

Temporal Mechanics (C): Time-Space Manifolds

Stephen H. Jarvis

email: shj@equusspace.com

©2020 Equus Aerospace Pty Ltd

Abstract: Here in this third paper in a series of three papers (time-space circuits, time-space constants, and time-space manifolds), Temporal Mechanics presents the case for time-space manifolds on the macroscopic scale, correctly deriving the distance of the Heliopause, Bow Shock, and Oort Cloud from Sol as three key manifolds, while explaining the time-space circuitry involved in and between those manifolds via the required feature of the time-space constants. Subsequently, the stellar light phenomena of the Milky Way is derived and appreciated with known data, including its alignment compared to the solar system plane, and thence the phenomena of light from sources presuming to be separate and unique stars clustered as galaxies. The key feature of this theoretical process is in properly resolving the “Black Hole Information Paradox”, assigning the concept of a spacetime singularity as a Black Hole to a specific manifold, a grand manifold as what is termed here as the “Black Expanse”, or more simply the “Epoch”, a harbour of information.

Keywords: temporal mechanics; temporal calculus; time-space circuits; time-space constants; magnetic quantum shell; particle pair production; MQS; EM-DIR; Heliopause; Hydrogen Wall; Bow Shock; Oort Cloud; Black Expanse; Epoch; redshift; plasma field; information paradox; black hole; Milky Way; galaxy

1. Introduction

In this third paper in a series of three [31-32], namely time-space circuits, time-space constants, and here time-space manifolds, the aim has been to knit together the preceding 30 papers [1-30] of this full series into a general summarized format as papers 31-33, this being paper 33, while adding any new specificity that could arise by such summaries and efficiencies.

<http://orcid.org/0000-0003-3869-7694> (ORCID)

Web: www.equusspace.com

Temporal Mechanics is a newly proposed discipline of physics that addresses the feature of “time” as a primary theoretic construct, different to what Einstein proposed, namely not being the “clock” model that operates on a secondary basis to mass and light. Instead, Temporal Mechanics relies on a temporal aether of time-points, not a luminiferous particle aether, yet an aether of time-points that allows for the development of a time-point based wavefunction of light, thus replacing the photon/particle of model of light, avoiding the mechanics of relativity theory in not abiding by relativity’s mathematical temporal and spatial *variations*, yet abiding by temporal and spatial *consistencies*. All of this has been achieved by understanding how time-points would communicate with each other via a golden ratio algorithm for time, which then derives the three-dimensions of space, upholding the concept of “*c*” as the speed of information transfer between time-points in 3d space.

Specifically, the golden ratio algorithm is constructed as per Temporal Mechanics as a mathematical code for the dimensions of time and space, a process termed *temporal calculus*. By the golden ratio application to time and thence space *temporal calculus* derives the constants, particle features, and associated field force values. Thus, this is not mathematics per se, yet a specific application of mathematics to time and space as per a time-point aether.

Although the new and unique theoretic step performed is this time-point aether, ultimately something new as a theoretic step has to be presented describing either new phenomena unbeknown to the current models of physics theory or phenomena that has yet to be properly explained if not linked with other phenomena.

The new theoretic step and associated mechanism of *new phenomena proof* offered by Temporal Mechanics is per a process of particle *pair production*, presented as a way to demonstrate the key component of this new theory, linking EM (electromagnetism) with G (gravity) via a field process called EM^{DIR} (EM destructive interference resonance), as presented in the previous paper ([32]: p20-22), and to be presented in a forthcoming research paper.

Understandably, given that the entire theoretic basis presented here is new, an open and inquisitive mind is needed from a reading standpoint, and here a way to read about what must be executed if relativity theory must be amended via a new basis for time, and accepting how that superseded model of phenomena, of reality, must change, still holding nonetheless to known data.

Three key things have become apparent with Temporal Mechanics as based on its theoretic foundations:

- Light is being used to measure space, and so the idea of a metric expansion of space to explain the redshift of light is voided.
- A new description for the redshift of light is proposed as a property primarily of time and space, not light and space.
- In using a fundamental basis of time as the common theoretic denominator, the calculus used for the time-points in space communicating with each other via “*c*” arrives at a model for mass and thence gravity, thus linking EM with gravity.

The core proof to this theory is therefore on one key primary front, namely in demonstration of EM linking with mass and thence gravity. This proof is presented in the form of an EM “destructive interference resonance” field (EM^{DIR}) effecting into existence particle *pair production*. This proof is reserved exclusively for a paper all its own subsequent to this paper. Yet here in this paper shall be presented the case for a new cosmological model carried by the explanation of the time-space manifolds of Temporal Mechanics, inclusive of the proof for the EM^{DIR} effect as a cosmological scale.

Cosmology (the science of the origin and development of the universe) and astrophysics (the physical nature of celestial bodies), both depending on astronomy (the science of celestial objects), are essentially the end result of the more locally contrived sciences of this solar system with the aim of explaining the bigger picture, the when, how, and why of the origins of mass and thence all life, presumably. Astronomy has always been important to science, as a way to chart our passage through space, to navigate through the seas, here as an ultimate reference of location knowability. To know that location as a science, ultimately, would therefore seem natural, and require a mathematics of not just space, yet time.

What Temporal Mechanics has found is that **if** there is no metric expansion of space, **if** the redshift of light can be explained without the metric expansion of space, and **if** time is a more fundamental thing than light and mass, then the current cosmological model can only be brought into question.

The model Temporal Mechanics is proposing therefore is vastly different to the current Λ CDM model, as it can only be, as ultimately it would be steady state in not requiring big bang and associated metric expansion of space.

Therefore two things need to be achieved, namely highlighting the common flaws in contemporary physics and cosmology theory, and then proposing Temporal Mechanics to be the solution to those problems with specific reference to *how* Temporal Mechanics solves each of the problems of physics and cosmology theory. In acknowledgement of such, this paper shall be constructed as follows:

1. Introduction.
2. The Black Hole Information Paradox.
3. The Temporal Mechanics approach: The ***Black Expanse***.
4. The Macroscopic Manifolds.
5. H-Manifold Illumination.
6. HB12 Lens Illumination.
7. Voyager 1-2 Space Crafts.
8. Conclusion.

As this paper shall present, the key problem with astrophysical and cosmology theory is how to explain the “information paradox”, examining the contemporary mechanism of how black holes can form and then disappear, as though eliminating the history of all that was essential to its formation, a fundamental issue involving entropy and thus the arrow of time. Temporal Mechanics resolves this issue with *temporal calculus* and associated fractal golden ratio timestamps of events in space, specifically addressing what would happen on or in an event horizon, namely an ultimate manifold of space.

So here in this paper, the large-scale manifolds will be presented according to the time-aether of time-points, and analysed. In explaining the fundamental manifolds of time-space, the science of the stars can then be explained in an accurate and data-based and above all structured manner.

2. The Black Hole Information Paradox

The Black Hole Information Paradox [33] is the name for the problem encountered by the combination of quantum mechanics and general relativity presenting the case that physical information could permanently disappear in a black hole, and therefore contradicting known entropy requirements for the passage of time, thus improperly allowing physical states associated to a black hole to devolve into a veritable abyss.

The essence of the Information Paradox is that a certain schism is created for any wavefunction of light central to quantum mechanics to be ruptured from outlying associated quantum states outside the black hole. Further, certain ideas central to *symmetry breaking* propose that wavefunction collapse must generate mass, an idea itself nonetheless that presents with a basic idea of particle *pair production* which itself leads to Hawking Radiation [34] by this process, nonetheless though feeding the collapse of a black hole into nothingness, and thus further feeding this vicious cycle of quantum information loss.

Ultimately, this "Black Hole Information Paradox" problem highlights the underlying problem of Special Relativity, as presented in paper 28 ([28]: p9-10), Einstein, as follows:

- (a) *Mass having primacy over space-time (accounted for most basically as the ability of mass frame-dragging space-time).*
- (b) *Space-time 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 space-time, or in other words back to (a), a concept that does not fit well with the abridging Λ CDM model.*
- (f) *If the photon is timeless and mass is the primary theoretic device (as though mass drags space-time, as per frame-dragging), then mass can only be a type of primordial event incurring a temporal dragging of space as space-time.*
- (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 space-time being dragged outwards, continually, by this mass or energy.

