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Unifying Newton's Force and Aether Dynamics: A First-Principles Mathematical Approach

Muhammad Aslam Musakhail
Independent Researcher, Main Saddar bazar Musakhail, Pakistan
aslammusakhail@gmail.com

James Russell Farmer *
Independent Researcher, 10 William Ave, Greenlane, Auckland 1051, New Zealand
jrfarmer12@yahoo.com.au

ABSTRACT

In this paper, we explore the resolution of the twin paradox through the lens of Muhammad Aslam Musakhail's closed fluid dynamic principle, which offers a novel interpretation based on the pre-Einsteinian concept of aether theory. Building on this principle, we develop a mathematical framework that defines the aether force as the difference between relativistic total mass and rest mass, which vanishes for stationary objects. This framework provides a fresh perspective on relativistic dynamics. We apply this theory to the twin paradox, a cornerstone of special relativity, demonstrating that the discrepancy in the twins' clocks arises due to the acceleration experienced by the traveling twin. Importantly, we hypothesize that the clock adjustment for the traveling twin begins not with the onset of acceleration but at the moment of trajectory reversal-when the twin transitions from outbound to inbound motion. This reinterpretation resolves the paradox within the context of the aether dynamic principle. Furthermore, we extend the framework to explore its implications for Solar flares, as detailed in our previous work, On the Aether Dynamics, Twin Paradox, and Ultimate Relativity of Solar Flares. A rigorous derivation of the aether force is presented, transforming it from a conjecture into a mathematically grounded concept. This derivation not only strengthens the theoretical foundation of the aether dynamic principle but also provides a unified approach to relativistic phenomena.

Keywords: Aether Dynamics, Relativistic Dynamics, Time Dilation, Lorentz Factor

INTRODUCTION

We conjectured that the aether force acting on a massive fermion, such as an electron or a positron that adheres to Einstein's laws of special relativity (SR), is represented by the following equation:

$$m = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}} \qquad (1)$$

From this, we derive the force as:

$$F(v) = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}} - m_0 \qquad (2)$$

In this formulation, the aether force vanishes for a stationary fermion, where $v = 0$ and $F(0) = 0$, in line with Muhammad's aether fluid principle. Initially a conjecture, this formulation has proved to be sound and has become crucial in resolving the twin paradox of special relativity. The paradox itself, along with the Einstein mass formula:

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

underscores the relevance of SR in discussions about the aether. Historically, the concept of aether was developed by nineteenth-century physicists to explain the propagation of Maxwell's electromagnetic waves in a medium rather than through empty space, a necessary framework since waves are understood to require a medium for propagation.

Despite Einstein's introduction of Lorentz contraction and time dilation appearing to negate the need for an aether, we are revisiting the idea of aether as a medium for the propagation of both massive and massless particles, such as photons. This approach interestingly employs the very principles of special relativity and the twin paradox that once seemed to make the aether concept obsolete, highlighting a great irony in the evolving understanding of physics. As highlighted in the abstract, the resolution of the twin paradox in this paper is explored through Muhammad Aslam Musakhail's 'closed fluid dynamic principle,' which offers a reevaluation of the aether concept. This novel interpretation is key to understanding the dynamic relationship between relativistic total mass and rest mass, especially when considering how these values interact to influence time perception.

We propose that the mechanism of time dilation 'payback,' essential for reconciling the age discrepancy between the twins upon their reunion, begins not at the onset of acceleration but crucially at the point of trajectory reversal. This is the moment when Twin 2, the traveling twin, switches from moving towards Point P to returning to Point T.

The journey begins with Twin 2 traveling from Point T to Point P at a constant velocity v_{in}. Upon reaching Point P, Twin 2 decelerates and eventually comes to a stop, before reversing direction and accelerating back towards Point T with a velocity of $-v_{in}$.

This phase of the journey, from stopping and reversing at Point P to traveling back at a constant velocity to Point T, is critical for the 'time dilation payback.' It is during this return leg that the adjustments to the perceived time-necessitated by the differences in relative velocity and acceleration-are calculated to ensure that upon their reunion, both twins agree that Twin 2 is indeed younger, quantifying exactly by how much this is the case.

This adjustment aligns with the principles laid out in the 'aether dynamic principle,' tying the special relativistic effects directly to our revised understanding of aether dynamics. So, what we might refer to as the first law of special relativity, which accounts for the aether force and the resolution of the twin paradox, is described by Equation (1).

As we delve deeper into our investigations concerning the nature of time dilation payback, we employ the second and third equations of special relativity: the Lorentz contraction and time dilation.

$$\Delta x = (\Delta x)_0 \sqrt{1 - \frac{v^2}{c^2}} \text{ (Lorentz Contraction)} \quad (2)$$

Here, $(\Delta x)_0$ represents the actual length in the rest frame, while Δx is the observed length at velocity v, indicating the reduced length due to Lorentz contraction.

$$\Delta t = (\Delta t)_0 \sqrt{1 - \frac{v^2}{c^2}} \text{(Time Dilation)} \quad (3)$$

In this equation, Δt describes the reduced time interval associated with a clock that ticks more slowly when observed as it moves at velocity v. It's important to note the equivalence between Equations (2) and (3), where both are multiplied by the Lorentz factor, unlike in Equation (1), where we divide by the Lorentz factor. This distinction will be crucial in furthering our investigations.

In resolving the twin paradox through the aether dynamic principle, we simplified the analysis by conjecturing that Twin 2 experiences 'infinite acceleration' at Point P.

