Article

Physics & Cosmic Order IV: Gravity, Quantum Relativity & System 3

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ABSTRACT

System 3 prescribes a discontinuous universe as an alternative to the assumed spacetime continuum of General Relativity. Space and time are projected as a linear series of atomic space-frames alternating with orthogonal quantum frames that are unified in the timeless Void. Space and time are defined by light in each space frame, consistent with Planck's constant. Since each space and quantum frame together defines one primary interval of time, they can be historically integrated by the introduction of historic coordinates. The mass-energy relationship of special relativity is defined by the relative box of this coordinate system. The Lorentz Transformations between different inertial systems are defined by the relative box with respect to the world box. Gravitational attraction between separate atoms results because atoms are separate in space-frames and united as one in the Void. This results from the inverse conjugate identities of space and quantum frames. The Coulomb force results from the universal countercurrent identities R_1 and R_2 associated with electronic charge in each atomic space frame that are united as photonic energy in each preceding quantum frame. Both forces reconcile unity and separation between quantum and space frames respectively in the same interval of time. The synchronous projection of atoms accounts for Mach's principle as a primary distinction between inertial velocity and gravitational mass. Electromagnetic fields derive from the need for the universal set to span successive increments of space-time to link free electrons with their proton partners, consistent with Maxwell's equations. The angular acceleration of galactic stellar populations tends to curve the integrated fabric of space-time at galactic centers with respect to their peripheries. This contraction of the integrated fabric of space-time drives fusion processes at stellar centers. Quantum relativity emerges naturally. New approaches result to celestial dynamics, cosmology and identity.

Key Words: Cosmic Order, physics, System 3, gravity, quantum relativity, Mach's principle, Foucault's pendulum, black holes, missing mass.

Preamble:

In a letter to his friend Michele Besso the year before he died Einstein wrote: "I consider it quite possible that physics cannot be based on the field concept, that is, on continuous structures. Then nothing remains of my entire castle in the sky, including the theory of gravitation, but also nothing of the rest of modern physics."

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The only alternate possibility is the discontinuous projection of space-time, distinct from the assumed spacetime continuum of general relativity. It requires a structural insight into the dynamics of how space and time are generated. Space and time are concepts derived *a posteriori* from this physical creation and there is no real justification for raising them to *a priori* status as general relativity does.

A discontinuous universe requires that atomic mass itself must be discontinuous. It must appear as particulate atoms separated by distance in a succession of synchronous projections, like frames in a holographic cosmic movie in which all atoms are still projections linked up by light. Light itself defines the space between them as mentioned prior. This general picture requires patient repeated reflection to fully grasp.

If atomic mass is discontinuous it must also synchronously disappear into timeless bundles of quantized energy, each quantum atom thus having a photonic energy equivalent that is both timeless and spatially indeterminate. It must be timeless so that successive still frames of spatial projection can close ranks to present the appearance of spatial continuity. It must be spatially indeterminate because atoms are only detectable as discrete particles of mass in the integrated fabric of space-time.

The alternate energy mode of mass constitutes a holistic boundless field that is orthogonal to the integrated fabric of space-time.as we normally perceive it. In the System it is called the Void. It is consistent with Planck's universal quantum of action and with Bohr's initial assumptions in establishing an ontological model of the atom.

Certain things necessarily follow. A primary interval of time is defined by the occurrence of one space frame together with one timeless quantum frame. One frame is the conjugate reciprocal of the other. The outer linear space between atoms is defined relative to the orthogonal spherical space within an atom. Space and time are quantized accordingly.

There is no other universal datum of reference that can define space and time. Space and time are a posteriori to creation. They do not exist as a priori entities in themselves.

Introduction:

System 3 illustrates how separate particular hydrogen atoms are synchronously projected by a unique universal set that intimately binds photon, electron and proton within each particular set everywhere at once. In each integrated space frame all atoms are linked up by light that defines external space in relation to the inner space defined within each atom by discrete photon energy levels. Light issues from within excited atoms and it thus has a universal relationship to each independent atom irrespective of their relative velocity.

Space frames specified by each atom alternate with timeless quantum frames that are the photon energy equivalent of each atom. All the discrete quantized energy equivalents of all atoms in the universe are holistically integrated as *one* by the unique universal set in the quantum frames.

This holistically integrated energy field is timelessly balanced and spatially indeterminate. In Systems 3 and higher it is called the *Void*.[1] It is a quantum sensorium or master memory bank from which the world of form is synchronously recalled to project a succession of integrated space frames that define events in space-time.

The Void spans and timelessly integrates the whole of space and time. The Void integrates history. The timeless Void is orthogonal to space and time, such that the integrated fabric of space-time is projected with the appearance of a seamless reality.

What we accept as a seamless reality is a discontinuous projection however. The discontinuity is betrayed by Planck's universal constant *h* that tells us that light comes to us as a discontinuous series of quantized pulses such that $E=hf$, where E is the photonic energy and f is the frequency of the light. This is consistent with System 3 and with the quantization of both space and time.

It will be shown in the next part that the *primary interval of time* is 1.519×10^{-16} seconds, consistent with zero angular momentum in the first orbit of hydrogen and with the hydrogen spectrum generally.

The *primary interval of space* is the distance that light can transmit in the primary interval of time, namely 4.554×10^{-8} meters. This defines the circumference of the largest fully coherent atom, since photonic energy in the internal spherical space of the atom functions orthogonal to its linear projection that defines linear external space between atoms. This circumference corresponds to the 12^{th} orbit of a primary hydrogen atom. It defines the ionization limit of atoms. Hydrogen is the largest atom, since electron orbits are contracted in heavier atoms.

Light Speed and Gravity Waves:

The speed of light is universal because it relates to each individual atom. It specifies a maximum speed of transmission through the integrated fabric of space-time because it defines the very nature of space-time. This does not mean that atoms are completely separate entities. Physical events remain synchronously correlated via the universal set that coheres with all particular sets at once. Neutral atoms are separate and distinct within each successive space frame but they are also holistically integrated as an indeterminate and timeless energy field in the Void within the *same primary interval of time*.

A primary interval of linear time is defined by each single recurrence of an integrated space frame in classical units of time consistent with the Planck-Einstein relation $E=hf$ above. Particular atoms are both distinct and indistinct *at the same time*. The oscillation between space and quantum frames accounts for the *wave-particle duality* of matter and the *uncertainty principle*.

[1] The Void is directly accessible in human experience. As human beings we too are required to span and integrate history in order to cope in a practical way with phenomenal experience. The Void is associated with our conscious intensions. We recall and re-assimilate elements of past experience in order to formulate plans that anticipate a future result. In this view we are participants in a cosmic mind with a cosmic role to play.

Gravitational phenomena derive from this fundamental ontological reality. Each spatially integrated frame that projects separate atoms on the space frame side is holistically unified as a coherent energy field on the quantum frame side. Physical matter is both *One* and *Many, at the same time*. It is one on the integrated quantum frame side and many on the integrated space-frame side.

This means essentially that gravitational attraction derives from the unity of all physical matter via the Void. Since the orthogonal Void spans space-time and integrates history, gravity acts through the successive projection of space-frames. Gravity derives from the primary projection of the physical universe frame by frame, and the attractive force between separate particulate masses is thus universally apparent.

Gravity is not a force transmitted through space-time faster than light. It is a quantum force of attraction that operates timelessly via the Void without mediation by a theoretical graviton . It is a primary member of a small family of a hitherto unrecognized quantum forces that operate timelessly via the Void.