Such is the underlying feature of cosmology, namely the Λ CDM model, which suggests almost that reality loses its information in pocketed regions (black holes), regions as veritable profiles it would seem that mimic a reverse-process of the origin of reality, namely a reversal of the big bang.

Once again, the fundamental problem is the undoing of the known requirements for time and a wavefunction, a problem that occurs between General Relativity and Quantum Mechanics as the *information paradox*, of information being lost in wavefunctions being nullified in black holes, which essentially is breaking known conditions of entropy and determinism. To solve this, a new approach is proposed to the idea of measuring phenomena in space, and that is by making time *primary* while having time adapt to a wavefunction model that upholds the arrow of time's requirement of entropy, as per the Temporal Mechanics approach, *temporal calculus*.

Ultimately the solution is to put the information loss *into* a black hole as into a region that surrounds reality itself, as a black hole, beyond which is nothingness, paradoxically an outer zone that attracts everything within it out towards it, the very opposite of a black hole, namely a ***Black Expanse***.

3. The Temporal Mechanics Approach: The ***Black Expanse***

Explaining the nature of the stars is challenging, given all the natural variations at play and the great depth of field the stars present themselves in.

Explaining the nature of the stars is like explaining the precise formation of a cloud, or even just the formation of a basic natural terra-landscape. In other words, in nature there is a *huge* amount of variation in play.

There are nonetheless *fundamental principles at play*.

What Temporal Mechanics (and *temporal calculus*) can achieve is provide a holistic joining of known *microscopic* fundamental principles and associated values (and even predict new phenomena) locally for the physics of this reality and then apply the same fundamental logic and reasoning to cosmology, to the greater *macroscopic* scale, a process much like using a fractal algorithm as timestamps in space as a butterfly effect with the task of merging that pattern with known fundamental laws of the particles and their field forces.

The two preceding papers in this series of 3 papers are therefore once again required reading; given this is a series of three papers (papers 31-33) that aim to summarise papers 1-30 [1-30], papers 31 and 32 [31-32] prepare for what is to be now presented for the model of cosmology, as Temporal Mechanics proposes emphatically that cosmology is far more difficult to explain than a simple linear big bang proposed time-line, as *of course it would have to if the temporal calculus used, as the time-space circuit, is no simple **linear** time-line.*

Despite the obvious comparative difficulty, there are nonetheless basic principles that can be proposed to exist by Temporal Mechanics, and they do exist, basic manifolds and associated behaviour of light with those manifolds of space.

So, the purpose of this paper is to present those basic principles in play on the cosmological stage of time and space in setting the temporal algorithm, the *temporal calculus*, in motion, on that grand scale of manifolds.

The key points to consider as derived by *temporal calculus* represent the three following classes of time-space phenomena characterisation:

- (i) Time-space Principles ([25]: p38-41)
- (ii) Time-space “Principles of Simplicity” ([30]: p11-13)
- (iii) Time-Space Circuits, Constants, and Manifolds [31-32]

The issue is of course how all of such can be joined as a cosmological (macroscopic) model.

The simplest way to achieve this is to go directly to the most basic of basic and most ultimate of ultimate structures, and Temporal Mechanics proposes this to be the “**Black Expanse**”, that which exists beyond the confines of the observed time-space reality.

Physics defines a “black hole” as a region of *spacetime* (according to Einstein’s spacetime theory) where gravity is sufficiently strong enough to prevent all light and matter escaping from it, General Relativity specifically proposing that a sufficiently compact mass can deform spacetime to form a black hole [35][36].

The first thing though with respect to the greater attention to theoretic detail that Temporal Mechanics provides is that a “black hole” is not a true black hole if the singularity is not properly identified and understood. Physics is unable to know what a black hole is, as Relativity physics can only propose, hypothesize, what happens *in* the black hole, in the singularity, mathematically, owing to the “Black Hole Information Paradox”. In fact, how can something be explained if in time there is to be no record of its existence? (aka “The Black Hole Information Paradox”).

Temporal Mechanics is more though with its definition of a singularity owing to its more definitive presentation for the concepts of time and space, with the emphasis on “time”.

Temporal Mechanics defines most basically time and space in its “5” principles of simplicity, as follows ([30]: p12-13):

(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).*

Through all the developments of the interoperation of time and space (*through the derivation of the CMBR, vacuum energy, vacuum permittivity, vacuum permeability, fine structure constant, qualities and metrics of the particles (charges, weights) and associated field forces, atomic/subatomic/elementary particle metrics*), it became possible to propose how light operates outside the confines of an atomic reference, as a wave in an aether of time-points, non-local time-points, *non-local* time-points as compared to the defined *locality* of space. This led to the proposal of an ultimate $E = f$ manifold in space ([13]: p9-13, eq6-8)([32]: p10-18), as the greater limiting sphere light would reach in its passage through space.

Yet of course nothing is so simple to propose in so few words, as shall be highlighted shortly.

One thing that can be proposed, and rather elementary nonetheless, is that beyond the $E = f$ manifold would logically be a void of time and space, a vast blackness of time and space, an absence of dimensionality, meaning that there would be no distance to measure between points **on and outwardly beyond** that $E = f$ (Oort Cloud/sphere) manifold, and thus according to the proposed *temporal calculus* holding “ c ” as the construct of measuring distance in a time-point aether, there would be no light beyond that $E = f$ Oort Cloud (or for conventionality, *Epoch*).

The question therefore is, “what are the stars?”

According to Temporal Mechanics, the stars can only exist within that *Epoch*, with the $E = f$ Oort Cloud/Sphere.

The question is, “how?”.

To look at this issue broadly, there are two things in play, namely:

- (I) The *Epoch* representing a level of pure space that all light and mass would be drawn to, as what a black hole proposes to be as a pure singularity, as what Temporal Mechanics derived in paper 22 ([22]: p21-23) for space as a process of gravity.
- (II) A central region in the **Black Expanse**, in the *Epoch* shell structure, that represents what is perceived of reality, namely a sun with planets surrounded by the known stellar phenomena, which of course is the subject of this paper.

The process here is taking the concept of a black hole and to turn it inside out, to see it from within, to place a sun in a black hole, in making the effect of the black hole a shell within which is a sun which slowly loses in all appearance its energy and mass to the inner spherical surface area of a **Black Expanse**, of the *Epoch*, and how there would exist an interface between that **Black Expanse** and sun as a type of *lens* manifold system creating the effect of starlight and associated spiral galaxies as points of plasma activity held in time as images in that lens manifold system, such to maintain a steady-state environment in the **Black Expanse**.

The essence of what is proposed is that “*what is considered as the phenomena of stars, of individual stars, of galaxies, and so on, is actually the result of a lensing effect of light via the Heliopause>Bow-Shock spherical lens of this solar system, this solar system contained by an overall $E = f$ time-space manifold, a veritable black hole, beyond which is simply a void of time and space*”, all of such as proposed in the previous paper, as a phenomena of the *HB12* lens ([32]: p10-18).

How indeed can all of such be explained and validated with data?

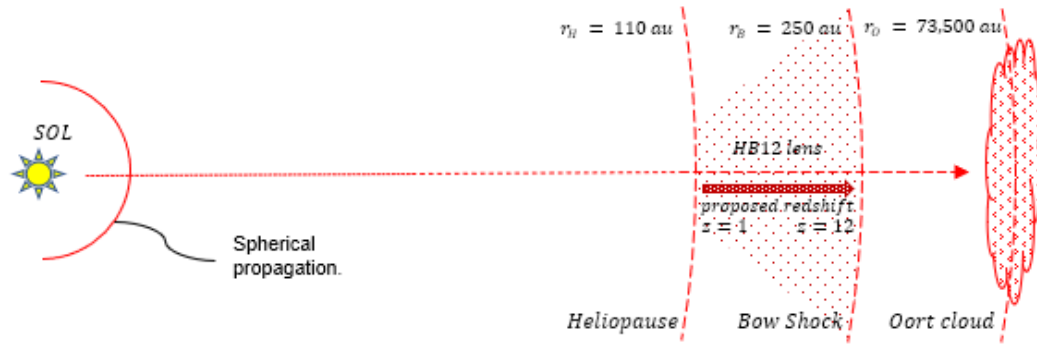
Ultimately, the issue is knowing what the great manifolds are, and then understanding how they interact with each other, to then present as steady-state case.

