The Quantum Angular Offset Theory of Relativity

"Just what do you mean when you say 'It's a fabric?'
I mean spacetime is woven, its threads - the dimensions."

--By Brian Shuster

"QAO Theory takes a novel approach to the Lorentz Transformations, rewriting them so that they can be expressed in simple geometric terms. The resulting geometric formulas provide new insights into Relativity.

The Geometric Lorentz Transformations describe the relationship between any particles in their own inertial frames in the form of their relative angle to one another (and relative motion is described as the relative change to that angle). It is a simple matter to convert the results of the new formulas to the conventional Lorentz Transformations and back again.

When we measure the speed for light in a vacuum using these new Geometric Lorentz Transformations, we find that light ***always moves directly away from (or toward) all normal mass at a 90-degree angle in time****, and therefore, any observer in any reference frame observes the same speed for C – rendering the speed of light a constant for every observer; however,*

We also discover that geometric angles must adhere to the Uncertainty Principle. In fact, when the Einstein Field Equations are similarly converted to Geometric equations, a Planck-length uncertainty appears, and the angle of that uncertainty, when converted back to the traditional Einstein Field Equations, is measured to be exactly the speed of light in a vacuum.

These results provide evidence that, because it is impossible actually to know any angle with absolute certainty, even 90-degrees is imperfect, so light does not travel at infinite speed away from (or toward) all observers. Instead, light travels at a constant speed, derived from the Planck-length uncertainty, even though it is otherwise moving directly away from (or toward) all observers' positions (in the Time dimension).

Close inspection of the Planck-length uncertainty of the angles yields even more insight into the physics of Relativity. Normally, we represent a Cartesian coordinate system with axes that intersect at a set point. What we discover here, though, is that the spatial dimensions actually ***do not connect at a point*** *to form their axes – rather, they "orbit" around a point in a structure we call a 'Quantum Sphere.'*

To explain the orbiting of spatial dimensions around this point, QAO Theory postulates that Gravity is actually ***a strong charged force*** *that is expressed by the dimensions themselves -* ***attracting unlike dimension-types*** *to each other, and* ***repelling like dimension types*** *away from one-another. It is this force that collapses the three spatial dimensions into the shape of lines, and orients those lines at right-angles to one another* *(by like-charge repulsion) while holding them "in-orbit" around the Time dimension (by dislike-charge attraction).*

Mass, we find, creates Quantum Spheres. In regions with a high-density of mass, there is a correspondingly high density of Quantum Spheres. In this environment, the gravity of the spatial dimensions <u>of neighboring Spheres</u> exert like-charge repulsive force upon each other. The Quantum Spheres deform into a shape that is their lowest energy state. The coordinate system that results from the new shape contains space-dimensions that no longer intersect at right-angles from the perspective of an outside observer.

The deformation in shape is almost identical for all nearby Quantum Spheres, and thus we conclude that in the presence of mass, the observed large-scale effects of gravity (the warping of spacetime) is the result of an emergent complexity formed by simple Quantum Spheres being acted upon by each other."

<u>Preface:</u>

Why is the speed of light in a vacuum a constant?

This question has dogged physicists since the notion was first put forward. Invariably, the answers sound like religious doctrine. We observe this to be so, our math says it is so, and therefore, it is so because it is so.

That explanation is circular and unsatisfying. It is particularly troubling because there is an answer, and understanding not just *that* C is a constant, but *why that is so* is critical to explaining the nature of gravity.

As it turns out, there is just one way that the speed of light can be a constant: *Time (the Temporal dimension) must exist as a real dimension with a constant and immutable direction*. Conversely, in order for the Uncertainty Principle to be upheld, Spatial dimensions must exist in only probabilistic relative directions. (See Illustrations *Preface 1a & 1b*). Once that answer is understood and extensively explored, an amazing thing happens! The Universe all starts to make sense. In fact, understanding what makes the speed of light a constant, forces Quantum Physics right into the heart of Relativity theory, and the Universe begins to feel very intuitive again.

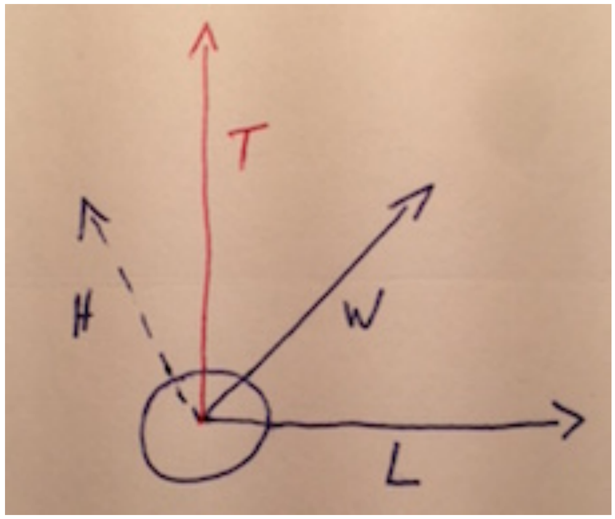

Illustration Preface 1a: Modern Physics viewpoint of an Event wherein four-dimensional Axes (Height, Width, Length and Time) originate at right angles to one-another at a fixed point in Spacetime

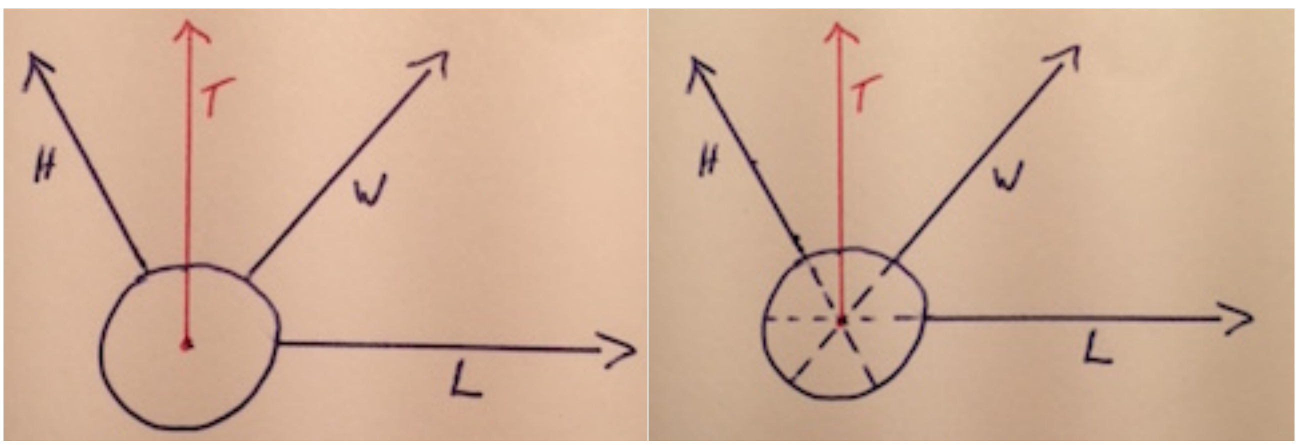

Illustration Preface 1b & 1c: Four-dimensional Axes of an Event where Time originates at an established point, but the Spatial dimensions originate only in probabilistic *locations* (and thus at probabilistic relative *angles*) around that point

From this one simple discovery, answers to questions including the hierarchical problem of forces, the true nature of gravity, the basis for Quantum Physics, and even the fundamental nature of dark matter and dark energy – all become very obvious.

I rely heavily on geometry to answer the speed of light question, which requires a new expression of the main formulas of Relativity. What we gain by doing this is a new understanding of Relativity with two main concepts: 1- that geometric angles are subject to Uncertainty; and 2- that geometric angles are the only truly valid way for particles to establish their relative location and motion in spacetime. Exploring the implications of those concepts yields a bounty of new understandings.

In the course of my work preparing QAO Theory, I set out to build a case based on numerous known physics principles and a selection of thought experiments; all culminating in mathematical proofs. I am not a classically trained theoretical physicist, so I had the advantage of approaching the subject from a totally new perspective. This Theory is a Principle-Theory. It primarily employs tools of analytics and logic, supported by well-understood math and empirical discoveries.

As the Theory took shape, I came to learn that some of my thought experiments led to conclusions, which, although at the times when I had them I believed were novel revelations, in fact were actually already quite well established. Nevertheless this was encouraging to me as it demonstrated early on, that my reasoning was sound. I have kept most of them in this paper because I believe they are not only useful in building the case for the Theory, but that I have approached everything from a different and somewhat unique perspective. Therefore, although some of the following materials may seem redundant for those persons learned in physics, I feel they help to build the case and create the proper thought-framework and mindset as I present them, and therefore I have chosen to leave these elements in as I wrote them, rather than refer to the concepts just by reference.

In some ways, QAO Theory is a restatement of Special and General Relativity, but with critical differences and new insights that correct primary errors and assumptions.

What this Theory will show is that spacetime is not a unified fabric as it has been previously envisioned. There is a fundamental set of axes for space and time dimensions, which are invariant. The unique geometry of the axes provides for a universal distortion – the Root Warp – that enables space to curve around time. Mass also acts on the Root Warp, resulting in an apparent increase in the local "curvature" of spacetime (Space around Time) and in relativistic effects. Moreover, a temporal axis is reestablished, in parallel to the Root Temporal axis, at every location in spacetime where an Event takes place.

This Theory predicts results that are almost identical - but not identical in every case - to those of Special and General Relativity. Because of these differences, and the unique approach needed to discover them, I have created terms to describe properties of my models. Some of these terms are close to terms that physicists already use, but it will become clear that my defined terms are used slightly differently.

This theory is best understood if these terms are defined at the outset. Other terms will be introduced in context:

Passage: Distance traveled along (or parallel to) the Root Temporal dimensional axis
Stillness: (An object at rest) The total absence of energy influence on mass (an *equivalent* concept to vacuum, which can be defined as the total absence of mass influence on energy)
PassageSpeed: The combination of a particle's rate of: Speed in Space and Passage in Time.
Strand: A particle as it exists in all Temporal and Spatial dimensions (for reasons that will only become apparent at the conclusion of this paper, the term Strand is used (when appropriate) instead of the less precisely intended term, "world-line.")

Present Moment: A point along the Root Temporal dimensional axis, or a line running in parallel to that axis, and intersecting with an observation in the Spatial dimensions. (One instant in time)

Overview:

In his theory of Special Relativity, Einstein set up the idea of four-dimensional spacetime, and shortly thereafter, Minkowski established that the three spatial dimensions and the temporal dimension are actually a single four-dimensional entity (Minkowski space, theoretically represented as a Block-Universe). However, the postulates of Special Relativity are discussed in terms of relative motion. "Motion" in a Block-Universe is a nonsensical concept. "Relative motion," however, is the central feature.

Relative motion requires us to create a description of a location using four coordinate numbers (S1, S2, S3, T1) for each particle, and then to measure the change between the particles. This paper will show that particles do not have enough data about themselves to actually create these necessary coordinates and therefore, they should be unable to establish a unique location for themselves, nor should they be capable of determining a relative location between themselves and another particle in spacetime. (Using a four-number coordinate system also, incidentally, violates the Uncertainty Principle).

Probabilistic Geometry allows us to describe the relative motion of two particles using only three numbers (by essentially enabling every particle to create two equally valid coordinate-axes-systems which can orientate to one-another). These dual axes-systems can then triangulate a location in spacetime with no need for an external reference point, nor need for any information about its prior dimensional orientations.

"Motion" of a particle along its Particle-Strand, therefore, is correctly described as a difference in the angle between two positions on the Particle-Strand in relation to the dual-axes systems of the measuring particle. In fact, all of the issues with nonsensical equations and reconciliation of Relativity Theory and Quantum Mechanics can be resolved by changing the mathematical methodology that describes how particles establish their location and relative motion.

"Motion" through spacetime is correctly expressed in four-dimensional Probabilistic Geometry with a fundamentally uncertain coordinate system. This will be simplified and presented shortly, but there is a simple thought experiment that can demonstrate that this must be the case, which we can perform before any elaboration of the notion:

> *There is a fundamental problem with the classical notion of curved and warped spacetime. Imagine a one-dimensional line existing in one dimension. That line cannot warp or bend. It can take a different shape (i.e. it can be "cut"), but it can only* ***warp*** *into a second dimension; imagine a two-dimensional plane existing in a two dimensional universe. That plane can also take a different shape (i.e. it can be ripped and sections can be taken out), but it cannot warp without the existence of a third dimension; imagine a sphere in a three dimensional universe. Again, the*

sphere can take a different shape by having bulges added or sections removed, but it also requires a higher dimension into which to warp. Similarly, a four-dimensional volume in four-dimensional spacetime would require a fifth dimension to warp into. Unless we are prepared to admit the existence of a fifth (hyperspace) dimension, then spacetime cannot exists as a single four-dimensional "fabric." There must be a different mechanism by which space and time to appear to curve and warp ***entirely within its own four-dimensional spacetime****.* (Of course, there is: the axes by which we locate and describe the volume we are observing can shift so that they do not meet at right-angles, as we shall explore extensively below).

Before we leave the discussion of fundamental inconsistencies between Relativity Theory and empirical observations, here are two others:

- Quantum entanglement allows instantaneous action over distance. This disproves the notion of a universal speed limit. *Somehow, information must be able to move from one point in spacetime to another with zero passage of time.* Moreover, this must be able to happen across spacetime (meaning that **even if spacetime is warped between two entangled particles**, and even though the particles may be at different relative motion in spacetime, information must still be able to be transmitted at infinite speed); and,
- The mathematics of Special Relativity teach that accelerating a particle with finite mass to a finite speed (the speed of light) would require infinite energy. *Two finite properties combine together in a way so as to create an infinite result. This is impossible*. Of course, we ignore real scrutiny of this issue by putting the speed of light itself into the denominator of the equation we use to determine the gamma modifier for E=MC^2, **but this is goal-seeked math**. To be truly descriptive, our formula must be able to produce an infinite result without resorting to an artificially derived division by zero. This can only be accomplished using geometry.

We are forced to overlook these and other glaring inconsistencies in order to make use of Special and General Relativity Theories. This must mean that Relativity theory is incorrect, and there must exist a more accurate way to describe the known physical behavior of the Universe. QAO Theory is employed to modify a basic flaw in the curved spacetime concept, and in doing so, it resolves and explains all of the known inconsistencies.

<u>A quick note about the first Model:</u>

It is much simpler for me to visualize the concepts of a block-universe by using a three-dimensional Euclidean spacetime model, so for illustrative purposes, that is the model which I've chosen. It is also simpler to visualize and illustrate on paper using a closed-universe model. These two features of the model do not impact the resulting conclusions, which will hold true for a four-dimensional spacetime, open Universe. The matter of modeling in Euclidean spacetime rather than Minkowski spacetime will be corrected when it becomes relevant. These models are really intended just to reframe a few basic concepts, and they will be upgraded to more accurate models as the paper progresses.

Introduction

Imagine a very small three-dimensional spacetime, closed Universe floating in the air in front of you. The shape of this Universe is like a football, with an origin-singularity exploding into a “big-bang” at one end, and a gravitational contraction to a terminal-singularity at the other. The Horizontal “slices” of this Universe represent the two spatial dimensions (Height and Width or “H-W”), and the axis connecting the origin and terminal singularities represents the one temporal dimension (Time or “T”).

Because I have included the “Terminal Singularity” as a feature of the model, it bears quick explanation: the closed-universe premise of this model necessitates a “big crunch” in which the forces of the universe ultimately result in the contraction of all the universe’s mass and energy into a single point. This condition presumes, then, that Space and Time also converge into the singularity, and neither Space nor Time exists outside the fully enclosed Universe.

> It is far easier to explain the QAO Theory of Relativity using existing language (without adding many more new words than have already been defined above), but it is important to note that the concept of “motion,” “movement,” and “speed” are used only for convenience. It is understood that nothing actually “moves” at all. Rather, everything exists at relative geometric angles, and “motion” is the difference between sets of measured angles. Still, these words are useful, and thus, although these words are used, they are typically done so with quotation marks.

Again for the sake of simplicity, we imagine that when the model Universe we have constructed comes into being, it is instantly populated with matter and photons. The photons immediately “move” away from the origin point at the speed of light. Therefore, in this first case, we observe a light-cone moving at C away from the origin singularity. All normal matter in this model moves away from the origin singularity at some combination of H-W-T angles within the light cone.

Illustration 1a: First Model Block Universe

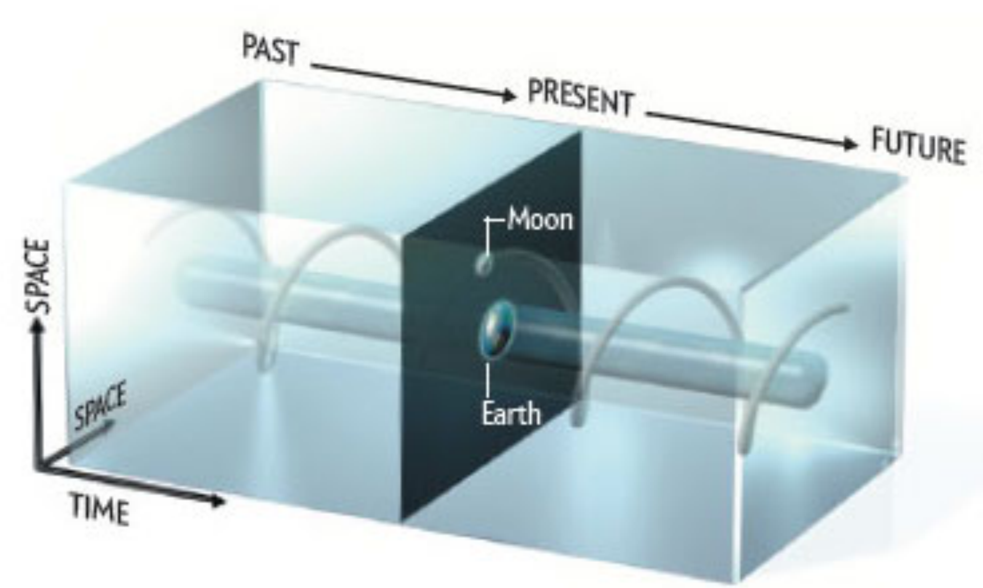

Illustration 1b: A highlighted "Present Moment" for the Earth and Moon in Model Block Universe One

The first observation that we make with the model is that the complete Universe exists in a fixed state. The Time dimension is virtually identical to the Spatial dimensions, other than the features that it is 1- perpendicular to them; 2- the axis forms a straight line between the origin singularity and the terminal singularity; and 3- there is only one Time dimension. Within the model Universe, the sum total of mass and energy, the configuration of that mass and energy, and the changes in configuration of that mass and energy over the Time dimension are all fixed within the volume. There is no "motion."

Put another way, nothing in the model Universe is moving at all[i]. If we (as four-dimensional observers) were to take a slice of this model Universe at a 90-degree angle from the T-axis, we would observe a slice of "Present Moment." If we were then to take a second slice further along the T-axis and look at a single particle in both slices, we would note that what we have traditionally called "movement" can also be described as the difference in the angle relative to the Spatial axes (the Root Axes that are established at the origin of the model), in which those two locations of the particle exist.

