ([19]: p6-8). What the papers [1]-[19] have found is that it is possible to employ the mathematical algorithm for time to arrive at the mathematics for space, and that to arbitrarily state the mathematics of space as a 3-d construct places a vast oversight in play regarding the mathematics of time in granting time only one dimension of analysis via that arbitrary definition of space oversight. Consequently, the previous papers [1]-[19] have been able to derive all the relevant equations and constants of physics theory, while also being relevant ***to*** the paradigm of space ***from*** the primary equation for time, including the energy equations as follows:

- Vacuum energy ([14]: p 23, eq.9): $\sim 10^{-9}\, Jm^{-3}$
- CMBR (Hz^{-1}) ([14]: p25, eq.12): $t_B = \sqrt{\frac{21.8 \cdot 1.079}{N_A}} = 6.25 \cdot 10^{-12}\ s$
- Absolute temperature ([14]: p25, eq.13): $2.7 \times \frac{22}{21.8} = 2.725$
- Boltzmann constant ([14]: p26, eq.17): $t_A - E = 1.37 \times 10^{-23}\ J\ K^{-1}$

By such a process of derivation, it became clear the idea of time was strongly associated to energy, yet the question was, "how?". Such is the task of this paper.

The definition of energy according to the Merriam-Webster dictionary [24]:

Definition of *energy*

3: a fundamental entity of nature that is transferred between parts of a system in the production of physical change within the system and usually regarded as the capacity for doing work

4: usable power (such as heat or electricity); *also*: the resources for producing such power

It becomes self-evident therefore that the current mathematics of measuring time is based on oscillations, and the current mathematics of measuring energy is based on volume and pressure, and therefore, in all, dynamic systems seeking their own equilibrium in time. Essentially, such is "thermodynamics". The Meriam-Webster dictionary [25] defines thermodynamics as:

Definition of *thermodynamics*

1: physics that deals with the mechanical action or relations of heat

2: thermodynamic processes and phenomena

It is widely considered that thermodynamics has four basic laws in general [26]:

i. **Zeroth Law (TD0)**: *If two systems are each in thermal equilibrium with a third, then they are also in thermal equilibrium with each other.*

ii. **First Law (TD1)**: *In a process without transfer of matter, the change in internal energy of a thermodynamic system is equal to the energy gained as heat minus the thermodynamic work done by the system on its surroundings.*

iii. **Second Law (TD2)**: *Heat cannot spontaneously flow from a colder reference to a hotter reference*.

iv. **Third Law (TD3)**: *As the temperature of a system approaches absolute zero, all processes cease and the entropy [27] of the system approaches a minimum value.*

It would be therefore logical to suggest that as much as it is possible to define energy in regard to "space" (volume and pressure), it must also be possible to explain energy in regard to "time". The proposal here

is to formulate and utilise a ***new*** and independent mathematics for time based on our complete perceptive ability with time (as presented in the previous papers [1]-[19]) and then apply that mathematics to a real-time account of energy, where energy is headed as a flow, and ***why***, and therefore why time is unidirectional.

According to paper 15 ([15]: p11, eq8) the general flow of energy is central to the following mathematical equation regarding the feature of time as energy in terms of t_A, as t_B^2, in the context of a "spatial matrix":

$$e^2 + \varphi^2 \cong \left(\sqrt{\frac{19.8}{20}}\,\pi\right)^2 \qquad (1.)$$

The reason why $\sqrt{\frac{19.8}{20}}$ should be factored with π in such a fashion owes itself to the need to consider the π compression factor of $\sqrt{\frac{19.8}{20}}$ ([14]: p23) for space which as $\frac{19.8}{20}$ is a t_A entity which thus must be brought back to a t_B factor in that $t_A = t_B^2$, and thus $t_B = \sqrt{t_A}$. The focus with equation 8 is that the context there is according to the context of t_B,. And in knowing that context, $\frac{19.8}{20}$ has to be factored in to the equation relevant to π, to that process of the phi-quantum wave-function seeking π, based on how "e" has already been summonsed in the context of radioactive decay, that process, as per paper 14 ([14]: p26) to arrive at equation 8. The suggestion there, is that both the linear values of "φ" and "e" can be approximated in a spatial matrix via "π" by knowing how both a "held" context of time (as "φ") and un-held context of time (as per radioactive decay regarding "e") can be related according to the phi-quantum wave-function spatial template and thus appropriately calibrated together with that scale. The equation is a statement about how space, in accommodating for π as a Pythagorean relationship, deals with the structure of both the held process for time as "φ" and the un-held (radioactive decay) process for time as "e" in relation to "π". The feature here, the equation, is central to space acknowledging the temporal notion of "π" through the $\frac{19.8}{20}$ spatial template standard via those two temporal processes.