Since all relative motion depends on the speed of light for its detection, and since gravity is associated with the synchronous projection of all matter, there is no measurable way to establish that gravity is a force transmitted as a gravity wave at the speed of light through a spacetime continuum. Motions due to gravity or any other force can only be known through a succession of space frames over time and their detection depends on the speed of light.

The synchronous projection of successive space frames can themselves be regarded as waves associated with all particulate matter. The wave nature of particulate matter only becomes apparent in relative motions. While wave-like distortions or perturbations in the local fabric of space-time may be detectable in the immediate vicinity of rapidly rotating super-dense neutron stars, due to localized intense levels of non-synchronous space-frame skipping, there is no related mechanism that will allow such effects to propagate endlessly throughout the integrated fabric of space-time even if they can occur.

There is no such independent thing as a spacetime continuum for a superimposed wave effect to propagate through. Experiments to detect gravity waves in the normal synchronous environment of our solar system are unlikely to turn up any convincing evidence that they exist. At least five methods have been proposed to detect gravitational waves: resonant bar detectors on Earth, laser interferometers on Earth, space microwave interferometers, laser interferometers in space, and Doppler tracking in space. [2]

The Calculus and Historic Integration:

The method of integration in the calculus depends upon summing the differentiation of small increments that approach zero in equations that relate to Cartesian coordinates. The method was questioned at the time it was introduced because of the indeterminate magnitude of infinitesimal

[2] Ciufolini and Wheeler, *Gravitation and Inertia*, Princeton U Press, 1995.

increments.[3] Are space and time infinitely divisible? Zeno's paradoxes indicate that this does not make rational sense. Discontinuity is also indicated by quantum jumps in position from one electron orbit to another orbit via the Void without traversing the inner space between orbits. Space and time must be generated in discrete amounts that place a minimum limit on the increment of the differential in the calculus.

Knowing that these discrete jumps exist allows a natural process of *historic integration* that is similar in some general respects to integration in the calculus, but only when cosmic relationships are involved. This can find a variety of mathematical applications in astrophysics, stellar evolution and galactic organization on a cosmic scale consistent with the Lorentz transformations, just as Schrödinger, de Broglie and Bohm demonstrated applications associated with the inner space of the atom and sub-atomic interactions on the microscopic scale.

System 3 & Historic Integration:

The Lorentz Transformations derive from relative space-frame skipping in conjunction with *historic integration* over a succession of frames. Since space and time are quantized so is relative velocity, mass and momentum as it relates to the speed of light. This must be so since the spatial distribution of atomic matter on the space-frame side of System 3 has reciprocal quantum counterparts in the timeless Void.

Since the Void constitutes an indeterminate orthogonal space as a conjugate energy field, it constitutes organized timelessly quantized mass as energy. See Figure III-3. Both the Particular and Universal Sets of System 3 invert the subjective to objective orientations of the *centers* that constitute them in transformations between space and quantum frames. They also invert the manner in which they mutually cohere together. They are mutually *reciprocal*. It will be said that the quantum frame is the *conjugate equivalent* of the space-frame. The Void is consequently orthogonal to the integrated fabric of space-time.

In other words the coalesced photonic energy equivalents of atomic matter have quantized spatial relationships in the Void. The Void is a conjugate field that reflects the spatial distribution and organization of particulate matter but not in a way that can be explicitly determined from the space frame side as a human being. The field is a boundless[4] and all embracing unity. It is *one*. There is no distinction of separate phenomena in the Void. Nevertheless energy transformations from space-frame to space-frame are effected through the orthogonal agency of the Void. They are not transmitted through the integrated fabric of space in a single frame because there is no particulate motion in a single space frame. Each synchronous space-frame is a still projection that defines an increment of time.

[3] The calculus assumes that space and time are continuous, allowing of infinitesimal increments. It is noteworthy that George Berkely refuted Newton's theory of fluxions over this issue in the Analayst, 1734. Luce AA, Jessop TE, Eds. *The Works of George Berkeley, Bishop of Cloyne*, 9 Vols., London and New York, 1948-1957.

[4] In is interesting that the concept of the boundless was expressed by the Milesian philosopher Anaximander as the source of the world in the sixth century BC. Waterfield R. trans. *The First Philosophers*, NY: Oxford U Press, 2000. Boundless implies timeless also, so it was not likely intended as an origin in time. His words may reflect a direct experience of the Void.

Each synchronous projection of a still space-frame is integrated by electromagnetic (EM) activity alone. EM activity emanates as *efflux* from within atoms due to quantum jumps between space-frames, together with fusion and fission processes. It is energy in a dynamic process of *efflux* and *reflux* associated with the synchronous projection of matter as mentioned in Part III.

Consistent with this view *historic integration* involves summing relative increments of space-time associated with the projection of atoms, taking into account both the orthogonal conjugate field of the Void and the integrated fabric of space-time. This is analogous to summing the differentiated area of rectangles under a curve along the x axis in Cartesian coordinates with respect to diminishingly small increments in the value of x in the calculus. There are major differences, however.

Introducing Relativity with Historic Coordinates:

In order to grasp the significance of *historic integration* we can assign *historic coordinates* such that the x axis represents a mass in relative motion in three dimensions with respect to a stationary frame of reference "A" given by the origin of the coordinates. The y axis represents the quantum energy equivalent associated with the moving mass represented by the x axis.

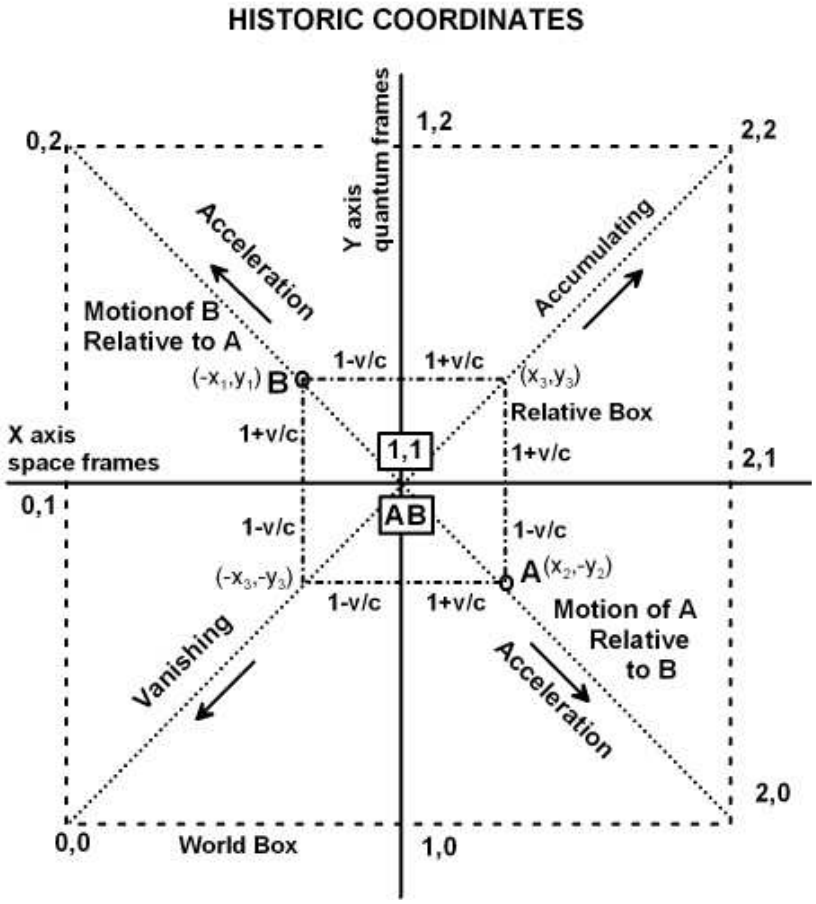

Figure IV-1

The origin of the x and y coordinates can be assigned the value 1,1 since any point in A is relatively stationary with respect to every other point in A and thus A is fully synchronous with itself. Every unit atomic mass in the inertial frame of A has a one-to-one correspondence. If a second frame of reference "B" is stationary with respect to A then its historic coordinates will also coincide. See Figure IV-1.