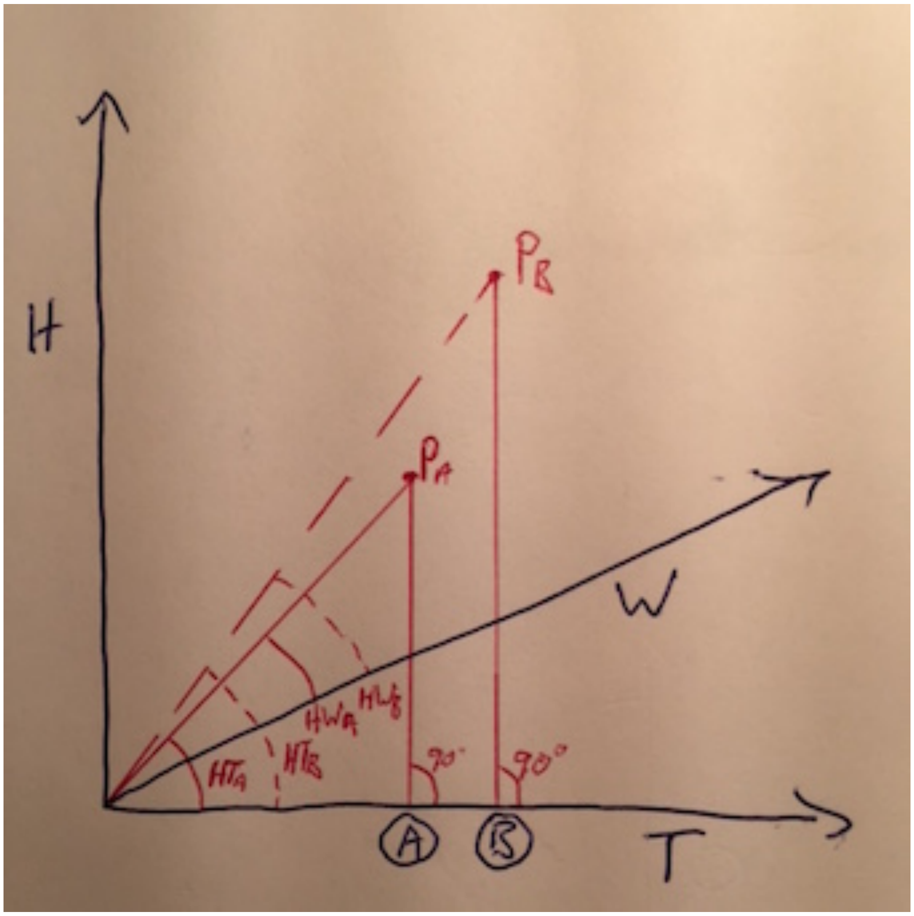

Illustration 2: Particle in position A (PA) observed at Present Moment TA (90-degrees from Time) has a precise location at angle (HT)A and angle (HW)A. When in Present Moment B, the position (PB) is described as Perpendicular to Time at angle (HT)B;(HW)B. The “movement” from Position A to Position B is completely described as a change in the angles from the Root axes at the measured Present Moments.

I acknowledge that I’m cheating a bit here, by allowing us to be four-dimensional observers of the three-dimensional model, and the particle involved doesn’t have the same access to information that we have. Much later, we will resolve this issue, but for now, this illustration is provided to establish foundational material. Let’s leave this discussion for a moment and return to the model Universe that we have set up:

Imagine a particle that is “moving” at normal speeds through the various dimensions of the model Universe. This particle would appear to be a very tiny strand (world-line) stretching in a largely straight line along the H-W-T axes from the origin singularity.

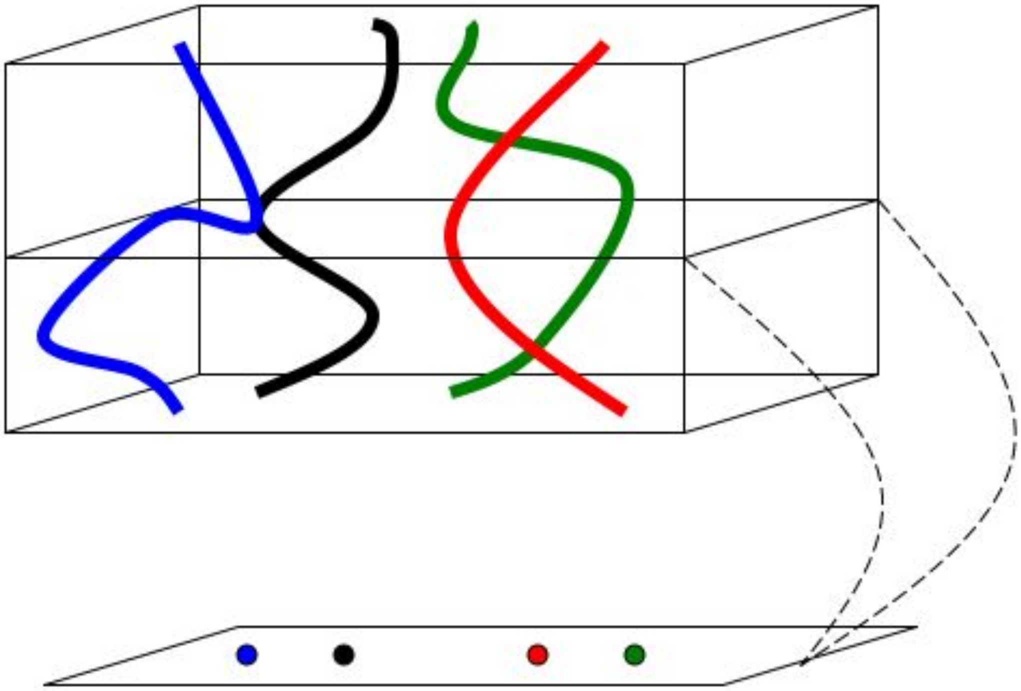

Illustration 3: 4 Particles “moving” through Universe Model 1 viewed as world-lines, or more precisely, “Particle-Strands” with permanent and fixed positions throughout space and time.

Because we can observe that there is no “motion” within the model, we could be tempted to draw several conclusions. One correct conclusion would be that a particle’s observed “speed” (for a non-accelerating particle) is equivalent to the measurement of the length of the particle’s Strand relative to the length of the Time-axes. In other words, if we are attempting to gauge the “speed” of two particles within the model, we could look across a one-unit measure (or natural unit measure, or arbitrary-stretch-of-axis measure) along the T-axis and observe that if the length of the particle-strand for particle A was longer than that of a similar measure for Particle B, then we know that Particle A is moving at a greater “speed” through space than Particle B.

This very simple concept has radical implications in revealing the true nature of Gravity, which will be discussed much later. (The teaser for this concept is that: if the particle-strand of Particle B is longer than the strand for Particle A, even though both particles may be otherwise identical, then the longer (the faster moving) Particle B has *more mass-per-time-unit* than Particle A).

Another tempting, but *incorrect*, conclusion we might want to draw is that we could measure the speed of a particle even without a second particle being present.

Because we are *modeling* a **space-time** universe using only Spatial dimensions (without animations, it’s really the only way to do it – to “draw” the Time dimension in space on the paper/screen), we intuitively want to assume that we can measure units along all three dimensional axis using the same “length” as a unit of measure. Such a system would allow us to discuss a particle-strand from two different positions, and conclude a “distance” travelled over “time.” This ignores the inherent problem that there is no universal conversion of space units into time units.

In fact, one could argue that it is actually the lack of ability to convert Space units (distance) in to Time units (time) that is the foundation of relativistic effects.

In isolation, all that we can conclude about the speed of a (non-accelerating) particle along any given stretch of its particle-strand, is that it has a movement relative to the Spatial axes and relative to the Temporal axis. Relative to these axes, a non-accelerating particle is always moving at 45-degrees. (One could argue that both Spatial dimensions should be included in the angle-of-motion calculation; however, because Spatial dimensions are all identical, their axes are freely rotated in Space-Time, and thus for a single non-accelerating particle, all Spatial dimensions above one can be ignored).

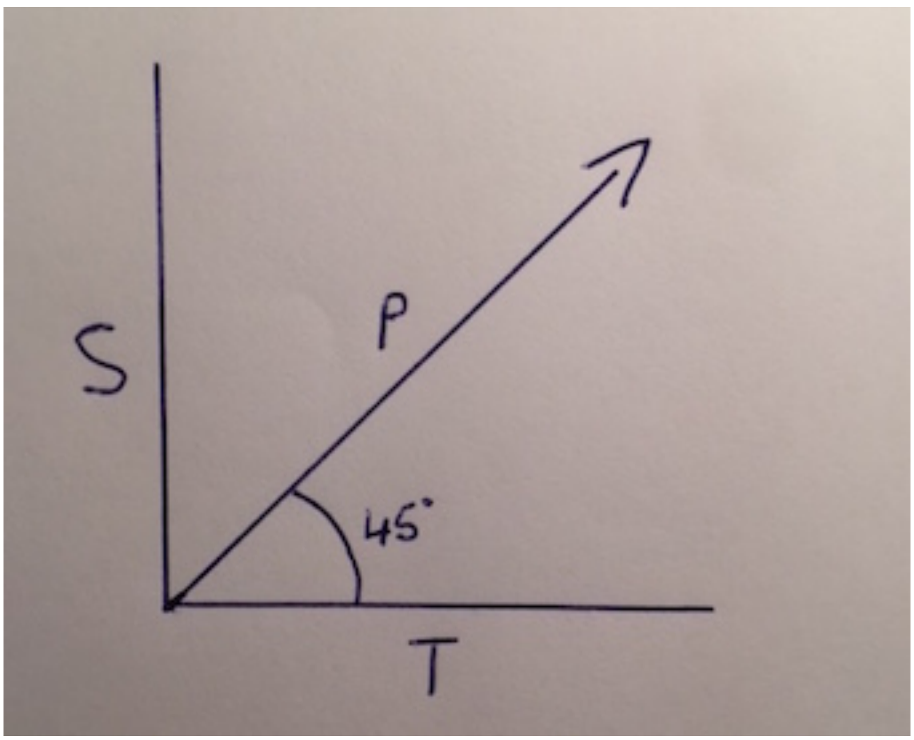

Illustration 4: Particle in “motion” through spacetime with no reference units on S or T

Why 45-degrees? Examining Illustration 4, we see that there are no units of measurement along either of the axes. All that can be known about an isolated, non-accelerating particle-strand is that: it either has no motion in one-dimension type, or that it has motion in both dimension types. Motion in both dimension types means that the particle “moves” in space and in time. Over any arbitrary measure along one axis, there will be movement of the particle along both axes. Since there is no non-arbitrary conversion of units between space and time, I select the simplest method by assigning isometric units to the axes. This will always result in the observation that all particles, when measured in isolation, move at a 45-degree angle between the Space-Time axes, with two very important exceptions – particles that move *only* along a Spatial axis, and particles that move *only* along a Temporal axis.

Examining these two exceptions provides extraordinary insight into the true nature of the Universe. The exceptional case of a particle with movement only along the Spatial axes will be discussed later, in the context of a more accurate model; however, the special case of a particle moving only along the Temporal dimension is examined presently.

For the purposes of this discussion, let us imagine a particle with a center of momentum frame (zero-resting-energy) that is created at the instant of the Universe's instantiation into existence. In the current Model, this particle is created at the Origin Singularity, as are all other initial particles and energy.

All such zero-rest-energy particles would move instantly to the Terminal Singularity. In depth analysis of this contention is presented in this endnote[ii], along with the mathematical proofs for four-dimensional spacetime. For continuity and for simplicity, I will also now examine and prove this with simple extrapolation:

Even notwithstanding relativistic effects, the more slowly a particle moves in space relative to another particle, the more rapidly it moves in relative time. Let us imagine two Particles that start at the same location in spacetime. Particle A is moving at one unit of distance per one unit of time, and Particle B is moving through space away from the starting point at twice that speed. (For this thought experiment, we will assume the starting point is an observer, and otherwise these are the only two particles in the universe).

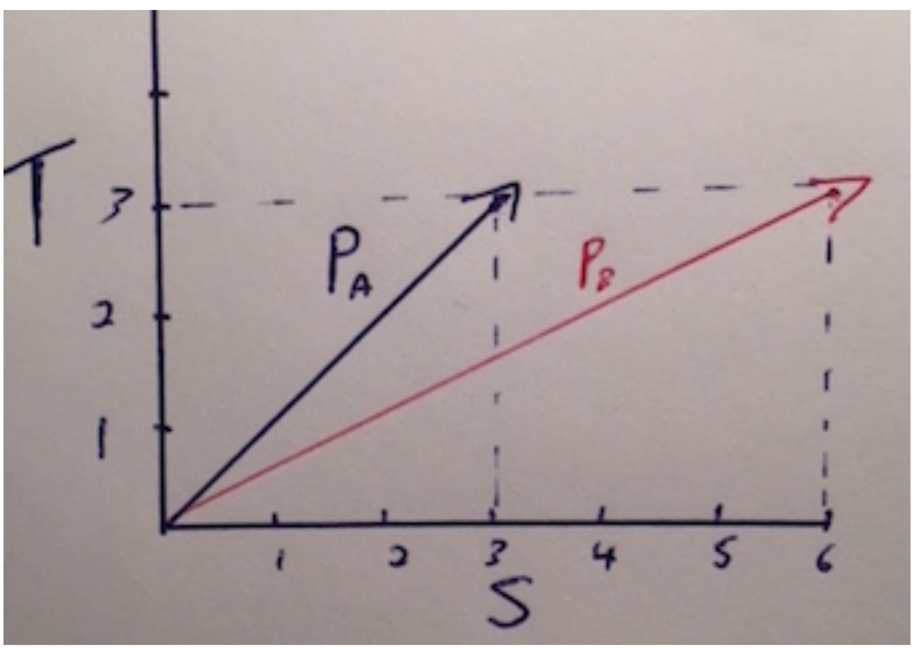

Illustration 5: Two Particles in motion from the perspective of Particle A. Particle B (fast) is moving twice the speed through Space as Particle A (slow) (Note I have starting using the vertical axis for Time and horizontal for Space)

In Illustration 5, we see the relative speed of Particles A and B. As discussed above, if they were to observe themselves in isolation, each particle would describe itself as moving at one unit along the Temporal dimensional axis for each one unit it moves along the combined Spatial axes. We can, however, use the distance traveled by each respective particle as a measuring unit for the other. When we do this, we create a new unit of measure that has equivalence between the dimension types.

In this case, we know the angles formed by the particle-strands along the T-S axes. PA is arbitrarily chosen to be 45-degrees and PB is, therefore, 67.5-degrees to T-S). We can now choose a point along the Temporal axis (a Present Moment) and measure the length of the particle-strand for Particle A from the point of origin (3 units). This becomes our new measuring unit, and we can apply that same measure to the Spatial-axis. When we do this, we can measure that Particle A has moved three units in space (of course, the units are isometric by definition), and Particle B has moved twice as far – six units. Therefore we can determine that, in this model, particles moving at those relative angles have those relative "speeds." This validates the technique for establishing relative speeds in the model geometrically, and I will expand on this principle soon, to validate a similar technique for our observed universe.

> When viewed from our everyday human perspective as mass primarily travelling along the Temporal dimension, we see that particle A has moved one meter per second whereas particle B has moved at two meters per second. When viewed from the spatial dimensional perspective, however, we would note that A has *passed one second in one meter*, whereas B has only *passed half of a second in one meter*.
>
> Both particles have the same "speed" in spacetime – only Particle B has more speed along the *Spatial* dimensional axes, whereas Particle A has more speed (a higher Rate of Passage) along the *Temporal* axis.
>
> This is a key concept: One can measure spacetime "movement" in terms of *time* or in terms of *space*. When measured in terms of space, one would ask "How much time has Passed per meter of movement?," rather than "How many meters has the particle moved per second of time?"
>
> In light of this, we can conclude that speed is not a complete term in the context of a block-universe and spacetime. Rather, particles should properly be discussed in the context of the combination of their rate of Speed (through space) and their rate of Passage (through time). I call this, "PassageTime." If relativistic effects are not considered, then *any two particles will always have the same PassageSpeed over any identically measured* ***absolute lengths of their respective particle-strands*** (when measured in identical units - units derived from one object's isometric units of measure and applied to both objects).

Simply put, this means that normal objects are always moving in both space and time. Adding speed to movement in space slows the relative passage of time, whereas adding haste to the passage of time slows the speed of the object in space. If we measure the length of one particle-strand, we can apply that length to any other particle-strand and know that they had the same PassageSpeed (notwithstanding relativistic effects).

Therefore, we can conclude that we can use the length of a particle-strand as a new unit of measure to determine the relative PassageSpeeds of particles that are in identical frames of reference.

Returning to our discussion of two particles, this logic can be extrapolated. Let us examine how the same graph looks from the perspective of Particle B:

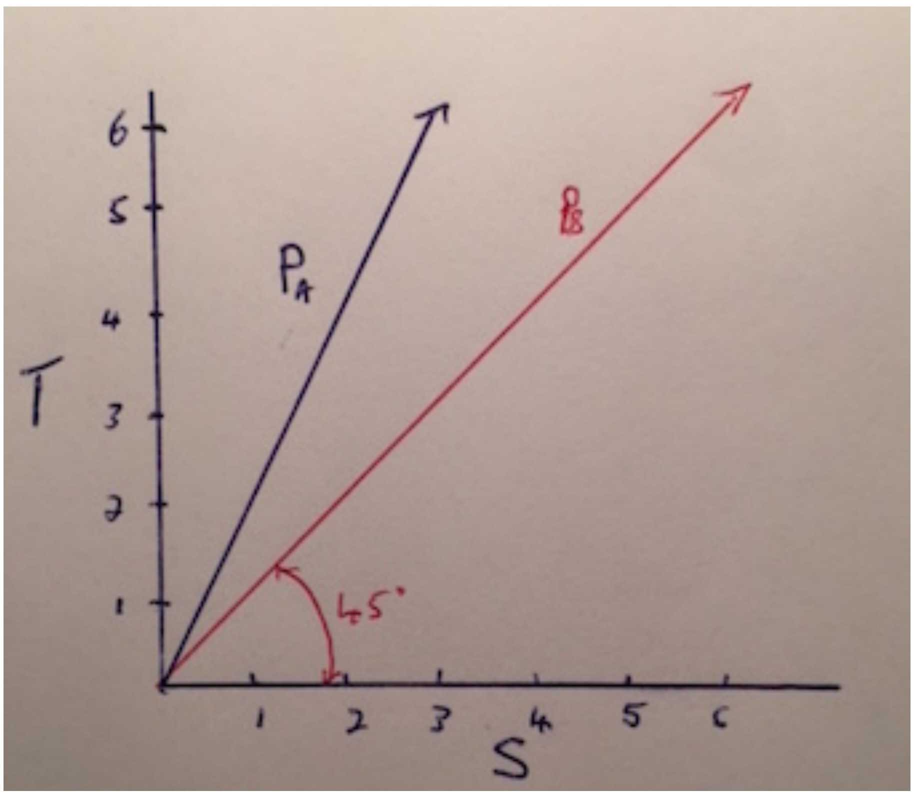

Illustration 6: Two Particles in motion from the perspective of Particle B. Particle B (fast) is moving twice the speed through Space as Particle A (slow) as seen from the perspective of Particle B (now at 45-degrees)

Every non-accelerating particle at normal (non-zero, non-infinite) PassageSpeeds will view its own angle of motion to be 45-degrees for its own isometric units. Thus, from the perspective of Particle B, Particle A has decreased its angle towards the Time axis and increased it from the Spatial axis.

