Journal of Modern Physics, 2023, 14, 839-864
https://www.scirp.org/journal/jmp
ISSN Online: 2153-120X
ISSN Print: 2153-1196

Time Dilation Cosmology

Joseph H. (Cass) Forrington

Managing Editor, Journal of Cosmology, California, USA
Email: captcass@captcass.com

How to cite this paper: Forrington, J.H. (Cass) (2023) Time Dilation Cosmology. *Journal of Modern Physics*, **14**, 839-864.
https://doi.org/10.4236/jmp.2023.146049

Received: April 6, 2023
Accepted: May 26, 2023
Published: May 29, 2023

Abstract

This model ties gravitation and celestial mechanics and kinematics directly to time dilation. It is a new theory of cosmology and the evolution of galaxies. Space and time are not two separate things, but two aspects of a single thing, "spacetime". Whatever affects space, affects time, and vice-versa. If time speeds up, space must contract to maintain the speed of light, *c*, and when space thickens into a mass, it is harder to evolve forward, and time appears to slow. If spatial events are spinning as time passes, then the forward direction of time is spinning. This is Einstein's curvature in the forward direction of time. Herein, the basis is outlined for time dilation cosmology in a space-time/quantum continuum, including the time dilation-based derivation of the mass of the Cosmic Microwave Background Radiation (CMBR), and time dilation formulas are derived for stellar system orbital, and galactic rotation, velocities, the force in time in Newtons, the Hamiltonian, the Hubble shift, the empirical gravitational constant, *G*, and other formulas, showing their direct relationship to the difference in the rate of time between the far distant observer's invariant 1 s/s rate of time and the slower rate of time at the coordinate point, proving the universe is not composed of separate bodies moving through space, but is an evolving 3-dimensional holographic continuum containing varying densities evolving forward in the forward direction of time, the 4th dimension, at apparently different rates of time, the velocities merely being compensation for those slower rates of time in a continuum evolving forward overall at *c*, which is why light propagates at *c*, even from a moving source. As per General Relativity, if there is no rate of time difference between coordinate points, there is no gravitational attraction between those points, and no gravitationally induced velocity. This model resolves all the major conundrums in astrophysics, eliminating Dark Energy and Dark Matter, and ties astrophysics directly to quantum physics.

Keywords

Gravitation, Time, Celestial Mechanics, ISM: Kinematics and Dynamics, Cosmology: Theory, Galaxies: Evolution

1. Introduction

Astrophysics has been plagued by conundrums since Hubble saw the red shift in the light of galaxies that increased with distance. This led to the Big Bang theory and caused Einstein to give up looking for his cosmological constant that would eliminate big crunches and bangs so we had a stable, eternal, universe, and it began the search for "Dark Energy" to explain how the universe could be expanding at an accelerating rate.

Then came the discovery that stars outside the corotation circle of large spiral galaxies had velocities that actually increased, instead of decreasing, beginning the search for the "Dark Matter" that could be causing this acceleration.

I had been considering these improbable explanations for decades and in 2015 I had an inspiration regarding gravity being an evolution down time dilation gradients, rather than objects "falling through space".

This sent me back to school, studying quantum mechanics through MIT's open courseware and other sources, and then tensor calculus so I could read Albert Einstein's work in the original to confirm I was not violating General Relativity, but complimenting it.

This being so, it then took me three years to derive the Hubble Constant through time dilation, which was necessary for me to prove the universe was not expanding and that spacetime was a continuum. That derivation and initial model got my first paper, "General Relativity: Effects in Time as Causation" [1], published in the Journal of Cosmology in July of 2019, even though it lacked the formulas for proving gravitationally induced velocities were directly related to, and due to, time dilation.

Finally, in January of 2021, I realized I had been looking at the dilation gradient from the surface of the Sun outward, when I needed to be looking at it from the far distant observer, who is outside all gravitational fields, inward. The base formula I was looking for then emerged from the universally accepted time dilation formula.

Over the course of its nearly year of development, the preprint of the new paper had over 700 astrophysicist/quantum physicist downloads from a list of 384 astrophysicists in 33 English-speaking universities and 114 quantum physicists in 19 English-speaking universities worldwide.

It was submitted to the Journal of Cosmology in November of 2021 as a replacement for the original paper and, after a nearly six-month review process, was accepted and it replaced the original version in July of 2022.

Time Dilation Cosmology resolves all the conundrums in astrophysics and is moving us from a universe of objects moving through space, to densities in a 3-dimensional holographic spatial continuum evolving at the speed of light, c, in the forward direction of time. This ties astrophysics directly to quantum physics and gives us a proper view of gravity.

It also allows us to pursue the development of gravity drives whereby we would be evolving our waveforms through the continuum through the manifestation of virtual time dilation gradients, instead of forcing densities to shift through the use of external force.

Quantum physicists can also refine their predictions as the Hamiltonian is now not dependent on velocities, but, rather, the time dilation that manifests those velocities.

The principles of time dilation cosmology can also be applied to other scientific fields such as particle physics, chemistry and meteorology.

In the paper, "General Relativity: Effects in Time as Causation" [1], published in July of 2022, this model predicted the James Webb space telescope discovery of galaxies like CEERS-93316, $z = 16.7$, and GLASSz-13, $z = 13.0$, proving the validity of this model's view of the cosmological horizon. LIGO'S Sept. 14, 2015 detection of a "gravity wave" [2] is a proof that spacetime is a continuum, and a proof of the nature of the evolving continuum is IBEX failing to find a shock wave at the edge of the heliopause as expected [3], because the heliosphere is not "moving through space", but is evolving through the continuum. This is reaffirmed by the "dead zone" discovered by Voyager 1 [4].

2. Fundamental Concepts

In § 15 of Einstein's 1916 paper on GR, "The Foundation of the Generalized Theory of Relativity" [5], he calls the time dilation elements his "energy components" (his quotation marks), while considering the Hamiltonian function, and this paper focuses on those time elements. Einstein's tensor only contains spacetime elements, *i.e.*, x, y, z and t, and is the actual description of the evolution of events that "describe" the "effects" (Einstein's words—author's quotation marks) of gravity.

Einstein's tensor describing gravity does not require the stress-energy tensor and the stress-energy tensor is meaningless without the corresponding Einstein tensor. In § 16, he says, "It must be admitted, that this introduction of the energy-tensor of matter cannot be justified by means of the Relativity-Postulate alone…". It is only used to provide a sense of the conservation of energy and momentum. Therefore, it will not be used in this paper. Only the relativistic effects in Einstein's Tensor will be considered, as this is what GR describes.

He also remarks in § 21, in his comparison to Newton's theory as a first approximation, that, "The remarkable thing in the result is that in the first-approximation of motion of the material point only the component g_{44} of the fundamental tensor appears". This is the time-time component.

It is also the time-time component that determines relativistic mass in that for an object in freefall within a time dilation gradient, the velocity and rate of acceleration are determined by the difference in the rates of time between frames, just as the evolving geodesics describing the particle's apparent motion are.

Though not considered herein, it should be noted that the stress-energy tensor is also scaled using the time elements to make it agree with the results of Einstein's Tensor. It is the time elements that General Relativity relies on.

If there is no rate of time difference between coordinate points, there is no gravitational attraction between those points and no gravitationally induced velocities relative to each other. Gravitationally induced velocities are dependent on differences in the rates of time. As all mass accretions are due to gravitational attraction, if there were no differences in the rates of time, there would be no mass accretions and no celestial bodies.

Space and time are not two separate things, but two aspects of a single thing, "spacetime", which is a continuum. There are no "separate" spaces and there are no "separate" bodies in space, just different densities within the continuum.

Whatever affects space, affects time, and vice-versa. For example, if time speeds up, space must contract to maintain the speed of light, *c*, and when there is a spatial density, a mass, space has more inertia and is harder to evolve forward, and time appears to slow. When we see curvature of motion and spins in space, we are also seeing curvature and spins in the forward direction of time. This is Einstein's curvature of events in the forward direction of time.

It is not that spatial events evolve forward over the passage of time, but, rather, that time evolves spatial events forward as time evolves forward. Time is evolving space, and spatial densities, forward. This is a slight, but extremely significant, shift in perspective.

We can, therefore, view time as the fundamental force of the universe, an irresistible force that evolves all spatial events forward in the forward direction of time.

For this reason, time dilation cosmology allows us to largely eliminate G from our formulas and replace it with the difference in the rates of time represented by Einstein's "energy components" in the g_{44} component. This also ties astrophysics directly to quantum physics as we now see the spacetime continuum as the quantum continuum, an eternally evolving 3-dimensional holographic spatial continuum evolving forward at *c*, which is why light propagates at *c*, even from a moving source, in the forward direction of time.