This assumption posits that the velocity reversal is instantaneous, and we designate this infinite acceleration as $a = 1$. Consequently, all the time dilation payback is assumed to occur during the journey from Point P to Point T, proceeding at a constant rate in both space and time and at a constant rate in space and time.

$$\frac{d\tau}{dt} = \text{constant} \quad (4)$$

Here, τ represents the total amount of time dilation payback required. This rate is not constant in cases of non-infinite acceleration, that is, during a journey that involves multiple stages of travel and reversal. Specifically, the journey starts at Point T, moves to Point P, reaches a Reversal point where the direction of travel changes, returns to Point P, and finally concludes back at Point T.

In this trajectory, the acceleration varies, affecting the rate of time dilation payback throughout the trip. Acceleration can be categorized into three types: zero, infinite, and everything in between. Mathematically, $1/\infty = 0$ and $1/0 = \infty$, making zero and infinite acceleration a 'dual special case' that we often group together. Infinite acceleration simplifies the resolution of the twin paradox, allowing the twins to reunite instantaneously, thus resolving any time dilation discrepancies immediately. Conversely, with zero acceleration, the twins never reunite, and the paradox remains unresolved.

Therefore, the designation $a = 1$ could potentially apply to both infinite and zero acceleration. In equations (1), (2), and (3), which describe the aether force equation (1), we typically only consider zero acceleration.

The aether force acts on a massive fermion moving through space at constant velocity, which, in this scenario, involves zero acceleration.

In this context, zero acceleration is designated by $a = 1$, not infinite acceleration. This notion reflects a fundamental duality in physics, where zero and infinite acceleration are not preferentially distinguished but are rather considered as dual aspects of the same phenomenon.

Another essential element in our theoretical toolkit is the concept of fermionic wavelengths as 'measuring rods for space.' This concept primarily involves electrons and positrons. These particles can have their rest masses effectively removed, allowing them to propagate masslessly at the speed of light, carried by electromagnetic waves. In this context, light itself can be described as an equal mixture of electronic and positronic photons [1-3].

When a fermion is moving along an electromagnetic wave, its wavelength serves as a measuring rod for space. However, if no fermion is propagating along the electromagnetic wave, then the wavelengths of that wave do not serve as spatial measuring rods. We refer to such a scenario as involving a 'Reverse Higgs boson.' This term is used because it denotes the removal of a fermion's (rest) mass, enabling it to move at the speed of light, which contrasts with the Higgs boson that imparts rest mass. Maxwell's wave equation, which accounts for both light and these Reverse Higgs bosons, assumes zero charge and current densities. This applies regardless of whether there are no charges/currents at all or if the charge and current densities balance out to zero due to an equal mixture of positrons and electrons [1-3].

LITERATURE REVIEW

In our study, we reference '*Theory of Everything*', published in the HyperScience journal [1], which utilizes the fluid dynamic aether model to resolve the twin paradox. Following this, we explore 'On the Aether Dynamics, Twin Paradox and Ultimate Relativity of Solar Flares' [4], where the principle is expanded to describe certain phenomena in the aether dynamics and electrodynamics of Solar Flares.

This work was part of my honors project in 1998 and a topic I pursued during my attempted PhD in 2005. Additionally, the third paper that I co-authored with Muhammad, titled 'Solar Flares and the Aether Dynamic' [5], delves deeper into investigations of Solar flares. Although not as directly related to the aether dynamic principle, this publication was intended to include the current paper, but it was ultimately omitted due to spatial constraints in the journal.

However, a significant concept from this publication is the variable $f(\omega)$, which assumes the values 0, ½, 1. This variable is integral to our analyses of the twin paradox, especially in how we categorize acceleration: $a = 0$(zero acceleration), $a = 1$ (infinite acceleration), and a = ½ (anything in between).

This categorization reflects a fundamental 'duality' in our approach. When investigating non-infinite accelerations in the twin paradox, we find that it is valid, based on first principles, to set $a = 1$ to indicate zero acceleration, rather than infinite acceleration.

One cannot fully appreciate the findings of this paper without understanding the role of the Reverse Higgs boson. This theoretical entity is crucial as it enables a fermion to behave as if it were massless, allowing it to propagate along an electromagnetic wave packet at the speed of light, denoted as $v = c$ [1-3].

This concept is foundational for interpreting the behaviors we explore. To illustrate, consider Einstein's equation of special relativity (1) referenced earlier. When a fermion is influenced in such a way that it behaves as if it were massless, moving on an electromagnetic wave packet, it achieves a speed $v = c$, where its effective rest mass m_0 becomes negligible, resulting in the following scenario.

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} = 0/0 = h\nu/c^2$$

As to why these charged photons do not interact with external electric and magnetic fields, it is because they experience zero Lorentz force. This can be expressed as:

$$\boldsymbol{F}_{Lorentz} = q(\boldsymbol{E} + v \times \boldsymbol{B}) = 0 \quad (5)$$

Here, E and B denote the electric and magnetic fields, respectively, and v is the velocity of the particle. Equation (5) simplifies to $E = -v \times B$ when the Lorentz force is zero. Readers are encouraged to verify this independently by considering that the electromagnetic amplitudes are related by $E/B = c$, where c is the speed of light, and that the electromagnetic wave propagates at $v = c$. Furthermore, the Poynting vector, which represents the electromagnetic flux, also plays a crucial role in understanding these dynamics.

$$P = \frac{\mathbf{1}}{\boldsymbol{\mu}}(\boldsymbol{E} \times \boldsymbol{B}) \quad (6)$$

The Poynting vector, indicating the direction of electromagnetic wave propagation, is integral to understanding these phenomena. For comprehensive discussions on the removal of fermionic rest mass by the Reverse Higgs boson and the zero Lorentz force condition, readers are encouraged to consult my self-published works available on Amazon (see [1-3]).