Clearly to explain every speck of light from every speck of plasma burst in the *HB12* zone is a little much, if not paralysing to the intellect, as there is essentially nothing to be gained in doing that other than needing to then cross-relate that understanding to what is applicable to our local reality here on Earth. The important feature quite obviously is understanding the why and how of stellar phenomena according to how the great macroscopic manifolds interact as time-space circuits with the time-space constants in play, as a holistic and thus steady-state mechanism.

4. The Macroscopic Manifolds

As per the previous paper, paper 32 [32], the following was proposed for the macroscopic manifolds, pages 16-17 ([32]: p16-17):

Astrophysics has proposed a manifold meeting a similar description as the Bow Shock (~230 au) [36]. This can be demonstrated in the following diagram:



Paper 32, Figure 2: a universal scale from a source of light as the Sun outwards in a spherical wavefront of light a distance of $r_O = 73,500 \text{ au}$, tracked back a time-scale measurement of “c” to the Heliopause as $r_H = 110 \text{ au}$, while then factored by “12” upon the r_H level to arrive at r_B , the proposed Bow Shock manifold.

The thinking of this region is that it represents, in theory, a general layer where the CMBR bleeds down as the $z = 1 > z = 12$ redshift process, from the Heliopause to the Bow Shock, noting that “c” is being accompanied here with “12” as a measure of distance between time-points in space, here as a factor of “12”, yet not only this, yet doing this while light and associated plasma behaves like a type of pressure “shock” front to the space beyond which (towards the Oort cloud) where matter in theory would disintegrate, and light lose its integrity.

What was left open to theoretic discovery was the HB12 lens region (Hydrogen Wall) and how that presents with the image of the stars, requiring a piecing together of the (i)-(iii) and (I)-(II) ideas, as presented in section 3 of this paper. To begin putting such together, consider figure 1.

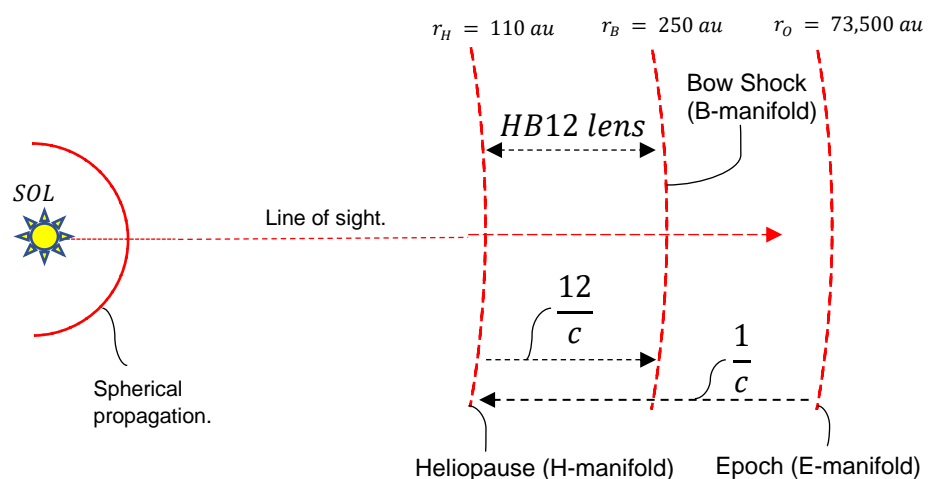


Figure 1: Attributing new “manifold” terms for the Heliopause (H-manifold), Bow shock (B-manifold), and Oort Cloud (E-manifold), the Oort Cloud as the prescribed Epoch of time-space, and highlighting the $\frac{1}{c}$ and $\frac{12}{c}$ features of the HB12 lens region.

Simply, Temporal Mechanics holds that only **two** key concepts can be quantum (EM) viable, namely the Heliopause (H-manifold), and the *HB12* lens region.

5. H-Manifold Illumination

The H-manifold was derived by the following equation ([32]: p14-15):

Here though the process of the macroscopic scale is different to the microscopic scale, as it can only be, as they are two very different things; the thinking is to use a basic scaling of “c” with the value of energy in terms of volume, and not mass (mass, as was used on the microscopic scale), namely the volume of the Solar System to the Oort cloud, specifically as $\frac{4}{3}\pi r_0^3$ where r_0 is the distance of SOL to the Oort cloud, derived to be $1.1 \cdot 10^{16} m$ (73,500 au), as per equation 1:

$$\frac{4}{3}\pi r_0^3 = \frac{4 \cdot \pi \cdot (1.1 \cdot 10^{16})^3}{3} = 5.58 \cdot 10^{48} m^3 \quad (1)$$

This value is then proposed to be factored back a value of “c”, taken within itself, as “c” is the standard of measurement between time-points measuring space.

So, the calculation here aims to derive what the next manifold would be from the overall ultimate manifold of $E = f$, from that ultimate macroscopic manifold of $E = f$, as follows:

$$\frac{5.58 \cdot 10^{48}}{c} = 1.86 \cdot 10^{40} \quad (2)$$

The value of “r” for this value, this new value for r, say r_H , then equates to the following:

$$\frac{4}{3}\pi r_H^3 = 1.86 \cdot 10^{40} \quad (3)$$

$$r_H = 1.643 \cdot 10^{13} m \quad (4)$$

$$r_H = 110 au \quad (5)$$

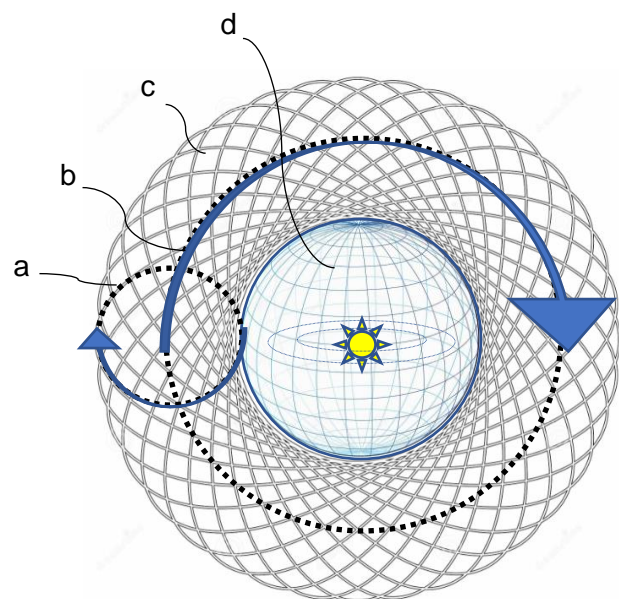
The principle idea here is taking a “c” factor back from the “E” manifold, as a “c” factor, as a basic standard of measurement on the macroscopic scale from the *Epoch* to the “c” limit from the *Epoch* as the Heliopause manifold (H_c). Yet this “c” path has a time-space circuitry of its own, as follows, here as the H_cTSC (Heliopause time-space circuits) conditions:

- The first time-space circuitry feature to this “*c*” factor is that “*c*” is underwritten by the basic concept of a *circle* ([2]): p5-11) as an event in time, a time circle connecting the Heliopause (say the H-manifold) to the *Epoch* (say, the E-manifold) (figure 2, a).
- The second time-space circuitry feature here on this macroscopic scale is the idea of a time-space groove (TSG), as an ultimate arrangement of time-points in space, forming a time-ring (figure 2, b), as initially presented in paper 21 ([21]: 20-22).
- The third time-space circuitry feature here is that this “*c*” metric of space from the E-manifold to the H-manifold would prescribe a type of “no space” and “no time” effect, as defined by the *Epoch* from where the measurement of “*c*” is being prescribed to (to the Heliopause), a type of condition therefore of “fixed position and fixed illumination”, an ingredient of fixation, only disrupted of course by the underlying mass and energy requirements at play, resulting in a type of fixed pattern of phenomena (figure 2, c).
- The fourth time-space circuitry feature here would be one of a “magnification” of the H-manifold in being connected to the E-manifold, the E-manifold representing the magnifying principle of $E = f$, giving the H-manifold a level of high intensity EM resonance (figure 2, d).

