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On the Aether Dynamics, Twin Paradox, and Ultimate Relativity of Solar Flares

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ABSTRACT

In our previous work, *Theory of Everything*, we addressed the longstanding twin paradox of special relativity by introducing the concept of Aether force dynamics, F(v). This was achieved through the recognition that Aether force is cumulative, encompassing the sum of all force increments required to accelerate a massive body to velocity v. Similarly, the time dilation experienced by twin 2, the moving twin, is a cumulative effect, involving all time dilation increments accrued during their journey. This contrasts with the Lorentz contraction and mass dependence, which are instantaneous effects. Our approach successfully unified special and general relativity, extending the latter's focus on gravitational accelerations to incorporate any form of acceleration, thus leading to what we term the Ultimate Theory of Relativity. We have also applied this framework to describe dynamic processes in solar flares, drawing an analogy to the cinema problem, which involves maximizing the angle subtended by an observer to a screen. As in the twin paradox, the analysis necessitates the consideration of potential infinities, achieved by dividing finite quantities by zero or zero by zero. Remarkably, this led to a simultaneous application of Ultimate Relativity to both the cinema problem and solar flare dynamics, revealing that acceleration approaching infinity, a=1, is central to understanding these phenomena.

Keywords: Dark Energy, Quantum Mechanics, Consciousness, Atomic Forces, Energy Transformations, Fundamental Principles, Reality

INTRODUCTION

The concept of infinity has long posed challenges for physicists and mathematicians, who often seek to avoid it, especially when it involves division by zero. A commonly cited example is the claim that Einstein made a schoolboy mistake by dividing by zero in his calculations. It is, however, straightforward to note that if 1/∞ = 0, then similarly 1/0 = ∞. Despite this, discussions around infinity tend to provoke strong reactions, with many asserting that infinity is not a number. In truth, infinity is best understood as a number without bounds. During my time at Imperial College (1999–2001), it became increasingly apparent to me that a photon could be described as an electron (or positron) that had been accelerated to the speed of light, losing its rest mass in the process. This results in a total mass expression of

$$\frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}=\frac{0}{0}=m_e$$

where m_e is the electron rest mass. While I initially struggled to prove this premise, years of analysis have led me to a more profound understanding of its implications. Discussions with fellow physicists about this idea have often met resistance. For example, an undergraduate colleague, now a prominent physicist at the University of Sydney, dismissed the concept as physically meaningless. Nevertheless, recent developments in our exploration of the cinema problem have provided unexpected insights into solar flare dynamics, a topic central to both my honors thesis (1998) and attempted PhD (2005). The mathematical pathway is intricate, frequently involving ratios such as $y/x = 0/0 = 0$ and the concept of infinite acceleration, $a = 1$. Our findings have led to the formulation of a new mathematical theorem, complementing L'Hôpital's rule, which addresses cases where functions yield the indeterminate form $0/0$. This theorem offers insights into the renormalization techniques used by quantum field theorists to eliminate unwanted infinities. Moreover, it has become clear that the cross-section of a solar flare's electromagnetic flux tube can be understood as the screen in the cinema problem, whose subtended angle must be maximized. This realization transforms the cinema problem from a mathematical curiosity into a fundamental aspect of physics, directly connected to our Ultimate Theory of Relativity. Through our investigation of the twin paradox, we have successfully unified special and general relativity. This unification has not only provided a new perspective on the twin paradox but also offers a comprehensive explanation of solar flare dynamics through the framework of Muhammad Aslam Musakhail's Aether dynamics. Ultimately, our findings suggest that the occurrence of solar flares is governed by the second law of thermodynamics, with electromagnetic processes driving the maximization of entropy.

LITERATURE REVIEW

The foundation of this paper, as with much of our previous work, is drawn from my self-published works available on Amazon:

1. Grand Unification of the Four Fundamental Forces of Physics [1]
2. Quantum Theory of Electrodynamics [2]
3. A Saucerful of Science [3]
4. (Soon to be published) Autobiography of James Russell Fields: A Rock Musician Who Knew Something about Electromagnetic Fields and Waves

The current study builds primarily on the analysis of the *cinema problem* introduced in A Saucerful of Science. Significant effort has been invested in refining this work for journal publication. Key ideas from my earlier publications are also incorporated, including the *Reverse Higgs boson process* discussed in Grand Unification of the Four Fundamental Forces of Physics. This process describes how a massive fermion, such as an electron or positron, accelerates onto an electromagnetic wave packet, loses its rest mass, and ultimately becomes a photon traveling at the speed of light, ccc. To interpret this process meaningfully, it requires a negation of the Lorentz force, ensuring that photons are not deflected by external electric or magnetic fields-a concept outlined in both Grand Unification and Quantum Theory of Electrodynamics.

A crucial theoretical influence for this paper comes from Quantum Theory of Electrodynamics (QTE), which marked the genesis of my research in 1988. The inspiration for this line of inquiry was sparked by a *Scientific American* article about photons trapped in glass prisms. My initial, more rudimentary formulation of this theory was published in the *Toth-Maatian Review* (Lubbock, Texas, Editor Harold Willis Milnes, PhD) across three installments between 1990 and 1993. These early publications laid the groundwork for my continuing exploration of photon dynamics and the behavior of electromagnetic fields.

A particularly important contribution from these works is the resolution of the indeterminate form ∞−∞, which can be reinterpreted as 0×∞ = 0/0 = ∞/∞. This mathematical insight has been instrumental in circumventing the issue of infinities, shedding light on the methods used by quantum field theorists in their *renormalization* techniques. Rather than viewing infinities as problematic, we posit that they represent an inherent and elegant feature of physical theory. In this context, infinities are not obstacles but instead contribute to the deeper understanding of quantum field theory, adding to its intellectual beauty rather than detracting from its significance as a robust physical framework.

METHODOLOGY

From early on, my academic focus was on becoming an electromagnetic theorist, which led me to choose Solar Flares as the subject of my honors project in 1998. After presenting my research to the Department of Theoretical Physics at the University of Sydney, I encountered skepticism from a lecturer who remarked, not an electromagnetic theorist. Undeterred by this dismissal, I pursued further studies at Imperial College London, where I completed an MSc in Quantum Fields and Fundamental Forces. During this time, I spent six months at the Institute Henri Poincaré in Paris, studying *Supergravity, Superstrings, and M-theory*, and writing my dissertation titled *Duality and M-theory*. In this dissertation, I addressed the transition from 10 to 11 space-time dimensions as one moves from superstring theory to M-theory, which represents 11-dimensional supergravity. My research concluded that this dimensional transition is fundamentally linked to Dirac's electromagnetic theory, which postulates the existence of a *magnetic monopole*.

The theme of electromagnetic theory has been a central aspect of my work since my honors project, and I have continued to explore magnetic monopoles throughout my career. M-theory, in particular, opened up the exciting possibility of developing a theory of quantum gravity. My ongoing research, which aligns with the broader framework of M-theory (as discussed in the **Literature Review**), reflects my dedication to understanding quantum gravity from an electromagnetic perspective. This paper forms part of my larger project on solar flares, which I am currently developing into a PhD thesis.

The research presented here represents the culmination of years of work and is intricately linked to my investigations into electromagnetic phenomena, solar flare activity, and the theoretical underpinnings of quantum gravity. My contributions to electromagnetic theory have surpassed my initial aspirations, extending far beyond my original expectations. In fact, my current research positions me to finalize and submit a PhD thesis on solar flares, a topic I have been dedicated to since 1998. This paper is an integral part of that body of work. Given the trajectory of my research and the significant contributions I have made, I look forward to the opportunity to submit my PhD thesis, a journey that was interrupted nearly two decades ago. After my forced removal from the degree program at the University of Sydney, and the stalling of my academic career despite my distinction in Senior Physics in 1986, I hope that the University of Sydney, or perhaps another institution, will provide me with the chance to finally complete this journey.

THE CINEMA PROBLEM, WITH ELEVATION

We start with the basic cinema problem, with the screen of dimension h elevated a distance y above the floor level and the sitting position a distance x horizontally from the screen position, as pictured below.

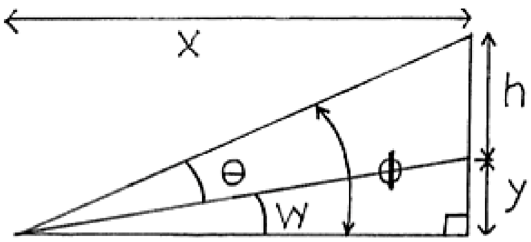

Figure 1: The standard cinema problem, y = constant

According to the figure above, we seek to maximize the viewing angle of the screen, θ, by varying the horizontal displacement, x, for a constant y. Upon inspection of the figure, we have the following identities:

$$tan\,\phi = \frac{h+y}{x},\quad tan\,\omega = \frac{y}{x} \quad \text{then } \theta = \phi - \omega$$

$$= tan^{-1}(\frac{h+y}{x}) - tan^{-1}(\frac{y}{x}) \qquad (1)$$

Then to maximize the angle θ, we put ∂θ/∂x = 0. We shall not attempt to solve this differential equation at this point, other than to point out that in the extremities, x → 0 then θ → 0, and for x → ∞, θ → 0, so that clearly to maximize the viewing angle, θ, the required displacement x is somewhere in between 0 and ∞.

Supposing now we consider y to be variable. That is, it is possible to elevate the observer at the seating position, x. We do this by varying y. As y → 0, the viewer approaches an elevation that coincides vertically with the bottom of the screen. We shall only consider displacements y → 0, not y negative.

If y < 0, we need to analyze a different figure. However, this will not be necessary as we find that as x → 0, y → 0, i.e. as x is reduced, y → 0 and there is no possibility of y becoming negative. Further, consider the position (x,y) = (0,0) in the infinitesimal limit.

As x increases, so does y such that the viewing angle is minimized with displacement x. In the reverse direction, then, we seek to maximize the increase in angle θ with displacement.

We seek a trajectory, y = f(x), such that as we move towards the screen, the rate at which the viewing angle θ increases is maximized. The gradient of this trajectory gives the angle with respect to the floor and the vertical,

$$tan^{-1}\frac{dy}{dx} = \alpha, \qquad (2)$$

this is the angle the observer must move with respect to the axes defined by the screen and the floor to maximize the rate at which the viewing angle, θ, increases with distance r along the trajectory. The solution y = f(x) that maximizes ∂θ/∂r along this trajectory must pass through these points defined as the x values that give maximal viewing angles θ for given displacements y.

This will turn out to be the case as we must incorporate the above differential equation, ∂θ/∂x = 0, into an analysis whereby y is no longer a constant, but variable.

In the next stage of the analysis, consider the path r defined as having direction r = dy/dx at every point along the curve y = f(x). In the infinitesimal limit, the path r is tangential to y = f(x) at every point, (x,y).

To proceed further, we take an analogy out of electromagnetic theory in physics. Consider the electric field intensity, E, given by the gradient of the scalar potential,

$$E = -\frac{\partial\phi}{\partial r} \qquad (3)$$

in the direction such that |E| is maximized with displacement, r. To find the vector r, in two dimensions as in our cinema problem, one needs only to find its components, E_x, E_y, these two vectors given by the directions of the x- and y- axes respectively, and magnitudes respectively by ∂ϕ/∂x and ∂ϕ/∂y. The vector

E_r, the total electric field, is given by the sum of the x- and y-components. In our cinema analysis, we assume the viewing angle, θ, is an analog of a potential field in physics. In particular, the change in a potential field between two locations in the field does not depend on the path taken between these two points.

This requirement is clearly satisfied by our cinema potential, θ. Clearly the change in potential θ as we move between two points in the field does not depend on the path taken. However, in the analysis that follows, we'll be concerned not with a maximization of the scalar potential θ, but with a maximization of the magnitude of the vector, ∂θ/∂r. This quantity is not a potential field, nor is its modulus, as its change in magnitude and its direction depends on the path taken.

Similarly, in Theory of Everything, F(v) does not depend specifically on the combination of all the various forces/accelerations that got the massive body to velocity, v. Numerous accelerations are possible. We have, possibly, an amalgamation of forces involved in arriving at the Aether force F(v). Or, just one Newtonian force, one acceleration involved, but various possibilities for this singular acceleration.

Ultimately, we shall connect this to various acceleration possibilities in the twin paradox, ranging from a = 0, (the twins never re-unite), to a = ∞, (instantaneous reversal, the time-dilation pay-back occurs at a uniform rate with distance on the reverse journey. The acceleration chosen becomes the path chosen, in the cinema problem).