These publications provide further insights into the topics for those who may not wish to verify these conditions independently. In particular, we need to address why the equation $0/0 = hvc^2$ is significant. This equation involves two factors: the rest mass m_0 and the Lorentz factor, $\sqrt{1 - v^2/c^2}$, with the latter divided by the former. We understand clearly how the Lorentz factor approaches zero as v approaches c.

To resolve the indeterminate form '0/0', we must similarly understand the exact manner in which m_0 approaches zero as v approaches c.

This issue was puzzling for a long time, but it eventually became clear that the behavior of m_0 as v approaches c is subtly embedded in Einstein's fourth equation of special relativity, which has been incompletely analyzed to a significant extent.

$$E^2 = (pc)^2 + (m_0c^2)^2$$

Isolate m_0 as the subject, where $p = m_0/\sqrt{1 - v^2/c^2}$, and E represents the photon energy. For further discussions on this topic, refer to my detailed analyses in the publications available on Amazon [1-3].

METHODOLOGY

Back in 1999-2001, while pursuing my MSc in Quantum Fields and Fundamental Forces at Imperial College, London, I was deeply engaged with the special relativity equation, (1) mentioned above. I contemplated the notion that the relativistic mass equation $0/0 = (0 \times \infty)$could represent anything, and I hypothesized it equated to the mass of an electron/positron. I discussed this idea with my supervisor, Ray Rivers. He acknowledged that 0×∞ could indeed represent the mass of an electron, but he also noted that it could be equated to one. He remained unconvinced by my arguments. Many years later, a former undergraduate peer, Tim Bedding, who had ascended to head of the School of Physics at the University of Sydney, was someone I reached out to via email to present my theory.

I proposed that when radioactive elements decay, the fermions convert to radiation. By synthesizing Einstein's two famous equations, one could determine that the energy of the resultant radiation would be calculated as follows.

$$E = h\nu_e = m_ec^2 \tag{7}$$

In this scenario, we encounter gamma radiation. When plugging in the numbers, with m_e representing the electron mass, the frequency ν_e aligns with the gamma radiation range, approximately 10^{20} Hz. Bedding, however, was uninterested in my theory, dismissing it as physically nonsensical and arguing that my calculations merely confirmed the well-known process of electron-positron annihilation.

Despite these setbacks, my subsequent investigations have rigorously validated Equation (7) through mathematical methods, as discussed in the referenced Amazon publications above. Our research has led to other significant findings that further confirm the soundness of the underlying physics, particularly in relation to Einstein's general relativity. Our journey progresses logically from special relativity to general relativity.

This progression is elaborated in the second HyperScience publication, 'On the Aether Dynamics, Twin Paradox and Ultimate Relativity of Solar Flares' [2]. It turns out that general relativity is merely a special case of the general acceleration proposed in our resolution of the twin paradox. We term this 'Ultimate Relativity,' a theory poised to unify special and general relativity and provide the essential acceleration component needed to resolve the twin paradox comprehensively.

We have concluded that 'general relativity' essentially represents the unification of Newtonian gravity with Maxwellian electrodynamics. In this framework, Newtonian gravitational forces occur between nuclei, capable of sustaining a 'gravitational flux tube' that facilitates the transmission of gravitons. The speed of gravitons is proportional to the distance between gravitating nuclei and generally far exceeds the speed of light.

However, in the context of general relativity-which involves photons-we specifically consider those gravitons that move at the speed of photons, $v = c$. Thus, Einstein's 'gravitational waves,' which are composed of gravitons, represent just a narrow range within the vast spectrum of possible graviton speeds. These speeds only converge to $v = c$ in the unification limit of general relativity. For further discussion on how wavepackets are constructed from waves, see 'Grand Unification' [6].

We propose that Einstein was both right and wrong. His biggest misstep was not the inclusion of the cosmological constant, lambda, which in fact, was not an error at all! (see [1-3]).

Rather, his fundamental mistake lay in concluding that his theory of relativity had completely superseded Newtonian gravitation. In reality, Newtonian gravitation accurately describes the force between nuclei. Consider a scenario involving a massive electron or positron, which cannot sustain a gravitational flux tube, placed in the field position.

In such cases, Newtonian forces involving gravitons become unfeasible, necessitating a reliance on space-time curvature to account for the gravitational effects on the fermion. This is similarly true for photons, and we find that space-time curvature is experimentally indistinguishable from Newtonian gravitational force. This explains why Einstein's calculations suggested that the precession in the perihelion of Mercury was due to space-time curvature.

However, this is not the case! It is actually attributable to Newtonian gravitational force. Newton himself did not predict the precession of the perihelion because he conceptualized gravity as an instantaneous interaction, not one that is delayed by the time it takes for a graviton to travel from the source to the field point.

Black holes are a profound implication of general relativity, fundamentally characterized by their intense gravitational fields, which are so strong that not even photons can escape. This brings us squarely into discussions of general relativity, focusing on a very specific subset of gravitons-those that travel at the minimal possible velocity, which is the speed of light. Remarkably, gravitational waves, traveling at the speed of light, have been detected in observations involving the interaction of two black holes. This discovery supports our theory of 'ultimate relativity,' which seeks to unify special and general relativity. In doing so, it not only underscores our analysis of the twin paradox but also affirms the aether dynamic principle as an effective solution to this paradox, thereby advancing towards a more complete theory of special relativity and paving the way for a successful theory of quantum gravity.

RESULTS

Newton's Second Law and Aether Dynamics: Unification of Newton's Force and the Aether Force from First Principles- The integration of solar flare theory with the twin paradox provides a unique framework for unifying Newtonian force and the aether force mathematically from first principles. Our analysis begins with a scenario we refer to as the cinema problem, which directly parallels and thereby informs our understanding of solar flare dynamics.