It should be noted that historic coordinates have no universal origin at a unique point in space and time. In this respect they are generalized coordinates that can be used to designate relationships between any two inertial systems. It should especially be noted what the designated origin 1,1 at A means. This defines it as an inertial frame of reference that is stationary and thus synchronous with itself because all atoms in A are synchronously linked by light without space-frame skipping.

The distance light can travel in each space frame is *c*. Light defines space relative to each atom in each space frame. This means that the unit distance along the x axis represents the distance light can transmit in each space-frame relative to each atom, which defines a primary interval of time relative to each synchronous atom in A. This is a universal ratio that can be translated into classical units of time and space.

Each quadrant of the historic coordinates thus represents a complete space-frame along the x axis and its corresponding quantum frame along the y axis in a given inertial system. For example if a particle could move at the speed of light relative to A then each quantum jump would be one unit in a negative direction along the x axis from x=1 to *x=0*. Each quantum jump in position would be the distance light can travel in a primary interval of time.

Since a primary interval of time is 1.519×10^{-16} seconds the corresponding unit distance that light can travel in a single space-frame is 4.554×10^{-8} meters.[5] Travelling at the speed of light the unit mass would disappear relative to a stationary observer at the origin A while its quantum energy equivalent would double. The particle would jump to position 0, 2 on the historic coordinates.

The unit value of the ordinate of A (y=1) along the y axis thus defines a quantum energy equivalent to atomic mass in a space-frame together with a quantum equivalent of the distance light can transmit in a single space-frame.

This means that the quantum energy equivalent of a mass at A, represented by the ordinate *y=1*, is equivalent to the designated atomic mass at A, represented by the abscissa *x=1*, times the square of the speed of light. $\boldsymbol{E=mc^2}$. The square of the speed of light is represented by the square area of unit dimensions defined by the coordinates of A at the origin 1, 1. One can thus see *why* $\boldsymbol{E=mc^2}$.

The origin at point 1,1 represents the *historically integrated mass-energy of any mass in A, over any span of space-time,* because there is no net relative motion within the inertial frame of A.

[5] This will be shown in Part V.

Relative Motion and Relative Space Frame Skipping:

Relative motion of B with respect to A introduces relative space-frame skipping in A with respect to B. Light can not link up all the synchronous space-frames in A with those in B because of its motion so some are skipped in A relative to B, even though A remains fully synchronous with itself. There is a consequent displacement of B some negative distance along the x axis relative to A. This represents a discrepancy in the number of mutually synchronous space-frames between B and A with respect to those of A that are synchronous with itself.

The y axis represents the *conjugate field* of the Void. The y axis should not be construed as identical to a complex plane. It is a conjugate field that is spatially indeterminate and timeless. It nevertheless consists of timeless quantized energy equivalents of atoms together with associated quantized elements of space that mirror corresponding spatial relationships in each space-frame.

The rate of space-frame skipping represented as a change in x of B in a negative direction along the x axis thus introduces orthogonal accumulations of the quantized energy equivalents of the atoms in B with respect to A. If the motion is constant this accumulated energy equivalent is constant. It can be represented by a single point on the 45^0 diagonal above the negative x axis, as shown in the upper left quadrant of Figure IV-1. This point is illustrated as one corner of the *relative box* of B.

Relative rates of space-frame skipping associated with relative rates of quantum jumps in position with respect to the x axis also represents a contraction in relative linear space in B as perceived from A. This is represented by the remaining synchronous frames that are not skipped in A relative to B.

Deriving the Lorentz Transformations:

When the inertial system B is moving at constant relative velocity *v* with respect to A, the proportion of space frames observed skipped from the perspective of A on the space-frame side is proportional to the relative motion of B as a fractional ratio to the speed of light *c.* Space frame skipping is directly proportional to *v/c,* since *c* has a constant relationship to each atom in each space-frame.

The quantity *v/c* is thus a direct ratio of space-frames skipped in the inertial system A with respect to the inertial system B. Light can not fully bridge the quantum jumps of B with respect to A so space frames in A are skipped to compensate. As a result A observes a contraction in B in the direction of travel. The proportion of space frames not skipped from the perspective of A between A and B is thus *1- v/c.* This quantity is represented by a single discrete increment in the abscissa to $-x_1$ at B as shown in Figure IV-1

From the standpoint of A there is also a correspondingly equal relative accumulation on the quantum frame side of B that is equivalent to *1+v/c.* This quantity of quantum energy is represented by a single discrete increment in the ordinate to $+y_1$ that is the energy equivalent to the $-x_1$ increment in the abscissa.

The increment along the abscissa times the increment along the ordinate represents the historic integration of A and B. It defines a square between the integrated fabric of space on the space-frame side of System 3 and the corresponding orthogonal Void on the quantum frame side consistent with $E=mc^2$. This square relationship represents the historic integration of A and B, since the orthogonal Void integrates the history of change that has taken place on the space-frame side. In other words the square represents the degree of mass-energy synchronicity between the space and quantum frames of B relative to A.

The perspective of a stationary observer in B can also be represented at the origin 1, 1. This gives a similar result in the opposite direction along the diagonal in the lower right hand quadrant, by the shift in the relative position of A to x_2, $-y_2$ at the diagonal corner of the relative box.

In either case the historic integration is represented by the area of the conjugate square in diagonally opposite quadrants of the relative box. It is given by $(1+v/c)(1-v/c) = 1-v^2/c^2$.

The projection of the square onto the space frame side only of either A or B is thus given by the square root of $1-v^2/c^2 = (1-v^2/c^2)^{1/2}$. This quantity is a universal transformation factor from the inertial system of A to that of B, or vice versa. It represents the degree of relative space frame-skipping and corresponding quantum frame accumulation as it applies to mass. It also applies to the integrated fabric of external space relative to each atom, and to relative time, in one inertial system as compared to another.

The internal spatial relationships of electron orbits within neutral atoms are not affected since space-frames associated with the projection of each atom are either skipped entirely or not at all. Atoms are not flattened in the direction of travel. System 3 resolves this enigma in current relativity theory. Inner space is distinct from external space.[6]

With respect to mass, the space-frames of an observer at A are skipped relative to a moving mass in B, such that the observed mass M in B carries with it a relative accumulation of quantized energy that effectively increases its relative instantaneous mass M according to the formula $M=M_0/(1-v^2/c^2)^{1/2}$, where M_0 is the rest mass.

With respect to linear space L in the direction of motion of B with respect to A the contraction of length L associated with skipped space-frames in A with respect to B is given by $L= L_0(1-v^2/c^2)^{1/2}$. The relative length of a static dimension in the inertial frame of B is shortened in the direction of B's motion because space-frames in A are skipped relative to it. With fewer synchronous frames between them A sees B shortened.

