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Examining and Dismissing the Arguments for the possibilities of Superluminal Travel as posited by Einstein, Minkowski, Cox, Forshaw, Hawkins and others

ABSTRACT

This thesis seeks to demolish any ideas concerning the possibility of reaching far distant stars within a human lifetime; showing that such fallacies are founded on faulty thinking. I demonstrate why this tempting idea is sadly not at all a possibility.

The ambitious explanations for the possibility of tampering with the passage of time and with making malleable spatial distance are rooted in Einstein's Special Relativity. They involve manipulating the model of spacetime and the exploiting of questionable time and space dilation.

I examine these claims and find fault with several premises and with the many experiments on which these assertions are based, maintaining that erroneous arguments have been accepted as a certainty for this conjecture.

KEYWORDS

Alcubierre, Andromeda, black holes, Cox, Einstein, Forshaw, geodesics, gravitational lensing, Hawkins, light, light clock, Mathematics, Minkowski, spacetime, spatial dilation, Special Relativity, superluminal travel , time Dilation, twins, warp speed travel, wormholes,

CONTENTS

CHAPTER ONE

Time and Space Dilation examined.

I hope, in this chapter, to get to a position where we can clearly deconstruct the mathematical equations and the illustrated theories of Time Dilation.
It is the interconnected predictions of time being flexible and for being dissimilar for different observers which purport to allow journey distances, for a spacecraft, that can be accomplished more quickly than light could achieve.
Therefore I start by studying, in detail the misconceptions within Einstein's Special Relativity, especially where he uses the idea of time dilation as the cornerstone of the concept of spatial dilation.

The pages of Wikipedia, Hyper-physics, Fourmilab, Einstein-online, et all, and physicists such as Stephen Hawking, Brian Cox, Jim Al-Khalili, Russell Stannard and hundreds of others, all expound their belief in the reality of time dilation and their concomitant conviction about superluminal travel.

This widespread confidence is almost entirely based upon Einstein's employment of the famous Pythagorean theorem to a 'thought experiment' of fast travelling parallel mirrors, whereby the track of light represented by the hypotenuse corresponds to the 'time' understanding of one observer, whilst the shorter upright arm represents the 'time' understanding of a second observer.
This is incorrect conceptually.

Remaining 'proof' arises from inconclusive experiments (see chapter 2) and from mathematical equations (see chapter 3) which are again founded, erroneously, on the above Pythagorean assumption and are, therefore, also faulty.

Unfortunately, the idea of spatial dilation for specific frames of reference is a *direct* consequence of the time dilation concept and it is the belief that spatial distances can be manipulated that has allowed for the proposal of super-fast space travel. In this essay I will demolish all pertinent principles in current thought to prove my point.

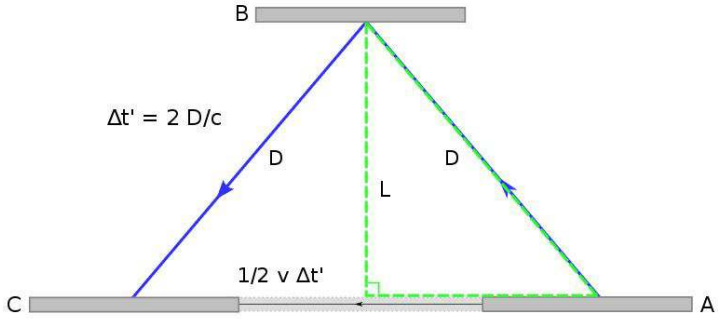

Diagram 1; A reminder of Einstein's maths, on there being a time difference for two observers.

So let's examine this issue first. The concept: a light clock.

"Light bounces between two travelling parallel mirrors. A traveller, with the mirrors, sees the light bounce (tick) between those mirrors over distance L. A distant observer experiences the time as being distance D. Therefore, as light speed is a constant, the outsider observer sees the traveller's clock as running more slowly than his own."

DIVERSE TIME 1. THE LIGHT CLOCK

Let us imagine a beam of light traversing two counties in the UK., rather than reflecting between adjacent mirrors in a railway carriage or within a speeding spacecraft. In this case the light is projected from Cromer in Norfolk, to Aberdeen in Scotland; a distance of 510 miles.
Two opposing mirrors, one at each location, have been set up on identical sliding tracks, correctly situated to face one another by the use of Global satellites.
The two tracks, which enable the mirrors to slide sideways, are built on beaches, both being at the same height above sea level. These two tracks are of the same length as each other and both have serrated interfaces that engage with a cogwheel drive from matched motors. The mirrors face each other perfectly and can be moved to the left and right in perfect synchronisation.

A light pulse can cover this distance in 0.00255 of a second.
If the southern mirror is only partially silvered, a powerful laser beam can be pointed through the centre of that Cromer mirror, aiming towards the centre of the Aberdeen mirror. From this a bouncing light beam is set up.

The Earth's equator turns at approximately 1000 miles per hour
The Earth moves around the sun at approximately 112,500 miles per hour
The sun travels at 540,000 mph, etc etc.

Slightly depending upon whether these speeds are cumulative or subtractive at the time, it can be seen that the target in Aberdeen will not move out of the way of the approaching light beam, during the pulse's rapid travel, by any significant amount, such that the laser's beam will very nearly hit the Aberdeen mirror's centre point.

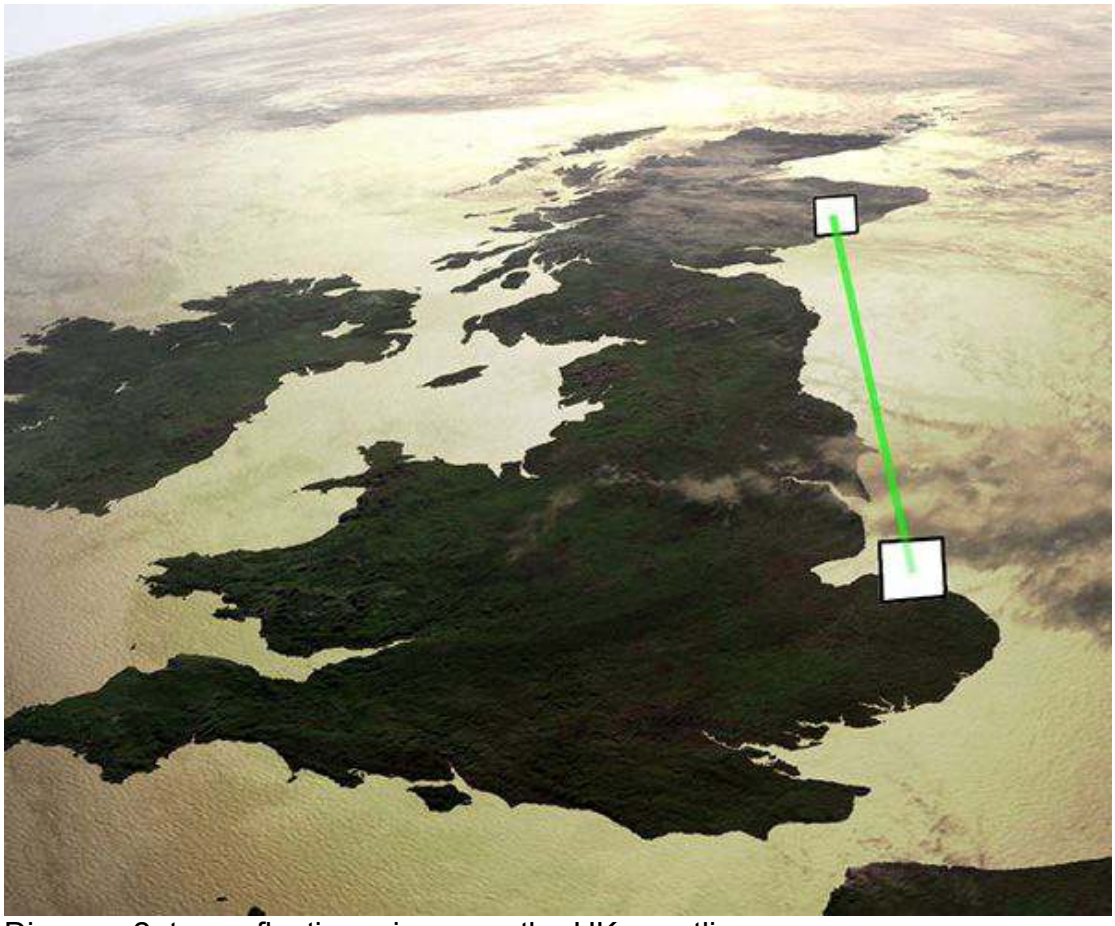

Diagram 2; two reflecting mirrors on the UK coastline.

So, here we have set up a large and horizontal version of Einstein's "light clock", as the beam is continuously reflected between these two distant mirrors.

Next we engage the motors and propel both mirrors, synchronously, to the West. The light beam does not "know" the mirrors are moving. Light has no inertia so is unaffected by the mirrors travel. The planes of the mirrors still face one another perfectly, so the beam must still traverse the distance between the mirrors over exactly the same latitude and longitude coordinates as it did when first set in motion.

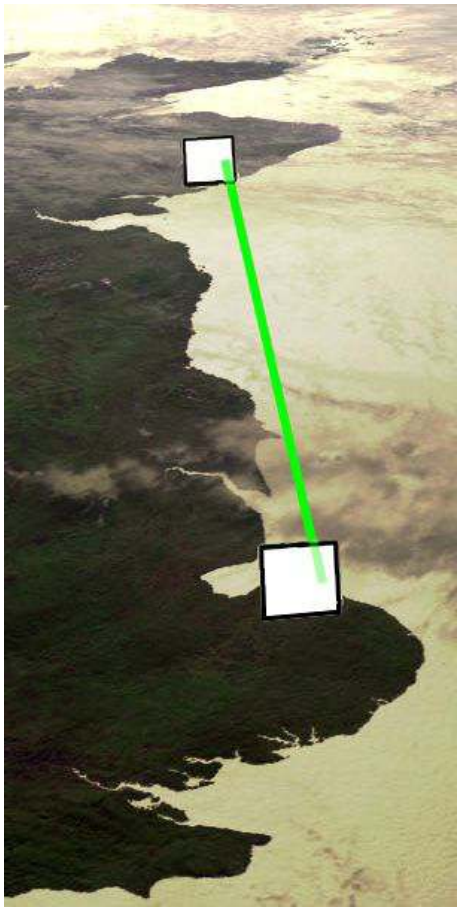

Diagram 3; the mirrors are driven to the west.

The result of this displacement of the mirrors is that the light beam is no longer passing from the centre of each mirror, but is bouncing back, still from matching points, but slightly to the eastern edge of the mirrors.

It can be seen that if these two opposing mirrors continue to be driven an equal distance to the West, the bouncing beam will finally be released, escaping from the eastern edge of one or another of the mirrors.

The point of this 'imaginative trial' is to show that Einstein's own 'thought experiment' employing a "light clock" of a beam bouncing reflectively between two mirrors is flawed, *especially* when he attempts to move the clock away from its initial position.
To use such a clock to demonstrate that, *in motion*, light within the clock will have further to travel (as experienced by an outside observer) than a 'static' light clock, does not compute, *as the beam just cannot ever be moved,* even although the mirrors can be. Further to this a light beam hitting a mirror at right angles can never reflect obliquely.

In addition, should the above mirrors *never* be driven sideways on their tracks, the reflecting light beam will, inevitably, still 'fall off' one or another mirror, as these mirrors are, of course, moving 'in global space', (out of the route of the beam). Those mirrors, therefore, are not 'static', relative to the rest of the galaxy and beyond, whereas the reflecting beam itself will be consistently 'trapped' in its original global path. (as in diagrams 11 and 12)

We must agree, therefore, that a beam cannot be 'dragged' by the mirrors and that a beam has no 'knowledge' of their independent movement, whether created by motor drives or their travel within the cosmos.

The incorrect assumption of Einstein in this matter is *so important* that we *have fully to dismiss* the employment of a right-angle triangle as a 'proof' of differing time spans for differing referential frames.

Therefore, let us build a small version of the Cromer / Aberdeen system, (in keeping with Einstein's drawings) which I will continue to refer to as a "light clock". (diagram 4)

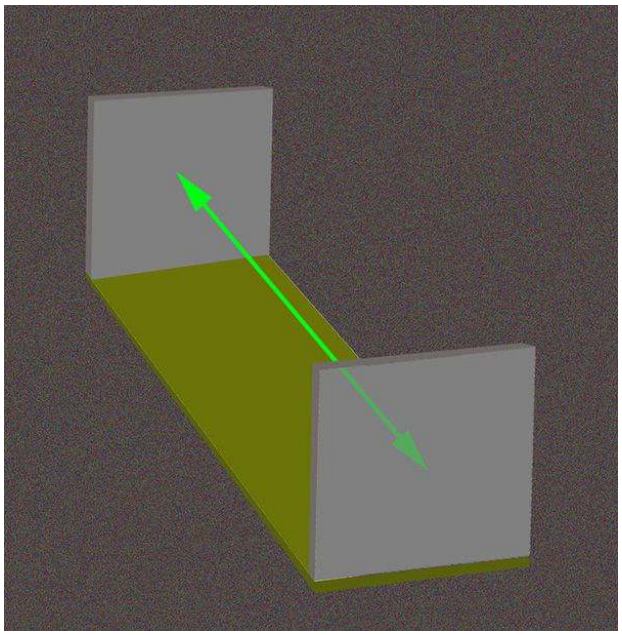

Diagram 4; "light clock"

The whole basis of time dilation relies on a premise that cannot work *ever*, therefore no theory can be based upon it.
We have discovered that moving the unit from diagram 4 *across* the line of the beam forces the beam to move towards the edge of the mirrors, (diagram 5) finally to escape when the mirrors are moved too far to contain the beam.

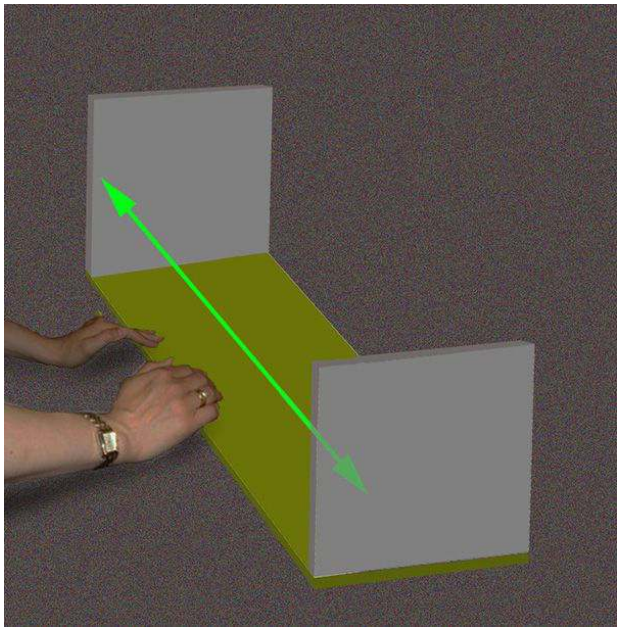

Diagram 5; a "light clock" pushed against the direction of beam path. One more push and the beam will 'escape'.

However, clearly, until planetary movement allows the reflecting light beam to escape anyway, we *can* move the mirrors for and aft along the 'extended' line of the light's direction of travel, as the two mirrors will continue to bounce back the light from their centres.

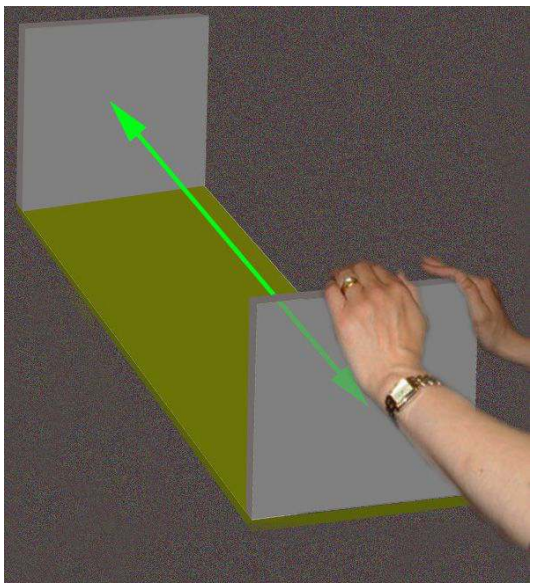

Diagram 6; "light clock" pushed in direction of beam path

Also, if continuing to lie on a flat plane, the two-mirror unit *may also be spun, on the spot* whilst the beam continues its back and forth travel between the mirrors, which therefore stay, during this particular movement, *parallel* to one another. They continue to bounce the beam back at 90 degrees from each of their surfaces.

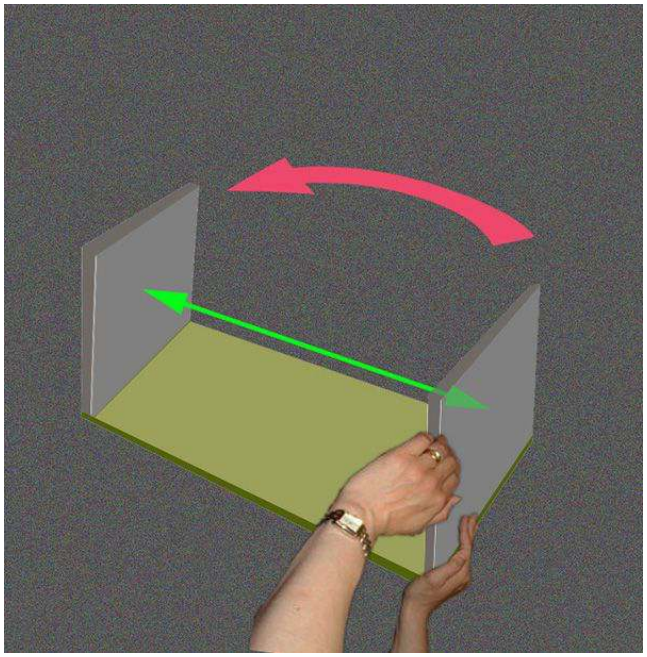

Diagram 7; "light clock" twisted, such that mirrors remain parallel to one another.

Astronauts on the International Space Station are travelling at 27,600 kilometres per hour, relative to the Earth (which is 400 kilometres 'beneath' them), yet are unaware of their relative velocity. Likewise, a mirror system, such as we have been examining, should it be hurtling through regions of space, would also have no 'knowledge' of how fast it was travelling, as knowledge of 'speed' requires data regarding relative time and distance, both of which would be unknowable.

Therefore, whilst in longitudinal flight and whilst accommodating any sideways movement required in order to keep the beam centralised to the mirrors, away from the effects of planetary movement, the 'trapped' beam will maintain its light speed reflections.

Therefore, basing a hugely wide-reaching hypothesis on the *completely* flawed concept regarding the behaviour of a travelling "light clock" has led to very many subsequent incorrect conclusions, all of which need to be reassessed.

