

Article

Physics & Cosmic Order VI: Cosmology & System 3

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ABSTRACT

System 3 requires that the universe is hierarchically discontinuous with cyclical motions introducing space frame skipping that must be accounted for on galactic, solar and planetary scales. On a galactic scale gravity holds stellar populations in orbit around their black hole centers but this centripetal acceleration introduces the skipping of external linear space frames. On a solar scale this external space-time contraction is compensated for by fusion processes in stellar centers that contract the inner spherical space of atoms. A balance is required between these two phenomena in order to preserve a preponderance of synchronicity in the universe at large. This results in quantum forces that rotate and impel young hydrogen rich stars radially outward in the galactic disc while drawing old stars rich in heavy elements and neutrons back toward an accretion disc where they are eventually regenerated into primary hydrogen for periodic ejection from the black hole center as fresh feedstock for new generations of stars. Typical calculations indicate that galaxies are cells eternally regenerating their stellar populations in this way. Quantum forces, including gravity, are not transmitted externally through space-time. They operate frame by frame through the agency of the orthogonal Void that integrates history to maintain a preponderance of synchronicity in the universe as a whole. Space and time are quantized by the discontinuous projection of atomic matter. They are implicitly defined a posteriori to creation by processes at the atomic level. There is no a priori spacetime continuum that predetermines a beginning or end to the universe. There are alternate explanations for the red shift, the background radiation and for other mysterious phenomena.

Key Words: Cosmic Order, physics, System 3, cosmology, gravity, quantum force, nuclear synthesis, contraction of space-time.

A General Review:

There are hierarchies implicit in the way System 3 works that are evident in phenomena on a cosmic galactic scale, a solar scale and a planetary scale. On a galactic scale different galaxies revolve in different patterns with respect to one another. This necessarily introduces space frame skipping at their centers with respect to their peripheries. The orbital path of stellar populations curve accordingly since gravitational acceleration toward the center involves the skipping of only external linear space frames relative to the spherical inner space associated with the gravitational mass of each atom that makes up each star. Except at the limit of external space frame contraction near black holes at galactic centers, the inner space frames associated with the

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synchronous projection of atomic mass are not skipped. They compensate for external space-time contraction at the galactic level by contracting internal space through fusion processes in the centers of stars at the solar level.

Gravity is implicit in the primary projection of space-time. The spherical inner space of atomic matter has an orthogonal relationship to linear external space in each space frame. This relationship defines space in each space frame. Both inner and outer space are united as one in each conjugate quantum frame that is orthogonal to each space frame. These quanta of spatially indeterminate energy are collectively unified for all atoms as a boundless and timeless energy field called the Void.

Together, space frames and timeless quantum frames define increments of space and time with each synchronous recurrence of space frames from the timeless Void.

The boundless unity of the quantum equivalent of all matter as energy is expressed externally on the space frame side of each conjugate sequence by the gravitational contraction of external space, frame by frame, bringing matter together. The unity of the quantum Void seeks conjugate reconciliation with separate atoms on the space frame side because atomic matter is both one and many *at the same time*. (Keep in mind that the timeless Void is orthogonal to each space frame.) Since this occurs at the atomic level with the primary projection of atomic matter, gravitational acceleration is distinct from gravitational mass. As Galileo showed, different masses fall at the same rate of acceleration. They are invested with inertial acceleration that is identical to their gravitational acceleration.

On the face of it this seems to require that inertial and gravitational mass are identical. This led Einstein to postulate that gravitational forces could be the result of the inertial effects of acceleration associated with the curvature of a hypothetical spacetime continuum. Consequently the equivalence principle between gravity and acceleration became a foundation stone of general relativity. In the discontinuous universe defined by System 3 a different interpretation necessarily results, since space and time are quantized and not continuous.

Black Holes and Space Frame Skipping:

There is evidence that black holes are a common feature of galactic centers. For this to be so it requires a skipping of external space-frames across the radius of the galaxy to the limit defined by the primary interval of time at the galactic center, where space and time are skipped completely at the event horizon of a black hole.

This space-time profile of the galaxy is defined by the continual gravitational contraction of just the external space frames associated with the angular velocity of the galaxy's stellar population. This is evidenced by the relatively constant angular velocity of star systems around the galactic center. Their period is a function of their distance from the galactic center but not their velocity. Stars migrate along and through the spiral arms because their gravitational mass is distinct from their inertial velocity as evidenced by Foucault's pendulum and a related interpretation of Mach's principle.

The centers of galaxies play the role of universal observer since they provide a singular state of relative rest, consistent with a preponderance of synchronicity in the universe as a whole. Galaxies may migrate with respect to one another but relative migration rates are linked to their relative angular velocities, which are linked hierarchically to rates of stellar formation, rotation, migration and lifespan.

The expansion of an assumed spacetime continuum is believed to account for the progressively higher red shifts of more distant galaxies. These increased recession rates with increasing distance that are claimed by the Big Bang hypothesis are not possible in a discontinuous universe. Galactic migration rates are constrained by synchronous quantum forces that regulate their relative angular momentum and stellar dynamics. Galactic migration rates must be compensated for in this way to maintain a preponderance of synchronicity on a cosmic scale. There are alternate explanations for the red shift and background radiation in a discontinuous universe that shall be explored later.