[6] In his initial theory of the atom when working with Rutherford, Neils Bohr stated that some of the classical laws of physics do no apply within the atom. This remarkable statement requires that the inner space of the atom is distinct from external space. It was a necessary first step to construct a theory of the atom that fit the evidence. We will return to this in the next Part.

With respect to the internal frequency of a clock associated with the degree of synchronicity remaining between A and B the frequency of the clock ticks *T* in B are retarded with respect to A according to $T=T_0(1-v^2/c^2)^{1/2}$.

With respect to the reciprocal external frequency Φ of a wave associated with the degree of synchronicity remaining between A and B the frequency of the wave Φ in B is increased with respect to A according to $\Phi = \Phi_0/(1-v^2/c^2)^{1/2}$.

These are the Lorentz transformations [7,8,9,10] between any two inertial systems moving with constant relative velocity with respect to one another.

Note that although there is a relative skipping of space-frames the space-frames not skipped are nevertheless mutually synchronous. This is another inconsistency with current relativity theory. There is such a thing as simultaneous events although this may not be determined by measurements with clocks in space-time as Einstein maintained.

Acceleration, Historic Coordinates, and Special Relativity:

If B is steadily accelerating in a linear direction with respect to A there will be incremental jumps in the historic coordinates of B along a diagonal through A. The size of the incremental jumps will depend on the rate of acceleration and each increased quantum jump in B represents a corresponding force that is the equivalent of one or more discrete skipped frame sequences. Force, like space and time, is also quantized. Force exerted externally in the integrated fabric of space-time is the conversion of mass-energy in skipped space-frame sequences into acceleration.

If we take a look at Newton's second law of motion $F=ma$, we see that the units of force are essentially the same as the units of mass. The SI Newton unit of force was introduced to accommodate a discrepancy in units between the two sides of Newton's equation. The discrepancy is unit distance per second per second. Given that space is quantized according to the distance that light can travel in a primary interval of time, acceleration thus represents a progression in the rate of space-frame skipping between the body accelerated and the stationary frame of reference. Mass is converted to energy that becomes translated as a force within the space-time fabric of the stationary frame of reference.

For example we burn fuel to accelerate a car or a rocket ship. The combustion products weigh slightly less than the reactants by the amount of energy needed according to $E=mc^2$. At normal rates of acceleration that we experience this mass discrepancy is far too small to measure because c^2 is very large. At relativistic velocities approaching the speed of light it becomes very

[7] Michelson, Morley. American Journal of Sciences, **34**, 1887, p. 333; Phil. Mag., **24**, 1887, p. 449;.
[8] Lorentz, H. A. "Michelson's Interference Experiment." In Lorentz HA.; Einstein A; Minkowski H; Weyl H. *The Principle of Relativity: A Collection of Original Memoirs on the Special and General Theory of Relativity.* New York: Dover, p. 3-7, 1952.
[9] Lorentz, Arch, Néerl., **2**, 1887, pp. 168-176.
[10] Planck, M., Eighth Lecture, General Dynamics, Principle of Relativity, In *Eight Lectures on Theoretical Physics.* Colombia U Press, 1915

significant as *v/c* approaches 1. Whatever the case it represents the conversion of skipped space-frames associated with mass into energy translated as a force of acceleration.

As B is accelerated toward light speed relative to A at the origin, it moves on a 45 degree diagonal through A, upwards to the left. That is, it moves in a negative direction along the x axis toward zero, while also moving in a positive direction along the y axis toward the value 2.

The reverse is true of A from the perspective of B. This is illustrated by lower right hand quadrant of the *relative box* in Figure IV-1. With acceleration the *relative box* expands toward the *world box.* On a cosmic scale indicated by the *world box* there are differences indicated between A and B as a reference frame, even though the Lorentz transformations equally apply.

In other words, as a reference atomic mass in B approaches the point of disappearing with respect to one in A there is a corresponding doubling of quantum energy associated with the atomic mass of B in the orthogonal quantum field of the Void, as indicated by the upper left hand quadrant of the world box. From the perspective of A at the origin, A remains synchronous with itself and it takes infinite energy to accelerate B to light speed as A approaches zero relative to B.

With respect to B, A effectively moves along the diagonal in the lower left hand quadrant of the world box toward 0, 0. B disappears with respect to A and vice versa. But the world box indicates that there is only a doubling of mass-energy of B in the quantum field of the Void relative to A. This doubling nevertheless indicates hat B has reached light speed.

Although the mathematics indicates that it takes infinite energy relative to A to accelerate B to light speed, this is because A is vanishing relative to B. B is still synchronous with itself and so is A. The conservation of the total mass-energy of B with respect to A is thus illustrated by diagonals in both left hand quadrants of the historic coordinates.

While constant relative velocity is a succession of constant jumps in position that involves no energy input in a frictionless environment, forced acceleration within a relatively stationary inertial frame of reference does require energy input. A frictionless rocket ship traversing interstellar space must expend energy of some kind to accelerate. The energy is translated via the Void to increase the magnitude of quantum jumps in position from space-frame to space-frame as it moves along the diagonal.

Like all relative particulate motion, acceleration occurs in discrete increments in whatever manner a progressive degree of relative space frame skipping is introduced. Gravitational acceleration does not require external energy input because gravitational attraction is implicit within each primary interval of time.

This implicitly requires that there are fundamental differences between forced linear acceleration relative to a stationary inertial frame of reference and gravitational acceleration on a cosmic scale. Gravity and acceleration are not equivalent. This contradicts another cornerstone on which General Relativity theory is erected in addition to the assumption of a spacetime continuum.

Reverse Transformations and Cosmic Coherence:

The reverse situation applies to A from the perspective of B if B is taken to remain synchronous with itself at the 1, 1 origin. Then the expansion of the *relative box* toward the *world box* accelerates A along the diagonal in the lower right quadrant of the world box toward the position 2, 0. From the standpoint of B there is a doubling of space frames in A even though there is a relative vanishing of related quantum frames. It can appear to B that A can accelerate unimpeded to light speed and vanish without trace. An event horizon swallows A in a singularity from the standpoint of B.

But mass-energy conservation requires that B moves along the diagonal in the upper right hand quadrant of the world box towards a relative doubling of both space and quantum frames at 2, 2. The right hand half of the historic coordinates is the reciprocal of the left hand half.

We thus find that although the Lorentz transformations apply equally between different inertial systems, there are other reciprocal relationships between them on a cosmic scale as illustrated by the world box. Relativity theory does not currently take cognizance of this.

In practical terms this requires that there must be a universal frame of reference associated with a preponderance of synchronicity in the universe as a whole. Since all matter in the heavens is in a perpetual state of cyclical motions within cyclical motions this necessarily introduces a *family of quantum forces* to accommodate relative space-frame skipping on several cyclical levels in such a way as to preserve synchronicity with the universe as a whole. The universal set of System 3 requires *universal coherence* with all particulate matter. There must be coherence for us to observe phenomena in a coherent way, which obviously we do. We will return to this later.

Gravitational Force & Acceleration:

According to Newton's formulation of gravity, two masses m_1 and m_2 separated by a distance d exert a mutual force of attraction proportional to the product of their masses and inversely proportionate to the square of the distance between them. $\boldsymbol{F \sim m_1 m_2 / d^2}$.

