

Science & Cosmic Order

A New Prospectus

Book 1 - Physics

Robert Campbell

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SCIENCE AND COSMIC ORDER

A NEW PROSPECTUS

FOREWORD

In the broadest sense, science concerns how experience is organized and integrated, for by the endeavor we seek to integrate our experience in more meaningful ways. Our efforts therefore imply that there is an order underlying the whole of experience that can be understood. It is this that is meant by cosmic order. It has two faces that are properly complementary. The face directed outward to our mutual social undertakings is the face of science that will concern us here. The other face seeks meaning in personal experience. It is a spiritual pursuit that is essentially private but nevertheless relevant. This strange Janus-faced order has been a subject of interest to humans since we first looked at the stars and wondered.

In the pages that follow, it will be shown that there is a non-linguistic way to delineate a self-consistent System of organization that is all pervasive. It allows of unlimited elaboration within itself through a progression of discrete sub-systems, associated with the reconciliation of multiplicity and unity. It is a living dynamic system. In this respect it offers new insights into both the physical and biological sciences.

Book I concentrates on the development of the lower three systems with the main emphasis on the physical sciences, introducing new mathematical identities and a related quantum-relativity with cosmological implications. The lower systems are most fundamental. They transcend and subsume the higher systems. They generate the primary patterns elaborated upon in the higher systems.

Book II is devoted to System 4, with the main emphasis on its precise correspondence to nervous system function and the integration of meaning, synapse by synapse. The same pattern is shown to prevail throughout biological evolution. It is thus evident within the cell as it relates to organ and host in complex multi-cellular creatures. This fundamental integrative power offers new horizons to the whole of science.

The presentation has a strong academic flavor, for it must be rigorously self consistent, and also consistent with the vast fund of factual knowledge that we have accumulated over the centuries. The informed lay reader may nevertheless follow the general development if they persist. It is a captivating adventure.

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The angular velocity of galactic stellar populations is relatively constant at various galactic radii except near an accretion disc at black hole centers. This results in a relatively constant galactic contraction ratio across the galaxy's external space-time profile. As fresh stocks of primary hydrogen are ejected radially outward from the center the contraction profile generates the accretion of new stars that continue to migrate outward until their accumulated internal space-time contraction associated with fusion processes exceeds the contraction profile of the galaxy. At that point old dense stars become drawn back toward the center of the galaxy by the same quantum forces. In this way galaxies creatively regenerate their stellar populations eternally with a variety of observational effects. These include the red shift, the background radiation, quasars and related phenomena.

CHAPTER I

A NEW PROSPECTUS, AN ANCIENT THEME

Abstract:

A review of historical theories about the nature of phenomenal experience reveals a pattern that shifted, in the west, toward an externalized causal view in linear time, with Aristotle's rejection of Plato's Theory of Forms. Earlier perspectives of the cosmic order focused upon the interdependence between universal and particular aspects of experience. When modern science began it was thus founded upon Aristotle's view of local causal influences. In this century, quantum and relativity theories have developed as often contradictory solutions to universals that keep intruding into the landscape. A new methodology that complements traditional approaches to science offers a coherent assimilation of the empirical evidence. The result is a synchronous *quantum relativity* integrating universal and particular elements of phenomena, at all levels of experience from the atom to the cosmos—a new view of the *cosmic order*. In the process a new class of *quantum forces* becomes apparent that integrates history by maintaining a preponderance of synchronicity in the primary projection of matter on a cosmic scale. This timeless universe addresses many questions associated with the quantum of action, light transmission, relative motion, missing mass, gravitation, electromagnetism, red shift, background radiation, quasars, and other phenomena. This universal methodology for the sciences is the picture on the cover of box that can guide the assimilation of the jigsaw pieces of empirical evidence into a coherent whole.

In the last few generations we have been encouraged to take smug satisfaction in the frantic pace of our scientific achievements. There is little need to elaborate. From the first motor car to the moon in a living memory! From the first feeble wireless to global satellite communication! We are probing the heavens, the atom, and the mind to the very frontiers of creation itself, at least so we tell ourselves.

If we step back for a broader view of the canvas, however, a strangely inconsistent perspective emerges. Different patches of the landscape clash grotesquely. Some gaping holes have been left untouched, some remain in a state of confusion. Other scenes have been painted over so many times that the history of development has been lost under layer upon layer going back to antiquity. From our involvement close up we are prone to believe that the incongruities can be glossed over in the modern idiom, a grand unified view emerging in triumph, once and for all. Praise be to man! Is science becoming a religion? Or can the one exist without the other?

Our myopic fixation obscures a fundamental reality. Our collective knowledge, however immense, is utterly dependent upon a few fragile principles of understanding, very tenuously rooted in our cultural ancestry, and in good measure lost in the misty dawn of recorded history. Moreover, our capacity to alter, develop, create, or discover such underlying precepts is extremely limited. They change only with the tide of history, for they determine the plot as the human story evolves.

These precepts concern the structure of phenomenal experience itself—the *cosmic order*. Our power to cope with experience derives from them, to the extent that they are consistent with the cosmic order. But the cosmic order cannot be deduced through logic or reason, for these qualities of the mind themselves depend upon it.¹ Glimpses of the cosmic order are revealed by experience itself through insight into its nature. Logic and reason follow on a leash of language to fill out the story accordingly. It is a ponderous path that we tread through time, for the steps that we take can span millennia.

We are accustomed to think that the roots of western philosophy, science and mathematics lie nourished in the golden age of Greece. While this may be a milestone in the story, the Greeks in turn found inspiration in cultural developments that had bloomed over two thousand years prior and persisted. The Indus Valley, Mesopotamia, and Egypt were linked by the Persian Empire to the shores of Greece in the mid sixth century BC, bringing these influences more sharply into focus.² Early Greek thought was very much in accord with much earlier insights into the cosmic order and related questions that had already been entertained elsewhere for centuries.

Plato's *Theory of Forms*,³ for example, generally centered around the relationships of universals to particular manifestations of them, as in the case where the leaves in the forest are all representatives of a transcendental thing known as an archetypal leaf. We see here the familiar "unity in diversity" theme that pervades so much of Vedic thought, the

universal and particular aspect of things being perceived as mutually interdependent.

There are anomalies in the pattern of course, even where connections between Greece and India seem obvious. For instance early non-Vedic Indian materialism, in rejecting that nature reveals any transcendental power working behind it, declared: "*Fire is hot; water, cold; and the air is temperate to the touch. Who could have brought such distinctions into being, if they were not of the very essence of those objects.*" Although Aristotle was not a materialist in the same sense, this view is strikingly similar to his position that the essence is what a thing is by its very nature, what gives it its identity, thus identifying the essence with substance. Yet Aristotle didn't extend his position to embrace atomic theory as proposed by Leucippus and Democritus in the late fifth century BC, a development that was similar to the appearance of atomism in both the Vedic and non-Vedic systems of India. The Nyaya-Vaisesika, for example, postulates indivisible and super-sensuous particles as the ultimate cause of all the material products found in the universe.⁴

In 325 BC, the Persian Empire fell to Alexander the Great, an event that signaled a turn in the tide of history. Alexander's teacher, Aristotle, was instrumental in reformulating Greek thought and the shape of things to come. He set aside the vagaries of mystical insight into the creative order in favor of deduced conclusions based on assumptions about the nature of phenomena. He granted objective analysis ascendancy over intuitive insight. Through his treatment of syllogistic argument, experience thus became externalized, although this momentous step was to take more than two thousand years to mature. By identifying essence with the concrete individual object, Aristotle atomized the universe more surely and permanently than Democritus ever could have done, although it is unlikely that he intended the course that ensued. His nexus of four causes, operative through an assumed linear flow of time, completed a general framework for linking up an atomized universe in its all pervasive vessel of space. Together with subsequent and consistent contributions from Euclid of Alexandria, Archimedes of Syracuse, and Apollonius of Perga, the door was closed on the sacred geometries that had preceded them for two thousand years. The plot for events far in the future was outlined in their place. This is not to reduce Aristotle's contribution to this framework alone, for this was not his conscious intention and the breadth of his work is well known.

In the East, a causal principle had long since become firmly established, however it bears little resemblance to causality as it developed in the west. The law of *karma*, as a causal principle, derived from the

cosmic order. The latter was first expressed as the *rta* very early in the Vedic period, later reappearing as the *dharma*. A distinguishing characteristic of the law of *karma* is that it is operative in a way that both transcends and subsumes events in the whole of space and time, and yet is related to them also. It is not operative through linear connections in an assumed flow of time. It is cyclic. It concerns a transcendent reality that is manifest in the cosmic order as the interdependence between the universal and particular aspects of being. The cosmic order was known with equal clarity as *maat* in ancient Egypt and as such it was essential to all value judgments. *Maat* was in fact represented as the fulcrum of the balance that weighed the human heart against the feather of *maat* in the Hall of Two Truths.⁵ The cosmic order, being both immanent and transcendent, thus constituted the basis of the final judgment of the dead before the resurrected Osiris.

In the west, the Romans transported the essentials of the plot throughout Europe, where the ideas incubated in the western mind for more than a thousand years. Aristotelian thought, with all its divergences from the work of Aristotle, gained a firm footing, alongside Plato's perennial influence. With the coming of the renaissance, many of the works ascribed to Aristotle and misplaced for centuries, were reintroduced from Arabic sources in the twelfth and thirteenth centuries. While this may have served as much to muddy the waters as to clarify them, it did refocus attention on the issues underlying the development of the western plot.

Events had only to wait for Galileo, Copernicus, Kepler, Descartes, then Newton, first to determine empirical relationships, then to formalize into explicit laws the precepts that already rested comfortably in the bed of western culture.⁶ Modern science was born after a very long gestation period. And if Aristotle did not completely discard the spiritual inclinations of his teacher Plato, his modern descendants have surely done their best to lay them to rest forever.

Nevertheless, there are many enigmas in the story. For instance, Newton's interest in physics waned in his fifties when he began to devote much of his time to theological pursuits, including an intense interest in the Hermetic tradition. From our current cynicism, one might be inclined to dismiss this in association with a reported nervous breakdown. However his interest in the magical realm of alchemy had influenced his thought in his younger days when he was developing the theories to which we are so indebted, and which appear altogether antithetical.

It is a very long way from the cosmic order, known to the ancients as the *rta* and *maat*, to the physical mechanistic world that Newton unwittingly launched in full fury. The former was an intrinsically moral

order. The latter is lacking in human values whatever. Anthropomorphism became seen as a violation of Aristotelian identity, there being no underlying unity implicit in the diversity of phenomena. All things are objective isolates and man is the law maker charged with the need to bind them together with causal chains. But men have not been the conscious authors of the plot. It seems that for some reason, during this period, in this remote workshop of the universe, a job has simply needed doing.

It took two centuries for Newtonian physics to stretch to the point where holes began to appear in the fabric. Universals began creeping out from under the Aristotelian carpet and new and better brooms were needed. It is true that universal gravitation had finally been accepted over protests about action at a distance, but one universal is tolerable if a broom may one day be found to manage it. However others began creeping out, unsightly things, and embarrassing. Electromagnetic forces began acting at a distance all over the place. Faraday, being unburdened by a higher education, introduced the idea of the field as a carrier between bodies⁷. Then Maxwell exploited the field to incorporate light as an electromagnetic phenomenon with wave characteristics.⁸ It was a neat solution for electromagnetism, but then, alas, the speed of light turned out to be universally constant. In the name of Zeus why?

Fortunately Einstein proved to be a pretty good broom maker. Impressed with Maxwell's success, he turned the whole of space and time into a field,⁹ and in the process turned another ugly pariah into a boon. It was a brilliant solution. The intermediary field curved to finally bridge gravitational action at a distance. But is acceleration through space and time really the same as gravity? Can they be judged equivalent solely on their apparent subjective effect? Could there be another explanation?

In the meantime Planck had pulled another universal out of black body radiation, like a rabbit out of a hat.¹⁰ This was a monster of such proportions that the normally sober minded establishment was reluctant to look it in the face. Why in the name of Zeus should the entire electromagnetic spectrum be quantized? It is a continuous spectrum. Why should radiation come like a series of discrete pulses according to a universal quantum of action? Planck was disturbed by his magic too, called it an act of desperation.

Then de Broglie came along with his quantization of matter, in waves no less, according to the same universal quantum of action. The idea came to him as an intuition that matter was like a little clock in motion. He was "greatly smitten" by the fact that the transformation formula for a wave, in special relativity, is the reciprocal of that for the frequency of a clock.¹¹ Aristotle would have been smitten as well. How is

it that the internal frequency of a thing translates as the reciprocal of its external appearance? Where does this place Aristotle's identity of essence with substance? And what about cause and effect? Not only has matter become both wave and particle, but one can't be sure about both position and momentum. And how does an electron jump from one atomic orbit to another without traversing the space between?

This was a nasty set of horrors indeed, and the best that could be done was to speculate with chagrin on the probable outcome. But does one allow a place of honor to the laws of roulette in the hallowed halls of science? Can a group of men of the Copenhagen School decide for us all that we exist as probability waves? De Broglie didn't like it. Neither did Einstein, and no doubt a good many others lost some sleep, or flinched in their graves. We are talking about the stuff of our bodies. But that is only an anthropomorphic concern. There are no universal aspects implicit in the particular aspects of being. Or are there? The quarks, of course, are another chapter in the story.

Although Heisenberg might have liked to discard the idea of particulate matter altogether, his uncertainty principle deals, among other things, with the problem of being unable to accurately know both the position and momentum of a particle at the same time. This uncertainty, it is claimed, is a function of $h/2\pi$, as if Planck's constant, h , is the circumference of a circle, or a cycle of time generated by energy, and the uncertainty is roughly the radius or amplitude. A universal cycle of time? What is that? Although the connotation is obvious, there is a taboo against expressing it as such. It would shatter the whole concept of space-time as a continuous field and Einstein's best broom would lie broken. Big bang cosmology would undergo gravitational collapse, unable to sustain that everything has evolved through local influences from a singular event, at some incredible time when the entire universe was unimaginably smaller than a single proton. Not even the discovery of mountains of dark matter could hold it up. Those nasty universals keep getting in the way, in spite of our wildest inventions.

At this point we may leave the historical tale incomplete, for it is not intended as an exhaustive account, nor is it intended to treat our difficult and faltering steps lightly. Our progress through the ages has been earned through enormous commitment, no less for the pyramid builders than for the great numbers of scientists working today. This brief review is intended to emphasize a very fundamental theme in the drama that dates back at least five thousand years. The cosmic order is very much a matter of the mutual interdependence of both the universal and particular aspects

of experience. Neither can be known to the exclusion of the other, for they are mutually defined by their mutual relationship. This is a profoundly fundamental relativity principle.

It was twenty-three centuries from the pyramid of Zoser, at Saqqara, to Alexander's conquest, twenty-three centuries ago. It seems that we are due for another turn in the tide of history, for we have exhausted the precepts underlying the development of science since the time of Aristotle. Although they have allowed us to accumulate immense knowledge, they are no longer adequate to cope with the ominous social and environmental circumstances that face us. The kind of physical mechanisms that we have grown accustomed to think in terms of simply do not allow us to take the first step in understanding the organization of living processes. We now stand thwarted by the very precepts that allowed us to reach for the moon.

There has been great resistance to allowing universals into the realm of science, perhaps partly because of religious overtones and the fear that we will regress into another dark age of oppressive dogma. But science can only avoid considering this alternative at the risk of becoming an oppressive religion itself, every bit as mindless as a pack of witch hunting saints gone mad. There is a middle road, where new insights into the cosmic order can offer solutions to the enigmas that face us, in a manner fully consistent with the factual evidence, and in a creative and constructive way. If the cosmic order turns out to be an intelligent order in the process, that should be no reason to recoil, for we will have gained further posts by which to better understand how intelligence works.

Opportunities are provided by circumstance. Only recently has sufficient evidence accumulated to allow us to make a comprehensive attempt at formulating a more fundamental set of precepts more closely attuned with the cosmic order. Key pieces of the puzzle, presented above, suggest a scenario very different from the one that we presently imagine to reflect reality. The main points can be summarized as follows:

- 1) Planck's constant clearly points to two alternate modes for what we perceive as the material content of the universe. The one mode is fixed as particulate matter and is specifically determined in spatially complete form. The alternate mode, although quantized as bundles of energy that correspond to particulate matter, is non-specific and cannot be spatially identified. This requires that the material content of the universe is in fact involved in a very rapid and universally synchronous oscillation between the two modes. One mode is spatially complete, the other mode spatially indeterminate and timeless, such that events are prescribed by sequential frames in a holographic movie of cosmic proportions. The spatially

complete frames will be called *space frames*. The timeless spatially indeterminate frames will be called *quantum frames*.

2) What we know as the wave character of matter is associated with the synchronous oscillation back and forth between the two modes. This means that the entire universe is vanishing and recurring very rapidly with and before our eyes, the continuity of events being provided by quantum jumps in position from one space frame to the next, through the agency of the timeless quantum frames. This is analogous to an ordinary movie where the blank screen facilitates the projection of successive frames to lend the illusion of continuous action. The blank screen in this case is the spatially and temporally indeterminate quantum frames that are integrated as a boundless orthogonal field that is called the Void. The Void allows an ever changing assimilation and configuration of particulate matter in a series of space frames. There is thus a dynamic identity between spatial form and quantized energy as non-specific emptiness, the Void. The Void acts as a *master sensorium* or memory bank. It is a repository of experience behind space frames. Because experience is in reflux and renewal, the sensorium also spans and integrates history. It regulates non-synchronous elements that arise due to relative motions.

3) The quantization of the electromagnetic spectrum, as it projects through space, is a universal measure of this fundamental oscillating action, hence Planck's relation $E=hf$. The quantization of energy, E , is a function of the frequency, f , because the universal action, h , is synchronous for all frequencies. The electromagnetic spectrum is being interrupted across its entire breadth by the successive disappearance and recurrence of space frames, thus requiring light to project as a series of discrete pulses.

4) The speed of light, as measured in vacuum through space, is universally constant because the recurrence of space frames is universally synchronous irrespective of relative motions. Relative motions can be known only between relative positions in successive space frames. Light derives from within atoms and can only move a specific distance with respect to each atom in each successive space frame. It must close the space in the integrated fabric of space-time by linking up all atoms of particulate matter. Light defines space relative to each atom. Space and time are quantized.

5) Time, as we are able to measure it as a linear phenomenon, is associated with the recurrence of space frames. We measure time by regular cyclic motions, such as the rotation of the earth, and these motions reflect a series of quantum jumps in position through successive space frames. Each successive frame thus specifies a universal primary interval

of time. It is possible to measure the length of this interval in terms of classical units of time because each space frame recurs for a specific duration relative to the propagation of light. It will be shown that this primary interval is 1.519×10^{-16} seconds. This is roughly the time required for light to circumscribe the largest atom, since the atom must be spatially coherent within each space frame.

6) Although a common simultaneity for separate bodies, in relative motion through space, may not be established through direct measurements with clocks, as relativity theory maintains,¹² we may nevertheless attach a universal significance to the concept of synchronicity. Since there is sound evidence to clearly indicate that matter is inherently intermittent, it in fact must be synchronous if we are to perceive the material surroundings with any degree of integrity at all. Although synchronous distortions may be introduced through relative motions that affect spatial perceptions and our ability to make measurements, this does not discredit the fact that a preponderance of synchronous events still prevail. Even in extreme cases where synchronous distortions may be so severe as to result in black holes, these can only manifest relative to a preponderance of synchronous events.

7) Gravity is universally operative independent of transmission through space and time, since it is associated with the universally synchronous projection of the movie. It is an expression of an underlying unity implicit in all particulate matter. The attractive force of gravity resides in the universal aspect common to diverse forms of matter separated in space, and it is effected through the quantum mode. The tendency to come together is an expression of the oneness of physical being, a oneness that is manifest in the Void. In this respect the unity of the quantum frame is the conjugate inverse of the space frame where particulate matter is separate and distinct. Since atomic matter oscillates between form and Void to define a primary interval of time what we see as separate matter is both One and Many at the same time.

8) Relative motions tend to distort the perception of space and time because light is unable to fully bridge the quantum jumps in position between successive synchronous frames, and yet the movie must cohere as a whole. In Newtonian physics this tendency manifests as a force required to accelerate one body with respect to another. This shows up as a discrepancy of units in the familiar relation $F=ma$. The units of force and mass are essentially the same, leaving a discrepancy in distance per second per second. This is a discrepancy of change in position through successive frames that represents a relative skipping of space frames associated with Force. This distortion in the uniform perception of space and time is balanced by an external expenditure of energy as work. This is the inverse

to the effect of gravity as an attractive force that functions from within. We shall see that gravity is one of a class of forces that function via the quantum mode.