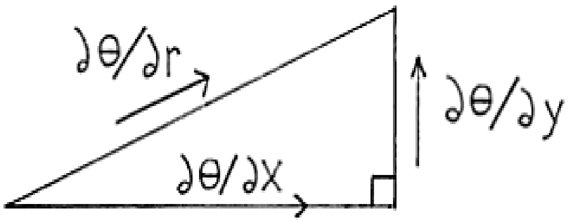

Figure 2: Analysis of a scalar potential field, φ, or θ

Without any further ado, we analyze the potential field, θ, according to the theorem of Pythagoras:

$$\frac{\partial\theta}{\partial r} = \sqrt{(\frac{\partial\theta}{\partial x})^2 + (\frac{\partial\theta}{\partial y})^2} \tag{4}$$

We now seek to extremize this quantity, in the same way as we extremized the scalar potential, θ. To do this we proceed as before, taking a spatial derivative and setting this to zero. However, in the previous instance there was only one variable, x, whereas in the new analysis there are two variables, x and y, so we must take two spatial derivatives, and set them independently to zero. The analysis proceeds as follows:

$$\frac{\partial}{\partial x}\left(\frac{\partial\theta}{\partial r}\right) = 0 \tag{5}$$

$$\frac{\partial}{\partial y}\left(\frac{\partial\theta}{\partial r}\right) = 0 \tag{6}$$

Solving for both of these, we shall find the ultimate angle of projection to maximize the rate at which the viewing potential θ increases with distance r will be given by:

$$tan^{-1}\left(\frac{dy}{dx}\right) = \alpha$$

Extremizing the (non-potential) field, ∂θ/∂r, whose magnitude is given by the vector r = f '(x) for y = f(x). We must solve, or attempt to solve, the two partial differential equations above. In the final analysis it will do to just analyze the solutions as x, y → 0. It will be evident that the solutions do not acquire any negativities in y, such that the analysis put forward in Figure 1 is the correct analysis. Now let's take the partial derivative ∂/∂x and set it equal to zero, as above. We find:

$$\frac{\partial}{\partial x}\left(\frac{\partial\theta}{\partial r}\right) = \frac{\left(\frac{\partial^2\theta}{\partial x^2}\right)}{\sqrt{(\frac{\partial\theta}{\partial x})^2 + (\frac{\partial\theta}{\partial y})^2}} = 0 \tag{7}$$

Given then that one or other of ∂θ/∂x, ∂θ/∂y in the denominator will not vanish as x, y → 0, then a reasonable deduction to make will be that for all x, y, even x, y → 0, the nominator above will vanish:

$$\frac{\partial^2\theta}{\partial x^2} = 0 \tag{8}$$

By exactly the same process, we find:

$$\frac{\partial^2\theta}{\partial y^2} = 0 \tag{9}$$

So, we are taking double partial derivatives of θ = ϕ - ω, above, where the two angles in question are given by arc tangents. To proceed with the differentiation, we need the following identity:

$$\frac{\partial}{\partial x}(tan^{-1}\text{x}) = \frac{1}{1+x^2} \tag{10}$$

We proceed firstly with the y-partial derivative, as it appears to be simpler.

$$\frac{\partial}{\partial y}\ [tan^{-1}(\frac{h+y}{x}) - tan^{-1}(\frac{y}{x})]$$

$$= \frac{1}{x} \times (\frac{1}{1+(\frac{h+y}{x})^2} - \frac{1}{x} \times \frac{1}{1+(\frac{y}{x})^2})$$

$$= \frac{1}{x} \times [1 + (\frac{h+y}{x})^2]^{-1} - \frac{1}{x} \times [1 + (\frac{y}{x})^2]^{-1} \tag{11}$$

Next we do a second y-partial differentiation:

$$\frac{\partial^2}{\partial y^2}(\phi - \omega) = 2\left(\frac{y}{x}\right)\left[\frac{(\frac{1}{x})^2}{[1+\left(\frac{y}{x}\right)^2]^2}\right] - 2\left(\frac{h+y}{x}\right)\left[\frac{(\frac{1}{x})^2}{\left[1+\left(\frac{h+y}{x}\right)^2\right]^2}\right] = 0 \tag{12}$$

and so:

$$y \times [1 + (\frac{h+y}{x})^2]^2 = (h + y) \times [1 + (\frac{y}{x})^2]^2 \tag{13}$$

Finally, we proceed with the x-partial differentiation.

$$\frac{\partial}{\partial x}(\phi - \omega) = \frac{-(h+y)x^{-2}}{1+(\frac{h+y}{x})^2} + \frac{yx^{-2}}{1+(\frac{y}{x})^2} \tag{14}$$

Then we take the second partial derivative.

$$\frac{\partial^2}{\partial x^2}(\phi - \omega) = \frac{\partial}{\partial x}[yx^{-2}(1+\left(\frac{y}{x}\right)^2)^{-1} - (h+y)x^{-2}(1+(\frac{h+y}{x})^2)^{-1}] \tag{15}$$

This is quite a complex differentiation, so we'll do it in separate steps. Firstly:

$$\frac{\partial}{\partial x}[1 + (yx^{-1})^2]^{-1} = -[1 + (yx^{-1})^2]^{-2}(-2yx^{-2})yx^{-1} \tag{16}$$

Secondly:

$$\frac{\partial}{\partial x}[1+((h+y)x^{-1})^2]^{-1} =$$

$$2[1+((h+y)x^{-1})^2]^2(h+y)x^{-2}\,[2(h+y)x^{-1}] \quad (17)$$

Finally, putting it all together and taking limits as x, y → 0. We have two differential equations:

$$\frac{\partial^2}{\partial x^2}(\phi-\omega) = \frac{\partial^2}{\partial y^2}(\phi-\omega) = 0\,. \quad (18)$$

Or do we? Consider the equation we have arrived at, above, specifying $\partial^2/\partial x^2$ (ϕ - ω). To confirm this is zero, it would certainly be helpful if the first term, the term multiplied by y, was zero. One is tempted to say, well one of its factors is y, and y → 0, therefore the term itself is zero. But this will not necessarily be the case if the other term is an infinity of order 1, because it is possible that $0 \times \infty \neq 0$, there are two other possible outcomes, K (= any nonzero, non-infinite number), and ∞. And it will *certainly* not be the case if the other term is an infinity of higher order than 1, i.e. ∞^n, n > 1. So let's investigate this term, the factor of y in the first term of the equation for $\partial^2/\partial x^2$ (ϕ - ω), above, in the limit x, y → 0. We have:

$$\infty^3 \times (1+0^2)\text{-}1 \times \infty^2 \times 0 \times \infty^2 \times (1+0^2)^{-2}$$

$$= 0 \times \infty^7 \sim \infty^6 \quad (19)$$

We have, in this calculation, taken the position that y/x = 0/0 = 0 is a zero of order 1. (See Back to the cinema problem, below). For two reasons:

(i) y/x = 0/0 occurs all over the place in these equations, and it is very unlikely that we'll get anywhere unless we choose it as zero, rather than the other two possibilities, K and ∞.
(ii) It is in agreement with Figure 4 below, or at least you could rule out, from Figure 4, the possibility that x/y = 0, that is, the y/x = ∞ possibility.

Now where we are headed in this discussion is an assertion that, nevertheless, we'll be taking y → 0 as a zero of order unbounded, that is, whatever it needs to be. So that $y \times \infty^6 = 0 \times \infty^6 = 0$, specifically. Because then we can make our analysis of the $\partial^2/\partial x^2$(ϕ-ω) equation a lot easier. The position will be that if, in a calculation, you arrive at an infinite result, and this is undesirable, then you are permitted two possible options: 1- Eliminate the ∞ by specifying a zero of arbitrary order n, 2-Take the anti-derivative, and see whether doing so eliminates the ∞. If not, take the anti-derivative again, and again see. Continue to integrate, take the anti-derivative, until the ∞ disappears. The expectation will be that the ∞ disappears after you have integrated n times.
We shall discuss this process, this new mathematical theorem, further below. However firstly, let's just see where all this is leading us. So we take the anti-derivative of $\partial^2/\partial x^2$ (ϕ - ω), that is not remotely a problem because we got it by differentiating. So if we apply, x → 0 and y → 0, does our infinity vanish? We have, from the ∂/∂x (ϕ - ω) equation above, the outcome:

$$\frac{\partial}{\partial x}(\phi-\omega) \rightarrow \frac{y}{x^2}-\frac{h}{x^2}(1+\frac{h^2}{x^2})^{-1}$$

$$= \frac{y}{x}\times\frac{1}{x}-\frac{1}{h} = 0\times\infty-\frac{\mathbf{1}}{\boldsymbol{h}} = 0 \quad (20)$$

Now we have not yet considered the h + y term in $\partial^2/\partial x^2$ (ϕ-ω), the term that does not have the potential to immediately vanish upon consideration of y → 0. Because, as y → 0, (h + y) → h, not zero. We shall do that below, see equation (32). But for now, we are focused on the question as to how ∂/∂x (ϕ - ω) vanished in the limit x → 0, y → 0, y/x → 0. Because we expected a number of anti-derivatives from $\partial^2/\partial x^2$ (ϕ - ω) would be necessary. The key lies in the fact that the expression for ∂/∂x (ϕ - ω) contains a special type of zero, y = 0. The term in question is (h + y). It doesn't matter what sort of a zero y is, the outcome will be h + 0 = h. It doesn't matter how many infinities y = 0 can negate, the result is the same. It just acts like a first order zero, regardless of what order it is. And because of this, we take the anti-derivative of $\partial^2/\partial x^2$ (ϕ - ω) and we come up against this special kind of zero, then we are permitted to remove it, *then repeat the differentiation*, this time with y absent, h + y = h, and we expect to have removed the infinity. Let's see. So let's repeat the differentiation of ∂/∂x (ϕ - ω), this time with h + y = h. For clarity, we repeat the equation:

$$\frac{\partial^2}{\partial x^2}(\phi-\omega) = \frac{\partial}{\partial x}[yx^{-2}(1+\left(\frac{y}{x}\right)^2)^{-1}-(h+y)x^{-2}(1+\left(\frac{h+y}{x}\right)^2)^{-1}]$$

So, we differentiate term (1), no (h + y) term:

$$\frac{\partial}{\partial x}(yx^{-2}\times[1+y^2x^{-2}]^{-1}) = \frac{y}{x^2}\times y^2\times -2x^{-3}\times -1\times[1+(\frac{y}{x})^2]^{-2}+[1+\frac{y^2}{x^2}]^{-1}\times y\times\frac{-2}{x^3} = \frac{y^3}{x^5}-\frac{y}{x^3}\,.$$

$$= 0^3\times\infty^2 - 0\times\infty^2 = 0 - \infty = -\infty \quad (21)$$

Now consider term (2), and putting y = 0 → h + y = h.

$$\frac{\partial}{\partial x}(hx^{-2}\times[1+h^2x^{-2}]^{-1}) = hx^{-2}\times -[1+\frac{h^2}{x^2}]^{-2}\times h^2\times\frac{-2}{x^3}+\text{h}\times\frac{-2}{x^3}\times[1+h^2x^{-2}]^{-2}$$

so that term (3) is as

$$-x^4\times -x^{-3}\times x^{-2} = +\frac{1}{x} = +\infty \quad (22)$$

and the term (4) is,

$$-\frac{1}{x^3}\times x^2 = -\frac{1}{x} = -\infty \quad (23)$$

Adding term (3) and term (4): Term (2) becomes

$$\infty - \infty = \infty. \quad (24)$$

(This is a mathematical identity, it can be shown, relatively easily, that: $\infty - \infty = 0 \times \infty = 0$, K or ∞, and we take the latter option). Finally yielding: Term (1) + term (2) = $\infty - \infty = 0 \times \infty = 0$, K or ∞, and this time we take the *first* option, *zero*. It's a good thing we had $\infty - \infty - \infty$, right? If we had $-\infty - \infty - \infty$, we'd be stuffed! Okay? Because there is no way to make that equal to $\infty - \infty = 0 \times \infty$!

THE MEANING OF ∞ - ∞, FINITE OR INFINITE?

Call $\infty - \infty$ = alpha, α = finite or infinite. We investigate two alphas, $\infty - \infty$ and $\infty + \infty$.

(I) $\infty - \infty = \alpha$,

so multiply both sides of this equation by zero $0 \times \infty - 0 \times \infty = \alpha = \infty$ or not ∞:

(i) $\alpha \neq \infty$ then $K_1 - K_2 = 0$, (Ks both > 0 as the interval in question is between zero and ∞ not minus ∞). $K_1 = K_2$.
(ii) $\alpha = \infty$ then $K_1 - K_2 = K_3 \rightarrow K_1 > K_2$.

(II) $\infty + \infty = \alpha$.

(i) $\alpha = \infty$, multiply both sides of (II) by zero $O \times \infty + O \times \infty = O \times \alpha$. then $K_1 + K_2 = K_3$, and
(ii) $\alpha \neq \infty$, $O \times \infty + O \times \infty = 0$. then $K_1 + K_2 = O$, forcing:

No allowable solutions, K_1 and K_2 both positive, both zero. In total summary, it has become evident that $\infty + \infty = \infty$, whereas $\infty - \infty$ can equal ∞ itself, or any non-infinite number, i.e. any constant and can equal zero itself which as we shall see is not a finite number.

$\infty - \infty = \infty$, add $\infty \rightarrow \infty = \infty + \infty$,

(obviously, we simultaneously expect this to be the case). As an anti-corollary to Sam's Squeeze theorem, we conclude that it is not possible that $O\times\infty$ could be equal simultaneously to zero and infinity. So, the safest thing would be to assume, in the absence of any further conjecture, that it is equal to neither of them, i.e. $0 \times \infty$ is equal to any (finite, nonzero) constant. $\infty - \infty = K$, K is either zero or infinity or anything in between, i.e. a finite number. (Obviously ∞ is not a finite number. However, neither is zero, → zero is simply a place holder in a particular digital quantity).
For example, consider that 68 and 68.0 mean different things but it is easy to confuse the two and make a critical error. You can get as close as you like to zero but never get there just as you can get close to ∞ but never get all the way there. The origin is not a number. We have started with counting numbers, introduced fractions and irrational, imaginary numbers all about the origin. We can only specify zero to a given number of decimal places or significant figures, cannot necessarily specify to infinitely many significant figures, only get closer and closer to absolute zero. (←→ we cannot specify a number to infinitely many zeros or critical decimal places. One can only get closer to absolute zero as defining a larger number of place holders. It is the same for the definition of ∞, but in the opposite sense).

THE FINAL CONNECTION

We have declared the quantity $\infty - \infty$ to be a universal number, i.e. it lays claim to all possibilities whereby it can be equal to zero, or infinity or anything in between, i.e. any (finite) constant. But we already know this to be true of the quantity $0 \times \infty$, by Sam's squeeze theorem and its corollary. What if these two terms are in fact equal to each other, as they have the same outcome? Let's see what happens in consequence of this conjectured equality.

$0 \times \infty = \infty - \infty$.

$0 \times \infty + 1 \times \infty = \infty$.

$(0 + 1) \times \infty = \infty$.

$\infty = \infty$.