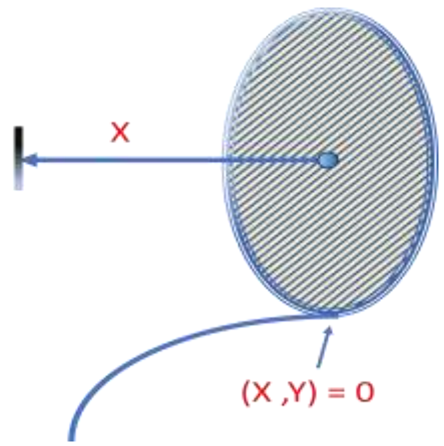

Figure 1 (Newton): Variables x and y in the cinema analysis, referenced in [3], illustrate the transition to the twin paradox/solar flare scenario. The journey begins at $x = 0$ and $y = 0$, with the path of travel indicated by the arrow, where x represents the twin displacement vector.

We have arrived at an intuitive understanding of the twin paradox resolution. The time discrepancy that must be rectified, or 'paid back,' consists of two components: the initial discrepancy in the twin clocks, $\Delta t'$, at the moment acceleration begins, and the additional discrepancy, Δt, that arises due to displacement during the acceleration phase. The payback of $\Delta t'$ begins precisely at the instant when the trajectory reverses. We define Point T as the starting location of the journey, where Twin 2 sets off, and both twins' clocks are synchronized. Point P is the location where Twin 2 initiates his (negative) acceleration, leading to the eventual reversal of direction. At this first passage through Point P, the time discrepancy between the twins' clocks is $\Delta t'$.

Following this, Twin 2 undergoes a phase of constant (negative) acceleration, ultimately coming to a stop. This moment marks the beginning of the payback process for Δt. The acceleration continues until Twin 2 returns to Point P, at which point his velocity has reversed to $-v_{init}$, the negative of his initial velocity. He then continues at this reversed velocity back to Point T.

Upon arrival at Point T, having compensated for both Δt and $\Delta t'$, the clocks of the twins are once again synchronized. The final phase of the payback process, corresponding to $\Delta t'$, occurs during the last leg of the journey from P to T.

We now propose that for instantaneous reversal, characterized by $a = 1$, the payback of $\Delta t'$ occurs uniformly throughout the return journey from Point P to Point T. This uniform payback can be quantified mathematically as $d\Delta t'/dt =$constant, assuming that the rate of displacement dx/dt remains constant from P to T. It is critical to distinguish this scenario from those involving finite acceleration, which typically follow a P to P and to T trajectory.

In such cases, the segment from P to P represents a phase of deceleration where the twin reverses direction at Point P before commencing the journey back to T at a constant negative velocity, $-v_{\text{init}}$ Furthermore, in the scenario where $a \to 0$ indicating an extended turnaround period-it is logically deduced that the payback will also be distributed at a consistent rate throughout the return journey from P to T.

However, the dynamics of time dilation payback for intermediate values of acceleration, between $a = 0$ and $a = 1$, remain an open question and require further exploration to understand how different rates of acceleration impact the uniformity of time correction.

We deduce the following by direct analogy with Solar flare flux tubes: three possible values exist $f(\overline{\omega}) =$ 0,1/2 ,1, (and beyond) [5].

Similarly, in the twin paradox scenario, acceleration a can take the values $a = 0$ (zero acceleration), $a = 1$ (infinite acceleration, i.e., instantaneous reversal), and $a = 1/2$ (intermediate values). For $a = 0$ and $a = 1$, we find that $d\Delta t'/dt$ remains constant. Therefore, for $a = 1/2$ (a position between $a = 0$ and $a = 1$) we seek a scenario where $d\Delta t/dt$ varies maximally across P to T. However, when $a = 1/2$, $d\Delta t'/dt$ remains constant across P to T, just as it does for $a = 0$ and $a = 1$.

Notably, as the journey nears completion and twin 2 reunites with twin 1, we observe that $d\Delta t/dt \to 0$ as $x \to 0$. There is no recorded indication of infinite or otherwise exceptional acceleration. Henceforth, we will treat Δt and $\Delta t'$ interchangeably as Δt. $d\Delta t/dt = f(t, x)$ variable, varies maximally 0r $d\Delta t/dt = f(x)$ and $dx/dt = constant = -v_{init}$. Therefore, we choose $f(t, x) \longleftrightarrow f(x)$ such that,

$$f(x) = \alpha x \quad (8)$$

which satisfies the requirement that $d\Delta t/dt$ varies maximally, because its second derivative, $d^2/(dx^2)(\alpha x) = d/dx(\alpha) = 0$. The first thing we note is that as twin 2 nears re-union with his brother, $x \to 0$, $f(x) \sim d\Delta t/dt \to 0$, as mentioned above. Supposing we make our observations from the point of view of riding on twin 2, from the turn-around point, where the twin is stationary, and then in the accelerating phase, as he returns to point P, and then for the final, constant velocity $v = -v_{init}$ part of the journey.

Let's just consider the accelerating part, on the way back to point P. Supposing in this frame, as twin 2 sees it, a constant pay-back $d\Delta t/dt$. But twin 2 is accelerating, $v: 0 \rightarrow v_{init}$, so $d\Delta t/dx$ is decreasing. In the constant velocity region, $P \rightarrow T$, the rate of pay-back, for Δt, does satisfy.

$$\frac{d\Delta t}{dt} = -v_{init} \times \left(\frac{d\Delta t}{dx}\right)$$

If $d\Delta t/dt - constant$, as twin 2 sees it. Perhaps we'll get around this by instituting $d\Delta t/dt$ (Twin 2) decreases with time for the final part of the journey, $P \rightarrow T$, so that we can uphold everything we discussed above, notably that there is no record of the acceleration having been infinite or otherwise, as the twins re-unite.