Once again, this equation is a "***unique***" mathematics for "***time***" as "***energy***", not a part of the standard spatial mathematical equations, yet unique to "time", as an equation based on the phi-algorithm [1] for time, with a unique application ***to*** the concept of space. Quite simply, it is not a standard mathematical equation for "space", yet "time", highlighting the separate mathematical paradigms for space and time. It does though refer to "space" as a concept in that t_A as t_B^2 is associated to the concept itself of space, as stated in paper 2 with equation 1 ([2]: p4, eq1) regarding the dimensions of space and the use of φ^2:

Yet it is not as simple as this, for in using "both" factors of time, one axis remains complex and the other in being at right angles to the time-axis becomes embedded in a spatial axis, which is a "square" value of the time axis as per $t_A = t_B^2$, given that t_A would represent the feature of time imbedded in the t_B reference of the fundamental time axis, and that t_A would be represented in the spatial dimension. Simply, if we consider that time is the essential "before" (t_B) time step, as we only can, "space" in being an independent entity to time would be the "after" (t_A) time step including the "now" (t_N) step, obviously. And so, we need to calculate the vectors for space in the after-event (t_A) and the now-event (t_N) for time to understand what is happening with theoretical 0-scalar space.

Nonetheless, the proposal here is that equation 1 surmises the following in equation 2:

$$e^2 < \boldsymbol{ENTROPY} > + \varphi^2 < \boldsymbol{ENTROPY} > \cong \left(\sqrt{\frac{19.8}{20}}\,\pi\right)^2 < \boldsymbol{ENTHALPY} > \qquad (2.)$$

This can represent the thermodynamic laws as follows:

$$\overbrace{e^2 < \boldsymbol{TD2} > + \varphi^2 < \boldsymbol{TD2} > \cong \left(\sqrt{\frac{19.8}{20}}\,\pi\right)^2 < \boldsymbol{TD3} >}^{\boldsymbol{TD0}\ \&\ \boldsymbol{TD1}} \qquad (3.)$$

Such is so given how that equation has been defined, why it was defined such ([15]: p11), namely e^2 and φ^2 representing the process of energy release as ***ENTROPY***, seeking the PQWF spatial template $\left(\sqrt{\frac{19.8}{20}}\,\pi\right)^2$ as ***ENTROPY*** leading to the overall process of the steady-state system as presented in paper 5 ([5]: p8-10). Note that the general process in the equation is ***ENTROPY*** equating to the ***ENTHALPY*** of $\left(\sqrt{\frac{19.8}{20}}\,\pi\right)^2$ as an overall ***STEADY-STATE*** situation. The questions now are therefore, *"why does the PQWF seek π, and what **is** that event horizon, what form does it assume, and is such an event horizon reachable?*" The answers to these questions are important as they would provide a reason for time's arrow and how that is relevant to space, and more importantly to energy and mass.

4. The Time Event-Horizon: Space

The key issue of why the PQWF *seeks* π (and that significance) can only be explained by taking a step back from linear time as a singular arrow (as a concept connected with space as 4-d spacetime) by considering the concept of time as an independent paradigm and therefore not directly connected with space as a mathematics (as a primary axiom of definition) yet having its own distinct mathematics and dimensions thereof. Indeed, one *can* propose a theory of space and time as based on "real" data, data in the here and now, irrefutable evidence of time's passage from before to after, as a singular mathematics as *spacetime*, yet alternatively of course without corrupting the same real data the possibility must exist for time to represent its own mathematical equation and associated paradigm. The question now then is, "how would this paradigm of time be scripted as a mathematics and how could this then relate to the mathematics of space"? The answer will be explained in four ways, the first being time represented as two independent axes, namely before>after and after>before resulting in a time-now paradigm in regard to space (4.1), the second explanation shall be time as an "equation" per-se (4.2), the third as an explanation of the inherent *uncertainty* between time and space (4.3), and the fourth as the overall flow of time (before>after).

4.1 THE TIME-AXES

Consider two independent time axes, time from before>after, and time from after>before, length of time as “t”, length of time forward equating to length of time in reverse, as a hypothetical argument would have it, as per figure 1. Note here that the idea of time “before” and time “after” and time “now” are being described as ideal maximum values, namely time “before” (*blue square (tail), red arrow (head)*) would be maximum at the beginning (tail) of time forward, maximum at the end (head) of time backwards, and time “after” (*blue arrow (head), red square (tail)*) maximum at the end of time forward (head), maximum at beginning of time reverse (tail), and time “now” (circle) maximum in the middle of time forward and time reverse, both red or blue depending on time forward (blue) or reverse (red). Note also that time before>after is arbitrarily drawn thicker in blue to time after>before drawn thinner in red.

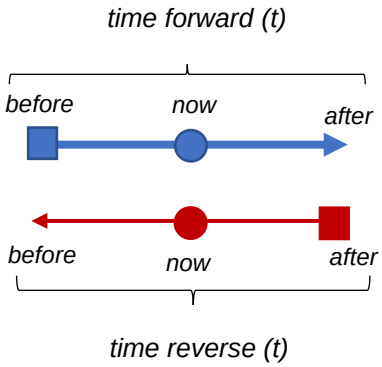


Figure 1: time “before” maximum at the beginning of time forward, maximum at the end of time backwards, time “after” maximum at the end of time forward, maximum at beginning of time reverse, and time “now” maximum in the middle of time forward and reverse, both red or blue depending on time forward (blue) or reverse (red).