That is, equating zero times infinity with infinity minus infinity results in a statement which is universally true, confirming our observation that the equality of these two terms seems likely. So now, finally, we have the two differential equations we were looking for:

$$\frac{\partial^2}{\partial x^2}(\phi - \omega) = \frac{\partial^2}{\partial y^2}(\phi - \omega) = 0$$

Just a little more on the matter of the (h + y) term. In the relevant equation, $\partial^2/\partial x^2\ (\phi - \omega)$, the only zeroes or infinities that occur involve x. Specifically, there are a lot of $y/x = 0$. This means that wherever y occurs, isolated from an x, it occurs in the manner (h + y), $h \neq 0$. This is what we call a first order zero in y, that is, $y \times K = 0 \times K = 0$, or, equivalently, $y \times \infty = 0 \times \infty = K$.
Now we started out with one option, y a zero of order n, such that $0 \times \infty n = 0$. As an alternative to that, we integrate repeatedly until we do away with our infinity. We expect that the order of the zero, y = 0, starts out at n, and is reduced by one for each integration. Such that the infinity will vanish when you have integrated n times. Now we devise another variable, which we call y'. This variable represents a multiple of the identity $\partial^2/\partial x^2\ (\phi - \omega)$. It starts out equal to y, y' = y = zero of first order. But each time you integrate, the order of y' *increases*, as opposed to the order of y decreases. So when you have integrated *once*, you have $y' \times \partial^2/\partial x^2\ (\phi - \omega) = 0 \times \infty = 0$, as opposed to $0 \times \infty = K$, y' now being a multiplicative of $\partial^2/\partial x^2\ (\phi - \omega)$ zero of *second* order. *That* is why you do not have to integrate n times to get $\partial^2/\partial x^2\ (\phi - \omega) = 0$, in this instance. You only have to integrate once! $\partial^2/\partial x^2\ (\phi - \omega)$ vanishes, which is the desired result.
Now we back to this matter of y, y'. y acts as a zero of order 0n. Either it takes out the term that is specifically in y, (not h + y), and the other term, the term in h + y similarly vanishes, (see equation (32) discussion below), or you just integrate the entire expression for $\partial^2/\partial x^2\ (\phi - \omega)$, continually, the order of the y = 0 zero decreasing by one, from n initially, until you get $\partial^2/\partial x^2\ (\phi - \omega) = 0$. What about y'? In line with our discussions, it starts out as a zero of order 1. So, if we integrate, there is only one direction it can go. It has to increase its order, n = 1 → n = 2. So, if it is there, in $\partial^2/\partial x^2$

(ϕ - ω), as a zero of order 1, then when you integrate, the new y' will have to satisfy $0 \times \infty = 0$, and $\partial^2/\partial x^2$ (ϕ - ω) will vanish. But why does it have to change its order at all? Consider l'Hôpital's rule. You start out with f(x)/g(x) = 0/0. If you differentiate f(x) and g(x), assuming you do not come up with 0/0 again, then you have 0/0 → 0/K, or K/0, or K/K'. So it is entirely necessary that the order of at least one zero changes. But in the new extension to l'Hôpital's rule, the new theorem that deals with ∞, and not $0 \times \infty = 0/0 = \infty/\infty$, there is only one function of x, f(x), not two, f(x), g(x). So, if y' is a zero of order 1, in $\partial^2/\partial x^2$ (ϕ - ω), then it is necessary that it becomes a zero of order 2, when you integrate, therefore $\partial^2/\partial x^2$ (ϕ - ω) will vanish. And as for the matter of why y' suddenly becomes a multiplicative factor of the entire $\partial^2/\partial x^2$ (ϕ - ω) expression, when it started out as just h + y → h, well that occurs simply to be consistent with the fact that our nth order zero, y, is multiplicative over a large component of $\partial^2/\partial x^2$ (ϕ - ω), and the other component of $\partial^2/\partial x^2$ (ϕ - ω) simply vanishes anyway, again see equation (32) discussion below.

A NEW MATHEMATICAL THEOREM – DIVISION BY ZERO

There are two possibilities for division by zero.

(i) $\frac{K}{0} = \infty$

and

(ii) $\frac{0}{0} = 0,\ K\ or\ \infty$

(The option, $\infty/0 = \infty^2$ we call *trivial*, we'll not be bothering with that possibility). Now what if you want to find out which of the three options is the case in possibility (ii). Supposing that:

$$\frac{f(x)}{g(x)} \rightarrow \frac{0}{0}$$

as x → 0. Then l'Hôpital tells us:

$$\frac{0}{0} \rightarrow \frac{f'(x)}{g'(x)}$$

That is, you differentiate the two functions f(x) and g(x), and re-consider the limit as x → 0. If it's *still* indeterminant, you do it again, etc.

What about possibility (i), you do a calculation, such as a calculation in quantum electrodynamics, or quantum chromodynamics, and you come out with an unwanted infinity. They get around the problem in QED and QCD by a process called renormalization. But we have got around the problem our own way! We have instituted a new mathematical theorem, to go with l'Hôpital's rule. You integrate. And if the infinity is still there, then you integrate again. And so on. *Or*, you institute an absolute zero, without integrating. This is a zero of order n, and we expect that if you do it by the other method, integrating, you will have to integrate up to n times. Now how do we justify this rule? Consider the following quirky analysis

$$y = x2 \rightarrow \frac{dy}{dx} = 2x\ .$$

But:

$$y = x^2 = x + x + x + \ldots + x$$

So

$$\frac{dy}{dx} = 1 + 1 + 1 + \cdots + 1 = x$$

2 = 1!

So what is the solution to this seemingly enormous disparity? The problem is that you have an unspecified number of terms, when you say x times. But the function $f(x) = x^2$ and the function f'(x) = 2x have to cater for x → ∞. And when you do that, you get an infinite number of terms, and that is inconsistent with the limiting nature of calculus. When you have an infinity of terms, that is inconsistent with the fundamental operation of calculus which, for both differentiation and integration involves limits dx → 0. So if you throw an infinity in there as well, something fundamental changes, because of the possibility that $0 \times \infty = K \neq 0$. So if you break the rules of calculus in this fashion, the only way you can rectify the situation is to reduce x from infinity. In fact, you have to get x away from infinity *as far as possible*. That is, x → 0, and *then* you are in agreement. Only then will you have no contradiction, only then will you have 2x = x.

So, in our discussion of the cinema problem, you want to eliminate an infinity. It is entirely analogous to the calculus discrepancy we are considering. So you can do one of two things. Either make a zero an *absolute zero*, that is, make it *as small as possible*, $y \times \infty^n = 0 \times \infty^n = 0$, for any n. *Or*, you can take an anti-derivative, and continue to do so, until the infinity disappears. And stop there! Once you have the correct result, $\partial^2/\partial x^2$ (ϕ - ω) = 0, if you continue to take the anti-derivative any further, you will more than likely come out with the wrong result, just as in the operation of l'Hôpital's rule, you stop differentiating f(x) and g(x) as soon as you get an outcome 0/0 → 0, K or ∞, otherwise, you get the wrong result.

Now you are likely to have to pay a price for taking anti-derivatives in this fashion. That price will more than likely be the introduction of an integration constant. In the language of QED and QCD, this becomes renormalization constant. Specifically, 0/0 = 0 → 0/0 = K. Where could such an event fit into our discussions above? Recall ∞ - ∞: 0 → ∞. We have discussed the meaning of ∞ - ∞ at length, above. It is the same thing as 0/0, or $0 \times \infty$. So in this discussion, we have introduced *two* renormalization constants. Firstly, 0/0: 0 → K, and secondly, 0/0: K → ∞. Since the processes $0 \times \infty = K$ and $K \times \infty = \infty$ are mathematically equivalent, the second transformation, 0/0: K → ∞ *does* involve the introduction of a second integration constant, renormalization constant, even if it is not immediately evident what that constant, K' is, all we see is the first integration constant, K. Multiplying something infinitely small, by infinity, to get a finite result, K, is the same thing as multiplying a finite quantity, K, by infinity to get an infinite result. And we select K, and/or K', to make the equations balance. Most particularly such that $\partial^2/\partial x^2$ (ϕ - ω) = term 1 + term 2 = 0, terms 1 and 2 of necessity being both non-infinites. We *can* deal with infinite terms too, and we have done so, and you see this where our calculations lead to ∞ - ∞, which becomes 0/0 = 0 × ∞ = ∞/∞, with the possibility for a non-infinite final outcome.

So this brings us to the matter of infinities in QED and QCD, which are fixed by a process called renormalization. Infinities arise in the analysis of certain Feynman diagrams. And it is not simply a one-off accident, or small number of accidents. In QCD an entire renormalization group is required. These infinities are a fundamental part of the physics. In QED, for example, you get logarithmic divergences, log x, (x → ∞), and you get linear divergences, x, (x → ∞), and you get quadratic divergences, x^2, (x → ∞), each of these, in order, being a more serious divergence that has to be rectified. The new suggestion becomes, from our investigation of the cinema problem, that we remove these divergences simply by integrating. Perhaps this is another avenue particle physicists should pursue. Or perhaps that is what they are doing anyway, in their renormalization processes. Because in these fields of study there are things called renormalization constants. Perhaps these are none other than our integration constants, 0/0: 0 → K.

So, putting it all together, in consideration of l'Hôpital's rule and our new rule for eliminating infinities, if you have f(x)/g(x) = 0/0 = 0, K or ∞, then you differentiate f(x), g(x), continually until you arrive at a result of 0, K or ∞. By contrast, if you have G(x), could be G(x) = f(x)/g(x), equals ∞, i.e. *without the possibility* of G(x) = 0 or K, then you use the new integration theorem, as opposed to the differentiation theorem of l'Hôpital. That's about it, really.

As well as *Renormalization constants* in Quantum Field theory, (QCD, QED), we have *Renormalization differential equations*. Well, how do you solve a differential equation? You *integrate*, right? It's beginning to look very much as if our new mathematical theorem is consistent with renormalization processes in quantum field theory, that is, the particle physicists have been using this theorem all along. By way of explanation, consider a differential equation such as the Schrodinger equation.

$$(-\frac{\hbar^2}{2m} \times \nabla^2 + V)\psi = E\psi \qquad (25)$$

where $\nabla^2 = \partial^2/\partial x^2 + \partial^2/\partial y^2 + \partial^2/\partial z^2$ is the Laplacian, in Cartesian coordinates. Such a thing is a frightful mess, how are you going to solve it? You solve it by doing things to simplify it, right? Firstly, you convert to spherical coordinates, x, y, z → R, θ, ϕ. This simplifies matters because the potential term V(R) is only a function of R, not θ or ϕ. Then, to simplify matters still further, you claim the following:

$$\psi(R,\theta,\phi) = \psi(R) \times \psi(\theta,\phi) \qquad (26)$$

This simplifies matter because ψ(R) becomes just a constant with respect to differentiation with respect to θ, ϕ, and ψ(θ, ϕ) becomes a constant with respect to differentiation with respect to R. Well, it works! Clearly God, the creator, has chosen for ψ(R, θ, ϕ) to be *separable*, in this manner. And with good reason! If you choose this separability, it turns out that every atomic orbital in existence has one of only four simple geometries, the geometry of the s-orbit, the p-orbit, the d-orbit and the f-orbit. That is, all 100 plus types of atoms have one of four very simple geometries, for every electron, in every orbital. The problem then becomes simply one of calculating the value of ψ(R), for each individual electron orbit of each individual atom. The *size* of the orbits. Physicists and chemists have fallen short in this endeavor, but that is another story. Anyway, that was just to illustrate what is involved in solving differential equations, and that is what physicists have been doing in their renormalization processes in quantum field theory, and it would appear very strongly that this is in accordance with our new mathematical theorem, our extension to l'Hôpital's rule.

BACK TO THE CINEMA PROBLEM

Consider:

$$\frac{\partial^2}{\partial y^2}(\phi - \omega) = 0$$

As y → 0, 0 × $[1 + (h/x)^2]^2$ → h. It is easy to solve this for x. Use the following identity:

$$0 \times \infty = \text{constant.}$$

We'll justify this shortly. For the moment, note that the product of zero and infinity is any finite nonzero constant. So, if y → 0, then:

$$[1 + \left(\frac{h}{x}\right)^2]^2 = \infty \qquad (27)$$

with the obvious consequence being that x → 0. That is, the trajectory that maximizes the increase in viewing angle with distance, r, will never make it into the y negative region, so our analysis is correct. In the preceding analysis, we have made the following two connections:

$$(1)\ y[1 + (\frac{y}{x})^2]^2 = 0 \times [1 + (0 \times \infty)^2]^2$$
$$= 0 \times [1 + 0]^2 = 0 \qquad (28)$$

Similarly,

$$(2)\ \frac{h+y}{x} \to \frac{h}{x}$$

that is:

$$\frac{y}{x} = \frac{0}{0} = 0 \times \infty = 0 \qquad (29)$$

These two identities have, furthermore, taken care of the zero in the denominator associated with the x^2 terms which we multiplied out of the equation. Mathematical justification of 0 × ∞ = constant. Perhaps we can justify $0 \times \infty = zero$, according to Sam's squeeze law:

0 × 10 = 0,
0 × 100 = 0,
0 × 1000 = 0.

It follows by extrapolation that $0 \times \infty$ = zero. We explain why this is a faulty analysis. Consider:

$$\infty \times 100 = \infty,$$
$$\infty \times 10 = \infty,$$
$$\infty \times 1 = \infty,$$
$$\infty \times 0.1 = \infty.$$

Using the same logic employed by Sam, it follows by extrapolation that $\infty \times 0 = \infty$. That is, we have used the same analysis to predict that on one hand $0 \times \infty$ is zero, and on the other hand $0 \times \infty$ is equal to infinity. The only logical conclusion to draw is that the logic was erroneous, and that in fact $0 \times \infty$ is equal to anything but 0 or ∞. That is, $0 \times \infty$ is equal to any finite, nonzero constant, as per the above assumption. Physical justification of $0\times\infty$ = constant. Physics tells us that a photon has a finite mass. We acquire this knowledge from two separate approaches:

(1) If a photon has a finite, non-zero mass, its momentum will be given by

$$p = mc = \hbar k = \frac{h}{2\pi} \times \frac{2\pi}{\lambda} \qquad (30)$$

To verify that this is the correct approach, we equate the Einstein mass-energy with the Planck photon energy. We know that this equality must hold as Einstein's special relativity was derived upon consideration of the passage of light, and further Einstein's photoelectric theory of light draws upon the Planck energy. So:

(2) When $mc^2 = h\nu$, $v = \nu \times \lambda$, therefore we have $mc^2 = \frac{hc}{\lambda}$ or

$$mc = \frac{h}{\lambda} \qquad (31)$$

as per the de Broglie equation, (1) above. Now this analysis applies to a photon travelling at the speed of light, c, as we know they must do. The Michelson-Morley experiment confirms that there is no reference frame where the speed of light is reduced to less than c, and it is upon this premise that Einstein derived his special theory of relativity. So we expect that if a photon were to be slowed down from speed c, its mass will vanish. Again, this expectation is verified by Einstein's analysis. Supposing a photon has a zero-rest mass. That is, we do not observe a stationary photon, as such an entity would be massless.