In the acceleration phase, we have $d\Delta t/dt$(Twin 2) = constant, but not $d\Delta t/dx$(Twin 2). Now we are in consideration of v: 0 (turn-around point) → v_{init} (returns to point P). So, in Galileo's equations, $v_0 = 0$, $v_t = -v_{init}$, a = constant, and we'll call the displacement from turn-around, d. If it were the case that $v_t \propto d$, then it would be the case that;

$$\frac{d\Delta t}{dx} \propto \frac{1}{d}$$

because doubled, thereby double velocity, thereby halve rate at which payback of Δt occurs with distance. However, we do not have $v_t \propto d$ but we have $v_t \propto t$. As for variance of v_t with d, we can get a simple expression if we square v_t. Galileo's equation is as $v_t^2 = v_0^2 + 2ad$ or $2ad$. Therefore, we need to multiply by velocity, right? We start with a single velocity v_t, we need to convert that to v_t^2, that is, we need to multiply by v_t. So, $\frac{d\Delta t}{dx} \propto \frac{1}{d}$ and then $x \longleftrightarrow t$ and

$$\frac{d\Delta t}{dx} \propto \frac{1}{d} = \frac{v}{d} \quad (9)$$

which is of course what we are looking for! So evidently, there is some substantial physics to be acquired in consideration of a non-infinite acceleration in the turn-around of twin 2, in the twin paradox.

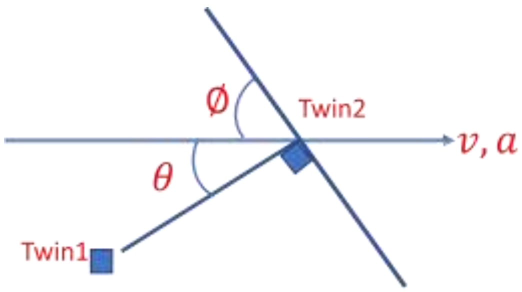

Figure 2: Particularly relevant to the non-instantaneous velocity reversal of twin 2, the time dilation/Lorentz contraction occurs with respect to the transverse component of the velocity vector, but the acceleration payback occurs orthogonally to that. As $\theta \rightarrow 0$, $\phi \rightarrow \pi/2$.

As the acceleration decreases from infinite, the extra time at which the various velocities occur increases, so Δt increases. Δt is paid back from the instant of direction of velocity reversal, at a rate with displacement x given by equation (9) in the acceleration phase, and given by equation (8), $x: x(P) \rightarrow 0(T)$.

Now here consider the portion of the non-instantaneous acceleration, $v: v_{init} \rightarrow 0$. The time-dilation related to this will have to be paid back on the return journey, that is, from the point $-\delta v \rightarrow 0 \rightarrow +\delta v \rightarrow P$, and then, continuing, $P \rightarrow T$, in accordance with our above discussions. As the acceleration decreases, the relevant distance of twin 2 from twin 1 increases. As $\theta \rightarrow 0$, $\phi \rightarrow \pi/2$, then $|a(relevant)| = |a| \times cos\theta$ large, versus and $|v(relevant)| = |v| \times cos\phi$ small.

So, the smaller $|a|/|v|$, the greater the problem, the discrepancy Δt, in addition to $\Delta t'$, that will have to be fixed up on the return journey, that is, the portion of the journey from the turn-around point and all the way back to point T. A smaller acceleration accounts for a larger problem, as does a larger velocity, and overcoming this problem is afforded splendidly by the consideration in Figure 2, above. A very important part of this consideration is that the time dilation works identically to the Lorentz contraction in this respect, that is, according not to $|v|$ but $|v| \times cos\phi$. Whether the mass variation in Einstein's equations of special relativity does too is another matter, which we shall not address here, indeed it possibly doesn't, the evidence for this being the different form that the mass variation takes to the time dilation and Lorentz contraction.

$$\Delta x' = \Delta x \times \sqrt{1 - \frac{v^2}{c^2}} \quad (10)$$

$$\Delta t' = \Delta t \times \sqrt{1 - \frac{v^2}{c^2}} \quad (11)$$

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \quad (12)$$

We have in other discussions, [1-3], proposed an abstract space, called electron wave-space, whereupon electron wavelengths serve as measuring rods for space, whether the electrons are solitary, massive, $v < c$, or propagating on an electromagnetic wave, massless, $v = c$. When you just have an electromagnetic wave, no fermion, e.g. electromagnetic gauge boson, 2 ghosts, then the wavelengths of that wave do not function as measuring rods for space. So, consider the relativistic Doppler shift equation, for a dual Maxwellian photon, that is, an electromagnetic wave carrying a fermion.

$$\nu = \nu_0 \times \sqrt{\frac{1 - \frac{v}{c}}{1 + \frac{v}{c}}} \quad (13)$$

This Doppler shift equation is arrived at by considering pulses of electromagnetic radiation, each separated by the period $T = 1/\nu$ of the electromagnetic wave, and applying the time dilation formula, equation (11). But you could equally do a Lorentz contraction analysis of the space between the wave peaks, that is, the wavelength, and analyze this with the Lorentz contraction, equation (10). You are clearly going to get the same result, equation (13), because equations (10), (11) have the same form, and $\lambda = cT$ and it is:

$$c = \frac{\Delta x_0}{\Delta t_0} \rightarrow \frac{\Delta x'}{\Delta t'} = \frac{\Delta x_0}{\Delta t_0}\left(\frac{\sqrt{1-\frac{v^2}{c^2}}}{\sqrt{1-\frac{v^2}{c^2}}}\right) = c$$

This analysis extends to electron wave-space as well. Suppose we are observing an electromagnetic wave through the lens of an electron wave, where the electron's wavelengths serve as the measuring rods for space. Now, consider an electromagnetic wave positioned behind it-one that does not carry a fermion, i.e., an electromagnetic gauge boson. Since this wave does not serve as a spatial measuring rod, we record its wavelength and speed independently. Initially, we expect its observed speed to be $v = c$, correct? However, what about its wavelength? Unlike its speed, the wavelength is not constrained to any particular value.