De Broglie Revisited:

As was shown in the derivation of de Broglie's wave equation¹ the relative skipping of space frames occurs in the stationary reference frame of the observer with respect to the moving particle. In de Broglie's case the wave length of the particle is determined by its quantum jumps in position relative to the skipped frames in the observer's frame of reference with a corresponding increase in conjugate quantum frames that accounts for the particle's apparent increase in relativistic mass.

His final wave equation states that the relativistic momentum of the particle p is inversely proportional to its apparent wavelength λ . Since the wavelength is synonymous to skipped external space frames with respect to the observer's stationary apparatus, the product of the momentum of the particle and the wavelength is equal to Planck's constant h . The external wavelength compensates for skipped atomic space frames in the stationary reference frame because the accumulated particle quantum frames increase the relativistic mass in direct proportion. This can be seen by examining the equation again.

$$p = \frac{m_0 v}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{h}{\lambda} \quad \text{VI-1)}$$

De Broglie essentially performed a second order historic integration by equating the Lorentz transformation formula for the internal frequency of the particle to the inverse transformation formula for the external phase of its wave motion. In other words his derivation included the primary projection of matter which he equated with the internal frequency of both the particle and the observer's reference frame. This is implicit in his stationary coordinate system.

¹ See Part V

The transformation formula for a clock represents the relative skipping of inner atomic space frames. They are skipped in the particle relative to the observer with a corresponding increase in its conjugate quantum energy frames associated with its relativistic mass according to $E=mc^2$.

The transformation formula for a wave represents the relative skipping of linear external space frames defined by the linear transmission of light. They are skipped in the observer's stationary reference frame relative to the moving particle accounting for the particle's quantum jumps in position. The observer and particle remain synchronous but a portion of the observer's space frames are skipped amidst those frames that remain synchronous such that the particle's motion is characterized by relative synchronous jumps. The one transformation formula is thus the reciprocal of the other.

This can be seen by referring to the historic coordinates in Figure IV-3.² The upper left quadrant of the relative box illustrates that it is the particle's space frames that are skipped relative to the observer with a corresponding increase in conjugate quantum frames. This accumulated quantized energy manifests as an increase in relativistic mass according to the Lorentz transformation for mass. But since the observer and particle continue to have synchronous frames with some skipping amidst them, it is the observer's external space frames that are skipped relative to the moving particle. The skipped external observer frames in the observer's frame of reference are the wavelength of the particle. They are the particle's quantum jumps in external position.

In the derivation de Broglie equated the transformation formulae for the external phase of the wave to the transformation formula for the internal frequency synonymous with the synchronous projection of all atomic matter. These two formulae derive from the historic coordinates in the first place but in a reciprocal way. One formula sees the particle from the outside making quantum jumps as a wave motion relative to its environment. The other formula relates to the internal discrepancy in skipped inner space frames associated with the projection of all atomic matter.

To make this distinction externally explicit de Broglie added a negative term to the wave transformation formula to account for the external displacement of the particle along the x axis. He divided the differential of this displacement $dx=vd t$ by the wavelength of the particle, λ . He equated this compound expression for the external relativistic wave to the internal transformation formula for a clock. Otherwise equating the two transformation formulae result in the expression $v^2/c^2=0$, because the relative velocity is already accounted for in both transformation formulae. The net result is zero velocity.

It may help to say this in another way. By introducing this displacement term de Broglie effectively reintroduces the relative external displacement of the particle with respect to the stationary observer, space frame by space frame. He places both transformation formulae in the external environment of the stationary coordinate system. Since the term is negative it indicates that the relative skipping is in the stationary observer space frames. This manifests as particle quantum jumps in position that are interpreted as wavelength.

² See Part IV

Frame Skipping on a Galactic Level:

On a galactic level the situation is not the same. De Broglie's wave equation was derived with respect to sub-atomic particles and a stationary coordinate system. It fits nicely with the wave resonance of electron orbital motions about an atomic nucleus, but the whole atom is a synchronous oscillation between space frames and conjugate quantum frames, consistent with the internal frequency of his "little clock in motion." His wave equation can not be applied to the relative motion of macroscopic objects because the wavelengths of the atomic particles are too small with respect to the size of large objects such as cars and airplanes. There are parallels on a galactic scale however.

On a galactic scale the gravitational acceleration of stars toward a galactic center relates to their synchronous gravitational mass. The external space frames are skipped frame by frame to curve the external integrated fabric of space-time for the galaxy as a whole with respect to the galactic center which harbors a black hole or event horizon. This center is associated with the synchronous projection of primary hydrogen on a cosmic scale since this is the only available datum of relative rest.

Likewise the space frames of rotating stars revolving around galactic centers are contracted by gravitational acceleration of their mass towards their stellar centers. This must find self consistency with the preponderance of synchronicity in the universe as a whole. The external and internal contraction of space-time must find mutual balance, much as it does in de Broglie's waves.

This links stellar centers in a tensional way with galactic centers. But the focus changes to the contraction of the inner space of atoms through fusion processes at their stellar centers with respect to their rotating peripheries. The resulting huge contraction of inner space due to fusion in the centers of stars seeks a balance with the contraction of external space due to the angular velocity of the galactic stellar population. This means in effect that the fusion processes in stars are driven by angular momentum.

This is analogous to de Broglie's derivation where internal space-time contraction must balance external space-time contraction. De Broglie waves contract inner space-time by the relative skipping of particle space frames which increases their relativistic momentum. This is balanced by the relative skipping of the observer's stationary external space frames associated with the particle's quantum jumps in position that are identified as particle wavelength.