9) When relative velocities approach the speed of light a more severe kind of distortion becomes apparent because relative space frame sequences are perceived out of synchronization. There is a relative skipping of space frames balanced by a relative accumulation of quantum frames between different inertial systems, because light cannot otherwise bridge the jumps in position. The quantum sensorium, the Void, spans the relative history. This shows up as the familiar relativistic discrepancies indicated by the Lorentz transformations of special relativity. There is still no sound reason to believe that these transformations "...do away with the absolute character of the concept of simultaneity," as Einstein stated. They merely account for synchronous distortions between inertial systems.

10) Space frames are skipped in the inertial system of the *observer* with respect to the moving body. This is balanced by a relative accumulation of quantum frames with respect to the observed body in motion. There is no compelling reason to suggest that the position of a so-called stationary observer is necessarily an arbitrary matter and that we must accordingly seek out mathematically covariant laws with respect to continuous transformations of space-time coordinates. This principle of general relativity does not take cognizance of the fact that experience is not presented to us in this way. Uniform patterns of cyclic motions dominate the heavens in a highly organized hierarchical manner, cascading down from galaxies to suns to planets and moons. When we speak of inertial systems as resisting acceleration we must therefore see it within the context of the theater in which we are observing the movie. Acceleration is always relative to the preponderance of synchronous patterns of momentum that prevail, for it both conforms to and disturbs those established patterns as they exist hierarchically. A classic example is Foucault's pendulum. The arc of its swings is constant with respect to the fixed stars thousands of light years distant and thus rotates to counter the earth's rotation. The pendulum may be set in its swings by the gravitational pull of the earth, but the direction of its swings is synchronous with respect to the universe at large.

11) Momentum is a quantization of uniform relative motion. This is inferred by de Broglie's wave equation, where the quantum of action, h , is equivalent to the product of the relativistic momentum of a particle, p , and its wave length λ . If the wave motion of matter is a result of the oscillation between quantum and space frames, then it follows that the wave length

assigned to a particle should be associated with the quantum jumps in position from one space frame to the next, relative to its perceived place in the projection of the movie. A curious paradox arises at this point, because one would expect the wavelength to increase with the momentum, an increase in velocity representing an increase in wavelength from frame to frame. In fact the opposite must be true, because the product of the momentum and wavelength is equivalent to the universal constant, h . There is again a dimensional discrepancy of unit distance per second per second, which indicates that the paradox is associated with a synchronous distortion between the observer and the particle. If the uniform motion of the particle is offset by a relative skipping of observer space frames, the paradox is resolved, because the observer is also a collection of quantized momentum in the movie production, moving with the earth in its orbs within orbs. A relative skipping of observer space frames thus has the effect of increasing the apparent frequency of particle space frames and reducing its relative wavelength accordingly. This is consistent with the alternate formulation of de Broglie's equation, where the momentum of the particle increases with the apparent frequency.

12) Uniform velocities may be considered inertial because particulate masses are independently assimilated in the movie. The duration of each space frame is sufficient to allow light to circumscribe any typical atom, but not larger conglomerates of atoms as molecules in concentrations of matter. The latter are assimilated through atomic characteristics that allow them to mutually relate collectively through interfaces of interaction. Within each space frame, however, activity is restricted to electromagnetic phenomena. The uniform motion of an atom, or a unified collection of atoms, is a quantized event, occurring from one space frame to the next, along with the preponderance of other synchronous events. If there is no change in the degree of synchronous relationships from space frame to space frame, then no forces are introduced associated with further synchronous distortions. Velocity, or the relative lack of it, is therefore inertial so long as the relative shifts in position from space frame to space frame are uniform. It should be noted here that this requires another kind of time, or rather timelessness, that is distinct from linear time as defined above in point 5. There is a kind of duration that spans successive space frames to historically integrate the synchronization of events.¹³ This underlying timeless duration is associated with the Void, and has been referred to as the *quantum sensorium*. For instance, there is a relative accumulation of quantized energy associated with moving particles to balance the relative skipping of observer space frames. This is essentially a quantization of experience that

does not actualize to the observer in spatially explicit form, although it remains associated with the moving particle as an increase in its relativistic mass, a physical contraction in the direction of motion, and a dilation of time.

13) A complete atom is a closed and spatially distinct entity. The photon energy level of the atom defines a closed spherical shell that constitutes the inner space of the atom as orthogonal and distinct from the external linear space between atoms. The relationship of photon to electron and proton therein is a closed electrically neutral relationship. If, however, an electron becomes excited beyond the ionization limit for an atom, then light is unable to bridge the distance within one space frame. The electron is said to be a free electron. Photon energy must span two or more space frames to close the relationship between electron and proton, and it is this spanning of space frames by photon energy that gives rise to electromagnetic fields. This also serves to integrate history over a succession of space frames, that is to say, light must link events over a period of linear time. Transmission of physical effects through the integrated fabric of space-time cannot exceed the speed of light.

14) In the organization of moons, planets, suns and galaxies, there is a wide variety of phenomena that necessarily follow according to the above scenario, some of them well known. For example we know that somehow, since the consolidation of our solar system, that about 98% of the angular momentum has come to reside in the planets, even though 99% of the total mass resides in the sun. The rotational motion of the solar system introduces synchronous distortions with respect to the galaxy that are associated with angular velocity, although the mass of the solar system must be generally synchronous with the galaxy at large. This angular tendency to synchronous distortions manifests as a relative skipping of space frames in the center of the sun with respect to its own periphery and the peripheral planets. Although this is largely accounted for by fusion processes in the center of the sun that effectively contract space they can not account for the whole discrepancy. There is a corresponding accumulation of quantized momentum associated with the planets that cannot actualize, and yet it must manifest itself in some way, if it is not to build to unlimited extremes. Since we observe a differential rotation between the center of the sun and its periphery, it is reasonable to conclude that the accumulated momentum becomes translated as a force of retardation operative at the center of the sun. (The poles rotate in 33 days, the equator in 25 days.) This force is not transmitted externally through space, but rather internally via the quantum mode, as an internal winding

down to preserve synchronicity. It is a force hitherto unidentified, and one of a small family of quantum forces operative on a cosmic scale.

15) The differential rotation of the sun accounts for the spiral wrapping of the sun's electromagnetic field around its girth, a portion of the field being swept out with the solar wind into the planetary disc and beyond. The great electromagnetic arches that pop out from the sun's surface, associated with sun spots and solar flares, appear as direct evidence of an electromagnetic bridging of discrepancies in angular synchronicity within the sun.¹⁴ The sun's magnetic pole reversals, that occur approximately every eleven years, are also essential to balance synchronous distortions that would otherwise accumulate to unmanageable proportions. The earth's pole reversals are much less frequent and have a different focus.

16) When we turn our attention to the galaxy, we find that the focus shifts to the regulation of its material content, as distinct from the angular distortions within solar systems. The material content of the entire galaxy must be preponderantly synchronous, both with itself and with other galaxies, even though it is in rotation with respect to other galaxies in the universe at large. In galaxies that tend to rotate as a unit, there will be a skipping of space frames in their centers with respect to their peripheries that will tend to accumulate to cosmic extremes. At the limit this manifests as black holes in their centers, with a relative enormous accumulation of quantized energy with respect to their peripheral rotation. But we can also see that black holes in the centers of any number of galaxies represent one, common, singular condition, with respect to the universal cosmic projection of atomic matter. The physical universe, as we see it, is one synchronous event. There may also be black holes in the centers of globular star clusters, where stars move independently in elliptical orbits about a common center, and similar patterns may be expected in elliptical galaxies.

17) Because galaxies must be preponderantly synchronous, quantum forces may come into play in a variety of ways. Angular synchronous distortions in solar systems, place them in immediate communication with the preponderance of synchronicity in the universe at large. Discrepancies between the external space frame skipping associated with the angular velocity of stellar populations around the galactic center seek a balance with fusion processes that contract internal space-time in stellar centers. The relative imbalance between internal and external space-time is translated to the galaxy's stellar population as a regulatory force governing stellar migrations within the revolving disc. The entire stellar population of the galaxy becomes tensionally coupled within. It becomes

one coherent whole. Stars must behave themselves within moderate limits and cannot go racing off without restraint at the beck and call of gravity, disturbing the synchronous integrity of the whole. Tendencies to excessive motions find a ready resistance. The apparent deficiencies in gravitational mass in current theories about galactic organization thus find new avenues of explanation that apply to many other phenomena as well.

18) There is a growing body of evidence to indicate that there is reflux of the material content of a galaxy through the galactic center. In this scenario, old heavy stars that have contracted internal space-time through fusion processes tend to migrate toward the center, where the integrated fabric of external space-time is contracted with respect to the periphery. They are drawn into an accretion disc and torn apart as they spiral in toward a black hole at the center. Then there are intermittent massive ejections of hydrogen from the center, with star formation apparent as it migrates out toward the peripheral disc.¹⁵ Starburst galaxies exhibit very high star formation rates that last for tens of millions of years. As more data becomes available it should consolidate into a picture of eternal stellar regeneration.¹⁶ In a synchronous universe, galaxies function as cells that creatively renew their stellar populations. The heavy elements, created through fusion processes in stars are recycled back into hydrogen in the galactic core. There may be other phenomena associated with mass/energy reflux, via the quantum mode, back through the centers of stars, perhaps extending their productive lives.

19) When we look through our largest telescopes at the distant quasars, some of them emitting more energy than a thousand galaxies like our own, from a core only a light year or so in diameter, what are we seeing? When we see them oscillate with bursts of energy equivalent to the creation of millions of suns over a period days, even hours or seconds, what are we seeing?¹⁷ The light from a galaxy a few billion light years distant can be older than our solar system by the time it reaches us. We have circumscribed our galaxy a couple of dozen times, and the distant galaxies may be turning somewhat slower or faster, the rate of stellar reflux being adjusted accordingly. Yet we share the same synchronous present with that galaxy as it exists today. In the projection of the cosmic movie, light must bridge the intervening discrepancies in linear time due to relative rates of space frame skipping. The light that comes to us from distant galaxies spans the integrated history of change relative to us, since we are still synchronously projected from the Void as things are today. A number of effects are to be expected. For instance synchronous discrepancies alone can red shift the light that we see, and this is not necessarily associated with recessional velocity at all. It may only be

associated with great distance. The associated history of relative space frame skipping shifts the frequency of the light toward the red end of the spectrum. Synchronous discrepancies accumulated over such a time can also greatly accelerate the apparent relative frequency of distant events, similar to de Broglie's moving particles but on a grand scale. Synchronous distortions may contract the history of stellar reflux in distant galaxies in the way that we perceive them, creating an illusion of highly exaggerated violent eruptions where none existed in reality. Such phenomena might be expected as observational homologues to real ejections of matter from galactic centers. Alternatively distant galaxies that have lower rates of relative space frame skipping may appear to be fragmented. There is no compelling reason to suggest that we are looking back in time toward the original creation of the entire universe. In view of the above, there are more compelling reasons to suggest that the universe never had an origin, that the creative process transcends events in linear time, that its history of change is eternally organized via the quantum sensorium.

20) The background microwave radiation is there, of course, and real. But is it really a remnant of the separation of matter and radiation during the early epochs of a supposed big bang? Given the current state of our understanding, there may easily be other explanations. This single wisp of evidence is hardly sufficient to support the theory in the face of mounting contradictions. To begin with, any theory of a universal physical origin at some primordial point in linear time must face formidable philosophical problems, fundamental contradictions of logic, reason, and self consistency, as is well known yet set aside. Such an origin negates any concept of natural order on which the theory may itself be based, placing us outside the whole of creation, divorced from our own experience. This renders the theory devoid of pragmatic value, for we find ourselves faced with a need to integrate history in order to cope with experience accordingly in an ongoing context. This problem aside, we can hardly extrapolate experience with confidence many orders of magnitude beyond what we can ever hope to verify by observations or experiments of any kind. But even in the observations available to us there are serious problems—age discrepancies,^{18 19} the clumpiness of the universe, the missing mass, the Hubble constant.²⁰ We are surely advised to look for more realistic alternatives than to undertake the invention of dark matter. Attempts at the computer modeling of cosmic evolution using various starting mixtures of dark matter are problematic even if it did exist.²¹ The missing mass is not a problem to a synchronous universe where galaxies are eternal cells of creative reflux. The mass missing is accounted for by quantum events in the centers of galaxies with respect to their peripheries,

integrating their dynamic integrity and their eternal regeneration. The universe may be clumpy. The age of stars does not have to be confined within an acceptable birth date for the entire universe. Galaxies may exhibit different characteristics, migrate, form loose associations, evolve and change, all within synchronous constraints. The background microwave radiation is related to the primary interval of time with respect to the preponderance of synchronicity in the universe at large, indicating an origin in the ongoing synchronous projection of the universe as it relates to our galactic neighborhood.

21) A synchronous universe introduces limitations in the application of mathematical methods currently available, because the properties of space and time, as we measure them, are not continuous. There is thus a minimum limit to the increment of the differential in the calculus that becomes very significant in quantum events. The uncertainty principle is related. The relative position of a moving particle can only be known precisely within a single space frame, whereas the relative momentum can only be determined over a succession of space frames. These characteristics are implicit in the nature of phenomena whether our measurements interfere with them or not.

The list could go on indefinitely, for we have only begun a review of the evidence, and haven't mentioned planetary processes, biological or social evolution, neurological processes or the nature of the mind. The above points should nevertheless be sufficient to indicate a need for a more fundamental and comprehensive insight into the cosmic order. They also suggest some clues as to what we require, and the general pattern of what we might expect, as follows:

i) We are concerned with the historic integration of the whole of experience and thus with the relationship of parts to the whole. This must allow for all possible variants of experience.

ii) There is an all pervasive dynamic interdependence between universal and particular aspects of experience that is fundamental to understanding the nature of phenomena of every kind. This is intimately associated with alternate modes in the cosmic projection of experience.

iii) The integration of experience displays hierarchical elements associated with degrees of universality subsumed in levels, as in the synchronous relationship of galaxies to suns to planets and moons. These hierarchies, as they are spatially perceived, are specific manifestations of a transcendent universal order.

These few points will suffice to sum up general objectives and guide lines to be pursued as a starting point in subsequent chapters.

REFERENCES AND NOTES

1. The organization of the human nervous system, to which we owe the integration of our perceptions, memories, feelings, thoughts, and actions, must reflect the organization of experience in general if our responses are to be appropriate to circumstance.
2. While western historians generally acknowledge this influence, the extent to which the historical development of ideas correspond or diverge between East and West has not been very thoroughly investigated or reported.
3. Gilbert Ryle, then Waynflete Professor of Metaphysical Philosophy at Oxford, reports in *Encyclopedia of Philosophy*, Vol. 7, p. 321, Macmillan, 1967, that Plato's elenctic dialogues were abruptly terminated with the *Gorgias* or the unfinished *Thrasymachus*, with a drastic change of direction. Whatever crisis this may have entailed, succeeding dialogues are almost devoid of his previous argumentative checkmating, and concentrate on presenting constructive philosophical doctrines, the *Theory of Forms* being the most famous by far. The theory is treated in the *Symposium*, the *Phaedo*, the *Republic* and the *Timaeus*, and it comes up again in the *Philibus*, the *Sophist*, and the *Parmenides*. Of thirteen letters reputedly written by Plato, there are four which are accepted as authentic by most scholars, but not all, including Letter VII, which is a piece of Plato's autobiography. This letter also contains an excursus on the *Theory of Forms*, and if authentic, shows that Plato held to this theory at least until his mid-seventies. It is not mentioned by Aristotle in any of the many passages in which he criticizes the *Theory of Forms*.
4. Hirianna M., *Essentials of Indian Philosophy*, (p. 57) London, George Allen & Unwin, 1949.
5. There are two accounts of the creative acts of the sun-god *Atum*, of the ancient city of Heliopolis, both from the *Pyramid Texts* inscribed on the walls of nine tombs (c. 2350 to 2175 BC.) in the necropolis of Memphis at Saqqara. Both accounts, lacking in psychological depth, describe the creation of the divine *Ennead* which includes the husband/wife pairs *Osiris/Isis* and *Seth/Nephthys*. However a stone, Stela no. 797 in the British Museum, its message dating from the beginning of the Old Kingdom (c. 2850 BC.), makes *Atum* and his *Ennead* the mere agents of an antecedent spiritual force, the supreme deity *Ptah*. "Mighty and great is *Ptah*, who rendered power to the gods and their kas: through his heart, by which *Horus* became *Ptah*; and through his tongue, by which *Thot* became *Ptah*. Thus the heart and tongue won mastery over all other members, in as much as he is in every body and every mouth of all gods, all men, all beasts, all crawling things, and whatever lives... It is the heart that

brings forth every issue, and the tongue that repeats the thought of the heart. ..." (James Henry Breasted, *Development of Religion and Thought in Ancient Egypt*, London: Hodder and Stoughton, 1912, p. 45.) Ptah was thus understood by the priesthood as both immanent and transcendent, but also to function through *maat*, the goddess representing the cosmic order. After Isis resurrects her virtuous husband Osiris following his murder (twice), by the jealous and evil brother Seth, Osiris thereafter resides in the underworld to judge the souls of the dead. Their son Horus was conceived after the first reunion/resurrection. Thot, the moon god, was the consort of Maat and the inventor of language. There is a triadic balance here between (right brain) intuitive insight into the cosmic order and (left brain) verbal expression, both emotionally fueled (Limbic system).(1) The extent to which the human heart balances the cosmic order, represented as a feather, is thus the basis of judgment. It's a deeply moral theme, essentially identical with the cosmic order as represented by the Vedic *ṛta*, the Sumerian *me*, the Hindu and Buddhist *dharmā*, and the Chinese *tao*. Joseph Campbell gives a general account in *The Masks of God: Oriental Mythology*, Viking, 1962, Penguin 1976. See also: the Papyrus of Ani, Wasserman, J., et al, *The Egyptian Book of the Dead*, plate 3, Chronicle Books, San Francisco, 1994; Moon, B., ed., Annubis and the Weighing of the Heart, p. 426-429, *An Encyclopedia of Archetypal Symbolism*, Shambhala, Boston, 1991; An account of Isis and Osiris is given by Sir James Fraser in *The Golden Bough*, Gramercy (Random House), NY, 1981. (first published 1890).

6. Arthur Koestler reviews the founders of modern science in *The Sleepwalkers; A History of Man's Changing Vision of the Universe* (First published 1959, Penguin, 1989). In other of his writings Koestler introduced the concept of the *holon*, a Janus faced part-whole, as a prevalent characteristic of how experience is organized. This is another expression of the interdependence of universal and particular aspects of experience, which Koestler describes as self-transcending and self-assertive. See *The Ghost in the Machine*, Pan Books, London, 1970.
7. Faraday, M., A Speculation Touching Electric Conduction and the Nature of Matter, *Experimental Researches in Electricity*, Vol. 2, London (1844). Faraday, M., On the Physical Character of the Lines of Magnetic Force, *Ibid.*, Vol. 3 (1855)
8. Maxwell, J. C., On Faraday's Lines of Force (1856); On Physical Lines of Force (1861); A Dynamical Theory of the Electromagnetic Field (1864), in Niven W. D., Ed., *Scientific Papers*, Vol. 1, Cambridge, 1890.
9. Einstein, A., On the Generalized Theory of Gravitation, *Scientific American*, April, 1950.
10. Planck, M., *Eight Lectures on Theoretical Physics*, Columbia University Press, NY, 1915.
11. De Broglie, L., in *Wave Mechanics, The First Fifty Years*, Butterworths, London, 1975.

12. Einstein, A., On The Electrodynamics of Moving Bodies, in *The Principle of Relativity, A Collection of Original Memoirs on the Special and General Theory of Relativity*, by H. A. Lorentz, A. Einstein, H. Minkowski and H. Weyl with notes by A. Sommerfeld, Methuen & Co., Ltd., London, 1924.
13. It is noteworthy that Henri Bergson postulated two kinds of time, analogous in some ways to the distinction being made here, although here they derive from a common root. Hanna, Thomas, Ed., *The Bergsonian Heritage*, New York and London, 1962.
14. Current theories are coming more in line with the interpretation of a synchronous universe. See Glanz, J., Does Magnetic Twist Crank Up the Sun's Outbursts? reporting in *Science*, **269**, 1517, 1995.
15. Evidence has been accumulating for several decades. Bart J. Bok published a summary, *The Milky Way Galaxy*, in *Scientific American*, March 1981. He points out that there are about 4,000 giant molecular complexes known within 13,000 parsecs (about 42,000 light years) of the galactic center. Being sites of star formation, each typically contains predominantly molecular hydrogen equivalent to several hundred thousand solar masses. The outer boundary of the central bulge, 5000 parsecs from the center, is ringed by giant molecular complexes. The central bulge itself contains a dense concentration of old stars. Within it, four concentric rotating rings of hydrogen have been identified expanding radially away from the center of the galaxy, the outermost, at 3000 parsecs from the center, being discovered in 1964 by Jan H. Oort and G. W. Roegoor of the Leiden Observatory. Bart Bok comments, "*Perhaps the ring is a new spiral arm unfurling. One is equally tempted, however, to speculate that the center of the galaxy expelled a kind of smoke ring some 30 million years ago.*" At 1500 parsecs, Butler Burton of the University of Minnesota and Harvey S. Liszt of the National Radio Astronomy Observatory, identified another rotating expanding ring of atomic and molecular hydrogen. Another ring, some 300 parsecs from the center, has regions of hot atomic hydrogen containing newly formed blue-white super-giant stars. Another cooler and more dense ring exists only 10 parsecs from the center. It thus appears that huge amounts of material are being emitted periodically from the center of the galaxy, which is feedstock for new generations of stars. The central three parsecs contains the highest concentration of stars in the galaxy. Star sized clouds of ionized gas are speeding around the center at high velocities, their velocities increasing with their proximity to the center. This suggests old stars being torn apart as they are being drawn into a super massive region at the galactic center, presumably a black hole. The pattern of creative reflux is thus already suggested by radio and infrared observations. The pattern is generally consistent, even required, by a synchronous universe. The creative reflux of experience is a phenomenon that we see all around us in nature, something that we do ourselves every day. We should have good reason to expect to find it a common feature of galaxies also.