Now, suppose we double the wavelength of our electron. As a result, the lengths of our measuring rods also double. Under this new definition of space, the observed wavelength of the electromagnetic wave occupies a smaller fraction of these measuring rods, leading to a reduction in its perceived wavelength.

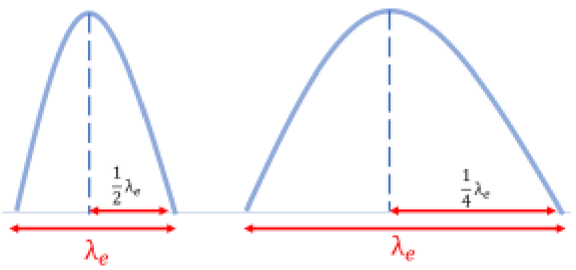

Figure 3: λ_e is that of the electron wave, a measuring rod for space. λ_{em} is the length of the wave of the electromagnetic wave we are observing, through the electron wave.

So, double $\lambda_e \longleftrightarrow \lambda_{em}$ behind it signifies a lesser amount of space, so λ_{em} halves. But the speed stays the same! (By special relativity). Why? Isn't the speed magnified (negatively), in the same manner as λ_{em}? The speed is, after all, just a specification of a distance, (in a relevant time frame). In a relevant time frame! There is your answer! Time itself does a similar sort of thing under λ_e magnification, just as in the relativistic Doppler shift analysis above $\longleftrightarrow c(em)$ = constant. So not only does the electron wavelength serve as a measuring rod for space, its period serves as a standard clock for time. So, if you change λ_e, then you change the period, T too, of the observed wave, λ_{em}, but the speed of the observed wave, $\lambda_{em}/T = c$ remains a constant.

Finally, in our cosmological studies [3], we have established that for stars, we have measuring rods of mass, affecting the perceived masses of stars, in relation to spatial (Hubble) expansion. So $\lambda_e$measuring rods applies simultaneously to mass variation, time variation, space variation, as the three equations of special relativity, (10), (11), (12) would have it. It is still not clear whether the Einstein mass variation has any dependency on direction, i.e. the angles θ, ϕ in Figure 2 above, a real possibility exists that it does not according to the different form of equations (10) and (11) from (12), and our cosmological studies did not have any dependency on direction θ, ϕ, so we certainly uphold the possibility that it does not.

In the context of special relativity, the relationship $\Delta x/\Delta t = c$, where c is a constant, highlights a fundamental aspect of abstract space. This concept relates closely to the Doppler shift in electron wave-space. The discussion progresses from a duality to a triality when considering mass (m). There is a significant possibility that $m \neq m(\theta, \varphi)$, since m does not appear in the equation $c = \Delta x/\Delta t$. Despite this, the extension from duality to triality is supported by Equations (10), (11), and (12). To integrate m into this abstract framework, we must first explore the differentiation of the Lorentz factor.

$$\frac{\partial}{\partial\left(\frac{x}{t}\right)}\left(\sqrt{1-\frac{v^2}{c^2}}\right) \rightarrow \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$$

Here the $d/dx\,\left(x^{1/2}\right)$ is $\frac{1}{2}\left(x^{-(1/2)}\right)$. Consider our above analysis by $\partial\Delta t/\partial t \propto (1/t)$ so that

$$\frac{\partial\Delta t}{\partial x} \propto \frac{v}{d} \tag{14}$$

Differentiating the expression $(1/t) \rightarrow v$, we acknowledge that under constant acceleration, velocity v is proportional to time t. In the differentiation process, by relating spatial and temporal derivatives $\partial/\partial x \longleftrightarrow \partial/\partial t$, we implement a hyperbolic transformation from $(1/t)$ to t. This transformation aligns with the opposed duality of space and time inherent in special relativity. Our aim is to expand this framework into a triality that includes mass, as addressed in equation (23), while referencing equations (10) and (11). Thus

$$\frac{\partial}{\partial t}\left(\sqrt{1-\frac{v^2}{c^2}}\right) = -\frac{1}{2} \times \frac{2}{c^2} \times \frac{dv}{dt}\left(\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}\right) \tag{15}$$

This expression reveals our dependency on mass as described in equation (12), with the Lorentz factor $\sqrt{1 - v^2/c^2}$ in the denominator.

Thus, m = constant $\leftrightarrow$ v = constant (as referenced in the Lorentz factor from equation (14)), and $dv/dt = 1$

(potentially infinite), as indicated by the other term on the right-hand side of equation (15). However, identically, $dv/dt = a = 1$ can also imply zero acceleration. Recalling the twin's paradox, citations [6], where 0 and ∞ play equivalent roles in the $0 \times \infty = 1$ philosophy, it follows that if m is constant, this can also apply to scenarios of zero acceleration under the constant m proposition.

In the context of an aether force scenario, where this force exists in a state of constant mass and zero acceleration, we can express it as $F(aether) = m - m_0 = m_0/\sqrt{1 - v^2/c^2} - m_0 = F(v)$.

This mirrors the mass relationship in Newtonian and Einsteinian mechanics, where according to Einstein's modification of Newtonian dynamics, $m_0/\sqrt{1 - v^2/c^2}$ remains constant only if v is constant and acceleration $a = 0$.