Because the spatial dimensions are evolving forward in the forward direction of time, and time has no depth, we can see that, even though we see dimensionality, the continuum itself only has an apparent depth of $6.8*10^{-10}$ m, derived by multiplying c by the inertial frame acceleration derived in 3.10 below.

Where X, Y, Z and T replace x1, x2, x3 and x4, Einstein's Fundamental Metric describes the Fundamental Direction and Rate (FDR) of evolution of the continuum:

Einstein's Fundamental Metric

	X	Y	Z	T
X	−1	0	0	0
Y	0	−1	0	0
Z	0	0	−1	0
T	0	0	0	+1

This metric can be visualized as the cube, **Figure 1**, below. The cube represents a universe with no spatial densities, just a smooth spatial continuum

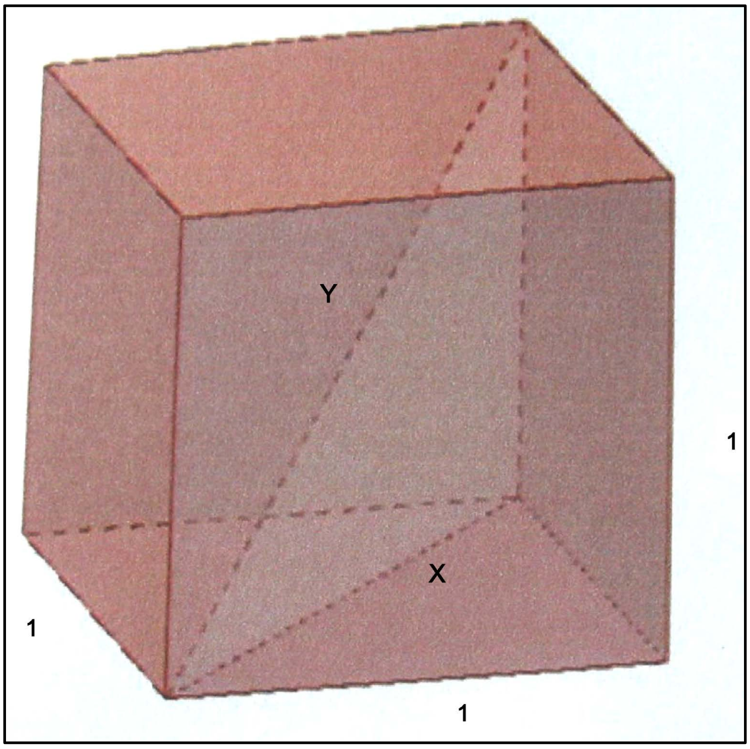

Figure 1. The fundamental metric.

being evolved forward at an even rate of time, the apparently invariant 1 s/s rate of time of the universe as a whole. The X, Y, and Z sides are all along the positive axes. Each dimension is pulled towards the forward direction of time, which is y in the cube. Space has inertia and this can be visualized as resulting in a stress on each spatial dimension.

We see acceleration throughout the universe because time is continuously accelerating and is keeping a continuous stress on space. As this is relative and is universally present, it can be an eternal process with no limit and does not affect the apparently invariant 1 s/s rate of the universe as a whole. As per Special Relativity, all inertial frames experience the same 1 s/s rate of time. Without that stress, there would be no apparent spatial evolution and space would not appear to evolve forward. The universe would just be a flat void. The length of y represents the Fundamental Rate of Acceleration, $\sqrt{3}$, in the forward direction of time. Due to spatial inertia, that rate of acceleration is kept constant and is reduced in the spatial dimensions to an acceleration factor of $\sqrt{2}$, which is x in the cube. The difference between these two factors, $\sqrt{3}-\sqrt{2}$, therefore, relates to Einstein's stress-energy tensor.

As spacetime is a continuum, space must keep up with the evolution of time. Otherwise, the continuum would be continuously stretching out. It is this stress that induces a gravitational compensatory velocity for all spatial densities/masses. All masses of any size must have a velocity.

As the Cosmic Microwave Background Radiation, CMBR, is a density, and must have a velocity, the author postulates that it is this continuous stress and resultant spatial acceleration that induces the velocity and generates the CMBR. The derivation of the mass of the CMBR must also include the velocity, as follows. Note that this is in the Fundamental Metric, where no other spatial densities or density induced gravitational fields exist:

The accepted energy of the CMBR is $E = \sim 4.17 \times 10^{-14}\ \text{J/m}^3$.

Assuming time is evolving forward at a fundamental velocity of c, space has an apparent fundamental compensatory velocity of

$$v = c \times \left(\sqrt{3} - \sqrt{2}\right) = 299792.458 \times 0.3178372451957 = 95285\ \text{km/s} \tag{1}$$

Using Einstein's energy formula, the mass of 1 m^3 of the CMBR is:

$$\begin{aligned} &E = mc^2 \times \sqrt{1 + v^2/c^2} \\ &m = E\Big/\left(c^2 \times \sqrt{1 + v^2/c^2}\right) \\ &m = \left(4.17 \times 10^{-14}\right)\Big/\left(299792458^2 \times 1.0492952\right) = 4.421778 \times 10^{-31}\ \text{kg/m}^3 \end{aligned} \tag{2}$$

Of course, if we plug this back into Einstein's formula, we get:

$$\begin{aligned} E &= \left(4.421778 \times 10^{-31}\right) \times \left(299792458^2\right) \times \left(\sqrt{\left(1 + 95285^2/299792.458^2\right)}\right) \\ &= 4.17 \times 10^{-14}\ \text{J} \end{aligned} \tag{3}$$

This derivation is also done using the apparent difference in the rate of time, *dRt*, between time and space in Section 3.4.

As Einstein notes, if we change any element in the Fundamental Metric, the direction of evolution, y, curves. This is where his g_{44} component becomes significant. If we place a density along the X axis, inertia increases and that creates a stronger resistance to the evolution of time, a drag, and the forward evolution, y, must bend towards that density. We now have a curvature of evolution in the forward direction of time towards what appears to be a slower rate of evolution in a mass, where we see an apparent time dilation.

We now see two apparent directions of evolution of events, **Figure 2**, below. The first is the Fundamental Direction of Evolution, FDE, which is the direction of evolution of the spacetime continuum as a whole in the forward direction of time at the invariant 1 s/s rate of Einstein's "far distant observer", who is outside all gravitational fields. The second is the Gravitational Direction of Evolution, GDE, down time dilation gradients. This is gravity and it is why gravity has only one direction and why it overpowers the other forces so easily even though it appears to be so relatively weak. It is an irresistible evolutionary force in time. The downgradient evolution of all events in space from faster to slower time coordinates is because slower time frames have lower pressure than faster time frames.

This pressure difference exists because photons have higher frequencies, higher energy, in faster time frames and lower frequencies, lower energy, in slower time frames. Space must also constrict in faster time frames to maintain c. With a smaller space and higher energy, we see pressure increase relative to slower time frames. The effect is augmented by the fact that the next instant

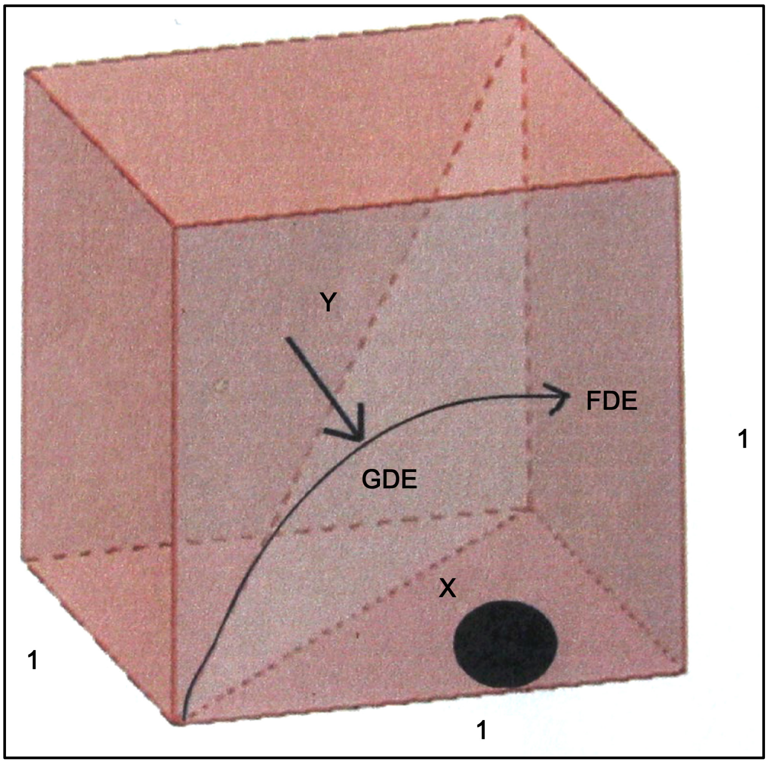

Figure 2. The FDE & GDE.

appears to manifest first upgradient.