It is *useless* to conceive of a theory which requires the exploitation of a property which is *physically impossible*. It would be like suggesting that 'if light beams passed through solid objects we could learn something intrinsic about the construction of those objects'.
Light cannot pass through any solid object, so to try and learn something from the 'if' is meaningless. To claim to have proved anything from the impossible criteria of an oblique reflection is similarly worthless.

We can hereby *completely refute* Einstein's idea of using Pythagoras to determine a greater travel distance, and travel time, for a moving bounced light and this impacts severely on the notions of superluminal space travel.

DIVERSE TIME 2; CONFLICTING EXPERIENCE

There is one other pertinent "thought experiment" which employs a false concept that we should examine and refute here.
This is the experiment describing a central light flash occurring in a fast moving train carriage, and how it may be viewed or interpreted differently by two observers.
The idea purports that for a travelling passenger the light from the centrally occurring flash will appear to hit both front and rear of his carriage simultaneously, whilst for an outside observer the light will strike first the rear, approaching carriage wall, before the flash hits the front retreating carriage wall.

This presumes that the source of the flash, for the passenger, *stays* at a central point in the travelling carriage, when, in fact, it corresponds solely to the railway sleeper over which the *source* of the flash was passing when it flashed, meaning that the experience for *both observers* is that the flash hits the rear wall first.

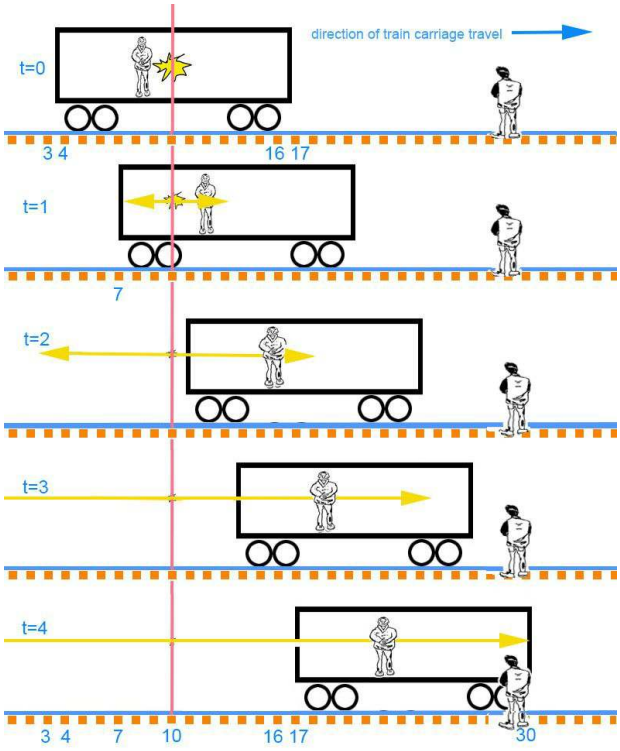

Diagram 8. the similar experience of a passenger and an outside observer regarding a 'central' flash of light in a travelling carriage.

OBSERVING LIGHT BEAMS

Any light beam's origin; its source, clearly has a definite location in the whole vagaries of space, and that place has to be common *to any observer* whether obvious or not.

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There is no such thing as an absolute frame of reference in which we can subsequently locate, positively, the source's initial position Once the source has emitted its beam of light, the source's true, global, location can never be exactly determined again.

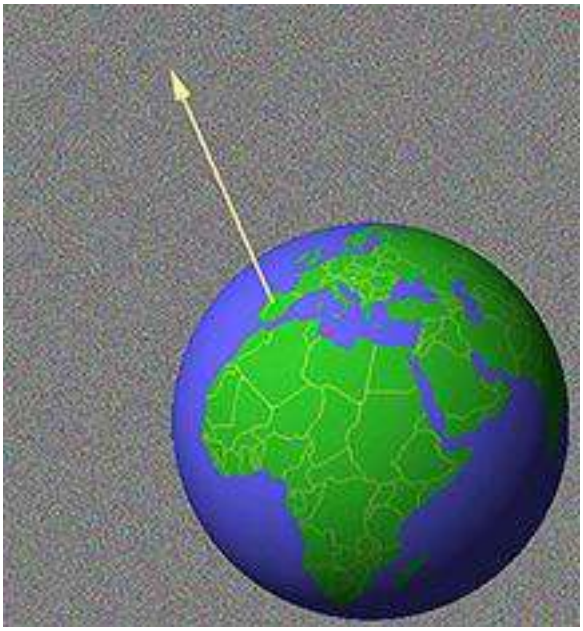

diagram 9. a pulse of light emitted from Madrid, Spain.

Stephen Hawkins asserts that; "A pulse of light is emitted at a particular time and at a particular point in space, then, as time goes on it will spread out as a sphere of light whose size and position are independent of the speed of the source."

In diagram 9 a beam of light is sent into space from Madrid, Spain. From the moment of its release, the *source* of that beam is subjected to movement away from its initial location by the rotation of the earth, by the movement of the Earth around the sun, and by the sun's path through the cosmos, etc.

Diagram 10 has a group of Spanish physicists watching beams being emitted from a transmitter in Madrid. If they could be bothered to continue to watch these emissions for three and a half years, (or until whenever) with twelve beams of light being generated each year, nothing would obviously change for

those observers; the pulse would continue to be dispatched, upwards, from the same source in front of them.

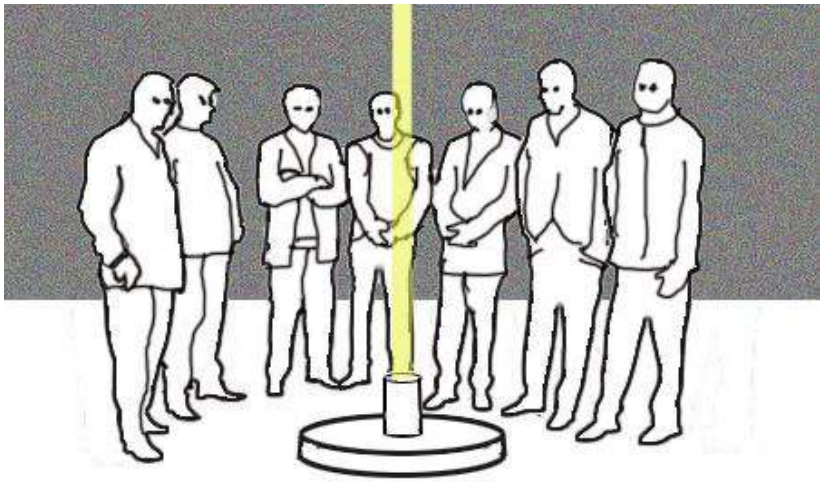

Diagram10; a group watch beams being emitted from a source.

However, observing the planetary movement outlined in diagram 11 below we can understand what another observer would see of the beams emitted from Madrid, over a three and a half year period, should he be standing on Alpha Centauri.

Clearly, the light's initial *trajectory* cannot be *altered* by the constant relocation of the source. Once released, that beam and the path it has taken, and is taking, is totally independent of the (now displaced) source. Any light ray, once emitted, is no longer affected, or influenced by, its source's changing location.

In the three and a half years of planetary movement, shown below, the *actual* location, in the whole void of space, of that original Spanish light source, is far, far away from where it was when that beam was released from it.

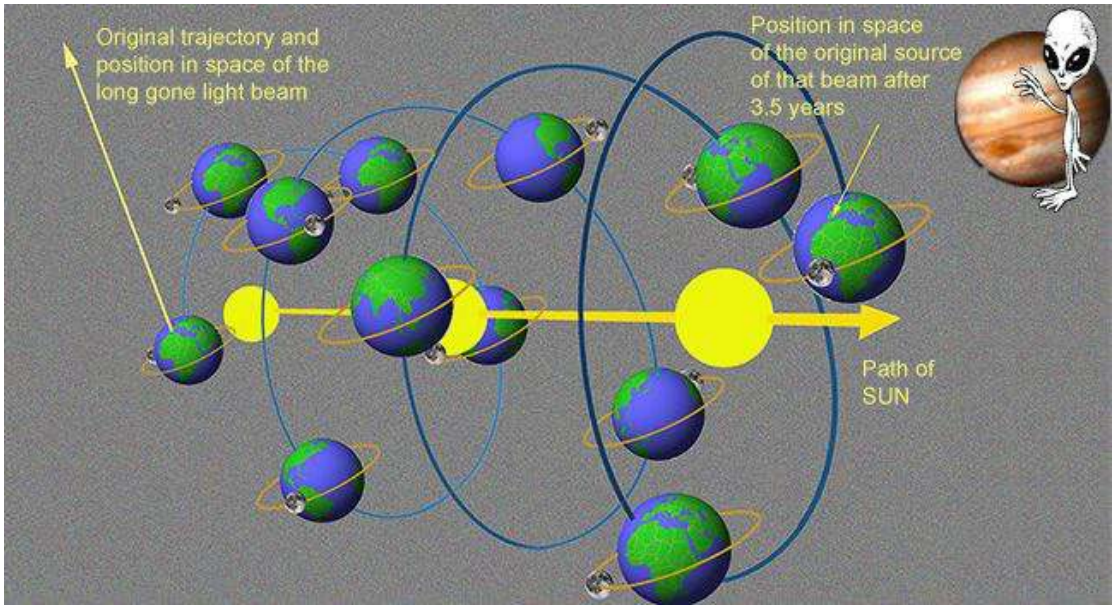

diagram 11; beam tracks emitted from the same Spanish source as seen by an observer on Alpha Centauri, as the Earth moves through the cosmos.

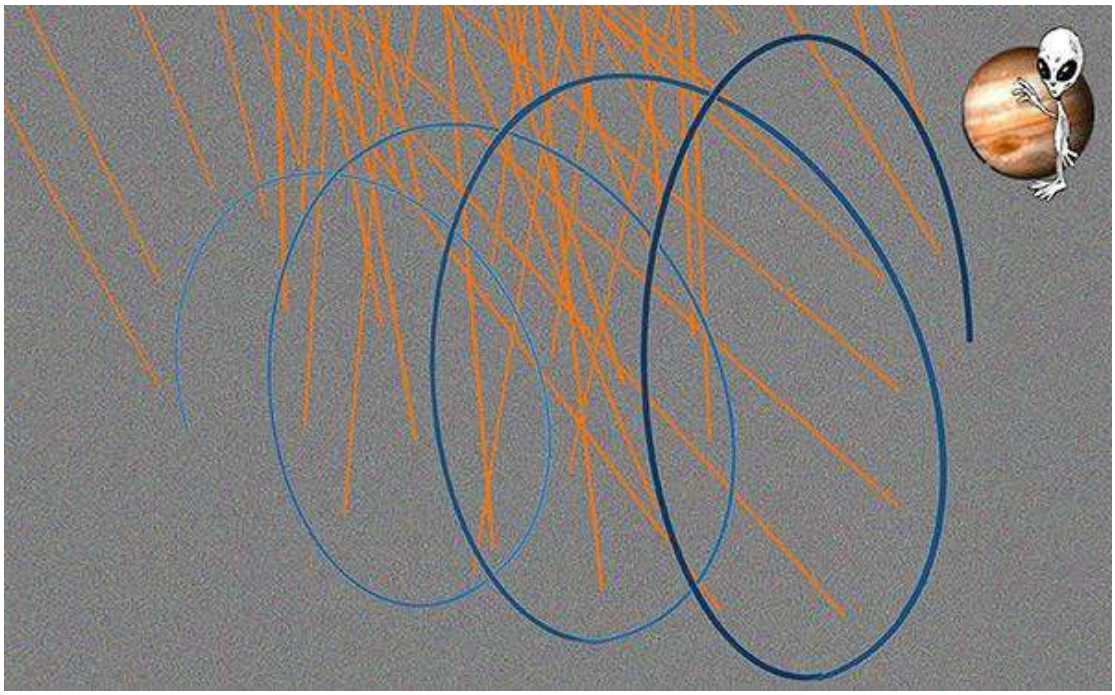

Diagram 12, showing all the pulses in their emission positions as the source moves through space, as viewed by the observer on Alpha Centauri.

As Earth moves through the Universe, the beam's *source* clearly changes its location in the greater scheme of things. The orange tracks,(above) which indicate the path of each beams' travel, emitted monthly, will never, ever, coincide with one another. Therefore, irrespective of the location of any observer, and irrespective of what an observer might be led to think is occurring, the differing trajectories in space of these beams are valid for all.

Some physicists choose to exploit a pulse of light, rather than using reflecting parallel mirrors to explain time dilation at high speeds. However, it should now be clear that even a regular pulse being emitted in a fast moving craft, aimed at an onboard target, would experience the pulse *missing* that target, as the goal will have moved out of the way of the approaching light.

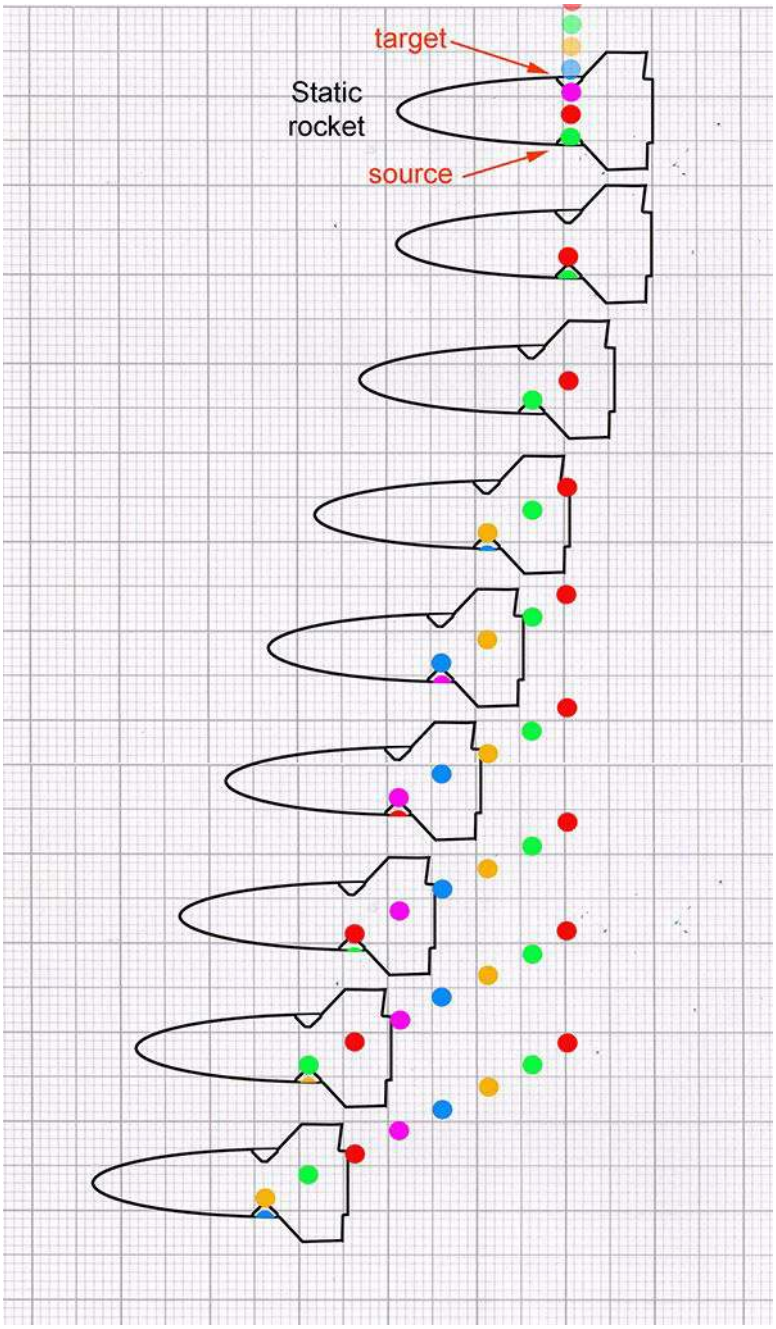

Diagram 13, Coloured pulses are emitted from a spacecraft's source and travel in a 'spatially' upward direction. The pulses miss the target as they are independent of the forward motion of the craft.

The static rocket of image 1 shows pulses of light emitted from an internal source and these pulses strike the target immediately above it.

Once the rocket is at high speed, an emitted pulse is instantly independent of its source, as we have seen earlier, and, therefore, those pulses are *unable* to hit the target due to the latter's rapid motion away from the direction of the approaching light pulse.

CHAPTER 2

THE MISLEADING DEPICTIONS OF SPACETIME and its implications for warp speed travel.

In this chapter I want to discuss how contemporary thought, regarding the model of spacetime, relies for its justification on imprecise Mathematics (see Chapter 3) and all too simple diagrams, which, representing cosmic phenomena, are considerably misleading, thus allowing significant alternative hypotheses to be overlooked.

I hope to show, through more careful descriptions of pertinent scientific beliefs, that the probability of being able to travel vast distances within a human lifetime is, thus, incorrect.

SPACETIME

Time is what passes between cause and effect; it gives order to events, allowing and causing entropy.

Herman Minkowski proposed unifying the three dimensions of space with a 'fourth dimension' of time, naming it spacetime; this being extrapolated from Einstein's Special Relativity. It has been the foundation of a mathematical model which combines space and time into a single manifold of events, or a woven continuum, able to describe, in a more uniform way, the workings of the Universe. In diagrams it is drawn as a mesh.

The presence of large amounts of mass or energy in the Universe is considered to be able to distort this spacetime causing the 'mesh' to warp. Einstein maintains that we understand this warping as the effect of gravity.

Minkowski claimed that coordinates in spacetime should define where and when events take place. Dimensions being understood as mere components of an imaginary *grid* system which determine the geometry of spacetime. The inherent hypothetical 'geodesics' allowing the representation of the *motion* of particles and light beams.

The analogy is drawn of a placed bowling ball in the middle of a flexible sheet, with the sheet distorting with the weight of the ball, which pushes down on it. Additionally it is suggested, that if you place a baseball on the same sheet it will roll towards the bowling ball.

And here we come to the crux of the problem. Although this action is clearly true of those balls, being on earth and subject to gravity, how can the same be true in space where there is no *single flat plane* to distort?

It is the very depiction of spacetime as being represented by a flat but distortable matrix, reacting to the proximity of mass, that I am questioning. If matter does bend a spacetime fabric, causing other bodies to feel the pull of gravity, why would that 'pull' be in *only one* direction?

Let us look at some examples of the apparent effects of mass upon a spacetime matrix that relate to currently upheld opinion.