16. Many galaxies emit strongly in the infrared region indicating high rates of star formation. In some cases the rate is so high that the entire galactic mass would be recycled in a billion years or less if the rate was sustained. Active periods are probably interspersed with quiet periods. Habing H. J. and Neugebauer, G., The Infrared Sky, *Scientific American*, Vol. 251, No. 5, Nov., 1984. Starburst galaxies are now known to be common with star formation rates up to a hundred times or more that of quiescent galaxies.
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18. Some globular clusters in the Milky Way and some galaxies appear to be about 15 billion years old, perhaps more, which stretches the upper limit for a big bang thesis. For example, radio galaxy 4C41.17 was found by Kenneth Chambers, George Miley, and Wil van Breugel to have a Doppler shift of 3.8, corresponding to 15 billion light years. Reported by Waldrop, M.M., The Farthest Galaxies: A New Champion, in *Science*, **241**, 905, 1988.
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20. Some measurements of the Hubble constant favor numbers that are much too high to fit Big Bang theories, but the search goes on. Travis, J., Hubble War Moves to High Ground, reporting in *Science*, **266**, 539, 1994.
21. Jayawardhana, R., A Dark Matter Recipe is Tested—And Found Wanting, reporting in *Science* **264**, 1845, 1994.

CHAPTER II

INTRODUCING THE SYSTEM

Abstract:

The quest for a theory of everything requires that there must be such a thing as universal wholeness implicit in the cosmic order. As an expression of the cosmic order one universal System determines how experience is organized and integrated. This System must integrate phenomenal experience by reconciling the manifold universe of our common experience with unity. This requires degrees of universality hierarchically subsumed in discrete levels of elaboration within itself. The One System subsumes an open ended series of higher Systems nested within it. We may thus speak of Systems 1, 2, 3, 4,... n,... where each higher system elaborates on the lower systems that subsume and transcend it. Since the System must delineate the nature of space and time there is no accurate way to describe the System in language within a space-time context. It can only be structurally represented with respect to the inside and outside of phenomena as active interfaces that we commonly know as the surfaces of things. We can not know the inside or outside as things in themselves. All we can know in phenomenal experience is active interface processes between them. The One System can thus be structurally represented from two perspectives, one passive (from outside active interfaces looking in) and one active (from inside active interfaces looking out). System 1 represents universal wholeness. It requires that all phenomena consist of active interface processes that share both a universal inside and a universal outside. This rift in universal wholeness between inside and outside requires that System 2 must elaborate upon System 1 with two related active interfaces to account for multiplicity. One interface must be universal and unique while the other is particular and many. System 2 requires a fundamental interdependence of particular and universal aspects of experience in alternating objective and subjective orientations with an active transformation between them. This threeness requires a fundamental discontinuity in the projection of space-time phenomenon. It is for System 3 to elaborate further.

Theories of Everything:

We all face a common question: how is experience organized and integrated? We all know there are many provisional answers. Nevertheless we each have a theory of everything. We each have a worldview that we implicitly believe is universally true for all people for all time. We need a holistic worldview to integrate our experience, even if we believe that there is no transcending meaning or purpose to life, that we are all driven by primal desires. Even if we believe that we face total psychic extinction at death we implicitly believe this is true for every sentient creature who has ever lived anywhere in the universe. We do not believe that we alone are singled out for oblivion. And we generally fail to see the contradictions implicit in our theory of everything. We can not function without a perceived integrating context that we implicitly relate to. All cultures and sub-cultures need one too. Science also seeks a theory of everything.

But do we really want a theory of everything? Would answers in left brain language satisfy the emotional quest in our hearts or be satisfying to our right brain intuitive perceptions? Can science write a new bible for all people for all time? Would it be a guide that we could follow to live by? Or would we rather have a universal methodology that would render the structural dynamics of the creative process transparent, and thus allow us to better interpret our thoughts and behavior in more positive ways whatever the context?

Despite our differences we have learned to cope together in various ways, although history painfully reveals that our solutions are often sadly lacking. All the same we have gathered an abundance of knowledge in the process that suggests a few salient features about the nature of phenomenal experience in general—about the cosmic order. We can make certain general observations about how it is structured to work.

We know that there must be some kind of system to the organization of experience. We seek out natural laws because we need universal principles of some kind to develop our sciences and facilitate rational techniques of behavior. We do this with an intuitive faith that the system is unique, not many, for the one *System* embraces manyness in the cyclic patterns that we see recurring in diverse areas of experience. Phenomenal experience by its nature relates to itself.¹

The System as an Expression of the Cosmic Order:

The one System is an expression of the Cosmic Order. But one System must allow for all possible varieties of experience in the way that it

integrates diverse elements as a whole. Since it must be all inclusive, it cannot be based on some ideas to the exclusion of others, while it must allow for mutually exclusive variants of experience. It is structural as opposed to behavioral.

The System is not something that can be contrived in language. It is not something that we can logically construct with our powers of reason. It is not something we can create, only discover. We can have intuitive insights into the structural possibilities of phenomenal experience. We can intuitively see that the one System must embrace the manyness that we see in a perpetual state of change around us. We may thus expect a ubiquitous interdependence between universal and particular aspects of experience. This is a very ancient theme. (See endnote 26.)

The reconciliation of oneness and manyness requires that the System must be hierarchical. Hierarchies in fact pervade experience. We find levels of sentient awareness from the plants, to the invertebrates, to the vertebrates, to man, that clearly reflect a hierarchical capacity to respond to and cope with the environment. There are hierarchies everywhere we look. Our social and economic organizations have hierarchical structures. The heavens are hierarchically structured from galaxies to suns, planets and moons. There are hierarchical structures implicit in our own anatomy. The human nervous system directs the muscles that animate our skeletal architecture.

These few observations² will form a starting point to delineate the System, not from the standpoint of a logical construction, but as an intuitive guide consistent with experience. Although the System must be self consistent, it cannot acknowledge a logic more fundamental than itself, if it is to be the one all embracing System. Neither can it be conceived within the constraints of space and time, since this would impose many *a priori* assumptions. Space and time are concepts derived a posteriori from the world around us and can not properly be raised to a priori status to explain creation.³

We can start by saying that the System includes distinct *hierarchical levels of elaboration within itself*. We can designate these discrete levels as *Systems 1, 2, 3, 4,...n,...* such that *each successive system is both transcended and subsumed* by all of the systems that precede it.⁴ In this way the System allows for any degree of elaboration within itself, while remaining one System, designated as System 1. Higher Systems must reconcile successive levels of multiplicity with unity.⁵ In this way the one System is an expression of how the Cosmic Order works in a manner consistent with phenomenal experience.

System 1 and Universal Wholeness:

System 1 transcends the whole of creation, the whole of history, the whole of space and time. It is an expression of *universal wholeness*.⁶ It can not manifest as a physical thing itself. That would define a boundary to it in space and time. System 1 must nevertheless specify boundary conditions or there could be no phenomena in experience.

We may represent universal boundary conditions if we designate System 1 with an active universal inside or universal center relating to a passive universal outside or periphery across an *active interface* between them. This active interface cannot be a static boundary or it would isolate an inside from an outside. It would not be one System; it would be two mutually isolated arenas, self contradictory and forever irreconcilable. There must be interaction between inside and outside across the interface.

The active interface must reveal itself in phenomenal experience as a *boundary condition between inside and outside*. This requires that all phenomena must share **both** a universal inside and a universal outside. All we can know is the active interface between them. We can not know the universal inside or the universal outside as things in themselves. The inside and outside have no boundary conditions.

When we look out at the night sky, we see a common peripheral darkness outside to which all things relate. We see separate things such as stars, the moon, meteorites, clouds etc. with boundaries and we think of them as existing in empty space. But space itself is not a thing with a boundary. This universal outside is not something we can know as a thing in itself. In the absence of phenomena it is elusive as a ghost. We can not know it in the absence of phenomena since our sense perceptions themselves constitute active interface processes integrated by more active interface processes throughout our nervous systems.

But we also intuitively sense there is a common center. If there is no universal inside then separate things can have no common characteristics. Then everything must be uniquely different in contradiction to our common experience. Atoms and molecules of a kind are known to have universally identical characteristics. Every particular thing is one of a universal kind. The human genome is universally shared by all people. And we experience a common center in our mutual humanity. We can empathize with one another and feel one another's joy and pain. The same is true to varying degrees with our animal ancestry. We share a range of ideas and emotions with animals, especially the higher mammals, and even insects to some extent. A cockroach senses one's intention to kill it. The whole cavalcade of phenomena that we see passing

may be seen as experience in perpetual change between a common inside and outside on many intermediate levels that are both subsumed and transcended by System 1. There are universal qualities to it.

Structural Representation of System 1:

It can be said that the entire process of creative change consists of dissemination from a universal inside to a universal outside and return back to the inside across one or more active interfaces between them. Dissemination from the universal inside or center will be called *efflux*. The process of return will be called *reflux*. This may be represented graphically from two perspectives, one passive and one active. From them one can intuitively grasp the structural nature of System 1.

The *passive perspective* (from the outside looking in), and the *active perspective* (from the inside looking out), are shown below in Figure II-1. The active universal inside is represented by light, **L**. The passive universal outside is represented by darkness, **D**. Light is thus illustrated relating to darkness across an active interface between them.⁷ In a more general sense the active interface involves energy processes of all kinds between a universal inside and a universal outside.

We see this confirmed in experience. Life giving energy comes to us from the atomic processes within the sun. Energy is captured within the molecular bonds of sugar to support the biosphere. It is the energy we digest inside our bellies that allows us to think and mobilize our bodies in response to our environment.

The active perspective represented in Figure II-1(b) is most important. The Passive Perspective (Figure II-1(a)) simply helps us to better visualize the active representation in higher Systems.

We are concerned with intuitive insight into the structural dynamics of phenomenal experience. The creative energy disseminates from the active center, as shown by the white arrow in Figure II-1(b), and there is reflux back toward the center, as shown by the black arrow. The process of reflux is less obvious in the physical universe as a whole, for it often occurs through the hierarchies involved, on a scale that we are only beginning to understand. We see this in the transformation of the atmosphere and the geological evolution of the continents over the past few billion years. Plants and invertebrates have influenced this process by the deposition of carbon, which in turn has influenced the internal dynamics of the planet and its electromagnetic character.⁸ In other words, organic life cycles arising from the planet in response to the sun relate back to transform the planet. There is likewise evidence for stellar reflux

through the galactic center.⁹ This is consistent with cyclical dissemination (efflux) and return (reflux) on many levels between one universal center and one universal periphery.

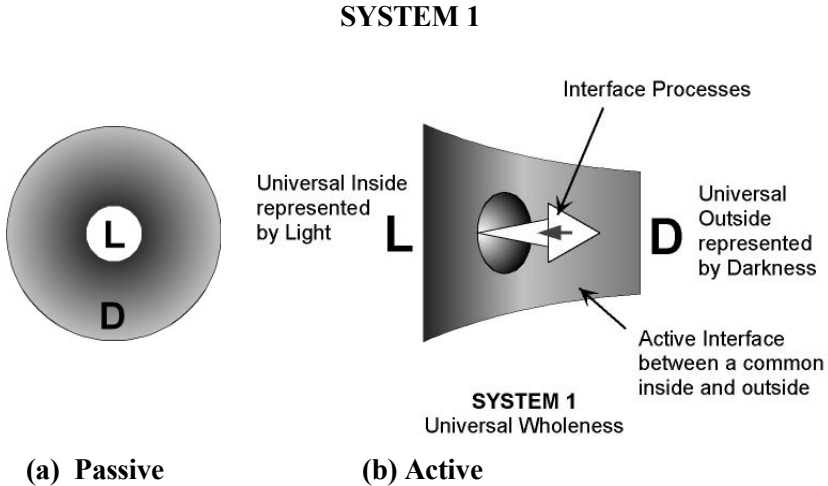


Figure II-1

A Rift in Universal Wholeness:

The concept of universal wholeness, as represented by System 1, requires an interdependent twoness as a level of subsumption within it. We cannot conceive of undifferentiated oneness without distinction, or attribute of any kind. Meaning slips away from us. In order for there to be a subjective and objective aspect to things we must be able to distinguish separate active interfaces as boundary conditions of phenomena. We must be able to distinguish things as separate surfaces. This requires two active interfaces, one universal and unique and the other particular, representing many. Manyness can only find reconciliation with oneness in this way, as we shall see.

This means that there is a fundamental *rift in universal wholeness* between the *universal* and the *particular* aspects of phenomena. It is this rift in wholeness that gives rise to the higher Systems that constitute the creative process. The creative process endlessly seeks to mend the rift in wholeness. As humans we likewise seek a unified worldview to creatively relate to.

Grand Unified Theories and the Big Bang:

Scientific attempts to resurrect universal wholeness from an atomized universe through the invention of Grand Unified Theories of various kinds fail to acknowledge that phenomena share a universal inside. They implicitly assume that physical phenomena share a universal outside only. Atoms, star systems and galaxies are believed to be embedded in a spacetime continuum consistent with General Relativity. Given the red shift of distant galaxies this extrapolates back to a Big Bang, when the universe, including the spacetime continuum and the laws of physics, spontaneously came into existence from nothing.

The Big Bang was the universal unifying event. Everything since has been determined by seeds inherent in that initial condition of infinite density. Ever since then the thermodynamic clock has been running down. With the formation of our solar system the evolution of biological life on Earth has likewise been a causal molecular accident devoid of transcending meaning or purpose. We have no subjective mind inside that transcends the externalized biochemical processes that constitute our physical bodies. All life is reduced to physical processes. This bleak scenario essentially leaves us spiritually and morally bankrupt, mere robots of accident driven by primal animal appetites.¹⁰

Quantum Mechanics and the Schism in Physics:

The development of quantum mechanics brought with it a dichotomous division between the practice and the philosophical interpretation of physics. Meta languages developed in the practice of physics based on how the sophisticated language of physics has come to be used, and not based upon any insight into the nature of reality. Consequently the practice of physics can make certain predictions in limited and contrived experiments. The results allow a growing number of diverse metaphysical interpretations that are generally mutually exclusive.

Moreover the metaphysical interpretations can never be directly confirmed in phenomenal experience of any kind. No one has ever seen probability waves, or infinitesimal strings, or dark matter, or parallel universes, or the Big Bang. No one ever will. These are blind belief systems. Science simply needs an integrating worldview to relate to, as with all cultures throughout human history. A growing variety of these metaphysical constructions are often hotly debated.

Early in the development of modern physics the legendary Bohr-Einstein debates highlighted fundamental conflicts between General Relativity and Quantum Mechanics. The latter was itself born in conflict

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between Heisenberg and Schrödinger and conflicts over interpretations continue. It is noteworthy that the year before he died Einstein wrote to his friend Michele Besso, quote: “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.”

The Big Bang is nevertheless preached to the public as gospel, despite serious philosophical contradictions and a swamp of theoretical obstacles. This exclusive objective view of the physical sciences divorces us from our own understanding placing us outside creation. This leaves us bereft of transcending values to guide our behavior apart from primal appetites, historically conditioned blind belief systems, and irrational fears that tend to confirm them. There is no natural human conscience that derives from transcending universal values within.

The Universal Center and System2:

The **only** alternative to believing that everything takes place in a universal common outside, is to also acknowledge a universal center to all phenomena. This brings us back to the universal requirement of both a subjective and objective aspect to all phenomena consistent with System 1 and a rift in universal wholeness. All we can know is active processes between a universal inside and a universal outside. This brings us to System 2.

System 2 is represented by two active interfaces. Each shares a common universal inside with respect to a common universal outside, as required by System 1. The *universal interface* is unique and transcends the *particular interface* which represents many of a universal kind. The universal interface is an *archetype* that each particular interface may structurally relate to in **only** two alternate ways.

Since active interfaces exhibit active centers, it will be convenient to call them *centers*. System 2 consists of two centers: center 1 and center 2. There are only two possible ways in which two centers may relate to one another with respect to a common inside and outside. They represent two alternate orientations. There is an *objective orientation* and there is a *subjective orientation*.

The Objective Orientation of System 2:

In the objective orientation illustrated in Figure II-2 the universal interface is inside the particular interface. The universal interface is designated as *Center 1* since it represents a common center to all particular

interfaces represented by *Center 2*. Together they relate objectively outwards to other particular Centers 2. Other particular Centers 2 are perceived in a common outside designated as darkness D. This is not a relationship in space and time. It transcends and subsumes space and time. Later we shall see that System 3 likewise derives from the rift in wholeness to elaborate the nature of space and time.

SYSTEM 2 - Objective Orientation

(a) Passive

(b) Active

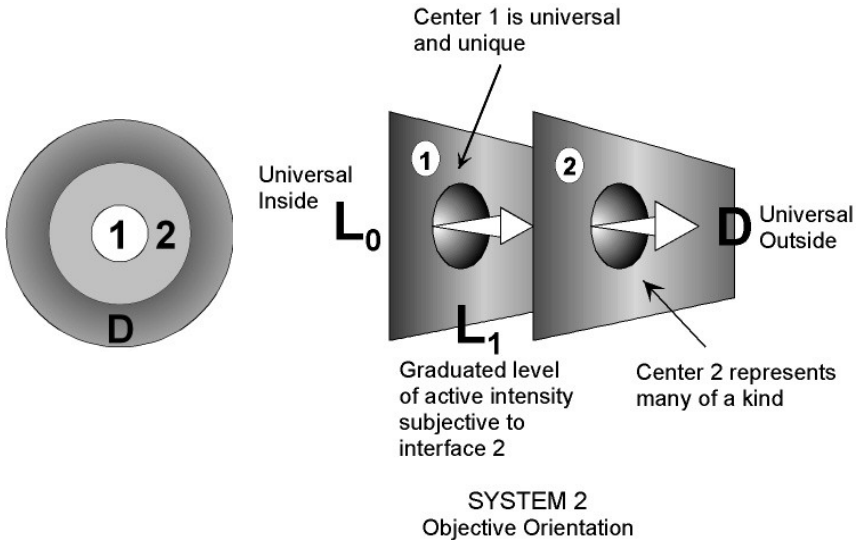


Figure II-2

In the objective orientation illustrated in Figure II-2, center 1 is within center 2. Both share a common center in light, L_0 , and both relate objectively out toward darkness, D. In Figure II-2(b) it can be seen that light disseminates through two successive centers, 1 and 2, such that there is a graduation of active intensity between them, designated L_1 . As active interfaces centers have active partitioning characteristics between inside and outside. Center 1 is universal and unique, while center 2 is particular and manifold. Center 2 represents any number of particular centers in the objective world. Everything shares a common active center inside and a common universal outside in darkness. This is consistent with System 1.

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We know, however, that not all particular things are the same. There are degrees of universality among them. All living creatures in the biosphere share the same DNA language, but we are not all trees, nor are all trees the same species, nor do all trees of the same species grow the same size and shape. Although we are beginning to see that particular centers subsume hierarchical levels within them that are distinctions of kind, the only distinction of kind that is explicit in System 2 is that between the universal and particular aspects of experience in general. This makes it a very fundamental characteristic of experience. System 2, like System 1, transcends and subsumes the whole of space-time. As particular human beings this requires that we seek universal wholeness as a condition of living. We need a universal worldview to relate to.

The Subjective Orientation of System 2:

In the alternate mode of System 2, called the subjective orientation, center 2 turns around to face center 1. It will be said that center 2 does a *perceptual transposition*. It turns inside out, so to speak, now standing apart from itself. It now faces center 1 that was formerly within it and through which it derives its energies. Center 2 now faces the universal center of the universe.

One may call this universal center God, or Allah, or Brahman, or universal intelligence, or universal values, or the Tao, or the Dharma, or Nirvana, or the Great Manitou, or whatever. The name is not important. It is what it is. It is the universal active interface of all creation.