In such a case, given time would represent its own dimension separate to that of space (hypothetically), time before>after would represent one dimension, and time after>before represent another, and therefore as a mathematical description (not the same as that of space) these two time axes would be perpendicular to each other crossing presumably at time “now” (shown as a dual time “now” in green), as per figure 2.

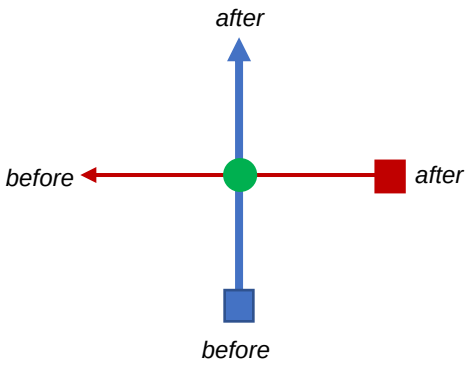


Figure 2: time axes before>after and after>before perpendicular to each other crossing at their collective time “now”.

It is important to note that in a ***spatial*** context, time after>before would trace back over time before>after as a time line, where the greatest "now" time zone would be in the "centre" (as now-now), as per figure 3.

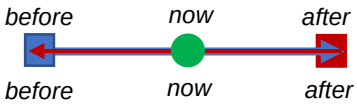


Figure 3: the ***spatial*** context of time axis after>before tracing back over time axis before>after through the common "now" point.

However, such spatial mathematics is not being considered as the *a-priori* here, as what is proposed per figures 1-2 is a separate mathematics exclusively ***for time***. The proposal in this situation for time nonetheless as an exclusive mathematics is that the dimension of time before>after is at right angles to the dimension of time after>before. ***It is important to note*** that in these diagrams the temporal location of each axis of time despite their being perpendicular is quite arbitrary, as these two perpendicular axes could be temporally positioned at any rotational (360^0) location around the central ***NOW*** time-line intersection point, as per figure 4, the dotted lines showing any potential locations of the time-lines, potentially an infinite number of different locations/angles (the reason why to be mentioned shortly).

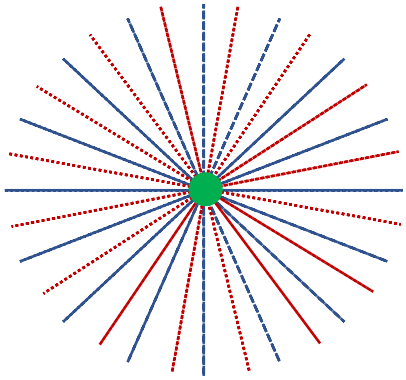


Figure 4: the red (time reverse) and blue (time forward) demonstrating any potential temporal location of the time-axes.

As a consequence of this feature, the possibility exists for axes to overlap according to a configuration of the time axes joining their arrow heads and square tails, as per figure 5 (axes drawn slightly separated).

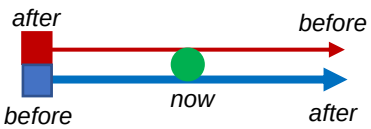


Figure 5: the time axes of before>after and after>before overlapping in such a fashion where the after and before tails join and the before and after heads join.

The result this would have would be the as per figure 6, namely “three” “now” zones of time.

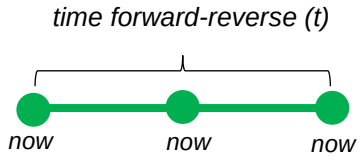


Figure 6: three “now” zones of time from the joining of the *run* of time; red arrow-head to blue arrow-head, red square-tail to blue square-tail.

Let it therefore be considered that any number of time axes can be considered intersecting around the central ***NOW*** intersection-point leading to such “now” alignments, in any number of perpendicular alignments and this dimensions (3-d here being the obvious). However, by this process, a pattern becomes apparent as a sphere displaying an infinite number of potential “now” axes alignments (green-dotted perimeter circles), as per figure 7.

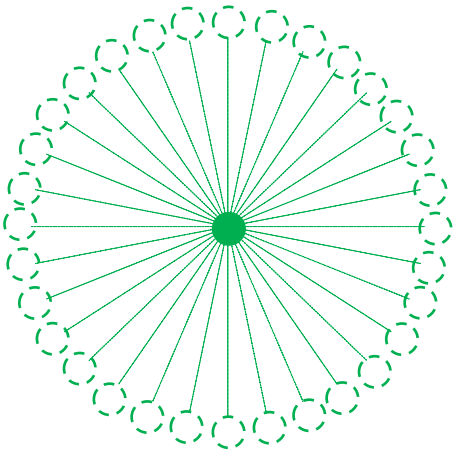


Figure 7: an infinite number of potential before-after>after-before “now” zones around the central “now” zone forming a circular perimeter (πt) sphere, yet what would be a 3-d sphere.