Now Einstein's special relativity tells us that as the speed of a (massive) body is increased from zero to c, the speed of light, its mass is amplified infinitely, that is, its mass approaches infinity. We expect Einstein's relation to hold also for massless bodies, (such as a photon). Its mass is multiplied infinitely from zero as its speed increases from zero to c, according to the identity $0 \times \infty$ = constant, above. This total mass at the speed of light is nonzero, and finite, and inversely proportion to the wavelength of the radiation – we assume of course that the electromagnetic radiation is non-infinite and nonzero, in mass, $m = h\nu/c^2$. The photon mass is given by $m = h/c\lambda$. For speeds less than c, the zero mass is multiplied by a finite multiplication factor, and of course $0 \times$ finite quantity = 0, (Sam's analysis), such that even photons of nonzero, non-infinite velocity have a vanishing total mass. That was our position before we knew a little more about it. The photon does have zero rest mass, but it begins its existence as a stationary electron/positron, p = 0 in Einstein's equation, $E^2 = (pc^2)^2 + (m_oc^2)^2$. It has its rest mass removed progressively in the acceleration process, v: 0 → c, such that the total mass $m = m_o/\sqrt{(1 - v^2/c^2)}$ is a constant. Not, as we mistakenly thought previously, that the rest mass magically vanishes just before speed $v = c$ is attained, such that m = 0 for any part of the process other than the arrival at $v = c$. We were wrong about that! As a corollary, the total mass of the stationary photon is equal to its rest mass, zero, as is the total mass of a non-stationary photon, with the proviso that such a massless photon does not acquire a speed as large as c.

Consider now an electron wave, described by the de Broglie relation above, $p = h/\lambda$. Such a wave can have an infinite wavelength, this occurs at speed zero. We now use another identity from Einstein's special relativity, the Lorentz contraction. This states that as an entity approaches the speed of light, its dimension along the light axis is reduced all the way to zero. That is, excepting the instance where its wavelength was infinite to begin with, this infinite wavelength is reduced infinitely from ∞ to some constant value as this matter wave, electron, becomes a photon, according, once again, to the identity:

$$\frac{\infty}{\infty} = \infty \times 0 = \text{some nonzero, non-infinite constant.}$$

A new thought is now proposed. We see, immediately above, in the acceleration process, massive fermion → massless photon, that the total mass m is a constant, $m = m_e$, the electron/positron rest mass, and m_o: m_e → 0. Well consider that stationary, massive fermion, speed v = 0. And consider the de Broglie expression, $p = h/\lambda$ ←→ $mv\lambda = h$. The requirement is clearly that $\lambda = \infty$. $m = m_e$ is a constant, and v = 0. So we institute an *infinite Lorentz contraction*, $\Delta x = (\Delta x)_o \times \sqrt{(1 - v^2/c^2)}$, and v: 0 → c. So if the length quantity Δx is the wavelength of the fermion, in the process of losing its rest mass, becoming a photon, then you have, in accordance with this proposal, λ: ∞ → K, some finite value, $(\Delta x)_o = \infty$, Δx = K. We learn something new about the Reverse Higgs process, we learn that of the three variables of Einstein's special relativity, the mass $m = m_o/\sqrt{(1 - v^2/c^2)}$, the length $\Delta x = (\Delta x)_o \times \sqrt{(1 - v^2/c^2)}$ and the time $\Delta t = (\Delta t)_o \times \sqrt{(1 - v^2/c^2)}$, the mass m and the time Δt are invariant, but the length is not. For the invariability of time under this transformation, see Autobiography of James Russell Fields. The proposal is that if you accelerate a clock, along with a massive fermion, onto a photonic wave packet, v: 0 → c, then that clock will tick at exactly the same rate as it was ticking before you made the transformation. That is only if you are talking about the Reverse Higgs process, m_o: m_e → 0. And similarly, of course, the mass is invariant. In the Reverse Higgs process, only Δx ←→ λ is a variable. This does *not* apply to what we call the energy input process, the low energy limit Einstein got by using a Taylor series expansion of $E^2 = (pc^2)^2 + (m_oc^2)^2$, whereupon he deduced a *constant* *rest mass*, E = $m_o c^2 + ½m_o v^2/\sqrt{(1 - v^2/c^2)}$. This is not the Reverse Higgs process, and it is evidently not because there is no ghost involved, whereupon the kinetic energy term has a ½ factor, no ghost, in contrast to the Reverse Higgs process, where there is no ½ factor in the KE term, $(pc)^2 = mc^2 \neq ½mc^2$. That is because an electromagnetic wave has a dual oscillation, of the E-oscillation and the B-oscillation, one carries the fermion, the other carries the ghost. There are two kinds of photon, one an electronic photon with a positron ghost, one a positronic photon with an electron ghost. If photons are charged in this manner, why do they not interact with external electromagnetic fields? Because the Lorentz force is zero, $F_{Lorentz} = q(E + v \times B) = 0 \rightarrow E = -v \times B$. Verify that for yourself, the ratio of the amplitudes is E/B = *c*, the direction of propagation, v, is that of the Poynting vector P = 1/μ (E × B).

We've fully covered photons. What then, about electrons? These do not have a vanishing rest mass. In analyzing the conversion between an electron at rest and a photon travelling at speed *c*, our analysis indicated the electron had an infinite wavelength at zero velocity according to the de Broglie wavelength, p = h/λ, or mvλ = constant, whereupon λ → ∞ as v → 0, for a non-vanishing electron rest mass, m = m_e. Now an electron can be incorporated upon an electromagnetic wave packet. It can be accelerated to speed *c*, whereupon it propagates upon the electromagnetic wave packet. In so doing, it loses its rest mass, such that what was once a rest mass becomes a total mass. For this to occur, however, in the stationary frame of the electron, the electromagnetic frequency must be such that it matches the electron rest mass, m_e, according to m_e = hc/λ, as above. If this identity is not satisfied, one must accelerate the electron to such a velocity that the Doppler shifted electromagnetic wavelength does satisfy this equation, in the rest frame of the electron. If this equation is not satisfied, the electron can never be incorporated onto the electromagnetic wave packet. Once the electron is propagating in such a manner, however, it is a simple matter to adjust the electromagnetic frequency by Doppler shift, such that the propagating electron appears to have a rest mass other than m_e, although it is safe to say this is an apparent total mass, not rest mass, according to our supposition that as an electron accelerates to be incorporated on the photon, its rest mass becomes a total mass.

ANALYSIS OF THE X-PARTIAL DIFFERENTIAL IDENTITY, IN THE LIMIT X, Y → 0

Again, as y → 0, we substitute into the results of the $\partial^2/\partial(x^2/y^2) = 0$ analysis and find:

$$0 = h \times \left(\frac{-2}{x^3} \times [1 + (\frac{h}{x})^2]^{-1}\right) + \left\{\frac{\frac{1}{x^2} \times \frac{2h^2}{x^3}}{[1 + (\frac{h}{x})^2\,]^2}\right\} \quad (32)$$

However, in setting y = 0, and making one term on one side of the relevant equation equal to zero, we have neglected the fact that this y = 0 is multiplied by ∞ in the limit as x → 0, and that therefore we might expect that the term does not vanish, as we have made the assumption that 0×∞ = constant ≠ 0 or ∞, where we have claimed it is equal to zero. The crucial fact in overwhelming this dilemma is that one of these terms is zero as y → 0, and the other is ∞ as x → 0. In such an instance, we have to resort to Sam's squeeze law, according to which y → 0 much more quickly than x → 0, (Figure 3), such that 0 × ∞ → 0, not some constant value, as x, y → 0. See the analysis below, culminating in equation (36).

PREVIOUS ATTEMPT TO ACCOUNT FOR THE VARIABILITY OF $0 \times \infty^N$

So in this instance, supposing we are multiplying zero (y= 0) by a number of infinities, say ∞^3, (x = 0), then we proceed as follows:

$$(0 \times \infty) \times \infty \times \infty = (0 \times \infty) \times \infty = 0 \times \infty = 0$$

We are dealing with two propositions. In one instance, Sam's squeeze law does apply, (x,y) → (0,0). In the other we have a collection of terms multiplied together that are infinities, all arising from x = 0, such that infinities can be divided by infinities, or equivalently, 0 × ∞ = constant ≠ 0 or ∞.

It appears that we can justify Sam's squeeze law in instances where the 0 and ∞ are associated with two separate variables, say x and y, rather than x and x. Let us consider the Lorentz contraction, in this case the wavelength, λ, and the contraction are both dimensionally along the x-axis, so the squeeze law does not apply, the identity 0 × ∞ = (non-zero) constant applies, as we have seen.

That was the position we took previously. Now we have modified our arguments considerably, see all previous discussions, other than immediately above. As promised, we shall confirm the identity expressed by equation (32), above:

$$\sim -x^{-3}\,x^2 + \frac{1}{x^5} \times x^4 = \frac{1}{x} - \frac{1}{x} = \infty - \infty = 0 \quad (33)$$

Consider another element of special relativity, the (infinite) multiplication of mass as v → *c*.

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \quad (34)$$

In the case of photons, the squeeze law does apply, one can go arbitrarily close to the speed of light, and the photonic mass will still be $m_o \times 0 = 0$. Wrong! See above!

Now we equate a total electron mass propagation upon an electromagnetic wave packet with an electromagnetic wavelength, or more specifically a frequency, (the identity acquired by putting the Planck energy equal to the Einstein energy). So the special mass variation applies to photons as well as matter, (electrons). The crucial point here is that photonic and electronic mass-energies are given by the amplitude of the wave. In the case of an electron, the mass is given by the amplitude of the wave. In the case of photons, the mass-energy, E, is given by the amplitude of the wave. Therefore, in this case, the squeeze law does apply, the zero and the infinity are terms in y and x, respectively. Now the amplitude of a wave is orthogonal to its direction of propagation, as pictured below:

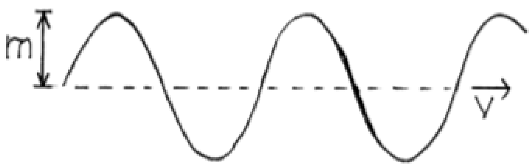

Figure 3: Orthogonal mass-energy amplitudes and wave propagations, for electrons and photons

In the other part of the analysis, directly below, we find that ∞ - ∞ = 0, not the general constant one would expect, i.e. this constant is in this case equal only to zero. Does this not ring a bell? One can have 0 × ∞ = 0, (squeeze law), or 0 × ∞ = ∞, (alternative squeeze law, depending on which term approaches zero faster), or alternatively, 0 × ∞ = constant. Similarly, ∞ - ∞ is expected to be equal to a constant which may or may not be equal to zero. Where the squeeze law operates, this constant is required to be zero, in accordance with the analysis for the cinema problem with elevation. Now suppose x → 0, then:

$$0 = -\infty^3 \times (\infty^2)^{-1} + \infty^2 \times \frac{\infty^3}{(\infty^2)^2} = \infty - \infty \qquad (35)$$

Now ∞ - ∞ = 0 is certainly a possibility, but it is not the only possibility.

Consider: ∞+constant = ∞, thereby ∞-∞ = -constant. Perhaps the requirement that x, y cannot change sign in our analysis results in the following deduction: constant = -1 × constant, thereby: constant = 0. Now in the foregoing analysis, we have divided infinities by infinities. We have from the physical interpretation of 0 × ∞ = constant that to divide infinities: $\infty/\infty = \infty \times 0$ = constant. But consider the y-partial differential equation analysis. We have stated:0 × ∞ = constant = h as x → 0. However, supposing we re-interpret: x → 0, therefore $\frac{\boldsymbol{h}}{\boldsymbol{x}} \to \infty$, $(\frac{\boldsymbol{h}}{\boldsymbol{x}})^{\mathbf{2}} \to \infty^{\mathbf{2}}$ then finally: $[1 + (\frac{h}{x})^2]^2 \to \infty^4$, whereby: $0 \times \infty^4 = (0 \times \infty) \times \infty^3$ = constant × ∞3 = ∞ ≠ h, since h is a finite quantity. We have a contradiction, as h was assumed from the outset to be finite.

Now consider equation (32), above. We are in the analysis that follows (32) dividing infinities by infinities. On the left-hand side, we have zero. On the right-hand side is a sum of two terms, the one on the furthest right written as a fraction. In this analysis the conclusions seem to be consistent with what we are looking for. But let us generalize. Supposing the nominator of the fraction is an infinity of order p, i.e. it goes to ∞^p in the specified limit. Then supposing the denominator is similarly an infinity of order q, approaching ∞^q. Then the other term is an infinity of order r, approaching ∞^r.

Next, if we divide both sides of the equation by the first term on the right-hand side, the one that hasn't been written as a fraction, and then add the negative term, (the non-fractional one), to both sides we acquire an interesting identity:

$$\infty^{p-q-r} = constant \qquad (36)$$

This now has the same form as the identity we got previously from the y-partial differential analysis, for which we have two distinct possibilities, both at odds with each other in the analysis: 0 × ∞ = h? Or is it, $0 \times \infty^4$ = h?

It was thought initially we could get around the problem of the h → ∞ in the preceding analysis by concluding that in the y-partial differential analysis we are not dividing infinities by one another, whereas in the x-partial differential analysis we are. However, the complete equivalence of the x- and y-partial differential analyses according to equation (36) makes nonsense of this interpretation, so there is here no way out of the unwanted conclusion that h → ∞. So, we seek some other way out of the dilemma. We require that in the y-partial differential analysis, it is not possible to divide infinities by infinities. We have a term in ∞4, but it is not permissible to divide this term by infinity as an alternative to multiplication by zero. The very simple reason for this is that the zero term is a term in y, whereas the infinite term is a term in x. Although x, y both approach zero in their respective limits, they do so at different rates. Not only that, but the respective derivatives ∂θ/∂x and ∂θ/∂y behave very differently in the vicinity of (0,0). The only sensible conclusion to draw in consideration with the foregoing analyses is that in the ultimate limit of θ maximization, the association between x and y occurs as in the figure below, in the limit
(x, y)→ (0,0).