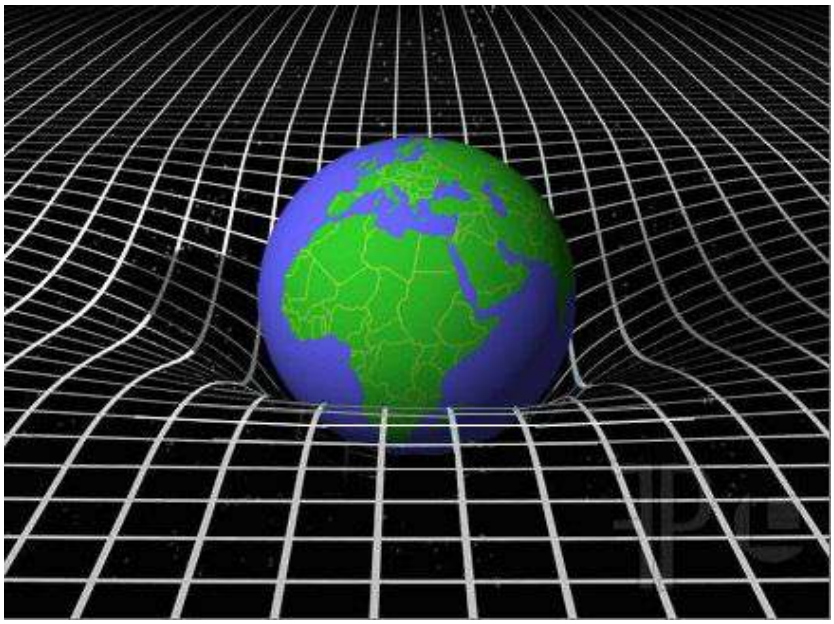

Diagram 14, what is acknowledged as being the effect of the Earth's mass on the fabric of spacetime.

Above we have the spacetime fabric represented by a flat plane grid that is distorted by the closeness of the mass of the Earth. The grid is drawn dished in a 'downward' direction, maybe for the convenience of understanding, but maybe because we cannot give up the notion of gravity acting 'downwards', nor can we abandon the natural horizon with which we are so familiar.

Unfortunately this results in an adherence to a too simplistic, depiction of a horizontal, level, surface representing a notional grid and the effects upon it.

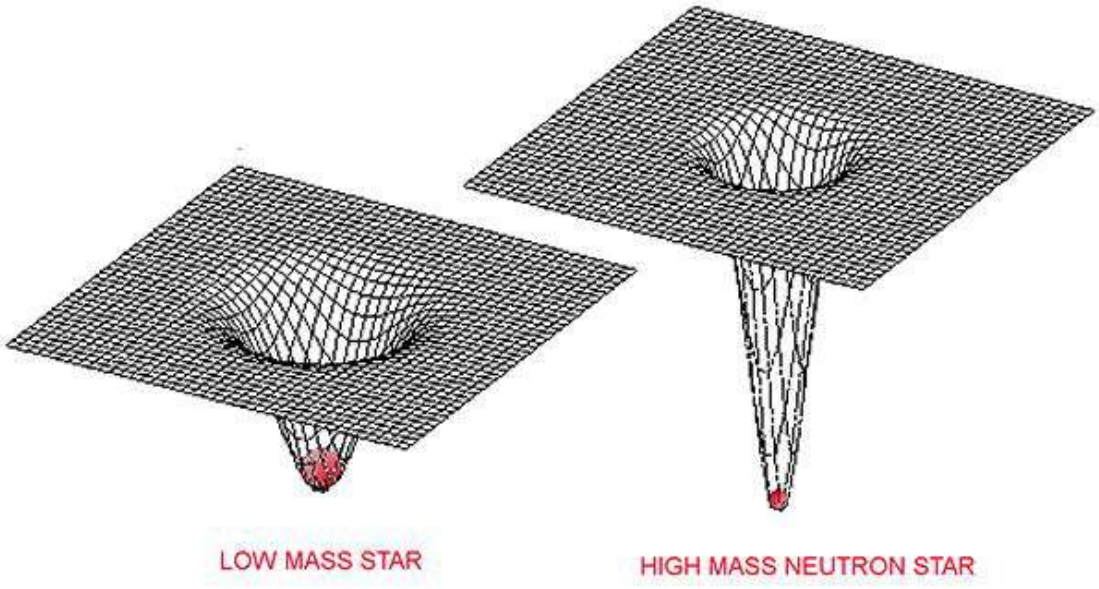

Diagram 15; another incorrect presentation of the 'flat' spacetime matrix

Again, in diagram 15 , we are shown a horizontal matrix and a gravity like effect on that grid caused by a 'lightweight' and a 'heavyweight' object.

Although this is a intended as a straightforward way to depict an asserted effect, it is a totally misleading way to envisage the deformation of any 'spacetime matrix', as it ignores the fact, that, although the web is but a concept, it could *never* be *just* one horizontal plane, affected in *just* one direction.

These images are stuck in a Euclidean universe.

Even whilst the spacetime matrix is still only a model, and not a proven functional phenomena, any impact of a mass upon it has to be properly conceptualised within the limits of that idea. The influence of a low or high mass star can never look like a lightweight and a heavyweight object dropped into a net!

Because we are currently accepting as useful this concept of a malleable space-wide matrix, then we have to be aware that depicting it as just one plane is seriously flawed. To plot the consequential effects of mass we would, therefore, require the theoretical construction of an all-encompassing, three-dimensional grid (of spacetime). This would, at each event, completely surround each mass by which it is distorted.

In the case of diagram 14, the Earth would be completely enclosed by spherical distortion, the effects of which, inevitably, would have to bend the fabric in *all* directions *equally*.

I will address this disingenuous but prevalent flat, horizontal, blanket-like representation of the fabric of space time again later where the apparent consequences of this representation, affecting the direction of light, are even more disturbing.

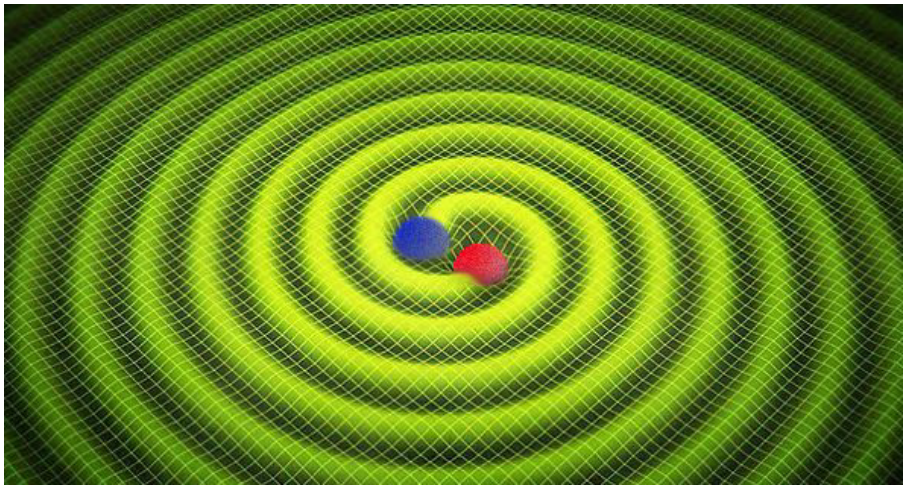
Diagram 16; the concept of ripples in the fabric of spacetime

The basic diagrams I am using replicate widely publicised images that seek to resolve the effects of mass on a spacetime matrix.
Interspersed with these are my own drawings of a better way to understand the spacetime model, which we are, in this essay, accepting as a useful hypothesis.

Again, diagram 16 purports to demonstrate ripples in the fabric of space-time, thus to reveal how the universe was created nearly 14 billion years ago.
At first it does appear to be a three dimensional description of the affect of a 'stone thrown into a pond' , but it is, in fact, just another flat, horizontal plane that has been vaguely disturbed by parallel waves that deform that single flat plane.
This Image of 'Gravitational waves', does not recognise the fact that any ripples, thus caused, would surely radiate from the source as an expanding *sphere*, not as an expanding circle.

The central notion of the Big Bang theory is the assumption that the Universe is the same in all directions. There is no up nor down, no left or right, nor clockwise or anticlockwise. It has no 'direction'.
This is known as the 'Cosmological Principle', which states that, wherever the observer is, and in whichever direction that observer looks, the Universe appears the same.

I therefore maintain that if the concept of spacetime is to fly then we have to abandon these simplistic drawings and take on board a much more complex view of how such a matrix would behave when affected by mass. And this may lead us on to whether or not it will be possible to travel vast distances through space in an acceptable human time frame.

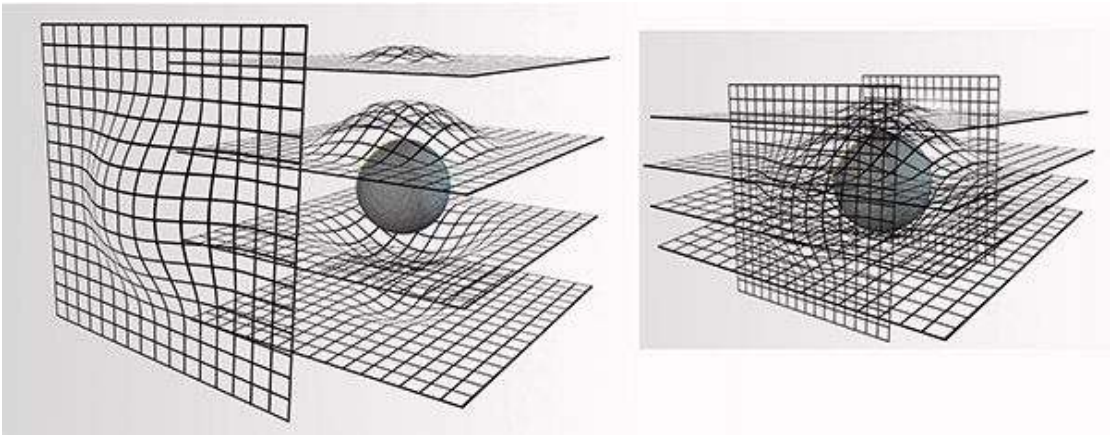

Diagram 17, If the mass of Earth bends the fabric of spacetime then this should affect a matrix that is not just horizontal, but all encompassing.

Here we have, on the left, for ease of viewing, a blown apart drawing of the three dimensional affect of a mass on the model of a spacetime matrix, with, on the right, those affected planes brought in closer to the mass source.

BLACK HOLES in SPACETIME

A black hole is considered to be a geometrically defined region of spacetime exhibiting such a huge gravitational attraction that nothing, including light, can escape from within it.
Further to the gravitational effects discussed above, General Relativity predicts that greater deformations of spacetime can occur when a highly compact mass is present having been formed by the collapse of massive stars at the end of their life cycle.
Millions of solar masses may be consumed by a black hole and this absorption will form a supermassive black hole. The boundary beyond which nothing can escape is known as the Event Horizon. It is presumed that supermassive black holes exist in the centres of most galaxies.

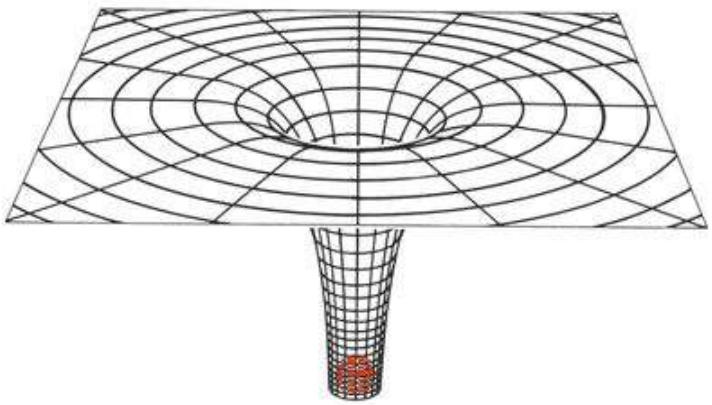

Diagram 18; the current idea of the geometrically defined region of a black hole.

Again in these images, crucially, the Cosmological Principle is ignored. As mentioned at the beginning of this chapter there is a problem with the simplification of an idea such as this. By defining a flat, horizontal blanket-like zone from which to demonstrate the spatial distortion a black hole definitely begs further questions

Why does the super dense mass at the heart of diagram 18 only attract material in one direction? That is, downwards, from above.

Why does the super mass, apparently, again from the diagram above, have no influence on material 'below' it, or beside it? Inevitably we must ask, why does it not attract material from *all around it*?

Perhaps it should initially be drawn as in the left hand diagram below, (which looks rather like the concept of a 'wormhole'); attracting material from *two* directions, before realising that we must surely add the possibilities of a 'pull' by the super-mass from *all* areas around it.

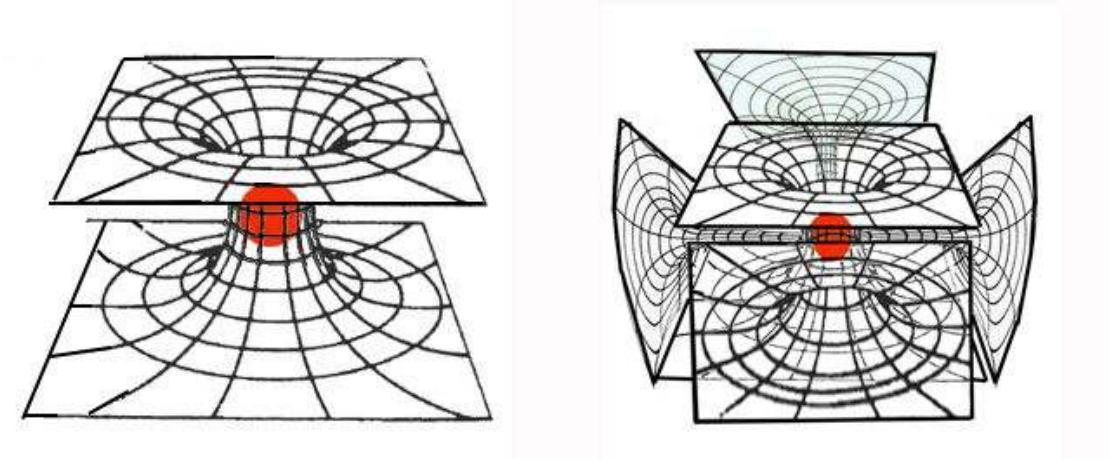

Diagram 19; A black hole able to attract material from (left) opposing sides and (right) from 6 sides.

Perhaps it would be more useful to envisage the actions of a black hole as a *globe* of influence, with the event horizon being a spherical shape at the limit of the mass's authority.

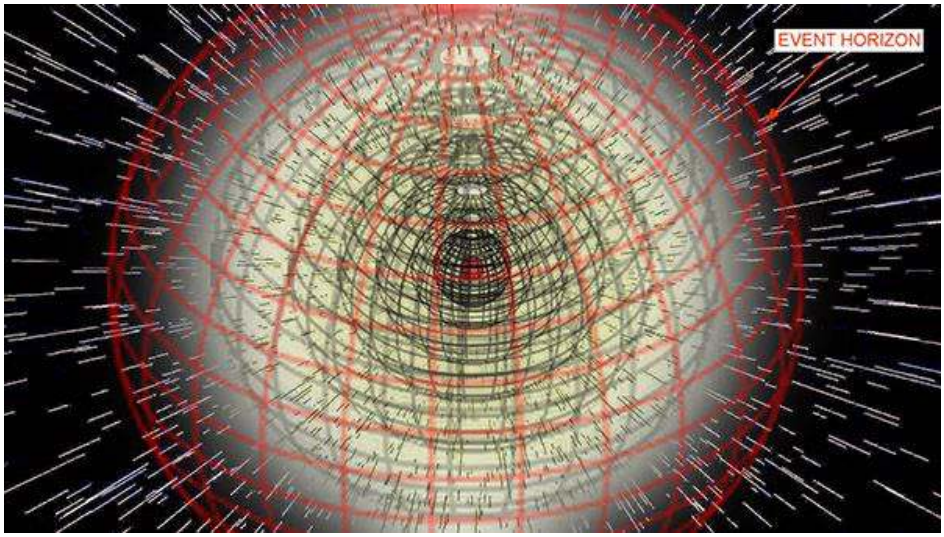

Diagram20; a global understanding of the effects of a black hole.

If we can come to terms with this more accurate way of depicting the model of spacetime, we can see from several physicists' writing how the 'flat model' has confused their thinking.

Bob Berman; "Our sun's enormous mass depresses spacetime like a heavy ball resting on a rubber sheet, making it sag. The earth rolls along this warped rubber membrane and curvingly arcs back to its starting point after a year."

GEODESICS and CURVED SPACETIME

This leads on to examining the concept that spacetime is curved.

The unseen matrix of spacetime, we have seen, is purported to pervade everywhere and its configuration, therefore, must necessarily dictate how any object must move through it.

Einstein defined gravity as a warping of space time around a massive object. The stronger the gravity the more spacetime is warped.

It is claimed that in spacetime geometry we cannot look at a straight line as being the shortest distance between two points, consequently it is considered acceptable to agree that anything moving through spacetime has its own trajectory of motion, as well as its own passage of time.

From this it is determined that spacetime's distortion allows the movement of an object to be predictable. However, that 'spacetime is curved' implies that it is, as a whole, curved in a particular direction; that there is an overall even distortion applicable anywhere. The idea that masses can influence the shape of spacetime does not, of itself, allow for anything other than; spacetime is 'bent all over the place' by different degrees, in diverse directions.

From General Relativity, we have that gravity is a consequence of spacetime geometry, and that, usually, any particle, free from any external, non

gravitational force, falls upon, or travels upon, 'Great Circles', or in spacetime upon a 'World Line' or a 'Geodesic'. For me it seems clear that these geodesics should *all differ*, each of their curves being dictated by the *local* affect of proximate, dominant masses, all of which will be on differing 'planes' and at different 'proper' distances.

It is easy to understand 'great circles' being curved when applied to a planet, or other spherical object, as can be made evident by the aircraft routes around the Earth. In spacetime a geodesic is the path followed by an object in free fall. That is, one that is not subject to any non gravitational force.

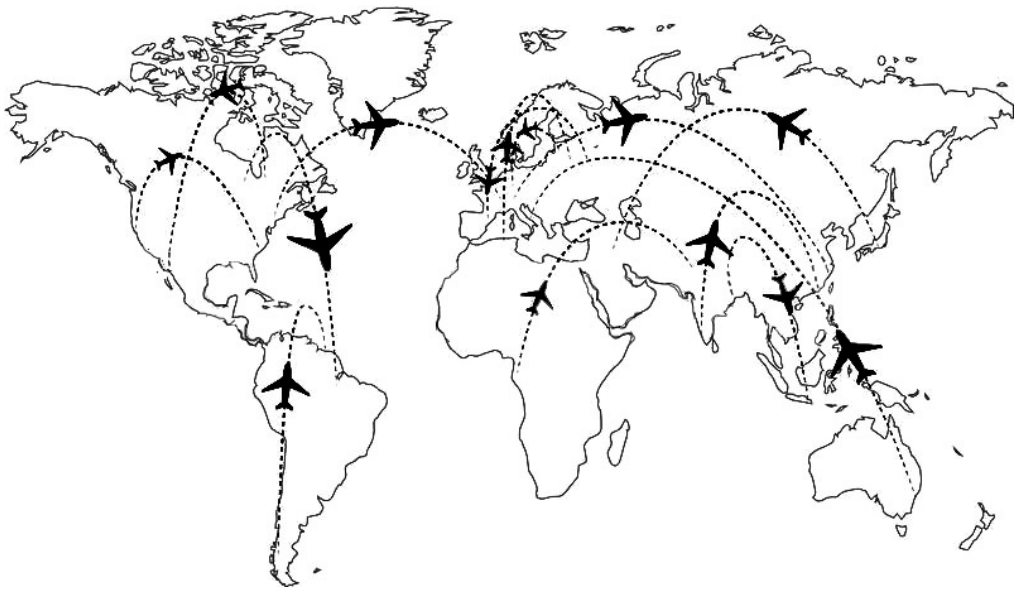

Diagram 21, World lines.