The evolution of spatial events downgradient translates the fundamental energy of time into kinetic energy. When events impede each other at the focus of a spherical time dilation pit, pressure builds and the kinetic energy is translated into thermal energy. When enough pressure and thermal energy builds, we see thermonuclear energy, and the primary events of hydrogen, helium, and lithium are fused into the more complex elements.

When the downgradient gravitational evolution of events impedes on itself at the focus of a spherical time dilation "pit", it has nowhere to go, and we see the GDE go into a spin. We know it spins because we see the evolution of spatial events spin in the rotation and revolution of planets, stars and galaxies. Spatial events follow the forward direction of evolution of time, both in the FDE and GDE. This is discussed further in Section 4.

Within a mass, we find that we get to a point where space appears to precede time instead of time preceding space. In the Sun, for example, at a radius of 2500 m, we get the following results using the time dilation formula,

$$T_0 = T\sqrt{1 - \frac{2GM}{Rc^2}} \tag{4}$$

where $T = 1$,

$$T_0 = \sqrt{1 - \left(2 \times 6.67430 \times 10^{-11} \times 1.989 \times 10^{30}\right) / \left(2500 \times 299792458^2\right)}$$
$$= -0.1816506 \tag{5}$$

and the difference in the rate of time (dRt),

$$dRt = 1 - T_0 = 1.1816506 \quad (6)$$

meaning time is passing faster, instead of slower, at the coordinate point.

This is because in a particle the spatial event is being repeated. Time is not evolving the waveform forward so it changes, but is repeating the waveform over itself, giving it a permanence. The spatial waveform is already in place, preceding the evolution of time.

The formulas derived in Section 3 are proof of the dynamics in time.

3. Converting to Time Dilation Cosmology Formulas

The orbital velocity formula for simple, circular, orbits,

$$V_{Co} = \sqrt{GM/R} \quad (7)$$

is derived using the gravitational constant "G", which is merely an empirically derived constant that makes our formulas work. It has no other scientific basis other than that it is the number that makes the formulas work; a place holder for the true dynamics. It is derived in terms of time dilation in Section 3.8 below.

Since a circular orbital velocity, $V_{Co} = \sqrt{GM/R}$, the time dilation formulas for orbital velocities are derived from the gravitational time dilation formula,

$$T_0 = T\sqrt{1 - \frac{2GM}{Rc^2}} \quad (8)$$

which contains the velocity formula within it, by substituting V_{Co} for GM/R, *i.e.*:

$$T_0 = T\sqrt{1 - \left(2/c^2\right)V_{Co}} \quad (9)$$

resulting in:

$$V_{Co} = \sqrt{\left(Tc^2 - T_0c^2\right)/2T} \quad (10)$$

where $T = 1$, is the far distant observer's invariant rate of universal time and T_0 is the time dilation factor of the coordinate point, this reduces down to:

$$V_{Co} = \sqrt{c^2\left(1 - T_0\right)/2} \quad (11)$$

and since $(1 - T_0) = (dRt)$ = the difference in the rate of time between the invariant 1 s/s rate of the universe as a whole and the coordinate point, we now have:

$$V_{Co} = \sqrt{c^2\left(dRt\right)/2} \quad (12)$$

If we multiply this by the $\sqrt{2}$ spatial acceleration factor, as in **Figure 1**, Section 2, we get:

$$V_{Co} = \sqrt{2} \times \sqrt{c^2\left(dRt\right)/2} \quad (13)$$

and this reduces down to:

$$V_{Co} = \sqrt{c^2\left(dRt\right)} \quad (14)$$

or, alternately,

$$V_{Co} = c\sqrt{dRt} \tag{15}$$

for simple, nearly circular, satellite orbits.

It should be noted that the time dilation factor is not dependent on the Time Dilation Formula and the use of G, as it can simply be determined through observation with the use of clocks.

3.1. $V_{Co} = c\sqrt{dRt}$ Solutions

3.1.1. Planets

	Dilation Factor	dRt
Mercury	0.9999999745010402	0.0000000254989604
Venus	0.9999999863540133	0.0000000136459868
Earth	0.9999999901293970	0.0000000098706030
Mars	0.9999999935219782	0.0000000064780217
Jupiter	0.9999999981028554	0.0000000018971445
Saturn	0.9999999989646751	0.0000000010353249
Uranus	0.9999999994856144	0.0000000005143855
Neptune	0.9999999996717441	0.0000000003282558

3.1.2. Planet Velocities

$$c\sqrt{dRt} \quad \text{vs} \quad \sqrt{GM/R}$$

$$\text{Mercury} \quad 299792.458 \times \sqrt{2.54989604 \times 10^{-8}} = 47.87\ \text{km/s vs } 47.89\ \text{km/s} \tag{16}$$

$$\text{Venus} \quad 299792.458 \times \sqrt{1.36459868 \times 10^{-8}} = 35.02\ \text{km/s vs } 35.03\ \text{km/s} \tag{17}$$

$$\text{Earth} \quad 299792.458 \times \sqrt{9.8706030 \times 10^{-9}} = 29.78\ \text{km/s vs } 29.79\ \text{km/s} \tag{18}$$

$$\text{Mars} \quad 299792.458 \times \sqrt{6.4780217 \times 10^{-9}} = 24.12\ \text{km/s vs } 24.13\ \text{km/s} \tag{19}$$

$$\text{Jupiter} \quad 299792.458 \times \sqrt{1.8971445 \times 10^{-9}} = 13.06\ \text{km/s vs } 13.06\ \text{km/s} \tag{20}$$

$$\text{Saturn} \quad 299792.458 \times \sqrt{1.0353249 \times 10^{-9}} = 9.64\ \text{km/s vs } 9.64\ \text{km/s} \tag{21}$$

$$\text{Uranus} \quad 299792.458 \times \sqrt{5.143855 \times 10^{-10}} = 6.80\ \text{km/s vs } 6.81\ \text{km/s} \tag{22}$$

$$\text{Neptune} \quad 299792.458 \times \sqrt{3.282558 \times 10^{-10}} = 5.43\ \text{km/s vs } 5.43\ \text{km/s} \tag{23}$$

3.1.3. Moons

	Dilation Factor	dRt
Moon	0.99999999988405094	0.00000000011594905
Phobos	0.99999999994939408	0.00000000005060592
Deimos	0.99999999997975202	0.00000000002024798

3.1.4. Moon Velocities

$$c\sqrt{dRt} \quad \text{vs} \quad \sqrt{GM/R}$$

$$\text{Moon} \quad 299792.458 \times \sqrt{1.1594905 \times 10^{-10}} = 3.228\ \text{km/s vs } 3.228\ \text{km/s} \tag{24}$$

Phobos $299792.458 \times \sqrt{5.060592 \times 10^{-11}} = 2.132 \text{ km/s vs } 2.138 \text{ km/s}$ (25)

Deimos $299792.458 \times \sqrt{2.024798 \times 10^{-11}} = 1.349 \text{ km/s vs } 1.351 \text{ km/s}$ (26)

These results clearly show that the compensatory velocities are directly related to time dilation.

As noted in Section 2, the slower apparent rates of time in masses are due to the fact that densities in the spatial continuum have more inertia and are simply more difficult to evolve forward than less dense space, so events appear to evolve forward at a slower rate of time.

The larger the mass, the slower the apparent rate of time, and the higher the compensating velocity. Hence, the velocities are only dependent on the two factors, *c* and the *dRt*.

The proof that masses are spatial densities is that time is not just dilated in the mass, but also in the space around the mass, in its gravitational field. Since time dilation increases the closer the coordinate point is to the mass, the spatial continuum must be denser the closer it is to the mass. This is not the same as the theoretical "ether" that was the subject of the Michelson-Morley experiment. It is space, itself. As time dilation is so slight, it is doubtful we can measure this directly. However, we should be able to indirectly detect this as, if time is dilated, the CMBR will also be lower in frequency and energy the closer it is to the central mass.

In a system, satellites have an apparent faster rate of time than the large central mass. Because they cannot evolve forward ahead of the continuum, they appear to revolve around the central mass. This is a vortex in time.