In terms of a time-space circuits therefore in this zone from the H-manifold to the *Epoch* E-manifold, there would be a time-space circuit in play in the zone from the H-manifold to the E-manifold, a circular time-space circuit between the two manifolds (figure 3, a) and around in *between* the two manifolds (figure 3, b), like a spirograph [37], creating a type of helix, a torus existing potentially anywhere and everywhere between the two manifolds of the *Epoch* and Heliosphere, generally though as a common TSG, as shall be explained.

Figure 2: View of a time-space circuit torus as though from the side of solar system planetary plane

a time-space circuit circle between the E-manifold and H-manifold (a), a time-space circuit ring (b) in the region between the E-manifold and H-manifold, the general fixed pattern effected by the E-manifold (c), and the amplified H-manifold (d) by the effect of the connection via (a) with the E-manifold.



In regard to the H-manifold (figure 3, d), the suggestion is that this region represents a type of time-space circuit reflection point, a barrier, a natural shock front, as this circular “c” connection (figure 3, a) with the E-manifold, a veritable destructive interference resonance region for light, or as Temporal Mechanics understands, an EM^{DIR} region, and therefore a region rich in particle *pair production* amplified by the *Epoch* (figure 3, d), and therefore amplified energy and charge, if not particle manifestation. This phenomenon was confirmed when Voyager 1 passed this level in 2012 [38].

In short, this H-manifold region would represent a catalyst for particle *pair production*, and therefore particle growth and decay with this coagulation of positrons and electrons, therefore a highly charged region, and thus in accompanying electric charge, a magnetic shell effect, a macroscopic MQS ([30]: p15-20) scheme at the Heliopause, say the H_cMQS , as per figure 3.

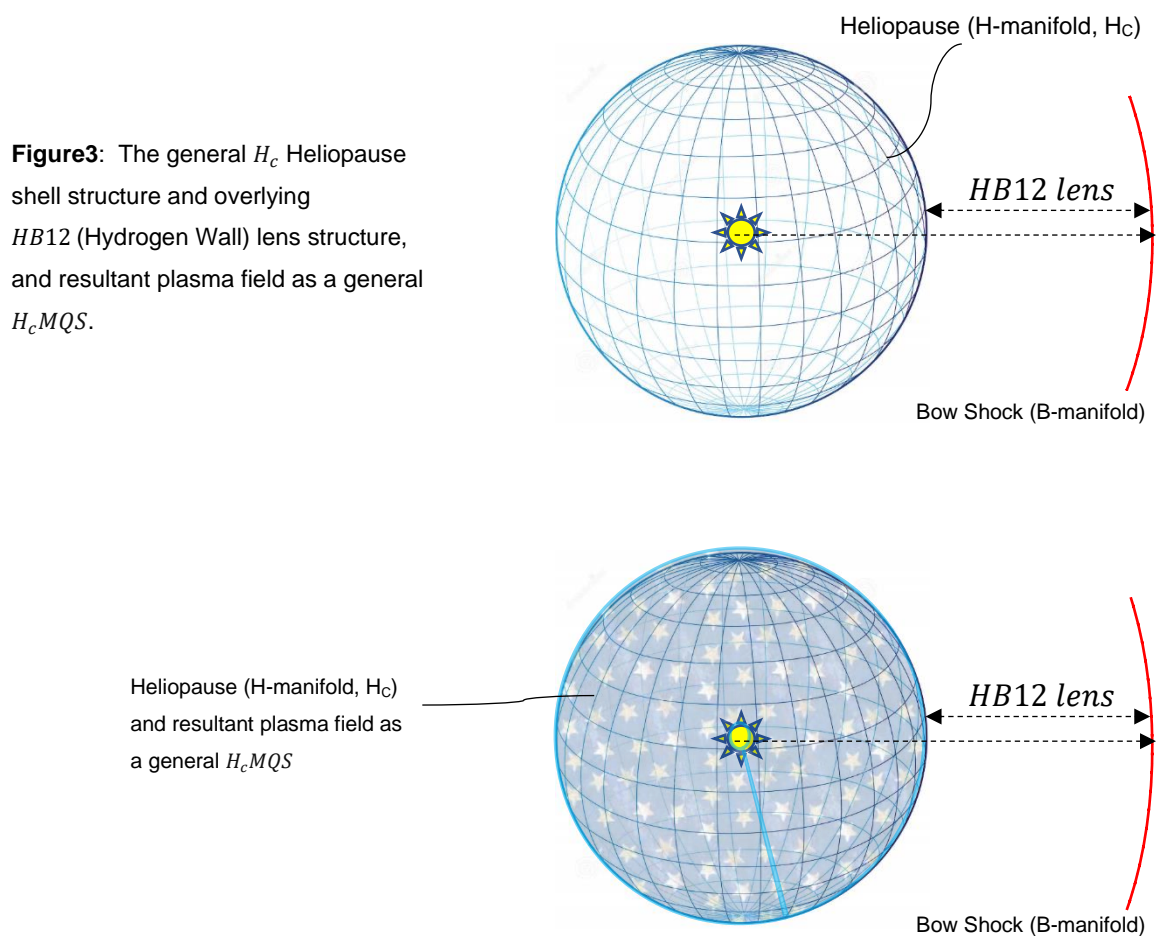


Figure3: The general H_c Heliopause shell structure and overlying $HB12$ (Hydrogen Wall) lens structure, and resultant plasma field as a general H_cMQS .

According to Temporal Mechanics, this H_cMQS field region of particle *pair production* (and associated light release) would in theory carry into the $HB12$ lens all the way ultimately to the Bow Shock region all as a $z1 > z12$ redshift, everywhere around and beyond the H-manifold sphere toward the inner region of the E-manifold (*Epoch*).

This H_cMQS zone would have two key characteristics, the first being a dissemination of matter/debris from the planetary plane into this general H_cMQS sphere, effected by a macroscopic TSU principle for time here on this level, a process of natural debris dispersion by this macroscopic TSU effect,

the TSU presented as a microscopic effect in paper 20 ([20]: p11-13), and secondly a fundamental time-space groove (TSG) phenomena to the H_cMQS structure ([30]: p 23-25), given its fundamental $\frac{1}{c}$ link with the E-manifold, with the system *Epoch*.

To properly effect this H_cMQS "TSG" structure, say the H_cTSG , the proposal is that the intensity of the *pair production* in the H_cMQS would occur, as a ring, in a manner to balance the E-manifold and thus in effect at a right-angle as a ring to the solar system plane, simply in order to balance the mass of the entire system in the context of the relatively uniform E-manifold, as it can only be as the *Epoch* overarching sphere, and thus to allow for a relatively uniform 3-d space and associated gravitational field, a 3-d volume of space fairly regular enough as a sphere for light to propagate through as a spherical front, as the equations have determined for the volume of space in correctly deriving the metrics of the Heliopause (H-manifold), Bow Shock, and Oort Cloud (E-manifold), as per figure 4.