It is the universal center of all phenomenal experience. It can not exist as a physical thing. That would mean that universal wholeness would have a fixed physical boundary which would negate the very nature of universal wholeness. The universal center transcends and subsumes physical things. In the subjective orientation this means that a particular human being can see the universal center of the universe face to face. This must be a private one-to one experience if universal wholeness is to be preserved. Neither interface can admit of more than one other active interface in this orientation if universal wholeness is to be preserved.

The point here is that the universal center can make itself directly knowable to a particular human being.¹¹ This distinguishes it from blind religious belief founded on dogma. (This is not an empty claim for intelligent design. Much more follows.) The two centers have an objective relationship facing one another within a subjective context, as shown in Figure II-3.

SYSTEM 2 - Subjective Orientation

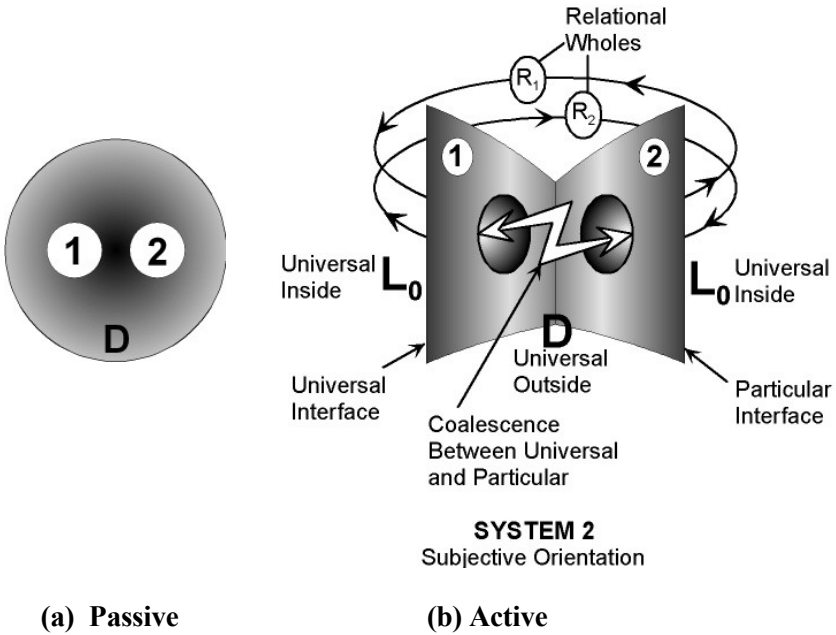


Figure II-3

In this subjective orientation the particular interface can only share phenomenal experience with the universal interface at the latter's discretion. All active communication is one way, from the universal to the particular. This must be so as a condition of universal wholeness. The two are *coalesced* as One but are two. Normal organic feedback to the particular consciousness is totally suspended. The particular human being can entertain no independent thoughts, ideas, or actions apart from universal wholeness. This implicitly requires that the universal interface is the manifestation of universal values. The universal center is the living manifestation of truth, unity, harmony, love, compassion, justice, mercy, and cosmic order.

If this is not so there can be no such thing as values that transcend our short sojourn here on Earth. There can be no transcending meaning or purpose to life. Everything is just a result of blind objective happenstance as in the exclusive outside option assumed by science. We might as well seek to gratify our appetites however gross they may be, so long as we can get away with it. There is no real basis to truth or justice or law or compassion or mercy or love.

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In the passive mode it is clear that centers 1 and 2 are mutually distinct as separate centers, yet they must relate to one another as one. They are an elaboration of System 1. In the active mode the two centers are shown mutually perceived as one by the double headed **Z** arrow. They both share the same source of energy inside, **L₀**, and the same peripheral darkness, **D**, outside. It will be said that they are *coalesced* as one, although they are two. They must relate both as two and as one.

Through this subjective mode of System 2 universal wholeness is known. There is a *countercurrent* exchange of energy between and within the two centers to complete their mutual identity, since they share the same outside and inside. The rift in universal wholeness that gives rise to the creative process is bridged. There is a return to the subjective orientation for universal wholeness to know itself through the evolutionary process.

Subsumed Hierarchies Implicit Within the Particular Center:

System 1 indicates that all things are in a perpetual flux of dissemination and return. The objective mode of System 2 elaborates on the dissemination which is called *efflux*, while the subjective mode of System 2 elaborates on the return which is called *reflux*.

In the objective orientation, center 2 is manifold. It represents the quality of all particular things relating outward toward peripheral darkness. This particular quality is inherent within three dimensional separate things as we normally perceive them “out there.” But center 2 is an archetypal *open center* as opposed to a *closed center* with three dimensional boundaries as elaborated upon by System 3. System 2 transcends and subsumes space and time as prescribed by System 3.

For example, in the objective orientation center 2 can represent the universal quality of humanity that is within the physical form of all human beings. It can represent the genotype of humanity as an organized energy pattern. It can also represent the personal integrating archetype of a specific human being, subsumed by the human genotype. There is hierarchical organization implicitly subsumed by center 2.¹²

This is consistent with System 1, for each thing, as represented by center 2, contains center 1, and we intuitively sense that somehow there is an implicit wholeness to experience, even though it is presented to us as a multiplicity of separate things. We must have a holistic worldview to integrate experience.

In the subjective orientation a further qualification arises. Center 2 now relates directly to the universal center 1. This is not something that can be collectively perceived by a multitude of separate particular centers.

It would not be consistent with universal wholeness. On the one hand center 1 is unique, while on the other, center 2 may represent species, or individual members of species that subsume animating processes within them. Center 2 is the collective quality of a multitude. There can hardly be a direct mutual identity between one universal center and a multitude of individual members of a species.¹³ The identity of things must be mediated. Center 2 thus shows us another face in the subjective mode that is *not* manifold—that is on the inside of subsumed levels within it. This point will become very important later.

We are thus provided a reason as to why there must be degrees of universality hierarchically organized. Universal wholeness implicitly requires subsuming levels of organization within it. This requires that the subjective face of a particular center 2 must be holistic, not manifold, if the *idea* of universal wholeness is to be known. This is essential to the identity of anything.¹⁴ It also illustrates that not all experience is explicitly accessible in the public domain, as it is in the objective mode.¹⁵ The subjective mode is private, largely mute, and intuitively perceived. Each of us values the independent privacy of our mind. It is through private reflection that we intuitively seek a holistic worldview.

The Universal and Particular as Fundamental to Being:

This basic pattern of two orientations, one subjective toward the universal center inside, one objective toward the universal periphery outside, has been a prominent theme since the beginning of rigorous thought. For example Parmenides (born c. 515 BC.) was one of the most influential of the Pre Socratic philosophers. In the fragments of his poem, *On Nature*, that have come to us Parmenides describes a journey to the Goddess of Justice, where he learns of the Way of Truth, and of the Way of Seeming. These two ways are similar to the two modes of System 2. The universal center manifests the wholeness of everything that is, having no generated origin and having no termination. The Way of Truth is to see this, as in the subjective mode where one particular center 2 perceptually transposes to face center 1. In the way of seeming, center 2 is oriented outward to the objective world where all is perceived consisting of Fire and Night (light and darkness), offering an account of the origin of stars, planets, and all things on earth. The phenomenal world is thus granted a degree of transient reality, wherein the opportunity is provided to know the Way of Truth as Unity.¹⁶ These two ways became interpreted by Plato as “what always is and never becomes,” and “what is continually becoming but never truly is.”

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In his Theory of Forms Plato also recognized that universal archetypes determine the identity of particular examples of them. We recognize a tree by its relation to an transcendental archetype of all trees. Although his pupil Aristotle rejected the mystical transcendental character of Plato's archetypes, insisting that the quality of a thing was concretely implicit within the thing itself, nevertheless the universal archetype also remains implicit within the thing itself. Jung's Theory of Archetypes and the Collective Unconscious is closely related.

The hierarchies implicit in experience require the *self-similar*¹⁷ proliferation of the pattern in various ways if we are to determine the identity of anything. The same pattern recurs in different areas of experience. The heavens are organized as an immense community of galaxies, and however different they may be from one another, they are all galaxies. They share the same pattern of structurally organizing a subsumed community of stars. Stars are a subsumed level of organization that have the structural dynamics of their being determined in relation to the universal center of the galaxy.¹⁸ At another subsumed level we identify the planet as a characteristic whole only in the relationship of its kind to a sun. The sun is instrumental in organizing the planet's energies, although the planet is distinct also, sharing as it does its material content with the universe at large. Everything that is embraces this paradox of one and many, same and different, universal and particular, but in an ordered way.

Organic Evolution as Reflux Back to Universal Wholeness:

The evolution of organic life on the planet marks a return in ascending levels toward the sentient awareness of universal wholeness. The plants explored the vital energies of cellular chemistry, from single-celled algae to complex plant species, building on the lessons of experience in progressive levels of refinement, all relating to the capture and use of solar energy. The invertebrates explored the sensitive energies of motor response to their physical environment, depending on the vital energies of plants to sustain them while they developed characteristic behaviors universal to their species. The advance to the vertebrates marked the introduction of cerebral hemispheres and an autonomic nervous system within a fixed quadruped format. This provides a capacity for cerebral reflection on emotional patterns of behavior within an anatomical framework that is universal among the reptiles, birds and mammals in the biosphere.¹⁹ The patterns of sensitive response worked out by the invertebrates are integrated anew without re-exploring multiple limb structures, compound eyes and so on. Vertebrate evolution has a different

focus altogether, in which patterns of behavior become progressively varied and consciously modulated in higher species. A dog has a greater repertoire of emotional and behavioral responses than a crocodile. This capacity to tailor experience to suit circumstance implicitly requires the progressive subsumption of all quadruped behavior in the biosphere. Complex behavior consciously integrates primary elements of behavior previously established in evolutionary history.

The climb up the hierarchy has continued through the reptiles and mammals in such a way that in the human brain the brains of the lower species have a close anatomical association with the emotional reflux of experience into cerebral awareness.^{20 21} We know intuitively that our emotional experience is rooted in the history of the biosphere, that it is in fact an integration of that history in subsumed levels of experience. Our animal roots go back hundreds of millions of years.

With the introduction of language we must also deal with experience in abstraction, but this of course brings us to the need to understand how the whole of experience is organized. This has resulted in the bilateral polarization of neocortical function into linguistically explicit and intuitively mute hemispheres.^{22 23}

While we draw on the lessons of a few billion years in the biosphere²⁴ our minds will be satisfied with no less than comprehension of how the cosmic order is structured to function. There is a need implicit in the evolutionary process to know universal wholeness and thus transcend and subsume our origins in the biosphere. This could not be presented to us in more graphic terms. It is wired into our nervous system. The apparatus we must use to relate to experience must itself reflect the structure of experience. It must reflect the cosmic order.

Summary:

System 2 transcends and subsumes the whole of history by prescribing the universal pattern of creative efflux and reflux. This is more than speculative metaphysics, for the pattern has correlates everywhere we look in the world around us. The hierarchies of centers recycling energy through creative activity are real phenomena.²⁵ The integrating *archetypal idea* is known through its *particular forms*.²⁶ This is true even of things that we make. We identify a particular motor car by its correspondence to the archetypal plan inherent in all motor cars. The archetypal plan is a real idea. It specifies how cars work and how they are built for a definite purpose. And the plan is clearly implicit in the design of each particular motor car.

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The two modes of System 2 result from the perceptual transposition of center 2, such that it alternately relates outward to the manifold creation then inward to the universal center, center 1. The integrating archetypal idea of a motor car is conceived through reflection in the subjective orientation. The transformation to specific particular motor cars in the objective orientation is realized in their manufacture.

At the atomic level this recurrent action is associated with the quantum of action, h , such that the physical creation is projected as a very rapid series of still frames in a holographic movie, as suggested previously. This recurrent action functions in different ways on different levels through the hierarchy to maintain a subjective to objective balance in the integration of history. Although the pattern is implicit in System 2, it requires System 3 to elaborate upon it. System 3 delineates what will be called the *primary activity*, and it is at this level that we begin to see how space and time are projected in the cosmic movie.

We may expect to see light play a universal role in the integrating *idea* of universal wholeness through cyclic *routines* of action in the parade of ever-shifting *forms*. We shall see that the *idea* itself becomes translated into organizing *routines* that in turn are translated into the *forms* that we see. In other words, *idea*, *routine*, and *form*, constitute a universal hierarchy that is everywhere apparent in experience. These three active interfaces constitute the universal hierarchy of System 3. It is apparent even in speech, where mute *ideas* are given explicit *forms* through the *routines* of language. But it should be no surprise if we find that language has evolved according to the System, that it depends upon the System to convey its meaning.

This leaves us with a fundamental choice between two, and **only** two, alternative structural approaches to a theory of everything. The current scientific approach is exclusively objective. It acknowledges only a common outside between physical things. It implicitly denies or ignores that there is a universal inside shared by all phenomena. This leads to the blind belief in a Big Bang as the singular origin of all creation from nothing, without plan or purpose. There is no transcending reality beyond our brief sojourn on Earth. Life is a fortuitous chemical accident ending in oblivion.

The alternate approach recognizes both a universal inside and a universal outside. It is not a theory of everything that freezes creation into rigid belief systems with a variety of metaphysical interpretations that can never find direct confirmation in phenomenal experience. The System of delineating the Cosmic Order is a universal methodology that can complement traditional approaches to the sciences and expand our

horizons. It is not a blind belief system. It requires a relentless quest into the nature of universal truth. Universal values are the ultimate reality. The quest lends transcending meaning and values to living that mends the rift in universal wholeness.

The choice between the two approaches is up to each individual of course.

REFERENCES AND NOTES:

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- ¹ Bertrand Russell, in developing his logical atomism, asserts that it depends on the isomorphism of the structure of an ideal language and of the structure of reality. Russell, B., *The Philosophy of Logical Atomism* (1918), reprinted in *Logic and Knowledge*, Marsh, R. C., Ed., London, 1956. The position taken here is that there is an isomorphism that is implicit in the structural dynamics of the whole of experience through which experience relates to itself, also lending language its meaning. This does not imply that the whole of experience is reducible to language, since language is essentially a social endeavor dependent in large measure on a basis of shared experience within a common framework of understanding that socially evolves. The word isomorphism is generally replaced with the term self-similarity here.
 - ² Summarized at the end of Chapter I - *A New Prospectus, An Ancient Theme*.
 - ³ The approach here is original, which accounts on the one hand for the lack of direct references to the System, while on the other hand relating to a plethora of ideas expressed throughout history and far too numerous to attempt tabulation. Virtually every contributor to the world of ideas has glimpsed in some way some aspect of the System. The endeavor here is to illustrate a progressive structural development that is not itself dependent on language but from which the meaning in language derives. It appeals directly to intuitive insight. It is consistent with the structural dynamics of experience in such a way that it can offer pragmatic direction and application to the physical, biological and social sciences. It is a universal methodology that can complement traditional approaches to the sciences.
 - ⁴ In attempting to find ways to express the System, the author is indebted to the efforts of J. G. Bennett, who developed a Systematics based on the progression of the natural numbers and incorporating concepts of isomorphism and subsumption. Although the delineation of the System bears no correspondence to Bennett's Systematics, the latter nevertheless offers considerable heuristic value and was an encouragement to make this effort following profound cosmic insights that demonstrated how the cosmic order works. Bennett, J. G., *The Dramatic Universe*, London, Hodder and

Stoughton, 1956 (Vol. 1), 1961 (Vol. 2), 1966 (Vols. 3, 4). The development of the System here comes from these original insights into the cosmic order.

- 5 Attempts have been made to systematize the cosmic order throughout history, beginning with the creation myths of aboriginal cultures. Efforts became much more rigorous with the introduction of writing, number theory, and systems of measurement (c. 3000 BC) which gave rise to the sacred geometries that built the pyramids. The Pythagoreans were perhaps the last of an ancient tradition that perceived the cosmic order as an expression of number. The tetractys, employing the numbers from 1 to 4, expressed the ratios of the musical scale and was also related to the decimal system, the sum of the digits adding to 10. (Guthrie, W. K. C., Pythagoras and the Pythagoreans, in *History of Greek Philosophy*, Vol. 1, Cambridge, 1962.) It will be seen in System 4 that there is some foundation for this, but the System as introduced here delineates the roots of meaning from which the significance of languages, mathematics and numbers derive, not the other way around. Remnants of ancient traditions have persisted to the present day, with various attempts by philosophers and scientists to reintroduce the significance of number in theories of the cosmic order, for instance Johannes Kepler's dogged although unsuccessful attempts to discover a harmony of the spheres based on Pythagorean ideals. Modern science is much indebted to the spirit of the ancients rekindled in men like Kepler, Newton and others.
- 6 Italics are used to denote key words that are contextually defined and to further distinguish them if it is important in the context.
- 7 The relationship between an active and a passive aspect of experience, known as yang and yin respectively, is a prevalent theme of Taoist thought, so beautifully expressed in the poems of the Tao Te Ching. Blakney, R. B., trans., *The Way of Life*, NY., Mentor Books, 1955. It has found pragmatic expression in Chinese methodology since antiquity.
- 8 This was reviewed when the System was first introduced by the author as it related in a general way to organization structure, science, and the evolutionary process. Campbell, R., *Fisherman's Guide: A Systems Approach to Creativity and Organization*, New Science Library (Shambhala), Boston, 1985.
- 9 Bok, B. J., The Milky Way Galaxy, *Scientific American*, **244**, No. 3, March 1981.
- 10 Although this may seem a severe indictment of science, many like Richard Dawkins profess this belief, although it is doubtful they live by it to the full. Scientists are generally dedicated people. Currently there is simply no alternate paradigm that can bridge the gulf between the practice of science and our private emotional and spiritual concerns.
- 11 This work comes directly from an unusual series of cosmic insights of this general kind. This is not an intellectual contrivance of mine. There is more on this in the article *A Cosmic Insight* at www.cosmic-mindreach.com.

- ¹² This is generally consistent with Jung's theory of archetypes and the collective unconscious. See Volume 9, Part 1 of Jung's collected works.
- ¹³ Although the problem of identity is ancient and perennial, it centers mainly around two questions in both eastern and western traditions. On the one hand is the question of permanence through change. On the other hand is the question of unity in diversity. The picture that emerges in the delineation of the System is of a universal pattern to the process of change that is itself unchanging, and therefore permanent, while prescribing a dynamic relationship between the unity and diversity of experience.
- ¹⁴ A thoroughly pervasive isomorphism that manifests in different ways on different levels in the universal hierarchy, is again implicit in this requirement of the System. It is noteworthy that isomorphism is a fundamental tenet of Gestalt theory. Kohler, W., *An Introduction to New Concepts in Modern Psychology*. New York and Toronto, 1947; Rock, I. and Palmer, S., The Legacy of Gestalt Psychology, *Scientific American*, **263** No. 6, Dec. 1990.
- ¹⁵ A rigid behaviorism, that requires universal confirmation in the public domain, confines itself to the objective orientation, crippling itself accordingly. It must remain harnessed to physical causes of a local particular nature, operative in an assumed space-time context. While objective influences exist, there is no reasonable case that external causes account for all phenomena. This restrictive view of science cannot self consistently acknowledge hierarchies that are implicit in the natural order, regardless of how obvious they may be.
- ¹⁶ Kirk, G. S., and Raven, J. E., *The Presocratic Philosophers*, Cambridge, 1957; Taran, L., *Parmenides*, Princeton, 1965; Long, A. A., The Principles of Parmenides Cosmogony, *Phronesis*, Vol. 8 (1963), 90-107.
- ¹⁷ The term self-similar will be used to denote the isomorphism of experience. It is a more accessible description of the same structural pattern recurring in diverse areas of phenomenal experience.
- ¹⁸ The evidence points to closed event horizons in galactic centers. Yet black holes essentially provide a transition to and from a subjective mode in the synchronous organization of the whole physical universe. In later chapters it will be seen that black holes in galactic centers represent a common singular center or inside in the projection of the physical universe outside.
- ¹⁹ The quadruped format became established with the amphibians, the exception being the limbless snake which regressed back to the form of the more primitive eel.
- ²⁰ Papez, J. W., A Proposed Mechanism of Emotion, *Arch. Neurol. & Psychiat.*, **38**, 725, 1937.
- ²¹ MacLean, P. D., Contrasting Functions of Limbic and Neocortical Systems of the Brain and Their Relevance to Psychophysiological Aspects of Medicine, *Amer. J. Med.*, **25**, 611-626, 1958.