On a galactic scale the internal space-time contraction is accomplished by fusion processes in stars and further accommodated by quantum forces implicit in the universal projection of matter. Fusion processes in stellar centers can not reach an instantaneous balance with external space-time contraction associated with their angular velocity. The balance takes time. The surplus imbalance manifests as quantum forces implicit in the projection of gravitational mass.

These quantum forces can regulate the rotational and migratory patterns of star systems within galaxies that in turn have different dynamical patterns and orientations with respect to one another. The quantum forces are not transmitted through space-time. Like gravity they are

implicit in the synchronous projection of matter space-frame by space-frame from the timeless conjugate Void. They derive from the implicit requirement for a preponderance of synchronicity in the universe as a whole.

These considerations lead to a different methodology from traditional approaches to cosmological, astrophysical, and planetary evolution. It is a new methodology that complements empirical physics. The structural dynamics of the System must find confirmation in phenomenal experience in the private as well as the public domain. It provides an integrating context that necessarily constrains the many current interpretations of the evidence while exploring all possible varieties of phenomena. Some salient points are summarized below:

1) Cosmic Space and Time Defined:

- a) Space and time are universally defined at a cosmic level by the synchronous projection of primary hydrogen atoms. External linear space is defined relative to the maximum internal spherical space of each hydrogen atom in each space frame in each primary interval of time.
- b) The primary interval of time is defined by zero angular momentum in the first hydrogen orbit. It is $T_p = 1.519 \times 10^{-16}$ seconds.
- c) The radius of the first orbit is the Bohr radius 5.29×10^{-11} meters. The radius of the largest fully coherent atom is defined by the orthogonal speed of light around the circumference in a primary interval of time. It is the 12th hydrogen orbit. This is essential for the atom to be fully coherent and in communication with itself. It is n^2 times the radius of the first orbit or $144 \times 5.29 \times 10^{-11} = 7.62 \times 10^{-9}$ meters.
- d) A primary interval of external space S_p is defined by the linear distance light can travel externally with respect to each coherent atom in a primary interval of time. It is $S_p = cT_p = 2.998 \times 10^8 \times 1.519 \times 10^{-16} = 4.554 \times 10^{-8}$ meters. Both space and time are quantized in this way. There is no other universal measuring rod out there in space.

2) Galactic Level:

- a) The collective stellar populations of each galaxy are in mutual angular motions with respect to all other galaxies. The stellar populations of each spiral galaxy tend to revolve at a constant speed about a common center. The stellar populations of elliptical galaxies tend to move in mutually consistent elliptical patterns about a common center.
- b) The tangential inertial momentum of stellar populations in each galaxy is offset by gravitational attraction toward the center resulting in their angular motions about the center. The relative angular motions of galaxies prevent their collective gravitational collapse in much the same way that a spinning top does not fall over. Inertial momentum and inertial velocity are distinct from gravitational acceleration consistent with the original concepts expressed by Mach.. This is demonstrated by Foucault's pendulum, the gyro compass and similar phenomena.
- c) Gravitational attraction is implicit in the primary projection of atoms because the conjugate quantum frames of each atom are integrated as one in the Void while each atom is separate in each space frame in the same primary interval of time. Matter is

unified as One and is also separate as Many *at the same time*. This ambiguity between one and many seeks resolution through gravitational attraction frame sequence by frame sequence. Gravity is not a force transmitted through space and time.

- d) Gravitational acceleration toward the galactic center involves the skipping of external space frames at the center with respect to the galactic periphery. It does not involve the skipping of internal atomic space frames from which gravitational mass derives except at the limit of external space-time contraction near the black hole center of each galaxy. Atoms remain preponderantly synchronous with the primary projection of hydrogen on a cosmic scale. Their angular velocities are relatively constant with respect to the galactic center, except in the accretion disc near the galactic center.
- e) The relative skipping of external space frames at various galactic radii with respect to the center curves the integrated fabric of external space-time. This gives each galaxy its own characteristic space-time profile. Galaxies with higher rates of revolution have higher relative rates of stellar evolution and larger and more active black holes at their centers. They have steeper external space-time profiles.
- f) The relative linear migration of galaxies with respect to one another is constrained by the need for a preponderance of synchronicity at a cosmic level. Higher relative migrations require higher angular motions and steeper space-time curvature profiles.
- g) The relative angular momentum of galaxies tends to prevent them from merging due to mutual gravitational attraction depending upon how they are mutually aligned and their relative size. Their relative patterns of migration are regulated according to their mutual alignment and their relative rates of angular momentum. High relative momentum results in more active galactic nuclei.
- h) When relative rates of stellar formation, migration and regeneration are not sufficient to compensate for high relative rates of galactic rotation active galactic nuclei result with the axial ejection of material from their black hole centers. The space-time curvature profile becomes too high to preserve preponderant synchronicity on a cosmic level. The associated accumulation of conjugate quantum energy associated with the black hole in these active galactic nuclei can be relieved through axial ejections of matter at very high relative velocities far into space. This can act as a brake on the angular velocity of a galaxy to bring it back into line with preponderant synchronicity.