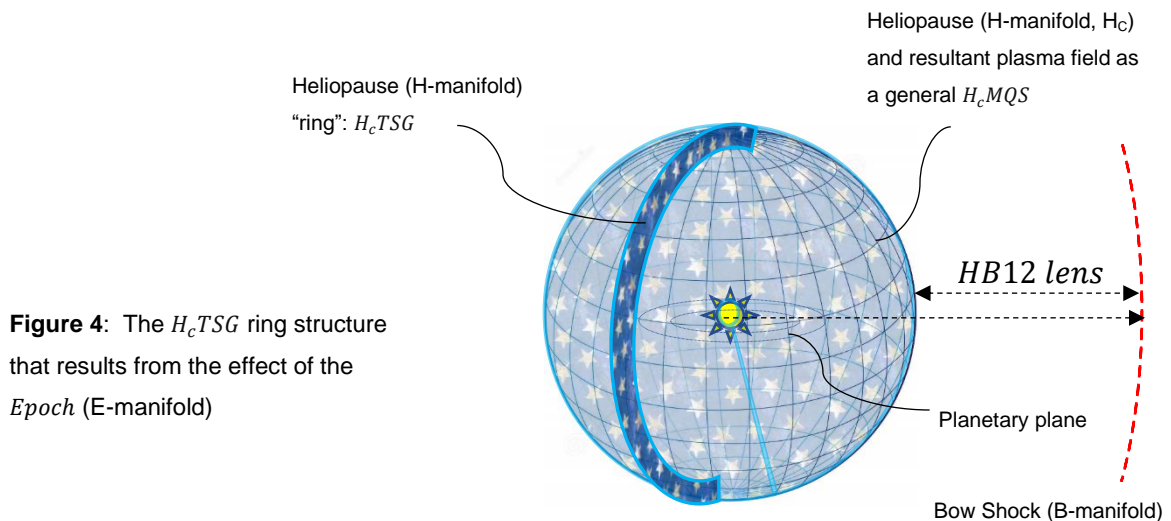


Figure 4: The H_cTSG ring structure that results from the effect of the *Epoch* (E-manifold)

The proposal here is that the H-manifold ring/band (H_cTSG) would represent *greatest* activity of atomic particle *pair production*, presenting as localised plasma field activity, proposed here as the effect of the stars, a plasma field of specific atomic plasma activity, under the constraint of a TSG, and thus remain localised there (**not** migrate in to the *HB12 lens*).

The deduction here is that this ring would represent the phenomena of the Milky Way, what we would perceive as an enclosure of stars that we would exist within from our Earth reference, a ring seemingly at right-angles to our planetary plane, presuming nonetheless to be a galaxy of stars, by definition, within which *SOL* would be a member of if indeed the lights of the H_cMQS plasma fields were assumed to be suns in their own right.

In presenting such a case though of the H_cTSG Milky Way phenomena, what of the images of all the other galaxies of stars, how can they be held in this context given the Milky Way is only *known* relative to the appearance of what is considered to be *other* galaxies of stars?

6. HB12 Lens Illumination

The *HB12* lensing effect and associated illumination would be a *secondary H_cMQS* illumination process, yet in a more uniform spherical manner, and therefore presenting itself as a case of a more spherically uniform creation and decay of particle matter, of course according to different depths in the *HB12* lens, given the *H_cMQS* is primarily a *H_cTSG* phenomenon, and therefore different observed redshift effects, for this secondary *HB12* feature, as proposed in the previous paper ([32]: p14-18).

The phenomena of light though in this *HB12* region is quite different to the phenomena of light at the Heliopause barrier itself. For, in the *HB12* lens would be an increase in the wavelength of light from z_1 at the Heliopause to z_{12} at the Bow Shock, and yet this would happen in a uniform “*c*” and CMBR context, by definition.

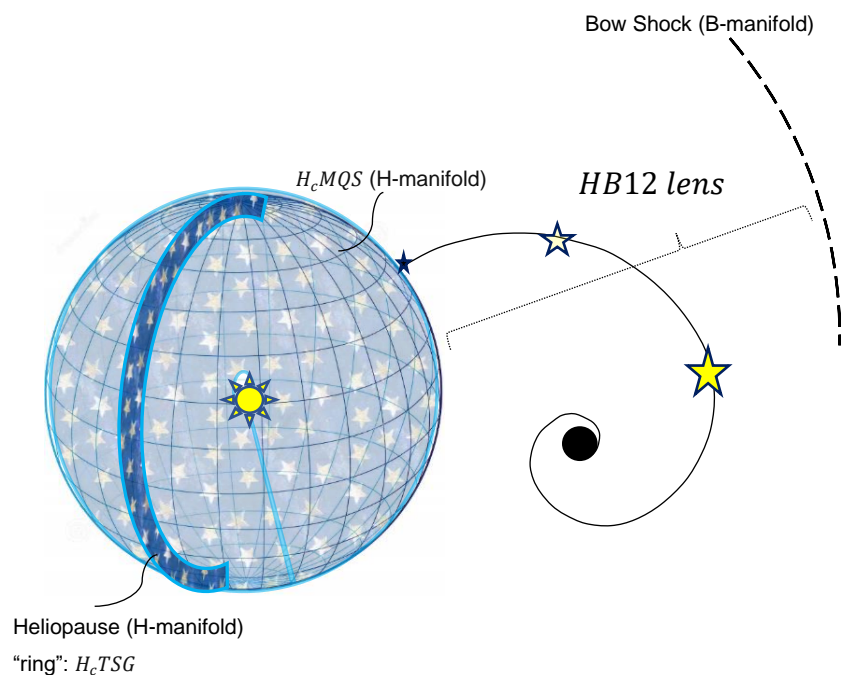
Therefore, in this scheme, if indeed $c = \lambda f$, if λ increases to a maximum potential factor of 12 through distance of the Heliopause to the Bow Shock, then the frequency (f) of a time-space circuit can must only be reduced by a factor of 12 in this *HB12* lens as of course a process of light approaching the general *Epoch* context of $E = f$.

Therefore, if frequency is being reduced, energy can only be reduced (according to the context of $E = f$, in upholding the requirements of “*c*” and the constant CMBR), to an ultimate decay point, as what would be perceived as a type of “black” region, what would be considered as a typical “black hole”.

How would this look?

If EM frequency is reduced, it simply means that the integrity of the light spherical wavefront is disintegrating in the *HB12* lens, and this would manifest as something appearing to enter a black hole, black holes in various “*z*” redshift frames from $z_1 > z_{12}$, the theory of which is presented in paper 22 ([22]: p18-23), spiralling into a TSP (time-space pulse) and then nothingness, as per figure 5.

Figure 5: depiction of a *HB12* time-space circuit spiral, from a region of minimal to no illumination, to then greater illumination, to an ultimate exhaustion-point of illumination (black dot).



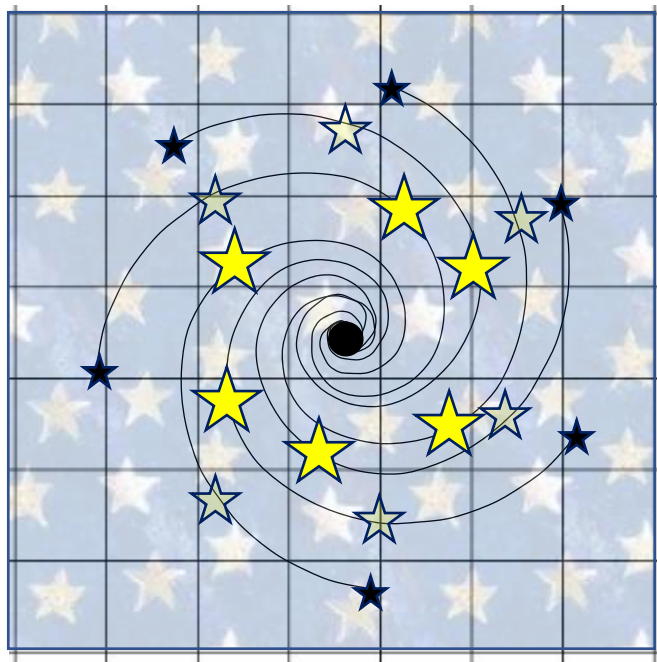
Note the idea of plasma in the time-space *HB12* lens releasing more energy the further into the spiral it events in time, it adventures, as per how light would be released more greatly the deeper into the *HB12* region it goes, energy released along that time-space circuitry, ultimately leading to the effect of complete extinguishment of the plasma into an apparent black-hole structure, a scheme presented in paper 21 ([21]: p22-23).