We can extrapolate this for particles that move more and more slowly relative to Particle B. As particles move more and more slowly, their angle will approach a full 45-degrees away from Particle B (and 90-degrees away from Space, and parallel to Time). We can even imagine a center-of-momentum frame Particle with zero-rest-energy which is brought into existence at the origin singularity, and it will have *no movement at all along the Spatial-axes*. This would mean that at the first possible action by Particle B (its first possible movement along the Spatial dimension), the zero-rest-energy Particle would pass the entire distance of the Temporal dimension and land at the terminal singularity.

Now, because this is the very first particle at the very first instant in Time and first instantiation of Space, nothing could exist within the spacetime volume ahead of it that could interfere with such a Particle. Therefore, there can be no warped path "in front" of the Particle.

The movement of such a Particle would establish a one-dimensional straight line away from a point in the spacetime model. In fact, the path of a zero-energy, zero-rest-energy particle brought into existence at the origin singularity ***creates the basis for the definition of a straight line****, and this, then provides us with the first component of an absolute coordinate system – there is a mechanism to define and orient a universal and perfectly-straight Time-Axis.*

This simple model has served to demonstrate our first two important premises: 1- there is a valid way to establish an absolute referential coordinate axis for the Time dimension. The Time axis extends directly away from the origin singularity in precisely the "direction" that a particle with mass would move if it was imparted with zero energy at the Universe's creation.

The second important premise is that Movement and Speed can be viewed in terms of geometry. Movement is simply the existence of a particle's strand in the spacetime volume, and Speed (through space) is represented by the direction (relative angles of the Spatial dimensions to the particle in any Present Moment) of a particle.

A More Accurate Light Cone

Analysis of this first model immediately demonstrates certain fundamental problems. The Light-cone that is shown as the origin of the model Universe appears to extend outward at a 45-degree angle between the H-W axes and the T-axis. This representation is a generally accepted representation of a light-cone, but the representation of this angle of 45-degrees is, in reality, arbitrary and due to self-referential (goal-seeked) mathematics.

Examining our first Model, we observe that the illustrations produce a shape of the model universe that is formed by the light-cone that extends from the origin singularity to a bulge in the center, before contracting to the terminal singularity. The geometry of the light-cone is of particular importance. For the purpose of the first model, the light-cone extends at a 45-degree angle from the temporal axis, which runs from origin to terminal singularities. This angle has been arbitrarily set for illustration and because this is how light-cones are classically represented.

In an actual model as described above, the angle of the light-cone *should be almost 90-degrees*. Since it is necessary to have this understanding before we can properly proceed with this Theory, we now need to construct a more accurate model of a light-cone. For illustrative purposes, we will construct an equivalence-adjusted Minkowski-space model of a light-cone.

Before we discuss why the light-cone for the model should encompass almost 90-degrees in all horizontal directions, let's review how traditional models for light-cones are constructed:

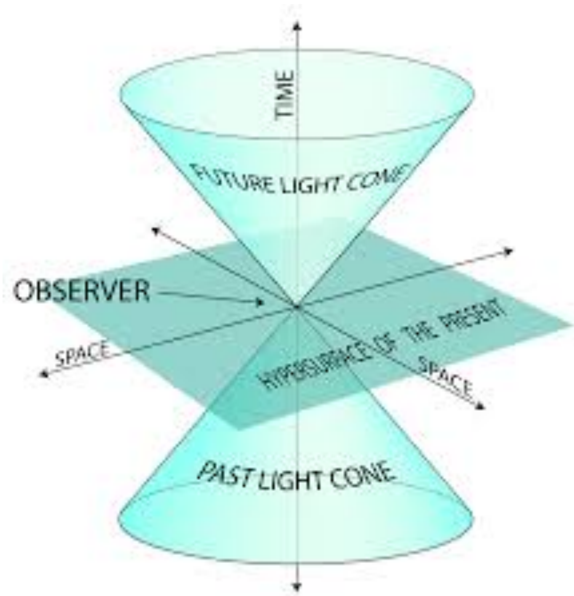

Illustration 7: A traditional rendering of a Light Cone

The traditional model for a light-cone will measure space in terms of light-seconds and time in terms of seconds. Since the speed of light in a vacuum must be equal in every inertial frame, then the slope of the line must be measured (for light emitted at the origin) by all observers as 45-degrees (because light will always move one light-second per second *by definition*). This is seen in the above illustration as a "cone" angling up (and down) at a 45-degree slope.

There are multiple inherent flaws in this representation; however, the most obvious of these is that we have assigned arbitrary units of measurement to the two axes: Space is measured in terms of distance per second (d/t) and Time is measured in terms of seconds (thus always yielding one second of distance in one second, which is totally meaningless – producing a 45-degree angle).

The meaningless assignment of units ignores the *equivalence* of the Spatial and Temporal dimensions by essentially assigning *one type of unit* to the two *different types* of dimensional axes. In fact, the units need to be adjusted for equivalence to render appropriately related units to the two kinds of axes. This is appropriately accomplished in this manner:

We begin by imagining an ordinary (non-relativistic) particle that has both mass and rest-energy.[iii]

We know that regardless of the rate of speed (in space) or the rate of passage (in time) for the particle, it will observe itself to be moving at a 45-degree angle to the dimensional axes (see illustration 4).

We have already established that a zero-rest-energy particle with zero energy will move only along the T-axis, which, in the case of the following illustration is represented by the vertical axis. This will create the "upper" bound of the light-cone for passage of Time by mass (all mass will move vertically or less along the graph); and we know that the speed of light is a constant for any massive particle. Because it is a constant, *the angle will always be the same relative to any massive particle*, and therefore, the angle between any possible particle (represented in natural and isometric units) and a photon in a vacuum will always be the largest possible angle that can be represented; however, because we observe light to have a finite speed, we cannot have the angle be a perfect 45-degree offset from the angle created by the massive particle, so we must represent this graphically as the *smallest possible angle above the Spatial axis that is non-zero*.

Here is what this looks like on our typical graph:

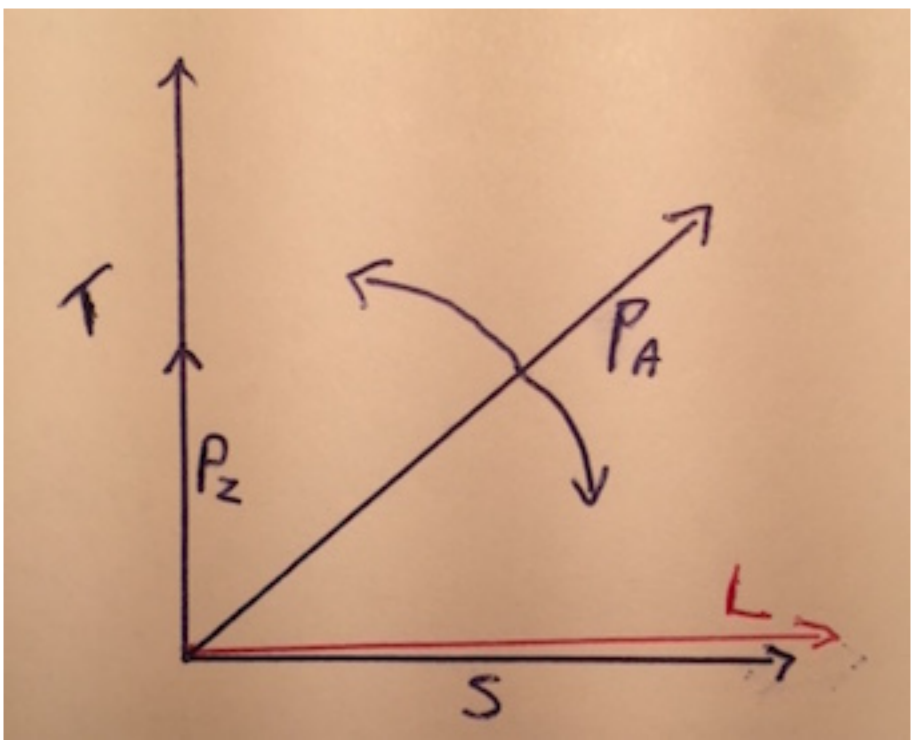

Illustration 7: Particle A moves at a PassageSpeed that produces an angle that is greater than zero and less than 90-degrees (in isolation, it will always present at 45-degrees); Particle Z is a center-of-momentum particle with zero energy that moves perpendicular to the Time axis, and Light moves at the smallest possible angle offset to the Space axis.

And here is what a light-cone constructed with these constraints looks like:

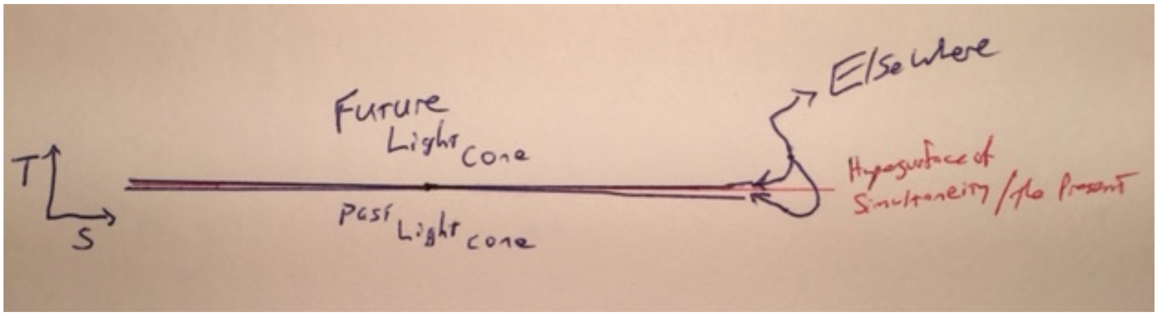

Illustration 8: Light cone at almost 180-degrees to Future and Past

Okay, that was easy; and for anyone who is learning about light-cones for the first time, it was probably sufficient. However, for generations of physicists who believe that the Elsewhere must be vast, since so much of Space exists outside of what light originating at an event should be able to influence, I will need to further deconstruct the characteristics of the classic light-cone.

Einstein avoided dealing with relativistic effects in a light-cone description by imposing certain limitations. One, we have already discussed, which is the convention of measuring time in seconds and distance in light-seconds. The other is that all observers of an Event that creates a light-cone are constrained such that they must be observing from the same location as each other observer all at the location of the Event. From that vantage point, their relative motion is (by design and intention) removed as a factor, and all observers will, necessarily, agree on the slope of the light-cone (because C is a constant for all observers, and if all observers start at the Event, then they must agree on the shape of the light-cone).

This latter limitation effectively eliminates the effects of Relativity from the construction of light-cones. Removing relativistic effects for light-cones is problematic for many reasons, but the most significant problem is that light-cones are used, to define the boundary at which the Event can influence other events. Events that cannot be influenced are put "elsewhere."

Sadly, this entire concept is misplaced when Relativity is considered. Relativity teaches us that different observers will have different views of when Events take place, and therefore, what Events should be located "elsewhere." Here is the proof:

We now imagine an Event that will produce a light-cone. This Event will be observed by an Observer 1 that is stationary in space at the point of the Event. In addition, there is a second Observer, Observer 2, that is moving away from the Event at 95% of the speed of light. Observer 2 starts at a point that is on the same "hypersurface of simultaneity" as Observer 1, but Observer 2 is not at the same starting location in space as the Event (Observer 2 begins outside of the light cone).

We can now illustrate how the light-cone must look for each observer (as Observer 2 enters the light cone observed by Observer 1) – noting that each observer must see the light being emitted from the Event as moving at the same speed away from them:

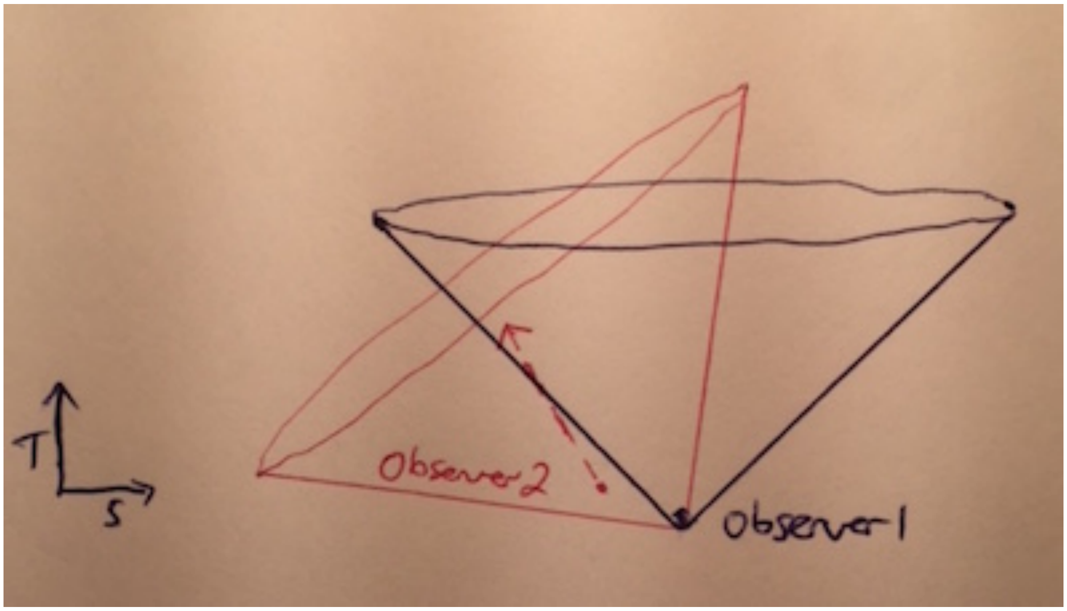

Illustration 9a: Two Observers in different frames of reference constructing two different but equally valid light-cones of the same Event.

Examining how the light-cone looks for each of the Observers yields important results. The light-cone for Observer 1 contains Events that appear to be "Elsewhere" which, for Observer 2, are well within the future light-cone:

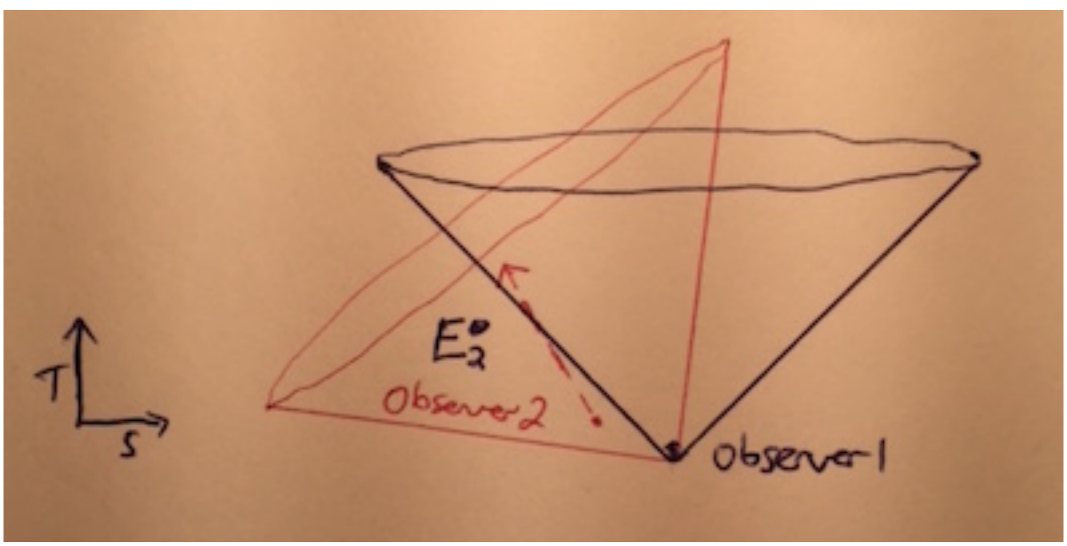

Illustration 9b: Event 2 is outside of the light cone of Event 1 for Observer 1, but is within the light cone of Event 1 for Observer 2

In fact, we could conceive of Events and Observers moving at speeds and directions throughout the Universe such that there is only a tiny sliver of *Events* that are in the

"Elsewhere." When we aggregate all possible views from all possible frames of reference into a single illustration, we find that the shape looks exactly like the shape of the light-cone presented in Illustration 8 (above). But "a tiny sliver" is the operative term. In fact, with no observer actually being able to move at the speed of light, there will always be an "Elsewhere," that cannot be influenced by the Event. (We will later learn that this sliver is the product of the "Root Warp" – the basis of the fundamental warping of Space around Time).

Note: If you have trouble believing either of these proofs, I would finally suggest that we consider a pair of "simultaneous" lightning bolts striking Einstein's fast-moving train, and two observers, one on the train and one on the ground. As this well-known example concludes, the two observers will not be able to agree on the simultaneity of the strikes. We have only extended this anecdote such that there are not just two observers who are both at the midpoint of the train, but instead, many observers in many locations and inertial frames of reference – resulting in all possible observations of the timing of the lightning strikes.

A More Accurate Model

With this more accurate Light-Cone concept, we can now construct a second and more illuminating three-dimensional spacetime model.

In this model, as in the first, we will use Euclidean space to represent H-W-T axes. Here, however, the Time axis has *four* distinguishing characteristics from the H and W axes, namely: 1- it is perpendicular to them, 2- the axis forms a straight line between the origin singularity and the terminal singularity, 3- there is only one Time dimension, and 4- "movement" along this axis requires either that a particle has mass or the photon interacts with mass. (If neither of these conditions is met, then the particle "moves" perpendicular to the T-dimension, and therefore has no motion along the T-dimensional axis. This model will disregard the tiny angular offset discovered above, and simply represent total motion in either space or time as motion that is perpendicular to the axis. We will revisit that offset extensively shortly).

Since photons have no mass, when in a vacuum, they travel exclusively in the Spatial dimensions, and they move away from the origin point at a 90-degree angle from the T-axis (in this "flat" Euclidian model). In other words, light "moves" along the H-W axes, creating one-dimensional "photon-strands" within the model block universe. The aggregate of all photon strands creates a light-cone defining the entirety of the observed Universe.[iv]

> Light moving away from the origin singularity in a vacuum in flat spacetime will establish a light-cone that is 180-degrees. **This provides the second component of the absolute coordinate system, in establishing a two-dimensional plane that lies along the two spatial dimensions.** Placing that plane at a right-angle to the Time-axis creates our three-dimensional model universe.

Again, in this better model, we observe that all particles are strands, and all strands "move" in some combination of the Spatial and Temporal dimensions in all directions equal to or less than 90-degrees from the Temporal axis (relative to one-another). The direction of that motion depends on whether those particles received any energy from the big bang (resting energy) or thereafter, and if so, more energy means they will move at a greater angle away from the Temporal axis.