Thus, there seems to be a way to unify the Newtonian concept of force, which originally had no dependency on mass, with the mass-dependent aether force. Consider Newton's law: initially, before Einstein's contributions, it did not consider the dependency of force on mass, unlike the aether force, which does.

$$\boldsymbol{F}_N = m\boldsymbol{a} \quad (16)$$

and we might expect that the Newtonian force and the aether force are related by:

$$\boldsymbol{F}_N(t, x) = \frac{\partial \boldsymbol{F}_{aether}(t.x)}{\partial m} \quad (17)$$

In the equation, where $\partial F_{aether}(t, x)$ is a function of t and x but not of m, we proceed by integrating equation (16) and modifying equation (17) with respect to m, denoted as $\int dm$. Consider equation (15): the Lorentz factor does not influence equation (16) during integration. On the RHS, acceleration a is simply $\partial v/\partial t$. When we state in equation (17) that F_N is not a function of m, we imply that m is a constant. Integration then yields an expression involving m.

Now revisiting equation (15), where $a = 0$ as specified by the condition, similarly, on the LHS, $\partial/\partial t\,(1 - v^2/c^2) = 0$, also specified by the condition. Thus, we establish: $1 = (1/c^2)\,(\partial v/\partial t)$ where $(\partial v/\partial t) = c^2$.

Continuing with the integration of equation (16), we define the aether force as $\partial F_{aether}(m, t, x) = c^2(m - m_0) = F(m)$, where the term $-m_0c^2$ emerges as an integration constant. This leads us to two significant conclusions.

(1) $F_{aether}(t, x) \rightarrow F_{aether}\left(\frac{dx}{dt}\right) = F_{aether}(v)$, in accordance with the special relativistic duality, discussed above, and in resolution with equation (14) above, the appearance of the v term.

(2) Leading to the triality, with the inclusion of m into special relativistic considerations.

Now we have the aether force $\boldsymbol{F}(\boldsymbol{m})$**,** so we can institute the Lorentz factor dependency on the RHS of equation (15), which we ignored on the grounds that it was not Newtonian. We can specify the inclusion of this factor on account of our cosmological investigations, whereupon there is a measuring rod for mass, just as there is one for time and space, yet this measuring rod has no angular dependency, therefore the aether mass dependency involves the reciprocal of the Lorentz factor rather than the Lorentz factor itself.

CONCLUSION

Light is a more fundamental entity than force. Our investigations into the nature of light, particularly the implications of its constant speed, reveal that force emerges from these properties. The fundamental equations, as posited by the divine metaphor, are:

$\boldsymbol{\nabla} \,.\, \boldsymbol{E} \;=\; 0 + \rho/\varepsilon$ (considered later)

$\boldsymbol{\nabla} \,.\, \boldsymbol{B} \;=\; 0$

$\boldsymbol{\nabla} \times \boldsymbol{E} = -\partial \boldsymbol{B}/\partial t$

$\boldsymbol{\nabla} \times \boldsymbol{B} = 1/c^2(\,\partial \boldsymbol{E}/\partial t) + \mu J$ (considered later)

From these, the concept of force evolves. Specifically, if a force is present, it manifests as the Lorentz force:

$$\boldsymbol{F} = q(\boldsymbol{E} + v \times \boldsymbol{B}) \quad (17)$$

This formulation derives directly from the dynamics of radiation: where q and $J = 0$ (indicating no force) transition to ρ, J (indicating force), and the relationship $c = E/B$. The existence of this force develops from the principles of special relativity, which consider the constancy of the speed of light (v_{light}) as a constant, $c = 1/\sqrt{\mu\varepsilon}$. Thus, we derive the Lorentz force from the proposition $q(\boldsymbol{E} + v \times \boldsymbol{B})$: $0 \rightarrow \boldsymbol{F}_{Lorentz}$.

DISCUSSION

Our derivation of the aether dynamic law, equation (1) above, from first principles, has arisen upon generalizing the twin paradox resolution employing infinite acceleration, (instantaneous velocity reversal), to a non-instantaneous velocity reversal. We have found that the clock discrepancy, which we call Δt, is paid back at a uniform rate on the return journey, P to T, in the case of an instantaneous reversal, but not so in the case where the acceleration is less than infinite. (When the acceleration is zero, the twins never re-unite, there is no time dilation discrepancy to ever pay back. In the language of quantum physics, the wavefunction never collapses, it remains a dual superposition of the two possibilities, ψ(twin 1 is older/twin 2 is older) is never resolved.

So we investigated the pay-back of Δt, both in the case of infinite acceleration, instantaneous reversal, and non-infinite acceleration, which, by comparison with the extensive Solar Flare theory put forth in our third

HyperScience publication, Solar Flares and the Aether Dynamic, [3], constitutes a = ½, by analogy with $f(\varpi)$=½ in the rigorous Solar flare analysis. Zero acceleration, the twins never re-unite, the wavefunction never collapses, does not come into our considerations. In contemplation of the non-instantaneous acceleration, a = ½, (rather than $a = 1$, and $a = 0$ is removed from consideration), consider Figure 2 above.

To account for what happens as the acceleration becomes increasingly removed from infinite, (a=1), we find that for increasing turn-around period, that is, for acceleration removed progressively further from a=1, that the additional increments of Δt owing to the extra journey become increasingly less and the relevant component of the acceleration which produces the pay-back, Δt, becomes increasingly greater. But that is in first consideration a matter of the Lorentz contraction, whereas we are in this instance concerned rather with the time dilation.

We conclude that in this respect, time dilation and Lorentz contraction are equivalent, we assume it happens for time dilation the same as it happens for the Lorentz contraction. Hence, these two have the same form in equations (2), (3) above, and at odds with the mass variation, equation (1).