System 3 relates Newton's law to the synchronous projection of atomic space-frames everywhere at once. They are synchronously projected from their quantum energy equivalents integrated as *one* in the orthogonal Void. Because the quantum side is the conjugate of the space-frame side this synchronous recall of independent atoms must also encompass the reciprocal relationship between the spherical inner space of each atom and the linear external space between separate atoms.

In this compounded situation two masses m_1 and m_2 are both timelessly united as one and they are also spatially separate. They are simultaneously both at once since each recall of a space-frame from the Void defines one primary interval of linear time. The two masses are impelled to

bridge this discrepancy between union and separation. This represents a force of mutual attraction that tends to contract the reciprocal external space between them.

Historic integration involves integrating space frames and conjugate quantum frames. This is a square relationship even in a single primary interval of time. The two masses are projected together from their quantum equivalents at the same time. The space-frame of one mass exists in the same primary interval of time with the quantum frame of the other and vice versa even while they are both united as one in the quantum frame and separate in the space-frame. That is what the integration of the square means. If the two masses are two identical atomic masses the attractive force will be proportional to m^2. If the two masses are different one will be heavier by some atomic multiple of the other so the square will simply be represented by the product of their masses. The attractive force will be proportionate to m_1m_2.

A similar but reciprocal relationship exists between their linear separation in external space with respect to the spherical inner space in each atomic space frame. The maximum inner space is fixed by the photon shell at the ionization limit. The reciprocal linear space of separation with respect to the photon shells of the atoms synchronously recalled in each space frame has a conjugate quantum equivalent in the Void.

The historic integration as it relates proportionately to the gravitational force of attraction is thus the reciprocal square relationship $1/d^2$. Combining these two into the integration of a single space and quantum frame gives Newton's universal force of gravitation $F=G.m_1m_2/d^2$, where G is a constant for dimensional consistency.

Gravitational force is a static force of attraction in each space frame. It does not result from the conversion of skipped mass as energy translated into a force of linear acceleration over a succession of space frames as in Newton's formula $F=ma$. It is not the same as burning fuel to accelerate a car. Gravitational force is spontaneous, everywhere at once.

If two masses are mutually restrained as when a person is standing on firm ground the force is constant and measured by the person's weight. If the person falls from an airplane without a parachute the person accelerates frame by frame and yet remains synchronous with the planet Earth so far as their mass is concerned. The skipped space frames associated with the person's gravitational acceleration are external linear space-frames only. The synchronous atomic space-frames that define the person's inner mass are not skipped. The person is projected still space-frame by still space-frame synchronous with the still frames of the planet and stars beyond.

Gravitational acceleration is thus different in kind to externally forced acceleration through space-time such as by the expenditure of fuel or by an exchange of kinetic energy.

The gravitational force of attraction increases little by little in each successive frame as the person falls because the distance of separation is being reduced. Over such a short distance the increase in gravitational force is negligible.

On a cosmic scale gravity applies to the preponderance of synchronous mass and its spatial distribution in the entire universe. In summary it can be said that gravity is associated with the primary projection of matter. The force of gravity derives solely from the unity of the quantum sensorium or Void as it is related to the synchronous projection of all atomic matter everywhere at once, frame by frame.

This underlines the important distinction between forced acceleration within the integrated fabric of space-time and acceleration due to gravity. Since gravity is associated with the synchronous projection of all atomic matter there is no relative skipping of space-frames associated with matter itself. The inner space of atoms is distinct from external space.

Earth atoms are not skipped relative to the centripetal acceleration of atoms on the moon due to gravity for example. Only increments of external space defined by the transmission of light in space frames between the earth and moon are skipped. This curves the integrated fabric of space-time between the earth and moon sufficiently to hold the moon in its orbit.

In the local environment of the solar system the inertial mass of the moon remains consistent with the gravitational mass of the earth and vice versa. There are important differences with respect to galactic dynamics however.

Foucault's Pendulum and Mach's Principle:

In 1851, the French physicist Jean Foucault suspended a 200 foot long pendulum on a wire from the dome of the Pantheon in Paris and set it to swinging under the force of the earth's gravity alone. It was shown that the arc of its swings remained constant with respect to the "fixed stars," thousands of light years distant, while the earth rotated beneath it. The experiment was repeated in 2001 at the South Pole to verify that the earth makes one complete revolution in 24 hours with respect to the swings of the pendulum. [11]

This demonstrates that the inertial velocity of the earth's rotation is something quite distinct from its gravitational mass, even though its gravitational mass is the same as its inertial mass in rotation. While motion of the pendulum is due to the gravitational attraction between the pendulum's bob and the earth, the arc of the pendulum's frictionless swings is synchronous with the projection of the universe at large and it remains unaffected by its proximity to the earth. The heavy bob of the pendulum is synchronously projected still frame by still frame with quantum jumps in position between frames that are fixed relative to the position of distant stars and not affected to by the inertial rotation of the Earth.

General relativity can not offer an explanation for this effect. The reason is implicit in the discontinuous universe prescribed by System 3. Atomic mass together with associated external space-frames are synchronously projected everywhere at once. Inertial velocity remains constant with respect to the preponderance of synchronicity in the universe as a whole in the absence of a force to change it.

[11] Baker GP. Seven Tales of the Pendulum. New York: Oxford U Press, 2011:388.

The gyro compass works on the same principle. There is thus a clear distinction between gravitational mass and inertial velocity, even though inertial mass remains consistent with gravitational mass in our stellar environment. The effect is associated with Mach's principle.

The Coulomb Force versus Gravitational Force:

Coulomb's law has the same form as Newton's law of gravitation and it can be seen to follow from similar considerations. Charge, like mass, derives from the linking up of particular centers in sets by the common universal set of System 3. The Coulomb force, however, derives from the relationship of centers within sets, whereas gravitational force derives from the relationship between separate particular sets.[12]

In each atomic space-frame, the Coulomb force is a static force like gravity. It is the force of attraction between electron and proton that holds the electron in orbit as it moves but the orbital motion of the electron is a series of quantum jumps in position between a succession of space-frames. There is no motion in a primary interval of time, and thus no energy loss due to magnetic induction.

The Coulomb force is directly associated with the countercurrent identities of the universal set as it tunnels through the particular centers of each particular set to intimately link them as a whole atom in each space-frame. On the quantum frame side the charge becomes coalesced as *one* within the quantum photon energy equivalent of the neutral atom.

There is thus a conjugate relationship between the space and quantum frames that is self similar to that of gravity but it relates with respect to charge in specific atoms, not to the cosmic relationship between all atoms.

The charge is both separate and distinct between electron and proton in the space-frame, and coalesced as *one* in the corresponding quantum frame in the same primary interval of time that defines the inner spherical space of the atom. The Coulomb force is impelled to bridge this difference between union and separation. As a static force it can only be measured between free electronic charges. This is structurally self-similar to the external Gravitational force between massive aggregations of separate atoms in suns, planets and moons.

When the electron remains within the ionization limit the Coulomb force is a centripetal force of acceleration between electron and proton in the internal spherical space of the atom that counterbalances the inertial tendency of the electron to move in a straight line as it orbits in quantum jumps around the much heavier proton.