For all other, elliptical, orbits within the "Kepler Zone", where Kepler's laws and General Relativity work as expected, we use the Vis-Viva Equation,

$$V_{Eo} = \sqrt{2GM/R - (GM/\alpha)} \tag{27}$$

where R = the distance to the coordinate point and α = the length of the orbit's semi-major axis. By replacing the velocity elements with the time dilation velocity formula we get:

$$V_{Eo} = \sqrt{2c^2(dRt) - c^2(dRt_\alpha)} \tag{28}$$

where dRt = the dRt for the coordinate point and dRt_α = the dRt for a distance the length of the orbit's semi-major axis.

3.2. $V_{Eo} = \sqrt{2c^2(dRt) - c^2(dRt_\alpha)}$ Solution

Hale-Bopp

Semi-Major axis, α = 27825203950200 m

Using the Vis-Viva equation,

$$V_{Eo} = \sqrt{2GM/R - (GM/\alpha)} \tag{29}$$

Perihelion = 136732453819.8 m: V_{Eo} = 44.011 km/s

Aphelion = 55470890455560 m: $V_{Eo} = 0.124$ km/s

Using the time dilation-based equation,

$$V_{Eo} = \sqrt{2c^2(dRt) - c^2(dRt_\alpha)} \tag{30}$$

where $T = 1$, the Dilation Factor at distance α

$$T_{0\alpha} = \sqrt{1 - \frac{2\left(\left(6.67430 \times 10^{-11}\right) \times \left(1.989 \times 10^{30}\right)\right)}{299792458^2 \times 27825203950200}} = 0.99999999946916353957 \tag{31}$$

dRt at distance $\alpha = dRt_\alpha = 5.3083646043 \times 10^{-11}$.

and the Dilation Factor at Perihelion

$$T_{0p} = \sqrt{1 - \frac{2\left(\left(6.67430 \times 10^{-11}\right) \times \left(1.989 \times 10^{30}\right)\right)}{299792458^2 \times 136732453819}} = 0.9999999891974198938 \tag{32}$$

dRt at Perihelion = $1.0802580106 \times 10^{-8}$

$$\begin{aligned} V_{Eo} &= \sqrt{2c^2(dRt) - c^2(dRt_\alpha)} \\ &= \sqrt{2 \times 299792.458^2 \times 1.0802580106 \times 10^{-8} - 299792.458^2 \times 5.3083646043 \times 10^{-11}} \\ &= 44.011 \text{ km/s} \end{aligned} \tag{33}$$

at Perihelion versus $V_{Eo} = 44.011$ km/s using the traditional Vis-Viva equation.

Dilation Factor at Aphelion

$$T_0 = \sqrt{1 - \frac{2\left(6.67430 \times 10^{-11} \times 1.989 \times 10^{30}\right)}{299792458^2 \times 55470890455560}} = 0.99999999997337228111 \tag{34}$$

dRt at Aphelion = $2.6627718888 \times 10^{-11}$

$$\begin{aligned} V_{Eo} &= \sqrt{2c^2(dRt) - c^2(dRt_\alpha)} \\ &= \sqrt{2 \times 299792.458^2 \times 2.6627718888 \times 10^{-11} - 299792.458^2 \times 5.3083646043 \times 10^{-11}} \\ &= 0.124 \text{ km/s} \end{aligned} \tag{35}$$

at Aphelion versus $V_{Eo} = 0.124$ km/s using the traditional Vis-Viva equation.

Time dilation factors are not additive. We do not add, for example, the Earth's dilation factor to the Sun's dilation factor, nor the Moon's dilation factor to the Earth's. Within each system, the greater dilation factor determines the compensatory velocity, e.g., the Sun's dilation gradient factor determines the Earth's velocity and the Earth's dilation gradient factor determines the Moon's velocity. Within the Kepler Zone, where bodies comply with General Relativity and Kepler's laws, the central body's dilation gradient determines the velocities of its satellites.

In large spiral galaxies, the Kepler Zone begins to end in the corotation circle, where the central galactic mass's dilation factor drops to the same as the individual stars' dilation factor. Outside the corotation circle, the Kepler Zone ends and the velocities appear to be anomalous using General Relativity and Kepler's laws, and the individual stars' velocities are determined by the stars' own dilation factors, which are now greater than the central galactic mass's. This does not occur in small spiral galaxies where the Kepler Zone encompasses all the stars within the system. This is why physicists are not looking for "Dark Matter" around small spiral galaxies and loosely organized elliptical galaxies that have no circulation around a central focus.

In Andromeda, M31, the corotation circle is at ~6 kpc, and the curves in Figure 3, which is "Fig. 7, Visible and dark mass of M31", from Tamm *et al.*, [6] show the velocity aberrations beginning at ~8 kpc. However, the shape of the velocity curve seems to indicate they begin earlier and that the data is probably missing the earlier changes because different mass stars begin the transition at different epochs.

As we are now seeing bodies' densities determining their own velocity in the Fundamental Direction of Evolution, y, as in Figure 1, Section 2, if we use the base formula for bodies in circular orbits within the Kepler Zone, we get a velocity that reflects the acceleration in the FDE, again, y in the cube. For the Sun, that gets us a velocity of 400 km/s in the FDE. To reduce that to what we observe in the spatial dimensions, we must divide by the Fundamental Rate of Acceleration, √3, and we get:

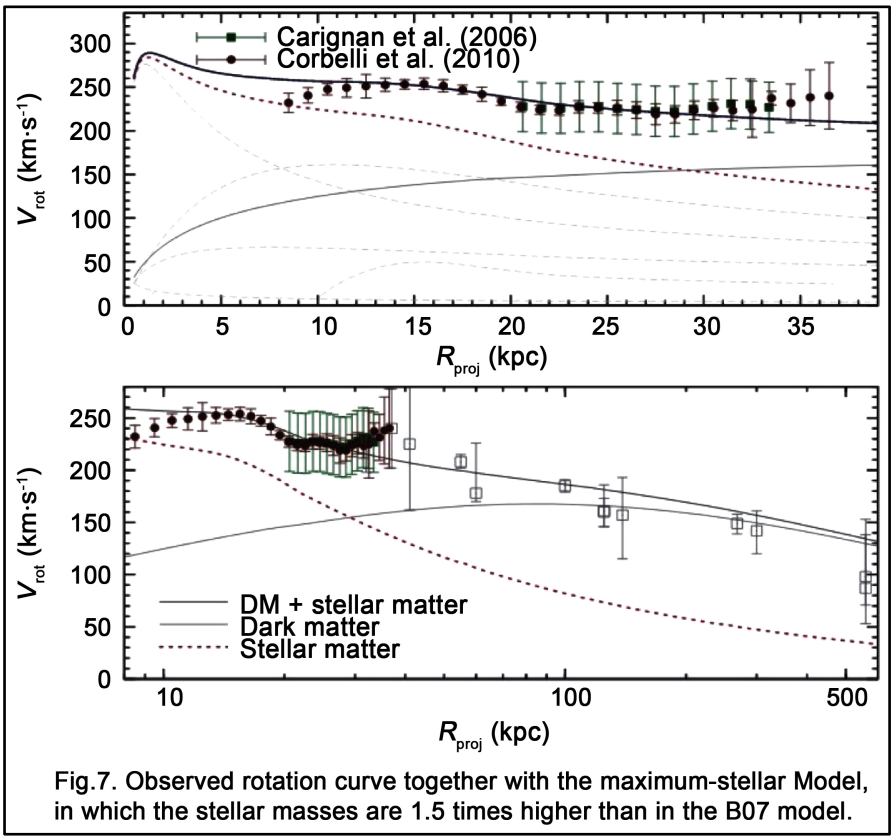

Figure 3. Galactic rotation curves M31.

$$V_{Go} = c\sqrt{dRt}/\sqrt{3} \quad (36)$$

for galactic rotation velocities for stars outside the Kepler Zone.

Using the Sun's surface dilation factor, we get the observed galactic rotational velocity of 231 km/s for the Sun. (This is obtained using a dilation factor for a radius of 8.22428833 × 10^8 m, which is 1.27192 × 10^8 m = 0.00018 larger than the normally accepted radius of the Sun. The author believes this is acceptable considering the Sun's dynamic nature and varying densities within its mass).