Given these tenets of spacetime, we can see that the path of a planet orbiting around a star *would be curved*, moving on a geodesic or within a curved (four dimensional) spacetime geometry, caused by the interference of the star's mass. This particular event of the bending of spacetime has, inevitably, to be a 'local' matter, not one to contribute to an even, overall curving throughout space.

Gravity Probe B is Nasa's satellite based gyroscopic experiment to measure the 'geodetic effect' of spacetime. To an accuracy of only 1%, it did detect an 'attraction effect' due to the mass of the Earth. However it was unable to measure any similar effects of a 'curved' spacetime farther afield.

As with aircraft routes around the Earth, geodesics in spacetime are considered to be the shortest paths between two points in a 'curved' space. But to relate this phenomena to all of space seems unlikely, especially as the idea has technical problems, because there is an infinite dimensional space of different ways to parameterise a 'shortest path'.

LIGHT

Light is unique and non intuitive, it is electromagnetic radiation carrying with it a certain proportion of the electromagnetic spectrum.

Light originates when an electron, the fundamental particle of electricity, drops down an orbit towards the nucleus, where it emits a photon of light.
(It is suggested that photons were created 370,000 years after the big bang.)

Max Planck initially described light as being emitted in little packets of energy called 'quanta', this name is now superseded by 'photons'. However in Quantum theory photons are *still* seen as wave packets.

In a vacuum light travels at 299 792 458 meters per second, and all the colours of the spectrum, whether separately, or within white light, travel at the same speed.

We understand that elementary particles are the smallest building blocks of everything in the universe, and that, therefore, *includes* light. In which case it would seem unlikely that light could function in a way different from any other collection of particles.
However there are physicists who insist that light can obey very different laws.

Michael Brooks, for example, insists that "a photon does *not experience time,*" saying that "the closer you go to the speed of light the slower time flows. For a photon travelling at the speed of light time simply does not exist".

Brian Cox agrees; "light does not benefit from the same laws, for a photon travelling at the speed of light the spacetime-distance between any two points in the Universe is zero. No time passes for a photon, and the whole Universe is a infinitely thin pancake, compressed in the direction of the motion of the photon".
"From our perspective here on Earth we can speak of light travelling for millions of years across the universe but from the light's perspective this has no meaning, because for it no time passes at all".

Let's question these statements.

If light is made of particles (wave/particles, see later) then why should it behave differently from any other particles with regard to respecting 'proper time' and 'proper distance'?
Proper time being defined as the time that would be recorded on a clock accompanying the object as it moves between two points.
If we use light to determine the distance of stars, (with spectroscopy) how can it both travel for millions of years, from that star to Earth (thus being capable of experiencing 'proper time') and yet also take *no time* through an infinitely thin pancake?

Light clearly has no 'mind of its own' and is therefore unable to 'consider' or be aware of time and distance, but is that enough to revise its physical capabilities?

If time has no meaning for light then also it can be said that time has no meaning for a spacecraft.
Except that a 'meaning' *can* be construed for the craft in as much as time affects the consumption of fuel and the wearing down of moving parts, and, of course, light *can* be affected by time as it diminishes with the inverse square law!

If the speed of light is independent of other reference frames, it must be its own (non accelerating) reference frame

Thus. there are several principles associated with spacetime that appear to contradict this view of light whereby it has counter intuitive characteristics.

SPACETIME 'GIVENS'
and their relevance to superluminal travel.

1) "A defining characteristic of spacetime is that distances in spacetime are invariant".
Surely this means that a distance in spacetime for light has to match that of a object speeding at 'c'?

2) "There is a consensus throughout the universe as to the lengths of paths through spacetime".
Surely this means that a path of light through spacetime has to match the path of a spacecraft?

3) "Every observer must agree on the spacetime distance between events even if they do not agree on the distance and time separately".
If an 'event' (a spacecraft leaves earth and that spacecraft reaches a distant planet) provides an established spacetime distance, then the same must be applicable for a beam of light embracing that same spacetime.

4) "Everything moves over space time at the same speed".
Light uses up all its spacetime speed quota on motion through space and in so doing travels at the cosmic speed limit. The time and distance in Spacetime must differ for the spacecraft.

5) "The Laws of Physics are identical in all inertial, *non accelerating* frames of reference". This is perhaps the most important precept as it assures us that the laws of physics affecting a cruising spacecraft, must match the laws governing light.

Further to this there are discrepancies in the physical details concerning the characteristics of spacetime between its greatest exponents.

Minkowski space involves an inertial frame of reference, in which two events are simultaneous, the *geodesic* will be the *straight line* between those two events, at the time at which the events occur.
For Minkowski there is only one timeline geodesic that connects any pair of time-like separated events, and that geodesic is the *curve* with the longest *proper time* between those two events.
Minkowski also finds a difference in the proper lengths of curves in any frame of reference should those curves differ temporally or should they differ spatially. The former being shorter, the latter longer!

Einstein's field equations dictate that in curved spacetime, it's possible for a pair of widely-separated events to have *more than one* time-like geodesic that connects them. In such instances, the proper times along the various geodesics will *not* in general be the same. And for some geodesics in such instances, it's possible for *a curve* that connects the two events to have either a longer or a shorter proper time than the geodesic

It would seem that it cannot automatically be implicit that a straight line, without the interruption or influence of mass or a warping of spacetime, tends to a curve. The implication of this is that a space traveller, seeking to employ the notional effects of spacetime to reduce the period of a journey to be within a human lifetime, cannot usefully employ a geodesic for that purpose.

LIGHT; PARTICLE / WAVE DUALITY

Now I am going to suggest that the packets, quanta, of visible light (maybe UV and Infra red too) each contain, bunched together, the wavelengths of the colours of light, irrespective of the different frequencies at which those electromagnetic fields oscillate.

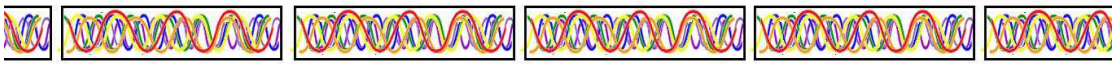

Diagram 22, packets of light.

Light has the ability to illuminate a hard object, thus producing a hard shadow beyond it. This was the thinking behind claiming light was solely a stream of particles.

The 'double slit experiment' defines light as being a wave as, when light is projected towards a plane in which is cut two narrow, vertical slits, the light is able to pass though both. Beyond the slits these waves recombine. Changes in the path length of both waves results in a phase shift creating an interference pattern.
Both a water wave and a sound wave, have *forward motion*, yet the medium of which it is made of *does not*. Light would seem to behave in a similar way whereby a string of molecules are jostled proving the appearance of forward motion.

Perhaps, like white light passing through a prism, the individual wavelengths get separated, with some passing though the first slit, and others through the second.

The weakness of the wave theory was that light waves, like sound waves, would need a medium for transmission, hence the decision to name light a wave/particle duality.

SPACETIME and the PASSAGE OF LIGHT

I want to examine further the hypothesis that for a photon travelling at the speed of light, the spacetime-distance between any two points in the Universe is zero.

If the spacetime distance is zero for light, how can the spacetime matrix carry with it the consequence that its endemic deformations affect that light between source and target?

If the whole Universe is, for light, an infinitely thin pancake, compressed in the *direction of the motion of the photon*, then what is present for the gravitational effect of cosmic masses to influence? How is the electromagnetic radiation re-routed?

Why would a photon have a 'direction of motion' if its spacetime distance is zero? It would need no speed at all.

If from our perspective here on Earth we can speak of light travelling for millions of years across the universe this must be relevant to all our measurements of our place in the cosmos; it must have a foot in reality.
It can be considered that for any inanimate object time has no meaning, as a 'meaning' requires consciousness. But objects without consciousness are still able to execute or achieve a function.

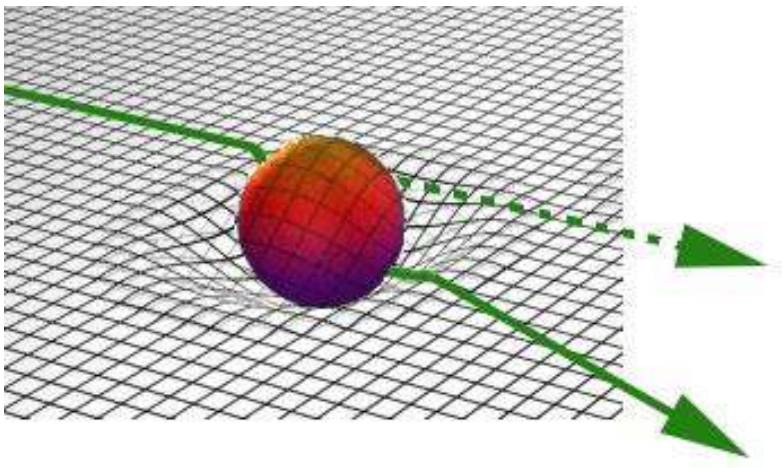

Diagram 23, the gravitation effect of a planet's mass re-routing a beam of light on a diagram that avoids the Cosmological Principle.

(Once more we have to deal with current images, as above, that fail to acknowledge that there is no up / down, left or right in the Universe.)

For us to be able to contemplate superluminal travel we have to have an exact understanding of the behaviour of light, as it is against light that all speed comparisons have to be made. The speed of light is the foundation and the boundary by which we acknowledge the possibility of travel at all, let alone to far distant stars.
If, for light, the Universe is an infinitely thin pancake, then why is it established that the passage of light can be influenced, not only by a single mass.
but by any chain of celestial masses in close proximity to its travel.

Any influential masses will not be set out in a flat plane, as in the diagram above, but they will be scattered at many 'levels' around the light's path. Any redirecting of the light's journey will be in every direction.
This particular conclusion is set to *disprove* that there is an overall *curve* in spacetime but that spacetime might be wavy!

Because of the known interruption of gravitational lensing, we know that we are often additionally fooled by the position of a celestial object, and it, therefore, requires many measurements of distance to obtain an acceptable average because of this.

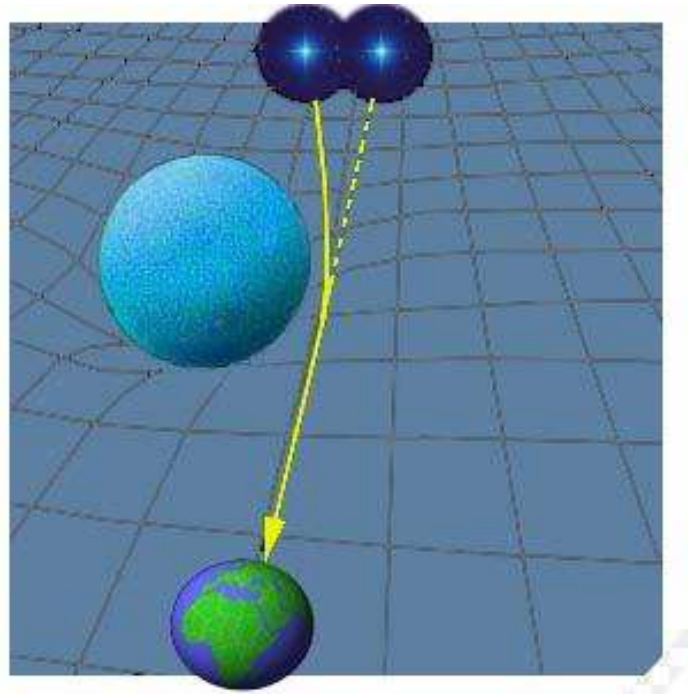

Diagram 24, the gravitational effect of a planet's mass re-routing a beam of light that provides a misleading understanding of a star's position in the cosmos.(also on a diagram that avoids the Cosmological Principle).

If light is just molecules that are jostled, then no time might pass for each individual molecule, but the effect of the jostling must be transferred from molecule to molecule at the speed of light. Thus there is both speed and

distance during this transmission. If photons are small packets of energy, or wave/particles then they would be subject to the laws of physics whereby, over time, particles can decay. Therefore it is disingenuous to say that no time passes for a photon.

LIGHT DISRUPTION

If the predicted effects of spacetime are correct then, as the Earth moves within the solar system, Andromeda, for example, will, inevitably, be occasionally occluded by innumerable masses capable of re routing the straight line of light from that distant galaxy.

In fact it must be possible for some light, directed towards Earth from deep space, completely to avoid reaching its straightforward target, given that light has to negotiate a path through a galaxy of 400 million stars! Light should be dancing about like the ball in a pin-ball machine. (diagram 25)

According to the Earth's position, relative to these intervening masses, and relative to the initial light source, the length of the route of that light must vary considerably as it affected or released by the attendant gravitational forces of those masses, in addition to the affiliated distortions of the spacetime matrix.

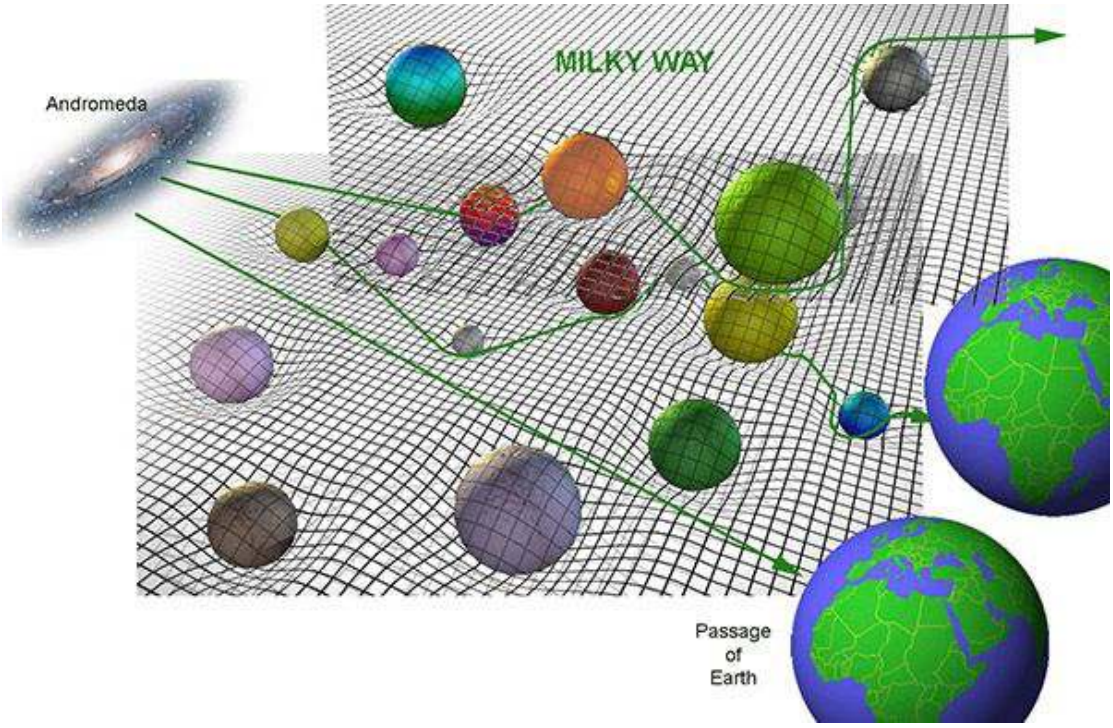

Diagram 25; light's pin-ball machine

GRAVITATIONAL LENSING

Gravitational lensing, originally extrapolated from Einstein's theory of general relativity and now proven, provides a more massive affect on light travel than the individual affects of singular celestial objects.

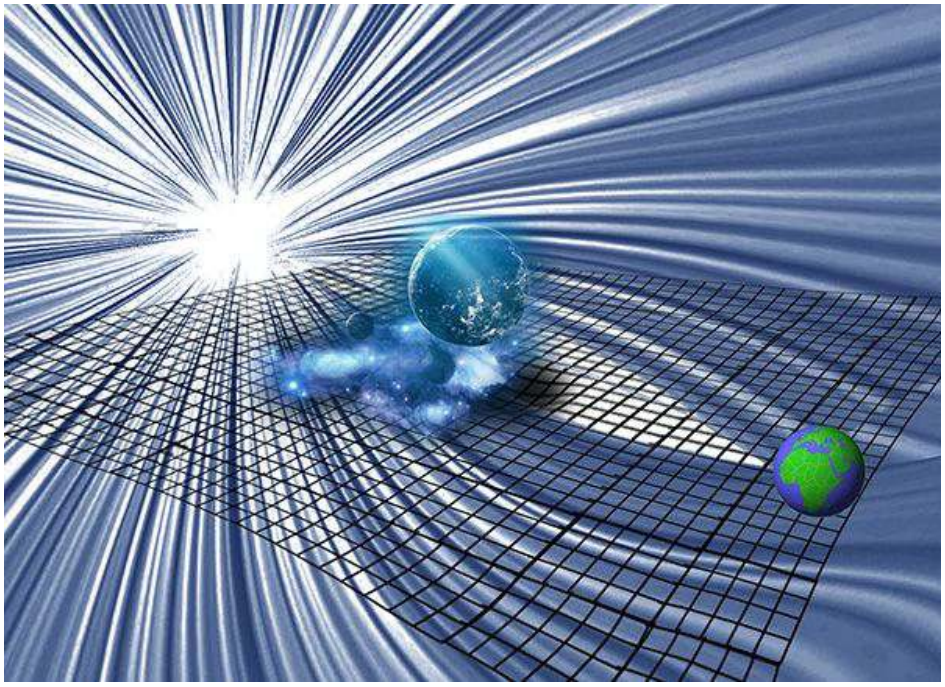

Diagram 26; Gravitational lensing.

If the light source, and the mass, and the observer lie in a straight line, the original light beam will appear as a ring around the massive lensing object. If there is any misalignment the observer will see an arc segment instead.

The gravitational field of a galaxy can extend far into space, and thus cause, on a greater scale, passing light rays to be bent and refocused somewhere else.

The Twin Quasar (SBS 0957+561) appears as two images, resulting from the gravitational lensing effect caused by the galaxy YGKOW G1, that is located in the line of sight between the Earth and the quasar.

As always the diagrams above represent a too simplistic view of physics; in this case light. By allowing just one cosmic beam to be considered avoids the fact that light is a broad wash that illuminates us from the sun and stars and therefore, no matter what small proportion is deflected by celestial mass, that percentage can only be an insignificant portion of those photons flooding towards us.