Figure 4: Gradients dy/dx in the limit of maximization of ∂θ/∂r. y approaches zero more quickly than x, y/x = 0/0 = 0

THE NON-POTENTIAL FIELD, ∂Θ/∂R

As we have concluded previously, θ is a potential field as the change in its value between any two points in the region under consideration is independent of the path taken between those two points. Not so for the field, ∂θ/∂r. Now in our analysis, we have optimized the rate at which θ changes with distance r along the given trajectory. We have, in the figure above, its behavior in the vicinity of (0,0). Consider two points on this trajectory near (0,0). If we are to maximize the rate at which θ increases along path length, wouldn't it be more appropriate to draw a straight line between those two points, and follow that trajectory? As per Figure 4 below? The crucial point is that ∂θ/∂r is not a potential, that it is a quantity which depends on direction as well as position. Wouldn't it result in a greater rate of change of θ if one did follow the straight line between those points? So we might expect that if we take the short cut, then when we get to the destination, the angle θ is larger for the shorter, straighter path. This is of course nonsensical as we are at the same position. The angle θ must be the same, whichever path we used to get there.

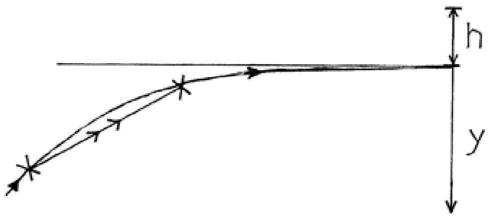

Figure 5: To increase θ more, take a short cut

We must attribute this uncomfortable consequence of our analysis to the fact that ∂θ/∂r, which we sought to maximize, is not a potential field. In particular, when it reaches its destination point, as in the figure above, the direction of the trajectory is somewhat different. It cannot get back on track instantaneously, as this would require an infinite acceleration. This brings us to the meaning of ∂θ/∂r. Supposing we assume that the observer travels at a constant speed along the trajectory, r:

$$v = \left(\frac{dr}{dt}\right) = constant \qquad (37)$$

Then:

$$\left(\frac{\partial\theta}{\partial r}\right) = \left(\frac{1}{constant}\right) \times \left(\frac{\partial\theta}{\partial t}\right)$$

That is:

$$\frac{\partial\theta}{\partial r} = \frac{1}{v}\left(\frac{\partial\theta}{\partial t}\right) \rightarrow v = \left(\frac{\frac{\partial\theta}{\partial t}}{\frac{\partial\theta}{\partial r}}\right) = \left(\frac{\partial\theta}{\partial t}\right)\left(\frac{\partial r}{\partial\theta}\right) = \left(\frac{\partial r}{\partial t}\right) \qquad (38)$$

Now we are dealing with a constant speed, but the direction in which the observer moves is variable along the path r, such that there is an acceleration. Now if the observer in his cinema chair changes direction abruptly, then this acceleration will be infinite.

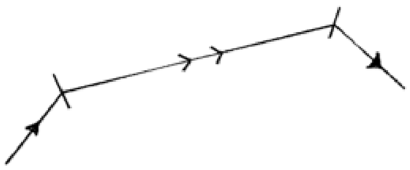

Figure 6: Infinite acceleration as observer changes paths abruptly from the optimal path, ∂/∂x (∂θ/∂r) = ∂/∂y (∂θ/∂r) = 0

Now of course the observer does not have to change paths abruptly. He or she can follow a curved trajectory, (more curved than the optimal trajectory), in the vicinity of the region where the short cut commences. When the short cut trajectory once again approaches the vicinity of the optimal path, it is necessary to change the direction of the trajectory once more, to get back on the optimal path. This will require again an element of acceleration, an acceleration in excess of that occurring in the optimal path trajectory, in the vicinity of where the two paths again coincide. In particular, as x → 0, it is essential that the erroneous direction of the non-optimal path be forced to coincide with that of the optimal path, through this excess acceleration such that the trajectory becomes horizontal, y = constant = 0. Now of course our hapless observer will ultimately crash into the wall of the cinema, x = 0, as he proceeds at constant velocity v = dr/dt. However, for a very brief instant, depending on the magnitude of the speed v, the viewing angle θ will approach its maximal value. Is this θ = π or π/2? It would appear to be π/2, and we would expect an ultimate angle of π to be achieved if we had started in the y-negative region. However, this is puzzling, as there has been no reference to the y-negative region in the analysis. The trajectory has approached (x, y) = (0,0) with no reference to this other region. The crucial point is, how far would the trajectory go into the y-negative region? What would be the benefit of say moving into this region insofar as y → 1 cm as opposed to y → 1 mm, and so forth? It is evident there is no significant reason why the trajectory would impede on the y-negative region, and so our analysis whereupon x → 0 as y → 0 is the correct analysis. The total change in θ between any two locations in the region under consideration of course cannot depend on the path taken. But the optimal path is curved, not a straight line. Why then, for a constant speed v, is the rate of change of θ with distance, ∂θ/∂r, not more optimal along the short cut? Again, Einstein's special relativity provides us with a solution to get out of this dilemma.

SPECIAL RELATIVITY AND THE TWIN PARADOX

In our analysis above of the physical meaning of 0 × ∞, we have made use of the Lorentz contraction, specifically of the wavelength of an electron wave packet as it is incorporated onto the photonic wave packet, λ: ∞ → constant as v: 0 → *c*. There is in special relativity a corollary to the Lorentz contraction, known as the time dilation. Just as lengths of objects contract as speed v → *c*, so time expands. That is, moving clocks move more slowly than stationary clocks, and this discrepancy becomes increasingly greater, approaching infinity, as the moving clock approaches the speed of light, *c*. In the limit of speed *c* the moving clock does not tick at all. An interval of time in the non-moving frame is infinitely larger than the corresponding interval in the moving frame. Well, we have had something additionally to say about that! Special Relativity operates in two respects, (1) the energy input scenario, $E = m_o c^2 + \frac{1}{2}mv^2$, and (2) the Reverse Higgs process, m_o: m_e → 0. The photon clock will only be stationary if you employ process (1), accelerating to the speed of light, whereupon the mass $m = m_o/\sqrt{(1 - v^2/c^2)}$ is infinite, which is of course impossible. Equally, (1) cannot be a mechanism for mass at v = *c*. Both mass and time require process (2) to achieve v = *c*. But, strangely enough, for electron → photon wavelength, one can employ the Lorentz contraction, $(\Delta x)' = \Delta x \times \sqrt{(1 - v^2/c^2)}$, without any reference to the Reverse Higgs process, for the electron acceleration process, and come up with a sensible result. (Infinite mass and frozen clocks are *not* sensible results!) We can rationalize this, however, this special relativistic discrepancy between length and mass/time. Consider *General* Relativity. Stationary in a gravitational field, a clock ticks slowly, the stronger the gravitational field, the more slowly it ticks. If you elevate a mass in a gravitational field, it becomes (microscopically) heavier. E = mc^2, so if you elevate a 10 kg mass by 10 meters, its mass will increase by $1000/(3 \times 10^8)^2 \sim 10^{-14}$ kg = 10^{-11}g. This would appear to be the solution of as to what dark matter in the universe is. See calculation, Grand Unification, [1]. There is no corresponding variation of lengths with respect to gravitational fields. So the three variables, (a) time/mass versus (b) length are consistent in this categorization, between special relativity and general relativity, which is very pleasing because, obviously, we are in the business of unifying special and general relativity into a scientific principle we call the ultimate theory of relativity, a theory that does not stop at gravitation but is inclusive of acceleration unto *any manner of force*.

Supposing we conduct a thought experiment, in which a pair of twins start off in the same location, but one is in a rocket ship and the other is stationary. The clock of the moving twin moves more slowly, so he ages more slowly. When eventually the rocket ship stops, turns around and comes back, we might expect that as they are reunited, the twin who was in the rocket ship would be younger. However, consider things as perceived by the twin in the rocket ship. In his frame, he himself is stationary, whereas his twin, on planet earth, is rocketing away, with the earth, at that same rocket speed velocity measured by the twin who is not in the rocket ship. According to the twin in the rocket ship, he would expect his twin, the earthling, to be younger. What is the solution to this paradox, it is not possible for each of the twins to be younger than the other, we require that one of them is younger and the other is older?

The solution is in the acceleration, as per the discussion above. The twin in the rocket feels his acceleration, as he takes off, and as he stops and turns around to come back. The twin back on planet earth feels no such acceleration. The twin on earth is in Newton's inertial frame of reference, while the other is not. The thing about special relativity is that it was derived in the pretext of a constant velocity. It is a special case, it does not necessarily apply to situations of non-constant velocity, i.e. accelerating systems. If one is dealing with accelerations, one needs a more general theory, Einstein's theory of General Relativity. Of course, the main purpose of this theory is to provide a satisfactory analysis of the motion of the planets under the force of gravity. The huge success of the theory is in the prediction of the precession of the perihelion observed in the planetary motions in our solar system.

Applying this logic back to the case of the elevated cinema observer, we expect that there is some kind of space-time discontinuity in the vicinity of the accelerating regions where the observer moves from the optimal path onto the shorter path, such that when the observer gets to the end of the short cut, and revises his direction to coincide with the direction of the observer on the optimal path, through a certain acceleration in excess of that occurring in the optimal path, the viewing angle will be θ, the same as observed by the observer who has followed the optimal path, as common sense tells us it must be.

We can apply this logic back to the twin paradox. The logical assumption will be that both twins will be the same age when the one returns from his trip in the rocket ship. There is a discontinuity in space-time which becomes more abrupt the greater the acceleration. In the case of infinite acceleration, this becomes completely abrupt. The more abrupt the acceleration, the greater the distance travelled in the short cut between where the observer leaves the optimal path and where the observer is reunited with it.

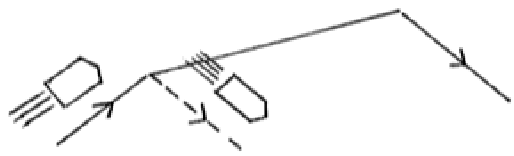

Figure 7: The cinema paradox (Figure 5 above) becomes the twin paradox

Of course, only at very large speeds will there be a measurable time dilation such that the clock of the accelerated observer travels more slowly, and he thinks he has travelled further than he in fact has. This thought experiment only applies at very high speeds, v. In the absence of high speeds, this thought experiment reduces to the problem of finding the optimal viewing distance, x, for various elevations y.

THE SQUEEZE LAW AND SPECIAL RELATIVITY

Consider $m = m_o / \sqrt{(1 - v^2/c^2)}$. The crucial point here is that the photon loses its rest mass, m_o: $m_e \rightarrow 0 = 0 \times m_e$, and the electron similarly loses its wavelength, λ: $\infty \rightarrow K = 0 \times \infty$, as v → *c*. So as previously we prioritized the three special relativity variables, time, length, mass, as time/mass versus length, now we seek to unify all three variables. So, talking about *rest mass*, not mass. So, talking about *photon*, not electron. Not the Reverse Higgs acceleration process, but just in consideration of the gravitational effects on a fermion that has been fully converted to a photon. So, if that photon is climbing out of a gravitational field, it loses frequency, just as a cricket ball climbing out of a gravitational field loses kinetic energy. And a photon falling into a gravitational field *increases* its frequency ←→ a falling cricket ball increases its KE. So, we go from the classification mass/time + length to mass + time + length, which is a very nice symmetry, and we are very happy with it.

We seek some kind of an equivalence between time, mass, length, as they appear in Einstein's equations of special relativity, all associated with a Lorentz factor, $\sqrt{(1-v^2/c^2)}$. So we had mass/time + length, length (λ) the odd one out. Then we had mass + time + space, *no* odd one out. Pursuing this matter further, time *cumulative* in the twin paradox, depends on what happened before, not just at that instant of time, (whatever instant in time means, Einstein tells us there is no absolute simultaneity), versus mass/length *not cumulative*, (doesn't matter what happened before). Finally, just on consideration of the bare variables themselves, *observed* mass increases, $m = m_o/\sqrt{(1-v^2/c^2)}$, whereas *observed time* decreases, the time intervals of the moving clock are observed to decrease, $(\Delta t)^{/}=\Delta t\sqrt{(1-v^2/c^2)}$, and finally, *observed* length decreases, the observed length is $(\Delta x)^{/}=\Delta x\sqrt{(1-v^2/c^2)}$. So we have an absolute symmetry of time, mass, length, it is possible to examine them in such a fashion that they all stand on equal ground, or in such a fashion that mass stands on its own, or in such a fashion that time stands on its own, or in such a fashion that length stands on its own. A marvelous symmetry, and we are very happy with it!

A PHYSICAL MODEL TO BASE THE CINEMA ELEVATION PROBLEM UPON – ELECTROMAGNETIC FLUX TUBES

A flux tube is a helical arrangement of magnetic (electric) field lines, with a central axial field. The helical surface field lines act as propagation vectors for electrons (positrons). We have seen how electrons can be accelerated to speed *c*, whereupon they propagate upon electromagnetic wave packets. Their rest mass becomes a total mass. In the case of fermionic propagation on helical surface field lines, these helical field lines define electromagnetic propagation vectors for fermions. Now the fermion on its helical pathway has two components of its total velocity, *c*. It has an azimuthal velocity, v_{az}, associated with the circular part of the motion, and an axial velocity, v_{ax}, the component in the direction of the central field. Thus:

$$|v_{ax} + v_{az}| = c \qquad (39)$$

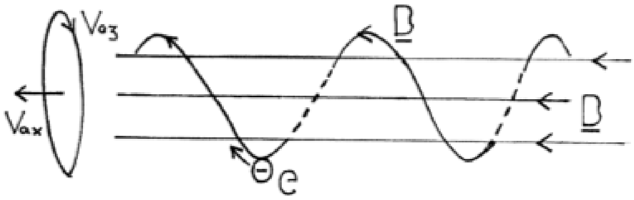

Figure 8: An electromagnetic flux tube

The axial velocity, v_{ax}, will be our extremized displacement vector, dr/dt, that we have dealt with at length in our cinema problem with elevation. We sought a displacement such that the rate of change of the angle θ with distance was extremized. Minimized. This becomes a rate of change with time along the pathway r, for a given speed v = dr/dt.