3.3. $V_{Go} = c\sqrt{dRt}/\sqrt{3}$ Solution

Sun

$$T_0 = T\sqrt{1-\frac{2GM}{Rc^2}} \quad (37)$$

where $T = 1$ and $2GM = 2.65503654 \times 10^{20}$,

$$T_0 = \sqrt{1-\frac{2.65503654\times10^{20}}{8.22428833\times10^{8}\times299792458^{2}}} = 0.9999982040213737 \quad (38)$$

$dRt = 1.7959786263 \times 10^{-6}$

$$V_{Go} = \frac{c\sqrt{dRt}}{\sqrt{3}} = \frac{299792.458\times\sqrt{1.7959786263\times10^{-6}}}{\sqrt{3}} = 231.95 \text{ km/s} \quad (39)$$

The proof of this formula is found in the derivation of the Mass/Radius formula for stars outside the Kepler Zone and the derivation of the mass of the CMBR:

3.4. Mass/Radius Formula for Stars Outside the Kepler Zone

where $dRt = (1 - T_0)$;

$$\begin{aligned} V_{Go} &= \sqrt{c^2(1-T_0)}/\sqrt{3} \\ \sqrt{3}\times V_{Go} &= \sqrt{c^2(1-T_0)} \\ 3\times(V_{Go})^2 &= c^2(1-T_0) \\ \frac{3\times(V_{Go})^2}{c^2} &= 1-T_0 \\ T_0 &= 1-\left(3\times(V_{Go})^2/c^2\right) \end{aligned} \quad (40)$$

As

$$T_0 = T\sqrt{1-\frac{2GM}{Rc^2}} \quad (41)$$

is also true, when $T = 1$,

$$1-\left(3\times(V_{Go})^2/c^2\right) = \sqrt{1-\left(2GM/Rc^2\right)} \quad (42)$$

Therefore:

$$\frac{M}{R}=c^2\left(1-\left(1-\frac{3\times(V_{Go})^2}{c^2}\right)^2\right)\Big/2G \tag{43}$$

For the Sun,

$$\begin{aligned}\frac{M}{R}&=\frac{299792458^2\times\left(1-\left(1-\frac{3\times 231000^2}{299792458^2}\right)^2\right)}{2\times 6.67430*10^{-11}}\\&=\frac{299792458^2\times\left(1-(1-0.00000178116358923231)^2\right)}{2\times 6.67430\times 10^{-11}}\\&=\frac{299792458^2\times(1-0.99999643767599407911160692514777514793 61)}{2\times 6.67430\times 10^{-11}}\\&=2.3984965\times 10^{21}\ \text{kg/m}\end{aligned} \tag{44}$$

Using a radius of 8.22428833 × 10^8 m for the Sun, as used to derive the galactic rotation velocity formula (36), and M = 1.989 × 10^{30} kg:

$$M/R=\left(1.989\times 10^{30}\right)/\left(8.22428833\times 10^8\right)=2.4184463\times 10^{21}\ \text{kg/m} \tag{45}$$

In Section 2, we derived the mass of 1 m^3 of the CMBR using Einstein's energy formula.

Where space has a compensatory fundamental velocity of

$$v=c\times\left(\sqrt{3}-\sqrt{2}\right)=299792.458\times 0.317837245195=95285\ \text{km/s} \tag{46}$$

Using Einstein's formula

$$E=mc^2\times\sqrt{1+v^2/c^2} \tag{47}$$

the mass of 1 m^3 of the CMBR is:

$$m=\left(4.17\times 10^{-14}\right)/\left(299792458^2\times 1.0492952\right)=4.42177\times 10^{-31}\ \text{kg} \tag{48}$$

We can now also derive that using the dRt between time and space by using the formula for fundamental compensatory spatial velocities,

$$V_{Go}=\frac{c\sqrt{dRt}}{\sqrt{3}} \tag{49}$$

where,

$$\sqrt{3}-\sqrt{2}=0.3178372451957822= \tag{50}$$

the dRt between space and time in the Fundamental Metric,

$$\begin{aligned}V_{Go}&=c\sqrt{dRt}/\sqrt{3}\\&=299792.458\times\sqrt{0.3178372451957822}/\sqrt{3}\\&=97580\ \text{km/s}\end{aligned} \tag{51}$$

$$\begin{aligned}m&=E\Big/\left(c^2\sqrt{1+v^2/c^2}\right)\\&=\left(4.17\times 10^{-14}\right)/\left(299792458^2\times 1.05163955\right)\\&=4.411921\times 10^{-31}\ \text{kg}\end{aligned} \tag{52}$$

As the *M*/*R* formula (43) provides the correct answer and contains $\sqrt{3}$ as a factor in its derivation, it justifies the use of $\sqrt{3}$ in the galactic rotation velocity formula, is a proof of that formula, and supports using it as the fundamental compensatory spatial velocity formula for the CMBR mass derivation.

It should also be noted that ($\sqrt{3}-\sqrt{2}$) is the scaling factor for the spatial velocity formula and also the time dilation factor for the time dilation-based formula, demonstrating that space and time are just two different aspects of a single thing; spacetime.

Note how every velocity equation above is now in terms of only c and the *dRt*, without the need to use *G*, the empirically derived gravitational constant. *G* is also derived in terms of the *dRt* in Section 3.8, below.

Knowing

$$GM/R = c^2(dRt) \tag{53}$$

we can now make that substitution in other formulas containing velocity as a factor.

3.5. Einstein's Energy Formula

The Kinetic Energy formula,

$$KE = mv^2/2 \tag{54}$$

is a velocity-based formula, as is Einstein's Energy formula

$$E = mc^2 \times \sqrt{1+v^2/c^2} \tag{55}$$

Einstein's formula contains two velocity factors, c and v. If we consider only $E = mc^2$, c is the velocity of the continuum as a whole and E is the energy expended in accelerating the mass to c. In the $\sqrt{1+v^2/c^2}$ element, (v^2/c^2) is the additional fraction of energy needed to induce the compensatory velocity.

Since

$$v^2 = c^2(1-T_0) = c^2(dRt) \tag{56}$$

then,

$$E = mc^2\sqrt{1+c^2(dRt)/c^2} \tag{57}$$

and, therefore:

$$E = mc^2\sqrt{1+dRt} \tag{58}$$

For the Earth, where $m = (5.9722 \times 10^{24})$ kg, $v = 29.79$ km/s:

$$\begin{aligned} E &= mc^2 \times \sqrt{1+\frac{v^2}{c^2}} \\ &= 5.9722\times10^{24}\times299792.458^2\times\sqrt{1+29.79^2/299792.458^2} \\ &= 5.36754570\times10^{35}\ \text{J} \end{aligned} \tag{59}$$

Versus,

$$
\begin{aligned}
E &= mc^2\sqrt{1+dRt} \\
&= 5.9722\times10^{24}\times299792.458^2\times\sqrt{1+6.96131131\times10^{-10}} \\
&= 5.36754568\times10^{35}\text{ J}
\end{aligned}
\tag{60}
$$

3.6. The Hamiltonian

$$H=\sum_i\frac{P_i^2}{2m_i}+\sum_{i<j}V\left(r_i-j_i\right) \tag{61}$$

where velocity,

$$v=c\sqrt{dRt}=c\sqrt{1-T_0} \tag{62}$$

and potential energy,

$$V=-mc^2\left(1-T_0\right) \tag{63}$$

As

$$P=m_iv=m_ic\sqrt{1-T_{0i}} \tag{64}$$

And,

$$P^2=\left(m_ic\right)^2\times\left(1-T_{0i}\right) \tag{65}$$

And,

$$H=\sum_i\frac{\left(m_ic\right)^2\left(1-T_{0i}\right)}{2m_i}+\sum_{i<j}\left(m_ic^2\right)\left(1-T_{0i}\right)\left(r_i-j_j\right) \tag{66}$$

And

$$\frac{\left(m_ic\right)^2\times\left(1-T_{0i}\right)}{2m_i}=\frac{\left(m_i^2c^2\right)\left(1-T_{0i}\right)}{2m_i}=\frac{m_ic^2\left(1-T_{0i}\right)}{2} \tag{67}$$

Therefore, since

$$1-T_0=dRt \tag{68}$$

$$H=\sum_i\frac{\left(m_ic^2\right)\left(dRt\right)}{2}+\sum_{i<j}\left(m_ic^2\right)\left(dRt\right)\left(r_i-r_j\right) \tag{69}$$

As the Hamiltonian is the principal operator in quantum mechanics, this now ties astrophysics directly to quantum physics.

3.7. Mass Inside a Steller Circle

"An approximate estimation of the mass inside the solar circle can be obtained for a set of parameters of R_0 = 8 kpc and V_0 = 200 to 238 km·s^{-1}, assuming spherical distribution of mass, as

$$M_0=R_0V^2/G=\left(7.44\text{ to }1.05\right)\times10^{10}M_\odot\sim10^{11}M_\odot$$

with G being the gravitational constant, and the solar rotation velocity V_0 being related to R_0 as V_0 = (A − B)R_0, where A and B are the Oort's constants (Oort 1965), which are determined by measuring the radial velocity and proper motion of a nearby star. See Kerr and Lynden-Bell (1986) for a review regarding the

Oort constants, and Table 1 and Table 2 for recent values." [7].