3) Solar Level:

- a) The curvature of the galactic space-time profile can be likened to the relatively flat shape of a vortex where the space-time curvature becomes very steep near the center until it becomes a black hole in the integrated fabric of space-time. The black hole consumes old dense stars and accumulates a corresponding amount of quantized energy with gravitational effects. This can be periodically relieved by radial ejections of primary hydrogen that provide feedstock for new generations of stars. It is the highly contracted space-time profile near the center of a spiral galaxy that impels primary hydrogen radially outward into the spiral arms. The more highly contracted space-time profile closer to the center is also instrumental in the contraction of giant hydrogen clouds into patterns of stellar accretion.

- b) The curved space-time profile of the integrated fabric of space-time is defined by the linear transmission of light from the atomic processes within stars that revolve around galactic centers.
- c) Ejections of primary hydrogen from galactic centers are periodic over many millions of years and are attended by episodes of starburst activity.³ Many starburst galaxies are observed with star formation rates that can be hundreds of stars per year, enough to regenerate their stellar populations in a billion years or less if the rate was sustained.
- d) Solar systems accrete under the contraction pressures exerted by the space-time curvature profile of the galaxy associated with gravity. The process is initiated by the galactic profile until gravitational contraction of each stellar system takes on a life of its own. Thermonuclear ignition takes place in the central star when the temperatures and gravitational contraction pressures at the solar center exceed critical limits. Hydrogen fusion begins. If it is a second generation star there may be appreciable amounts of helium and small amounts of heavier elements present.
- e) Fusion processes in the centre of the star continue to be driven by gravitational contraction pressures linked to but distinct from the rotational velocity of the star. Each star has a characteristic space-time contraction profile that is distinct from the profile for the galaxy.
- f) Gravity holds the star together, keeping it from flying apart due to its inertial angular momentum. Its rotational inertial velocity necessarily results in space-frame skipping at the center of the star with respect to its peripheral regions. This space-frame skipping must be accounted for to maintain the synchronicity of gravitational mass on a cosmic level. This is compensated for by the nuclear fusion processes that contract space-time at stellar centers.
- g) Space frame skipping can also be translated into a force of retardation at the center with respect to the periphery and the peripheral planets. If the combined effects of fusion processes and the quantum force of retardation can not keep pace with a preponderance of synchronicity, rapidly rotating stars can eject matter axially from their poles in an analogous manner to active galactic nuclei. This mechanism drives pulsars.
- h) Space frame skipping at the stellar level represents an ongoing contraction pressure just as the angular velocity of a galaxy maintains a relatively constant space-time curvature profile. The star system contraction of internal space-time seeks a balance with the galactic external space-time curvature according to its relative position and distance from the galactic center. The space-time profile of the galaxy will tend to regulate stellar migration by quantum forces accordingly. The quantum forces are implicit in the synchronous projection of matter, space frame by space frame. They do not act through space-time.
- i) Fusion processes at stellar centers generate energy sufficient to strip most electrons leaving ionized atoms of significantly contracted effective volumes. A higher degree of atomic packing can occur as a result. This is resisted by radiation pressure and the associated energies of free electrons.

³ Evidence for the periodic emission of giant hydrogen clouds moving radially outward was summarized by Bok, Bart J., The Milky Way Galaxy, *Scientific American*, **244**, 3; 92, March, 1981.

- j) Neutrons generated by fusion processes provide a huge degree of spatial contraction with a corresponding high degree of nucleon packing. The neutron contraction ratio is more than 15 orders of magnitude.
- k) A portion of highly energized electrons and protons escape the sun in the solar wind that bathes the planets out to the heliopause where the solar magnetosphere meets the interstellar medium.

4) Planetary Level:

- a) The solar system as a whole has a space-time profile that is subsumed within the space-time profile of the galaxy. The planets all revolve around the sun in the same direction and in roughly the same equatorial plane. They are held in their orbits by gravitational acceleration toward the sun. This contracts external space-time in a similar way that it does for a galaxy, except that the contraction relates to the sun at the center and not to a black hole. This means that orbiting planets that accreted from the same swirling cloud of gas and dust as the sun may also contribute to space-frame skipping that drives or regulates fusion processes in the sun.
- b) Planets rotate on their axis and most have moons so there is a level of space-frame skipping at the centers of planets with respect to their peripheries that defines another subsumed space-time profile at the planetary level. This results in patterns of quantum forces in analogous ways to those that regulate the migrations of stars.
- c) The focus in planets is on chemical synthesis and fluid internal dynamical patterns that compensate for space-frame skipping at the center with respect to the periphery. This results in dynamical surface patterns in planets as well as in some moons that respond to internally generated quantum forces.
- d) On Earth this fuels plate tectonics, ocean currents, atmospheric dynamics and it is also linked to subsumed levels of biological evolution consistent with Systems 4 and higher.
- e) There is a related effect on the Earth's magnetosphere that reverses polarity every few hundred thousand years.

5) Galactic Space-Time Profile:

- a) There is evidence that the angular velocity of stars across most of our galactic radius is relatively constant at about 230 kilometers per second regardless of their distance from the center. Their period of revolution changes with distance from the center, not their velocity. This is consistent with the synchronous projection of matter as prescribed by System 3. Stars migrate through the spiral arms that act somewhat like traffic jam back ups.
- b) In a discontinuous universe stars will necessarily have radial migrations such that they seek to balance the contraction of external space-time with their accumulated internal contraction of space-time due to fusion processes. Radial migration is driven frame by frame by quantum forces that derive from the need for a preponderance of synchronicity. Space-time phenomena are synchronously coherent and appear seamless.
- c) The quantum forces that determine radial migration rates and direction depend upon the accumulated contraction ratio of the star as a whole over its lifetime of fusion processes

at its center as compared to primary hydrogen. If this internal contraction ratio has proceeded to a lesser extent than the contraction of external space frames due to gravitational acceleration toward the galactic center then the star will tend to migrate radially outward away from the galactic center. If the internal contraction ratio has proceeded to a greater extent than the external contraction ratio of the galactic profile then the star will tend to migrate back inward back toward the galactic center.