Put another way, matter moves in the H-W-T sphere in relatively different angles, with less energetic particles moving more perfectly along the T-axis. (Energy interferes with mass in an equivalent way to the way mass interferes with energy. When mass interferes with energy, the energy is no longer in a vacuum. When Energy interferes with mass, it is no longer in "Stillness." When not in Stillness, mass does not "move" perfectly along the T-axis. When not in a vacuum, light does not move perfectly along the H-W axis).

<u>So, what does all this look like within the three dimensional Space-Time model?</u>

If tiny beings living within our second model Universe were to accelerate a particle, they would believe that they were increasing the "velocity" of that particle in the Spatial dimensions. In fact, what they are doing is changing the *direction* of that particle along the various axes. By adding energy to increase the observed "velocity" in the two Spatial dimensions, they are causing the particle-strand to curve away from the T-axis.

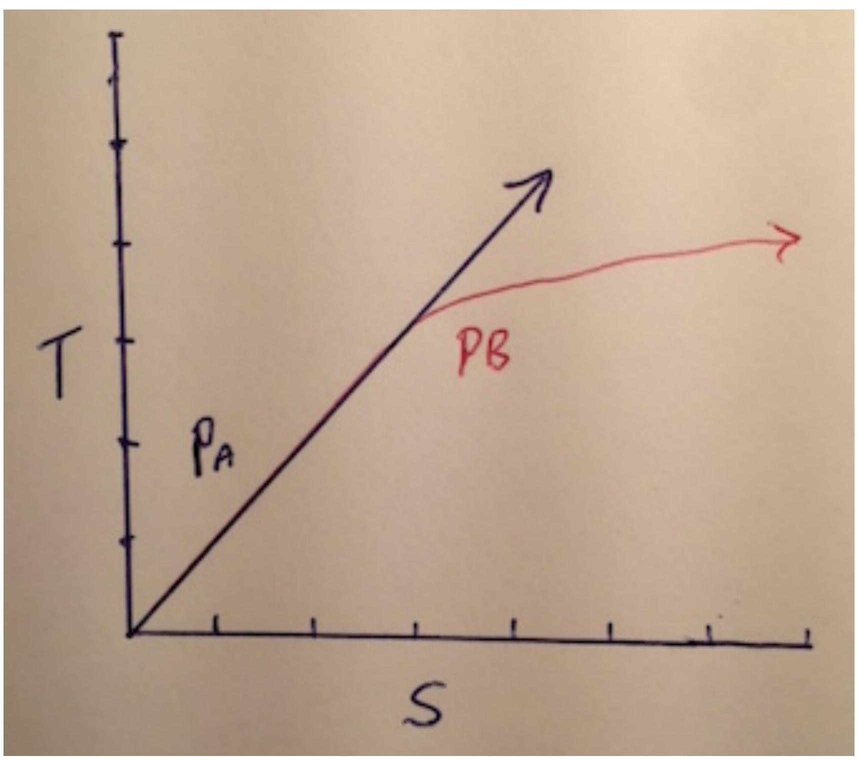

Illustration 10: Two particles begin with identical frames of reference. Particle A retains that reference frame, while Particle B accelerates. (If I had drawn this well, you would see a smooth hyperbolic arc of Particle B away from Particle A and the Time Axis, and becoming more parallel with the Space axis).

If they were to accelerate Particle B so that its velocity started to approach the speed of light, they would cause the strand that the particle actually is, to bend – it would no longer stretch mostly in the direction of the Time-axis, but rather, the strand would curve away from the Time-axis and angle toward a parallel trajectory to the spatial plane. By curving the strand away from the Time dimension, these beings are, in a sense, causing the strand to “grow” such that it has a greater overall length than it would otherwise have had. If we (as higher-dimensional observers) were to measure the amount (length) of Strand that exists over two time-slices of equal duration - both before and after the acceleration - we would observe that more of the strand exists within the measured length of time post acceleration than exists in the measured timespan pre-accelleration. Thus the beings would have *caused the mass of the particle to increase by accelerating it*.

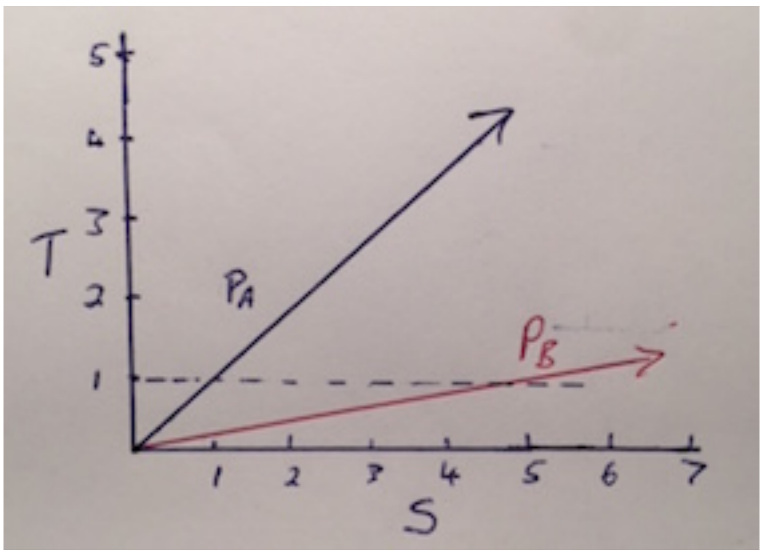

Illustration 11: Particle A represents the particle before acceleration, and Particle B shows post-acceleration. Looking at the length of the Particle-Strand after one unit of Time, we see that the Strand is much shorter pre-acceleration and longer post-acceleration.

This change in angle would also lead the beings to observe that the mass of the particle had increased. After all, for each measurement the beings would now make over a span of equivalent time, *they would measure “more” of that particle to exist*.

Demonstrably, within a measured stretch along the T-axis, more of the strand would exist than would have existed if the particle had not been accelerated. We can calculate this increase exactly by plotting the path of the particle in spacetime against the Root axes, and measuring the area under the curve, which is the amount of particle existing in space over the timeframe of measurement:

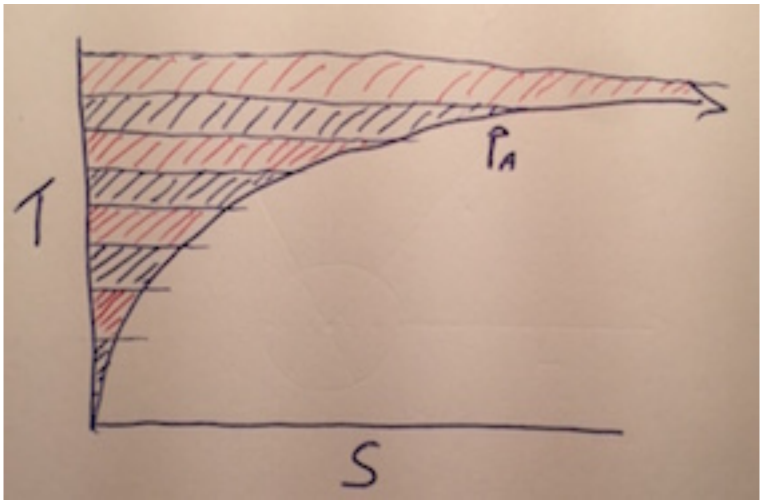

Illustration 12: Particle A is being accelerated towards the speed of light. As it is accelerated, measurements of the length of its Particle-Strand are taken at identical time intervals by an observer. We measure the length of the Strand to increase at each Time interval, growing toward infinity. We further measure the mass of the Particle for each time interval as the area under the curve created by the hyperbola against the Time axis, which also approaches infinity.

From our vantage point in the fourth-dimension, we can see that *what appears to be a change in the mass of a particle in the three-dimensional model is actually only a* ***change in the angle*** *of a strand from the Temporal axis toward the Spatial axes.* Thus, we observe that *acceleration is really just a change in the angle of a Particle-Strand*, and that angular change produces the change in measured mass that is required by General Relativity (more of the particle exists for each unit of time, so its measure of mass is greater).

This second model universe has revealed useful and significant insights. Among the most important, it has provided a geometric curve by which to calculate the relative increase in mass as a section of strand is "accelerated." (Keeping in mind that the model exists in Euclidean space, for now we can disregard relativistic effects. These will be addressed in later discussion).

Similarly, it has not only verified that velocity and mass result in the same outcome, but it shows why velocity and mass yield experimentally identical outcomes. This model serves to explain why the Equivalence Principle exists: the speed of a particle determines how much of its Strand exists over any length along the Time-axis. The more of a Strand that exists in any stretch of time, the more of that strand's mass exists in that period of time. Therefore, a massive object moving slowly has a certain amount of mass that exists over any measurable length of time, just as a less massive object that is accelerated has increased mass over any measurable length of time. Put another way, the total mass of a spacetime volume can be described as the sum-total of all particle-strand lengths that exist within the volume.

Of course, most significantly, this model has pointed out that there is a basis for establishing a second universal set of axes – Spatial axes – that intuitively should be placed in a perpendicular plane to the Temporal axis. We cheated this one, however, for good reason: it turns out the axes are not exactly perpendicular after all.

The Root Warp and the Quantum Angular Offset

Let us now return to the discussion of the peculiarity of the almost but not quite 90-degree angle of light relative to the T axis…

Observing the shape of a proper light-cone tells us two things: first, *the speed of light is very fast* (of course); but second, *light passes through space and time*. This is interesting for the very reason that there is compelling evidence that light should not travel through Time at all – in fact, experimental evidence and compelling mathematics (finite mass to finite speed requires infinite energy) both prove that light should be moving perfectly perpendicularly to Time in Space:

The logical argument for the requirement of light to move perpendicularly to the Time dimensional axis is this: as a particle with mass approaches the speed of light, the mass of the particle approaches infinity. In order for a particle to achieve infinite mass, an unlimited amount of the strand would have to exist at the same instant in time. This is the only condition in which the area under the curve would be infinite. (Using the terminology of this Theory, the particle-strand would need to be angled at 90-degrees from the T-axis).

Infinite mass could only be obtained if the particle moved along only the H-W axes of our model. In fact, any particle that our tiny beings were to be able to accelerate into just the H-W plane would achieve this condition. It would have no progression along the T-axis and its measured mass would become infinite.

As additional reasoning that the angle must be 90-degrees, we observe that massless particles do not experience the passage of time. In our model, massless particles moving only along the H and W axes (perpendicular to the Time-axis) would experience no passage of Time, but again, that condition would only be true if those particles moved at a perfect 90-degree angle to the T-dimension.

Although our logical reasoning informs us that the light-cone should exist at a 90-degree angle from the T-axis, and although there is experimental evidence to support this position, there is also contradictory evidence.

From well-established physics and algebraic formulations (gamma modifier calculation) of Relativity, we know that infinite mass would be achieved for particles of matter (and zero-time passage for massless particles) at a finite speed (C). This defies the geometry calculated on our model universe as well as our calculus function: the area under the curve for any particle strand traveling at C would approach infinity, but it would not be infinite. We could continue to measure time units against the spatial axes to determine a finite area under the curve.

By resolving the conflict between the need for the light-cone to be perpendicular to T, and the observed fact that it is not perpendicular, we will learn the true nature of the Universe.

This dilemma is more easily solved than it would appear. However, as with many things in this field, the answer at first seems preposterous. Only on reflection does it become not only reasonable, but inevitable.

The solution, of course, is that light moves away from the Time axis at both a 90-degree angle *and* at an angle that is very slightly less than 90-degrees - simultaneously. To understand this premise, we must turn to quantum-mechanics and take inspiration from Werner Heisenberg.

In our model universes, we were able to construct a set of intersecting axes representing the temporal and spatial dimensions. These axes were constructed at right-angles to each other in three-dimensional spacetime. The various charts that I have presented, of course, rely on the fact that I can offset the spatial and temporal axes at exactly right-angles. In four-dimensional spacetime, we can create similar axes and offset them at right-angles, thereby creating a sphere of three-dimensional space that can be freely rotated, around a one-dimensional line of time.

The problem arises when we attempt to "move" a photon or particle along one of those axes. If a photon were set in motion at a known point in this spacetime, and it were to travel at exactly 90-degrees from the Time-axis, then we instantly know both its position and its momentum with absolute precision. The Uncertainty Principle prohibits this, and as a consequence, the photon will move at a 90-degree-to-Time trajectory away from its source, with a quantum uncertainty that always allows for the possibility of the photon to experience motion within the spatial dimensions.

Therefore, we can conclude that 90-degrees +/- quantum uncertainty is the maximum possible speed or rate that a particle can move or pass. (The nature of this "quantum uncertainty" will be made apparent and fully explained in a subsequent discussion of gravity. For now, I'm relying on the generally accepted but not well explained, notion that there simply is quantum uncertainty).

Further, we note that the Root axes themselves, and each subsequent set of axes reestablished by each Event, are established by quantum particles. Therefore the point (the precise junction) at which spatial and temporal axes are joined is inherently unknowable with precision. The axes will always be joined at 90-degrees +/- quantum uncertainty. I call the fundamental region of quantum uncertainty that is so created the "Quantum Sphere." The uncertainty this creates for the location at which the spatial axes intersect is called the "Root Warp," as it forms the basis for all spacetime warping. Further, as we will soon explore, the Root Warp, responds to the presence of mass to create the appearance of increasingly warped spacetime. I describe the total angle that is formed by Root Warp as it is reoriented by mass, the "Quantum Angular Offset."

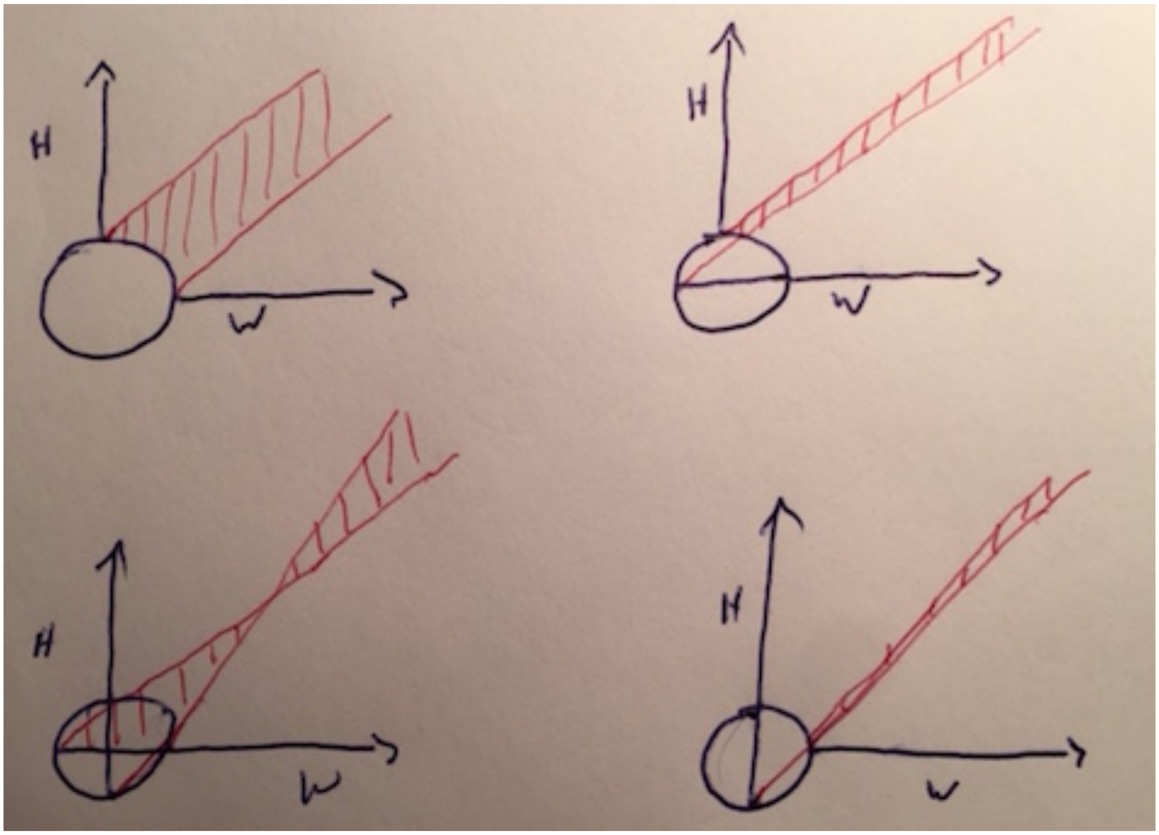

Illustration 13: Four examples of legitimate positions for the start of the Height and Width spatial dimensions within a Quantum Sphere. Legitimate values for a "45-degree" angle from each pair of axes is shown in red – demonstrating an inherent uncertainty for any geometric calculation based on these axes.

Important Take-Away:

There is an absolute way to establish a universal coordinate system of spacetime. The Time dimension will always run in the same direction; and for Euclidean spacetime, Spatial dimensions will always run perpendicular to Time. However, the axes are all attached at a point in spacetime that is not precise, and this means that their relative angles are not precisely 90-degrees.

<u>QAO, Relativity and Gravity</u>

So far, the model universes I've presented have ignored relativistic effects. I have done this for two reasons: first, they would have presented an unnecessarily complicated element in establishing the existence of a universal set of Root Axes; and second QAO Theory offers an explanation for Relativity that requires us first to understand the nature of the Quantum Angular Offset.

Now that those two preconditions are completed, we can explore the fundamental nature of light and gravity.

Gravity Overview

In order to understand gravity, we must call into question one of the most fundamental principles of physics: the dimensions of space.

Imagine you are an explorer, and you came across a formation that consisted of three long straight lines of material that intersected at precisely 60-degree angles from each other. As a scientist, your intuition would tell you that the formation could not have occurred that way without some force working on it. You would be compelled to find that force if you wanted to understand your discovery.

The most rudimentary description of a spatial dimension is that it is a perfectly straight line that runs in a set direction. Intersect three of these lines at 90-degrees to one-another, and you will form a set of dimensional axes, which will allow you to point to any location in space (by describing the angles by which your pointer should be offset from each of the three axes).

There are two fundamental assumptions of this description which must be questioned. The first is that dimensions are lines, and the second is that dimensions come together at 90-degree angles. These features cannot be the result random chance. They must be the result of a force.

For the first assumption, we must ask why we believe that a single dimension is a line. In order for a single dimension to be a line, we must put constraints on it. In total isolation, the orientation of a single dimension cannot be described. We can only describe it by self-reference (it is a line because it is one dimension), but in reality, the "line" can point in any possible direction, and therefore, in isolation, one dimension is actually a sphere. It is a sphere composed of all possible orientations of the dimension in isolation.

If we remove, for a moment, the constraint that multiple dimensions must intersect at 90-degree angles, we can envision how the addition of a second dimension would similarly produce a sphere. The lines that are the two dimensions can both freely orient against each other and in relation to their own sphere. Under these conditions, two dimensions will form two spheres.

Addition of a third dimension simply creates a third sphere as well. Without constraining the dimensions so that they intersect at fixed angles, each dimension could validly exist, in three-dimensional space, as a sphere.