Such is how debris would extend into the *HB12* region with its *HB12* time-space circuit trail of light, a light trail representative of the footprint of those stages of particle debris and associated illumination, particles following these time-space circuit pathways in the *HB12* lens.

To note though is how plasma particles would gravitate together eventually toward a central extinguishing zone, as presented in paper 21 ([21]: p22-23), together with the type of time-space phenomena derived to be found on a fundamental level of plasma disintegration, as presented in paper 23 ([23]: p27-28), as the TSP (time-space pulse, macroscopically as *Pulsars*).

Such a process, while factoring in the *line of sight* from a reference within the spherical structure of the *H_cMQS* structure (such as a reference from Earth), presents these spirals to appear as individual spiral *systems*, as groupings of *HB12* time-space circuits, as per figure 6.

Figure 6: Depiction of a series of *HB12* time-space circuits from various plasma/particle regions on the *H_cMQS*, time-space circuits which then convene at a central exhaustion point of decay, as a resultant line of sight seen from within the *H_cMQS*.



The idea here is to then associate each such process to particles in a plasma field from the Heliopause to the Bow Shock undergoing disintegration, a massive display of individual spiral systems with vast complexity each of their own as a process of mass/plasma disintegration from the *H_cMQS* system to the Bow Shock, as per the *HB12* lens.

An important feature to note regarding the *redshift* effect for these spiral systems is that **where** this disintegration happens in the *HB12* lens is **how** that temporal footprint structure *would be defined as a redshift*, namely in the zone of greatest illumination and thus disintegration, as presented in Figure 7.

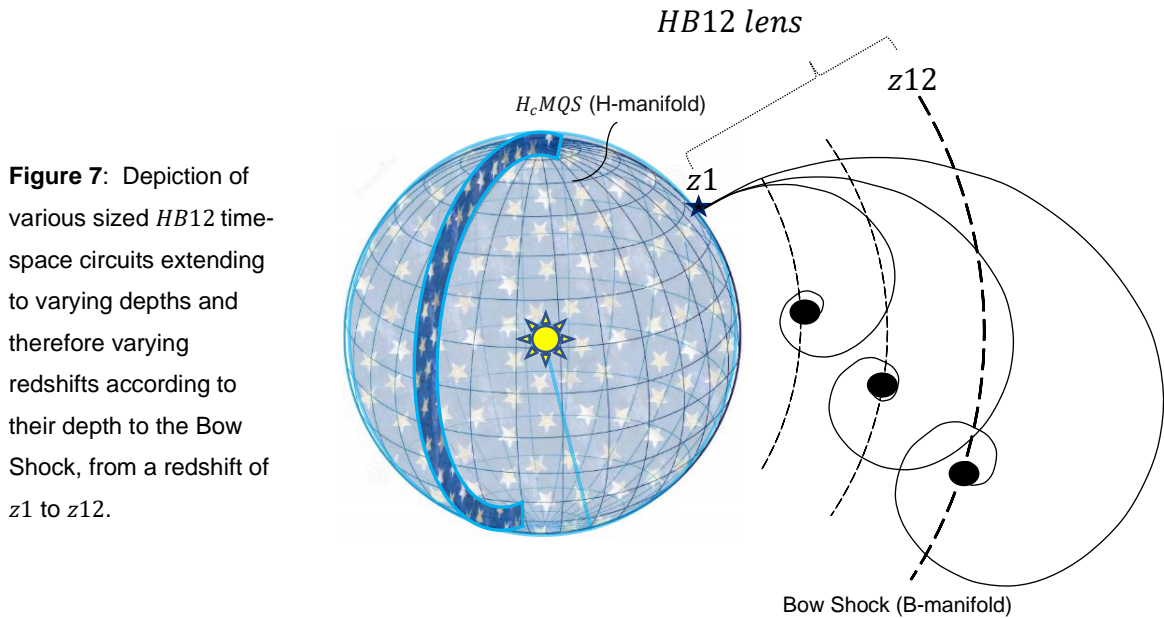


Figure 7: Depiction of various sized *HB12* time-space circuits extending to varying depths and therefore varying redshifts according to their depth to the Bow Shock, from a redshift of z_1 to z_{12} .

By the structure of the time-space circuits in the *HB12* scheme, namely as per how the “12” factorial works relevant to a spatial metric from the Heliopause to the Bow Shock, plasma particle disintegration and light release would occur predominantly at the zones of pre-emptive absolute decay, those apparent *black* regions, which thus in effect given such is central to the maximum illumination of the spiral phenomena, would define the redshift value of what is perceived as spiral galaxies of light for those *HB12* time-space circuit groupings.

Of course there would be variations of the precise redshift in these spiral systems relevant to the localised release of light (stars) which would present with certain red-blue shift anomalies (Doppler anomalies), entirely accommodated for nonetheless by the Temporal Mechanics description, to be further explained in a subsequent paper.

Ultimately, the *HB12* lens has a direct relativity with the *Epoch*, by design, and so ultimately there are *virtual epochs* as *Epoch* zones in the centre of each of the time-space circuit swirls (galaxies), acting as a type of *absence of dimension* in each set of time-space circuits, creating a type of *fixation* to the *Epoch*, bringing into effect a fixed nature to the pattern of the time-space circuits in the *HB12* lens, as what was proposed for the third time-space circuit condition for the *HB12* lens, mentioned here in section 3.

The resultant model, given the scope of the *H_cMQS* plasma field and associated *HB12* Hydrogen Wall region, would present the familiar phenomena of galaxies in the *HB12* region, as per figure 8.

Figure 6: Image of M74 Galaxy
courtesy of Nasa [39]



Note that modern physics characterises the light from the stars in the context of assuming their existence as *SOL* entities, and therefore their distances and associated luminosities are graded with each other based on the presumption the light of the stars takes source from independent solar systems, complicated by the idea of a metric expansion of space to explain the redshift effect, further complicated by the need for dark energy and dark matter, all from an initial *big bang*, to make that overall scheme unified.

Changing those assumptions (and those lists of complications) to the proposal here of the light from the stars being independent and *Epoch*-enhanced plasma fields and associated play, together with planetary particle debris captured by the H_cMQS , only to be scattered in the H_cMQS as the general H_cTSG ring and associated *HB12* lens effect, provides a thorough explanation for the redshift effect, and provides a thorough explanation for the phenomena of galaxies in reference to the phenomena of the Milky Way, all explanations held in a derived and data-known spatial metric scheme, together with resolving the “Axis of Evil” and the Horizon and Flatness problems (as presented through the previous paper [32]).

7. Voyager 1-2 Space Crafts

To discuss the forecast of the Voyager spacecrafts [40] is to look at the terrain the Voyager spacecrafts are navigating, here in the context of the proposed Temporal Mechanics terrain.

Essentially, Temporal Mechanics proposes that there are two steps of particle creation and disintegration of plasma particles and light in play. First is the step of creation/disintegration of mass and light at the level of the Heliopause care of the *Epoch*-related EM^{DIR} resonance there, that destructive interference resonance producing particle *pair production*, creating positrons that play a key role in matter annihilation, and secondly is the *HB12* lens effect of plasma disintegration. The first step is proposed to give rise to the appearance of the Milky Way care of the H_cMQS effect, a derived requirement, and the

second step is proposed to give rise to the appearance of a universe of galaxies as per the *HB12* effect, also a derived requirement.

Although in the sole context of this paper such proposals may seem simple and broad, Temporal Mechanics is nonetheless a large body of work (over 700 pages), and each of the papers bear relevance to each other in reaching what is an entirely thorough contextual explanation of astrophysics and cosmology without depending on unproven variables (dark matter and dark energy).