Using:

231 km/s for the Sun's V_{Go}

1 kpc = 3.08567758128 × 10^{19} m

At 8 kpc in the Milky Way, for the Sun:

$$\begin{aligned} M_{\circ} &= \frac{r \times v^2}{G} = \frac{2.468542065024 \times 10^{20} \times 231000^2}{6.67430 \times 10^{-11}} \\ &= 1.9735983268 \times 10^{41}\ \text{kg} = 9.92256574 \times 10^{10}\ M_{\odot} \end{aligned} \tag{70}$$

Versus:

where,

$$\begin{aligned} v &= \sqrt{c^2\left(1 - T_0\right)} \\ T_0 &= 1 - v^2/c^2 \end{aligned} \tag{71}$$

$$\begin{aligned} M_{\circ} &= \frac{c^2\left(R - T_0\right)}{G} = \frac{Rc^2 - T_0 c^2}{G} \\ &= \frac{2.468542065024 \times 10^{20} \times 299792458^2 - 0.9999994062788036 \times 299792458^2}{6.67430 \times 10^{-11}} \\ &= 1.9735983268 \times 10^{41}\ \text{kg} = 9.92256574 \times 10^{10}\ M_{\odot} \end{aligned} \tag{72}$$

3.8. Gravitational Constant

Earth dRt = 9.870603 × 10^{-9}

Radius of orbit, R = 1.49598262 × 10^{11} m

Sun Mass, $M_{\odot}$ = 1.989 × 10^{30} kg

c = 299792458 m/s

$$\begin{aligned} v &= \sqrt{GM_{\odot}/R} = \sqrt{c^2\left(dRt\right)} \\ v^2 &= \frac{GM_{\odot}}{R} = c^2\left(dRt\right) \\ G &= \frac{Rc^2\left(dRt\right)}{M_{\odot}} \\ &= \frac{1.49598262 \times 10^{11} \times 299792458^2 \times 9.870603 \times 10^{-9}}{1.989 \times 10^{30}} \\ &= 6.672319 \times 10^{-11} \end{aligned} \tag{73}$$

3.9. Force in Time in Newtons

Earth mass: (5.9722 × 10^{24}) kg

Earth orbital radius (R_E): 1.49598262 × 10^{11} m

Moon mass: (0.07346 × 10^{24}) kg

Earth/Moon center-to-center distance (r): 3.844 × 10^{8} m

Moon mean velocity: 10^{22} m/s

Sun mass: 1.989 × 10^{30} kg

Earth dRt at Earth R_E: 9.870603 × 10^{-9} s

Moon dRt_M: 1.153721 × 10^{-11}

Earth – Sun

where M = Sun mass, m = Earth mass, r = Earth orbital radius

$$\begin{aligned} F &= GMm/r^2 \\ &= \left(6.6743\times10^{-11}\times1.989\times10^{30}\times5.9722\times10^{24}\right)/\left(1.49598262\times10^{11}\right)^2 \\ &= 3.54259\times10^{22}\ \text{N} \end{aligned} \tag{74}$$

$$F = GMm/r^2 = Mmrc^2\left(dRt\right)/\left(Mr^2\right) \tag{75}$$

where M = Sun mass, m = Earth mass, r = Earth orbital radius. This formula reduces down to the centripetal force/gravity equation,

$$\begin{aligned} F &= mv^2/r \\ F &= \frac{\left(mc^2\right)\left(dRt\right)}{r} \\ &= \frac{5.9722\times10^{24}\times299792458^2\times9.870603\times10^{-9}}{1.49598262\times10^{11}} \\ &= 3.54154\times10^{22}\ \text{N} \end{aligned} \tag{76}$$

Earth Orbit Gravitational Acceleration

$$\alpha c = v^2/r = 29780^2/\left(1.49598262\times10^{11}\right) = 0.005928\ \text{m/s}^2 \tag{77}$$

$$\begin{aligned} \alpha c &= c^2\left(dRt\right)/r \\ &= \left(299792458^2\times9.870603\times10^{-9}\right)/\left(1.49598262\times10^{11}\right) \\ &= 0.005930\ \text{m/s}^2 \end{aligned} \tag{78}$$

Earth – Moon

where M = Earth mass, m = Moon mass, r = Earth/Moon mean center-to-center distance:

$$\begin{aligned} F &= GMm/r^2 \\ &= \left(6.6723\times10^{-11}\times5.9722\times10^{24}\times0.07346\times10^{24}\right)/\left(3.844\times10^{8}\right)^2 \\ &= 1.98104\times10^{20}\ \text{N} \end{aligned} \tag{79}$$

where M = Earth mass, m = Moon mass, $M_\odot$ = Sun mass, R_E = Earth orbital radius, dRt_E = Earth's dRt, R_M = Earth/Moon mean center-to-center distance:

$$\begin{aligned} F &= GMm/r^2 = MmR_Ec^2\left(dRt_E\right)/\left(M_\odot\left(R_M\right)^2\right) \\ &= \left(5.9722\times10^{24}\times0.07346\times10^{24}\times1.49598262\times10^{11}\times299792458^2\right. \\ &\quad \left.\times9.870603\times10^{-9}\right)/\left(1.989\times10^{30}\times\left(3.844\times10^{8}\right)^2\right) \\ &= 1.98104\times10^{20}\ \text{N} \end{aligned} \tag{80}$$

(Note: This is a 3-body solution, Earth, Moon & Sun)

where m = Moon mass, v = Moon velocity, r = Earth/Moon mean center-to-center distance:

$$F = mv^2/r = \left(0.07346\times10^{24}\times1022^2\right)/\left(3.844\times10^{8}\right) = 1.99604\times10^{20}\ \text{N} \tag{81}$$

where m = Moon mass, dRt_M = Moon's dRt, r = Earth/Moon mean center to center distance

$$\begin{aligned} F &= mc^2\left(dRt_M\right)/r \\ &= \left(0.07346\times10^{24}\times299792458^2\times1.153721\times10^{-11}\right)/\left(3.844\times10^8\right) \\ &= 1.98157\times10^{20}\text{ N} \end{aligned} \quad (82)$$

Moon Orbit Gravitational Acceleration

$$\alpha c = v^2/r = 1022^2/\left(3.844\times10^8\right) = 0.002717\text{ m/s}^2 \quad (83)$$

$$\begin{aligned} \alpha c &= c^2\left(dRt\right)/r \\ &= \left(299792458^2\times1.153721\times10^{-11}\right)/\left(3.844\times10^8\right) \\ &= 0.002697\text{ m/s}^2 \end{aligned} \quad (84)$$

3.10. The Hubble Shift

All of the above means there is another reason for the Hubble shift. Instead of an acceleration of objects in space away from the observer, it is an acceleration in the proper time within all living things, all observers. The simple proof of this is that plants grow upwards against gravity. It is not possible to move upward against gravity without acceleration. It is an aspect of being alive versus being inert.

Assuming a Hubble constant, H_O, of 70 km/s/Mpc, we find the apparent recessional velocity reaches c at 4282.7494 Mpc = 13.968062372 Gly. We perceive the rate of time for a body receding at c to be "0", which is a 1 s/s difference in the rate of time (dRt).

For a 1 s/s dRt at this distance, the rate of change is:

$$1/13.9680623\times10^9\text{ Gly} = 7.1592\times10^{-11}\text{ s/s/ly} = 2.33495160\times10^{-4}\text{ s/s/Mpc} \quad (85)$$

so, the dRt for 1 Mpc = 2.33495160 × 10^{-4} s/s and:

$$\begin{aligned} c\times\left(1+dRt\right) &= 299792.458\text{ km/s}\times\left(1+2.33495160\times10^{-4}\right)\text{s} \\ &= 299862.458\text{ km/s} \end{aligned} \quad (86)$$

and:

$$\frac{299862.458-299792.458=70\text{ km/s}}{\text{Mpc}} = H_O \quad (87)$$

and:

$$2.3349\times10^{-4}\text{ s/s/Mpc} = 7.1592\times10^{-11}\text{ s/s/ly} = 2.2686\times10^{-18}\text{ s/s} \quad (88)$$

acceleration within our inertial frames, manifesting an apparent 6.8*10^{-10} m continuum depth when multiplied by c.

Some LCDM adherents say distant velocities, past 6 Gly, have a higher H_o, indicating an increase in acceleration, but this is simply because the Cosmic Microwave Background Radiation, CMBR, is also being time dilated and that is a very small effect that only becomes evident at ~6 Gly and beyond.