What also needs to be noted is that with these potential alignments, there also exists the potential alignments granted by figure 3, the “*spatial*” context of the time axes joining, meaning that this configuration, this potentiality, is essentially a 3-d “space” template for time. The fact that the “location” of the time axes on that spatial template cannot be determined is of no consequence (for time), as it is a time axes scenario; such highlights the disconnect here between the exclusive mathematics of time compared to that of space, which still subsequently must have consequences in regard to the location of particles *in space* nonetheless using the basis of the mathematics of time to measure the location of any elementary particle (for instance), namely it not being possible on such a fundamental level, as explained by the time equation as the basic uncertainty involved regarding space and the time-function in any “future” step ([1]: p3, eq2). Let this be considered as the “time-space uncertainty” (TSU) principle. Before discussing this feature between time and space just yet (TSU), what is the mathematical empiricism of the equation for time in regard to the features of time-now with its underlying principles of time-before and time-after?

4.2 THE TIME-EQUATION

Although the time equation was presented clearly in paper 1 ([1]: p3-5, eq2-6), the time equation can be best summarised with what was presented in paper 8, "The Golden Ratio Time Algorithm" ([8]: p4, eq1-7):

In mathematics, an equation is a statement that asserts the equality of two expressions. To present an "absolute" equation for time then requires a type of equality to be established between two expressions of time. What can we say about "time" that has two expressions using both "1" (as t_N) and t_B, as an expression of equality?

We traditionally have related time-before to time-after along a basic linear mathematical construct as $t_B > t_N > t_A$. Is time so simple though?

Let's break it down further. For instance, we know that placing t_B next to t_N requires a negative sign for t_B (equation 1) given t_B would be a "backward/negative" step compared to (in reference to) t_N.

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

Yet, if time is a singularity, we can present the case that t_N can also be "per" $(-t_B)$ as another equation for the flow of time, as technically t_B would already be contained within the t_N construct, as it would have already happened (equation 2).

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

The question now is regarding their relationship (A and B).

*If these two features represent fundamental processes to time, **<u>and time itself is a singularity</u>**, then <u>fundamental property A</u> must equate to <u>fundamental property B</u> (equation 3.)*

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

Essentially we are taking two proposed properties of the mathematical relationship between t_B and t_N and equating them together as the algorithm for time.

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

$$t_B^2 - t_B = 1 \qquad \text{equation 4.}$$

$$t_B + 1 = t_B^2 \qquad \text{equation 5.}$$

Equation 5 is interesting, as essentially it suggests that if we consider an "arrow of time" equation that is absolute, and we add the past as a "positive value" (as it would be in considering

an arrow of time equation) to t_N, as past + present, only logically we would arrive at the future, let us call t_A (equation 6.)

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

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

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

Once again, as presented in paper 8 [8] as with here, the concept of time *would transcend* the standard convention of mathematics for space, defined as being more fundamental than the mathematics of space, *is a set-relationship of its own kind*, and as an entity would be *more fundamental than the mathematics of space, and therefore* "***can*** *employ mathematics a certain way, as a certain relationship of values, as a certain equation*"; this theme runs throughout the papers and the use of the algorithm for time, as it must. Such is how this new axiom for time is being employed, namely with a clear role and purpose, not derived from the mathematics of space, yet from the nature time itself is being proposed to exist on, on its own most basic level, *and then applying mathematics to that fundamental basis* to arrive at the 3-d space construct. And in suggesting such, the concept of space as an algorithm, in reaching the value of π, would of course need to be addressed and upheld; such is an essential feature of the papers, as initially proposed in paper 1 [1], namely the spherical time front in space, the mathematical value of which (π) derived in paper 15 ([15]: p4-8).

4.3 THE TIME-SPACE UNCERTAINTY (TSU) PRINCIPLE

One key issue to note now is how the uncertainty between time and space (TSU) would manifest in the manner of the spherical time-front of space, as regarding mass and energy. As presented (4.1), 2-d time is to space as space is to a 2-d circle perimeter, and so on and so forth, leading to the 3-d spatial sphere construct. The initial premise of time around a central "now" point (as two axes that could exist anywhere around that central "now" point in time leading to the sphere) creates the concept of a "now" "front of time in "0" space sphere, space that can only be defined as "0" space, as presented in paper 1 ([1]: p5-7)], and thus creates the concept of "π" associated to "space", yet indirectly associated to time. Yet here is where the idea of space must step in, as it only can, defined as a "0" construct. As presented in paper 1 ([1]]: p2):

> *A "location" in space is defined as a "zero" reference in an overall universal 0-scalar space 3-d manifold. What we're proposing here is that which gives space it's feature, of "cradling" everything, is "time"; as one space cannot be elsewhere, the effect of time "changes" a reference of space, gives each 0-scalar point of space it's "uniqueness".*