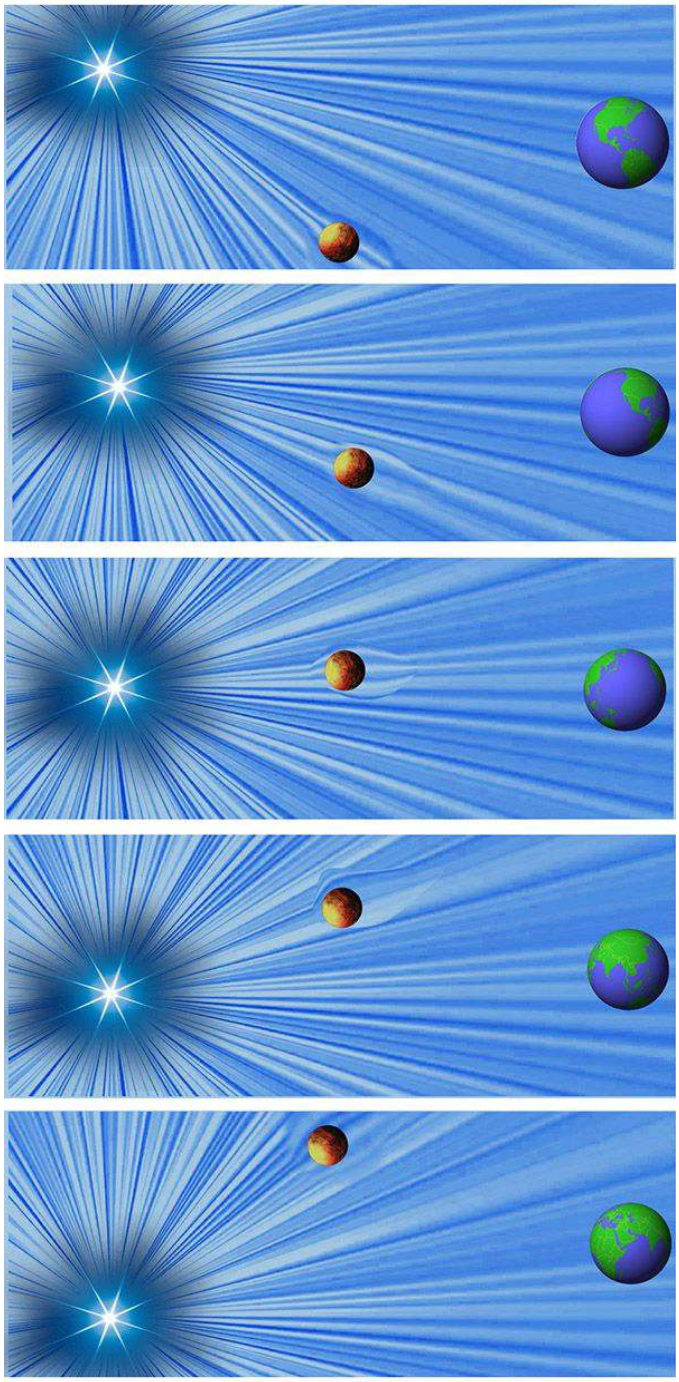

Diagram 27 only a small area of Earthbound light is affected by celestial distortion.

PREDICTED IDEAS and their TENUOUS SOLUTIONS FOR SUPERLUMINAL travel through SPACETIME

WORMHOLES

Now we come to the central point of this chapter, the contemplation of the possibility that time and space dilation will allow the crossing of space at superluminal speeds!

Part of the current belief in the possibility of *manipulating* a spacetime matrix is that, in doing so, we may facilitate apparent faster than light travel by circumnavigating, or penetrating, much of the space between ourselves and distant planets. Thus the 'wormhole' concept'.

Again the deficient visual misrepresentations of the notional properties of the fabric of spacetime allows for presumptions where time and space can be breached, or infiltrated, thus creating 'worm holes' which theoretically can allow a strange access from one part of space into another.

The diagram below looks very plausible until one recognises the faults that working in a single flat plane allow, especially without considering, not just 'adjacent' spacetime, but the whole of spacetime, everywhere.

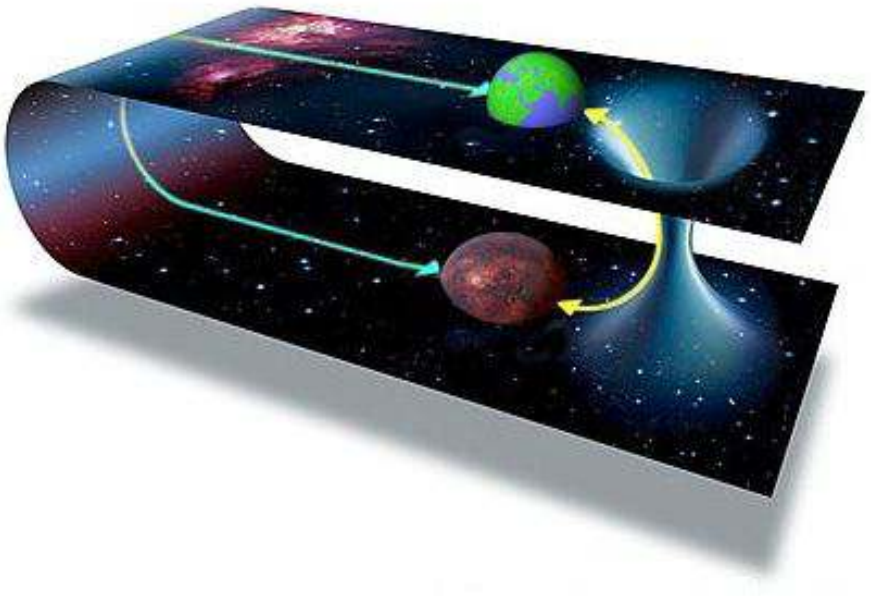

Diagram 28; suggesting that a 'wormhole' would provide a shorter route for a celestial journey.

Firstly no suggestion has ever been made concerning a mass so dense as to be able to bend the 'spacetime fabric' through 180 degrees, such that it returns along a parallel plane to that which has been bent.

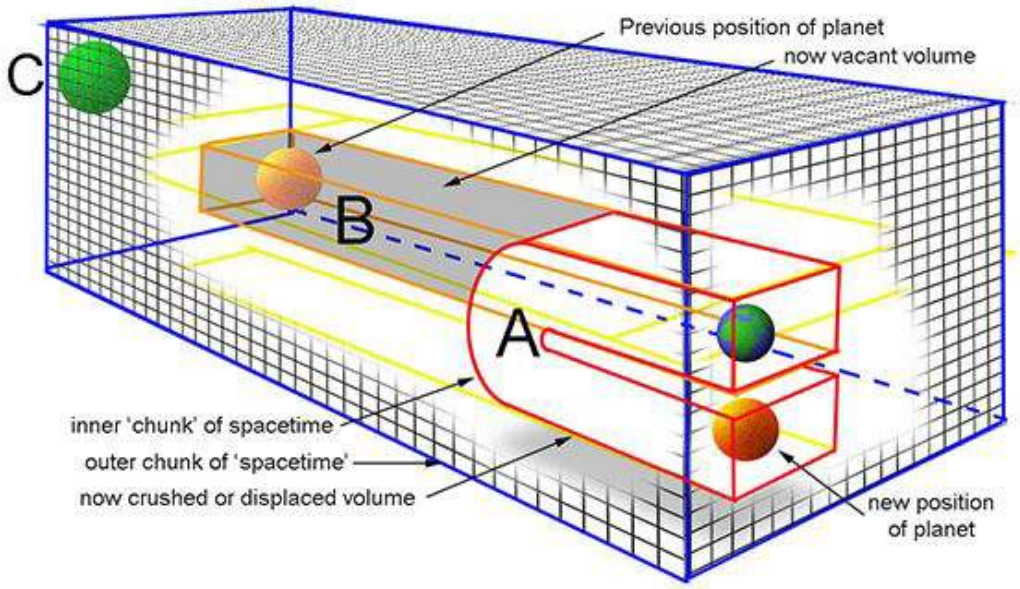

Diagram 29; the blue box represents a 3D 'chunk' of the spacetime matrix in which a smaller, inner, part has been warped through 180 degrees.

Here we have the same notion of the distortion of spacetime, but with the consideration of the surrounding volume of spacetime *also* being addressed. Can a wormhole be created, as in the flat concept of diagram 28?

With the above image (29) taking on board the attendant area of a larger 'chunk' of spacetime, (the blue box), this diagram shows the bending of that part of spacetime from diagram 28 as an *inner* 'local' volume. (Initially a red oblong box, now shown bent into the shape of a horseshoe magnet).

Let's examine the implications of this broader picture of such an event.

Firstly could there ever be a mass sufficiently dense as to be capable of bending a three dimensional 'oblong' of spacetime by 180 degrees? (I am using 'three dimensional' to delineate a volume of spacetime, which itself, of course, includes the time element).

The mass would have to be at point A, but then, that mass, of course, would still have a 'gravitational' effect on the chunk of spacetime it has displaced.

Next, in grabbing and bending this inner 'chunk' of space, such an action would leave the orange boxed grey volume at B, (in which the curled around lower length of the affected spacetime matrix previously resided), to be vacant.
How to explain this emptiness by maths or otherwise?

Next, we ask what has happened to the volume of spacetime that this 'curled around' volume has now occupied? It is squashed or pushed out of the way?

Next, the mass at A would also experience (in picture terms) a left / right pull on the spacetime fabric around it, where I have only drawn a north / south pull. A global gravitational effect would complicate the distortion to an even greater extent.

Next, now we have *not* placed the Earth and the distant planet on a flat plane, but within a 'chunk' of spacetime, where would the 'wormhole' have its beginning and its end?
Why would it, handily, start at the same 'levels' of time and space that are assumed in diagram 28? That wormhole is *no longer* able to be designed into a convenient location for short circuiting a spacecraft's journey.

There's more!
The whole concept of wormholes is to open up the possibility of shortening a journey between two planets. However, how can such a set of circumstances ignore the relationship those planets had, (before the spacetime distortion), with other celestial bodies, when spacetime is warped away from them to accommodate a gateway to another world?

The theoretical experiment in diagram 29 allows for the 'orange planet' being moved closer to Earth to facilitate this shorter journey between the two bodies. Supposing there was another celestial body '**C**' close to the initial position of the orange planet, being just outside the area of the now-bent 'chunk' of spacetime.

What would the relationship *now* be between green planet **C** and the orange planet, or between the green planet **C** and observers on Earth.

The more we allow for the crucial, wider implications of the original concept in diagram 28, the more we can see the intractable anomalies of the idea, meaning that a journey-shortening 'wormhole' is a ridiculous suggestion from some, at best, nebulous equations.

Now we come to the more bizarre conclusions regarding the abilities of high speed manoeuvring within a spacetime matrix, or the cheating of time by the rearrangement of its very fabric.

THE ALCUBIERRE WARP DRIVE

The Alcubierre Warp Drive believes in the possibility of harnessing negative mass in order to create a wave in the fabric of spacetime that would assist in propelling the ship more quickly. The craft, it is suggested, would travel on a free-fall geodesic in an accelerating warp bubble, the crew also free-falling and accelerating but feeling neither.
The craft would contract space in front of it and expand space behind it, thus, in its own reference frame, it would not exceed the speed of light, but would arrive at destinations ahead of light itself!

However the idea 'cherry-picks' from the theory of spacetime whereby it allows for a forward thrust, provided by a distortion of the matrix behind the craft, but ignores the equal and opposite force of an *undrawn* part of a whole matrix lying in front of the craft, which would act *against* the direction of motion.

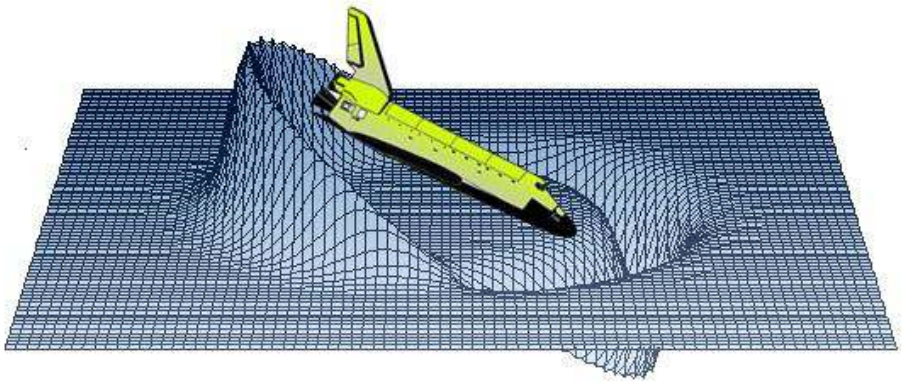

Diagram30;The Alcubierre Warp Drive

This idea is actually consistent with Einstein's field equations, but clearly is not physically practical, thus being a perfect example of how mathematical proof does not constitute any kind of reality, or is it able to lead us towards any universal truth.

We cannot rely on equations to provide practicable results in any area of theoretical physics, nor to excite us with a prospect of reaching far distant stars in a time shorter than that taken by light to traverse the same spatial distance!

The dialectic above should have drawn a perturbing picture of the scientific arena in which the notion of superluminal travel has been allowed to be nurtured. Now we investigate the mathematics behind superluminal travel.

Next, I am going to refer, mostly, to the published work by Brian Cox and Jeff Forshaw, but occasionally extending references further to include like-minded physicists. Each defend and preserve two particular scientific precepts concerning superluminal travel, although often, each providing a different explanation for a similar outcome.

1) The "Twins Paradox" exploits the notion of spacetime geodesics to allow for an astronaut twin to pass 40 of her own years in space, whilst the Earth (on which the stay-at home twin has her temporary life) passes 59,000 years.

2) "A rocket travelling close to the speed of light may cover the 3 million light year journey in 50 years." exploiting the theory of time dilation.

It is the employment of spacetime and geodesic travel that Cox / Forshaw rely upon in making their assertions.

1) TWIN'S PARADOX; GEODESIC REASONING

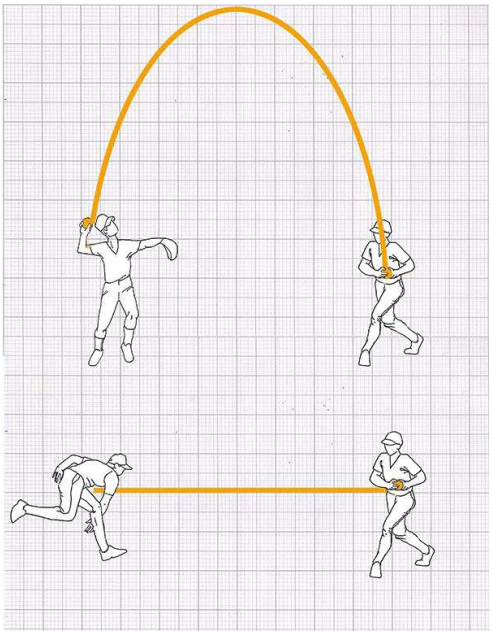

Diagram 31; Matching geodesics of a ball's travel in spacetime

From diagram 31we have two instances of one man throwing a ball, and another man catching it.
In the first case the throw goes high, travelling quite a distance, and taking quite a time to reach the catching man.
In the second case the thrower aims the ball directly at the catcher. This ball takes a linear path, it travels a shorter distance and travels much more quickly.
In Newtonian space the balls take two very different routes, but, the spacetime hypothesis asserts that they took identical paths, that is, they both travelled on geodesics.

This is where certain factors of spacetime fail to make sense in the real / known world.

We are asked to accept that spacetime unifies space and time in such a way that, in any particular event, the more space that is used the less time is expended; the more time that is taken the less space has been travelled.

Looking at the above diagram in the *respect of spacetime*, because the high thrown ball travels a *greater distance* than the low thrown ball, (given that they

both began and completed their journeys from the same points) a *shorter time* has, consequently, elapsed. And this, apparently, is due to the fact that the higher ball has used up more 'space' and therefore less 'time' than the straight thrown ball.

Obviously in common Newtonian space the opposite is true; the high thrown ball has used up more 'space' *and* more 'time'. Whereas the low thrown ball has travelled a shorter distance and travelled more quickly and arrived sooner.

This comparison of geodesic routes applied to spacetime is introduced into the Twins Paradox.

The Cox / Forshaw / Minkowski diagram (32) tracks the spacetime journey of a travelling astronaut 'twin', as recounted in this famous, scientific conundrum, whilst the second protagonist twin remains on Earth. The latter, because of the spacetime influence, aging, we are told, far more quickly.

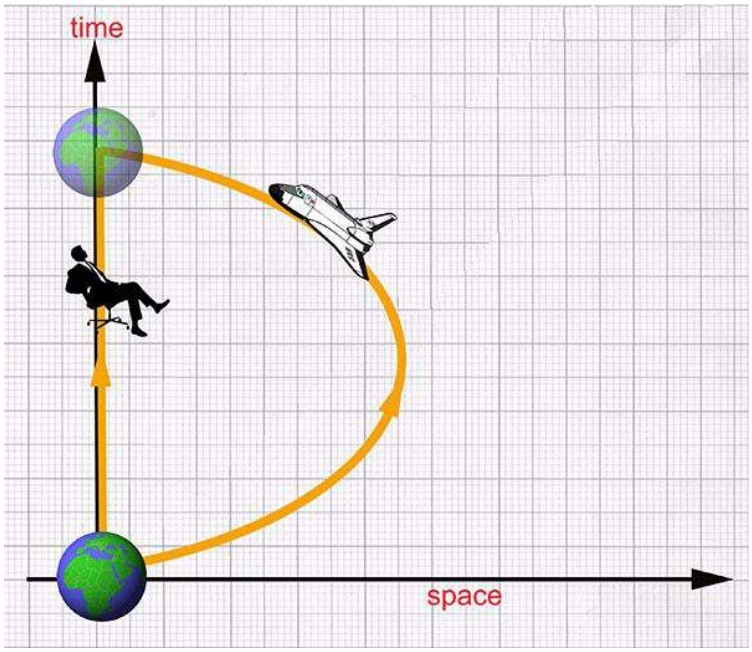

Diagram 32; describing the Cox/Forshaw twin's journey in spacetime.

The twins start and finish the 'event' at the same location (Earth)
The astronaut takes a longer 'space' path than her stay-at-home twin. She travels north-east, near the speed of light, then, she turns and travels north-west, again near the speed of light, to get back to Earth.

Spacetime theory demands that, because the stay-at-home twin has *solely* travelled through time, she must have travelled through the 'time' axis more quickly than the astronaut, who has spent more of her spacetime travelling in space, thereby using up *less* of her 'time'. The theory thus concludes that the

stay-at-home twin must have aged *more*, as she has not used any of her *'space'* quotient in her spacetime.

INCORRECT ASSUMPTIONS AND RESULTS

1) It is incorrect to claim that the stay-at-home twin has used *none* of her 'space', solely by not travelling from the Earth. The outcome of the paradox disregards the movement of the Earth which has moved from its initial location when the twins parted. (see diagram 33)
The Earth (and thus the stay-at-home twin) must have used up some spatial quotient in travelling through the cosmos, therefore depleting their time quotient.