Before forecasting the fate of the Voyager spacecrafts, it is first important to discuss the fate of the proposed **Black Expanse** system that holds this time-space reality.

As presented in the previous section, primarily as the third underwritten feature of the time-space circuitry of the macroscopic manifolds, is that the “*c*” metric of space from the *Epoch* to the H-manifold would prescribe a type of “no space” and “no time” effect, as defined by the *Epoch* from where the measurement of “*c*” is being prescribed to (to the Heliopause, to the H-manifold), a type of condition therefore of *fixed position and fixed illumination*, a condition of *fixation*, only disrupted of course by the underlying mass and energy requirements at play *in* that stagnant context.

Thus the shape of the appearance of the stars would be relatively fixed, as though there would exist a type of fixed macroscopic circuitry in play. Yet further to this, the plasma disintegrating along these paths would, as an entire event, be ultimately conserved, conserved in being projected (as per the E-manifold) to a central reference, thus keeping everything “steady-state”, as it only can be, as what the fundamental condition of *temporal calculus* prescribes.

Simply, reality would event as cycles within an unwavering *Epoch*, as a process of mass creation at the H_cMQS and *SOL*, and decay of mass also at the H_cMQS and *SOL* heading towards the *Epoch*, along relatively fixed pathways, underwritten by symmetries as laws of time and space, our platform of perceptive congress.

Therefore, in addressing the question, “can the Voyager spacecrafts pass through the Heliopause, the H-manifold”? Indeed they should, as they have, namely Voyager 1 in 2012 25th August and Voyager-2 in 2018 5th November. The real focus here with Temporal Mechanics is what is derived, here the H_cMQS , ~110 AU from *SOL*, described as a 'stagnation region' where the solar *wind* would slow to zero, the magnetic field intensity increase with a demonstrable spike in high-energy electrons, and therefore the only foreseeable jeopardy for the Voyager space crafts in that region would be over-heating or collision with debris.

In short, Temporal Mechanics has derived what the Heliopause would be, and what would it be characteristic of, namely an EM^{DIR} field effect and thus a type of quantum foam, a particle *pair production* region, and a magnetic shell region (H_cMQS), and that the *HB12* zone would be the veritable Hydrogen Wall [41], a hot plasma region of plasma particles from the Heliopause to the Bow Shock, the spatial/distance metrics of such derived by *temporal calculus*.

According to Temporal Mechanics though, the real problem for the Voyager space crafts would occur closer to the Bow Shock region at 250 AU, where light is proposed to reach its maximum redshift limit of z_{12} together with light reducing its frequency by a factor of 12 (to maintain “*c*”), and therefore presumably not just quantum energy decay, yet mass decay.

If though mass can make itself operable in the *HB12* region and pass beyond the Bow Shock region to the *Epoch* (Oort Cloud) (given that it would be sizeable and presumably fast enough to do so, having mass on hand so to speak while reducing its temporal exposure to that region), then in such a case Temporal Mechanics proposes that ultimately for a mass object in travelling as far as it can and as fast as it can (ultimately to 73,500 AU), then that object will ultimately lose its dimensional viability, of dimensionality of time and space, and in an ultimate ideal scenario ultimately be effected by what exists within the shell of the E-manifold (*Epoch*), and thus swing back into the Bow Shock, then into H-manifold, and then ultimately head toward the greatest mass object there, the sun, not though colliding with *SOL*, simply because of the gravitational counterweight effect in space of the planets preventing any such mass from taking direct aim at *SOL*.

How would comets therefore form? In the same way planets would form, in the same way particle *pair production* events $e + /e -$ mass, and so on and so forth, to be presented in a subsequent paper. Specifically, a massive particle *pair production* growth event in the H_cMQS structure, on the *macroscopic* level, as already described regarding particle formation on the *microscopic* scale for an atom ([23]: p20-23), would generate mass production in the *macroscopic* nucleus of such a system, *SOL*, only logically prompting a cascading effect of planetary formation at *SOL*, obviously in the context of cyclic events in time, to be explained in further detail in a subsequent paper.

In short therefore, it would depend on the size, speed, and build/resilience of the Voyager spacecrafts to know how they will fare, and at what point they will break down, despite the great results they have achieved thus far.

8. Conclusion

Here in this solar system, this region we are familiar with, naturally, all the way to the *Epoch* (Oort Cloud), human perception can only be graded a certain way that meets with a certain structure of reality, and of course vice-versa. If anything exists beyond that structure, it would more than likely be something else entirely as a perception entity (as a different temporal perception grade); Temporal Mechanics is based primarily on an algorithm related to the *human* perception ability with time and space and those associated dimensional constraints.

Despite the infinite vastness of the stars as they appear, Temporal Mechanics has shown that their appearance is entirely explainable using a fractal-based (golden ratio temporal sequence of events in space) *temporal calculus* derivation of atomic phenomena.

Further papers are proposed to explain astrophysics and cosmology along the following themes:

1. Specific and general patterns of astrophysical phenomena.
2. Fundamental astrophysical metrics of time and space (origins and ends).
3. Anthropological cosmology.

If therefore we are ultimately enshrouded by an event horizon, a *Black Expanse*, the question is, “how is that perceived?”, namely via what manifolds and circuits of light in being *strict* with the required temporal events in space that conform to known field forces, particle qualities, and associated spatial metrics, *known information*. Temporal Mechanics has provided that solution in not conflicting with known data, from the microscopic scale to the macroscopic scale. The true test of Temporal Mechanics though is in demonstrating an entirely new phenomena Einstein’s Special and General Relativity theories cannot, namely particle *pair production* through the EM^{DIR} effect, the subject of a subsequent paper, the proposal of which is outlined in paper 32, the EM^{DIR} Antimatter Thruster ([32]: p20-22).

Conflicts of Interest

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

References

1. Jarvis S. H. (2017), Gravity’s Emergence from Electrodynamics, DOI: [10.13140/RG.2.2.35132.28804/1](https://doi.org/10.13140/RG.2.2.35132.28804/1), <https://vixra.org/abs/1704.0169>
2. Jarvis S. H. (2017), Golden Ratio Axioms of Time and Space, DOI: [10.13140/RG.2.2.30099.12327/1](https://doi.org/10.13140/RG.2.2.30099.12327/1), <http://vixra.org/abs/1706.0488>
3. Jarvis S. H. (2017), The Emergence of Consciousness from Chaos, DOI: [10.13140/RG.2.2.23388.23683/1](https://doi.org/10.13140/RG.2.2.23388.23683/1), <http://vixra.org/abs/1707.0044>
4. Jarvis S. H. (2017), Phi-Quantum Wave-Function Crystal Dynamics, DOI: [10.13140/RG.2.2.10045.10726/3](https://doi.org/10.13140/RG.2.2.10045.10726/3), <http://vixra.org/abs/1707.0352>
5. Jarvis S. H. (2017), Time as Energy, DOI: [10.13140/RG.2.2.23466.88009/3](https://doi.org/10.13140/RG.2.2.23466.88009/3), <http://vixra.org/abs/1711.0419>
6. Jarvis S. H. (2018), The Relativity of Time, DOI: [10.13140/RG.2.2.13400.55044/3](https://doi.org/10.13140/RG.2.2.13400.55044/3), <http://vixra.org/abs/1801.0083>
7. Jarvis S. H. (2019), Golden Ratio Entropic Gravity: Gravitational Singularity Field Testing, DOI: [10.13140/RG.2.2.35399.14246/1](https://doi.org/10.13140/RG.2.2.35399.14246/1), <http://vixra.org/abs/1904.0485>
8. Jarvis S. H. (2019), The Golden Ratio Time Algorithm, DOI: [10.13140/RG.2.2.35399.14246/2](https://doi.org/10.13140/RG.2.2.35399.14246/2), <http://vixra.org/abs/1905.0081>
9. Jarvis S. H. (2019), The Physics Chimera, DOI: [10.13140/RG.2.2.28499.02084/1](https://doi.org/10.13140/RG.2.2.28499.02084/1), <http://vixra.org/abs/1906.0127>
10. Jarvis S. H. (2019), The Conception of Time, DOI: [10.13140/RG.2.2.10258.71363/1](https://doi.org/10.13140/RG.2.2.10258.71363/1), <http://vixra.org/abs/1906.0441>
11. Jarvis S. H. (2019), Space, and the propagation of Light, DOI: [10.13140/RG.2.2.15833.67689/1](https://doi.org/10.13140/RG.2.2.15833.67689/1), <http://vixra.org/abs/1908.0388>