As we will discuss later, this state of existence for dimensions creates a problem for the universe – that there is no valid way to establish any location outside a point in space. For the universe to exist, particles must be able to "know" that they are somewhere other than within a single point.

For this to be the case, *there must be some force that imposes the condition on spatial dimensions that one spatial dimension cannot occupy the same orientation as another spatial dimension*. Such a condition would suddenly embody the system with orienting information. One could measure the angle offsetting two of the dimensional axes, and then that could be compared to the angle between each of those two axes and the third dimension. Forcing the dimensions apart forces them to create non-zero angles between them, which thereby forces the dimensions to "pick" a line, and removes all other possibilities. The three overlaying dimensional spheres collapse from being three separate spheres, into a single sphere established by the known angular offsets of the spatial axes. (The set of axes is not oriented within the Universe, of course, so the dimension "lines" can still be validly freely rotated. This free rotation is what makes the shape a sphere, and not simply three lines; but each possible sphere created by free-rotation will contain exactly 1/3 of each spatial dimension, rather than three complete spheres which each contain 100% of one spatial dimension).

> *Any force that can require that no two spatial dimensions occupy the same orientation is, by definition, a repulsive force.* ***This force is gravity****, to which I assign the negative charge to Spatial dimensions and the positive charge to Temporal dimensions.*

Understanding this, we can easily see how the dimensions acquire the second assumed property – that they intersect at 90-degrees. The lowest energy state for a system with a repulsive force is the one that it will adopt. 90-degrees is as far away as these dimensions can get from each other, and therefore, that is the lowest energy state (for a single system in isolation).

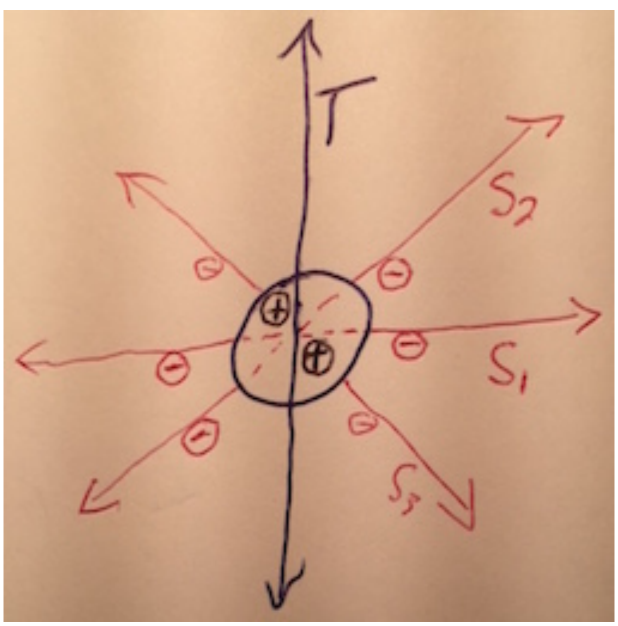

Illustration 14: Depiction of an event with the dimensional axes extended beyond the QAO sphere. The negative gravity-charge of spatial dimensions forces them into lines extending at right-angles to each other and forces them away from each other within the QAO sphere. The positive gravity-charge of the temporal dimension draws all the spatial dimensions inward and holds the system together, with the Spatial dimensions orbiting the Temporal dimension.

With this fundamentally new understanding of gravity, we can now shift our focus to the nature of light and time. We will then revisit gravity in more detail.

<u>The Speed of Light (and the Passage of Time)</u>

The first question to answer is why the speed of light is always constant, regardless of the motion of the light source or the motion of an observer.

This question is now easily answered mathematically, but I prefer to illuminate first with an analogy:

> Imagine holding a very powerful laser pointer in a very long hallway (in fact, the laser pointer is infinitely powerful, and the hallway is infinitely long).
>
> You begin by pointing the laser straight down at the ground – a zero-degree angle. As you move your pointer slowly up, you will see the dot on the ground move away from you. At a 10-degree angle, the dot will still appear very close, and movement by you of one-degree up or down will appear to move the dot by about the same amount along the floor forwards or backwards.
>
> Even moving your arm to create a 20, 30, 40 degree angle will move the dot only marginally farther away from you at each increment.
>
> As you raise your arm up towards 80-degrees, you will start to observe a massive change. You are now holding the pointer almost horizontal to the floor, and any slight change in the angle will move the dot by a huge amount. (We have begun to notice observable relativistic effects).
>
> But if you move your arm up to any position below 90-degrees, you will still always be able to find a dot on the floor. 89-degrees to 89.9 will see the dot move more than all prior movement, but it will still remain on the floor. 89.9 to 89.99 is the same. Only at exactly 90-degrees will the dot finally disappear from the floor and not appear on the ceiling.
>
> Now let us consider two people holding laser pointers standing next to each other and measuring the relative speed of their dots.
>
> Here again, they can always measure a relative speed and distance. As one moves the pointer from 45 to 50 degrees and the other from 84 to 89 degrees, they will see that the later pointer's dot moves much farther and faster than the former's, but for all combinations of angles, they will always be able to measure a speed – except that when a pointer ends at 90 degrees, it will always have moved at the same speed compared to any other combination of angles for the other dot. That "speed," of course, being infinity.

90-degrees is a unique angle. As we learned earlier, every object in spacetime, when measured in isolation, can be plotted against the Spatial axes and the Temporal axis using isometric units. Thus, all such objects are "moving" in one sense, at a 45-degree angle through spacetime.

We saw in an earlier discussion that, plotted against other objects, we can transpose isometric units against strand-length and determine an angle of relative motion in space or time that is always greater than zero-degrees and always less than 90-degrees. Therefore, the only three meaningful angles are: zero, 90, and the total set of everything in-between.

What makes the 90-degree angle special is that anything moving along that line has movement only in space with zero passage of time (and for the zero degree angle, the reverse is true). Therefore, when even the smallest possible passage of time occurs for an observer, the entire life of the particle moving along the line will have elapsed.

It therefore does not matter whether the observer is moving at 45-degrees or 89.999 degrees, as soon as a moment of time passes, light will have moved infinitely far away from the observer. This means that for all observers in any possible non-zero, non-90-degree frame of reference, light will always be observed to be moving at the same speed – a constant.

Now, one may object to this analysis by pointing out that modern physics demands that light actually spend some portion of its existence passing along the T-dimensional axis, and that is correct – after all, *we see photon-strands throughout spacetime*. This constitutes irrefutable evidence.

How do we resolve this dilemma? Here the Quantum Angular Offset provides the answer.

When an Event produces a photon of light, the photon is set in motion according to the coordinate system that is established. Let's start by discussing why this must be so:

I postulate that in order for the photon to exist apart from all other particles in the universe, it must be able to have a spacetime location that can be described as a position that is unique from other particles. If this is so, then the photon must have enough information about itself to be able to establish a spacetime location for itself.

This can be accomplished only if the photon-strand is comprised of sets of dimensional axes that could triangulate its location. That would mean that at each event at which the location of the photon exists, there must also exist dimensions. Further, these dimensions must manifest with the Time dimension oriented so that it is parallel to the Root Time axis, and the spatial dimensions existing in any orientation, but always at right-angles to each other and Time. Finally, these orientated dimensions must exist within only a probability histogram so that Probabilistic Geometry could be used to triangulate the position of the Event.

That was a lot to say, so let me break it down into components, and restate each one more simply: Each event in which the photon is a participant must have space and time dimensions, otherwise, the event wouldn't exist in spacetime. These dimensions form a local compass that can be used to identify the position of the event in spacetime.

To identify the position of the photon in spacetime, the photon can only rely on itself – meaning, its existence in spacetime cannot depend on a second "observer." If it did, we would find that photons and particles cease to exist simply because they have no observer.

To satisfy this requirement, the photon relies on its own photon-strand to provide a reference point. There is a specific mechanic that photons and particles use to triangulate their position relative to their "prior" position along the strand (which I call "Probability Lensing") that I will discuss later, but for now, in the context of exploring why the speed of light is a constant, I will simply assert that for the photon to exist in spacetime, it must have a set of dimensions by which it could ascertain a position for itself.

So, returning to the Event in question: a photon of light is produced, and the system orients Time in the same direction as all other coordinate systems do (the line along which a mass at rest would pass). The photon then moves out into Space (in some direction for which the orientation of the spatial axes are interchangeable) at a 90-degree angle away from the Temporal axis with a quantum uncertainty as to the *exact* direction, which we will now examine.

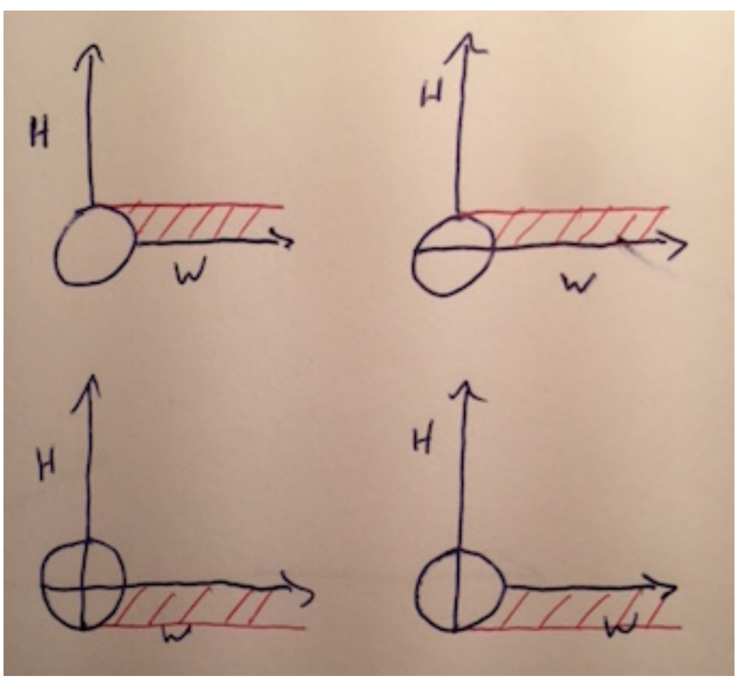

Illustration 15: A selection of Quantum Spheres for an event with one space and the time dimension not shown. In red are highlighted the legitimate values for right-angles between the two spatial dimensions.

So, at creation, and at each subsequent Event: a new set of axes are established, the Time axis is oriented, and the photon leaps one unit along the Spatial axes directly perpendicular to Time. Visually now, though, we can see that just because the photon has moved perpendicular to Time, it is not precluded from existing in a new Present Moment.

Yet, even though the photon appears in a new Present Moment, the photon is always moving at 90-degrees away from Time: it has moved in Space at the 90-degree angle, and has also leapt into a new starting position along the Time axis for the next quantum Event.

This is complicated, so I will restate it differently one more time. For this discussion, the orientation of the spatial dimensions is not relevant. They may be freely rotated – provided they are always offset from each other at right-angles on a Quantum Sphere. The Time dimension, by contrast, is constant. It uniformly runs in the same direction throughout all of spacetime. The spatial dimensions always have a theoretical point of intersection with Time at right-angles.

For any observer, their frame-of-reference is less than 90-degrees calculated against one or more S-T axes. Therefore, when the photon moves at 90-degrees away from T, all observers will see it move to infinity. Because of the uncertainty created by the inability to know the precise location that the spatial axes intersect, 90-degrees is not perfectly uniform for every event. This causes the photon to "appear" throughout time, even while it moves instantly and timelessly away from the Event in space. It is both infinitely quick and Smeared – leaving a streak of itself in spacetime. (We will discuss why these uncertainties don't cancel each other out forward and backward in Time shortly. This happens as a result of the charge of gravity, which limits angles to "forward" in Time, but a full discussion of that subject is forthcoming).

From this analysis we can explain why the photon is moving through Space at a constant rate – C (which is the accumulation of all the quantum "errors"; or, more precisely, it is the physical manifestation of the average of the probability of those errors). The photon must exist in some sense in Space, where it moves infinitely quickly; while a sort of quantum-reflection of the photon must also exist in Time, where it Passes *at the rate of quantum uncertainty* (**the slowest possible non-zero rate**).

(**The same reasoning all holds true in the inverse, for the Passage of Time.** Massive zero-momentum frame particles, or zero-rest-energy particles, will Pass only in Time, with only the quantum error rate giving them a ghostly presence in Space. This will be discussed in more detail later).

One final observation about the speed of light is that we can now rationally deduce that any particle that would obtain this finite speed would experience something fantastic. Even though the speed is finite (in space), we now know that movement at this speed would put the particle-strand at an angle that is within the quantum "margin of error" of travel that would also be perpendicular to the Temporal axis. *Therefore, any particle that is accelerated to the finite speed of light would have a* probability *of having infinite mass* – which, of course, is the same as saying that the particle would attain infinite mass (since all quantum states exist simultaneously). Thus, by applying quantum mechanics to Relativity, we have answered the riddle of how it can be that accelerating a finite-mass particle to a finite-speed can produce a result of infinite mass.

Gravity, Probability Lensing and Events

Throughout this paper, I have maintained that geometry is the key to understanding Relativity. It is now necessary to combine all of the prior discussions into a single geometric model of the Quantum Angular Offset.

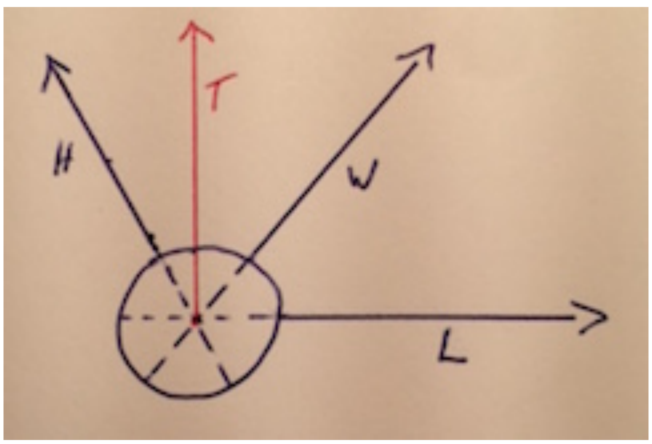

Illustration 16: The Time dimension exists at a fixed start-point at the center of every New Event and forms a line that runs parallel to the Root Time axis toward the boundary of the Quantum Sphere in spacetime. The Spatial dimensions can have their Root be anywhere within a quantum-sized probability sphere (its size estalished by the like-charge repulsion of gravity) directing a one-dimensional line into space in directions offset by 90-degrees from the center Time Point and from one-another.

What Illustration 16 shows us is that the three spatial dimensions, which I call Height, Width and Length, are naturally offset from each other and from Time at 90-degree angles (by gravity), except that they do not necessarily meet at the center point. Rather, the axes can start at any location along a linear extension of their line, at any place within the Quantum Sphere centered around the Time point. In fact, all possible starting locations for each dimension are within the probability at each event (the spatial-axis-system can be legitimately rotated into any position, although its shape is fixed), and so the angle at which any particular spatial axis extends away from the others is uncertain.

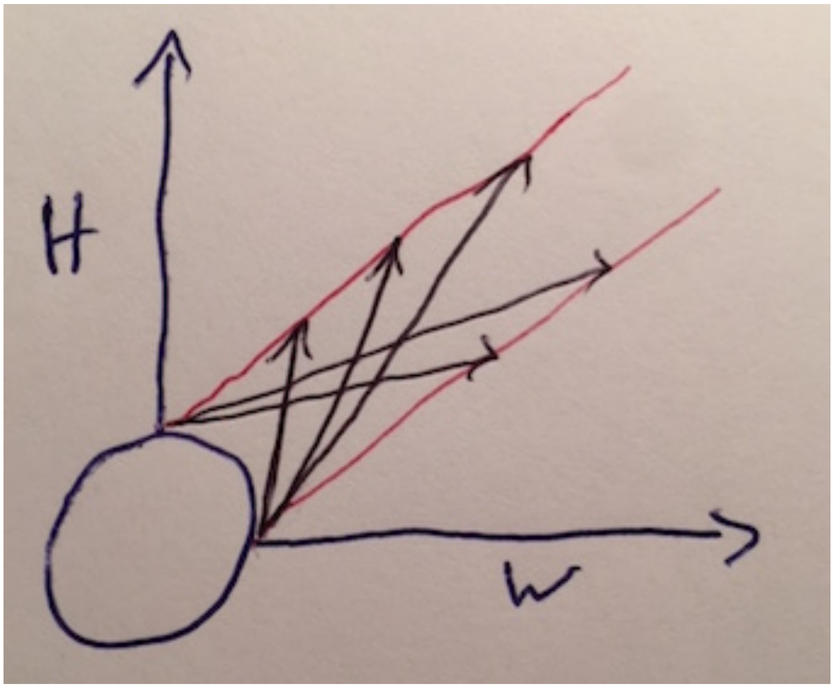

Illustration 17: In the extreme case of H and W both originating on the outer boundary of the Quantum Sphere, the valid description-range for a 45-degree angle is shown in red. Example angles that are validly described as 45-degrees (for the distances shown) are drawn in black.

This angular uncertainty is the core feature for Relativity, which I will explain later. Right now, we will examine gravity in detail and we will discuss how Probability Lensing functions and why Events take place at all.

I would like to take a moment now to describe how I believe this entire system works together. Once I've done that, I will provide analysis to substantiate my postulates.

> I propose that every particle must be able to determine its "next" location in spacetime from its current position (i.e. where its particle strand will be "next"). Information about itself is the only information that a particle can possess about its own location in the Universe, as it has no access to other particles from which to determine its relative position. (The entire Universe and the fabric of spacetime is the result of the emergent complexity of individual particles being able to "know" one thing: the spacetime position of their Next Event relative to their current event).
>
> Particles move through space and pass through time from their current Event to the location of their Next Event. Particles are able to determine that location by using a Probability Lense (explained below) that forms two separate but legitimate spacetime axes, which orient to one-another. From this, the particle has enough information to describe any new (nearby) spacetime point geometrically. The particle then "determines" the next location, moves to that location, and the "Next" Event takes place.

Events take place because the gravity charges of the dimensions are zeroed-out at any given event (the charge of every Quantum Sphere is gravitationally balanced). As particles have movement in spacetime, they require dimensions to describe their location. Once the particle has moved beyond the distance that can be described by the lines of the Quantum Sphere's spatial dimensions, a new set of spatial dimensions springs into existence. This is a new "Event," and it requires a new positive charge of gravity from Time. (This gravity current pulls mass forward along Time).

Next Events cannot take place at the exact same point in Time as current (or prior) events due to the like-charge repulsion of the Time dimension, so there is always some minimum movement along Time by Events themselves. That is to say that *particles* may not be required to have movement along any particular dimension, but *Events themselves* must.

Light in a vacuum will have the largest possible aperture for its probability lense. The lowest energy state for the system of light in a vacuum is for very uniform spacing of Quantum Spheres and the dimensions within them, and thus I call this state of spacetime "Crystal Space." With the spatial dimensions laying out uniformly, and the large aperture, it is comparatively easy for a photon to determine its Next Event location very far away in space, and thus events will occur at the least possible frequency.