- d) At some point in the life of a star a balance will be achieved between internal and external space-time contraction as it relates to each atom. At this point the star may possess a degree of radial inertial momentum outward from the galactic center but the quantum forces that regulates migration rate will tend to cease then reverse. This may account for backups in the spiral arms. As fusion processes proceed further the star will eventually reverse direction and migrate back toward the galactic center.
- e) The ratio of external space frames skipped to those not skipped is a function of v/c where v is the angular speed of the star around the galaxy and c is the speed of light. Since the angular stellar velocity is known to be relatively constant at approximately 230 km/second, the ratio of external space frames skipped in the galactic plane is $230/3 \times 10^8 = 7.67 \times 10^{-6}$.
- f) This requires younger stars that have accumulated a lesser contraction ratio as a result of fusion processes to migrate radially outwards. Older stars that have accumulated a greater contraction ratio will tend to migrate back towards the center where relative external space frame skipping is greatest.
- g) As old dense stars are drawn back to approach an accretion disc at the center the space-time profile curves much more sharply until it reaches an event horizon. On a cosmic galactic scale this requires these stars to accelerate without limit until they vanish from the synchronous projection of space-time. This corresponds to a doubling of their conjugate quantum energy in the Void as indicated by the upper left hand quadrant of the world box on historic coordinates in relation to other quadrants.⁴

6) Solar Space-Time Profile:

- a) Our sun constitutes 99% of the mass of the solar system but 98% of the angular momentum resides in the planets. This is the opposite of what should have happened as the solar system accreted according to traditional physics. Skaters spin faster as they pull their extended arms into their sides. The center should rotate faster than the periphery.
- b) The planets are comparatively great distances from the sun and are orbiting at higher velocities than the rotation of the sun. Earth for example is about 149.6 million kilometers from the sun on average and has an orbital velocity of 29.8 km/sec. This is much higher than the rotational velocity of the sun at its equator, even though there is much less mass involved. The equator of the sun rotates every 25 days while the poles through its center rotate slower at 33 days.
- c) The following lists the distance from the sun in millions of kilometers, the inverse mass ratio of each planet to the solar mass, and the orbital angular velocity of each of the planets around the sun:

⁴ See Part IV, Figure IV-1

• Mercury	57.9 million km.	5,972,000	47.89 km/sec
• Venus	108.2 “ “	408,520	35.3 “
• Earth	149.6 “ “	328,900	29.8 “
• Mars	227.9 “ “	3,098,710	24.13 “
• Jupiter	778.3 ““	1,047	13.06 “
• Saturn	1,427 ““	3,498	9.64 “
• Uranus	2,870 ““	22,759	6.81 “
• Neptune	4,496 ““	19,332	5.43 “

- d) Since the orbital angular momentum of a planet is proportional to the square of the radius this tends to invest the planets with most of the angular momentum even though the sun is over a hundred times larger than all the planets combined. Gravity holds the planets in orbit and contracts or curves the fabric of external space in dynamic patterns accordingly. Nevertheless any effect of the planets on fusion processes in the sun's center is small and may be neglected for our purposes. This is a fair assumption since fusion processes are mainly dependent on gravitational contraction overcoming radiation pressure and this is associated with solar size irrespective of orbiting planets.
- e) We can assume that it is the sun revolving on its own axis that contracts space-frames associated with fusion processes. We can also assume consistent with Foucault's pendulum that the inertial rotational velocity of the sun is distinct from its gravitational mass.
- f) To arrive at approximate limiting values we can assume that the velocity of the solar equator determines the outer limit of the inner solar space-time profile.
- g) The equator rotates in 25 days. The sun is about 1.4 million kilometers in diameter so the equator has an angular velocity of $1.4 \times 10^6 \pi / 25 \times 24 \times 3600 = 2.03$ km. per second. This incurs a rate of space frame skipping at the center of $v/c = 2.03 / 3.0 \times 10^8$, or 6.77×10^{-9} . This skipping rate is continual and thus represents a continual curvature gradient that alters only as the sun evolves over very long periods of time.

7) Nuclear Fusion and Stellar Space-time Contraction:

- a) According to current astrophysical theories fusion processes proceed in stages as hydrogen fuel is consumed and depending on the size of the star progressively heavier elements are employed as fuel up to iron. There is evidence that a slow neutron capture process can fuse atomic nuclei heavier than iron, however most heavier elements are believed to be formed from supernovae by larger stars.
- b) As the core of a star contracts in stages it generates more heat from the gravitational contraction which expands the outer shells where hydrogen and helium fusion may persist as they become red giants. This proceeds with the fused products of each prior stage acting as fuel for each succeeding stage until the end product of fusion in a star at least as large as our sun is iron.
- c) Our sun is eventually expected to shrink to a white dwarf about a million times more dense than the sun. White dwarfs are assumed to cool over time to very dense inactive black dwarfs. Stars that are more than several times larger than our sun go through their life cycles faster and end in a supernova that produces the heavier elements up to

uranium. They may leave a super-dense neutron star or perhaps a black hole at their center.