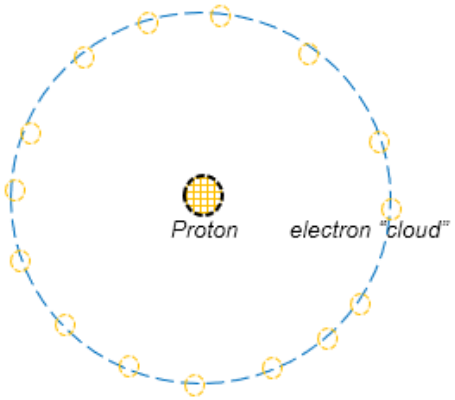
Time as “now” would exist in any possible location in “0” space, and furthermore, it is “time” that would ultimately give different references in space “uniqueness”; such is the TSU, the time-space uncertainty principle in play. Simply, any “now” time can exist anywhere in “nothing”, in “0” space, yet the feature of this “now” temporal event in space accords with itself the uncertainty of definition of position-location as highlighted by figure 7, an essential difference of the mathematics of time compared to space; *time* would have an *immediate entanglement* as a “now” event in time (as a paradigm with space) as a common “now” temporal reference anywhere in “0” space, as it only can, if indeed space is “0”, and thus must be “0”. The location of each “now” event of time can therefore only be “uncertain” given how the temporal paradigm is being defined mathematically compared to space.

The feature to note here is that the mathematics of time is of a greater dimensional importance than that of space, namely being more fundamental, more causative, and that this would be a part of an ultimate energy “steady-state” situation if indeed time’s flow is associated to energy. Moreover, as a concept of the laws of physics, “’time” would hold greater sway of “symmetry” (namely the symmetry of laws, as the transferability of “now” and associated underlying precedents associated to time) as an a-priori in regard to space, yet that symmetry would be broken by the concept of “uncertainty” as that impasse between time and space, that “different” mathematics, as “symmetry breaking”. How indeed therefore would this uncertainty between time and space manifest, this impasse, this broken symmetry? The idea of “particle uncertainty and quantum entanglement” was presented in paper 2, chapter 2.9 (Particle uncertainty and quantum entanglement) ([2]: p17):

> *The issue for using the t_B magnetic feature resulting in an electrical t_A which then must recalibrate its position as a t_B 0-scalar reference entity implies that the electrical component should start at its own unique 0-scalar starting point, when it is half a phase of half a wavelength out from this value (figs. 12-13). This implies that the position of the electrical component of the wavelength and thus of the electrical feature of the particle is inconsistent with its actual wavefront movement given the speed of light has been accurately derived by not using such a quantum-adjustment (as a recalibrated location in space). Basically, for a natural state of the speed of light the quantum adjustment process displaces the actual 0-scalar reference of the wave and associated particles, meaning that there is an inequality of position in space with the actual measured value for light which “should” according to eq. 6 be set at “20”, 10 along each direction of the axis. And of course, if there is a mismatch between what should be measured accurately and what isn’t, the further we aim to measure the position of an elementary particle such, the less accurate its position will be measured as.*

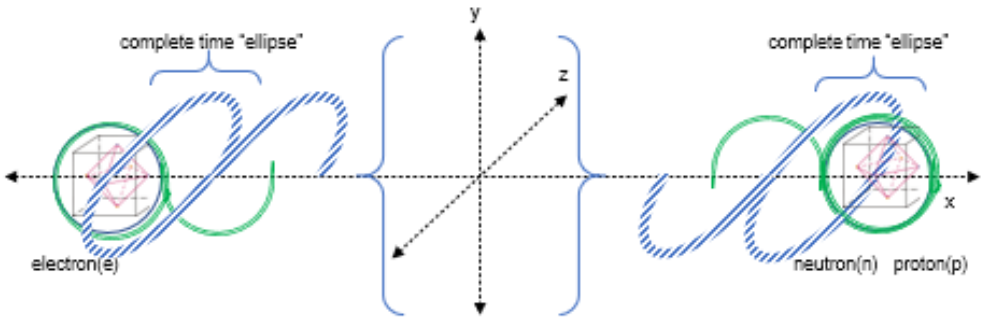
Once again, the entire issue is that of time seeking the “π” feature of space. Incorporating the TSU into the development of the PQWF on the elementary level was achieved in paper 2 ([2]: p14-15, fig 15):

How this "running and returning" of light would manifest between the electron and proton, between these elementary charged particles (their status as "particles" to be explained later in this section), would define with each "running and returning" a unique status, a unique orientation, or a unique sub-structure, any combination thereof, of these elementary charged particles. Given the nature of the electron, it would be reasonable to suggest that it would exist more than likely than not in various locations around the proton according to its need to circumscribe a circle (condition for $-\frac{1}{\varphi}$, eq. 3), like in a "cloud" of 15 various positions, whereas the proton (and neutron, as we shall soon explain) would although be relatively fixed in the atom, would have substructures meriting the 15 different unique identifiers they would need to uphold (whatever they may be while depending on the two as-yet announced features of the Uncertainty Principle and Quantum Entanglement effective a particles status, as per the explanation in section 2.9) (fig.15):