[12] Dimensionless relationships between the atom and the universe at large have been suggested many times in the past, together with various other dimensionless numbers. Sir Arthur Eddington was one of the earliest enthusiasts, pointing out that the coulomb force and the gravitational force between the electron and proton in the hydrogen atom differ in order of magnitude by a factor of about 10^{39} and this is approximately the square root of the assumed number of particles in the universe. Sir Arthur Eddington, *The Expanding Universe*, Cambridge University Press, 1933.

Since historic integration defines a square relationship between the space-frame and the quantum frame in a single primary interval of time, the static Coulomb force between two identical charges is directly proportional to the square of the electronic charge, and inversely proportional to the square of the distance between the charges. This is the same form as Newton's law of gravity.

Electromagnetic Fields and Maxwell's Equations:

The inner spherical space of an atom is a function of discretely quantized photon energy shells that define the radius of specific electron orbits. If the photon energy of the atom exceeds the ionization limit that defines the maximum radius of an atom the electron becomes ejected from the spherical inner space into the linear external space between atoms.[13]

It becomes a free electron and the charge between it and its proton partner persists in accordance with Coulomb's law. The electron and its proton partner are still intimately linked by the universal set that tunnels through them, but now the countercurrent identities $\mathbf{R_1}$ and $\mathbf{R_2}$ of universal term 2 must span a succession of space-frames to link them. (See Figures III-2 and 3.) It *must* do so since proton and electron are timelessly coalesced as *one* in the conjugate quantum frames. The coalesced pair *are* the total quantum of photon energy involved.

The lines of force of electromagnetic fields are defined by this spanning of space and time between electron and proton required by the countercurrent identities of the universal set. The active interfaces of the universal set remain confined within the particular centers of each particular set but the particular photon energy interface must also span the successive frames.

This requires that the countercurrent identities must carry with them specific quantized amounts of photon energy in each space-frame consistent with the conjugate energy equivalent in the quantum frame. This generates electromagnetic waves that transmit at the speed of light consistent with Maxwell's equations.

When an alternating charge is induced in a transmitting radio antenna wire an electromagnetic wave radiates laterally away from it at the speed of light. The intensity of the wave determines its amplitude. The electric component of the amplitude is orthogonal to the direction of travel. It oscillates parallel to the alternating direction of the electric charge in the antenna. The magnetic component of the wave oscillates perpendicular to the electric component.

The reciprocal relationship between space-frames and conjugate quantum frames becomes mirrored in the orthogonal relationship between the electric and the magnetic components of the transmitted electromagnetic wave. The two components of the waves are in phase because each

[13] As pointed out previously, the duration of the primary interval of time, has a value of 1.519×10^{-16} seconds. This is also the time required for light to circumscribe the 12th shell of the hydrogen atom, the shells being largest in hydrogen and the 12th being at an energy level close the limit of the ionization continuum. Hänsch TW, Schawlow AL, Series GW, The Spectrum of Atomic Hydrogen, *The Laureates' Anthology*, Vol. II, Scientific American, 1991. The primary interval of time is derived in Part V.

primary interval of time includes the space-frame component with the conjugate quantum component. The electric component corresponds to the space-frame and the magnetic component to the quantum frame. The latter is represented on the space frame side because the universal set is required to span successive increments of space-time in linking up electron and proton.

The two components of the wave are mutually orthogonal because the space-frames and quantum frames are orthogonal. The wave represents the stretching out of the charge relationship in the spherical inner space of the atom into linear external space. This drags with it the orthogonal magnetic component associated with related quantum frames in spanning increments of space and time.

Note that inside the atom there is no magnetic component produced because the electron does not move with respect to the proton. The whole atom is synchronously projected as a series of still frames and the electron only jumps between frames in synchrony with the proton.

The reciprocal product of the permittivity ε_0 and the permeability μ_0 of free space $\mathbf{1}/\varepsilon_0\mu_0$ is equal to the square of the speed of light c^2 because it has a reciprocal relationship to the square defined by the historic coordinates between each space and conjugate quantum frame in each primary interval of time.

The electromagnetic wave is superimposed on the integrated fabric of space-time which is defined by the transmission of light space-frame by space-frame. The linear propagation of the wave in external space is orthogonal to the self-similar circular motion of the electron frame by frame with respect to the proton in the inner space of the atom.

It is noteworthy that Maxwell believed that field lines represented elastic distortions of the ether. The lumeniferous ether was believed at the time to be the all pervasive medium through which light travelled and which filled all space, including vacuum.[14]

In this limited respect the ether might be taken to correspond with the boundless, timeless, and spatially indeterminate Void. The stretching of the countercurrent identities of the universal set to span a succession of space frames might be taken to correspond to his intuitive notion of elastic distortions.

General Relativity, Galactic Organization and Gravity:

Galaxies involve orbital motions of their stellar populations about their centers and gravity is the force that keeps stars from flying tangentially off into space under their own inertial momentum. A force of acceleration toward their center must be synchronously active over time. Stellar populations of all galaxies are in mutual rotation in differing dynamic patterns with respect to one another and yet they share in the universal synchronous projection of atomic matter everywhere at once.

[14] Maxwell JC [1873] A Treatise on Electricity and Magnetism. (two volumes) NY: Dover, 1954

Contraction of External Space:

Each star system can be represented by a point B with respect to the galactic center at Point A on historic coordinates. The acceleration of stellar populations toward the center thus contracts space toward the center at A with respect to the peripheral stars at B. The space frames at A are being skipped with respect to B on a cosmic scale.

Gravitational acceleration does not introduce relative skipping of atomic mass space-frames, but preferentially skips the sequential external space-frames that light transmission defines between atomic and stellar masses that are many frame sequences apart. The contraction of external space toward a galactic center at A necessarily introduces quantum forces that account for stellar formation and migrations of stellar populations.

For example the relative external contraction of space-time nearer the galactic center requires atomic matter to condense into stars that fuse space-frames of primary hydrogen into heavier elements. This contracts space in each space-frame to better suit the local external environment of space-time. Nuclear fusion is thus induced by the need for a balance.

The curvature of the integrated fabric of space-time also introduces a quantum force that results in the migration of younger stars toward the periphery while attracting dense old stars back toward the center.

On a cosmic scale, represented by the world box, space frame skipping can proceed without limit. The continual acceleration of the stellar population of a galaxy toward the center moves point B for the whole population diagonally up to the left toward the value 0 on the x axis and toward the value 2 on the y axis of the historic coordinates with respect to A at the center. See Figure IV-1.

Complementary Coordinate Movements - Left Side:

At this point the value 0,2 represents an energy equivalent of the mass of the stellar population accumulated in the Void with respect to the galactic center at A which has ceased to exist relative to the stellar population.

This means that as atomic space frames of peripheral stellar populations at B moved to the point 0,2, all atomic space frames at A have moved diagonally down to the left to the point 0,0 as shown in the lower left hand quadrant of the historic coordinates. The movements of A and B are complementary and reciprocal.

There is thus a black hole at the galactic center that represents a singularity common to all galactic centers. This means that beyond the event horizon is the universal inside. Only active processes across the active interface at the event horizon can be detected.

Note that black holes are distinct from the Void. The Void reconciles inside and outside timelessly. A black hole is an irrational hole in the primary projection of space-time.

Reciprocal Complementary Diagonal Quadrants:

The upper left hand quadrant of the historic coordinates has a complementary reciprocal relationship to the lower right hand quadrant. Quantum frames double in B as they vanish in A.