2) In Minkowski space, to which the Cox/Forshaw illustration relates, a 45 degree line represents the speed of light, where nothing can travel 'below' this line without travelling faster than light. However, the trajectory of the astronaut appears, in diagram 32, to dip below a 45 degree line , thus making that part of her trip impossible.

3) The curve of her travel is also misrepresented. The representation of an acceleration should be drawn as a convex curve as, gradually, a greater distance is being achieved over time. (see diagram 33)

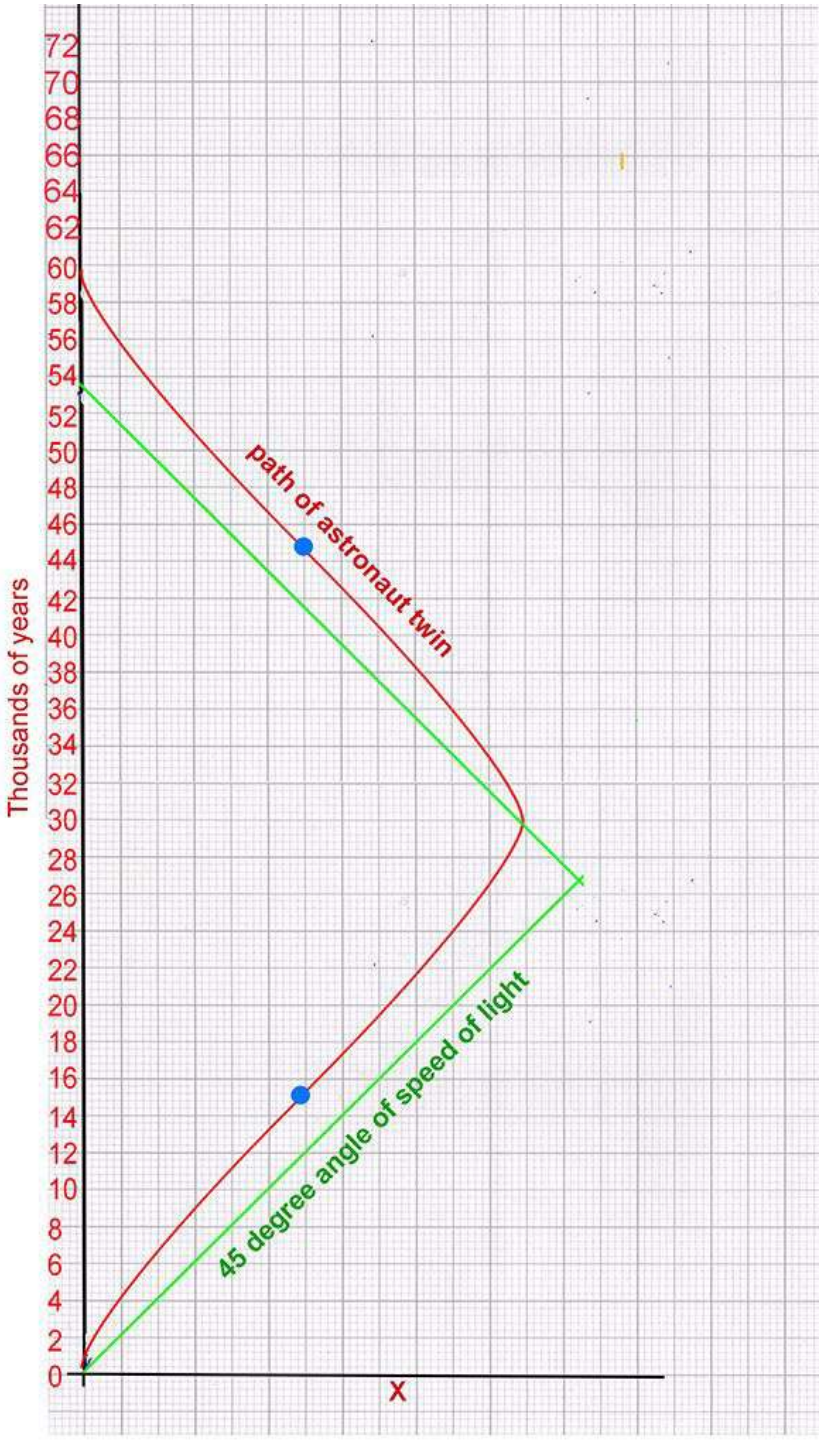

Diagram 33, the astronaut twin's 59,000 mile trip

The spatial distance, on the X axis, is unknown as the distance in space that the astronaut reaches is governed by her turn around point for a matching trip home.

4) Now, Cox / Forshaw may claim that the astronaut has only experienced 40 years passing for herself, but they claim that 59,000 years have passed on Earth. But the astronaut *returns* to Earth; to the 59,000 year mark at the top of our timeline.

Therefore, when the astronaut lands she has actually 'been around' (somewhere) whilst the Earth has lived through that 59,000 years. No matter whether her journey was the longer or the shorter, she has returned to Earth after 59,000 Earth years.

Clearly her earthbound twin is long dead, but the Earth, on which she had her 'being' has travelled up the timeline to the 59,000 year point, and this is where the astronaut *arrives at too*, at the end of her trip.

It is disingenuous then, to ignore the fact that no matter how much she has wandered about in space, she has *also* completed the same *time distance* as the Earth. These two figures need to be added together surely, time and space, as she has done both?

If it is true that the product of spacetime is achieved by equating both spatial distance travelled and overall time taken to both protagonists, allowing either more time and less space, or more space and less time, then there is a major dilemma in accepting this phenomena of spacetime.

The formula for spacetime is considered as being $S^2 = (ct)^2-x^2$. (and, by now, we have some very serious doubts about the use of Pythagoras) However, initially, theoretical physicists found that the original formula ($S^2 = (ct)^2+x^2$) gave them problematic answers. So, with a casual sleight of hand this equation was changed; the plus sign became a minus sign!

This then allowed the claim that a spacetime distance is biggest if we follow a path that has x=0. (The stay-at-home twin). Other paths (the astronaut twin's) will be shorter, utilising this 'nicely' reconfigured equation, because it now dictates that we have to *subtract* the always positive x^2. The claim then follows that the stay-at-home twin ages faster than the astronaut as she travels up a timeline with x being zero. So she ages more quickly! *Manipulated* mathematics to the rescue?

Let us examine further this issue.

<u>PLOTTING THE ASTRONAUT'S JOURNEY</u> (diagram 33; red line)

The plotting of the journey of the astronaut is governed by the requirement of her path never falling below that of the (green line) speed of light.
By the Cox / Forshaw demand, she accelerates for 10 years (to the first blue dot) then decelerates before turning back.
The depiction of this first part of her trip begins with a trajectory that climbs steeply from the start, curving ever closer to being parallel to the 45 degree line.
This line can never become straight as she is *accelerating* throughout this ten year stage of the journey. A straight line would have to represent an even speed cruise.
After the first blue dot, for the next ten years, she is decelerating to the turn-around point.

Thus her trajectory curves *away* from the speed of light line.

At the turn-around point she begins her acceleration again, so her trajectory starts steeply as before, gradually curving in to being almost parallel with the speed of light line again.
She then reaches the second blue dot. From here she is to decelerate again for 10 years. Therefore we see her line of travel curving back upward, using more time than space for her to complete her journey.

Such results do seem to benefit one character far above the other.
Our astronaut has 'been around' for a colossal 59,000 Earth years, plus she has been able to travel for quintillions of miles, and still she is only 40 years older.

It is said that if something sounds too good to be true then, most likely, it isn't!

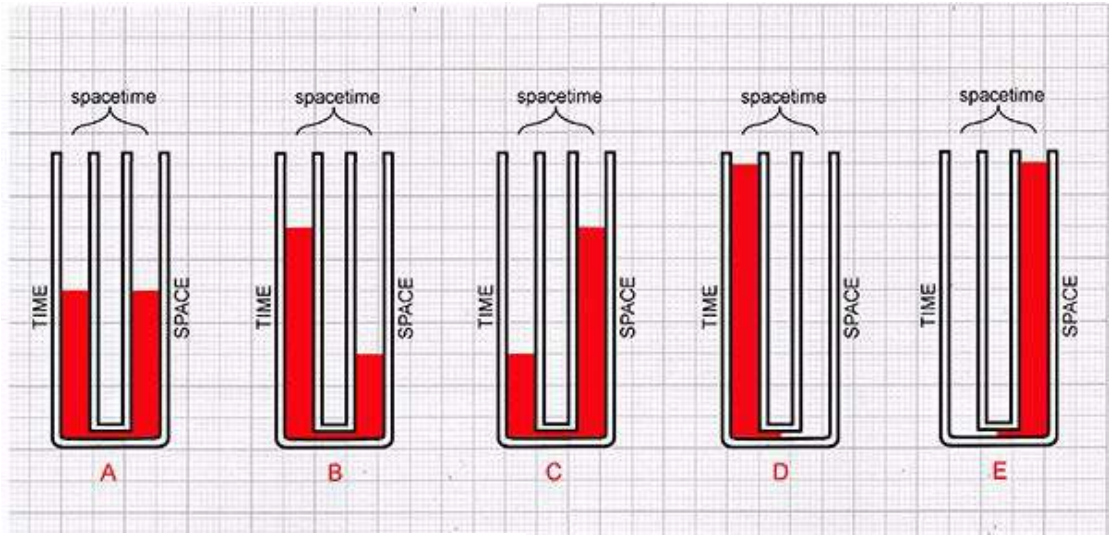

Diagram 34, Spacetime thermometer

The spacetime thermometer above reflects the idea everyone travels at the same speed through space time, some using their spacetime allocation mostly for distance, some mostly for time.

A character whose spacetime is represented by thermometer A, would travel equally through both time and space.
To match this overall spacetime experience, traveller B, taking more time from spacetime, would travel less far than A.
Character C, could be the 'astronaut twin', who has used little of her time but a lot of her 'space'.
Then we come the 'reductio ad absurdum' examples of D whereby this person has solely used up their time, and has nowhere to go. (But the earth upon which he stands is travelling a million miles every 16 hours), and
Character E, who, in using up all his 'space' will clearly live for ever, or get from any location to any other in zero time!

5) The Cox/Forshaw explanation for diagram 33, describes a 10 year acceleration at *1g* and a 10 year similar deceleration to reach her destination, and a 10 year acceleration and 10 year deceleration for her return to Earth.

Cox / Forshaw insist that; "The existence of the 1g force *must* be taken as a fundamental consideration when establishing the *different* time experiences of the two twins".

However, this *completely forgets* the “weak equivalence principle” which asserts that; 'one cannot distinguish between motion under gravity and motion under acceleration- *they are equivalent'*. Gravity is also 1g.

The stay-at-home twin is, therefore, experiencing the same 1g force as her travelling sister, and their *experiences in spacetime must, therefore, coincide* during the whole of the astronaut's trip.

6) With Cox/Forshaw suggesting that the astronaut twin is under constant acceleration or deceleration means that she is never in a inertial frame of reference. This claim is denied by others, see below, but who are able to deliver the identical results!

OTHER OPINIONS PROVIDING 'PROOF' for this paradox

Referring to the same paradox, Russell Stannard *does* accept that; “the effects produced by an acceleration are the same as those that would be produced by an equivalent gravitational field”
and;
“We can, therefore, replace the craft's acceleration by an imaginary gravitational field."

Other physicists, when recounting this same riddle, *do not* claim the 1g acceleration however. Both Charles Gerry and Russell Stannard's stories (having a similar outcome and result) require a 0.06 *cruising* speed for an *inertial frame to exist for most of the trip*. They both also allow the Earthbound twin to exist within an inertial frame.

Al-Khalili relies on the acceleration and deceleration of *one* observer only, (ignoring the fact that it could be the Earth moving, rather than the spacecraft) for his account of the 'Twins Paradox', explaining;
"Alice (the astronaut) feels the effects of her journey whilst Bob (home observer) remains stuck on the gently rotating Earth"!!

Clearly there is considerable dissention amongst our renowned physicists, each of whom expect to convince us of this ridiculous postulate!

To apply this spacetime reasoning equating one geodesic journey of 59,000 years (the Earth) with a second geodesic journey of only 40 years gives us a comparative ratio of 1475 to 1. Should we apply this ratio to the bowler and batsman in diagram 32 above it would mean that, if the straight thrown ball

took half a minute before being caught, the tossed ball would take just over 24 hours to arrive at the catcher's hands! Geodesics cannot apply here can they, or something is askew with the maths?

2) ANDROMEDA PARADOX; GEODESIC REASONING

From above, spacetime asserts that whenever objects are released to travel on their own, as long as they leave from the same point as one another and arrive at the same point as each other, they must follow the same geodesics of spacetime.

With spacetime being thought of as the "arena" in which all of the events in the universe take place, then all that one needs to specify is 'a point in spacetime'; a certain time and a typical spatial orientation for any journey.

For the Cox / Forshaw explanation of the possibility of a 3 million light year trip accomplished in 50 years they, yet again, exploit Einstein's mirror fallacy, utilising the Pythagorean equation, $x^2 + y^2 = z^2$, which I hope I have satisfactorily debunked in Chapter 1.

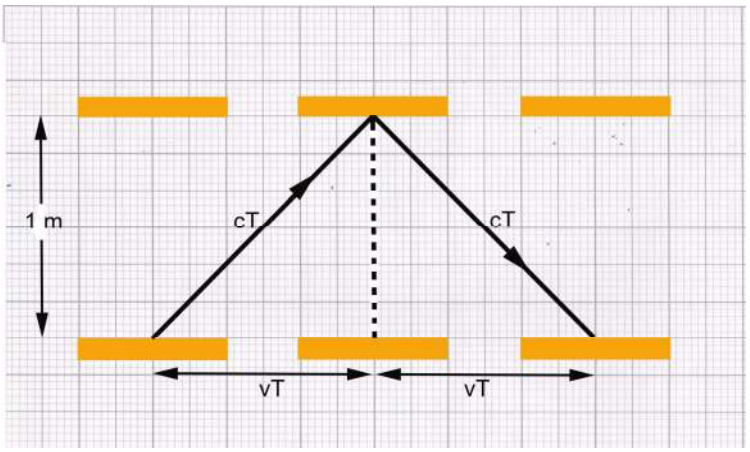

Diagram 35; the Cox/Forshaw equivalent still using Euclidean space

Cox/Forshaw give their diagram a different nomenclature from diagram 1 but speciously continue to maintain that the difference in length of the hypotenuse against that of the upright still constitutes the difference in elapsing time for their two observers.

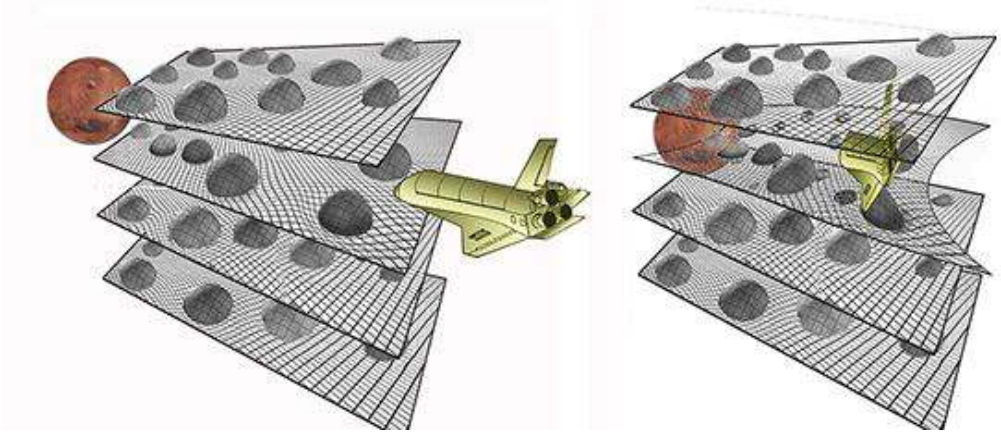

diagram 36,the specious affects of the shrinking of spatial distance

This is the Cox / Forshaw claim. The left image depicts a spaceship leaving Earth to travel through the matrix of spacetime. The right image shows a relevant part of the spacetime matrix being shortened, along with the craft being shortened in the direction of its travel.

In an attempt to puzzle out how the Cox / Forshaw argument works, and taking a tenet from the 'givens' of spacetime, I specify the two important points in spacetime geometry as being the Earth and Andromeda, with the spatial orientation being, that they are three million light years apart.

Below, diagram 37, is a Newtonian diagram representing this 50 year predicted trip for a rocket journeying to the Andromeda Galaxy.

This two dimensional drawing shows straight lines for the route, at present abandoning the 'curves' of spacetime, however, at least the departure and arrival points are common.

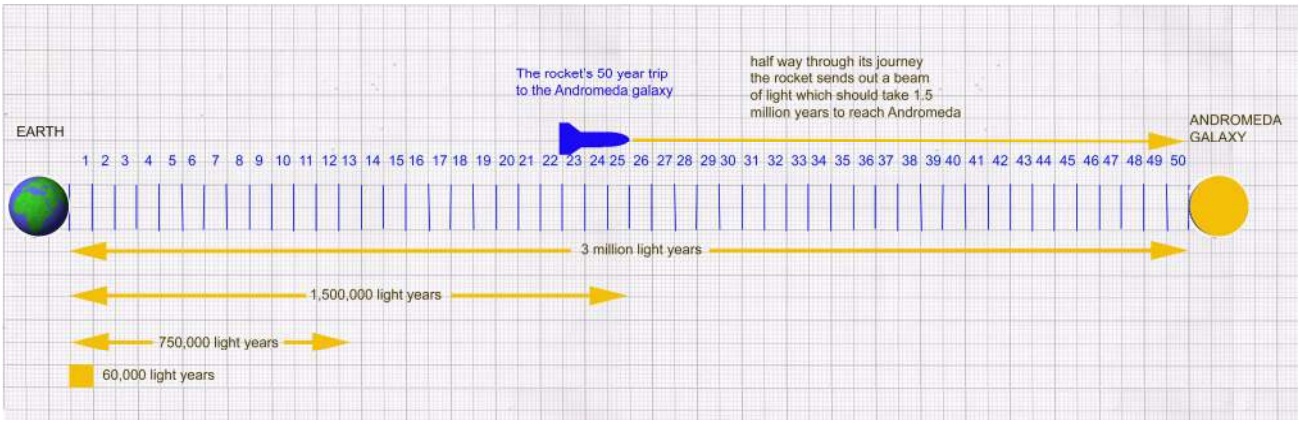

Diagram 37; an unattainable comparison

The blue figures are those attributed to the experience, in years, of our astronaut. These are compared with the full length yellow line representing a distance of 3 million light years.
In diagram 37 the rocket is half way through the trip, (whether or not we decide to accept it has taken 25 years for the astronaut, or 1.5 million years for a beam of light). The rocket emits a forwardly directed beam of light towards Andromeda.