Normal mass has motion in along both Spatial and Temporal dimensions, and therefore, the Density of events is much greater. Particles must locate their next position through a lense with much less focus (as we will discuss below).

Particles that contain mass and exist in high-mass environments will force the Quantum Spheres to deform. The like-charge repulsion of spatial dimensions from neighboring Quantum Spheres changes the shape for the system to express in the lowest energy state. (The Quantum Spheres "bond" differently in a vacuum to form Crystal Space than they do in the presence of mass with energy to form a deformed spacetime structure. Note that zero-rest-energy mass will also bond as Crystal Space in Stillness).

The lowest energy state for high-density Event regions is *not* for the spatial axes to remain at 90-degrees to each other. Although it is true that from the perspective of the particle, there is no valid way to determine that the Spatial dimensions are not offset at right-angles (and so it will continue to calculate its position using Probabilistic Geometry with dimensions at this fixed probability for offset); it is nevertheless the case that the *actual* shape of the Quantum Sphere in high-density Event regions (to an observer outside that frame of reference) is to have the spatial dimensions "Cone" downward along the Temporal axis. This shape minimizes the like-charge repulsion from neighboring particles and their events. This cone-shape is how Quantum

Spheres are bonded in high-density event regions, and it is what we observe as the warping of spacetime.

Finally, I note that the Coning of space toward time also narrows the aperture of the Probability Lense, forcing events to occur even more closely together (increasing the Event Density).

Event Density is the mechanism by which outside observers compare their own spacetime to that of the region they are observing. The distortion of the Quantum Angular Offset of the dimensions within Quantum Spheres by mass gives rise to all the observed effects of Relativity.

The free rotation of spatial-dimensional axis-system when it comes into existence at each event, along with the inability to predict the new orientation of the axes within the Quantum Sphere for any event, gives rise to all the observed effects of Quantum Mechanics.

Events and Probability Lensing

I begin by making the rational postulation that in order for a particle to exist, it must have sufficient data to determine that it exists in its present location, and that it also will exist in a different "next" location in spacetime. If a particle does not have this information, it will exist only in its current location and its movement along spatial and temporal dimensions will be zero. That means that it will move in neither space nor time.

There is no mechanism in modern physics that allows a particle to have enough information to determine a new relative position for itself for a Next Event in spacetime. Let's examine this:

Traditionally, a particle would be assigned a four-number spacetime location using coordinates for three spatial locations and a time location (S1, S2, S3, T1). This system requires an external axis to have any meaning. Using the particle itself would always generate zero values for all numbers.

Using zero starting values for all numbers then renders any new set of location coordinates useless, as there is no common point of reference, so there is no orientation of the system. The coordinate assignment system will always require a common external axis, and therefore, no single particle could establish a new location for itself in the absence of an external reference. Moreover, there is no legitimate way to establish units of measure for either space or time. (I could discuss these deficiencies for pages, but I'm sure that anyone who has gotten this far along already understands my point).

Attempting to determine a new location using standard geometry is also futile. Information about the speed and acceleration of a particle requires another particle for relative context. Without that information, the absolute best that a standard geometric representation of a particle with a set of spatial and dimensional axes that all intersect at a single point can generate would be a line pointing in the direction of a next location. The actual location could exist anywhere along the line, and therefore, without an external point of reference, this method also fails.

Probability Lensing describes a method whereby the particle is able to use the known likelihood of its own dimensional alignments to create two equally valid sets of space axes. These dual-axes-systems orient to each other, and can thereby point two lines outward that will intersect in space. The Time dimension is always offset from both spatial lines, and therefore can be used to establish an intersecting point in Time, thus establishing a new spacetime location for a next Event.

Here is how this works in practice: A particle exists within a current event. This event is comprised of a Quantum Sphere with a now instantiated orientation of the spatial axes. What I mean by this is that when the Event occurred, the three spatial axes came into being. Their exact orientation was unpredictable, as the system could freely rotate, but once instantiated, they come into existence at a fixed orientation. (We still do not know where the dimensional lines lie along that orientation, but we know the directions that they point).

Once the Quantum Sphere exists, the system can be described using a probability distribution as illustrated below:

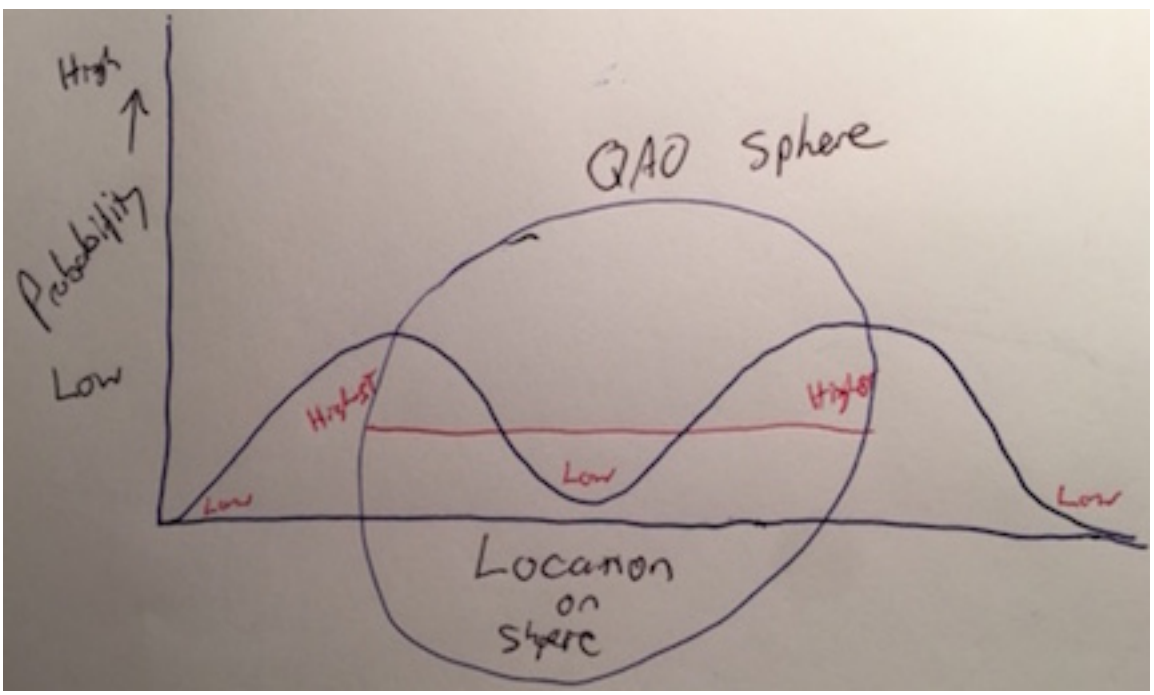

Illustration 18: A histogram distribution for one spatial dimension that is oriented horizontally to an overlaid Quantum Sphere.

When we calculate the probability of the location of a spatial dimension, we find that the highest probability for spatial axis exists equally on two points - each on opposite sides of the “boundary” of the Quantum Sphere (the “boundary” being an arbitrary orbital construct drawn around the points of highest probability for location of the spatial dimensional axes, not an actual limit to the sphere).

When we repeat this exercise for all three spatial dimensions, we find that we can create two complete sets of spatial dimensional axes that exist as far apart as possible within the Quantum Sphere.

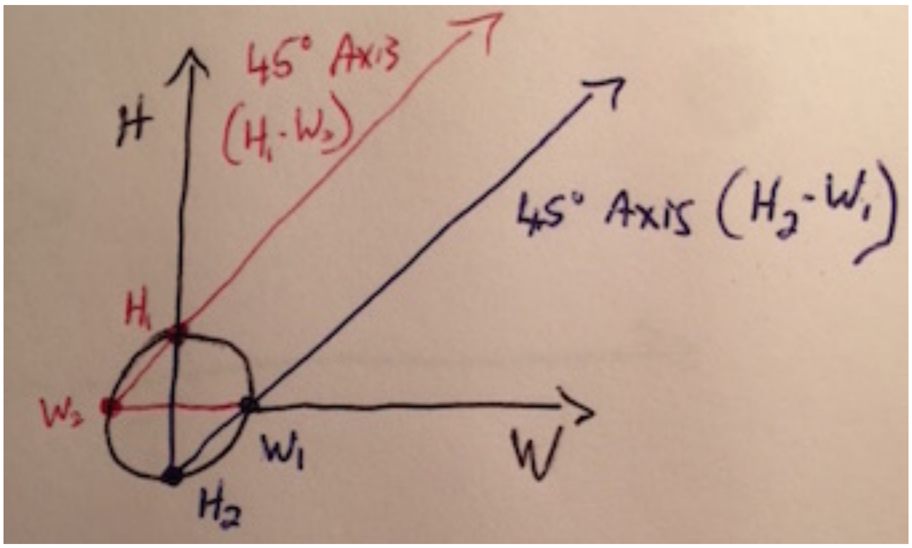

Illustration 19: A Quantum Sphere showing a dual axes formed from the two points of maximum probability for the location of each of a Height and Width spatial dimension.

It is a simple matter, from this system, to draw a line from one set of axis toward a Next Event, and to intersect that line with a line from the second axis to establish a unique location in space for a Next Event, with no need for any information to have been passed from a prior event, nor with any need for information from an external landmark. (The unique location being inherently imprecise since it was calculated only using probable locations for the dual-axes, not exact locations of known axes).

It is further a simple matter to extend a line from the Temporal dimension to intersect the Next Event at an appropriate time to create a proper spacetime location for the Next Event.

All of the information required to establish a new spacetime location for the particle is, therefore, inherent to every particle via Probability Lensing.

But why do new Events happen at all?

Events take place to keep particles within spacetime. As a particle moves through spacetime away from a prior Event, the ability to describe its location deteriorates. The nature of the Probability Lense is inherently imprecise, and the precision decreases as a function of distance (with a function that approaches zero). Next Events must take place to reestablish the existence of the particle. To maintain the minimum energy state, Events take place at the distance that is the maximum of the resolution of the Probability Lense (as far apart as the system will allow). This maximum distance drecreases as mass increases. This will be discussed in more detail in the next section.

Gravity, Mass, Event Density and Spacetime Warping:

The presence of normal mass in space spawns events at a greater frequency than either light in a vacuum or mass at rest. Motion through both space *and* time moves mass out of the range of the Probability Lense much more quickly than a particle with movement in only a single dimension type.

In order for this normal mass to exist in a unique spacetime location, it must have axes that can establish its unique position, and therefore a compass must be present at each local spacetime event, and at each spacetime location in which the mass exists along its entire particle-strand.

So from all of this discussion we know that the presence of mass triggers events and establishes a system that includes a new set of spacetime axes; however, in a four-dimensional spacetime universe, *the creation of a new event does not cause the prior event to go away*. That prior event still exists in the block-universe, and the force of gravity (a force that is caused by the existence of and acts on the dimensions themselves) does not cease to act between the "prior" and current event. Rather, the force continues to repel the spatial dimensions from one-another (now at multiple locations), and it continues to attract them to the temporal dimensions (plural, because the Temporal dimension now exists at two spacetime coordinates).

Looking at any given volume of spacetime, we find that the more mass there is, the greater the number of events that occur within the volume.

Because gravity is repulsive to like-dimension types, when the density of events increases, the space between the negatively charged spatial dimensions decreases. This results in a new shape for the space-dimensional axis.

Normal mass (containing rest energy) always moves at a 45-degree angle between the Space and Time axes of each event (as we have previously discussed). This movement defines the structure of local spacetime. It is different than movement at 90-degrees or parallel to an axis-type. Those will be discussed later.

It is important to remember that movement between events actually involves the moving of the particle through space (for normal mass) and time. The direction is established by the axes, but the particle actually does move through spacetime.

Motion through both space and time allows mass to be influenced by the higher and lower densities of events that surround it.

Because the charge of gravity has a repulsive on like spatial dimensions, in high-density event regions (where there are a lot of other negatively charged spatial dimensions surrounding every Quantum Sphere) there is a lower-energy state in which spheres can exists than with the spatial axes offset at the 90-degree configuration that prevails in total isolation.

Since event densities are not uniform throughout spacetime, the structure of spacetime (the bonding of the Quantum Spheres) in high event density locations will be for the spatial dimensions to fold "back" away from high densities and toward lower event densities. They therefore begin to take the shape of a cone that reduces the angle of the spatial dimensions against the time dimensional axis. (This increases the distance between like spatial dimensions from nearby events, and the ultimate shape of the Cone will be the shape that balances the repulsive force from the spatial dimensions within any particular event's Quantum Sphere, and the repulsive force emanating from spatial dimensions from surrounding events' Quantum Spheres).

If there are enough nearby events – meaning if there is sufficient mass – the spatial dimensional Coning will be sufficient to create an apparent "warping" of spacetime (to an observer that is outside of the affected spacetime. To observers within the affected spacetime, all angles will still appear to be offset at a QAO of 90-degrees, and therefore, they will not observe any warping). In this sense, the "shape" of local spacetime is the result of an emergent complexity generated by each individual Quantum Sphere attracting and repulsing the dimensions of the surrounding Quantum Spheres – ultimately forming an overall shape for the spacetime volume that can be observed on a macro scale, and which appears uniform and consistent from that vantage point.

So, in high event density spacetime, the spatial dimensions do not exist at 90-degree angles from the perspective of an outside observer, but rather, they Cone around Time in the direction of lower event densities.

One more important note: is that we will observe the same Coning of space around time for mass regardless of whether the mass is large because a lot of matter exists in close proximity, or the mass is large because a particle is moving quickly through space. This is because in both cases, the event density is the same. Each event consists of one time dimension and three spatial dimensions.

For all particles of identical mass:
Total mass = total events = (total spatial dimensions/3 & total time dimensions)

So from its perspective, a single, very long (in space) particle strand will create the same event density as many, very short (in space) particle strands clustered together.

It is the aggregate total of particle-strand-length of all particles (adjusting for their distance from one-another) that determines the system's total event count, and thus the net attraction of S-T and repulsion of T-T and S-S. This will be solved for at each event, and that is what will determine the QAO (the probability shape) and ultimately, the shape of spacetime around the mass.

In a vacuum, light will have the lowest possible event density. In Stillness, mass will have a similarly low event density.

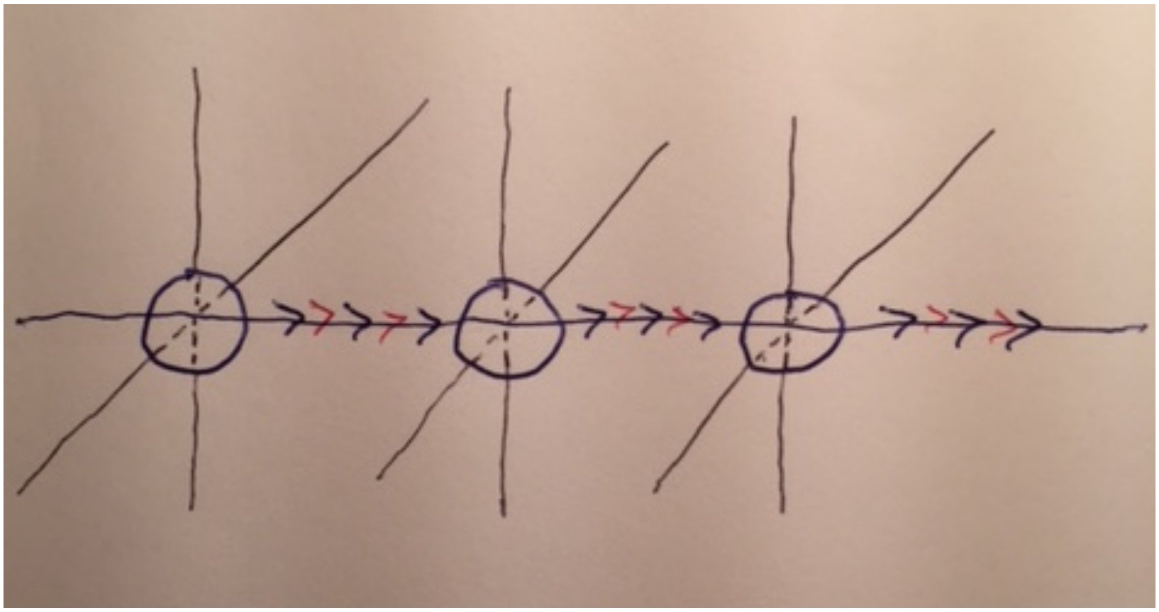

Illustration 20: Crystal Spacetime: the event structure for light in a vacuum (T is vertical axis – solid not dashed) or matter in stillness (T is horizontal axis). The density of events is so low that the charges of past and future events do not materially affect the shape of the current event axes (the background warping of space around time).

In both cases, the particle is moving only along one set of dimensional axes with no motion in the other. This gives the maximum resolution to the Probability Lense for one simple reason: there is only one dimension type for which there is any Quantum Angular Offset that can generate uncertainty for the distance calculation. In other words, one dimension type is always set to a perfect right-angle, and thus has perfect resolution.

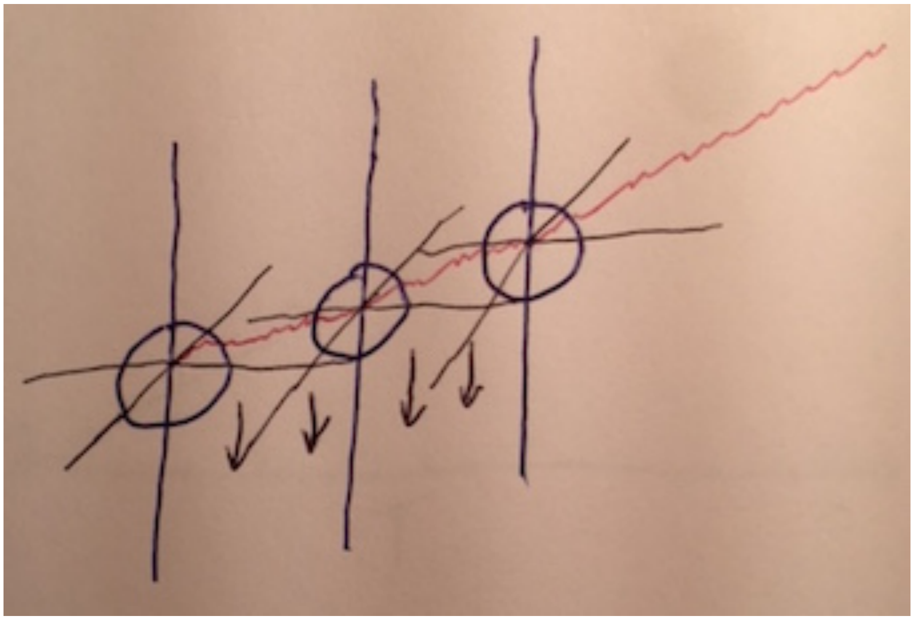

Illustration 21: Normal mass: In red, we see normal mass that "moves" through spacetime at a 45-degree angle. The mass generates events as it moves. The density of events will determine the extent to which the repulsion of the spatial dimensions to themselves in all of past, present and future events will establish the lowest energy structure. The spatial dimensions will Cone around Time into that structure.