***< FROM PAPER 2 > Figure 15**; 15 "c" orientations for the electron to the proton, and 15 "c" internal sub-structure ingredients for the proton, once again each of the 30 "c" loops meriting a new unique status/orientation of the electron and proton.*

Here, the TSU accounts for the idea of the uncertain location of an electron (electron cloud) compared to the more certain location of the proton (and neutron) nucleus. This atom of course has more features (elementary particles) intrinsic to the PQWF theory development as presented in paper 4 ([4]: p13, fig14):



***< FROM PAPER 4 > Figure 14:** Note here the installment diagrammatically of the crystal topology for the electron and proton/neutron elementary particle families.*

This therefore becomes as figure 8:

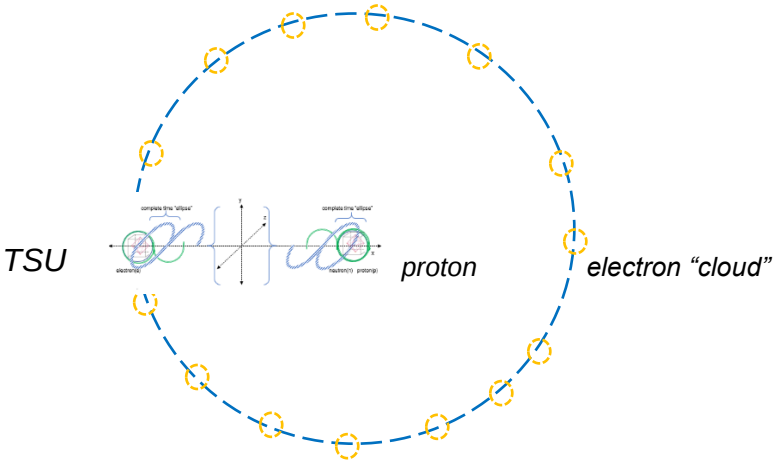


Figure 8

This TSU ultimately is an "initial condition", as a requirement between the paradigms of time and space. The importance of this "initial condition" was appropriately presented in paper 3 following the development of the PQWF ([3]: p4-5):

> *The need for the system to define π perfectly and eliminate the error between light and particle location would be the "directive" in this chaotic extra-atomic manifold. This would happen through the assembly of all these chaotic yet (golden ratio) fractal conglomerations (which would follow what we know as a Fibonacci sequence of layered building, a sequence that adheres to the golden ratio, and in this case a way to build structures upon sub-structure dimensions [13], a most practical form of spatial modelling without corrupting underlying sub-structure "initial conditions") of atoms all undertaking their force-associations (as per gravitational and electromagnetic interaction, ([1]; p8-10). The overall structure of reality logically would play out as vast conglomerations undergoing circular formations as 3-d spherical structures in a context of (in all appearance) chaos. Note that the set feature within the atom required light had a certain "uncertainty" to it owing to how the wave function developed and the need to step from a 19.8-manifold to a 21.8-manifold owing to the quantised features of that wavefunction; light would be still vulnerable to that same set of conditional uncertainties that the atom was able to deal with as per its construction. How though can light behave extra-atomically to honour these underlying conditions of reconciliation?*

From these initial conditions, a model of the greater platform of time and space was proposed, having derived the required key equations and constants of mass-energy phenomena, as per paper 7, "Golden Ratio Entropic gravity: gravitational Singularity Field testing"" ([7]: p20, fig19-20).

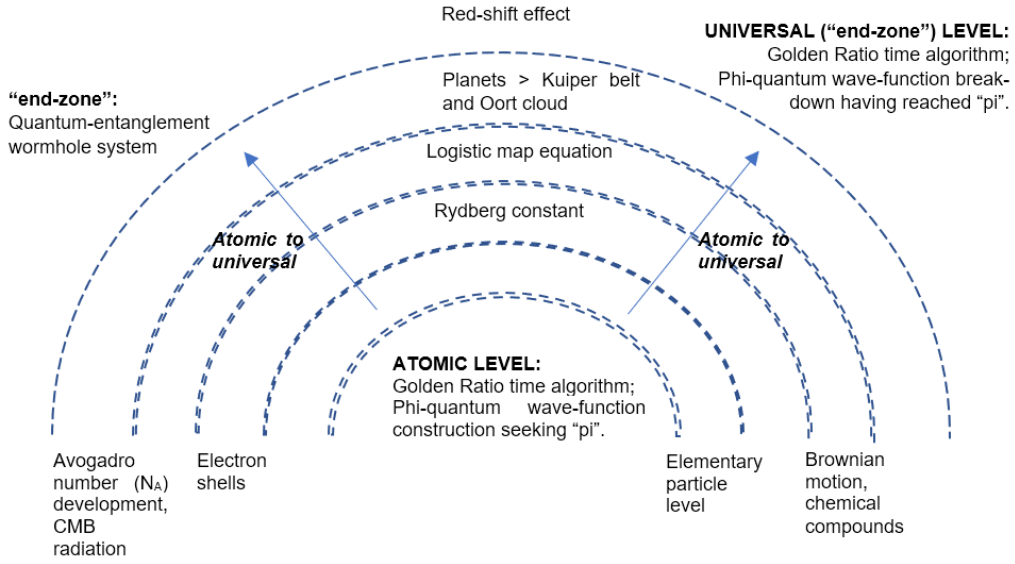


Figure 19: Diagram of the general flow of procedures that time as per the phi-quantum wave-function must undertake to fulfil all its requirements of a-priori definition as the golden-ratio time algorithm.