With the speed of light being independent of the speed of its source, then that beam must take 1.5 million years to reach that Galaxy. Here, spacetime cannot be presented to represent an infinitely thin pancake when we know from Spectroscopy that electromagnetic radiation travels at 'c'.
At the moment of the light's emission the craft also must have 1.5 million miles of travel remaining, irrespective of how slowly time is passing for its pilot.

There is another even more fundamental issue with the Cox / Forshaw claim. Avoiding complicated mathematics we find that 3 million light years is 14.6 quintillion miles.
If the rocket is an eighth of a mile tall it will have to travel 116.8 quintillion *times its own height* to reach Andromeda.
If time dilation can contract this distance to Andromeda by allowing time to pass more slowly, then, by the same laws, the rocket will be contracted, itself, in the direction of its travel.
Nevertheless it will *still* have to travel 116.8 quintillion *times its own height*, even with its reduced engine size and reduced fuel capacity!

Why then should this craft's trip take less time than light itself would take?

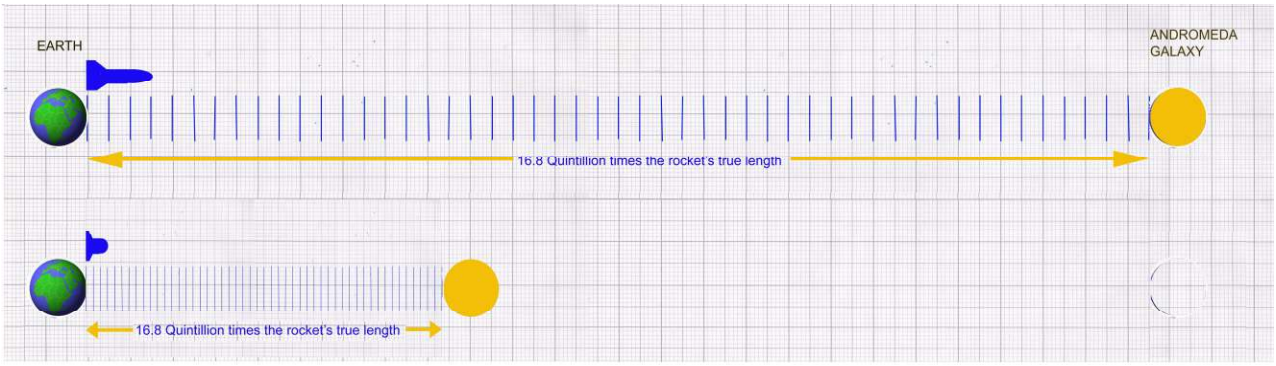

Diagram 38. a near light speed craft shortening its apparent travel distance, as seen by an outside observer! The craft is also shortened. Both have to travel a distance of 116.8 quintillion times the rocket's own height.

INCORRECT ASSUMPTIONS AND RESULTS

Below is the spacetime diagram 39, which demonstrates a trip to (and from) Andromeda, the red line being that of an accelerating craft, the green line representing Minkowski's claim that the speed of light cannot be violated by any action below that 45 degree line.

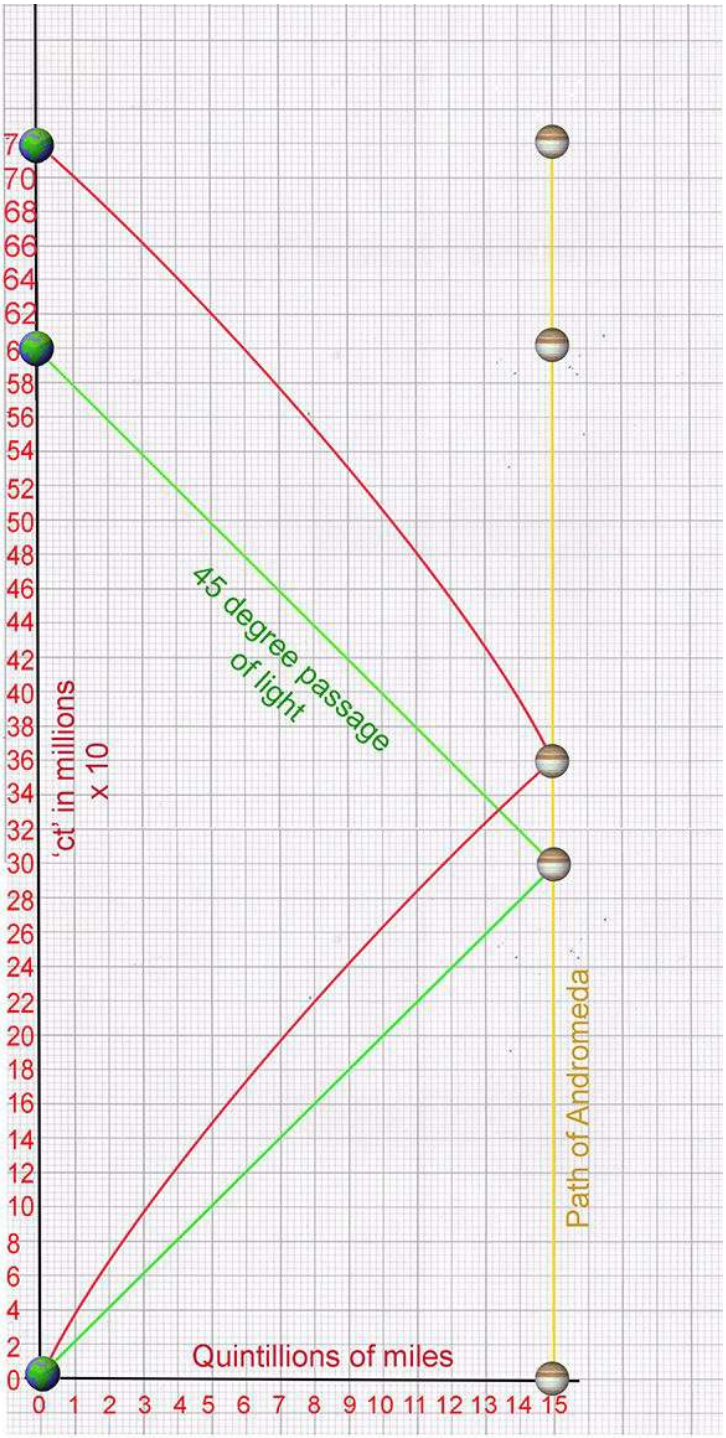

Diagram 39 a rockets trip to Andromeda.

Here we see light (green line) travelling at 'c', completing a 3 million light year trip in 3 million years. The accelerating rocket reaches Andromeda in 3.6 million years travelling close to the speed of light. The astronaut is moving up the time line in the same way as both Earth and Andromeda. Should she be at a 50 year level on the timeline she would be nowhere near her destination. There is no place on any graph that can record a slow running clock in the spacecraft, as opposed to a 'proper' time clock on Earth.

If such a superluminal event were possible the corollary would be that, after one day's travel, the rocket's astronaut will be *seeing light* behind her *that left Earth in 1851*. She will be able to count the visitors to the Great Exhibition in Crystal Palace.
After three days travelling the astronaut will see behind her the court of Henry V111.
After 64 days in space she will be able to record, with her rear facing camera the Pleistocene age.
Half way through his journey, should the astronaut direct a quick beam of light toward Andromeda, this pulse of light would arrive at the distant galaxy 1.5 million years later.
With the rocket having only 25 years of travel remaining, the astronaut will be easily outpacing this beam, contradicting the theory that light moves away from its source at 'c', irrespective of that source's speed.

ANDROMEDA and OTHER OBSERVERS REASONING

It was Galileo who asked "what if there were no observers" to the 'tree falling in a forest paradox', and this question might apply here too. Currently all *theoretical* proof of time dilation relies on the observations of two protagonists.

What would time be, and how would it differ, if not observed?

Also what if there was a *third* observer to complicate the issue? How would a third observer be involved in a spacetime diagram.

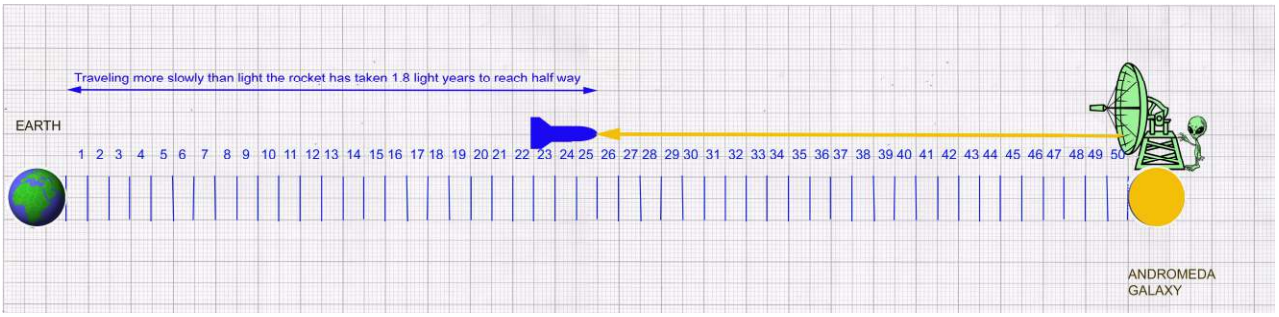

Diagram 40; an astronomer in the Andromeda Galaxy regards our spacecraft.

Here, an astronomer on Andromeda is looking towards Earth, as *we* are able to looks towards his galaxy.
If a spaceship took off from Earth 3 million years ago surely *that event* is what our alien would be seeing (at his) now? He would be seeing light from the

craft's *take-off flash*, given the that light has taken 3 million years to reach Andromeda.

From the spacetime diagram 39 above we can see that the rocket would be half way to Andromeda after 1.8 light years (travelling more slowly than light) If our alien were to have directed a pulse of light towards Earth 1.5 million years ago, when he saw the take-off flash, then that light would meet the rocket at a half way point . Given the way we record interplanetary distance we clearly do not accept that the path of light can be distorted by any significant amount by the matrix of spacetime.

After a millennia of generations, i.e.; 1.8 million years after the rocket's take-off, what would this astronomer's descendant see? He would see this rocket half way to his home planet. How could he see anything else, given that we all respect light speed?

Let us now introduce other characters to the charade. As our astronaut passes through the billions of stars of the Milky Way on her way to Andromeda she passes the little known occupants of those planets also. They are our additional outside observers. To them, even if the astronaut's clock is ticking slowly, and all protagonists will have their own comprehension of 'time', they will not fail to comprehend the 'proper' distance that the observed craft has travelled and has yet to travel.

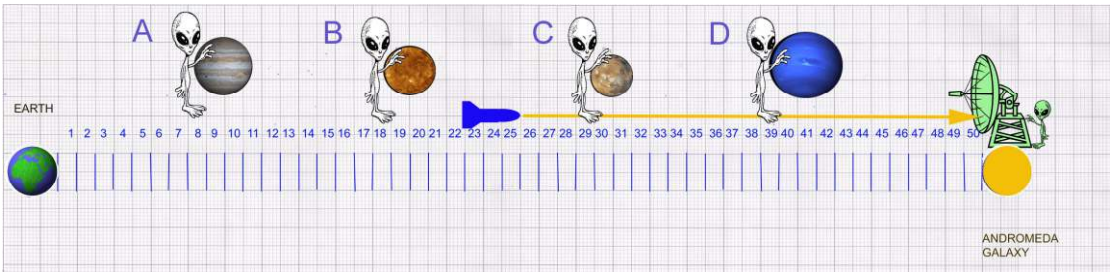

Diagram 41 Other observers of the flight to Andromeda.

Here we have some other alien observers.

Light from the take off flash would reach alien A after 480,000 light years.
Light from the take off flash would reach alien B after 1,080,000 light years.
Light from the take off flash would reach alien C after 1,740,000 light years.
Light from the take off flash would reach alien D after 2,340,000 light years.

Therefore, although the astronaut maintains she has only been travelling for A, 8 years, B 18 years, C twenty nine years and D thirty nine years, because her clock runs slowly, the poor aging rocket must have struggled through the same number of years that the aliens recognise.

Obviously the rocket has to do the proper miles, and the proper time, no matter how its captain disagrees.

Clearly something doesn't add up!

TIME DILATION; ERRONEOUS SCIENTIFIC PROOF

It is myths such as the Hafele and Keating experiment being propagated by enthusiastic scientists (who wish to prove something in which they already believe), that allow ideas of time dilation to be considered as fact.

Their, now famous, episode of, travelling atomic clocks within an aircraft, claimed that, on landing, that their clocks were out of sync with a previously checked, ground-based timepiece'.

The actual truth is;
Two scientists, Messrs Hafele and Keating, put 4 (yes, four) caesium atomic clocks (*so they could generalise any discrepancy!!*) on Pan Am flight 106 in October 1971 and flew for many hours.

Diagram 42/ Hafele and Keating with their *four* atomic clocks

On landing, the times on their clocks were no longer in sync with the US Naval Observatory device. There *was* a slight time difference; the slightness being that “if a man lived for 100 years, and spent all his life flying around the world, he would, after that time, be younger than his stay-at-home twin by one ten thousandths of a second" this exactly equalled the 'acceptable errors' for caesium clocks.

Other widely known 'proofs' for time dilation are debunked within the following;

1) http://www.physicsmyths.org.uk/timedilation.htm
Where inconsistencies in the Lorentz transformations are shown to lead to different conclusions regarding the interpretation of events in different

reference frames, not only with regard to the timeline of events, but due to the physical interaction of systems with regard to the whole causal chain of events.

2) http://phys.org/news/2010-04-discovery-quasars-dont-dilation-mystifies.html
Where events associates with quasars do not exhibit any time dilation

3) http://gsjournal.net/Science-Journals/Research%20Papers-Relativity%20Theory/Download/6363
Einstein's time dilation concept proved wrong by time sharing methods.

4) http://www.alternativephysics.org/book/TimeDilation.htm
The reference frame argument.

and, from my earlier essay;
5) http://gsjournal.net/Science-Journals/%7B$cat_name%7D/View/6227
concerning the misunderstanding of a muon's decay time at the Large Hadron Collider.

SUPER LUMINAL TRAVEL CONCEPTS and the HAWKINS and MINKOWSKI spacetime diagrams.

A further way to look at the issues of the probability of achieving superluminal journeys is to consider the hypotheses of Stephen Hawking and the spacetime diagrams of Minkowski (alluded to earlier).
Stephen Hawking compares events in spacetime with the ripples caused by a stone thrown into a pond.

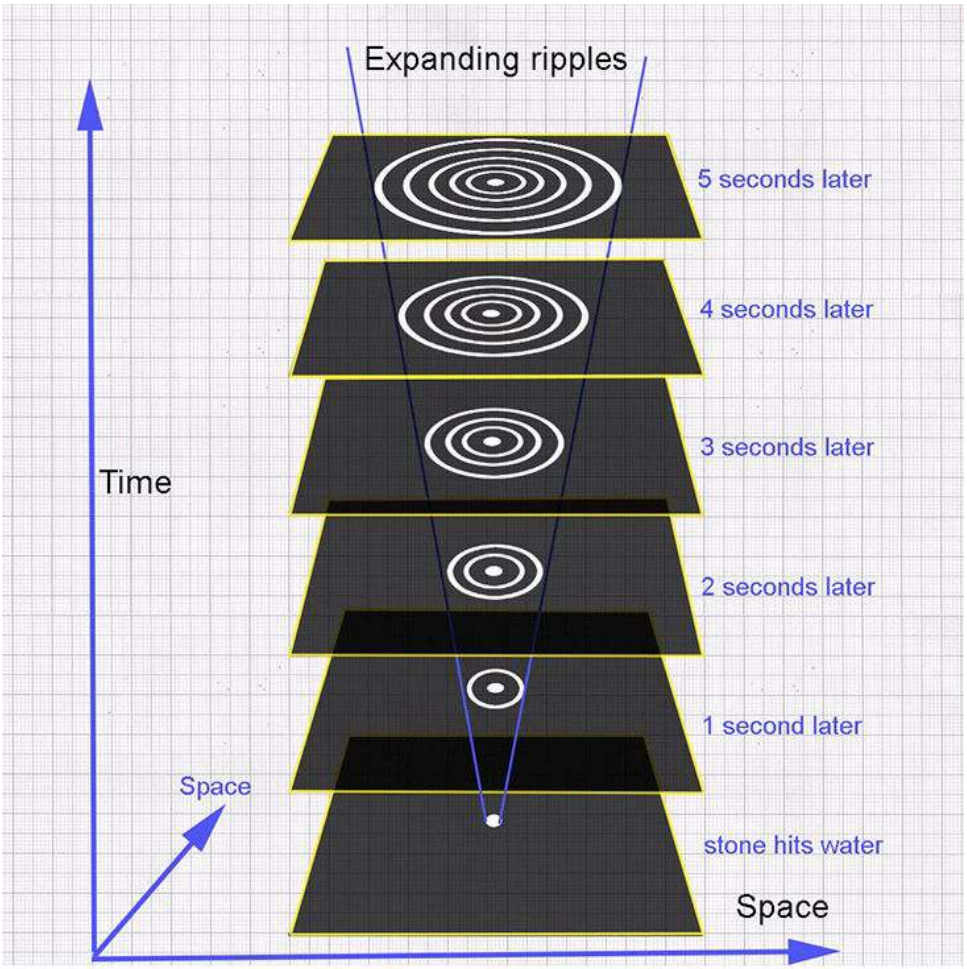

Diagram 43, expanding ripples in water to explain light propagating from an event.

This is virtually a 'spacetime diagram' as the 'Time' axis extends upwards from the two 'space' axes.

In Minkowski's spacetime diagrams he shows the future and the past as cones, above and below the x space axis, and, as we have exploited above, Minkowski maintains that the speed of light, through spacetime, always makes an angle of 45 degrees with either axis.

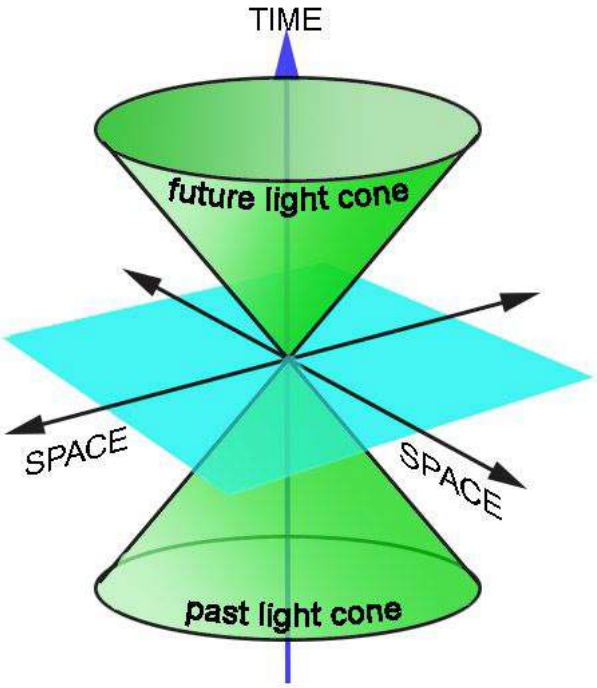

Diagram 44; Minkowski spacetime diagram.