We are concerned with the location at the time when the acceleration commences. Instantaneous reversal, then we have a straight line, straight pathway, all the way to the destination, the re-union of the two twins. A straight line, then we have the time discrepancy paid back at a constant rate with time/distance on the return journey. Non-instantaneous acceleration, then some of the pay-back will occur in the acceleration phase, and after the acceleration phase the payback will not occur linearly with time. With regard to a non-instantaneous acceleration, that involves further increments of time dilation with increments of velocity, those increments will also be paid back in the acceleration phase. Just as for an instantaneous acceleration, the return journey does not have to be accounted for separately, it is accounted for by the reversal in the laws of special relativity, owing to twin 2 reversing his direction with respect to the photon. The extra increments of time dilation owing to the acceleration are paid back on account of the fact that it *is* an acceleration.

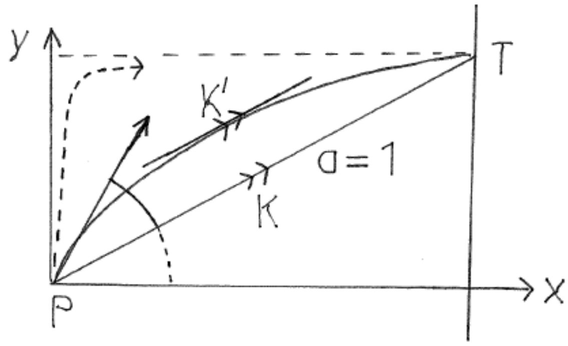

Figure 9: A Twin Paradox interpretation of the cinema trajectory. Vertical trajectory, (y-direction), corresponds to zero acceleration, effective speed v= 0. Horizontal trajectory, (x-direction), corresponds to infinite acceleration, a = 1, and effective speed v = ∞. K, $K^{/}$ are variables which we define below. The acceleration occurs at point P. Point T indicates the destination, the re-union of the twins

Consider, in the twin paradox, the acceleration a → 0. Only in the absolute limit a = 0 do the twins never re-unite. For infinite acceleration, the time-dilation payback occurs exclusively between points P and T, i.e. not P → P → T, and concerning this limit, it involves the maximum rate of time-dilation payback in the region P → T. Now regarding distance travelled in the acceleration region, (zero if a = 1 = ∞), we have d → ∞ as a → 0. The total time-dilation payback, which we call Δt, is the same regardless of the acceleration, in accordance with our discussions. It's just that for a = ∞, all of Δt occurs in the P → T region, but for decreasing a, Δt occurs increasingly in the acceleration region, that is, outside of the P → T region. Now let d be the total distance travelled after the onset of the acceleration. For a = 1 = ∞, this distance is just the distance between points P and T. For reduced accelerations, this distance also includes the distance travelled in the acceleration, being twice the distance travelled from the time the acceleration begins, at point P, until twin 2 is stationary. So we define:

$$\frac{1}{v} = \frac{\Delta t}{d} \rightarrow 0 \; as \; d \rightarrow \infty \; , a \rightarrow 0 \qquad (40)$$

Now consider the x- and y-axes in Figure 9 above. As acceleration a → 0, the trajectory is 100% vertical. As a → 1, the trajectory becomes the diagonal straight line, from P to T. We define speed, v, as the rate in time at which twin 2 follows the trajectory indicated in Figure 9, and d an increment of distance along that trajectory. So v = d/t. For a = 1 = ∞, v = 0, the trajectory never gets going, twin 2 is stuck on the y-axis, indeed he never gets moving at all in this abstract space we are investigating. The twins never re-unite. Conversely, as a → 1, infinite acceleration, the speed of twin 2 along the trajectory is maximized.

Now what is the point of this effective speed, v, in this abstract space? Consider that the time dilation payback rate, Δt/t is a constant, in this abstract space. So the slower the effective velocity, v, the greater the rate with distance, d, that time dilation payback is liberated. And d becomes absolute space, not merely this abstract space we have devised! Along the y-axis, the a = 0 trajectory, v = 0. Along the P → T trajectory, a = 1, you have v = ∞. So what do we do with our two variables, v and v? We divide one by the other to get something dimensionless, ok? Because surely a = ∞ = 1 is some kind of a venture into dimension lessness! So as a → 0, you have v(initial) → d/t = 0, and v (final) → d/t = ∞. The reason being that in the limit a→0, the trajectory increasingly approaches what we are trying to represent by the dashed line in Figure 9. Initially, as good as stationary, but rapidly achieving maximal speed v = ∞, speed along the x-axis. So: $d/t: 0 \to \infty$, and multiply by $1/v = \Delta t/d \to 0$, then:

$$\frac{d}{vt}: 0 \ \to K' \tag{41}$$

Now K is the maximal rate of time dilation pay-back, as shown in Figure 9, and it occurs for a = 1. K' is as shown. K and K' correspond to points of equal gradient on the two trajectories, the a = 1 trajectory, (infinite acceleration), and the a < 1 trajectory, (non-infinite acceleration). As a → 0, K' lies increasingly to the left, towards x = 0. So for a → 1, you have maximal rate of time dilation pay-back, Δt, in the region P → T, and it being a constant, and for a → 0, you have minimal rate of time dilation pay-back, it approaching a constant minimum. And, somewhere in between, 0 < a < 1, you have *maximal variation* of the time rate of time-dilation payback, Δt/t, in the region P → T. That is, the gradient of the trajectory line in this abstract space achieves its maximum curvature in the region P → T, somewhere in between a = 0 and a = 1. And that is what the cinema problem is all about! And now we have created some physics, out of something that seemingly was trivial in its physical context! It all worked because the onset of the acceleration signified a progression which would ultimately result in the reversal of the direction of propagation of the electromagnetic wave relatively to twin 2. Because of the loss of absolute simultaneity, according to special relativity, you cannot pin down the onset of the acceleration as being a separate event to the actual reversal, the point in time at which v (twin 2): -δ → 0 → +δ. Therefore, you do not have to bother with the additional time dilation that results from a multitude of constant velocity increments in the acceleration phase, just as you do not need further clock corrections on account of the reverse journey. So, you are only concerned with the clock discrepancy that occurred in the outgoing journey, prior to the *onset of the* acceleration, and with how much of that will be paid back in the acceleration phase, and how much will be paid back *after* the acceleration phase, that is, on the P → T trajectory. And for *instantaneous reversal*, (a = 1), you have a straight line on the return trajectory, and as you decrease a from 1 to zero, the trajectory remains connecting points P and T, but with increasing curvature from the straight line trajectory of a = 1, through a curvature maximum and then decreasing curvature, until finally you arrive at a = 0, or near a = 0, whereupon the trajectory in the P → T region approaches a straight line again, but in this case a *horizontal* straight line. Returning to Figure 8. Now the azimuthal velocity, v_{az}, the circular part of the electron motion, is responsible for the central field, B, (E in the case of positrons on the helical pathway, E). This is according to the right-hand rule, whereupon the thumb points in the direction of the current and the fingers indicate the direction of the field lines in a circular configuration. According to the magnitude of v_{az} is the central flux density. The larger v_{az}, the larger the fermionic current, therefore the larger the central (axial) flux density according to Ampere's law. Now we have Faraday's law:

$$EMF = -\frac{d\Phi_B}{dt} \tag{42}$$

where EMF, the electromotive force, is an energy, and Φ_B is the flux of magnetic field lines of a given flux density across a surface of a given area. We seek to maximize $d\Phi_B/dt$ whereupon we make the energy as small as possible, equivalently making the entropy, S = -EMF, as large as possible. So it is the second law of thermodynamics which drives the flux tube processes. So for a given central flux density, according to the azimuthal velocity v_{az} which produces this axial field, we seek to maximize the observed rate of increase of area with time, (does this ring a bell? It is identical to our cinema problem where we seek to extremize the subtended angle θ, and more importantly its rate of increase as we follow the propagation vector, r. Equivalently, as stated, we are maximizing the entropy and minimizing the (Gibbs) Free Energy). Now flux tubes are not straight, they are curved. Solar flare flux tubes are semi-circular in configuration. (Well, we cannot specify the exact geometry from these discussions). Terrestrial flux tubes associated with electromagnetic circuits have got to start and finish at the one location, the source of the EMF, and therefore must have a net circular configuration. In the figure below, the helical electron has a component, v_{ax}, of its motion, identically the field vector dr/dt, whereupon we seek to maximize the angle θ subtended, and thus extremize the entropy according to Faraday's law.

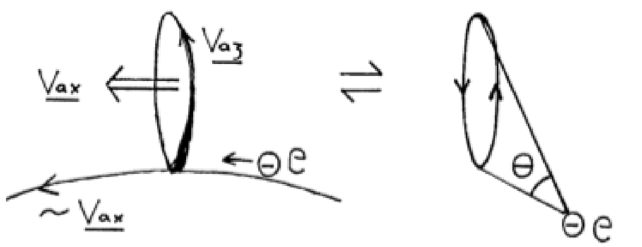

Figure 10: The helical fermion has an axial component of velocity, v_{ax}. The speed v_{ax} here defines a curved pathway, r, whereupon the rate of change of the angle θ is maximized

Now for all portions of the flux tube, we seek to maximize ∂θ/∂r for adjacent portions, x, y → 0. We are only concerned with the part of the trajectory infinitely close to a given cross-section of the flux tube, i.e. the cross-section at a given location on the flux tube. We are only concerned with the infinities, the description of the trajectory in the limit x, y → 0. In the vicinity of a given cross-section of the flux tube, we seek to extremize the EMF= - $d\Phi_B/dt$, such that we maximize

the observed rate of change of the total flux, that is, as the electron observes it in its path r. We are only concerned with the solutions of the differential equations we deduced, in the limit x, y → 0. The vector, v_{ax}, follows the vector, r.
Now in the twin paradox, applied to the cinema problem, we observed for both instantaneous acceleration and zero acceleration that $d^2\Delta t/dt^2$ is a constant across the region P → T. That constant being zero. That is, the rate at which Δt is paid back with time/distance does not vary across the region. We seek to make it vary *maximally*. So somewhere in between it is a maximum. We seek to maximize it. What if we similarly seek to maximize $d\Phi_B/dt$ in Faraday's law? In other words, back the energy, the EMF = $-d\Phi_B/dt$ as small, as negative, as possible. This is equivalent to making the entropy, the disorder, as *large* as possible. Perhaps thermodynamics is what drives Solar flare processes? And we are identically seeking to minimize dθ/dt in the cinema problem. Consider Figure 10 above.
On the helix, which defines a Solar flare, just like any kind of electromagnetic flux tube, if we increase v_{az}, then we decrease v_{ax}, because $\sqrt{(v_{ax}^2 + v_{az}^2)} = c$. Now if there is a constant linear density of charge along the helix, then if we increase v_{az} then we increase the internal axial field, E_{ax}. And if we reduce v_{ax} then we reduce the current J_{ax} associated with the helix, propagating dual Maxwellian photons, therefore also reduce the current associated with the internal charge carriers, weak-strong gauge bosons, so the dissipation J.E will presumably be invariant. Now J.E is the electrical dissipation, equally Power = VI Js-1 will be invariant. But we reduced the current, I, that is, J_{ax}! Therefore, we increase the potential, V. So, in conclusion, thermodynamics will be satisfied, entropy will be maximized, if v_{ax} is reduced as far as possible. That is, the physical conditions for the operation of a Solar flare flux tube are that its *helicity will be maximized*! And this condition for the operation of the Solar flare flux tube will simultaneously be met by the requirement that the flux tube is *curved*. Not a linear flux tube, connecting sunspots, that would be akin to a=1, maximal acceleration in the twin paradox, and not *overly curved*, that would be approaching a = 0, in the twin paradox, but somewhere, optimal, in between these two extremities. Check! Wrong about this! See below!

LORENTZ CONTRACTION

Insofar as increasing the observed angle increases the observed area but decreases the observed flux density such that the total flux Φ = BA is invariant as the observed increase in area with time/distance is maximized, once again, special relativity comes to the rescue. There is no way to define an electric or magnetic field, unless its flux density in the z- and y-directions is the same. Consider the ellipse with a flux of B to be maximized. The flux density in the z-direction is a constant, therefore so too in the y-direction, decided by the azimuthal current, which is responsible for the axial field, B.
So in the process of Φ maximization, we have a total flux Φ = BA, B invariant but A variable, such that the elliptical area A = π ×y×z, for a constant flux density. Consider the y-variation: the y-variation is at the heart of what separates this problem from the standard cinema problem, (x-variation, constant y). The velocity in the y-direction brings about a Lorentz contraction of field lines B in the x-direction. In the z-direction this does not happen. This change of flux in the x-direction is associated with variations in y, (Lorentz contraction), such that the elliptical area π × y × z is a variable of y not z and therefore the magnetic flux must be adjusted accordingly such that the flux before and after the Φ maximization transformation is unidirectional, i.e. equal, in the z- and y-directions.

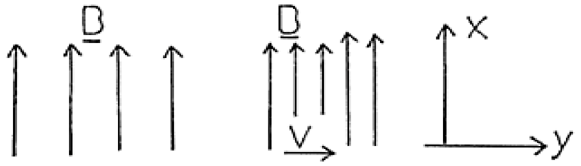

Figure 11: The Lorentz contraction of magnetic field lines of B

That is, we choose v_{axial} versus $v_{azimuthal}$ such that this happens, $|v_{ax} + v_{az}| = c$, i.e. the axial flux B has variations with y not x in this transformation, such that B_{axial} is the same before and after the transformation. So in the Faraday maximization process, the circular cross-section of the flux tube becomes an ellipse, A = π ×y×z. In the y-direction, the observed field lines B_{axial} become more spaced apart. To get them back into kilter, so that the flux density in the y- and z-directions is equal, we require the Lorentz contraction. Then for the total process, B_{axial} is a constant but the elliptical area expands as above, such that we maximize $d\Phi_B/dt$.