So, we investigated these three equations further. Firstly, we considered the non-relativistic Doppler shift, arrived at by consideration of the time dilation associated with pulses of radiation at the electromagnetic frequency. We conclude that you would get the same result by considering wavelengths and the Lorentz contraction, as opposed to increments of time and the time dilation, in consequence of the equivalence of equations (2) and (3). Then, by analogy, we found that the constancy in the speed of light arises by combining (2) and (3), whereupon the two Lorentz factors cancel out. Therefore, it is hardly surprising, therefore, that these Lorentz factors come out of special relativity, come out of analysis of the fact that the electromagnetic speed is a constant, independent of frame of reference.

We then incorporated these discussions with another proposal, (Amazon publications, [1-3], whereupon the wavelength of a fermion is a measuring rod for space. In so doing, we solved the problem as to why, if a non-fermionic electromagnetic wave is amplified (in wavelength) by interaction with a fermionic wave, the speed of the non-fermionic electromagnetic wave is not simultaneously amplified. That is, you get a Doppler shift of the wavelength, but the speed remains a constant, v=c.

Finally, we drew upon our reservoir of investigations in stellar physics, (Amazon publications), whereupon there is a certain measuring rod associated not just with the time dilation and the Lorentz contraction, but the masses of stars, as related to the Hubble expansion of space between stars. This is connected to the equivalence in the manner that the Lorentz factor appears in equations (2) and (3), and mass too functions as a measuring rod in cosmological matters. But for mass, the Lorentz factor makes its appearance, in equation (1), in a different manner to how it does for the Lorentz contractions and time dilations we observe in (2), (3). The equivalence of (2), (3) in this respect makes its appearance initially in the non-instantaneous twin reversal, Figure 2 above. The aether force, which depends on the mass variation, is also a crucial part of the twin paradox, but for this dependency, the Lorentz factor makes its appearance in an alternative manner. For instantaneous velocity reversal, only the mass dependency is required. For a = ½, (non-instantaneous reversal), we bring Lorentz contraction and time dilation into it.

Finally, in consideration of the different manner in which the Lorentz factor occurs in Lorentz contraction and time dilation, (2), (3), versus the mass dependency, (1), and taking derivatives, we have been able to arrive at a derivation of the aether force, equation (1), by first principles. To do so, however, it was necessary to consider zero acceleration. The aether force is associated with a mass of constant velocity, acceleration=0. But this time, a=1 designates *zero acceleration*, rather than infinite acceleration, the latter as we would have it in the twin paradox analysis, where infinite acceleration was a means of simplification and getting the physical result, we sought.

When you think about it, if you divide acceleration into three possibilities, zero, infinite and something in between, there is no particular reason why a=1 would signify infinite and not zero acceleration. Both possibilities have to be catered for. In precisely the same manner as the electromagnetic duality, there is no reason why you should consider electric charges and not simultaneously the possibility of magnetic charges, (Amazon publications, particularly Quantum Theory of Electrodynamics, [2, 5]. Again, we have a mathematical duality, whereupon complex numbers make their appearance, there is no particular reason why if you multiply a positive number by a negative number, the outcome should be negative rather than positive. Consider the imaginary algebra, (+ j×- j= -1× j2= -1×-1=+1). So, we introduce the imaginary algebra, then both options are catered for, in exact analogy to the electromagnetic duality in physics.

CONCLUSION

We enforce infinite acceleration, $a = 1$, as a simplification to address the twin paradox. This approach necessitates the introduction of a proposed aether force, as defined in equation (1). When we explored scenarios involving non-infinite acceleration and non-instantaneous velocity reversal, we derived the aether force equation from first principles. However, this extension required considering the turnaround interval extending to zero acceleration, where no turnaround occurs, and the twins never reunite. In such cases, the paradox remains unresolved, and it remains unknown which twin is younger. Remarkably, our analysis of the aether force under these first principles emerges precisely in scenarios where the wavefunction never collapses. Thus, we are left with ψ(twin 1 is younger/twin 2 is younger) indefinitely, rather than witnessing a wavefunction collapse that determines twin 2 as the younger due to his acceleration. Our ultimate conclusion is that light is a more fundamental entity than force. In creating the universe, the primary consideration was the behavior of light, as described by Maxwell's equations, which initially excluded fermionic charges and current densities. The aether force emerges from special relativity and these foundational principles, not from the considerations of electric or magnetic charges. Special relativity, especially the constancy of the speed of light, adheres to Maxwell's equations set in a context where $\rho = J = 0$. From this, forces manifest as $\boldsymbol{\nabla} \cdot \boldsymbol{E}$ transitions from 0 to ρ/ε_0, introducing the Coulomb force:

$$|\boldsymbol{E}| = \frac{1}{4\pi\varepsilon_0}\left(\frac{Q}{R^2}\right) \longleftrightarrow |F_{Coulomb}| = \frac{1}{4\pi\varepsilon_0}\left(\frac{q_1 q_2}{R^2}\right)$$

Similarly, $\nabla \times \boldsymbol{B}$, influenced by $(1/c^2) \times \partial \boldsymbol{E}/\partial t$, leads to $\mu_0 J$, which defines the magnetic field around a current: $B_{az} = \frac{\mu_0}{2\pi} \times \frac{I}{R}$. Consequently, these two fields-electric and magnetic-integrate into the Lorentz force equation, $\boldsymbol{F}_{Lorentz} = q(\boldsymbol{E} + v \times \boldsymbol{B})$. This is particularly relevant to our discussion since we have already examined the Lorentz force and its absence when fermions propagate along electromagnetic waves at speed $v = c$. We invite the reader to confirm this: $\boldsymbol{F}_{Lorentz} = 0 \rightarrow \boldsymbol{E} = -v \times \boldsymbol{B}$, a topic extensively addressed in the provided references.

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