- d) According to current theory based on continuous spacetime several scenarios are possible depending on the nature and size of the star. In a discontinuous universe more factors come into play because space-time itself is highly contracted by fusion processes especially via neutrons.
- e) The space-time contraction can be computed at various stages in a star's life according to estimated percentages of various elements. To make it easy and still demonstrate a principle the contraction ratios of only a few elements in the initial fusion stages will be considered.
- f) The contraction ratios can be very roughly approximated as follows. The effective volume of the atom is proportional to the inverse of the atomic number cubed times the volume of the first orbit of hydrogen, which is larger than the volume of the higher elements considered. The atomic number is the number of electrons in a neutral atom. Dividing by the atomic weight, taken as the number of nucleons of unit weight 1, which includes neutrons, gives the contraction density as a ratio to primary hydrogen. Since neutrons contract space by a huge amount, 15 orders of magnitude smaller than the size of a primary hydrogen atom, we can double the atomic number for computing contraction ratios for typical elements selected, without incurring significant error. Since we are computing the ratio of contraction with respect to hydrogen taken as 1, the actual volume is not significant.
 - Contraction ratio = $(1/2Z)^3$ /atomic weight, where Z is the atomic number. This reduces to $(1/2Z)^4$ for the elements listed since atomic weight is twice atomic number except for iron.
 - Ratio for Helium = $(1/4)^4 = 3.91 \times 10^{-3}$
 - Ratio for Carbon = $(1/12)^4 = 4.82 \times 10^{-5}$
 - Ratio for Oxygen = $(1/16)^4 = 1.53 \times 10^{-5}$
 - Ratio for Neon = $(1/20)^4 = 6.25 \times 10^{-6}$
 - Ratio for Magnesium = $(1/24)^4 = 3.01 \times 10^{-6}$
 - Ratio for Sulfur = $(1/32)^4 = 9.54 \times 10^{-7}$
 - Ratio for Iron = $(1/52)^3/56 = 1.27 \times 10^{-7}$
- g) It is clear that the first orbit of hydrogen is huge with respect to the volume of a nucleon. The Bohr radius of the first hydrogen orbit is 5.3×10^{-11} meters. The volume of the first orbit is 6.24×10^{-29} cubic meters. By comparison the volume of a neutron or proton is about 7.24×10^{-45} cubic meters or about 8.62×10^{15} times smaller. There is ample room for spatial contraction.

8) Some Typical Stellar Contractions with Age:

- a) By assuming different stellar compositions at successive stages in the life of a typical star like our sun the total contraction of space-time in the star can be compared with the galactic space-time profile. This can tell us whether there is a tendency for the star to migrate outwards toward the periphery or back inwards towards the center.
- b) Our sun is currently estimated to consist of 75% hydrogen, 23 % helium and about 2% heavier elements, which shall be assumed to be carbon, to keep things easy.

- c) Helium has a contraction ratio of 3.91×10^{-3} . This means that the volume of $1/3.91 \times 10^{-3} = 256$ hydrogen atoms have been contracted into the effective volume of each atom of helium. Since 23 % of the sun is helium this represents a percentage contraction ratio of $23 \times 256 = 5,888$ hydrogen atom equivalents.
- d) Carbon has a contraction ratio of 4.82×10^{-5} or 20,747 hydrogen atom equivalents. For simplicity to illustrate a point, assuming 2% of the sun to be carbon this represents a percentage contraction ratio of $2 \times 20747 = 41,494$ hydrogen atom equivalents.
- e) This means that a total of $75 + 5,888 + 41,494 = 47,463$ hydrogen atom equivalents are contracted into the volume of 100 atoms. There is a gross contraction ratio in our star of approximately $100/47,463 = 2.1 \times 10^{-3}$.
- f) Comparing this contraction ratio with that for the galaxy in point 5(e) above we see that the atomic contraction ratio of our sun is less than that for the external space-time profile of the galaxy which is 7.67×10^{-6} . This discrepancy between the internal atomic contraction of spherical space-time and the external linear contraction of space-time in the galaxy results in a quantum force that impels the sun radially outward space frame by space frame, which may be partially offset by the sun's rotation. It means there is a higher relative skipping of external space-frames at the location of the sun in the galactic radius. The complementary higher relative accumulation of atomic quantum frames associated with the sun can be translated into a quantum force that acts against the gravitational attraction toward the black hole center of the galaxy.
- g) We can assume a different atomic composition for a burnt out star that has used up nearly all of its hydrogen and helium fuel. To demonstrate a principle let us arbitrarily say that it is 5% hydrogen, 5% helium, 50% carbon, 30% oxygen and 10% iron.
- h) The equivalent hydrogen atoms will be the reciprocal contraction ratio times the percentage composition as follows:
- Hydrogen = $1/1 \times 5 = 5$
 - Helium = $1/3.91 \times 10^{-3} \times 5 = 1,279$
 - Carbon = $1/4.82 \times 10^{-5} \times 50 = 1,037,344$
 - Oxygen = ... $1/1.53 \times 10^{-5} \times 30 = 1,960,784$
 - Iron = $1/1.27 \times 10^{-7} \times 10 = 78,740,157$
- i) Total contraction equivalent in hydrogen atoms = 81,739,569.
- j) The gross contraction ratio is $100/81,739,569 = 1.223 \times 10^{-6}$ which is more than the external contraction of galactic space-time in 5(e) above. There is thus a resultant quantum force acting to reverse the radial migration back toward the galactic center space frame by space frame.
- k) Although the chosen percentage components of the star are arbitrary, stars achieve high concentrations of heavier elements later in their life cycles. The example serves to demonstrate that the gross internal contraction ratios of old dying stars, especially white dwarfs, black dwarfs and neutron stars, can easily exceed the external contraction of space-time in the galactic space-time profile.
- l) These simple examples show that galaxies can eternally regenerate their own stellar populations in a discontinuous universe. This process of reflux and regeneration can vary widely from galaxy to galaxy depending on galactic type, relative orientations and angular momentum. It will be said that each galaxy has a characteristic *reflux rate* that is dependent upon these factors.