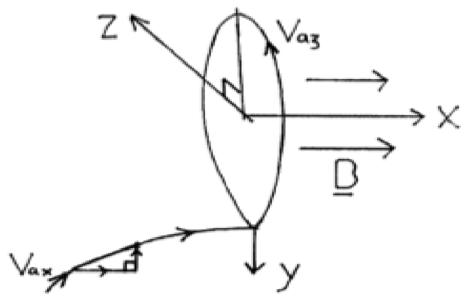

Figure 12: The axial electron velocity has a component in the y-direction, such that a Lorentz contraction of the axial magnetic field B occurs

So which cross-section of the flux tube are we concerned with? Where is our cinema screen? There are cross-sections right through the flux tube, from Solar flare foot point to foot point, from sunspot (+ve) to sunspot (-ve). We are concerned with the cross-section right in the middle of the flux tube, see Figure 10.
Now what is special about the location of this cross-section, apart from the fact that it is at the central position of the flux tube? It is where the electronic current is equal to the positronic current, and where the modulus of the electric charge density is equal to the modulus of the positronic charge density.
That is, where the net charge density is equal to zero. In an electric circuit, positrons come in at one end, and are

extinguished, exactly, by the time they reach the other side. Similarly, electrons come from the other side, etc. This is how it works:

Electronic current	J_e	$1/2J_{total}$	0
Positronic current	0	$1/2J_{total}$	J_p

And such that the net current, $J_{total} = J_e + J_p$, is a constant through the whole circuit. Finally consider Faraday's law, $E=-d\Phi_B/dt$. According to our analysis, $d\Phi_B/dt$ is to be maximized, not minimized, in order that a maximization of entropy drives the processes of electromagnetic flux tubes, the second law of thermodynamics. Accordingly, the cinema problem is associated with a maximization of θ, not a minimization. The cinema problem is at the heart of theoretical physics. We seek minimization of dθ/dt. But as the fermion approaches the (stationary) cross-section of the flux tube, when it gets beyond the critical point, θ is decreasing rapidly. Concerning the correlation between dθ/dt and $d\Phi_B/dt$, $\Phi_B = BA$, there is nothing we can do about the variation of the cross-sectional area A, but at least we can limit the variation of the component B, ∂B/∂t. As the fermion approaches the flux tube cross-section, it loses its y-component of velocity, such that the axial field ceases to undergo a Lorentz contraction. So consider the time rate of pay-back of time dilation deficit, dΔt/dt, or the spatial rate, dΔt/dx, it doesn't make any difference which, because the speed of twin 2, $v = -v_{init}$ in the region P → T. The rate is a constant (maximum) for a = 1, maximum acceleration a = ∞, and it is a constant (minimum) for a → 0. So, in between a = 0 and a = 1, the rate of pay-back varies with displacement x across the P→T region. Evidently it *decreases* with displacement, x. So, starting in the middle of the flux tube, in consideration of the *central* cross-section, we seek thermodynamic extremism, entropy maximization, in accordance with the discussions above. Well, to maximize dΔt/dt, or dΔt/dx, you simply go back to point P, right? That is, the electric potential between the central cross-section position, [e+] = [e-], $J_e = J_p = ½J_{total}$, total charge density ρ = 0, and a point somewhere in the flux tube, is extremized if you take that position in the flux tube all the way back to the sunspot. The positive sunspot, (protons), or the negative sunspot, (electrons), it doesn't matter which, we are just concerned with the modulus of the difference in potential between the central cross-section and the origin of the flux tube, the foot point, the sunspot.

Now we are in a position to make a telling statement about the twin paradox of Solar flares, specifically, the nature of the acceleration of twin 2, a=0, no reversal, no re-union, versus a=1, instantaneous reversal, re-union as soon as possible, and somewhere in between, which satisfies the thermodynamic extremism, and which describes the manner of operation of the Solar flare flux tube. In particular, you take two sunspots, one positive magnetic charge, and one negative magnetic charge. And you take a point somewhere in between, in fact at the central position of the flux tube, $J_e = J_p$, and you do a calculation of the force owing to these two clumps of charge, $F= (1/4\pi\varepsilon)(q_1q_2/R^2)$, or the potential $V= (1/4\pi\varepsilon)(q_1q_2/R)$. And you find you have a description of the moment in time that the flux tube is activated, that current starts to flow between the foot points. (James Russell Farmer, Physics honors Solar Flares project, 1998). But it is not clear whether this calculation describes a loop, as we know from observations is the manner of a solar flare flux tube, or a linear flux tube. It would appear to be the latter, in the absence of our cinema investigations. After I gave my honors talk to the Department of Theoretical physics, one academic, in fact the one who suggested I do physics honors after I went to show him some of my independent research, Chemical Physics, was trying to get his head around this. He couldn't see how it could be a loop. He was obsessed with proposition (b) in Figure 13 below.

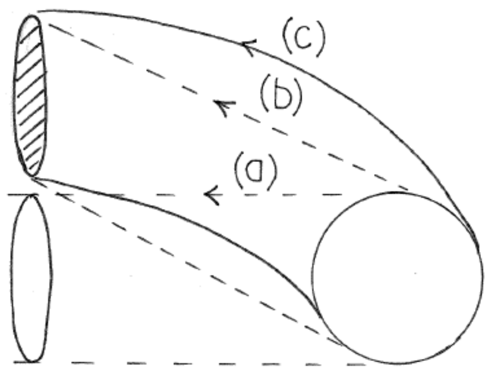

Figure 13: There are three possibilities for Solar flare flux tubes, in consideration of the acceleration problem in the twin paradox, (a), (b) and (c).

Firstly, you have (a), acceleration a=0, linear flux tube connecting Solar flare foot points by the most direct path. You never get to the shaded cross-section of the loop in question. The twin never gets to the re-union with his brother. No loop, just a linear electromagnetic flux tube, which cannot operate, due to the density of plasma at the radial position of the sunspot. A loop takes the propagation of the fermion out of this high-density plasma region, the Solar flare foot point occurs at the boundary between the high and low plasma densities. Then (b), again a linear flux tube, but this time connecting to the cross-section of the loop in question. Because you get straight lines and not curved lines, this corresponds to a = 1, infinite acceleration, in the twin paradox. Finally, (c), this is the observed operation of the Solar flare flux tube. It is somewhere between (a) and (b), and the exact nature of this interim position is afforded by thermodynamic extremism, the maximization of entropy. Finally, our electromagnetic flux tube is in the shape of a loop, it is no longer linear. And now, we know the reason for the existence of Solar flares!

LAPLACE'S EQUATION

Consider Figure 12 above. In respect of Lorentz contraction of the axial field lines, B_{ax}, through the center of the flux tube, we are concerned with the vanishing of the velocity component v_y of v_{ax}. That velocity affects the spacing of the field lines through the center of the flux tube, in the y-direction, by Lorentz contraction. But we have to deal also with their spacing in the z-direction. Well, in the limit v_y → 0, $v_{ax} = v_x$, you have, effectively, a *linear* electromagnetic flux tube. You forget all about the fact that it is shaped in a loop fashion. But even a *linear* flux tube is a three-dimensional entity, not two, so we expect a Laplacian in *three* dimensions, not two. So we bring z-variations into it. In the limit $v_y \rightarrow 0$, there is nothing to distinguish between the y- and the z-direction, they are equivalent, but the x-direction is something different altogether.

So what we said for the spacing of the axial field lines in the y-direction, we can say similarly for the z-direction. That is, if the spacing of the axial field lines, B_{ax}, decreases due to Doppler shift in the y-direction, it does so similarly in the z-direction. y- and z- are equivalent, if you say something about one of them, it applies simultaneously to the other.

In particular, if, in the cinema problem, we have $\partial^2\theta/\partial y^2 = 0$, then simultaneously we have $\partial^2\theta/\partial z^2 = 0$. And because y- and z- are entirely independent, *orthogonal*, (see below), then you have each of these independently to zero, a special case of the Laplacian $\partial^2\theta/\partial x^2 + \partial^2\theta/\partial y^2 = 0$. There is no interrelation between y- and z-. Now what about the x-component of the Laplacian? Laplace's equation is: $\nabla^2 V = 0$, or,

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2}\right) V = 0 \qquad (43)$$

(∇^2 is the Laplacian). We seek to put each of the three terms to zero, we have done that already for y- and z-. The first thing to address is that we are assuming the angle, θ, is representative of an electrical potential, V. Well, θ, which we have sought to maximize, represents an effective diameter of the flux tube. So it is representative of the magnetic flux, $\Phi_B = BA$, but for a *constant* flux density B_{ax}. Well, that constant flux density is wrought by our electromagnetic analysis above, whereupon we insisted on a constant linear spacing of fermions on the helix. And the azimuthal component of the velocity of these fermions on the helix gives rise to the central, axial field, B. So θ does indeed give rise to an electrical potential, V.

Because of Faraday's law, $V=EMF=-d\Phi_B/dt$. And this potential V is to be extremized, in exactly the manner that θ was extremized, in our cinema problem. What's more, the helix itself occurs in consequence of the extremization of the 4-vector (ct, x), which arises from Einstein's special relativity, which arises from electromagnetism. (Einstein's paper was called On the electrodynamics of moving bodies). But we need a *time derivative* of this flux, to make it a potential, which we certainly do have, because we are in fact in pursuit of extremizing dΔt/dt, or dΔt/dx, see below. That is, we have dΔt/dt = constant across region P → T, for a = 0, 1, such that we seek to extremize it, dΔt/dt variable = dΔt/dt(x) to be maximized, somewhere in between, and we have our Laplacian, in Laplace's equation, in correlation with a time derivative, which describes the operational condition of the solar flux tube, which operates exclusively at this set of parameters, dependent only on the quantity of charge stored at the most charged foot point and the distance between the two foot points, in contrast to a terrestrial electromagnetic circuit, whose operational condition is completely arbitrary. You can choose whatever voltage, resistance and current you like, in the terrestrial circumstance. Or, you can say dΔt/dt(t) becomes a variable, which we seek to extremize, $d^2\Delta t/dt^2 = 0$, as above. And it all holds together because we seek to extremize EMF, that is, $V = -d\Phi_B/dt$, and in so doing we achieve thermodynamic extremism, of the entropy. Bringing us to our final conclusion, since the y- and z- components of the Laplacian go independently to zero, then so does the x-component, $\partial^2 V/\partial x^2 = 0$, to satisfy the three-dimensional Laplacian, in Laplace's equation (43) above.

And, you will recall, we went to *enormous lengths*, in our discussion of the cinema problem, to confirm $\partial^2\theta/\partial x^2 = 0$. Introducing a new mathematical theorem to build on l'Hôpital's rule, no less, whereupon some absolutely *crazy* conclusions can be made about what quantum field theorists have been doing with their renormalization, and about the role of infinities in physics.

WHAT IS THE MEANING OF ACCELERATION A = 1 = ∞? THE TWIN PARADOX

So, in our analysis of the twin paradox, we instituted an infinite acceleration designated by a = 0/0 = 1. The reason being, for it, that it was the only way to get a simple, meaningful physical result out of something that was seemingly too complicated otherwise. So how do you arrive at this? For comparison, in QTE, we proposed that the mass of an electron as it is accelerated to the speed of light, becoming a photon, is $m = m_o/\sqrt{(1 - v^2/c^2)} \rightarrow 0/0 = m_e$, as $v \rightarrow c$ and m_o: $m_e \rightarrow 0$.

It was just a proposition that held the promise of getting some useful physics. It wasn't until much later that it occurred to us, well we know the rate at which the Lorentz factor $\sqrt{(1 - v^2/c^2)}$ goes to zero as $v \rightarrow c$.

Well, if we knew the rate at which the rest mass m_o went to zero as $v \rightarrow c$, then we could confirm our designation of the mass of the photon having been activated from the zero-velocity frame of a massive electron/positron is m_e, such that the mass of a photon in the naked Reverse Higgs process is m_e, and the frequency of such a photon is given by: $h\nu_e = m_e c^2$. And presto, we have that $m_o(v)$ variation, it is given by:

$$E^2 = (pc)^2 + (m_o c^2)^2$$

$$= [\frac{m_0 v}{\sqrt{1-\frac{v^2}{c^2}}} \times c]^2 + (m_0 c^2)^2 \qquad (44)$$

whereupon you make m_o the subject, putting the two m_o terms together, to get $m_o(v)$, and subsequently evaluate the photon mass:

$$m(photon) = \frac{m_0(v)}{\sqrt{1-\frac{v^2}{c^2}}}, \qquad (45)$$

and $E = h\nu = m_e c^2$, and you find m(photon) = m_e, in the limit $v \rightarrow c$. Very simple, very profound. So, can we do a similar sort of thing for the twin paradox, a = 0/0 = 1 = ∞?

In consideration of Figure 9, above. For a smaller acceleration, a → 0, we have a higher gradient at the start of the P → T trajectory. That is, from the point in space where the acceleration begins, whether it be instantaneous reversal or whether it be non-infinite acceleration, whereupon twin 2 has to travel some distance into the negative displacement region, before reversing and returning to point P, to complete his journey, ultimately, at v= $-v_{init}$.

Whatever the acceleration, however large the journey into negative displacement journey, the final part of the journey, P → Q, is achieved at velocity v= $-v_{init}$, but nevertheless the entire trajectory, including the negative displacement part of it, is described by the trajectories in Figure 9. Three of them. a = 1 (= ∞), a → 0, (dashed line), and something in between.

Now the rate of time dilation payback, dΔt/dt, is represented by the abstract velocity, v.