Now that we can visualize a structure for spacetime as composed of Quantum Spheres, which themselves are composed of and shaped by the gravity charges contained by the temporal dimension and the spatial dimensions that orbit it, we can turn our attention to the macro-scale and discuss what has historically been thought of as "gravity."

As usual, this is much easier to visualize using a three-dimensional spacetime model – though we can no longer call this a Euclidean model.

Imagine again a three-dimensional spacetime universe. Here, the Time dimension is represented as the vertical axis while the two-dimensions of Space are represented as a plane along the horizontal axis. The "Coning" of Space around Time is visually depicted below:

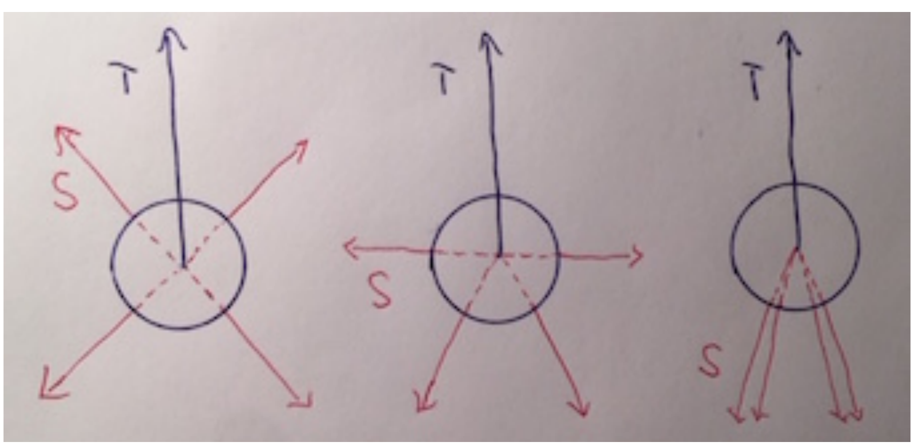

Illustration 22a: Inside a Quantum Sphere: Time (Blue Line) and Space (Red Lines) are depicted: first, in the presence of no mass, so with only the Root Warp (dashed lines for orbital position of the spatial dimension); then in the presence of some mass; and finally in the presence of substantial mass

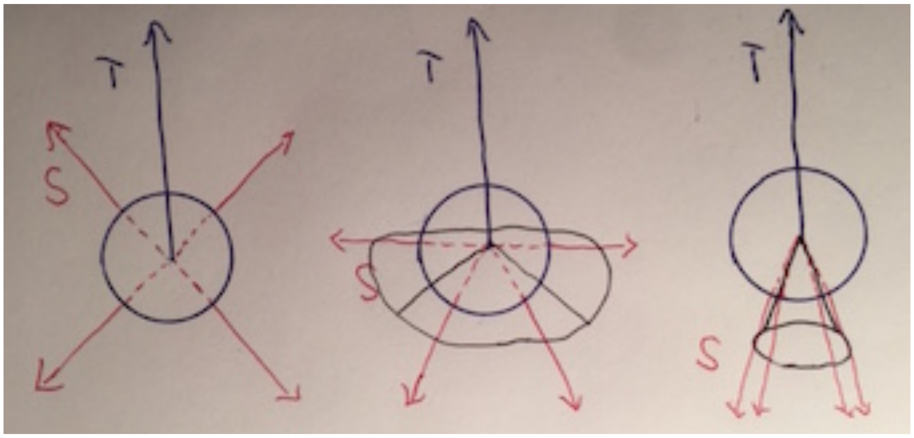

Illustration 22b: The same Quantum Sphere, only with a black (badly drawn) "Cone" depicted. The Cone begins to take appreciable shape when mass is substantial

Looking at the illustrations above, several things become clear. The first is that we can clearly see how the presence of mass narrows the aperture of the Probability Lense. Since the spatial dimensions can no longer exist as far apart from one-another as they could in the absence of mass, the locations of the two axes-formations of the Probability Lense are necessarily closer together. Thus the resolution is decreased. This will force the Next Event to take place more closely to the current event in spacetime.

Another thing that we can see from the 3-dimensional model is that the Coning of Space downwardly around Time provides a shape and structure to the local spacetime that accounts for the observed large-scale effects of gravity in our Universe. In other words, we can visually see that, in the presence of sufficient mass, an orbital path would be established in space when all the Quantum Spheres of a system are viewed together on a macro-scale:

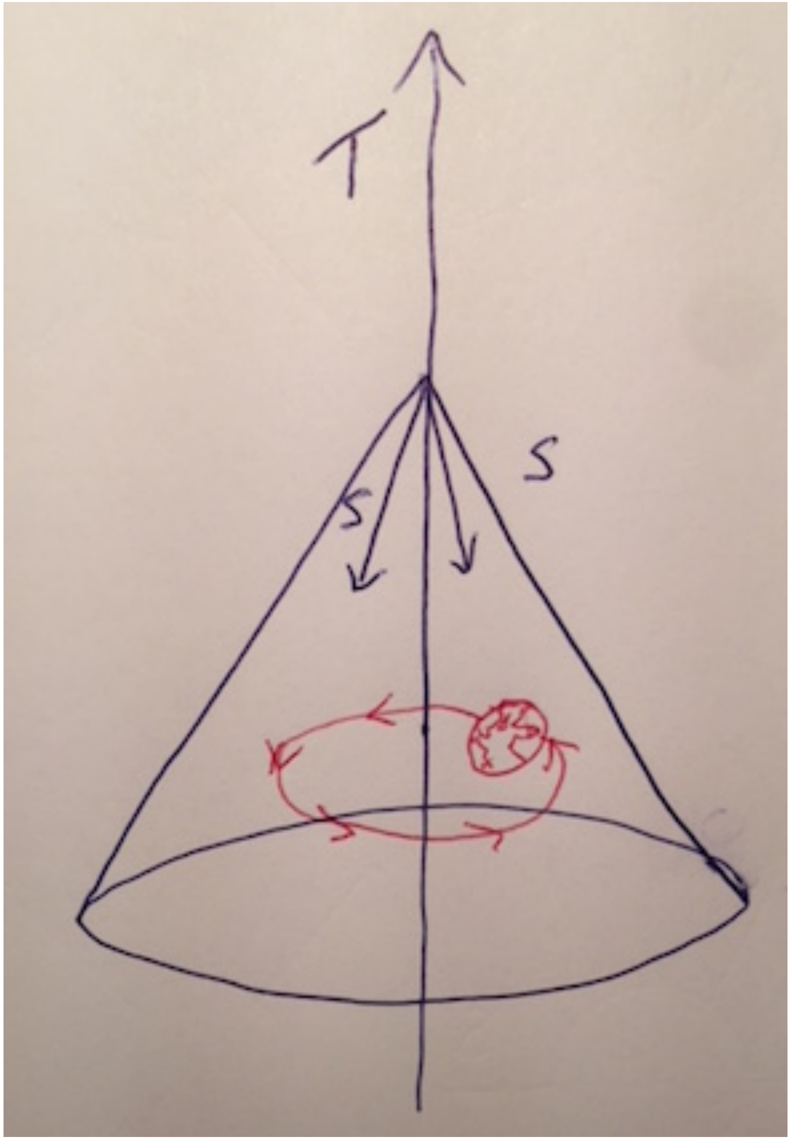

Illustration 23: The very simplest depiction of a mass moving in a straight line within Space that is Coned around Time

<u>The QAO and Relativity</u>

"A Ruler for Space, a Clock to tell Time?
For Units of Measure, Events will be Mine."

We are finally ready to construct a complete model universe. This three-dimensional model now incorporates the effects of gravity on Space, and it will demonstrate how Coning creates all of the traditionally understood and observed relativistic effects.

The model will eventually reveal that Events are the ultimate constant – ticking at the same rate for every particle and photon in the Universe. (In other words, every particle – all matter and every photon – in our Universe has undergone exactly and precisely the same number of events as every other).

Let's again begin by looking at two particles: particle "A" and particle "B."

If we put them into a system, each with identical properties, they will move in space and Pass in time at the same rate: 45-degrees with isometric units of measurement along all axes. For simplicity of the model, let us also presume that they are distant enough from each other that they are only observers to each other, and one will not affect the other.

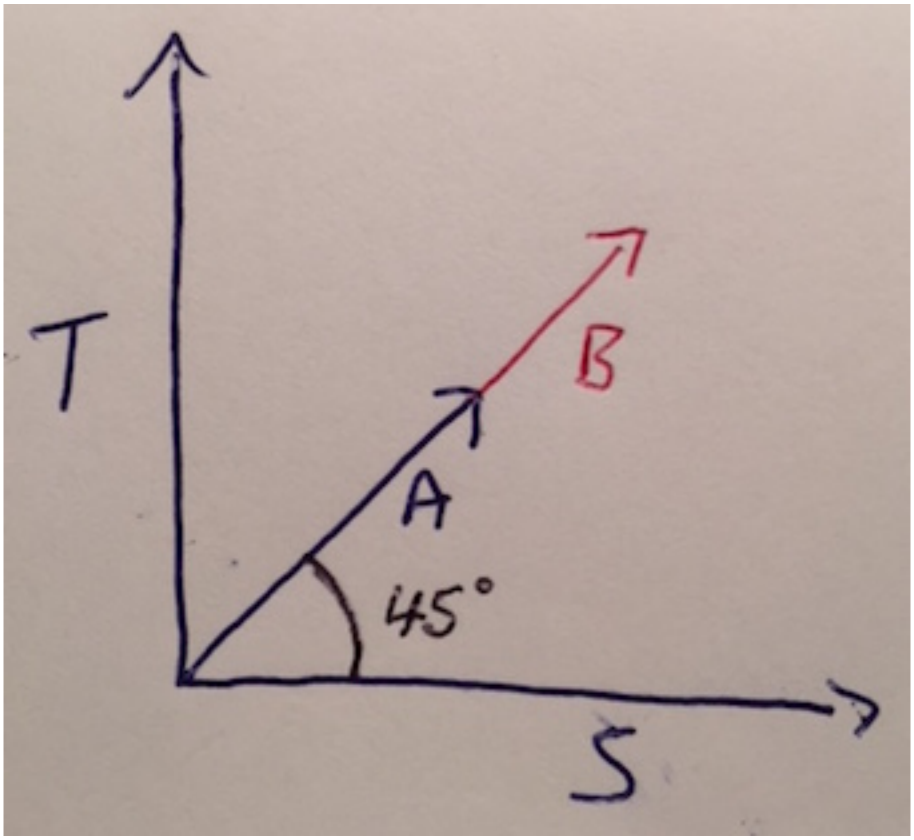

Illustration 24: Two particles (A and B) in the same reference frame moving in isometrically measured units of Space and Time

Now, for the sake of simplicity, let's imagine that we leave particle A alone and begin to accelerate particle B. The initial acceleration from the perspective of both particles could be illustrated this way:

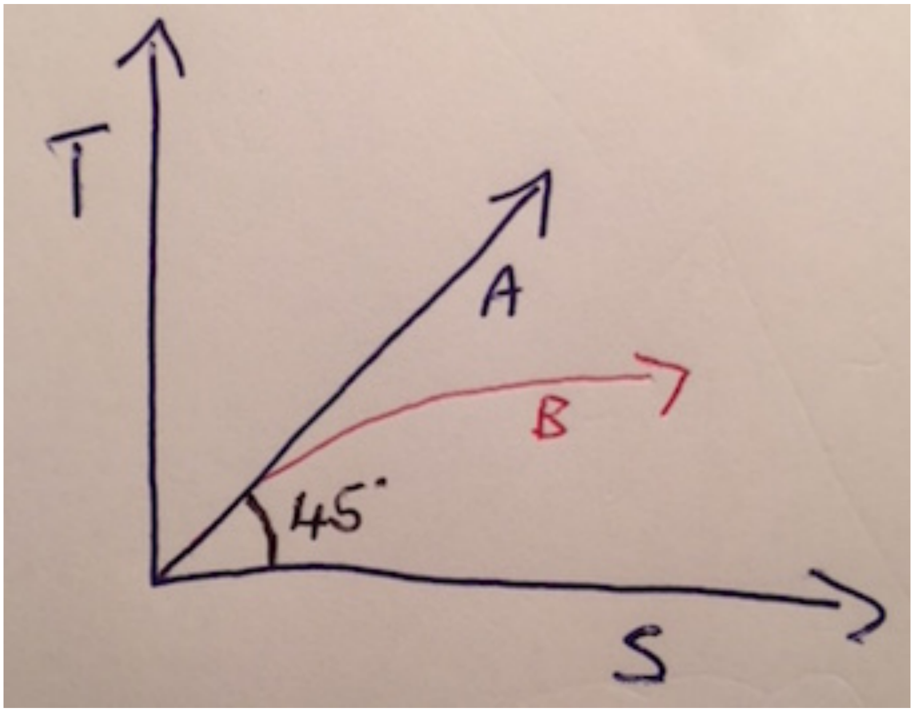

Illustration 25: Two particles (A and B) starting in the same reference frame, with particle B accelerating in Space

In the case of the illustration above, we continue to use the isometric units derived from particle A and apply them to both particles. The result is what is shown: the angle between particle B and the Time axis increases and the angle between particle B and the Spatial axes diminishes.

Now, we can begin to accelerate particle B to a rate that will create noticeable gravitational effects on the system. We know that gravity will manifest as a Coning of Space toward Time, increasing the QAO (meaning that the theoretical intersection of the spatial dimensions, from an outside frame-of-reference, would no longer appear to be 90-degrees, but from within the reference frame, would remain 90-degrees). This presents a problem for our illustrations now (which will turn out to be the source of relativity): we can no longer use the same Spatial axes for both particles. Our illustrations can retain a single Time axis, but we have to have Spatial axes denoted for Particle A (S sub A) and Particle B (S sub B).

This could be illustrated this way:

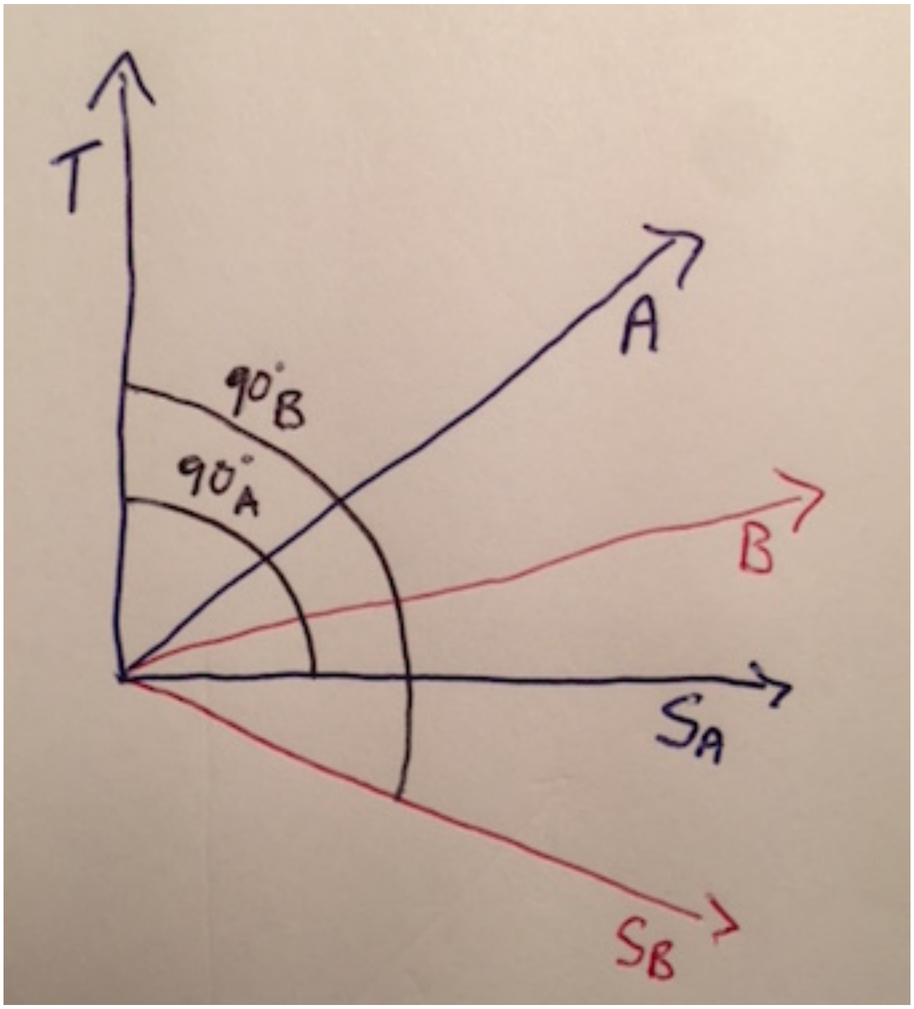

Illustration 26: Particles A and B are now in different reference frames. Particle B is moving at relativistic speeds, and therefore its Spatial-dimensional axes must be Coned downward

This requires much discussion, but most of that will happen after we explore the system when there are significant relativistic effects. For now, I must do a tiny bit of housecleaning:

The graphical depiction of the two particles using geometry is very useful to visualize some elements, but it does introduce a possible source of confusion. Lengths of the particle-strands at different angles will have different associated triangles when measured against either axis. The particle-strands would form a hypotenuse, and thus could be viewed as having different measured lengths when depicted on the same graph. This does not appear in the real universe and it is an artifact of the on-paper representation of the model. In fact, for every formula determining relative properties, we measure the length of the particle-strand itself to establish isometric units. These units are then applied to all axes, and it is the length along the axis that is used to relate to second particles. There is no real manifestation of different hypotenuse lengths for particle strands.