The Red Shift & Distant Galactic Phenomena:

Active centers are a common feature of distant galaxies, to such an extent that theorists⁵ are hard pressed to suggest a mechanism behind the prodigious outpouring of energy from Quasars, BL Lacs, and Seyfert galaxies. The accumulated skipped frame sequences associated with differing reflux rates between our galaxy and others separated by great spans of space-time offers an explanation.

The history of comparative rates of galactic reflux must be reconciled with the timeless conjugate Void that spans and integrates the history of change. The accumulated relative space frame skipping from our local perspective of more active distant galaxies becomes contracted in our space-time frame of reference. This happens through the agency of the Void since we remain timelessly synchronous with the distant galaxy despite the history of change as perceived across the reaches of space and time. Comparatively high reflux rates may in any case be expected to produce more active galactic centers, to which must be added this conjugate observational effect over great spans of space and time.

As burned out stellar corpses are reaped at high velocity in an accretion disc around a central black hole they ultimately disappear as their velocity approaches that of light. As demonstrated by System 3 this is not a situation of infinite regression and another Zeno's paradox. Events are quantized. The end result is the complete consumption of the star beyond the event horizon of the black hole. This stellar demise also regenerates the heavy elements to primary hydrogen so that it can be periodically ejected from the central event horizon. The regenerated hydrogen provides the feedstock for new generations of stars.

In conjunction with the reflux of its material content there is a need to reconcile the light energy emitted from a distant galaxy with the fact that the stars that radiate it are being recycled. Much of the light from a galaxy four billion light years away was emitted by stars that have ceased to exist, being replaced by waves of new generations since our solar system was born. Many of the stars have ceased to shine in the interim that it takes their light to reach us, while others have been born and grown old. These space-time facts must be reconciled with the conjugate Void that timelessly integrates the history of change.

The stellar light energy emitted is itself a phenomenon in reflux, spanning the limits of space and time. A shift toward lower frequencies and longer wavelengths signifies that the light energy itself is being refluxed cycle by cycle, in concert with the material reflux of the galactic stellar sources from which it sprang, space frame by space frame. Light is being recycled in concert with its stellar source.

This explanation of red shift is consistent with the evidence of distant active galaxies. The accumulated integration of skipped frame sequences, as related to the transmission of

⁵ Not all cosmologists accept the big bang hypothesis or that galactic red shifts are always caused by recessional velocity. Halton Arp has identified many linked galaxies with very different red shifts, suggesting an alternate explanation. This could be due to very different reflux rates between the galaxies since many involve quasars. Schilling, G., Quasar Pairs: A Red Shift Puzzle?, reporting in *Science*, **274**, 1305, 1996.

electromagnetic energy, has the effect of concentrating the apparent energy emissions of distant active galaxies. This concentration proceeds to the limits that accelerated reflux rates with respect to our galaxy allows. The light is at the same time red shifted and intensified.

There is a complementary side to the reflux explanation of red shift as it relates to the source. If the galaxy is four billion light years away, we are seeing it as it was at a time when our solar system had just consolidated. Our planet was still being heavily bombarded by the accretion process but was cooling to the point where it could soon support bacterial life. As the galactic images leapt through the interim period the solar system paraded around the Milky Way some twenty times, while life evolved up through the plants, the invertebrates, and the vertebrates to humans.

The evolutionary process has involved the historic integration of experience through these four successive major tiers, developing metabolism, mobility, sentient awareness and creative intelligence, all in synchronous patterns with the whole cosmos, albeit peculiar to our local circumstance.

As we struggle toward maturity in the process we have learned to create telescopes sufficiently powerful to look back through time and space to question our origins and our ultimate destiny. Yet each human being incorporates the evolutionary history of the planet. We *are* the integration of time and space. We span space-time and integrate history. In an evolutionary sense this eye that looks through the telescope is as old as the image it sees. But the eye has become synchronized in a hierarchy of self-similar patterns that have evolved over time and space in ways distinct from the history of the ancient light which spans our development.