- ²² Sperry, R.W., Hemisphere Deconnection and Unity in Conscious Awareness, *Amer. Psychol.*, 1969; Sperry, R.W., Gazzaniga, M. S., and Bogen, J. E., Interhemispheric Relationships: The Neocortical Commissures; Syndromes of Hemispheric Disconnection. *Handbook of Clinical Neurology* 4, 273, 1969.
- ²³ See *Inside Our Three Brains* at www.cosmic-mindreach.com.
- ²⁴ Emotional experience that fuels behavior is subject to efflux and reflux at multiple levels via the multi-synaptic reticular system and the autonomic nervous system. In association with the limbic system, emotional patterns are refluxed into cerebral awareness to fuel the process of conscious thought. The role of the reticular formation was first explored by Magoun and Moruzzi, 1949, and reviewed by Magoun, H.W., *The Waking Brain*, Thomas, Springfield, 1958, 1963. See also Luria, A.R., *The Working Brain*, Penguin, 1973. This theme will be elaborated more in higher systems.
- ²⁵ The hierarchical levels are elaborated on in higher systems. They become more explicit in System 4.
- ²⁶ There is an obvious correspondence to Plato's Theory of Forms here. In the ancient tradition of gematria, with which Plato was familiar, this sometimes took the form of the Vesica Pisces, the fish shaped vessel formed by two overlapping circles of equal diameter such that the center of each is on the periphery of the other. One circle represents internal dynamics the other external forms as perceived in space, their spheres of influence overlapping. The former is universal, the latter particular, the two being incommensurable, yet reconciled in the living creative process.

Their mutual incommensurability is demonstrated in the circumference and diameter of the circle itself, π being an irrational number. This incommensurability tells us that there cannot be a completely accurate objective science in isolation from a subjective aspect. (The problem has found renewed expression in the principle of indeterminacy of quantum physics.) The ancients must have known this, for it was fundamental to their understanding. The pyramid of Cheops (Khufu) is a monument to this paradox, its height (480.5 ft.) being the radius of a circle whose perimeter is the same as the square of its base (4 x 755 ft.) within the limits of accuracy permitted by Sir Flinders Petrie's meticulous survey. The ancients saw this irrational incommensurability as a rift in wholeness reconciled by the creative process. Their worldview was a living process.

At the dawn of recorded history two related numerical systems had been devised, one based on 10, the other on 6. The sexagesimal system of ancient Sumeria, used to measure cyclic events, is the source of our units of time and angular measurement. The roots of English linear measurement also go back to the time of the pyramids and it is related to the sexagesimal system through astronomical measurements. For instance the diameter of the sun (666.6 x 6 x 6 x 6 x 6 miles), the moon (6 x 6 x 60 miles), the radius of the earth (6 x 660 miles), the distance of the earth to the moon (6 x 60 x 660

miles), the average orbital speed of the earth (66,660 miles per hour), are all combinations of the numbers six and ten. Not only is it remarkable that such relationships exist in the heavens, it is remarkable that a system of measures should be chosen to quite accurately reflect them in ancient times. Numbers were one avenue of access to the cosmic order and they must have devised means of making at least some astronomical measurements.

While there may be much that is nonsense written on the subject, there is much that is not. Unfortunately it is impossible to understand the ancient approach within the current paradigm of western science. John Michell makes an interesting attempt to illustrate this in *City of Revelation*, Ballantine Books, NY, 1973. See also Joseph Campbell's brief account in *The Masks of God: Volume II, Oriental Mythology*, NY., Penguin, 1976, pp. 115-121.

The earliest civilizations were founded on various expressions of the cosmic order. In ancient Egypt it was known as Maat, in Mesopotamia as Me, in the Vedic tradition of the Indus Valley as Rta, later retranslated as the Dharma, in ancient China it was the Tao. We need an integrating context to relate to. We need to bridge the rift in universal wholeness in living.

CHAPTER III

INTRODUCING SYSTEM 3

Abstract:

System 3 has two sets of three centers, one set being unique and universal, the other set being particular and manifold. Each set has two orientations making a total of four terms. They interact in pairs, alternating between a quantum frame and a space frame in the synchronous projection of phenomenal experience frame by frame, as in a cosmic movie. In the alternate quantum frame atoms transform into timeless and formless bundles of photon energy equivalents that are universally integrated into an orthogonal energy field that is called the Void. Linear time derives from the synchronous recurrence of space frames in which particulate sets delineate three dimensional atoms. Light originating from within atoms defines space with respect to each atom, linking up all atoms within each space frame to provide the integrated fabric of space-time. Space and time are quantized accordingly. The quark-like universal set tunnels counterclockwise through the particular set. This gives rise to charge between centers 2 (electron) and 3 (proton), whereas clockwise tunneling corresponds to a degenerate involutory variant and antimatter. A regenerative variant accounts for the neutron, being stable only in connection with the expressive variant that delineates the photon, electron and proton. The neutrino is a particle remnant of a photon associated with decay processes. A new quantum relativity emerges naturally with profound implications in many areas.

System 3 Generated by Two Sets of Three Centers:

System 3 is generated by two *sets*¹ of three independent yet mutually related *active interfaces or centers*.² There are only four possible ways that three centers can relate to one another with respect to a *universal inside* and *outside* consistent with Systems 1 and 2. Each way will be called a *term*, so that we may designate terms 1, 2, 3 and 4.

They are illustrated in the *passive perspective* in Figure III-1. They are shown in the *active perspective* in Figures III-2, III-3, III-4 and III-5.

We may expect the four terms to mutually interact in a pattern that elaborates on Systems 1 and 2.³ The terms thus derive from two interdependent *sets of centers*, one unique and universal, the other manifold and particular. Each set has two alternate orientations, one objective and one subjective, consistent with System 2, giving rise to the four terms in all. Terms 1 and 2 are alternating objective and subjective orientations of the universal set. Terms 3 and 4 are alternating objective and subjective orientations of the particular set.

Since terms 2 and 4 are subjectively oriented they always occur together in alternation with the objectively oriented terms 1 and 3. It will be said that they *cohere* together in each orientation. They interact as one. The alternate orientations of the mutually coherent two sets delineate what will be called the *primary activity* accordingly.

The Primary Projection of Space and Time:

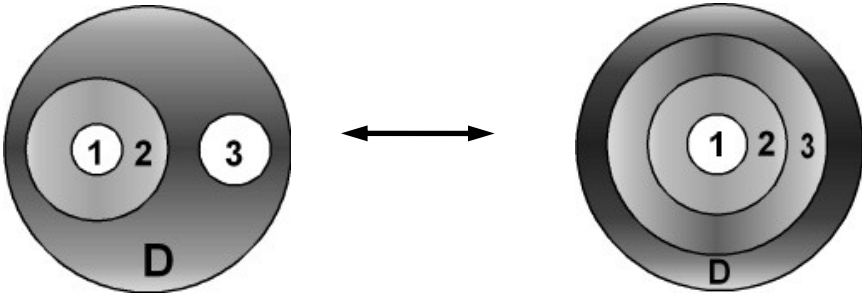
System 2 requires that System 3 elaborates with three dimensional physical forms that define the nature of space and time. On a purely physical level System 3 specifies the structural dynamics of the atom as it relates to electromagnetic energy. The three active interfaces or centers 1, 2, and 3 correspond respectively to photon, electron and proton in a primary hydrogen atom.

The particular and universal sets cohere together to define a particulate three dimensional space-frame to each primary hydrogen atom, alternating with a *formless and timeless quantum frame*. This results in a succession of integrated *atomic space-frames*. Because the timeless quantum frames collectively constitute the conjugate *Void*, each synchronous recurrence of a space frame defines a *primary interval of time*⁴ in the linear succession of three dimensional space-frames as in a *cosmic holographic movie*.⁵ (See Figures III-1, III-2 and III-3.)

Deciphering Meanings of Terms in Alternating Orientations:

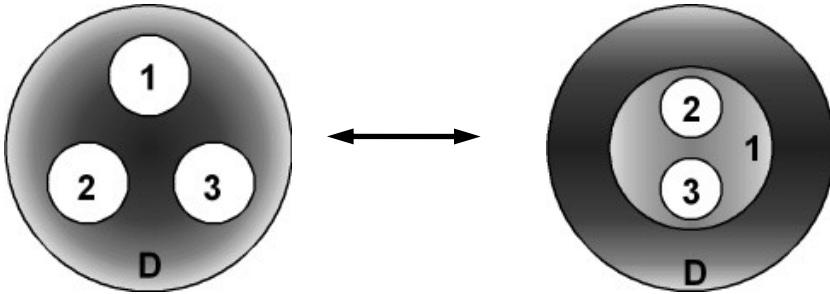
The alternating orientation of the universal set regulates the synchronous recall of the quantum energy equivalents of all atoms in the universe from the *Void* into particulate form, everywhere at once. This results in a very rapid series of synchronous frames that provide the *integrated fabric of space- time*⁶ in the *holographic comic movie*.

SYSTEM 3 TERMS
Passive Perspective



a) Term 2: Means
 (Universal)

b) Term 1: Discretion
 (Universal)



c) Term 4: Consequence
 (Particular)

d) Term 3: Goal
 (Particular)

Figure III-1

It will be said that the objective orientation of the universal set, term 1, has *discretionary characteristics*, since it integrates the quantum energies of the particular sets in the *Void*⁷ for coherent recall into another integrated space frame in the projection of the cosmic movie. This will be explained more later.

It will likewise be said that the subjective orientation of the universal set, term 2, acts as a *means* of linking up the three particular centers (photon, electron and proton) of each set into whole atoms everywhere at once. This will become apparent in the active perspectives as the two sets of terms *cohere* together.

The objective orientation of each particular set may be seen as a *goal*, since it combines the universal inside and outside of each atom in a timeless energy bundle. The active representation shows how the internal and external aspects of each atom find eternal reconciliation, which is nevertheless subject to recall by the universal set. The integrated *Void* of quantum energies is a boundless field with the characteristics of *universal wholeness*. This may be seen as a *goal*. The creative process must bridge the *rift in universal wholeness*.

In the subjective orientation of each particular set, term 4, the three centers form closed surfaces with respect to one another. This identifies them in three dimensions as photon, electron and proton respectively in the manner that they cohere together with the subjective orientation of the universal set. This will be called a *consequence* of the *primary activity*. The primary activity thus defines space and time with respect to each primary hydrogen atom. This general picture will be clarified when we examine the active perspectives of each term and how they cohere and interact together.

It should be noted here that subjective and objective orientations begin to compound within themselves. This is consistent with the way the System elaborates in discrete stages within itself. The complex compounding of subjective and objective orientations, one within the other, proliferates in all the higher Systems. For example Rover is a dog that is objectively separate from Tippy but they are both subjectively dogs that are objectively separate from humans even though dogs and humans both share subjective characteristics as vertebrate animals, and so on. Universals and particulars interact in cycles within hierarchical cycles.

This is why language is such a hopelessly simplistic tool to express the cosmic order. Linear logic can not untie the knots within knots that become ever more complex in the cycles within cycles of the higher Systems. Only the graphical representations of hierarchical relationships between the universal inside and universal outside can facilitate direct intuitive insight into the structural dynamics of the cosmic order. The meaning in language derives from this.

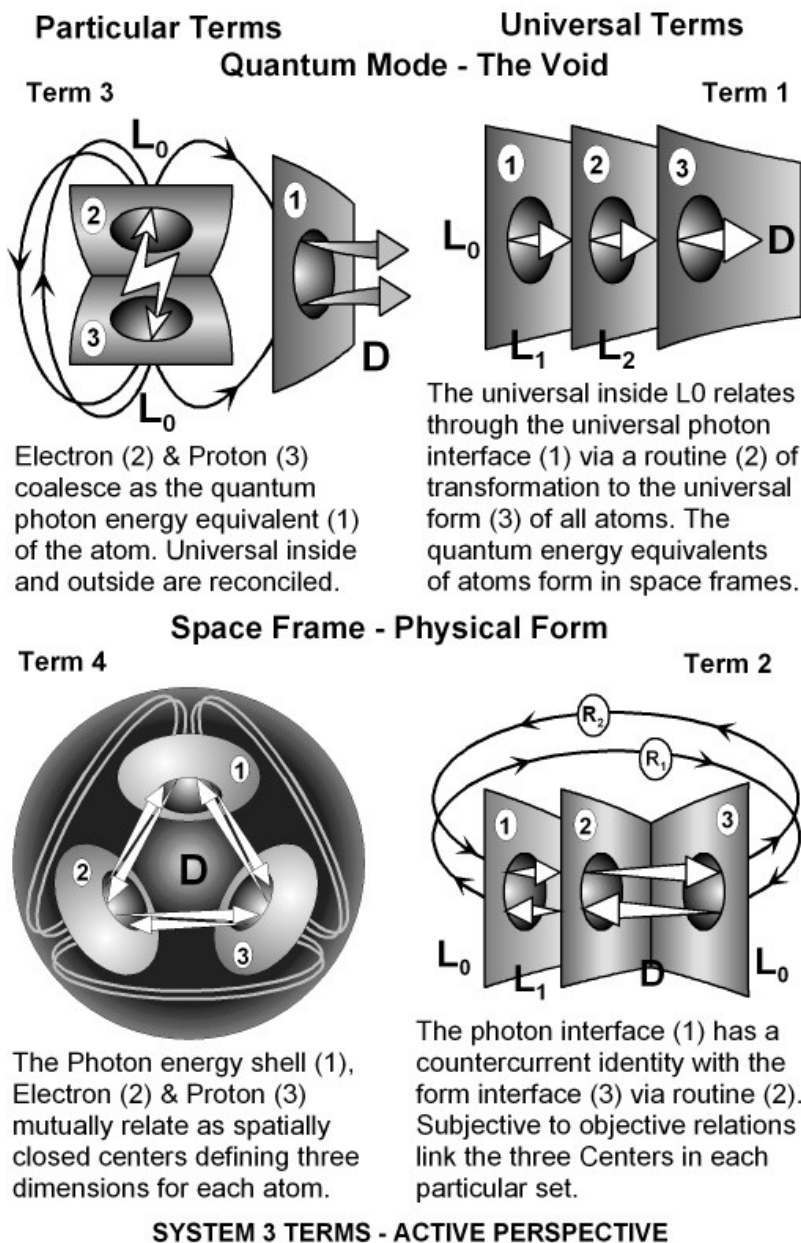


Figure III- 2

Three Dimensions to Space in the Subjective Orientation:

The three particular centers of the subjective orientation in term 4 are mutually separate and face one another. In order for them to be mutually separate they must be mutually *closed*. In other words they must exhibit mutually *closed surfaces* that define three dimensions or they could not be mutually separate. This requires that each of the three centers must exhibit *closed spherical characteristics*. They are represented by elliptical surfaces in the diagram of term 4. The photon interface exhibits a *closed spherical energy shell*. The electron and proton interfaces exhibit themselves as *hard physical particles of matter with mass*.

It can be noted here that the structural requirement for mutual closure is always implicit in three active interfaces that are mutually separate and face one another. Each must be spatially closed with respect to the other two. Yet they must remain *intimately related as a particulate triad of centers that define one whole*. This works in a variety of ways in the higher systems which become much more complex. **Only** triadic relationships of this general kind are mutually closed.

At the same time the universal set of three centers cannot exist as separate centers with three dimensional characteristics or they could not be universal. They can not define a three dimensional limit to the universe because this would contradict the universal center required by System 1.

The three universal centers are *open* as opposed to *closed*. Open centers are represented by two dimensional surfaces in the diagrams. They can not independently exist as separate things in space and time even though they are real centers. They transcend the limitations of space and time. In term 2 they universally define a subjective to objective relationship.

In the particulate space-frame, term 4, the open universal centers of term 2 are confined within each closed particulate set of three centers in term 4, like quarks, as shown in the space frame side of Figure III-3. They define the *subjective to objective relationship* between each of the three closed particular centers of term 4, namely photon, electron and proton. They *tunnel through the particular centers to intimately link up the three particular centers in pairs* to form each whole atom. They do it for all atoms everywhere at once.⁸ (Note that it is essential for the universal linking up between particular pairs of centers to proceed in the same countercurrent direction. No closed particular interface can have two universal centers.)

This means that primary hydrogen atoms universally consist of closed photon energy shells, particulate electrons and particulate protons that are *universally identical*. The photon energy shell provides a maximum spherical boundary or surface for each atom. It defines the *inner space of the atom*, distinct from *external space*. It is consistent with the *Idea* of a whole atom. The electron provides a *Routine* of activity that relates the photon energy shell to the proton. The mass of the physical atom is concentrated in the central *Form* of the proton. This is consistent with the way the universal set defines the universal hierarchy: *Idea* → *Routine* → *Form*.⁹ The photon, electron and proton are everywhere intimately linked by one unique universal set as whole separate atoms. Each physical atom is a distinct subjective orientation of how a particular and universal set *intimately cohere* together. This subjectively defines all atoms that objectively exist as separate physical things in external space as illustrated on the space frame side in the bottom half of Figure III-3.

The universal linking up of photon, electron, and proton in a neutral atom defines the inner space of the atom, distinct from the outer space between separate atoms. The *inner space is spherical and thus orthogonal to linear external space*. The photon energy shell defines the *ionization limit* of the atom. Light originates from within atoms and thus defines external linear space with respect to the inner spherical space of each atom in each space frame. The cosmic projection of independent atoms constitutes the *universal measuring rod of space relative to light*. Both space and time are quantized accordingly. Otherwise space and time have no universal meaning.¹⁰

The *universal means* to activity functions in different ways at different levels in the evolutionary hierarchy, but it always entails a balance between countercurrent identities that relate a subjective to an objective aspect. A thing's identity is known through a common sense belief that everything has both an inside and an outside.

In one sense perhaps we owe this to the Aristotelian side of our heritage and Aristotle's insistence that the essence of a thing is within the thing itself. But we see also, in this term, that everything is a member of some universal class or archetypal energy pattern, sharing characteristics with all things of its kind, just as Plato might have stated it in his Theory of Forms.

As an elaboration of System 2, the universal characteristics of System 3 transcend and subsume the particular characteristics, the latter becoming more explicit in the higher systems.

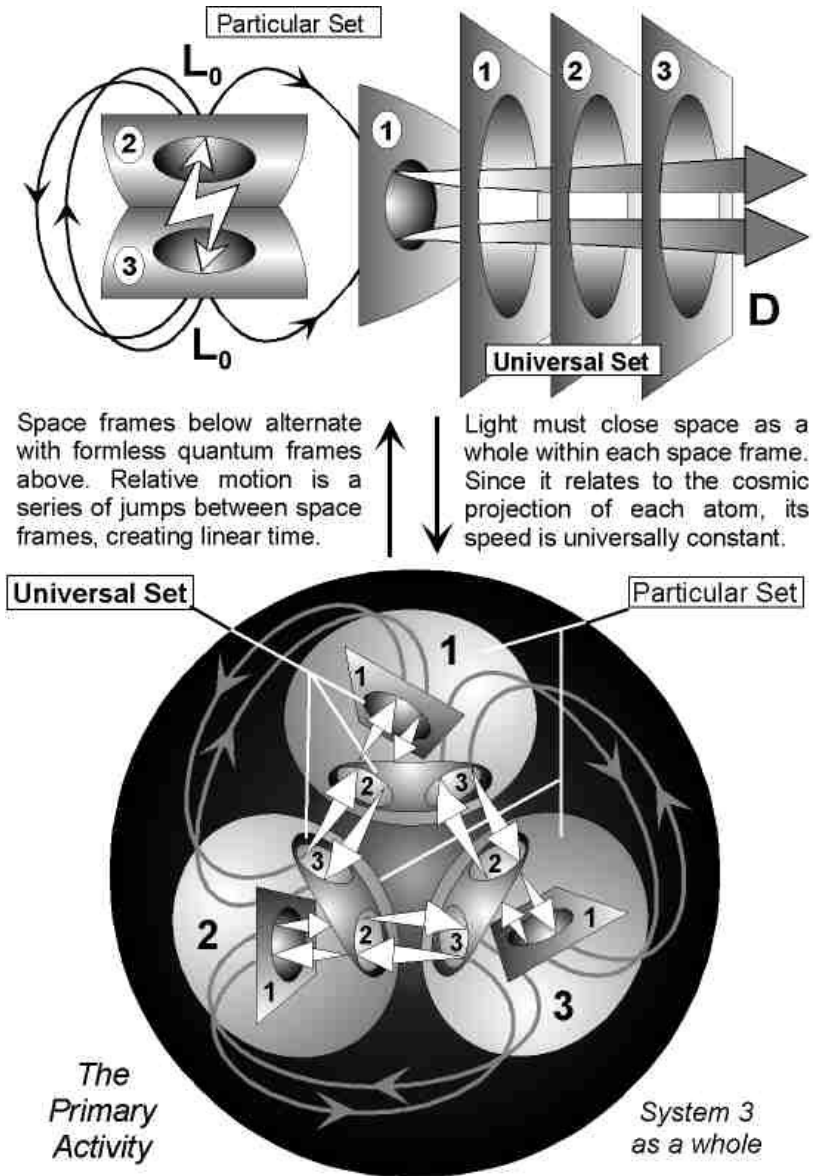


Figure III-3

The Quantum Frame as the Void:

The subjective particulate orientation has physical *form* as three dimensional surfaces. It is called a *space-frame* as illustrated in the bottom half of Figure III-3. The alternate *quantum frame* in the top half of Figure III-3 has no physical form. It is a balanced *quantum of photonic energy*. It is an energy package that timelessly reconciles inside and outside as it relates to each particular atom represented also by term 3 in Figure III-2. The photon, electron and proton centers that constitute each quantum equivalent of each atom are coalesced together as *one open photon interface*. All such open interfaces are energy equivalents of individual atoms and can be universally integrated as *One* by the universal term 1 illustrated separately in Figure III-2. They can be one with the universal photon interface (center 1 in term 1) that integrates the formless energies of atoms as a boundless energy field that is called *the Void*. The universal set in the top half of Figure III-3 integrates the quantum energies of all the atoms of the universe at once.