When this acceleration is proportionately added to the proper and coordinate

time elements of Einstein's field equations, based upon their individual relative rates of time, singularities and infinities are avoided because the geodesics are slightly distorted:
where t_1 = coordinate time and t_0 = proper time, the time elements

$$\Delta t_1/\Delta t_0 = \left(\Delta t_1 \times \left(1+\left(\Delta t_1 - \Delta t_0\right)\times 2.2686\times 10^{-18}\right)\right)\Big/\left(\Delta t_0 \times \left(1+\Delta t_0 \times 2.2686\times 10^{-18}\right)\right) \tag{89}$$

For each second of Δt_0 this becomes:

$$\left(\Delta t_1 \times \left(1+2.2686\times 10^{-18}\,\Delta t_1\right)\right)\Big/\left(1+\left(2.2686\times 10^{-18}\right)\right) \tag{90}$$

This manifests as a net acceleration of the proper time relative to the coordinate time as the dilation gradient deepens and $\Delta t_1 \rightarrow 0$. It also causes the FDE to always precede the GDE, which relative rate of evolution to the FDE is determined by the slope of the dilation gradient. This prevents the FDE and GDE from coinciding and the subsequent formation of a singularity in a Big Crunch scenario both within a MECO (Black Hole—see Section 4), where we instead see the ever-tightening spiraling evolution that results in a quasar's emissions when no more energy can be contained by the vortex, or the universe as a whole, which we see spiraling off in all directions in the galaxies.

Obversely, as $\Delta t_1 \rightarrow \infty$, infinite divergence is impossible as Δt_1 is always divided by a sum > 1; *i.e.*,

$$\infty\Big/\left(1+2.2686\times 10^{-18}\right) < \infty \tag{91}$$

This now leads us to a subject that is normally taboo in scientific journals, because for this derivation of the Hubble shift to be correct, the effect must be cumulative over time, *i.e.*, it must be passed on from generation to generation of observers, just as life itself is passed on from generation to generation through the sperm and ovum, etc.

The proof of it, however, is found in the phenomenon of non-locality. We have experimentally proven that entangled particles affect each other immediately at distance and over time, no matter the distance and time passed since their entanglement. In quantum physics, we speak of an electron being a waveform that exists in an infinite potential well. The author postulates that two entangled particles are actually a single particle when in superposition. They can most certainly be affected that way.

The fact that the traditional two observers, Alice and Bob, can observe this entanglement, means Alice and Bob are also entangled. It is the only way the experiment and phenomenon can work. This means Alice and Bob are just two different points of view for the same observer, and are one in superposition.

4. The Limits of Relativity

We see two "Limits of Relativity" where time appears to stop. One at the cosmological horizon, looking outward, and one at the event horizons of the black holes at the center of spiral galaxies.

Black holes are actually Magnetospheric Eternally Collapsing Objects, or MECOs, the centers of which are just empty space. This is the latest advancement in our understanding of what we used to consider to be "black holes". It is beyond the scope of this paper to get fully into their physical aspects, which are well-documented by Astrophysicist Rudolph Schild of the Harvard—Smithsonian Center for Astrophysics, who led a team that was the first to find an intrinsic magnetic field in quasar Q0957 = 5616 [8] [9] in 2006.

As a spiral galaxy is a circulation event, a spiral galaxy is also a vortex in time, like a stellar system, as noted in Section 3.1.4. However, in the MECO we see both the FDE and GDE go into a spin. We can deduce this due to the velocity of the GDE → c at the event horizon. In the MECO, the GDE nearly catches up to the FDE, which is evolving forward at c in a spin. This being so, in the empty space within a MECO, we are actually looking into the FDE. When time spins, space spins, and the CMBR spins, which produces the MECO's magnetic field.

As it is not possible to get to place where time stops, if one were to approach the cosmological horizon it would appear to recede, and more galaxies would simply come into view. This prediction was made in the paper "General Relativity: Effects in Time as Causation" [1], and that is what the James Webb space telescope found with galaxy CEERS-93316, z = 16.7, at only 250,000,000 years after the hypothetical Big Bang, in what is supposed to be a "dark age" lasting ~400,000,000 years.

As the James Webb was looking at an area of the sky equal to a grain of sand held at arm's length, the probability that this is the farthest galaxy is statistically zero.

Not only do galaxies fill the sky to that distance, but also far beyond. This nullifies the Big Bang and Lambda Cold Dark Matter, LCDM, models as viable models of the universe as they are currently presented.

Likewise, if one were to approach a MECO, which is probably not possible due to the intense radiation due to the high concentration of stars, the dilation gradient would have to shift and the universe would open before the traveler, meaning each galaxy is a branching of the universe in a new direction.

5. Spiral Galaxy Formation

In spiral galaxies, the spiral arms rotate as a unit and contain mixes of mass densities. They do not "sort themselves out". So, the galaxy is evolving in the forward direction of time as a system, just as the stellar systems are. We also see that spiral galaxies follow the Fibonacci sequence. This indicates a structural pattern, not a random pattern, prevails, as it does throughout nature. Realizing that densities slow time, what we see in the spiral arms are ripples, or waves, in the rate of time; gravity waves. Time is slower in the arms and faster in between the arms. This leads us to believe the spinning MECO creates the gravity waves according to the Fibonacci sequence, and the spiral arms form in the troughs of those waves.

In the Milky Way, the central MECO, Sgr A*, has an accretion disk which is inclined ~23˚ to the plane of the galaxy. If we go back to our **Figure 1** cube that describes the Fundamental Metric, we see that $y=\sqrt{3}$ and $x=\sqrt{2}$, where y equals the acceleration factor for the FDE and x = the acceleration factor for the dimensional spatial planes, X, Y, Z, in the GDE, and the diagonal, y, forms a 35.26˚ angle with the base XZ plane.

If we then divide the base angle by the average of the acceleration factors, we see we get the ~ angle of inclination of the tilt of the accretion disk:

$$35.26^\circ \Big/ \frac{\sqrt{3}+\sqrt{2}}{2} = 22.41^\circ \tag{92}$$

As noted in Section 4, the GDE nearly catches up to the FDE in the MECO. We know this because the velocity of the GDE → c at the event horizon. This leads us to postulate it is the difference between the acceleration factors in the FDE and GDE, as they both head into the center of the vortex of the MECO, that creates stress in the evolving spiral and the resultant inclination. This relates back to Section 2, where we noted that the difference between these two factors, $\sqrt{3}-\sqrt{2}$, relates to Einstein's stress-energy tensor.

The MECO is the eye of a cosmic hurricane caused by spatial pressure differentials. Faster time has photons at higher frequency and therefore higher energy, in a necessarily smaller space required to maintain c. Slower time is lower in pressure due to slower frequencies and lower energy in a larger space.

At the event horizon, spatial events are spinning near c. They can't reach c because of the inertial drag of space, but it is so close, we see relativistic effects.

As objects, in this case photons, protons (which break down into quarks and electrons) and electrons, etc., approach c, they elongate and increase in mass. This greatly diminishes their frequencies as wavelengths stretch out, and that greatly decreases their energy. That energy is translated into space as extremely high stress as the FDE continues to evolve forward at c, dragging space along with it. As the vortex deepens, this highly stressed space is compressed and we have the empty space Schild's team found in quasar Q0957 = 5616 [8] [9] in 2006; just smooth, stretched and compressed space with all wavelengths nearly in-discernable, or perhaps pressed into superposition.

Eventually, the MECO can absorb no more, and the excess energy is released in a stream emanating from the core and the MECO becomes a Quasar.

It is also postulated that the precession of the tilted accretion disk could generate the gravity waves that form the basis of the spiral arms. As the disk precesses around the MECO, its tilt distorts the space around it.

If this is so, then we should expect a tilted accretion disk in all spiral galaxies and, if it is the difference in the acceleration factors creating that tilt, then all spiral galaxy accretion disks should have an inclination of ~23˚ to their galactic planes. These postulates will be proven if the James Webb telescope finds that other accretion disks in other galaxies are so inclined.

As we have shown that slower time is low pressure, and faster time high pressure, just as we get hurricanes in our Earth's atmosphere due to differences in atmospheric pressure, this leaves us with a cosmic hurricane, a rotating time vortex spinning space and the CMBR, creating a Magnetospheric Eternally Collapsing Object (MECO), the off-balance spin of the CMBR generating the magnetic field, and the precession of the tilted disk generating gravity waves that contain particles in the troughs, whose individual velocities are determined by their own densities or the dilation gradient of the central mass, whichever dilation gradient is deeper. The dynamics between the particles in the arms, gravitational and Coriolis, where leading edges become trailing edges, etc., account for larger particles not evolving out of the arms, *i.e.*, for the arms' stability.