There is another reciprocal situation to consider. If we think of B representing the stellar population of a galaxy synchronous with itself we can consider B at the 1, 1 origin of the historic coordinates. Nevertheless A represents the galactic center and we find that old stellar masses drawn to migrate back to the galactic center tend to accelerate relative to B as they get very near the galactic center at A. They migrate and accelerate to find a better balance between internal and external space-time.

Old heavy stars can also balance their contracted internal space-time with external space by their rate of rotation as evidenced in rapidly rotating neutron stars. This can moderate rates of migration but will be left aside for now.

The bulk of the stellar population B represents the preponderance of synchronicity in the universe as a whole while accelerating old stellar masses tend to move along the diagonal into the lower right hand quadrant of the coordinate system as they approach the galactic center A. As they accelerate around an accretion disc at the center they progressively lose their associated quantum energy equivalent to the Void at point 2,0 in the lower right hand corner of the world box.

On a cosmic scale there is thus no directly associated accumulation of quantum energy to prevent old heavy stars from accelerating to light speed and disappearing beyond the event horizon at the galactic center A. There is no quantum energy that defines their mass and the synchronous external space frames have doubled at light speed.

Complementary Coordinate Movements - Right Side:

This situation in the lower right hand quadrant is complemented by the relative movement of B along the diagonal in the upper right hand quadrant of the world box to the point 2, 2. Relative to the situation at A where quantum energy vanishes it doubles relative to B at the upper right hand corner of the world box to preserve the conservation of mass/energy. However the conjugate space frames also double for B. This compensates for the loss of B's space frames in the upper left corner of the world box at point 0,2.

We thus find that the right hand half of the diagram in Figure IV-1 is the reciprocal of the left hand half and they mutually balance with a doubling of B with respect to A.

The Top Half with respect to the Bottom Half:

The top half of the diagram represents the preponderance of synchronicity in the galaxy and the universe at large with respect to the bottom half of the diagram that represents the non-

synchronous portion of space frames and quantum frames at the galactic center. The doubling of space and quantum frames in the top half is balanced by the vanishing of the space and quantum frames in the bottom half. The top half represents the synchronous stellar population. The bottom half represents the event horizon at the black hole galactic center.

There is a growing body of empirical evidence that a singular condition in black holes is shared by galactic centers. The singularity is associated with the primary synchronous projection of primary hydrogen in the universe as a whole.

The Reflux of Old Stars to Primary Hydrogen:

Since there is a general accumulation of quantized energy in the Void associated with the reflux of old stars back to the black hole it must find a balance over the expanse of history in the historic integration of space-time.

When the quantum accumulation of energy at A reaches a significant imbalance with the preponderance of synchronicity at B the balance can only be restored by the periodic emission of primary hydrogen outward into the galactic disc. The heavy elements fused in stellar centers are thus regenerated back to primary hydrogen.

Each new generation of primary hydrogen is impelled to move outward from the center with successive generations of star formation within it to compensate for the spatial contraction near the center. As old stars contract space through the fusion of heavier elements they are drawn back again toward the center to maintain synchronicity, and are eventually accreted back into the black hole as they approach light speed. The cyclic birth, death and regeneration of stellar populations is eternally repeated in this way.

Since the relative angular velocities of galaxies regulate stellar migration rates with respect to one another as a whole on a cosmic scale, gravitational acceleration is regulated as well. Relative rates of stellar formation and reflux are regulated accordingly. If reflux rates are very high this can result in highly active galactic nuclei with jets of material being ejected at high velocities orthogonal to the accretion disc to compensate. This can act as a brake over time, to preserve synchronicity with the universe as a whole.

Missing Mass and Gravity:

It should be emphasized here that matter is not at the unrestrained beck and call of gravity on a cosmic scale. Quantum forces introduced by relative angular motions moderate and regulate linear motions to preserve a preponderance of synchronicity with the primary projection of matter in the universe as a whole. Stellar motions tend to retain their collective spatial integrity because of the requirement for coherence with the universal set. This places galactic stellar masses in tensional contact with one another. There is no “missing mass” and no dark matter but quantum forces can qualify as organized “dark energy.”

From this brief overview it should be clear that System 3 necessarily implicates the regeneration of stellar populations and a variety of other effects that are not currently recognized and that may allow mathematical treatment. In the next Part V the foundations of atomic structure and quantum mechanics are reviewed in a cosmic context, taking into account the structural dynamics of System 3.

Three Kinds of Identity:

System 3 clearly indicates three distinct kinds of identity. They have never been formally acknowledged as distinct even though they have been used in the most fundamental formulae of physics.

The first kind of identity will be called *Aristotelian Identity*. It is the identity that we are most familiar with and that mathematics primarily depends upon. It equates separate things and numbers of things that are perceived as identical in space and time. Ten goats are the quantitative equivalent of ten fingers. One goat is identical with another, and so on. Rules of syllogism and algorithms develop accordingly.

It may be noted that mathematics begins with the invention of numbers. The *Idea* of ordinary counting depends on the *Routine* of adding one more to give the *Form* of the succeeding number, consistent with the hierarchy of System 3. Although numbers quantitatively equate separate things in the integrated fabric of space-time, each number also has a qualitative aspect that defines it as a unified whole that we intuitively recognize [15] [16]

This is demonstrated in Bertrand Russell's attempt to define numbers. After some discussion of "primitive" concepts and classes, he defines number as follows: "***The number of a class is the class of all those classes that are similar to it.***
"*...In other words, a number (in general) is any collection which is the number of one of its members; or more simply still:*
"***A number is anything which is the number of some class.***
"Such a definition has a verbal appearance of being circular, but in fact it is not... This kind of procedure is very common and it is important to recognize that it is legitimate and even often necessary."

The difficulty which Russell has in defining number stems from the recurrent character of the primary activity, alternately representing number as a particular quantity and then as a universal quantum quality. By the word 'class' he clearly intends a unifying quality which defines the quantitative number.

Along similar lines Dirk J. Struik points out: "Greek mathematicians made a distinction between 'arithmetica' or science of numbers (*arithmoi*) and 'logistics' or practical computation. The term *arithmos* expressed only a natural number, a 'quantity composed of units' (Euclid, Book VII,

[15] Russell B. Introduction to Mathematical Philosophy. NY: Touchstone 1971.
[16] Struik DJ. A Concise History of Mathematics, 4th Ed., NY, Dover, 1987, p. 60.

Def. 2; this also meant that 'one' was not considered a number)... This lasted until the Renaissance. Stevin, in his arithmétique of 1585, pleads passionately for the recognition of 'one' as a number like other integers."

The point is that counting in whole units is self-similar to the space and quantum frames of System 3 involved in counting. In this regard the square of any number is equal to twice the sum of all the digits up to the quantum frame that qualitatively defines the last number in the sequence, similar to historic integration.[17] This is consistent with the second kind of identity.

The second kind of identity is called *Conjugate Identity*. It is the orthogonal identity between space and quantum frames represented by the historic coordinates. These identities creep in unnoticed to the formulation of our most fundamental laws of physics. This will be demonstrated in the next Part especially with Louis de Broglie's derivation of his wave equation for matter.

The third kind of identity can be called *Triadic Identities*. They relate to the way the countercurrent identities of the universal set intimately link up the three particular centers of each particular set. Quark theory and quantum chromodynamics makes use of triadic identities although they are difficult to accurately express mathematically.