The Void embraces the whole of historical memory, in the broadest sense, while also placing certain constraints on the future because of the nature of the past and the structural requirements of recall back to the world of physical form. The Void *historically integrates* phenomenal experience. (Historic integration will become very important in later chapters.)

Atoms jump back and forth synchronously between the particulate space frames and quantum frames. Since the quantum frames are formless and timeless the particulate space frames close ranks to provide the illusion of continuous space. On the space-frame side this is called *the integrated fabric of space-time*. The timeless Void is *orthogonal to the integrated fabric of space-time*. There is an irrational boundless seam associated with the rift in universal wholeness between the synchronous projection of each integrated space-frame.¹¹ (*Space-time* is hyphenated to distinguish it from the *spacetime continuum* of general relativity.) In this way these two alternating modes define events in the *discontinuous projection of space and time*.¹²

The jumps back and forth define the *wave-particle character of matter*. Atoms are waves and particles *at the same time*, since each successive space-frame form a timeless quantum frame defines a *primary interval of time*. The wave character of matter only becomes apparent with relative motions. Exact *relative position* is defined in a *single space frame* while momentum requires a *succession of space*

frames. The more one is known the less the other can be known precisely, consistent with the *uncertainty principle*.¹³

System 3 and Electronic Charge:

The bottom half of the integrated System 3 diagram in Figure III-3 shows the universal set linking up the three centers of the particular set in pairs. Note that this happens in a counterclockwise direction such that the universal (U) and particular (P) Centers U-2, P-2 and U-3, P-3 correspond. They are *mutually aligned active interfaces*. There is a subjective to objective relationship between electron (P-2) and proton (P-3) that is associated with electronic charge. The particulate electron interface (P-2) has the universal photon interface (U-1) within it as it relates to the particulate proton (P-3). This means that there is a subjective to objective energy imbalance in the relationship of the electron (P-2) to the proton (P-3). Nevertheless the countercurrent identities of the universal set (represented by the elliptical arrows) that *tunnels* through and links electron and proton, require that the energy imbalance must be equal and opposite.

This energy imbalance that accounts for charge between electron and proton is reinforced by the inverse relationship of electron (P-2) and proton (P-3) in the way that they are independently linked to the photon (P-1) by the tunneling of the universal set.

If an atom receives sufficient energy to eject the electron beyond the ionization limit that defines the *inner space of the atom* prescribed by the photon energy shell, it still remains linked to its proton partner by *countercurrent identities*¹⁴ (R_1 and R_2 in term 2 of Figure III-2) of the universal set. This must be so since they remain linked as a quantum of photon energy in the timeless quantum mode. This requires that the universal photonic energy implicit in the countercurrent identities must span a succession of space frames to link electron and proton in the integrated fabric of space-time. The universal set will reach to the ends of space and time to do this.¹⁵ This drawn out spanning across space frames accounts for electromagnetic fields consistent with Maxwell's equations.

Note in the space frame side of Figure III-3 that if the tunneling of the universal set that links P-1, P-2, and P-3 is reversed to a clockwise direction with respect to the particular set then centers U-3, P-2 and U-2, P-3 do not correspond. Their alignment is mutually reversed. The universal imbalance that determines charge is thus reversed, resulting in antimatter. This is a *degenerate variant* of System 3 that is normally

very short lived. It is called the *involutionary variant* as opposed to the *evolutionary variant* of a normal atom. (There is also a *regenerative mode* of System 3 that defines a neutron.¹⁶ The neutrino qualifies as a photon remnant of decay processes.)

Conjugate Identities and the Void:

The quantum frame is the *inverse* of the particulate space-frame. A close examination of the quantum frame with respect to the space frame in Figure III-3 illustrates the inverse relationship. In the space frame the universal set is confined inside the closed centers of the particular set linking them up. In the quantum frame the particular set is confined within and integrated with the universal center 1. Each particular atom is quantized as a particular photonic energy bundle, center 1. Collectively all such quantized photonic energy bundles constitute the universal photonic center 1 in the universal set.

In the space frame the photon energy shell C1, the electron C2, and the proton C3¹⁷ are mutually closed separate surfaces. In the quantum frame the electron and proton are coalesced as one with the open photon interface.

There is a mass-energy equivalence between the quantum frame and the particle space-frame of the atom as a whole in each succeeding space-frame. There is no particulate motion within each space-frame. This includes the fabric of each integrated space-frame that defines a synchronous still projection of the whole physical universe. All relative motion occurs as quantum jumps in position between space-frames. The only activity within each space frame is electromagnetic in nature. The integrated fabric of space-time is a linear series of still frames. The universe is very rapidly disappearing and recurring with and before our eyes.

Light is in *active reflux* through the physical form of the cosmic movie. Light links up all atoms to define external linear space relative to the inner spherical space of each atom. There is an inverse relationship here also since *linear external space is orthogonal to the inner spherical space of each atom*. In the quantum frame the internal and external aspects of each atom are coalesced in an eternal relationship that is integrated in the Void and *the Void is orthogonal to the integrated fabric of space-time*.

Later we shall see that relative motion introduces *relative space-frame skipping* which accounts for *relativistic effects*. For now it is enough to see that there is equivalence between the quantum energy equivalents in the Void and the *immediately following* projection of an

integrated space frame. Since this can involve a relative skipping of space-frame sequences there can be a corresponding increase in quantum energy associated with a moving particle that can manifest as increased relativistic mass.

It will be said that there is a *conjugate identity* between each particulate atom in a space frame and its *relative formless energy equivalent* in the preceding quantum frame, consistent with the Schrödinger wave equation.¹⁸ When we are considering a particle moving with respect to a fixed apparatus there is a relative skipping of apparatus space frames with respect to the particle so the particle assumes relativistic distortions consistent with the Lorentz Transformations. This will be revisited in a later chapter.

Keep in mind that all of the quantum energy equivalents of each and every atom in the universe are integrated into a unified quantum field by the single universal set of three open centers. This boundless energy field called the *Void* has meaning distinct from the so-called *vacuum* of traditional physics.

Conjugate identities between space and quantum frames are clearly distinct from how we normally interpret the physical equality between physically separate things such as two identical atoms in the integrated fabric of space-time. The mathematical equals sign generally relates to the latter kind of identity where we may say the mass of one atom equals that of another. We shall call this Aristotelian identity to distinguish it from conjugate identity. There are also triadic identities associated with how the universal set tunnels through to intimately link the three particular centers of the atom in each space frame. These are associated with quark theory.

The Integrating Power of the Universal Set and the Void:

The universal photonic interface (Center UC-1) is the most central one in the universal set (term 1) of the quantum frame that integrates the energies of the Void. It contains the universal inside L_0 and relates out through the electronic interface (UC-2) which in turn relates out through the universal protonic interface (UC-3) to the universal outside D. (See the Figures III-2 and III-3.) This defines a step-like progression from light energy inside to darkness outside.

However the Void is a formless and timeless energy field without specific boundaries or spatially explicit phenomena of any kind. It has boundless space-like characteristics as a holistic energy field and yet it is totally Void of phenomena.¹⁹ It is *spatially indeterminate*. So the

step-like or time-like progression can only be realized by a synchronous transformation back to the particulate mode where all atoms in the universe are recalled as separate three dimensional forms. This in fact defines a *primary interval of time*. The Void is thus a *master sensorium*. It is a master *memory bank* from which the universe of *forms* is recalled.

All physical atoms in the universe are thus synchronously recalled and projected from the Void as a discrete succession of independent space frames linked up by light. The electromagnetic spectrum is sliced across its entire breadth by the synchronous projection of each successive space frame. This accounts for Plank's constant and the quantization of light energy. Light is emitted and transmits as a series of discrete pulses consistent with each space-frame.

The particular quantum energy equivalents of each atom are open in the quantum mode since they can not be specifically identified. They are universally integrated as the one Void. The particular proton (PC-3) and electron (PC-2) are coalesced as *One* within the open photonic interface (PC-1). The particular electron and proton interfaces relate inside one another and thence outside through the open photonic interface. (Examine the diagrams closely to see this.) In this way they reconcile the universal inside with the universal outside. The internal and external aspects of each particular set are eternally balanced.

While the quantum energies of the Void are eternal, they are also subject to recall by the universal set. As constituents of suns, planets, comets etc., atoms are perpetually in a state of complex relative motions from space-frame to space-frame. Constant relative velocity does not involve any energy change between space frames but it does involve a constant process of relative space frame skipping. Acceleration on the other hand involves energy changes from space-frame to space-frame that are associated with an increase or decrease in relative space-frame skipping.

These relative changes from space-frame to space-frame are effected through the Void by the universal set as it transforms from the objective orientation, term 1, back to the subjective orientation, term 2, in each succeeding space-frame. The universal set spontaneously integrates the universe of change frame by frame in the synchronous projection of the cosmic movie. It has discretionary characteristics that derive from the need for the physical universe to have a preponderant degree of *coherence* with itself. It is this universal property of *coherence with all particular sets at once* that preserves a preponderance of synchronicity in the universe as a whole. Electromagnetic fields that

span and integrate a succession of space-frames to the very ends of space and time are very much involved in these discretionary characteristics of the universal set.

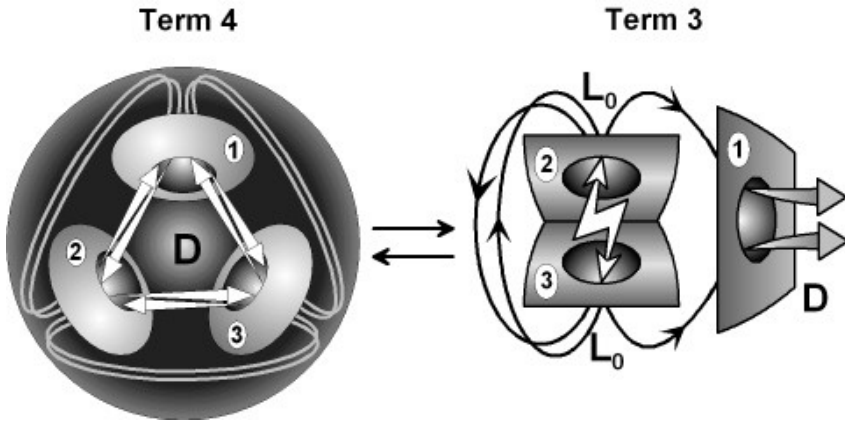
Another Look at the Particular Transformations:

The universal hierarchy of System 3 has been identified with the symbolic expression *Idea*→*Routine*→*Form*. In any human activity we give *Form* to *Idea* through a *Routine* of activity. We give form to an *Idea* in a painting by the *Routine* of making repeated brush strokes until the *Form* of the picture matches the idea we had in mind. So the primary activity relates to all activity.

In the particular *goal* term shown as term 3 in Figure III-4, centers 2 and 3 of each particular set are coalesced as *one* within center 1. The universal *goal* of activity is the realization of unity implicit in the *idea of universal wholeness*. This is achieved through the reconciliation of the subjective and objective aspects of experience as a creative enterprise.

In this term 3 we find that the particular *routine*, center 2, is coalesced with the particular *form*, center 3, within the *idea*, center 1. The *coalescence* of centers 2 and 3 together represents an element of *technique* by which a specific *routine* results in a specific *form*. In other words the particular idea implicitly contains a *quantization of technique* and yet the centers are open and unbounded, taking no specific identity as a physical form. The *routine* of pottery making coalesced with a *form* is nevertheless implicit in the *idea* of a vase. When we see the vase we appreciate the technique of its manufacture.

There is another way to visualize this. In term 3, centers 2 and 3 objectively relate directly to one another, but not directly to center 1. They are inside center 1, being subjective to it. Centers 2 and 3 each contain the primary level of active intensity designated L_0 , so that they form a mutually coalesced identity illustrated by the countercurrent flow within L_0 . But since they are mutually *coalesced* as one, they also relate inside one another, thence outside through their common periphery, center 1. If there was no coalescence, there would be an intermediate graduation of active intensity, L_1 , that would relate out through center 1 to darkness. But this is superseded by L_0 in the coalescence. Centers 2 and 3 thus relate both inside and outside *at the same time*, reconciling the subjective and objective aspects of experience as a quantization of *routine* with *form*. This is an *element of technique* that makes the idea a reality, but not as a physical entity within this objective term.



Particular Transformation

Figure III-4

The particular term 3 has no time-like characteristics as in the successive steps from a common inside to a common outside indicated in the universal term 1. On the contrary the term reconciles the internal and external aspects of experience through their *simultaneous* realization. Since the centers relate neither internally nor externally to the exclusion of the other, but rather both at once, it is an *eternal* relationship. The term thus represents a timeless element of cosmic memory in which energies are balanced in the realization of unity.

The cosmic memory is a *master sensorium* of quantized experience that is non-specific. It cannot be identified in space, or located in time. It is a mirror reflection of the whole of space and time as an indeterminate field of ordered energy from which quantized elements are assimilated by the universal set in the projection of the cosmic movie. Before pursuing this further it will be helpful to first take a look at Term 4.

Note that the transformations back and forth between terms 3 and 4 occur with the perceptual transposition of center 1 with respect to centers 2 and 3. It is the photon interface that turns around to face the electron and proton in the transformation to term 4 or to contain them within itself in the transformation back to term 3.

The particulate world of our normal sensory experience, in which we see everything as separate physical things, is a *consequence* of the

primary activity as delineated by System 3, and as further elaborated upon by the higher systems. The three centers of term 4 are mutually balanced in an objective relationship, within the subjective context of the term. The term is a *consequence* of the balance achieved in term 3, the objectively oriented *goal*.

A balanced objective relationship between three mutually independent active interfaces requires that they be spatially closed, as illustrated in term 4. They cannot be open unbounded interfaces and remain mutually independent as forms in the fabric of space. We thus find particulate matter to have spatially identifiable surfaces. And the suns planets and people that are clothed in particulate matter themselves assume closed forms in mutual relationships with spatially bounded ideas and routines. The primary activity is a universal pattern to all activity.

The three centers mutually interact to sustain their mutual balance, but through darkness. This imposes some rather curious requirements. Keep in mind that we are considering a single particular set, representative of all particular sets. The centers within each set are intimately related, unlike separate grains of sand on a beach, or separate molecules in the air, which consist of molecular collections of separate particular sets. We are talking about the kind of intimate relationship that exists between the nucleus, the cytoplasm and the membranes of a cell, or between the photon, an electron and a proton within an atom of elemental hydrogen.²⁰

Each of the three centers perceives two others as separate and distinct, yet mutually essential to their mutual being. Each particulate center is linked to the two others by the *countercurrent identities* R_1 and R_2 of the universal term 2 that tunnels through the particular centers in pairs to intimately link them up. No set of *relational wholes* can form *countercurrent identities* between any two of the centers to the exclusion of the third. Each center must admit of a *double identity* that finds confirmation in the double identity of each of the other two centers. The resulting countercurrent identities require that there must be *closed surfaces* or *boundaries* that are spatially specific because of their dual nature. They cannot relate one on one, but must relate one on two, since all three are united as one.

In the case of photons, electrons and protons in primary hydrogen atoms this dual identity makes them physical surfaces, distinct from the open unbounded interfaces of the universal set. Atoms assume physical forms in the tight succession of fleeting increments of time. They exist

between transformations back into the orthogonal quantized elements of memory that are timeless and thus span space and time..

Humans are dressed up in atoms and molecules that constitute a physical body and yet we can entertain Ideas that we can translate into Forms by specific Routines that are not themselves physical things. A pair of shoes is a human *Idea*. We employ *Routines* of activity to shape the molecules of leather into *Forms* consistent with the *Idea*. Human creations are inherently distinct from atoms and molecules as things in themselves. Nevertheless all physical human activity works with physical matter. That does not mean that all human activity is causally driven by physical matter. We have evolved up through the species, climbing the ladder of sentient awareness from plants to invertebrates to vertebrates to human. In the process we have learned how to manipulate the physical environment through our creative endeavors employing the self-similar application of the System.²¹

Human beings are archetypes of System 2 clothed in the three dimension molecular forms of System 3. The archetypes of System 2 are highly organized active interfaces that transcend and subsume System 3 and with it events in space and time. The archetypes that transcend space and time give meaning to physical phenomena not the other way around.

Another Look at the Universal Transformations:

In term 1, the centers are nested one within the other, such that energy transformations successively traverse centers 1, 2 and 3 from a universal inside to a universal outside in darkness. There is nothing mysterious about this. Everyone knows that an *Idea* gives direction to *Routines* of activity that give direction to *Form*. This universal hierarchy is represented as *Idea* → *Routine* → *Form*.

Term 1 is an objective orientation since all three centers relate from a common inside to a common outside in darkness. Two intermediate graduations of active intensity are designated **L₁** and **L₂**. They represent the *Idea activity* that is subjective to *Routine* and the *Routine activity* that is subjective to the *Form* as it takes shape. In System 3, each of the universal centers is *open* and *unbounded*. This means that they relate universally to the whole of phenomenal experience. In a primary hydrogen atom this means that they relate to all the atoms in the universe at once. They also apply in a primary way to all human activity. Any *idea* is translated into a *form* through a *routine* of activity, from procreation to building a house or driving a car.

The *step-like progression* in the universal term 1 from center 1 to center 2 to center 3 designates a process of transformation in a time-like way. But this activity is not continuous. As pointed out before it takes place in discrete steps. These steps involve the active *Routine* of transforming to the alternate subjective orientation, term 2, where the *Idea* assumes a specific *Form*.

Since the universal hierarchy of term 1 is *discretionary* not any *routine* of activity will do. Even electrons are not free to roam in random orbital *routines*, for they are part of one, coherent, highly ordered creation. Quantum numbers are a reflection of the cosmic order that implicitly imposes a regimen upon events at the atomic level. Term 1 works in conjunction with term 3 by selecting the quantized elements of technique that are appropriate in the ongoing projection of the cosmic movie.

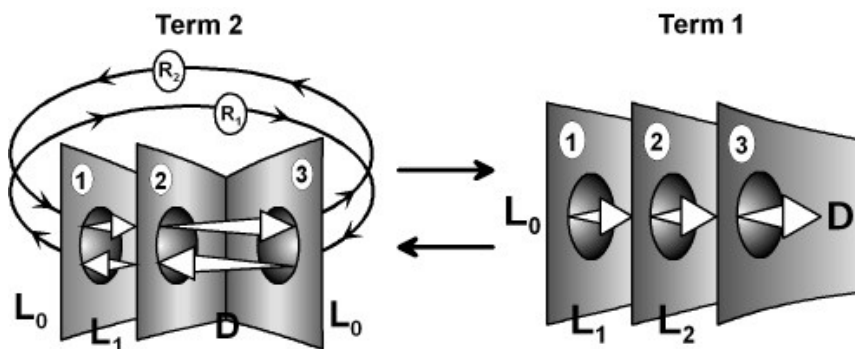
The universal set transforms from the objective orientation term 1 to the subjective orientation term 2 by the *perceptual transposition* of center 3, the proton or *form* interface. Note that this is the inverse perceptual transposition of the corresponding particular set transformation. The particular term 3 transforms to term 4 by the perceptual transposition of the photon *idea* interface, center 1. This implicitly requires that the *form* of the particular photon energy shell must relate to the closed *forms* of the electron and proton in a manner consistent with the universal *form* of all atoms.

The *countercurrent identities* of term 2 are illustrated by the relational wholes \mathbf{R}_1 and \mathbf{R}_2 . They relate the *idea* to the *form* through the *routine* and there is feedback from the *form* to the *idea*. In \mathbf{R}_1 the subjective *idea* behind the *routine* lends it direction as it relates objectively to the *form* and there is countercurrent feedback \mathbf{R}_2 in the opposite direction.

We are familiar with this in human activity. If we are making a vase on a potter's wheel the *idea* of the vase directs our *routines* that give shape to the *form* of the vase. And we get countercurrent visual feedback until we see that the *form* of the vase matches the *idea*.

There is a physical correspondence to this countercurrent process in the way the photon, electron and proton mutually interact as separate centers within the atom. An examination of the space-frame side of Figure III-3 shows that each of the three closed particulate centers has three universal centers confined within it, as the latter intimately link up the former. Within the proton, represented by the particulate center 3, there are two universal centers that relate in one

direction to the photon (UC-1 and UC-2), and one universal center that relates in a different direction to the electron (UC-3). There is a direct correspondence here to the two up quarks and one down quark that universally characterize all protons.²²



Universal Transformation

Figure III-5

Quarks are thus perceived, not as fundamental particles, but as three universal active interfaces that reinforce closed particles in their double subjective to objective identities in their sets. In System 3 there are three universal interfaces active within the particular photon and electron as well, but in a way that reinforces their relationship to the central Form of the proton. This interpretation is substantiated by regenerative role of the neutron outlined below. The neutron has two down quarks and one up quark.²³

As mentioned before antimatter involves the reverse clockwise linking up of the particular sets by the universal set. This degenerative mode of System 3 has the effect of reversing charge.