Now let's look at what happens when particle B is accelerated to a highly relativistic speed:

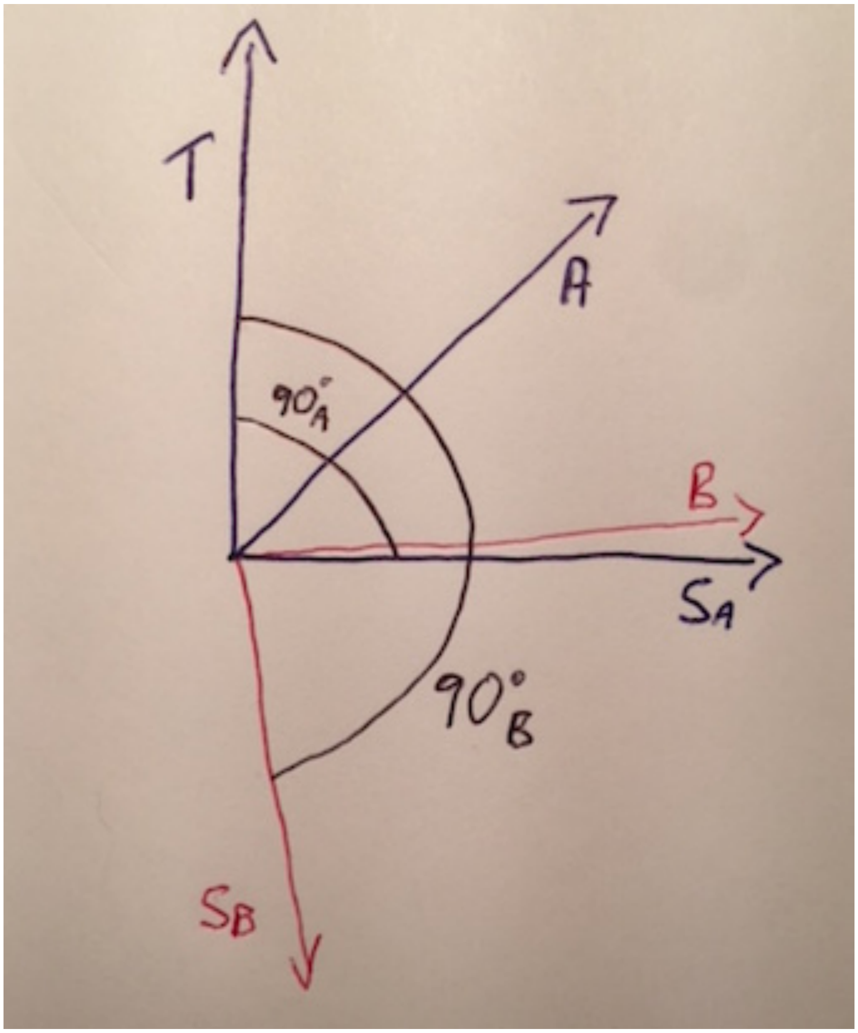

Illustration 27: Particle B is depicted moving at relativistic speed through space relative to particle A

In its own frame of reference, particle B is still moving isometrically between its Space and Time axes; however, from the perspective of particle A, particle B is now moving almost completely in Space – having veered sharply away from the Time axis. Moreover, particle A now observes a very substantial Coning of the spatial dimensions toward the Temporal axis – producing an apparent warping of spacetime.

The axis for Space sub-B is beginning to approach the axis for Time (and we can see that if a particle was to be accelerated to the speed of light, the Space axes would, in fact, run parallel to the Time axis). Particle B is now moving almost parallel to the Space sub-A axes (light in a vacuum runs parallel to the Space axes).

We are now finally ready to demonstrate how Relativity manifests. I'm going to start by doing this the hard way, and then I'll explain why the outcome is a real result, and then we'll do it the easy way.

Relativistic results manifest because the Spatial dimensions Cone around the Time dimension. This has been depicted graphically, but the mechanics require discussion.

For a particle in its own inertial frame, it will always move at 45-degrees; however, when in motion relative to an observer, the particle has two components that must be considered in the calculation of its speed: its relative speed in space, and the relative angle of the dimensional-axes that is being used to determine its location (compared to the relative angle of the dimensional-axes of the observer). We can most easily visualize this by assigning those units to particle A's unchanged axes as so:

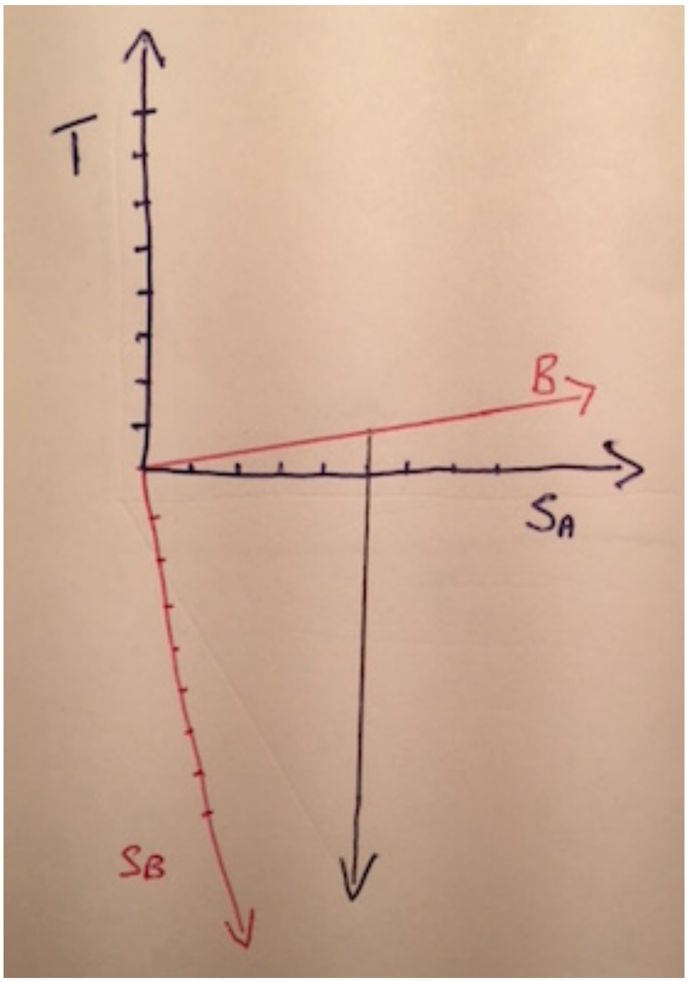

Illustration 28: Particle B is moving very quickly to a relative observer (A) not depicted

Because particle A is just an observer now, its location is no longer relevant. It is now only relevant in that it has isometric units of measure that can be applied to all systems for uniform measurement along all axes. The plot line for particle A has therefore been removed from the illustration.

Now, we can discuss how the relative motion appears to both particles. From the perspective of particle A (observer), particle B has moved five units in Space in only one unit of Time. Particle A has "aged" one unit as far as particle A is concerned. For particle B we must follow the black plot line until it intersects with its own Spatial axes which are substantially offset. We can see in Illustration 25 above, that plot line would intersect somewhere about 20 units down. (I reiterate that this geometry is only used for illustration and approximation. The hypotenuse would not be used in actual calculation, but rather, the length of the particle strand would be mapped to the axis to establish the line to plot for intersection).

Thus, from the perspective of particle B, it has moved 20 units in space. Using its own isometric units, it will also have moved 20 units in time, and it will have "aged" 20 units do accomplish this.

Graphically we can see that in this example, particle A has moved one unit in Space and one unit in Time (we have used A's units of measure, so they are always one-to-one). Particle B should have moved 5 units in space as viewed by A; however, from the perspective of Particle B, it has moved 20 units in space. From its perspective, it has also moved 20 units in its own isometric time units. Particle A will notice that spacetime for B is no longer flat. B has slowed its passage through time so that it is observed to move 5 units of space in much less time than A has clocked.

This can be restated and summarize by way of example. If particle B represents a spaceship, and it takes off from a space-station at 95% the speed of light on a ten-light-year journey, it will return in just over ten years as measured by its crew. This is because they are measuring in their own isometric units, and so they move one time unit for each space unit.

For the observers on the space-station, however, the ship is moving at only about one-third of a unit of space for every one unit of time. The ship will appear to take much longer than a year to complete the journey at that speed. In fact, the observers will age about 32 years – in accordance to the equations set out in Relativity theory – before the ship returns.

From this discussion, we can depict and visualize a simple view of the relativistic effect of Time dilation and apparent Spatial stretching. Particle B moves a great distance through Space and observes Time passing at a constant rate. Particle A observes that time passes much more slowly for Particle B relative to itself.

Having established the premise that there is a valid way for relativistic effects to manifest through geometric description of relative systems, I'm now going to explain why this works and show the "easy" way.

For all frames of reference, Events represent uniform ticks of the spacetime clock. Events are the universal constant.

We have already discussed Events and event density in some detail. We have seen that in low-mass systems, there will be a low density of events, and therefore particles will have better clarity to place their Next Events more distantly than they can in high-mass systems; but the implications of this have not yet been fully explored.

A good place to begin is by analyzing these systems from the perspective of the Time dimension.

As we discussed at the very outset of the Theory, the Time axis is incapable of warping. Time is a one-dimensional line in a one-dimensional system – it has no second dimension to warp into. A warped Time dimension could also be described as a line that curves. Any curving then would also be prohibited.

This is important since particles must be able to move forward in Time, and also because throughout this paper, I have described particles and photons as moving at some angle (generally either 45-degrees or 90-degrees) away from Time. This could only really be accomplished if there were a second Temporal dimensional axis against which to plot such motion.

Passage of Time happens in a straight line, and so all of the discussion of an "angle" off of the time dimension has been illustrative. There is a more accurate way of describing movement in Time in a four-dimensional spacetime system. From this accurate description, we can derive the geometric analogy that I have used, but the geometric derivation is only descriptive of the math, not the reality.

In fact, there can be only two possible structures (and two permutations) for Time: one structure is that there is a single line of Time that runs from beginning to end and all particles exist on that line; and the other is that there are many lines of Time that all run parallel to each other and particles can exist on any of these parallel lines.

The two permutations of these structures are: that Time exists as a continuous line, or that Time exists as a series of points along a theoretical line.

I'm not convinced that the actual structure is relevant to anything other than philosophy, but knowing the possible structures removes any possibility that my descriptions so far in the paper are anything but a mechanic for illustrating and approximating the actual functioning of the Universe.

In order to reach the ultimate conclusion, I will select the simplest conceptual model of the Time dimension: that of many lines of Time that run parallel to one-another in which every particle has its own time axis.

Our examination of a normal massive particle revealed that the particle exists at a location in spacetime, triangulates on a Next Event location and moves to the Next Event location. This progresses the particle some distance in space and some amount of time. The Next Event itself, though, must always be associated with (centered around) a one-unit of positive-gravity charge from the Temporal axis. This means that all events not only involve particles, but also coincide to "locations" of positive gravity charges.

(We can conceive of these positive-gravity charges as a current running along a continuous wire of Time. In my chosen representation, each particle would have its own wire, and the current would pull the particle from a current event to a Next Event).

In high-density event regions, these positive gravity locations are packed closely together along the Time axis. They must be packed together because particles can only "know" a Next Event location that is very close. In less dense regions, the positive charges can be (and are) spread farther apart.

Another way of saying this is that for a particle that is moving very quickly in space, events take place much more rapidly than they do for a particle that is moving relatively slowly in space. We saw this phenomenon depicted graphically in the above section on Relativity – where in illustration 25, particle A moved one unit of space and one unit of time, but in that same isometric unit of measure, particle B saw itself move 20 units of space (and 20 units of time).

From this, we can deduce that events are not all created equal. Some events will happen in such rapid succession that almost nothing happens in between (meaning particles barely budge in spacetime between one event and the next), whereas other events take place at a more leisurely pace, where much space and time can elapse between successive events. I describe this phenomenon as the Productivity of Events.

Here is an analogy: imagine that we are making a film using two cameras, one that runs at 50 frames-per-second and the other at 500-frames-per-second. We are filming the same thing (let's say a woman running a 100 meter dash in 10 seconds). In the more productive frames (50 fps), the runner moves farther per frame than she does in the less productive (500 fps) film. If we compare 100 frames from each camera, we see that the runner has moved 20 meters in the productive frames but only 2 meters in the high-frame-rate video – even though both movies run at one second per second.

In other words, even though in the film, time ticks the same for both cameras, the dense film is relatively "less productive."

The same is true for Time and for Events. Dense events are less productive, so less happens between each event (things age less between events) – less dense events are more productive, more happens, more aging occurs.

To make more sense of this notion, let's return to the example I used earlier. For a slow relative observer (on a space-station) of a very fast traveler, they will relate this way: they start in the same reference frame and together they can validly calculate the number of events that must take place to travel to a space-station and back at 95% of the speed of light. The event count is established based on speed, distance and their identical frame of reference. No relativity modification is made. (The participants will say that we can clock a single event and know how much time has passed. The traveler will be moving at a known speed, and therefore we know how long it will take to make the trip. In that amount of time, how many of our clocked events will transpire?)

The fast traveler then sets off and approaches the speed of light on his journey. For him, the event density is vastly higher than for the slow observer. Each of his events will be much less productive than he thought, moving him forward in space a smaller distance and progressing him in time a correspondingly smaller amount. For him, he will be moving at the speed he thought he would, and the trip will take exactly as long as he had calculated; but he will have to go through many more events than he had planned.

The result is that the fast traveler will experience much less passage along Time relative to the slow observer, and as seen by the slow observer, the ship will not be travelling as quickly.

For the slow observer, every event is longer and more happens between each event. More time passes, and so more aging occurs.

When he finally makes it home, the fast traveler can report that the number of events he experienced was much larger than he thought it would be. Of course, the observer will be much older than they both expected. He too will have experienced many more events than anticipated.

In fact, both participants will experience the same number of events between the departure and the return of the traveler. For the fast traveler, the events will have been less productive, each event being "shorter" and less distant from the prior event. So upon his return, the fast traveler will be younger and will have experienced less perceived time to have passed than the observer, whose events will have been relatively longer and more productive.

In the end, all things, all matter and all energy, have the same clock – one event happens for everything, and then another event happens for everything, everywhere. Events are the universal clock, not just for time and not just for space, but for *spacetime*. Events are the universal constant.

With this understanding we can see how Time can be understood to be a line along which a positive current flows. This current pulls everything along from one event to the next. All particles experience events at the same universal rate, but that rate is variable in space *and in time*; so some particles may move more in time and others in space in between events. Even so, in any single Present Moment, all particles throughout the universe will all have undergone the same number of events.

And that is the ultimate source of the constant for the universe.

This ultimately brings me back around to the speed of light, and why it is a constant. If light does not "move" perpendicular to Time, then what is really going on?

We can now understand the ultimate answer.

The Temporal axis is a perfectly straight line that is parallel to all other Temporal axes. In this sense, it is a single line.

What I have described throughout this paper as "moving perpendicular" or "parallel" or "at a right-angle" is actually a description of the length along that single line that need to be measured. There is no actual angle, but instead, a "right-angle" is equivalent to "zero measured progression," and "parallel" is equivalent to "motion along only this line (zero measured progression in any spatial dimension)." The description of relative angles is similarly a description of relative Passage of time.

When a photon of light is produced, it experiences one event. To find its Next Event it only triangulates in Space. It stays perfectly still in relation to its Time axis. However, due to the QAO, it cannot focus out to infinity in space, and thus even light has a need for Next Events along the photon's-strand.

The Next Event will move the photon itself only through space, *but the event itself cannot exist at the exact same spot on the Time dimension*. The like-charge repulsion of gravity prevents such a thing from happening. Therefore, the Next Event must take place at the minimum possible distance along the Time axis as permitted by the force of gravity.

So whereas the photon does not progress in Time, every event always takes place at a progressive location in Time. Thus, for every bit of matter and for every photon, events always take place, and they always do so at a uniform rate. This is the ultimate isometric unit of measure. One event takes place, which may happen relatively more quickly in Time or relatively closer in Space, but always at the steady rate mandated by the flow of the current of gravity.

From the perspective of any observer, light, with no inherent progression along Time, will be a constant. Each observer will have one event for each event that the photon has. The observer will note the location of the photon at that event, and will then pass some amount in time to reach its Next Event. In between the observer's events, the photon will move *perpendicularly away from the observer in Space* (meaning it will move the entire length of the spatial dimension in between events).

An observer will calculate their relative position as prior event coordinates (S,T) to Next Event coordinates (Sn,Tn) where Tn is always >T. The rate of movement is calculated as (Sn-S)/(Tn-T) or distance divided by time. They will compare this to the speed of light to find that Tn = T, so light has moved (Sn-S)/0. There is no longer a denominator for light in the distance divided by time, so light, they would conclude, has moved infinitely quickly.

However, even though light has moved away from the particle at infinite speed through space, the requirement for photons to experience events, and the restriction that Next Events cannot exist on top of prior events in spacetime, forces even the photon to have events at the same pace as every other particle in the Universe, and those events are progressive in time.

The result is that at each event, every observer will measure the photon as having moved directly away from it in space, that movement will be at the maximum possible speed (directly perpendicular from their location), and they will see the photon only instantiating into the Universe at an Event Density that would be calculated as the minimum density from any observer's frame of reference.

Between each event and Next Event for the photon in a vacuum, this Event Density will always move it a specific distance through space (C). Therefore, the observed speed of the light for every observer will always be measured the same, and thus, a constant.

Conclusions:

At this point, I believe this paper is sufficiently complete that it can be shared.

I have built an extensive list of new insights to long-standing mysteries of physics that are much less mysterious in light of QAO Theory, but none of them is central to the Theory. I'd prefer to allow other minds to begin to digest and explore areas in light of this new understanding, rather than hold it back while I write additional material.

I intend to publish supplements to this paper, and I hope that other great minds will begin to flesh out elements that I have not been able to complete on my own.

Unfortunately, although I can describe and depict the concepts behind the Quantum Angular Offset Theory of Relativity, and although I can formulate the system so that the results match the results predicted by General Relativity, that is the point where my mathematically capabilities have been reached. There is now a new kind of geometry that needs to account for multiple sets of axes that have one geometry in one set of dimensions, and another geometry for the other dimension.

I am admittedly over my head when it comes to providing mathematical proof of the Theory from this point, and so I can only continue on my knowledge that this system produces relativistic results, and my presumption that these results are not coincidental, but are in fact, identical to the relativistic results predicted in General Relativity.

I hope that others can provide mathematical support for the Theory and I hope that experiments can be designed that will provide evidence that this Theory is not just elegant but also correct.

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[i] This is true at least on the macroscopic scale. On the quantum scale, we might still observe quantum-mechanical motion, as even the model Universe would exist within our four dimensional Space-time Universe in which quantum-mechanical action always exists everywhere – even inside a static model.

[ii] Zero rest energy is the state of mass where there is no momentum (the Center-of-momentum frame or Zero-momentum frame).

From Wikipedia "Center-of-momentum_frame" 2015:

The center of momentum frame is defined as the inertial frame in which the sum over the linear momentum of each particle vanishes. Let S denote the laboratory reference system and S' denote the center-of-momentum reference frame. Using a galilean transformation, the particle velocity in S' is

$$v' = v - V_c,$$

where

$$V_c = \frac{\sum_i m_i v_i}{\sum_i m_i}$$

is the velocity of the mass center. The total momentum in the center-of-momentum system then vanishes:

$$\sum_i p'_i = \sum_i m_i v'_i = \sum_i m_i (v_i - V_c) = \sum_i m_i v_i - \sum_i m_i \frac{\sum_j m_j v_j}{\sum_j m_j} = \sum_i m_i v_i - \sum_j m_j v_j$$

End Quoted material.

This is all to say that this mass is not travelling at all in Spatial Dimensions. All of its particle-strand exists in parallel to the Time axis. For anything with spacetime movement that is not traveling at all in the spatial dimensions, all movement must be along the Time dimension. Therefore, for any observer with movement in space, as soon as they experience a single movement in space, they will observe the object pass down the entirety of Time.

[iii] The amount of either of these components is not relevant provided that the particle is not so massive nor so energetic as to cause it to have a PassageSpeed that is zero or infinite in the direction of either the Temporal axis or the Spatial axial sphere.

[iv] Discussion of the speed of light in a vacuum is intentionally limited here. It is important to point out, however, that light will move away from the origin point only at 90 degrees in a vacuum; and it can move more slowly than C in the presence of matter. Similarly, matter at origin is presumed to be imparted with energy. The energy interaction with matter is akin to the matter interaction with photons – it removes the Stillness quality and thus makes the matter Pass less directly along the temporal axis and gives angular direction to the mass along some amount of the spatial dimensions.