Concluding Observations:

Prior to Einstein, motion was assumed to be relative to an all pervasive ether which acted as a medium for the transmission of light. Since motion relative to the ether could not be detected, Einstein set the question aside, simply asserting that the velocity of light was universal.[18] His Special Theory of Relativity was thus preferred over the equivalent, but twice amended, ether theory of Lorentz-Fitzgerald and Lorentz-Larmor, to account for spatial contraction and time dilation with respect to the ether.

In his thorough review of the matter, Adolf Grünbaum points out that the philosophical preference for Einstein's theory stems from the fact that it refuses to postulate a preferred ether frame of reference when there is no physical foundation for doing so. He also points out that the General Theory of Relativity fails to incorporate essential features of Mach's program, that it fails to repudiate the concept of "absolute space."[19]

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[17] In 1888 Richard Dedekind writes: "...it appears as something self-evident and not new that every theorem of algebra and higher analysis, no matter how remote, can be expressed as a theorem about natural numbers,—a declaration I have heard repeatedly from the lips of Dirichlet. But I see nothing meritorious—and this was just as far from Dirichlet's thought—in actually performing this wearisome circumlocation and insisting on the use and recognition of no other than rational numbers." Dedekind R., The Nature and Meaning of Numbers, *Essays on the Theory of Numbers*, English translation first published by The Open Court Publishing Company (1901), NY: Dover, 1963.

[18] Einstein, A., *On the Electrodynamics of Moving Bodies*. Jeffery GB, Perrett W, trans, In: The Principle of Relativity, London: Methuen & Co, 1923.

[19] Grünbaum, A., *Philosophical Problems of Space and Time,* NY., 1963; Grünbaum, A., The Bearing of Philosophy on the History of Science, *Science*, **143**, 1406, 1964; Grünbaum, A., Relativity Theory, Philosophical Significance of, *The Encyclopedia of Philosophy*, Vol. 7, NY., Macmillan, 1967.

Dirac also indicates that the original ether theory can play the role of the perfect vacuum of special relativity since quantum mechanics allows the assumption that all values of the velocity of the ether are equally probable.[20] Einstein, however, remained adamantly opposed to the direction that quantum mechanics took until the end of his life.[21,22,23,24]

For Einstein, de Broglie, and others, the point of departure was Heisenberg's principle of indeterminacy. At age 23, Heisenberg, working as Max Born's assistant, had found a mathematical rule in quadratic arrays. Max Born writes:[25]

...Such quadratic arrays are quite familiar to mathematicians and are called matrices, in association with a quite definite rule of multiplication. I applied this rule to Heisenberg's quantum condition and found that it agreed for the diagonal elements. It was easy to guess what the remaining elements must be, namely, null; and immediately there stood before me the strange formula

$$qp - pq = \frac{ih}{2\pi}$$

where q represents the position of a particle and p its momentum.

What does this unusual equation mean? There is a difference in the product of p and q that is dependent on their order. Dirac saw that the dominant characteristic of Heisenberg's theory was that it contradicted the commutative axiom of mathematics.[26] Why?

To answer this question we may look to System 3 again. Relative position is given in each space frame, changes in position being effected through a series of quantum jumps in position from one space frame to the next. Momentum, by its nature, depends on changes of position between space frames. Momentum may therefore be measured between space frames immediately prior to, or immediately following, the space frame in which the position is determined. It depends on the order in which the measurements relate to one another. The relative indeterminacy of the two is

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[20] Dirac, P.A.M., Is There an Aether? *Nature*, **168**, 906, 1951.

[21] In a letter to Born in 1947, concerning Quantum Mechanics, Einstein wrote, "I cannot seriously believe in it because the theory cannot be reconciled with the idea that physics should represent a reality in time and space, free from spooky actions at a distance." He was convinced that the "'old one'... is not playing at dice." *The Born-Einstein Letters*, translated by Irene Born. Walker, New York, 1971. This famous objection was formalized in a paper, A. Einstein, B. Podolsky, and N. Rosen, Phys. Rev. **47**, 777 (1935). Experiment did not substantiate his objection, thus indicating action at a distance in some sense that is better interpreted as quantum correlation..

[22] Objections to a probability approach were expressed by David Bohm for many years. Bohm, D., *Quantum Theory*, Englewood Cliffs, NJ: Prentice-Hall, 1951.

[23] Albert, D.Z., Bohm's Alternative to Quantum Mechanics, *Scientific American*, May 1994, Vol 270, No 5.

[24] System 3 provides a mechanism for quantum correlation via the universal set. In doing so, System 3 is not consistent with a blind probabilistic interpretation of reality, so that it contains elements of both sides of the argument.

[25] Mehra J, Rechenberg H. The Formulation of Matrix Mechanics and its Modifications in *The Historical Development of Quantum Theory*, Vol. 3, NY., Springer Verlag, 1982.

[26] Dirac PAM. *The Development of Quantum Theory*. NY: Gordon and Breach, 1971.

therefore a function of the recurrence of space frames given by the universal quantum of action in the expression $ih/2\pi$.

Since we obviously observe that physical forms cohere as integral wholes, it must follow that the universal quantum of action is synchronous with respect to the material content of the universe as a whole.

Now the pieces fall into place. Einstein has his way that God does not play dice with the universe, but space and time are discontinuous, invalidating most of his relativistic assumptions. And Heisenberg has his way that position and momentum are not simultaneously knowable, but the rules of roulette do not govern the universe.

If one wants to consider that relative motions occur with respect to an omnipresent ether, then the ether is the quantum sensorium, the Void, and it is spatially indeterminate, not allowing of measurements of motions relative to it. Yet the Void provides a basis of historic integration that is not reducible to a linear series of local physical influences. The universal set as it relates to the Void is the implicitly discretionary means through which experience is hierarchically integrated.

As intelligent beings we are products of the higher systems as elaborations of Systems 2 and 3 and we are synchronous with the physical projection of the universe according to System 3. It is through our relationship to the same universal hierarchy and its elaborations in higher Systems that gives us access to the Void and allows us to span space and time, in this remote corner of the universe, to observe the whole of creation. We integrate history when we integrate phenomenal experience in order to function coherently.

Where does this leave us from the standpoint of having pragmatic theories with which to cope intelligently? Special Relativity remains reasonably intact, albeit with a very different interpretation attached. General Relativity does not fare as well, nor do the cosmological models associated with it. Space and time cannot be considered an a priori continuous field as a thing independent from the gravitational mass which conditions its curvature. There is no such independent thing as a spacetime continuum. There are alternate explanations for the Red Shift in the spectra of distant galaxies, and also for the cosmic background radiation, both of them consistent with the System and more credible in the light of all the other evidence. Quantum theory remains partially intact, but with the conceptual nature of the quantization of all experience vastly modified in such a way that a self consistent Quantum Relativity emerges naturally.[27]

Whatever apparent damage the System may do to existing scientific frameworks of understanding, it mends much more than it tears, and it offers a great deal more besides. It offers us an insight into the nature of intelligent systems, a new family of quantum forces, and completely new perspectives to explore in astrophysics and cosmology. The higher Systems

[27] There are aspects of this that are somewhat similar to David Bohm's conception of wholeness and the implicate order, for that could be taken as an apt description of the System. He too is speaking of the cosmic order, although some of his views diverge from those expressed here. Bohm D. *Wholeness and the Implicate Order.* London: Routledge and Kegan Paul, 1980.

offer challenging new insights into biological systems, how they are organized and work, with the attendant hope that we can better come to understand our place in the cosmos and how better to organize our affairs accordingly.