A variety of effects may be possible due to differing reflux rates between the Milky Way and remote galaxies. If reflux rates are comparatively high, a remote galaxy may appear to be intensely more active than it is, as noted. If they are comparatively low, it may appear to be dissipating and more fragmentary than it is or was. Likewise our galaxy may appear to be active or quiescent to a distant observer depending on our comparative reflux rates.⁶

Different patterns are possible with elliptical, spiral, bar spiral, and irregular galaxies and they can vary over long periods. This interpretation of red shift offers a variety of possibilities to explore and the methodology to scientifically explore them. The advantage of System 3 is that the evidence converges on a single explanation. Otherwise conflicting interpretations are arbitrarily inconclusive forever.⁷

⁶ Most theories galactic formation after the big bang suggest they started small, however a group of Caltech researchers (Lu, Wallace, Sargent, Womble and Bartlow) reported in the January 1996 issue of *Astrophysical Journal Letters* what appears to be a gas-rich spiral galaxy about the size of the Milky Way with a red shift of 4.4, placing it at the edge of the universe right after the big bang, before large spiral galaxies were supposed to be around. Appenzeller T. A Familiar Face for a Distant Galaxy? reporting in *Science*, **271**, 1996.

⁷ The Hubble telescope has provided fragmented images of galaxies with a 2.4 red shift corresponding to a distance of 12 billion light years (depending on the Hubble constant used). Some theorists are suggest that these are building blocks of galaxies shortly after the big bang, others dissenting. James Glanz, Galactic Building Blocks Found? reporting in *Science*, **271**, 756, 1996.

The Background Radiation:

The discovery of the background radiation by Penzias and Wilson in 1964 has been promoted as virtual proof of a big bang origin to the universe, a theory that until then hung precariously on the Doppler red shift of distant galaxies as the only direct evidence. At a blackbody temperature of 3.0^0 K, the radiation has a wavelength of about 0.0967 centimeters at the maximum energy density of the Planck distribution. This corresponds to a frequency of about 3.10×10^{11} Hz.

From the standpoint of the System we are not faced with a universe of matter unfolding from infinite density as it expands in concert with a space-time continuum. Rather matter is in synchronous equilibrium with quantum energy as it defines the nature of space and time through the perpetual reflux and reintegration of history. In a synchronous universe there is a combination of factors that can contribute to the background radiation. These factors are connected to the synchronous generation of the cosmic movie itself.

The primary interval of time is 1.519×10^{-16} which corresponds to a frequency of synchronous primary hydrogen projection of 6.58×10^{15} Hz. As we have seen above, this primary projection rate of space-time associated with the hydrogen atom becomes contracted by a hierarchy of relative motions cascading down from the galactic level through the solar level to the planetary level, which in turn subsumes the higher Systems associated with biological evolution. Each level has its own distinctive patterns of space-time contraction that must be reconciled with a preponderance of synchronicity in the universe as a whole on a cosmic scale.

The contraction ratio of external space-time in the Milky Way is estimated at approximately 7.67×10^{-6} . The accumulated contraction ratio due to nuclear synthesis within the sun is estimated at approximately 2.1×10^{-3} . There is also a contraction ratio associated with the revolution of the earth and other planets around the sun and a contraction ratio associated with the rotation of the earth together with the revolution of the moon. Radial stellar migration rates due to quantum forces also come into the equation. These interdependent factors tend to compensate for one another to maintain a preponderance of synchronicity on a cosmic scale. This suggests that the background radiation may simply represent the resultant preponderant synchronicity rate. Some evidence for this was presented by the astrophysicist Gerrit L. Verschuur. He found a good degree of direct correlation between neutral hydrogen clouds in our Milky Way galaxy with peaks in the Wilkinsin Microwave Anisotropy Probe (WMAP) that sought to detect galactic seeds in the early universe by scanning the microwave background in an area of sky.⁸

Concluding Remarks:

Galaxies are stellar communities with populations that are born and die like any community but there is no compelling reason to believe that any specific galaxy ever had a birth or will face an ultimate death. Galaxies may evolve, exchange material via axial ejections, grow from scattered or fragmentary populations, migrate and merge but there is no compelling reason to believe that

⁸ Verschuur G L. High Galactic Latitude Interstellar Neutral Hydrogen Structure and Associated (WMAP) High Frequency Continuum Emission, *Astrophysical Journal*, July 23, 2007.

this whole incredible universe ever had a birth in an assumed spacetime continuum, or that it will ever face an ultimate demise.

The Big Bang hypothesis is based on the presumption that such a thing as an a priori spacetime continuum exists. Where then are the universal measuring rods of space and time? It is a contradiction in terms to derive them from measurements in this physical creation to explain an origin to their own creation. Einstein himself questioned the continuum basis of his own theories late in life.⁹ The continuum is a mathematical fabrication and an unsubstantiated belief. There is no evidence whatever that such a thing exists as an independent entity with curvatures conditioned by concentrations of gravitational mass embedded within it.

There is only one fully consistent alternative to the a priori spacetime continuum hypothesis. The universe is discontinuous and synchronous at the atomic level. Atoms themselves define space and time. Space and time are a posteriori to creation. The creative process is eternal and in intimate communication with itself through conjugate quantum influences. These quantum effects are operative on hierarchical levels that permeate the cosmos.

In summation, if we carefully consider all of the evidence reviewed thus far, it seems clear that the early development and consolidation of quantum theory was very much in accord with System 3. This requires an altogether different cosmological perspective than the one which has developed. The main contributors to the theory came within a hair's breadth of actually stating that the entire physical universe is discontinuous and synchronous, including Planck, Bohr, Heisenberg, Born, de Broglie, Schrödinger, even Einstein with his quantum explanation of the photoelectric effect. In the context of their time it would have seemed a reach too far and yet they all in effect made this implicit assumption without actually going so far as to state it in so many words. By taking that one small step we find ourselves with the same hand of cards in a very different game.

⁹ See Part IV, Preamble