6. Summary

All the gravitationally induced velocities in the universe can be directly related to time dilation without the use of *G*, the empirical gravitational constant, which can also be directly related to time dilation. This indicates that the velocities are merely compensation for the apparent slower rates of time in masses, which must keep up with the evolution of the spacetime continuum as a whole, which is a 3-dimensional holographic energy field evolving forward at *c*, which is why light propagates at *c*, even from a moving source, in the fundamental forward direction of time, the Cosmic Microwave Background Radiation being manifested by the continuous stress placed on space by time, represented by the difference in the fundamental time and spatial acceleration factors, $\sqrt{3}-\sqrt{2}$.

The time dilation relationship also holds true in other formulas containing velocity as a factor, indicating time is the fundamental force of the universe, which is largely manifested through the effects of time dilation.

Around large spiral galaxies, we see there is a "Kepler Zone" close to the center, apparently bounded by the corotation ring, where Kepler's laws and General Relativity apply, as it is the deeper time dilation gradient of the central mass determining the velocity of the stars. Outside the Kepler Zone, the velocity of the stars is determined by their own, now deeper, time dilation factors, and the fundamental compensatory velocity formula applies.

In small spiral and elliptical galaxies, all the stars lay within the Kepler Zone and physicists see no evidence of "Dark Matter".

The spacetime continuum is only apparently bounded by two Limits of Relativity where time appears to stop, one at the cosmological horizon and one at the event horizons of the central MECO's in spiral galaxies. As it is not possible to get to a place where time stops, both Limits of Relativity would recede when approached, revealing an apparently infinite continuum that is branching out in the MECO's, and the spiral galaxies formed around MECOs are cosmic hurricanes generated by the differences between higher pressure-faster time and lower pressure-slower time areas.

A summary of the time dilation-based formulas is as follows. Note that all the velocity formulas are derived using only *c* and the *dRt*, and the others *m*, c^2, *R* and the *dRt*. (Even though the formulas for the Mass/Radius ratio of stars outside the Kepler Zone in spiral galaxies and for the mass inside a stellar circle utilize *G*, for simplicity's sake, *G* is also derived using the *dRt*). It is further noted that where mc^2 appears, it brings that formula into concurrence with Einstein's energy formula. This is particularly significant in the Hamiltonian, the primary operator in quantum mechanics, given the fact that in § 15 of Einstein's 1916 paper on *GR*, "The Foundation of the Generalized Theory of Relativity" [5], he calls the time dilation elements his "energy components" (his quotation marks), while considering the Hamiltonian function.

It is also noted that we can now determine the *dRt* directly from the velocity and vice-versa. Knowing the *dRt* allows us to figure the *M*/*R* of the system's central body, be it a planet, star or galaxy, whether the body lay within the Kepler Zone, or without.

Formulas:

$V_{Co} = c\sqrt{dRt}$ for simple, nearly circular, orbits within a Kepler Zone. (93)

$V_{Eo} = \sqrt{2c^2(dRt) - c^2(dRt_\alpha)}$ for elliptical orbits within a Kepler Zone. (94)

$V_{Go} = c\sqrt{dRt}/\sqrt{3}$ for galactic rotation velocities for stars outside the Kepler Zone. This is the fundamental compensatory velocity formula. (95)

$E = mc^2\sqrt{1 + dRt}$ for Einstein's energy formula. (96)

$F = mc^2(dRt)/r$ for centripetal force & gravity. (97)

$F = \frac{Mmrc^2(dRt)}{Mr^2}$ for the force in Newton's for 2-body systems. (98)

$F = MmR_E c^2(dRt_E)/\left(M_\odot (R_M)^2\right)$ 3-body solution for the force in Newton's for 2-body systems, in this case Earth, Moon and Sun. (99)

$M_\circ = \frac{c^2(R - T_0)}{G}$ for the mass inside a stellar circle. (100)

$G = rc^2(dRt)/M$ for the empirical gravitational constant. (101)

$\frac{M}{R} = c^2\left(1 - \left(1 - \frac{3\times(V_{Go})^2}{c^2}\right)^2\right)\bigg/2G$ for the Mass/Radius ratio of stars outside the Kepler Zone in spiral galaxies. (102)

$H = \sum_i \frac{m_i c^2(dRt)}{2} + \sum_{i<j} m_i c^2(dRt)(r_i - r_j)$ for the Hamiltonian. (103)

7. Conclusions

Spacetime being a single continuum with two aspects, the reason astrophysics has been plagued with seemingly unresolvable conundrums like the Big Bang, anomalous galactic rotation velocities and an infinitely accelerating expansion of the universe, and corresponding continuously futile searches for Dark Energy and Dark Matter, is because we simply misinterpreted Hubble's red shift as due to a spatial acceleration in coordinate frames instead of the alternate possibility of an acceleration in time in our inertial frames. Quantum physics, meanwhile, has progressed steadily over the same period because it is the correct way to view the universe, *i.e.*, as an observer-dependent evolving energy field, the spacetime/quantum continuum. Once we view astrophysics in that same light, all the conundrums disappear and we can explain what we are seeing quite logically.

In the paper, "General Relativity: Effects in Time as Causation" [1], published in July of 2022, this model predicted the James Webb space telescope discovery of galaxies like CEERS-93316, $z = 16.7$, and GLASSz-13, $z = 13.0$, proving the validity of this model's view of the cosmological horizon. LIGO'S Sept. 14, 2015 detection of a "gravity wave" [2] is a proof that spacetime is a continuum, and a proof of the nature of the evolving continuum is IBEX failing to find a shock wave at the edge of the heliopause as expected [3], because the heliosphere is not "moving through space", but is evolving through the continuum. This is reaffirmed by the "dead zone" discovered by Voyager 1 [4].

The author postulates that the James Webb telescope discovery of galaxy CEERS-93316, $z = 16.7$, at only 250,000,000 years after the hypothetical Big Bang, in what is supposed to be a "dark age" lasting ~400,000,000 years, invalidates Lamda Cold Dark Matter as a viable theory as presently presented and, therefore, likely eliminates the Big Bang origin it tries to explain.

Time dilation cosmology, which utilizes Einstein's "energy components" from General Relativity, within an apparently infinite, eternally evolving spacetime/quantum continuum, appears to offer a more logical, viable, model, with no conundrums or dark elements yet to be explained. It should be remembered that until Hubble saw his shift, Einstein, and other physicists and astronomers of his time, believed the universe to be eternal and infinite. Hence, Einstein's failed search for his cosmological constant that would eliminate the possibility of Big Bangs and Crunches, which this model now does, as per Section 3.10. and the paper "General Relativity: Effects in Time as Causation" [1].

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

[1] Forrington, J.H. (Cass) (2022) *Journal of Cosmology*, **27**, 15110-15145. https://thejournalofcosmology.com/General%20Relativity%20and%20Effects%20in%20Time%20as%20Causation%20JoC.pdf

[2] LIGO Caltech (2016) Press Conference, Washington, DC. https://www.ligo.caltech.edu/detection

[3] NASA (2013) IBEX Reveals a Missing Boundary at the Edge of the Solar System. https://www.nasa.gov/mission_pages/ibex/news/nobowshock.html

[4] John Hopkins University Gazette (2013) APL Gets More Solar Surprises from NASA's Voyager. https://hub.jhu.edu/gazette/2013/august/apl-voyager-space/

[5] Einstein, A. (1916) *Annalen der Physik*, **354**, 769-822.

https://doi.org/10.1002/andp.19163540702
https://en.wikisource.org/wiki/The_Foundation_of_the_Generalised_Theory_of_Relativity

[6] Tamm, A., Tempel, E., Tenjes, P., Tihhonova, O. and Tuvikene, T. (2012) *Astronomy & Astrophysics*, **546**, A4. https://doi.org/10.1051/0004-6361/201220065

[7] Sofue, Y. (2017) *Publications of the Astronomical Society of Japan*, **69**, R1. https://doi.org/10.1093/pasj/psw103

[8] Schild, R.E. and Leiter, D.J. (2008) Black Hole or MECO? Decided by a Thin Luminous Ring Structure Deep Within Quasar Q0957. https://arxiv.org/abs/0806.1748

[9] Shiga. D. (2006) Mysterious Quasar Casts Doubt on Black Holes. *New Scientist*, Space. https://www.newscientist.com/article/dn9620-mysterious-quasar-casts-doubt-on-black-holes/