It is also possible for particle accelerators to produce other particles that are transient homologues of System 3, however they are highly unstable. Other fleeting “resonances” possible in high energy collisions tend to reflect symmetries of Systems 4 and higher. This does not mean that they are fundamental building blocks of atoms. On the contrary, the System indicates that they are highly transient phenomena of a higher order.

The Regenerative Mode and Neutrons:

There is only one other structural possibility in System 3, and it corresponds to the neutron, a particle that decays into a proton, an electron and an anti-neutrino. The three are intimately bound as one in the neutron, which is quite stable within a stable nucleus. The photon energy shell is collapsed in a neutron. It is bound with electron and proton into a single particle.

The sequential order of the universal set normally proceeds as *idea* \mapsto *routine* \mapsto *form*. The reverse sequence makes no sense as a creative activity. As a universal means to activity, *idea* is subjective to *routine*; *form* is objective to *routine*. The *form* of the painting is the creative translation of the *idea*, not vice versa. But given the painting in completed *form*, it can and does evoke the *idea* implicit within it. There is a *transference of idea* from creator to observer through the medium of the completed painting. In this limited context, Marshall McLuhan may have had a point: “The medium is the message.” The neutron as the *regenerative mode* is specific to the particular context in an atomic nucleus. Outside that context it is unstable.

Figure III-6 has been simplified to clarify features of the regenerative mode. The countercurrent relational wholes R_1 and R_2 of the universal set have been omitted. The direction of flow is still indicated by the light gradient within each of the universal centers that link up the large particular centers. The universal set is shown as small ellipses that tunnel across the boundaries of the particular set. Note that center 2 is perceptually transposed to contain center 3 and relate directly to center 1, thus binding the particular set together as form. Compare with Figure III-3.

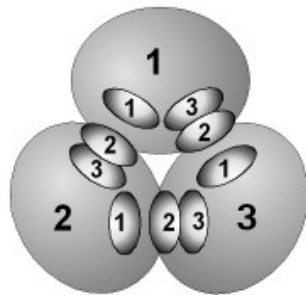


Figure III-6

If we picture the three particular centers of an atom combined together as one in a neutron (compare the space-frame side of Figure III-3 with that of Figure V-1) they effectively lose their independent subjective to objective identities as separate centers. There is no inner space to define them as separate entities as there is in a neutral atom. The photon energy shell has collapsed.

This is the case if the universal *routine* interface, center 2, does a *perceptual transposition*, such that it contains center 3, the *form*

interface, within it. In thus transposing the *routine* interface turns around to face backward, internally, toward the universal *idea* interface. The proton *form* is thus fed back as a unitary *idea* that binds the photon, electron and proton as one single particle. There is a photon binding energy required associated with the anti-neutrino when the neutron decays. This corresponds to the weak force or weak interaction in traditional physics.

This mode of a space frame set will be referred to as the *regenerative mode* of System 3. It involves the nature of unity in conjunction with the *expressive mode*. It occurs only in connection with the *expressive* mode within the context of the *evolutionary* variant of the creative process. Neutrons are thus found to occur in the fusion of heavier elements. We will return to this in Chapter V.

In the neutron note that the perceptual transposition of center 2 has turned one of the so called *up quarks* into a *down quark*, so that the neutron has two downs and one up, consistent with quantum theory. Since the binding energy that brings the three particles into intimate contact must occur within the context of an evolved form, the neutron is unstable outside the nucleus. In β -decay the reverse perceptual transposition transforms a neutron back to a hydrogen atom through the quantum frame.

In a free neutron an anti-neutrino is released to preserve momentum. This can be seen as a particle remnant of a photon since the *routine* electron interface reverses its orientation from the photon back to the proton. The energy released in the neutron decay is ample to eject the electron beyond the ionization limit of an atom. If the decay takes place in the nucleus of an atom the proton produced remains in the nucleus increasing the atomic number by one.

Summary Observations:

System 3 delineates the structural dynamics of the *primary activity* as a universal pattern inherent in all activity. It provides a universal methodology that complements traditional approaches to the sciences. System 3 relates especially to the physical sciences. Since this introduces a radical departure from currently accepted methods, a few general observations may help to clarify some points of departure.

- 1) System 3 is generated by two sets of three active interfaces or centers. One set is universal and one set is particular representing many of a kind. The two sets cohere together in alternating objective and subjective orientations.

- 2) The oscillating orientations of System 3 constitute a succession of particulate *space-frames* that define linear time, alternating with *quantum frames* that are quantum constituents of the formless and timeless Void. The Void is an eternal memory bank, or *quantum sensorium*, spanning and integrating the whole of history. It is orthogonal to the integrated fabric of space-time.
- 3) Each particular space-frame delineates the structure of a primary hydrogen atom that defines the spherical inner space of the atom distinct from the linear external space between atoms.
- 4) There is no particulate motion in a space frame, only electromagnetic activity. All relative motion occurs as quantum jumps in position between space frames. Relative motions between atoms introduce relative space frame skipping which accounts for relativity effects. A quantum-relativity emerges naturally.
- 5) Since all light is emitted from processes within atoms it defines external linear space orthogonal with respect to the inner spherical space of each atom. The speed of light is universally constant because light itself defines space with respect to each synchronous atom independent from relative motions.
- 6) Synchronous distortions result from patterns of relative motions, accounting for electromagnetic and relativistic effects.²⁴ Since space and time are quantized relative to each atom, relative space frame skipping due to complex patterns of relative motions in the heavens introduce a variety of effects. A new approach to cosmology results from the need for a preponderance of synchronicity in the universe as a whole
- 7) System 3 is not consistent with the spacetime continuum assumed as fundamental to general relativity. Curvatures in the integrated fabric of space-time result from patterns of relative space-frame skipping due to angular motions. Relative space-frame skipping is generally consistent with the effects of special relativity, albeit from a different perspective that acknowledges universal influences, including quantum correlation.
- 8) The System is not consistent with a Big Bang origin, since it is not consistent with a spacetime continuum and other assumptions essential to that theory. A new *quantum relativity* emerges with System 3, which has relevance also to subsumed biological and social systems of order.
- 9) The System acknowledges more than one kind of identity. Conjugate identities are clearly distinguished from Aristotelian identities and triadic identities. There are many profound implications involved in reinterpreting mathematical identities.

- 10) System 3 prescribes a coherent perspective of a discontinuous but synchronous universe. This requires that there is a minimum limit to the increment of the differential in the calculus. Quantum correlation and the uncertainty principle are associated. New methods are required that take cognizance of these phenomena.

REFERENCES AND NOTES

- ¹ In System 3 a *set* comprises three *intimately related active interfaces or centers*. They are fundamentally identified by a universal hierarchy that specifies their step-like progression from a universal center or inside to a universal periphery or outside. As before italics are used to denote words that are contextually defined and to further distinguish them if it is important in the context.
- ² Active interfaces are called centers for convenience. They exhibit a universal inside or center.
- ³ This does not mean that the centers of System 3 are derived from a partitioning of the centers of System 2. The Systems coexist and are not derived one from another in a temporal sequence.
- ⁴ The primary interval of time will be discussed in succeeding chapters.
- ⁵ This are similarities to David Bohm's implicate order. Bohm, D., *Wholeness and the Implicate Order*, Routledge and Kegan Paul Ltd., London, 1980. The System delineates specifically how the cosmic order works.
- ⁶ The integrated fabric of space-time is distinct from the spacetime continuum of general relativity. It is the synchronous projection of all atoms in the universe linked up by light in the succession of space frames that define linear time.
- ⁷ The Void is an accessible phenomenon in private human experience. It is cosmic as opposed to organic in nature. Taoist poetry is especially full of references to the Void.
- ⁸ This also means that the three centers of a particular atom remain linked even if they become separated far beyond the spatial limits of the atom. This provides an underlying mechanism to account for the paradox of Einstein, Podolsky and Rosen and the experimental failure of Bell's inequalities to rule out action-at-a-distance. This does not mean that action can be transmitted through the integrated fabric of space-time faster than light however. It occurs because of the universal synchronous projection of the universe that inherently links the particles intimately together. It's noteworthy that David Bohm has approached this problem of universals by introducing a quantum

- potential associated with all particles. Bohm, D., and Peat, F.D., *Science, Order, and Creativity*, NY., Bantam, 1987.
- ⁹ Hierarchies are an implicit characteristic of phenomenal experience. Logical paradoxes arise by not taking universal hierarchies into account. In Russell’s well known paradox The Contradiction arises when classes are treated as being on a par with their members. Russell, Bertrand, *The Principles of Mathematics*, 2nd ed., London, 1937.
- ¹⁰ The *universal means* to activity functions in different ways at different levels in the evolutionary hierarchy, but it always entails a balance between countercurrent identities that relate a subjective to an objective aspect. A thing’s identity is known through a common sense belief that everything has both an inside and an outside. In one sense perhaps we owe this to the Aristotelian side of our heritage and Aristotle’s insistence that the essence of a thing is within the thing itself. But we see also, in this term, that everything is a member of some universal class or energy pattern, sharing characteristics with all things of its kind, just as indicated in Plato’s Theory of Forms. As an elaboration of System 2, the universal characteristics transcend and subsume the particular characteristics, the latter becoming more explicit in the higher systems. Aristotle interpreted Platonic forms as universals, rejecting the implication of transcendence. He made a distinction between primary and secondary substance (in the *Categories*) in which species and genera, for example, assume a secondary status. Owens, J., *The Doctrine of Being in the Aristotelian Metaphysics*, Toronto, 2nd ed., 1957.
- ¹¹ Irrational numbers are closely associated with this lack of spatial continuity. Richard Dedekind recognized this in 1858. Space is everywhere continuous and also everywhere discontinuous. Dedekind, R., *Continuity and Irrational Numbers* in *Essays on the Theory of Numbers*, Dover publications Inc., NY, 1963
- ¹² The question of spatio-temporal continuity has raised problems for at least 2500 years, when Zeno of Elea first formulated his famous paradoxes to illustrate the absurdity of logic based on the assumption of a continuum which allows of infinitesimals. Raven, J.E. *Pythagoras and the Eleatics*, Cambridge, 1948. Using a kind of double speak the paradoxes were claimed refuted (yet again) by resorting to Internal Set Theory, which speaks of non-standard numbers which have *no numerical meaning* but disrupt the continuous topology of the so-called “real line.” McLaughlin, W.I., Resolving Zeno’s Paradoxes, *Scientific American*, Vol. 271 No. 5, Nov. 1994. Language can justify anything. The point is that Zeno’s arrow must reach the target on time because it travels a discrete distance in each primary interval of time. There is no paradox in a discontinuous universe because space and time are not infinitely divisible.
- ¹³ The formalism of quantum theory emerged out of a heated debate between Heisenberg’s discrete atomic states of matrix theory and Schrödinger’s wave

transitions from one harmonic mode to another. While Schrödinger's waves salvage a perceptual model of the atom, the wave function is deemed to suddenly and discontinuously collapse in making sense of quantum mechanical measurements. These two views have been generally shown to be mathematically equivalent and both are essential to the theory. In the context of System 3, their general equivalence is apparent if the wave motion is seen to result from a series of quantum jumps in position from space frame to space frame. However Heisenberg went further, claiming his uncertainty relations to be true and unalterable, even mounting a challenge to causality, while also arguing that statistical uncertainty enters because of the physicist's attempt to observe nature. Cassidy, D.C., *Uncertainty: The Life and Science of Werner Heisenberg*, NY., W. H. Freeman, 1991; Cassidy, D.C., Heisenberg, Uncertainty and the Quantum Revolution, *Scientific American*, Vol. 266 No. 5, May 1992. In the view offered here, it can be seen that position and momentum cannot be known simultaneously simply because relative position is defined within a single space frame, while motion is defined over a succession of frames.

- ¹⁴ The countercurrent identities are designated by Relational Wholes R_1 and R_2 . Relational wholes are formed when energy efflux from L_0 within one or more centers completes a circuit back to L_0 within another center. This is required since all active interfaces or centers share a universal inside, as prescribed by System 1.
- ¹⁵ Quantum correlation also stems from the coherence of the universal set with the synchronous projection of all atoms.
- ¹⁶ See Chapter V, *Science and Cosmic Order: A New Prospectus*, *ibid*.
- ¹⁷ C1, C2, C3 are used to designate the relevant centers. PC designates particular centers. UC designates universal centers.
- ¹⁸ The quantum energy equivalent of a moving particle is represented by the complex conjugate of the wave function in the Shroedinger wave equation.
- ¹⁹ The Void it is a highly structured energy field, as will become more apparent in higher systems. It goes far beyond the accepted attributes of the vacuum in physics parlance. The latter is currently seen as a kind of infinite well of virtual particles accessible only within the constraints of the uncertainty principle, and therefore unknowable. On the other hand it is a remarkable thing that the world's religious traditions have been making references to the Void and to an identity between form and emptiness for millennia, particularly in the East. Taoist poems are especially full of this kind of imagery and it's a central theme in the Buddhist traditions also. This same sensorium, structured through experience in a balanced way that reconciles inside and outside, is spatially indeterminate and one homogeneous whole. As the poet Wang Ching-yang expressed it long ago, "It's a vast and undivided expanse of shining mist." Blofeld, J., *Taoism: The Road to Immortality*, Shambhala, Boston, 1985. Normal access to this timeless

- repository is simply a function of appropriateness to the ongoing stream of spatial projection. It spans space and time. It integrates history. It is orthogonal to the integrated fabric of space-time.
- ²⁰ Elemental Hydrogen is primary in the projection of the physical universe. Biological and social structures that are better understood by higher Systems nevertheless have self-similar or isomorphic correspondences to System 3 also. For instance organic cells, body organs, and the host body as a whole, have an intimate mutual relationship in any multi-cellular creature that integrates how they work together as one.
- ²¹ Two biological theories, both claiming consistency with Aristotle, contend that the form of the whole organism is a teleological factor in the development of its parts, its behavior, and its physiology. The vitalism theory differs from the organismic theory in maintaining that there is a non-physical entity associated with the organism. While both theories lack the ability to illustrate the precise relationship of parts to the whole, so do purely mechanistic physicochemical approaches to biology. Woodger, J. H., *Biological Principles*, London, 1948. Schubert-Soldern, Rainer, *Mechanism and Vitalism: Philosophical Aspects of Biology*, trans. Robin, C.E., Notre Dame, Ind., 1962. Since the System is intimately concerned with the dynamic interdependence of the universal and particular aspects of experience, it offers a new approach to understanding the integrated structure and function of living organisms. This becomes much more explicit with the elaboration of System 4 in Part II.
- ²² The quark-lepton analogy associated with the electron may relate to the fact that both electron and proton are mediated by inverse relations with the photon, consistent with the countercurrent identities in the universal set. It is light energy in efflux and reflux that links the particles through space, whereas within the universal centers 1 and 3, the countercurrent identities are completed in L_0 in a manner that transcends space and time.
- ²³ Although the father of quark theory, the views of Murray Gell-Mann are not consistent with those expressed here. In quantum theory quarks are conceived as entities having specific independent mass in a kind of internal quark space, all quarks of a kind somehow managing to be identical for completely unexplained reasons, despite their confinement and weird properties. The point is that universals can't rightly be ignored by tacitly assuming them in another disguise. Science generally denies that universals as transcending influences are operative either in the nature of matter or in living biological processes. There are exceptions, however. For example Murray Gell-Mann appeals to unity in diversity themes in addressing social problems and our human need to cope with macroscopic complexity. Murray Gell-Mann, *The Quark and the Jaguar*, W. H. Freeman. NY, 1994. There are many contradictory positions held in the scientific community.
- ²⁴ Relative motions between electron and proton in the spherical inner space of an atom are of a different kind to that between different particular sets in

external space, or between electron and proton divorced from their atomic union. Motions internal to the atom cannot be relativistic in the same sense since it is a closed fully coherent relationship independent of external spatial referents in this respect.

CHAPTER IV

GRAVITY, QUANTUM RELATIVITY & SYSTEM 3

Abstract:

System 3 prescribes a discontinuous universe as an alternative to the spacetime continuum assumed as the foundation stone 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 that spans and integrates space and time. 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 world 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 and Coulomb forces follow similar considerations. Gravitational attraction between separate atoms contracts external space-frames since atomic quanta are united as one in corresponding quantum frames by the universal set. The Coulomb force is generated by the universal countercurrent identities that intimately link electron and proton in the inner space of the atom that are likewise united as photonic energy in the preceding quantum frame. Both forces reconcile the unity and separation between quantum and space frames in the same interval of time. The synchronous projection of atoms everywhere at once accounts for Mach's principle and the distinction between inertial velocity and 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 world box requires gravitational acceleration of galactic stellar populations to curve the integrated fabric of space-time at their centers with respect to their peripheries. The resultant contraction of the integrated fabric of external space-time requires a balance with internal space-time contraction through fusion process at stellar centers. Quantum relativity emerges naturally. This indicates new approaches to celestial dynamics and cosmology. Three distinct kinds of identity are distinguished by System 3.

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.”

This 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.

The discontinuous projection of space and time requires that 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.

If 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.

This alternate energy mode of mass constitutes a holistic boundless field that is orthogonal to the integrated fabric of space-time. 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. All light issues from within excited atoms and it thus has a universal relationship to each independent atom irrespective of 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 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 the 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.

The *primary interval of time* is 1.519×10^{-16} seconds², consistent with zero angular momentum in the first orbit of hydrogen and 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 is 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 external space between atoms. This circumference corresponds to the 12th orbit of a primary hydrogen atom. Hydrogen is the largest atom, since the 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, however, 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*.

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 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*. It is the primary member of a 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.³

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 increments.⁴ Are space and time infinitely divisible? Zeno's paradoxes indicate that this does not make rational sense. So do 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 amounts 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 space frames. Since space and time are quantized so is relative velocity, mass and momentum as it relates to the velocity of light. *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 field associated with the organization of 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 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 boundless⁵ 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.

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. It is energy in a dynamic process of *efflux* and *reflux* associated with the synchronous projection of matter. This is outlined in Chapter 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.

HISTORIC COORDINATES

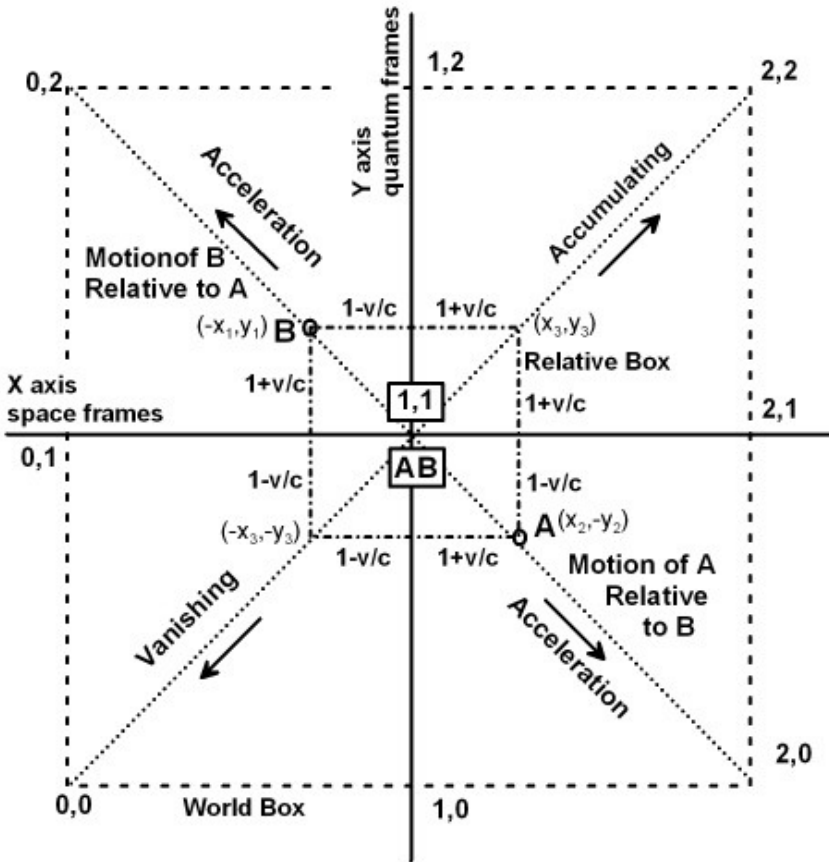


Figure IV-1

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 mass in the inertial frame of A has a *one-to-one mutual 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 at A *means* by being 1 unit along the abscissa and 1

unit along the ordinate. 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 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.⁶ 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 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 *mass* at A, represented by the abscissa $x=1$, times the square of the speed of light. $E=mc^2$. 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.