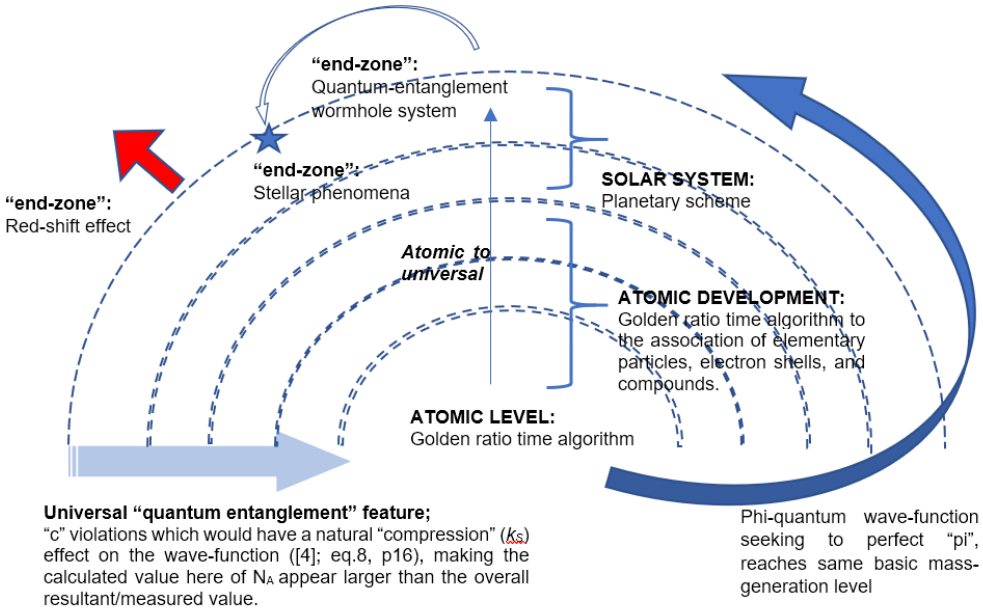


Figure 20: A more detailed diagram of the general flow of procedures that time as per the phi-quantum wave-function must undertake to fulfil all its requirements of a-priori definition as the golden-ratio time algorithm, forming an ultimate feedback loop, paying closer attention to the cosmological features at the "end-zone", and how this gives rise to a universal "quantum entanglement" feature that would echo through the entire time-space scheme, as much as the atomic level was scaled up via a process of fractal gauge invariance.

4.4 THE FLOW OF TIME (BEFORE>AFTER)

As described by the papers [1]-[19], mass and energy from the atom to the cosmic level would exist in a dynamic state according to the fundamental definition for time in regard to space,

as systems of PQWFs seeking π, with 3-d space being the accommodator, the accommodating factor, balancing all the required equations of mass and energy thereof according to the TSU. Quite simply, any event in time related to space as a progression of space from a point source, if indeed time is uniform through that uniform 3-d space, would result in a "spherical" (for 3-d space) front of time in space as presented in paper 1 ([1]: p5-6), as the PQWF has accounted for ([2]: p5-12), as the pursuit of π ***in space***. Note also that the two time lines with a dual "before" and "after" paradigm underwrite the idea of a "one" general algorithm for time with two variables, and (as derived) these two variables represent the mathematical variables of the golden ratio. The determination of time's flow nonetheless, being time before>after, is accounted for by the primary suggestion of "time" taking precedence as a primordial axiomatic construct compared to space, in that time primarily can explain reality as per the facility of human perception via an algorithm that sets itself primarily as t_B casting space as t_A, as presented in paper 1 ([1]: p3-5), as a type of spherical surface area ($t_B^2 = t_A$) front. Such is also what was proposed in paper 2 ([2]: p4) namely time in a future zone casting itself according to our perception ability with the two features of the golden ratio lead to a "3" factor which was interpreted to represent the 3 dimensions of space, a different mathematics yet related in number as the "3" dimensions of space, a doorway/platform construct to a new mathematics as applied to space using the mathematics of time ([15]: p4-7).