Taking this idea into the cosmic sphere, Hawkins tracks an event such as the sun dying, and plots the impact on the earth through the use of a analogous spacetime diagram.

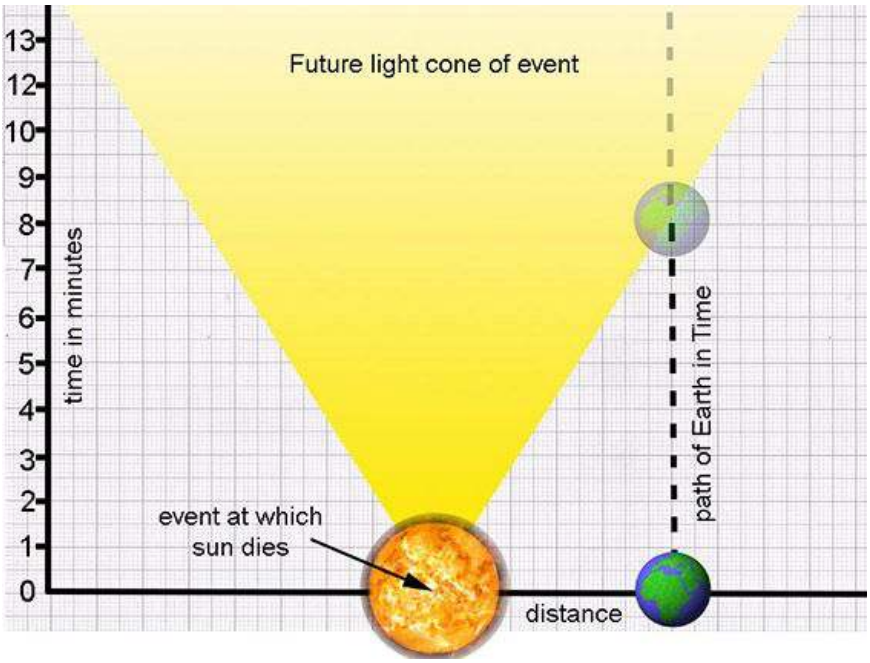

Diagram 45 the path of the Earth and the 'light from an event' meet at a space time distance, the coordinates of which we can determine.

Light from the sun takes eight minutes to reach Earth. Should the sun suddenly 'go out' Hawkins plots the above spacetime diagram of the Earth experiencing this disaster.

He draws a Minkowski cone of future light emanating from the 'event'.

Given the 'proper' distance that the Earth has from the sun, an upward projection has the Earth coinciding with that future cone after an eight minute interval.

Now lets look again at the Cox / Forshaw argument of a 3 million light year distance being able to be contracted to a 50 year journey for a spacetime assisted spacecraft..

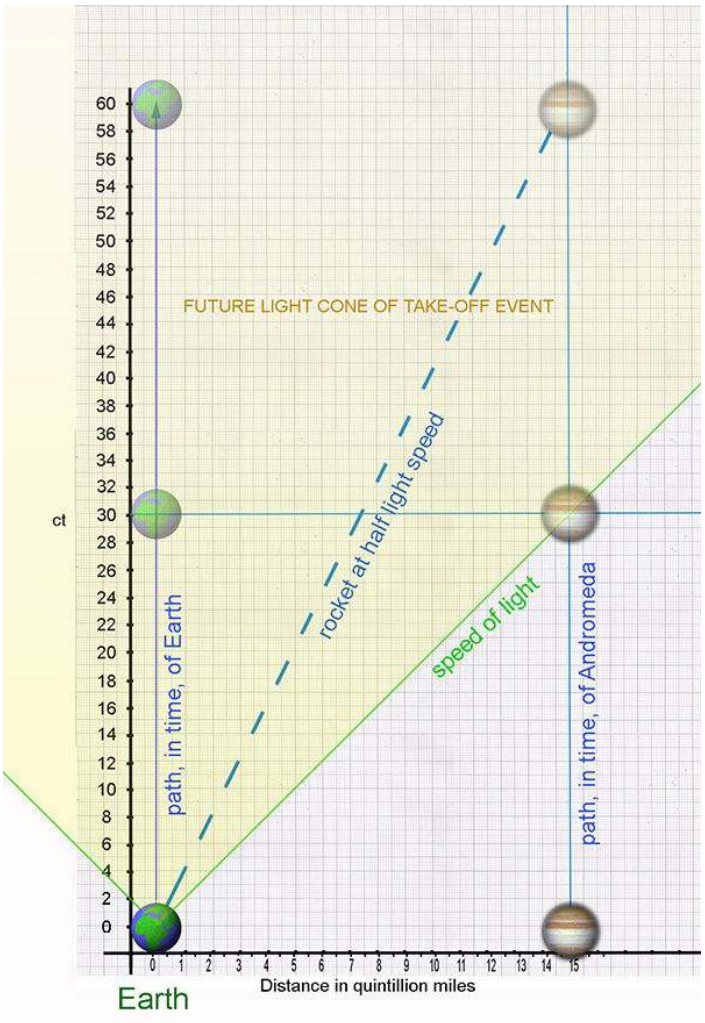

Diagram 46; comparing the journeys of a space craft and of light from Earth to Andromeda.

Here we establish the 'future cone' of light generated by the take-off flash of the rocket.

A planet from the Andromeda Galaxy, 14.6 quintillion miles from Earth, tracks (upwards, as does Earth), through time. The light cone from the take-off event, and the Andromeda planet-tracks, coincide at 30 million light years (the accepted light year distance from Earth).
A *half speed* rocket, plotted through the same spacetime, meets the Andromedian planet in sixty million years, not fifty years!

The Earth travels only on the time path, so uses all its time passing; 30 million years. But the rocket?
I suggest that the astronaut dies of old age en route, the rocket runs out of fuel about half way. Rocket detritus crashes into Andromeda after 60 million years.

Considering how mathematics dominate the arena of superluminal travel, there are many ways in which the example above may be visualised. Below we have a comparison of the speed of light against a half light-speed spacecraft.

However, there seems no way of mathematically representing the event of 50 years coinciding with 3 million light years.

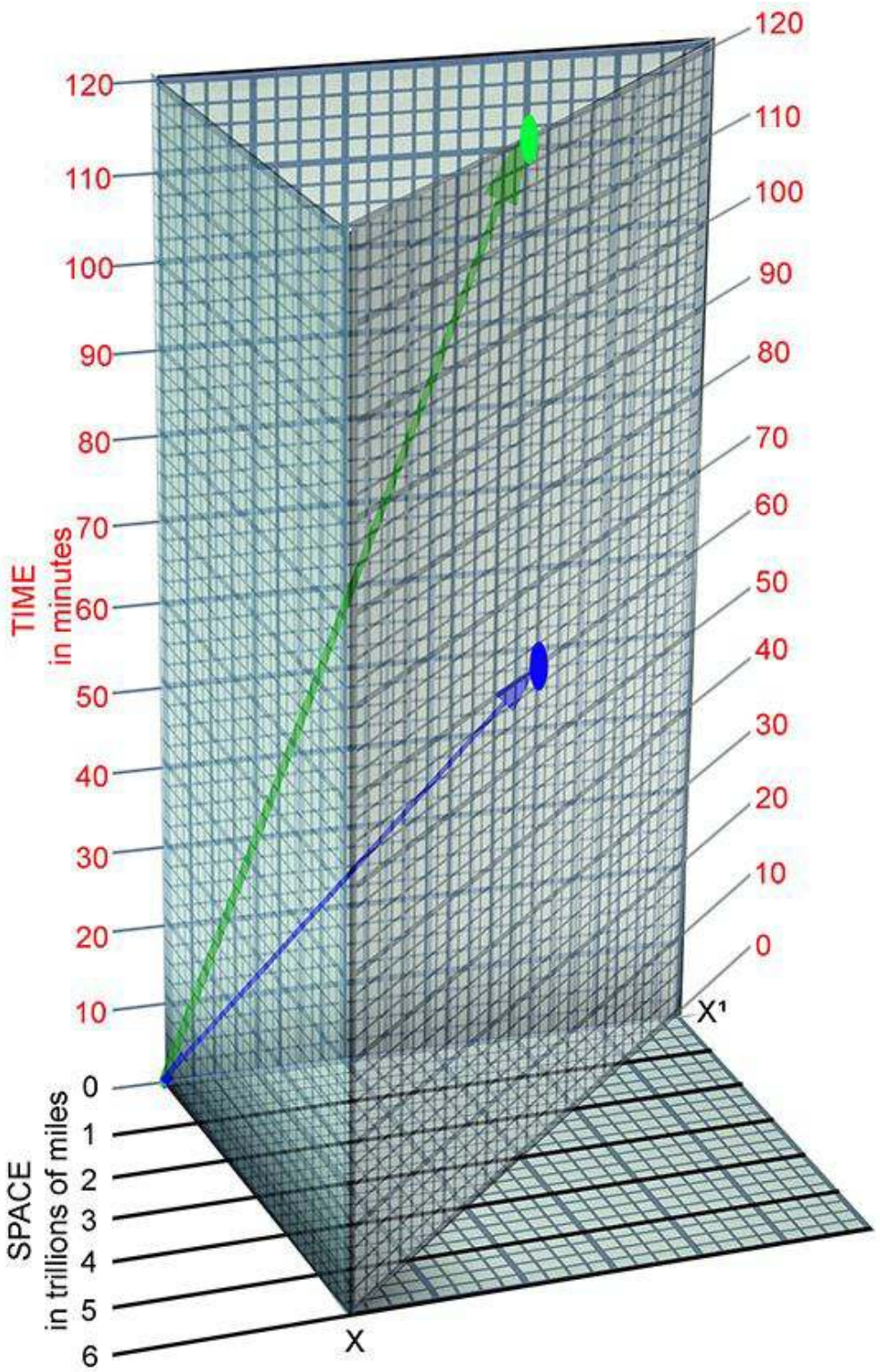

Diagram 47; The journey directions of light and half speed spacecraft.

CHAPTER 3

DOUBTFUL MATHEMATICS

Before we look at the final chapter where I evaluate another of Cox / Forshaw's theses, I add below several examples and quotes which go to show how widespread is the unease with which mathematics and various experimental procedures are viewed. I list these as an excuse that enables me to question so much currently accepted thought.

A cardinal rule for any research involving statistics, is that you cannot find your hypothesis in your results.
Before you go to your data with your statistical tool you have to have a hypothesis to test.
If your hypothesis comes from analysing the data, then there is no sense in analysing the same data to confirm it. I believe that much of the 'proof' for time dilation has arisen through this erroneous approach.

There are very many example of mathematics and experiments that have been used to 'prove' scientific issues that have later been debunked, therefore it is not unreasonable to assume that current mathematical thought and current experiments might well turn out to be unfounded or incorrect.

After the first world war the British and German expedition to prove Einstein's theory of the deflection of light by celestial bodies later showed errors as great as those they were trying to measure. At the time these results were heralded as a proper proof of what they sought.

The Steady State theory of the Universe was another 'proven' fact until debunked in 1965, after which it was abandoned.

In 1915 Einstein himself was so sure that the Universe was static that he modified his theory to make this a possibility, introducing the so-called Cosmological Constant into his equations!

Now it is accepted that 'dark matter' makes up a quarter of the Universe, but we have never found any.

With regard to energy conservation in the whole universe physicists disagree about figures but say its just a matter of *interpretation* of the same equations!

Also, occasionally maths has to use 'imaginary' numbers to assist results.

Kurt Godel says that every mathematical procedure is based on something that is not provably true. There is nothing that is entirely trustworthy about mathematics.

And untrustworthy is the choice to modify existing accepted equations to help prove a point! The Pythagorean equation that provided unacceptable results for spacetime had mathematicians complacently swapping a plus for a minus sign in the equation $S^2=(ct)^2 + x^2$ to $S^2=(ct)^2 - x^2$.

It is accepted that Quantum Mechanics introduce us to an unavoidable element of unpredictability and randomness into science.

Richard Feynman said, "Everything we know is only some kind of approximation."
And John Butterworth claims that proving something exactly with experiment is impossible; mostly it's a matter of judgement.

Even the wonderful piece of equipment at Cern, the Large Hadron Collider, that purports to discover even more subatomic particles, admits that even a perfect detector would be hampered by some 'background' which would be quantum mechanically mixed with the signal, clouding results.

CHAPTER 4

A DETAILED CRITICISM OF THE COX / FORSHAW BELIEF IN TIME DILATION

As a matching bookend to this thesis I am going to revisit the Cox / Forshaw hypothesis concerning the conflicting experiences of two observers, as they continue to adhere to this consideration as a definitive proof of time dilation. My comments and criticism throughout are in a blue font.

They embark upon a development of Special Relativity by exploiting their own 'thought experiment' in which they consider the outcome of putting a *boxed* 'lightclock' on a moving train, along with other time pieces, including a

pendulum clock. Being in an enclosed space, they say, the time pieces cannot 'tell' whether or not they are moving.

I claim that as the lightclock will immediately lose its reflecting beam, it will be 'obvious' to those clocks whether or not they are moving.

Cox / Forshaw then appear to contradict their first statement as they then maintain that if the lightclock *behaved differently* (which it will) from the pendulum clock, they would drift out of sync, (for the light clock it would not be out of sync, but it would have stopped working) and that discrepancy would allow us to say that the clocks are moving.

Then they assert that "if the moving lightclock is running slow, as determined by the observer on the platform, then so too must *all the other clocks run slow*. The passage of time is slowed down on the moving train according to someone on the platform."

This seems to contradict the fact that a *divergence* between the clock's times apparently shows that they are in movement, yet all the clocks, apparently running slow, also show the same thing.

Cox/ Forshaw follow up on the trust in Einstein's moving mirrors with a further assertion which again proposes a differing time experience between the train passenger and platform observer.
They suggest that these two protagonists measure distances *relative to their own positions*, and measure time using their own wristwatches.

This sounds straightforward until, (in a bizarre use of the 'moving in an upward, timeline' direction) we are assured that
the passenger on a train, which has travelled for 2 hours at 100 miles per hour, can still consider him/herself to have travelled a distance of *zero* since the passenger never left his/her seat.

This needs further investigation.
Yes, the passenger could be the 'static' object (having travelled zero distance) providing we then accept that the world and the train track have moved.
Cox/Forshaw argue that only time has moved for the passenger. (s=ct where t is 2 hours and 's' being the spacetime distance)

But when they consider the event from a *bystander's* point of view, sitting on the ground (static relative to the Earth) watching the train pass, they are suddenly abandoning the 'who is moving' principle.
The outside observer measures time and distance *relative to himself*, noting that the passenger has travelled for 2 hours at 100 mph, allowing him to calculate the passenger's journey as being X=vT.

Taking this further they then allow
that the passenger's trip, for the outside observer, has travelled a spacetime distance of $s^2=(cT)^2-(vT)^2$.

(by applying an *adapted* Pythagorean equation!) From this they calculate that,
for the 'static' observer, the passenger's journey took a little longer than the passenger's opinion of the event.
Does an opinion of time and place count for anything if times and places are so physically suspect?
I have said that Einstein's flawed 'thought experiment' has led to unlikely presumptions,
so let us examine the anomalies.

Firstly, This is an unsound argument as one protagonist is considered as being "relative to the Earth" and the other is not.

The outside observer may be considering himself as 'relative to himself' however, this does not preclude the all important issue that he is, in the proposition, sitting on Earth, whilst the other is travelling *over* or *across* the Earth.
The 'common' locality, cannot be overlooked whether it be the Earth or even *the other protagonist* himself especially when both are in an inertial (non accelerating) frame of reference.

Next, and further to the above, a decision has been made about 'who is moving'; (it's not the passenger, apparently) a decision that could be reversed to prove the opposite. In fact in every example to be made in this dialectic it is almost impossible for any protagonist *ever* to be 'other than moving'.

Next, spacetime rules say
that *distance between events is invariant*, and that everything moves over spacetime *at the same speed*.
Also, distances in spacetime are universal.

Does this not mean that for both the passenger and bystander the distance travelled by the passenger is relevant, and the time taken by him to make that trip *must* coincide, as the start and end points of the trip correspond?

Next, if a wristwatch is a satisfactory way of measuring spacetime distance, then, in this example, why should there be any difference in the time their watches read, after two hours, if they were synchronised at the outset?

The above refutation of the results of the Cox/Forshaw argument would appear also to counter the spacetime way of thinking, in that
(a) a moving clock uses up some of its fixed quota of 'spacetime speed' whilst moving through space, leaving less time for its motion through time, and (b) a moving clock doesn't move so fast through time as a stationary clock, which is a way of saying that it ticks more slowly.

Spacetime cannot use, for its explanation, motorbikes which travel north being comparable with 'no movement' on an x axis, as, similarly, a passenger on a plane, who has also never left her seat, cannot say that she has travelled a distance of zero, if we are to use the local relativity of the Earth.

How pleasantly surprised, then, must these travellers feel, when they alight to find that they are, actually, in a different, distant location, relative to where they were on Earth? Euclidean space does seem pertinent here.

Therefore, as it is *totally unlikely* that in *any event* there are *no* characters who are 'not moving', it seems an unreal and non-useful thought to consider one as being 'relative to oneself'.

When one arrives at a chosen destination, at any given distance from the point of departure, the change in the 'space between traveller and locations' has to be valid, especially in spacetime.

Therefore, clearly, *more* than 'just time' passes for *every* protagonist at *any* event, if we agree that nothing is static.
The only possible significant relative situation is being *relative to another particular, chosen, protagonist* in a matching event.

ONE LAST WORD

And lastly, given that this thesis seeks to debunk the whole idea of the possibility of superluminal travel, I find it more than interesting that NASA do not use any of the applied mathematics, or the physics, or the spacetime equations of Einstein, Minkowski or Lorentz in planning their spacecraft's trips into deep space. For them an Earth bound guidance system is what is relied upon!

LIGHT CLOCK PHOTOGRAPHS

Below, as a photographic footnote, I provide photographs that do demonstrate that parallel mirrors, when moved, will lose any beam bouncing within them if moved beyond the width of those mirrors.
Here we have 4 images of a working 'light clock' situated on a table marked with a grid.

Image 1

Image 1 above shows a working 'light clock' positioned on a table marked with a grid. The beam is bouncing back and forth on the right hand side of the mirrors. The main frame is approximately two and a third squares in from the left hand table edge.

Image 2

In image 2 the 'lightclock' has been moved slightly to the right, as can be seen by its new position at three squares from the left, on the table's grid. The bouncing beam has stayed in its position relative to the table, but is now central to the mirrors.

Image 3.

Now the 'light clock' has been shifted even further to the right (three and a third squares) and the reflected beam is almost at the left hand edge of the mirrors; but *still directly above* the same grid mark on the table. With one more slight movement to the right of the light clock's frame and the bouncing beam will escape.

Image 4

Lastly, image 4, we twist the 'light clock' around, in a clockwise direction; it's now on a diagonal to the grid. The bouncing beam turns with the mirrors as they remain parallel to one another.

END

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