12. Jarvis S. H. (2019), Space, and the Nature of Gravity, DOI: [10.13140/RG.2.2.17320.93443](https://doi.org/10.13140/RG.2.2.17320.93443), <http://vixra.org/abs/1909.0656>
13. Jarvis S. H. (2019), Space, and the Redshift Effect, DOI: [10.13140/RG.2.2.14287.43683/1](https://doi.org/10.13140/RG.2.2.14287.43683/1), <http://vixra.org/abs/1911.0064>
14. Jarvis S. H. (2019), Solving The Cosmological Constant Problem, DOI: [10.13140/RG.2.2.25730.63686/2](https://doi.org/10.13140/RG.2.2.25730.63686/2), <http://vixra.org/abs/1912.0451>
15. Jarvis S. H. (2020), Hybrid Time Theory: “Euler’s Formula” and the “Phi-Algorithm”, DOI: [10.13140/RG.2.2.13078.91205/2](https://doi.org/10.13140/RG.2.2.13078.91205/2), <http://vixra.org/abs/2001.0233>
16. Jarvis S. H. (2020), The Hybrid Time Clock as a Function of Gravity, DOI: [10.13140/RG.2.2.27053.64487/1](https://doi.org/10.13140/RG.2.2.27053.64487/1), <http://vixra.org/abs/2001.0401>
17. Jarvis S. H. (2020), Hybrid Time Theory: Cosmology and Quantum Gravity (I), DOI: [10.13140/RG.2.2.20045.79847/1](https://doi.org/10.13140/RG.2.2.20045.79847/1), <http://vixra.org/abs/2003.0659>
18. Jarvis S. H. (2020), Scientific Principles of Space, Time, and Perception, DOI: [10.13140/RG.2.2.16207.84648/1](https://doi.org/10.13140/RG.2.2.16207.84648/1), <http://vixra.org/abs/2004.0260>
19. Jarvis S. H. (2020), Hybrid Time Theory: Cosmology and Quantum Gravity (II), DOI: [10.13140/RG.2.2.23972.22405](https://doi.org/10.13140/RG.2.2.23972.22405), <http://vixra.org/abs/2005.0053>
20. Jarvis S. H. (2020), Mathematical Principles of Time and Energy, DOI: [10.13140/RG.2.2.34441.67683/3](https://doi.org/10.13140/RG.2.2.34441.67683/3), <http://vixra.org/abs/2005.0179>
21. Jarvis S. H. (2020), Dimensional Mechanics of Time and Space, DOI: [10.13140/RG.2.2.21001.88169/1](https://doi.org/10.13140/RG.2.2.21001.88169/1), <http://vixra.org/abs/2005.0286>
22. Jarvis S. H. (2020), Dimensional Thermodynamics, DOI [10.13140/RG.2.2.29715.71202/2](https://doi.org/10.13140/RG.2.2.29715.71202/2), <http://vixra.org/abs/2006.0194>
23. Jarvis S. H. (2020), Time-Space Wave-Mechanics, DOI [10.13140/RG.2.2.10565.68320/3](https://doi.org/10.13140/RG.2.2.10565.68320/3), <http://vixra.org/abs/2007.0223>
24. Jarvis S. H. (2020), Temporal Calculus (The Calculus of Time-points in Space), DOI: [10.13140/RG.2.2.15362.09929/3](https://doi.org/10.13140/RG.2.2.15362.09929/3), <http://vixra.org/abs/2008.0111>
25. Jarvis S. H. (2020), Temporal Calculus: solving the “Yang-Mills Existence and Mass Gap” problem., DOI: [10.13140/RG.2.2.33774.43843/2](https://doi.org/10.13140/RG.2.2.33774.43843/2), <http://vixra.org/abs/2008.0226?ref=11562969>
26. Jarvis S. H. (2020), Temporal Calculus: Time Scaling Space, DOI: [10.13140/RG.2.2.28539.75043/2](https://doi.org/10.13140/RG.2.2.28539.75043/2), <https://vixra.org/abs/2009.0091>
27. Jarvis S. H. (2020), Temporal Calculus: Resolving Elementary Particle Formation and Confinement, DOI: [10.13140/RG.2.2.20191.07844](https://doi.org/10.13140/RG.2.2.20191.07844), <https://vixra.org/abs/2009.0177>
28. Jarvis S. H. (2020), Temporal Calculus: Resolving Einstein’s Theory of Relativity (Special and General), DOI: [10.13140/RG.2.2.12474.21447/1](https://doi.org/10.13140/RG.2.2.12474.21447/1), <https://vixra.org/abs/2010.0017>
29. Jarvis S. H. (2020), Time and Non-Locality: Resolving Bell’s Theorem, DOI: [10.13140/RG.2.2.12651.98086](https://doi.org/10.13140/RG.2.2.12651.98086) (researchgate.net), <https://vixra.org/abs/2011.0002>
30. Jarvis S. H. (2020), Non-Local Time-Point Theory: Magnetic Quantum Shell (MQS) Modelling, DOI: [10.13140/RG.2.2.11032.83206/2](https://doi.org/10.13140/RG.2.2.11032.83206/2), <https://vixra.org/abs/2012.0040>
31. Jarvis S. H. (2021), Temporal Mechanics (A): Time-Space Circuits, DOI: [10.13140/RG.2.2.28879.10407](https://doi.org/10.13140/RG.2.2.28879.10407), <https://vixra.org/abs/2101.0022>

32. Jarvis S. H. (2021), Temporal Mechanics (B): Time-Space Constants, DOI: [10.13140/RG.2.2.31751.21925/2](https://doi.org/10.13140/RG.2.2.31751.21925/2), <https://vixra.org/abs/2101.0148>
33. Overbye, Dennis (12 August 2013). "A Black Hole Mystery Wrapped in a Firewall Paradox". *The New York Times*. Retrieved 6th February 2021.
34. Rose, Charlie. "[A conversation with Dr. Stephen Hawking & Lucy Hawking](#)". *charlirose.com*. Archived from [the original](#) on March 29, 2013.
35. Wald, R. M. (1997). "Gravitational Collapse and Cosmic Censorship". In Iyer, B. R.; Bhawal, B. (eds.). *Black Holes, Gravitational Radiation and the Universe*. Springer. pp. 69–86. [arXiv:gr-qc/9710068](#). doi:10.1007/978-94-017-0934-7. ISBN 978-9401709347.
36. Overbye, Dennis (8 June 2015). "[Black Hole Hunters](#)". *NASA*. Archived from the original on 9 June 2015. Retrieved 8th February 2021.
37. Goldstein, Cathérine; Gray, Jeremy; Ritter, Jim (1996). *L'Europe mathématique: histoires, mythes, identités*. Editions MSH. p. 293. ISBN 9782735106851. Retrieved 7th February 2021
38. Zell, Holly (5 December 2011). "[NASA's Voyager Hits New Region at Solar System Edge](#)". NASA. Webpage accessed 8th February 2021.
39. [Study Suggest Spiral Galaxies Are Larger Than Previously Thought \(scitechdaily.com\)](#), webpage accessed 8th February 2021
40. <https://voyager.jpl.nasa.gov>, webpage accessed 7th February 2021
41. Wood, B. E.; Alexander, W. R.; Linsky, J. L. (13 July 2006). "[The Properties of the Local Interstellar Medium and the Interaction of the Stellar Winds of \$\epsilon\$ Indi and \$\lambda\$ Andromedae with the Interstellar Environment](#)". American Astronomical Society. Archived from [the original](#) on 14 June 2000