If it is absolutely vertical, (in the y-direction), it never gets off this trajectory, twin 2 never rendezvous with twin 1, and furthermore, the speed v along the trajectory is zero. This is as opposed to a *horizontal* trajectory, i.e. entirely in the x-direction, the abstract speed v = ∞, the rate of payback Δt/dt is a minimum, in fact it is zero. Perhaps we should be in consideration of a *displacement* payback, dΔt/dx, because then the rate, for a → 0, is zero, because v = 0. And if for a ≠ 0, but a → 0, at the rendezvous point, the trajectory is approaching horizontal, the rate of payback near the rendezvous point is approaching zero. So we start out in some intermediate trajectory, 0 < a < 1.

In the case of Solar flares, there will be a one preferred trajectory out of an infinite number of trajectories in this region. That trajectory will be the manner in which the thermodynamics are extremized, and it corresponds to the helicity of the flux tube being maximized, yet *not* reaching infinity, not achieving $v_{ax} = 0$, $v_{az} = c$. There is some factor which we have not yet ascertained which brings the helicity to a maximum before that happens. In fact, a considerable time before that happens, as we observe the Solar flare helicity in magnetograms, and it is a *long way* from infinite helicity.

For starters, the dimension of a Solar flare is enormous, and secondly, we are far removed from the case of terrestrial electromagnetic flux tubes, whereupon the helix is wound up so tightly that we do not observe anything other than B_{az}. And this fact has been a thorn in the side of terrestrial electromagnetic theorists, it has prevented them from appreciating that electromagnetic circuits are a special case of the more general electromagnetic helix.

All Maxwell's equations are telling us is that the integral around an azimuthal field line is in proportion to the current it encloses, such that the magnitude of these azimuthal field lines B_{az} is inversely in proportion to distance from an axial current, and there is nothing, either experimentally or theoretically, to indicate these magnetic fields could have an axial component.

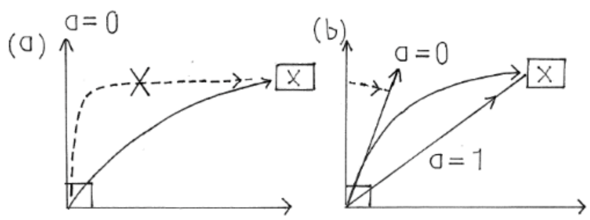

Figure 14: We start out, (a), with a = 0, a vertical trajectory. It doesn't even get onto the dashed line, the low acceleration limit, a → 0. And it is stationary in this abstract space, v = 0. Now you give acceleration an increment of nonzero acceleration. You rotate that vertical vector representing a = 0 by a certain amount, as in (b)

So, institute a reversal, nonzero acceleration, then the twin 2 vector achieves a horizontal component. (pure horizontal would represent v = ∞, in this abstract space, see discussions above). If we go all the way to a = 1 = ∞, then we rotate the acceleration vector all the way until it is connecting P linearly to the rendezvous point, point T. So, as shown in Figure 14, as you increase a from zero towards a = 1 = ∞, you in fact rotate the a = 0 vector, such that it is no longer strictly vertical. Trajectories along this a = 0 vector are still vanishing in terms of the abstract velocity v. But that occurs only at the origin. As soon as you get past t = 0, you get off this linear trajectory, however infinitesimally, and v continues to increase from there. Twin 2 travels to his destination, his rendezvous with twin 1. At ever decreasing rates of dΔt/dt pay-back, as the gradient of his trajectory decreases. As a → 0, the payback dΔt/dt approaches zero as the journey comes to its conclusion. Or perhaps approaches a nonzero minimum in line with some handling of zeroes and infinities that we have not completely grasped at this point.

As a → 1 = ∞, we approach a constant rate of payback with time/distance, dΔt/dx, or dΔt/dt → constant in the trajectory P → T.

So, let's start at a = 0, vertical acceleration vector. Rotate this a = 0 vector *all the way* until this vector connects linearly to destination, rendezvous point, that is, a description of the journey a = 1 = ∞. So you have *two vectors, superimposed*. One represents infinite acceleration, the other represents *zero* acceleration. And they are both super-imposed! The vector is both zero and infinity! So what do you do? You multiply it by itself! The magnitude, squared, of this vector is:

$$0 \times \infty = 1! \qquad (46)$$

So, *all by itself*, it satisfies the normalization condition. In quantum mechanics, one *normalizes* wavefunctions, so that their integral over all space is:

$$\int \psi_1^* \psi_1 \, d\tau = 1. \qquad (47)$$

In this manner, there is a probability that an electron will be located somewhere in space, the integral is over all space. The wavefunction is normalized. If you introduce a *second* electron, say in a secondary Schrodinger orbit, then similarly this second electron, whose wavefunction we designate ψ_2, will also be normalized. And the net overlap, the net interaction between the two electrons, is:

$$\int \psi_1^* \psi_2 \, d\tau = 0. \qquad (48)$$

The two wavefunctions, corresponding to the two electrons, are said to be orthogonal, constituting no net interaction. So when you employ the Schrodinger equation, for *multiple electron atoms*, the electromagnetic potential is just a radial function of the nuclear charge, $V = (1/4\pi\varepsilon) \times q_e^2 Z/R$, where Z is the nuclear charge. You do *not* have to include electron-

electron repulsion in the potential term V, which becomes V(R), since there is no net interaction between any two electrons. They are orthogonal! Physicists and chemists have tried to do this, account for electron-electron repulsion. They have come up with nothing more than approximations, and they have been barking up entirely the wrong tree.

Now orthogonality of wavefunctions, such that they are what we call orthonormal, that is, orthogonal to one another and *normalized*, has a direct correspondence with ordinary vectors in Cartesian space. A vector x in the x-direction, and a vector y in the y-direction, and a vector z in the z-direction, are all orthogonal to one another, that is, their dot product among themselves is zero:

$$x \,.\, y = 0,\; x \,.\, z = 0,\; \text{ and, }\; y \,.\, z = 0 \qquad (49)$$

Further, if we choose to make them ortho*normal*, then their magnitudes are 1, just as in the case of Schrodinger wavefunctions:

$$x \,.\, x = y \,.\, y = z \,.\, z = 1. \qquad (50)$$

That is, unit vectors. So, finally, we have a reason for the fact that the vector we have designated as a = ∞ in fact has a length of *one*, that is, infinite acceleration is designated as a = 1, in the twin paradox, and in the cinema elevation problem, and in Solar flares. Finally, we investigate this somewhat perplexing matter of a = 1 = infinity with reference to gravitational considerations, since we are in the business of unifying special and general relativity into ultimate theory of relativity, whereupon we cater for accelerations not just of a gravitational nature, such that general relativity just becomes a special case of accelerations in general. One cannot go too far in attempting to justify a = 1 = infinity.

THE TWIN PARADOX – INSTANTANEOUS REVERSAL/INFINITE ACCELERATION IN THE REALM OF GRAVITATION

So we have, in the Aether theory of the twin paradox, the unification of special and general relativity, that twin 2, the accelerating twin, undergoes an instantaneous velocity reversal, after time = t, of, $a = 0/0 = 1$ = infinity. So in what manner does a = 1 signify an infinite acceleration? Well, consider zero acceleration, a = 0. Then:

$$0 \times \infty = 1 \qquad (51)$$

So with regard to *zero* acceleration, a = 1 signifies an infinite increase in acceleration, from a = 0. Most particularly, the acceleration of twin 2 doesn't have a meaning, except with regard to the inertial phase, a = 0. Without the inertial phase, a = 0, F(a) doesn't even come into consideration. That is as opposed to an arbitrary Newtonian acceleration, where the inertial frame does not necessarily come into consideration. In applying Newton's law, F = ma, we are only concerned with the acceleration, there is no reference to any inertial phase which came before the acceleration. Similarly in General Relativity, consider a clock stationary in a gravitational field. This is equivalent to the accelerating twin 2 in the twin paradox. The clock is ticking at a certain rate, but this is meaningless unless referred to another frame, an *inertial* frame. That is, it is meaningless unless referred to a frame outside that gravitational field, or in free fall in that gravitational field, at that same location. So:

$$0 \times \infty = a = \frac{GM}{R^2} \qquad (52)$$

by analogy with what happens in the twin paradox. It is not a = 1, it is a = GM/R^2, but that is a trivial matter. What is *not* a trivial matter is the fact that this does *not* signify an infinite acceleration! What is different about this case from the case of the twin paradox? Consider the gravitational inertia frame, the frame where a body is in free fall, at that location. This is equivalent to the non-accelerating phase of twin 2, the outward journey at velocity v, for time t. But what is the speed in the gravitational inertial frame, to correlate with twin 2 moving at v_{init} on the outward journey? It is undefined! There you have it, that is what separates the two cases, the twin paradox versus the case of General Relativity. In the twin paradox case, an infinite acceleration is made possible by the fact that in the inertial frame, the velocity is defined. The instantaneous reversal of twin 2 is a *reflection* of the fact that velocity is defined in the inertial frame!

That is, we have seen that for 0 × ∞ = 0/0 = K, the value of K is dependent upon the relative rates at which the numerator versus the denominator go to zero. Well, in the case of the twin paradox, since we know Δv = 2v, then we can work out the rate that the acceleration goes to infinity, upon instantaneous reversal. It depends upon the value $v = |v_{init}|$. Such a thing is not possible in the general relativistic equivalent. That is why 0/0 = GM/R^2 cannot signify an instantaneous reversal, an infinite acceleration, in the general relativistic case.

DISCUSSION

Really it has been a matter of un-fathomed fortune that our investigations of the cinema viewing problem, undertaken just as a matter if curiosity at moments that could otherwise have been idle has progressed into a fully-fledged theory of Solar flares and in accompaniment with a new area of physics which we dub the Ultimate Theory of Relativity. Again, an extreme matter of fortune that I was contacted by Muhammad Aslam Musakhail, requesting that I work on his Closed fluid dynamic principle with him. Without that, it would not have been possible to fully solve the twin paradox, it would have been impossible to propose an Ultimate Theory of Relativity, and it would not have been possible to bring my investigations of Solar Flares to a satisfactory conclusion. The mathematics of the cinema viewing maximization problem only involves straightforward differentiation, but nevertheless is quite intricate, and to make something physical out of them, the only possibility was to simplify using infinities. Exactly the same as for our twin paradox investigations in Theory of Everything. And lo and behold, the two infinity investigations came together. The twin paradox will henceforth, eternally, be a measure of a new area of physics, the unification of Einstein's special and general relativities, Ultimate Relativity, and in connection with Muhammad's Aether theory, and, to boot, this Aether dynamic lies at the basis of the dynamics of Solar flares. Physicists currently know nothing, theoretically, worth speaking about, with regards to Solar flares. Solar flares are not currently understood is the sort of comment you are likely to find in the literature. The reason for this is that they do not understand about something we have been investigating for a long, long time, decades, in fact. And that is, the electromagnetic flux tube. Physicists do not understand that such a thing exists, by the fundamental laws of physics, and that a terrestrial electromagnetic circuit is one version of it, and a Solar flare loop is another example of it. The helical configuration of a magnetic field comes into existence according to the existence of what are known as 4-vectors. But you have to *extremize* 4-vectors, in the same way we extremized our viewing angle in the cinema problem, and in the manner we extremized the thermodynamic entropy to put the solar flare firmly into the realm of Ultimate Relativity. And physicists have not done this. Perhaps the reason why they have not been *inspired* to do this is that the surface helix magnetic lines of a terrestrial current are so immensely tightly wound that there is no manner, theoretically or experimentally, to observe any axial component. Physicists are laboring under the mis-apprehension that the magnetic field lines around a current are *entirely azimuthal*, (they *close in upon themselves*), and this is hugely stalling their progress, they do not see the helix, therefore they do not see the electromagnetic flux tube. Ironically, they *do* see the helix in observations of solar flares, with magnetograms, but because they have not got their thinking caps on about matters of terrestrial electromagnetism, they do not see the connection. About the only useful thing physicists are doing with respect to Solar flare theory is investigating the nature of magnetic reconnection, and in the words of Bob Dylan, a train-load of them bogged down in a magnetic field. We have made some interesting conclusions about magnetic re-reconnection, and that will appear in the PhD thesis, and the topic did not go un-mentioned in the honors project, 1998. Well, it's ironic that they are investigating magnetic reconnection when the mistake they are making is in the proposition that the azimuthal field lines, B, in electrical circuits connect to themselves, when in fact they do no such thing, they are a continuous, helical entity, extending from one end of the conductor to the other.

Myself, I have been led to these conclusions owing to a number of factors. My MSc studies in quantum field theory, string theory, and supersymmetry. My MSc dissertation in M-theory, and the opportunity Muhammad has given me to work on his Aether dynamic principle. Finally, on the matter of my net tertiary studies. They can kick me out of a PhD, put on hold my progression as a research physicist, but they cannot stall my progress to glory. In the absence of an opportunity to do research in an official physics department, I occupied myself with further coursework studies, culminating in five coursework degrees, two BSc degrees, one masters in science, one masters in agriculture plus diploma in sustainable horticulture, (Unitec, Auckland). And additionally occupied my time with personal research endeavors. Such that by the time I finished my coursework studies, 2019, my research mind was razor-sharp like possibly no mind ever was, such was the misfortune that fell upon me with my PhD expulsion at the end of 2005, an academic misfortune and the path to digging oneself out of it having probably been unrivalled before, or since, or ever.

CONCLUSION

If there is one thing in this paper that stands out as something that was worth investigating, and has been successfully investigated, it is the assertion, in the twin paradox analysis, that infinite acceleration, instantaneous trajectory reversal, can be represented mathematically by $a = 1$. This proposition was the only way out of quite considerable mathematical difficulties in the twin paradox theory put forward in Theory of Everything. Similarly, certain conclusions about infinities, culminating in no less than a new mathematical theorem, provided a way out of some difficult mathematical matters in this paper, On the Aether dynamics, Twin Paradox and Ultimate Relativity of Solar Flares. It was a most pleasing matter to be able to propose a new theorem not in physics but in *mathematics*! And finally, to stumble onto the meaning of $a = 1 = \infty$ in the twin paradox, after investigations that served to link the twin paradox to matters of Solar flares, via the cinema extremization problem, well that was something really special! Finally, the entire premise of the paper came to a conclusion insofar as the realization was made that the paper, ultimately, is in consideration of Laplace's law of electromagnetism.

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