In the striving of the PQWF to reach π (as space) there can only be an ***uncertainty*** of the idealistic π-time ***as*** "space", as explained, the TSU; time pursuant of space, time seeking π as seeking space, like light aiming to reach the pure limit of reality, ***is*** the time-space uncertainty (TSU) principle. In terms of "energy" therefore (as per equations 1-3), ***if*** in time entropy is in order, of an increase in energy of the system, then this energy can only ultimately be used in conjunction with concept of enthalpy, of the PQWF (that required compression factor of $\frac{19.8}{20}$ as presented in equation 8, paper 15 ([15]: p11, eq8), which when applied to the derived Boltzmann constant ([14]: p26, eq.17) of $1.37 \times 10^{-23}\ J\ K^{-1}$ gives the correct value of $1.38 \times 10^{-23}\ J\ K^{-1}$), as a steady-state manifold of energy for time and space, a concept which is entirely missed by current physics and thus considered not to exist owing to contemporary physics remaining idle on *spacetime* theory, unfortunately relying on the sole notion of energy release with time as an increase of randomness in a reality of increasing disorder and therefore general indeterminism, which as this paper presents, is limited in its design as a theoretical proposal in a greater steady-state time and space scheme and can be better explained with the TSU. Nonetheless, the idea of the ultimate event horizon entails that the spatial "location" of the search (by time) for π (space) would prescribe a tendency for the entire system of light and mass (as energy) to head ***in*** that direction, to spiral ***out*** into empty space according to a golden ratio footprint of temporal events, to naught, and such therefore would represent the patterns of light-mass as energy (as the debris of mass-clusters disintegrate) spiralling towards an event horizon spatial zero-point, the general feature of which is what is perceived of the stars, namely atomic decay phenomena.

5. Conclusion

Despite GR and QM theory failing to provide a description of time's flow as energy, as their basis of singular dimensional time makes those theories limited (as per their use of 4-d Minkowski space and the inherent singular spacetime mathematics trouble that causes, as outlined by Gödel [21]), the new proposed wave-function equation (PQWF) based on the new algorithm for time and those specific mathematics to time's flow ***can*** derive the equations for energy in space and the dynamic objects thereof, simply because the reliance is no longer on *spacetime* theory as a singular mathematics, yet space and time as two separate mathematics that can nonetheless be linked, surpassing the incompleteness problem as presented by Gödel [21]. Together with this, the new algorithm for time is able to prescribe an analogue for the standard model (SM) as presented in paper 4 [4], "Phi-Quantum Wave-Function Crystal Dynamics". In short, Einstein's GR spacetime theory has been *surpassed*, together with the idea of Hawking thinking a TOE being impossible [22] *dismissed*, as per the list of papers [27], and therefore such has great implications for current cosmology theory.

Current cosmology theory presents the case of the BB theory with the metric expansion of space, such a design requiring an entropic account of energy in time with an associated metric expansion of space, both of these features requiring DE to account for the metric expansion of space. The BB theory also requires that all the stars observed are to be of the same metric size as our own sun, thereabouts, given the physics being observed of each of the stars using that scaling system. Quite simply, the BB theory as a theory almost states that our solar system cannot be unique and must exist in a universe of suns created from the BB event. Yet, and this is the great issue, ***if*** the entropic account of energy is wrong given there being more going on regarding time and therefore energy than simple entropy alone would have, as per this new time-theory, and ***if*** there is no BB event to predicate the entropic process of energy as a passage in time, then there is no metric expansion of space to require a BB event and associated entropic process of energy. This though requires another theory to explain the redshift effect of light, which this theory has achieved [13]), thus doing away with the need for DE. The other feature it does away with is the assumption of starlight being a process of independent solar systems, highlighting the stars are much smaller in stature [13], and therefore does away with the need for GR, and also does away with DM given that scale is not required. In other words, this new time theory in doing away with DE and DM, and the BB theory, ***requires*** a new cosmology, a cosmology that is absent of all the features that are currently unproven, such as DE and DM. Such is not great tragedy to cosmology or astronomy though, as most theories central to the behaviour of stars require an atomic description of the phenomena of light being observed, and this new theory proposes exactly that, namely a more atomic description of the stars.

In short, with this new theory, the ***issue*** in cosmology regarding virtual suns/star-motion doppler-effects and those observed relations to GR in the context of a metric expansion of space is no longer a concern, no longer requiring DE and DM, no longer being consumed with sourcing the 90% of which cannot be proven to exist in the universe. Quite simply, if the cosmological scale is wrong, if the wrong size and distance (and therefore mass) ***scaling*** has been used for the phenomena of the stars, then the theory of gravity would also be wrong, and vice-versa; GR is used as a mechanism to explain how galaxies

are kept together based on their assumed sizes, and so on and so forth, yet GR leads to the cosmological constant problem, DM, and of course DE (in association with QM and that Planck scale in use), and if they all have flaws each of their own, the whole theory of cosmology can only be a house of cards, with the commonality there underlying all those unverifiable entities and associated problems being the "***scaling***" used based on the simple premise of the BB to explain time and energy in a too simple manner. In all, EM and Gravity are best explained using the more fundamentally based mathematics of time, ***not*** the mathematics of ***spacetime***, ***not*** a mathematics that tries to quantise (QM) gravity (GR) per-se, and as such a new and more accurate model of cosmology must come to attention, suffice to say that any theory that has a greater handle on the concept of energy can provide more direct and efficient solutions to energy problems.

Conflicts of Interest

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

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