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 relative motion within the inertial frame of A.

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 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° diagonal above the negative x axis, as shown in the upper left quadrant of Figure IV-1.

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 equivalent to the 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 $x_2, -y_2$.

In either case the historic integration is represented by the area of this conjugate square. 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.⁷

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.

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 $T=T_0(1-v^2/c^2)^{1/2}$.

These are the same as the Lorentz transformations between any two inertial systems moving with constant relative velocity with respect to one another.⁸

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 whether this can be determined by measurements in space-time or not. Einstein dispensed with simultaneity.

Acceleration and Historic Coordinates:

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 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.⁹ The discrepancy in units between the two sides of the equation 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 and 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 in the frame of reference is very small. At relativistic velocities approaching the speed of light it becomes very large. 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 a zero point, 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 with respect to B there is only a doubling of mass-energy in the quantum field of the Void relative to A. This 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 within the context of 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 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 effectively 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 thus the reciprocal of the left hand half.

We thus find that although the Lorentz transformations apply equally between different inertial systems, there can be reciprocal relationships between them on a cosmic scale as illustrated by the world box. 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. And there must be coherence for us to observe phenomena in a coherent way.

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.

System 3 relates Newton's law to the synchronous projection of atomic space-frames everywhere at once. They are synchronously projected from the quantum energy equivalents of atoms that are integrated as *one* in the orthogonal Void. The quantum side is the reciprocal of space-frame side. This synchronous recall of independent atoms into particulate form also generates a reciprocal relationship between the spherical inner space of each atom and linear external space between separate atoms.

In this compound 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 will be 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 separation in external space relative to atomic inner space and also to the conjugate quantum equivalent in the Void. The integration as it relates proportionately to the gravitational force of attraction is 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.

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 a cliff 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 space-frames. They are not synchronous atomic space-frames that define the person's inner mass. The person is projected still space-frame by still space-frame synchronous with the planet.

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 and the person's inertial and gravitational mass remain the same.

On a cosmic scale gravity applies to the preponderance of synchronous mass and its spatial distribution in the entire universe. This is distinct from relative space-frame skipping due to linear velocities and forced acceleration. Gravitational force is the reciprocal of force generated through the physical expenditure of energy that results in linear acceleration.

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 and it is related to the synchronous projection of all matter everywhere at once.

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 everywhere at once 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 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. This demonstrated that the inertial velocity of the earth's rotation is something quite distinct from its gravitational mass which 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 swings is synchronous with its spatial relationship to

the universe at large and it remains unaffected by its proximity to the earth. General relativity can not offer an explanation as to why this is so.

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.*

The gyro compass works on the same principle known as Mach's Principle. It remains oriented in a fixed position relative to the "fixed stars." There is thus a clear distinction between gravitational mass and its inertial velocity, even though its inertial mass may remain consistent with gravitational mass in our stellar environment.

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.¹⁰

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 similar to that of gravity.

So 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. It results in 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 as it orbits in quantum jumps around the much heavier proton. This is structurally self-similar to the external Gravitational force between massive aggregations of separate atoms in suns, planets and moons.

Since historic integration defines a square relationship between the space-frame and the quantum frame even in a single primary interval of time, the Coulomb force is directly proportional to the square of the electronic charge, and inversely proportional to the square of the radius of the electron orbit that specifies the inner distance between electron and proton. 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 coherent radius of an atom the electron becomes ejected from the spherical inner space into the linear external space between atoms.¹¹

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 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 photonic 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 but 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 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 must be 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 quantum and space-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.

The reciprocal product of the permittivity and the permeability of free space $1/\epsilon_0\mu_0$ is equal to the square of the speed of light 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 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 that was believed at the time to fill all space, including vacuum. 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 roughly correspond to his intuitive notion of elastic distortions.

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.

We thus have an effect in the relative rotation of galaxies where 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 contracts space toward the center with respect to the periphery.

Since the gravitational acceleration does not in itself introduce relative skipping of atomic mass space-frames, but preferentially skips external space-frames between atomic or stellar masses, quantum forces are necessarily introduced that account for stellar formation and migrations of stellar populations. This relative contraction of space-time nearer the center requires matter to condense into stars that fuse space-frames of atomic mass into heavier elements that contract space to suit the local environment of space-time. This curvature of the integrated fabric of space-time also introduces a quantum force that results in the migration of younger stars toward the periphery and dense old stars back toward the center.

On a cosmic scale, however, represented by the world box, space frame skipping can proceed without limit. The continual acceleration of the whole 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. At this point the value 2 represents an energy equivalent of the mass of the stellar population accumulated in the Void with respect to the galactic center which has ceased to exist relative to the whole stellar population. There is a black hole at the galactic center that represents a singularity common to all galactic centers.

The upper left hand quadrant of the historic coordinates has a complementary relationship to the lower right hand quadrant. If we take B to represent the whole stellar population of a galaxy synchronous with itself at the origin of the coordinates we find that old stellar masses migrating back to the center lose their quantum energy equivalents as they approach the speed of light. B then represents the preponderance of synchronicity in the universe as a whole and old stellar masses move into the lower right hand quadrant of the coordinate system. As they accelerate around an accretion disc at the center they lose their associated quantum energy equivalent to the Void. There is no directly associated accumulation of quantum energy to prevent them reaching light speed

and disappearing completely beyond an event horizon at the center. This is consistent with a growing body of empirical evidence.

This singular condition in black holes is shared by galactic centers. It is associated with the primary synchronous projection of primary hydrogen in the universe as a whole. There is a generalized accumulation of quantized energy in the Void associated with the reflux of old stars back to the black hole that must be periodically released as a new generation of primary hydrogen emitted as efflux from the center. This is represented by the upper right hand quadrant of the historic coordinates. The accumulated doubling of both space-frames and quantum frames builds to restore the black hole to a synchronous condition with the universe as a whole. This finds expression in 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 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 in 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.

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” but quantum forces can qualify as “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 allow

mathematical treatment. In the next chapter 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 each number also has a qualitative aspect that defines it as a unified whole.^{12 13} This is analogous to the space and quantum frames of System 3. Also 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.¹⁴ This is consistent with the second kind of identity.

The second kind of identity we have 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 chapter 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 to some extent.

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.¹⁵

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."¹⁶

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.¹⁷ Einstein, however, remained adamantly opposed to the direction that quantum mechanics took until the end of his life.¹⁸

For Einstein, de Broglie, and others, the point of departure was Heisenberg's principle of indeterminacy. At 23, Heisenberg, working as Max Born's assistant, had found a mathematical rule in quadratic arrays. Max Born writes:¹⁹

...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.²⁰ 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 position is determined. It depends on the order in which the measurements relate to one another. The relative indeterminacy of the

two is 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.²¹

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 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.

REFERENCES AND NOTES:

- 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.
- ² This will be shown in the next chapter.
- ³ 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. Ciufolini and Wheeler, *Gravitation and Inertia*, Princeton University Press, 1995.
- ⁴ 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 *Analyst*, 1734. Luce, A. A., and Jessop, T. E., Eds., *The Works of George Berkeley, Bishop of Cloyne*, 9 Vols., London and New York, 1948-1957.
- ⁵ 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. *The First Philosophers*, translated by Robin Waterfield, Oxford University Press, NY, 2000.
- ⁶ This will be shown in Chapter V.
- ⁷ In developing his initial theory of the atom when working with Rutherford, Neils Bohr arbitrarily 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. We will return to this in the next chapter.
- ⁸ The arguments advanced by Lorentz (and independently by Fitzgerald), that the phase differences of light to be expected in the famous experiments of Michelson and Morley can be compensated by changes in the relative dimensions of the arms of the interferometer apparatus, is similar to but not identical to a relative skipping of space frames between the two orthogonal

arms. Michelson and Morley, *American Journal of Sciences*, **34**, 1887, p. 333; *Phil. Mag.*, **24**, 1887, p. 449. Lorentz, *Arch. Néerl.*, **2**, 1887, pp. 168-176. Lorentz H.A., Michelson's Interference Experiment, also Einstein A., On the Electrodynamics of Moving Bodies, both in *The Principle of Relativity, A Collection of Original Memoirs on the Special and General Theory of Relativity*, Methuen, London, 1924. Also Planck, M., Eighth Lecture (General Dynamics, Principle of Relativity.) *Eight Lectures on Theoretical Physics*, Columbia University Press, 1915.

- ⁹ They were identical before the Newton was introduced to mark the difference in units.
- ¹⁰ 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.
- ¹¹ 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 T.W., Schawlow A.L., Series G.W., The Spectrum of Atomic Hydrogen, *The Laureates' Anthology*, Vol. II, Scientific American, 1991. The primary interval of time is derived in Chapter V, where it is shown to be related to the red shift of distant galaxies and also to the cosmic background microwave radiation.
- ¹² Bertrand Russell attempts to define number in, *Introduction to Mathematical Philosophy*, Touchstone Books, NY, 1971. 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 quality. By the word 'class' he clearly intends a unifying quality which defines the quantitative number.
- ¹³ 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, 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.” Dirk J. Struik, *A Concise History of Mathematics*, 4th Ed., NY, Dover, 1987, p. 60.
- ¹⁴ 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.
- ¹⁵ Einstein, A., *On the Electrodynamics of Moving Bodies*. Ibid.
- ¹⁶ 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.
- ¹⁷ Dirac, P.A.M., *Is There an Aether? Nature*, **168**, 906, 1951.
- ¹⁸ 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. Objections to a probability approach have been expressed by David Bohm for many years. Bohm, D., *Quantum Theory*, Prentice-Hall, Englewood Cliffs, New Jersey, 1951. Albert, D.Z., *Bohm’s Alternative to Quantum Mechanics, Scientific American*, May 1994, Vol 270, No 5. 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.
- ¹⁹ Mehra, J., and Rechenberg, H., *The Formulation of Matrix Mechanics and its Modifications, The Historical Development of Quantum Theory*, Vol. 3, NY., Springer Verlag, 1982.
- ²⁰ Dirac, P.A.M., *The Development of Quantum Theory*, NY., Gordon and Breach, 1971.
- ²¹ There are aspects of this that are 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.

CHAPTER V

QUANTUM ATOMS AND SYSTEM 3

Abstract:

The Bohr model of the atom is fully reviewed, since it provided the foundation for developing the quantum mechanical approach to atomic structure. The most fundamental contributions to atomic and quantum theory are shown to be fully consistent with System 3. The primary interval of time is derived from the first orbit of the hydrogen atom, the number of intervals per orbit being the cube of the principal quantum number. The derivation of Louis de Broglie's wave equation is reviewed. Particle waves are clearly associated with relative jumps in position due to relative space frame skipping. The neutron is a regenerative mode of a secondary System 3. This applies to the fusion of the higher elements that contract internal space-time in stellar centers to compensate for contractions in the integrated fabric of external space-time due to relative space-frame skipping associated with the angular motions of stars. The perceptual transposition of the electron interface associated with the neutron accounts for the strong force and the weak force consistent with nuclear models. Inconsistencies in the Bohr semi-classical model are reconciled with the quantum mechanical model to provide transparent insight into the structural dynamics of the atom. A tertiary application of System 3 is linked to chemical synthesis and the evolution of planetary systems. The reflux of old stellar populations back through the galactic center regenerates the periodic primary projection of hydrogen radially outward to provide feedstock for new generations of stars. Galaxies are cells eternally regenerating their stellar populations. Alternate explanations for the red shift of distant galaxies and the background radiation are reviewed in Chapter VI on cosmology.

Early Work on Atomic Theory:

Atomic hydrogen has been the focal point of investigation in seeking out the mysteries of atomic structure, for obvious reasons.¹ It is the simplest element, each atom consisting only of a proton, an electron,

and photon, intimately linked as a coherent whole. The structure of hydrogen has become an open secret because its telltale spectral fingerprints are everywhere in evidence throughout the heavens. When heated, a gas emits light at certain wavelengths that show up as lines in its spectrum, and hydrogen is the main constituent of stars. It constitutes the bulk of the mass of the entire universe and is the stepping stone to the higher elements. Investigators into the mystery of the atom have focused on this prime candidate and the clues it offers toward understanding secrets of the cosmic order. It has been an admirable piece of detective work.

Following the pioneering work of Anders Jöns Ångström in the mid nineteenth century, Sir William Huggins identified ten spectral lines as being emissions of hydrogen in the spectra of stars. Johann Jacob Balmer followed up in 1885, showing that he could account for these lines by applying a simple empirical formula. Then the Swedish investigator Johannes Rydberg discovered in 1889 that the line spectra of many elements could be fitted by a single empirical formula.² For hydrogen the formula can be simplified to

$$\frac{1}{\lambda} = R \left[\frac{1}{m^2} - \frac{1}{n^2} \right] \text{ where } \lambda \text{ is the wavelength of the spectral}$$

line, R is the Rydberg constant, and m and n are integers.

The Bohr Model of the Atom:

In 1912, Neils Bohr was working in the laboratory of Earnest Rutherford, who had shown that an atom consists of a small dense positively charged nucleus surrounded by the required number of negatively charged electrons to make up a neutral system. In undertaking to explain the spectra of hydrogen atoms using this model, Bohr hypothesized that within the atom some well established laws of physics do not apply, otherwise an electron orbiting a nucleus would radiate away all of its energy. This deserves some emphasis. *Bohr hypothesized that some well established laws of physics do not apply within the atom.*

This remarkable statement makes a clear distinction between the internal space of the atom and the external space between atoms where the well established laws of physics do apply. He suggested that the electron could exist in a stationary orbital state without dissipating energy, and that light is emitted or absorbed only when it suddenly jumps from one stationary orbital state to another *without traversing the distance between orbits*. The frequency of the light is determined by the difference in energy between the two orbits, divided by Planck's constant h . This is in accord with the Planck-Einstein relation $E=hf$, where f

represents the frequency and E the difference in energy between electron orbits.

It was thus obvious that the expression $(1/m^2 - 1/n^2)$ in Rydberg's equation is proportional to the difference in energy between two orbital states m and n of the atom. Accordingly Bohr defined the value of the Rydberg constant in terms of electronic mass m , electronic charge e , and Planck's constant h .

$$R = \frac{2\pi^2 m e^4}{h^2} \quad \text{V-1)}$$

The interesting point in reviewing this is that Neils Bohr, in formulating his theory of the atom, had to make a number of postulates that are consistent with System 3. In doing so he had no compelling intuition about the System other than facing the necessity of reconciling the observed phenomena with a coherent theory of the atom. He followed no logical process of reasoning consistent with a prior basis of understanding. He set conventional wisdom aside together with the consensus of opinion. Like Max Planck before him, and Louis de Broglie after him, he took a flying leap of faith, a quantum leap, you might say.³ Bohr was trying to marry the Planck-Einstein relation $E=hf$ to Rutherford's orbital atomic model and they didn't seem very compatible. He nevertheless advanced the following propositions:

The Centripetal Force Postulate of the Bohr Atom:

He postulated that the centripetal force that holds the electron in orbit is equal to the angular momentum of the electron. The centripetal force that attracts the electron to the proton nucleus is the Coulomb force. It is directly proportional to the product of their electric charges (e^2 in the case of hydrogen) and inversely proportional to the square of their distance apart (r^2). This relationship, being similar to the gravitational force, was shown to follow directly from System 3 and historic coordinates in the last chapter.

There are important points from previous chapters to emphasize however. The charges on the electron and proton are equal and opposite because they are locked in an intimate one to one relationship *within one particular set*.⁴ They are equal in magnitude because the universal countercurrent identities R_1 and R_2 between the electron center C2 and proton C3 of the space frame in Figures III-2 and III-3 are *mutually balanced*. They have opposite charge because they have opposite subjective to objective orientations.

These mutual relationships are separate in the space frame and united in the quantum frame in the same primary interval of time. *There is no electromagnetic field extended externally through space*, as when the atom is ionized and the electron is separated from the proton by a distance greater than light can span in a single space-frame. There is no relative motion between electron and proton in the inner space of the atom in each space-frame. There is therefore no radiation associated with the electron's orbit to dissipate its energy and cause it to fall into the nucleus. These are not separate bodies in the same sense as a comet going around the sun.

The inner space of the atom is a closed system in this respect. Electromagnetic activity is *confined* within the neutral atom. It determines the fundamental identities of photon, electron and proton by their mutually intimate structural relationship. Nevertheless this internal relationship must be reconciled with the realities of external space. Bohr thus equated the centripetal force holding the electron in orbit with the Coulomb force, assuming a circular orbit, as follows:

$$\frac{mv^2}{r} = \frac{e^2}{4\pi\epsilon_0 r^2} \quad \text{V-2)}$$

where m is the mass of the electron, v its velocity, r its distance from the nucleus, and ϵ_0 is called the permittivity of free space, a constant necessary for dimensional consistency.

Equation V-2 may be rewritten as follows:

$$v^2 = \frac{e^2}{4\pi\epsilon_0 mr} \quad \text{V-3)}$$

The Angular Momentum Postulate of the Bohr Atom:

Bohr also placed a quantum condition on the orbital angular momentum, *although there was no apparent justification for doing so*. He required that *only certain* stable “non-radiating” orbits for the electron are possible, and that the angular momentum must be an integral multiple of $h/2\pi$ as follows:

$$mvr_n = \frac{nh}{2\pi} \quad \text{V-4)}$$

where n is a whole number (1, 2, 3, ... etc.) that identifies the orbit. It is known as the *principal quantum number*.

Solving equation V-4 for v and squaring both sides gives

$$v^2 = \frac{n^2 h^2}{4\pi^2 m^2 r_n^2} \quad \text{V-5)}$$

where r_n represents the radius of the n^{th} orbit with principal quantum number n . Equation V-5 can be substituted in equation V-3 to give

$$r_n = \frac{\epsilon_0 h^2}{\pi m e^2} n^2 = n^2 a_0 \quad \text{V-6)}$$

thus $r_1 = a_0 = \frac{\epsilon_0 h^2}{\pi m e^2} = 5.29 \times 10^{-11} \text{ meters} \quad \text{V-7)}$

where a_0 is called the *Bohr radius*. It is the radius of the first stationary circular orbit, where $n=1$.

No wonder Bohr created a stir. In equation V-4 he introduced that troublesome group of symbols again, $h/2\pi$, as if h was the circumference of a universal cycle of time and the amplitude, meaning the radius of the circle analogous to the cycle of time, was related to angular momentum. Why should that be so?

Let's take another look at System 3. A primary interval of time is defined as the duration of a single space-frame expressed in classical units of time, and within a single space-frame only electromagnetic activity takes place. Particles only move in quantum jumps between space-frames, so momentum is quantized accordingly. Each jump is directly associated with the cycle of action designated by h . The electron jumps move around the circumference of the spherical energy shell as specified by the closed photon interface a fixed distance from the proton. The linear radius r is incommensurable with the circumference because of the irrational nature of π , but the electron's relative motion is discontinuous from space-frame to space-frame. That is *why π is irrational*. Each jump around the circumference is made through the agency of the orthogonal Void.

There was no justification for the assumed equivalence between the angular momentum of the electron with $nh/2\pi$ expressed by equation V-4 until Louis de Broglie later pointed out the *wave resonance* between the electron and its orbital path, according to equation V-8 where λ represents the *de Broglie wave length* of the electron. (We will come to de Broglie's derivation of his wave equation and its relationship to System 3 shortly.)

This view is consistent with System 3 because the relative jumps in position of the electron around each orbit must be a constant whole

number multiple of $h/2\pi$. This expression for wave length represents each jump. There can be no such a thing as part of a jump. The de Broglie waves are not a continuous wave motion through a space-time continuum. The whole atom is discontinuous and the electron makes equal jumps around the orbit relative to the proton in the absence of any change in the photon energy level that determines its orbit. This requires a whole number of quantum jumps around an orbit as expressed in equation V-8. This specifies the essential condition of resonance.

$$2\pi r_n = n\lambda_n \quad \text{V-8)}$$

In the first orbit $n=1$ so according to equation V-8 the electron wave length is equal to the circumference of the first orbit. This means that the electron does not move at all between quantum jumps. It jumps to the same relative position in each successive space-frame. This means that the electron has zero angular momentum in the first orbit. On the other hand, from a classical mechanics standpoint, the electron's orbital velocity may be calculated from equation V-4 and this velocity then corresponds to one revolution in one primary interval of time as also indicated by System 3. Nevertheless, the orbital quantum number, l , that concerns angular momentum in the quantum formulation of Schrödinger's wave equation is taken to be zero when $n=1$. This interpretation is essential to explaining the spectral lines and line splitting in magnetic fields.⁵

The Schrödinger wave mechanical treatment gives more values for the orbital quantum number than the semi-classical (SC) Bohr model where electrons move in de Broglie waves around circular orbits. These additional values concern the orientation of the angular momentum in orbits greater than $n=1$. In the first orbit the angular momentum is zero so it has no relative orientation. In a magnetic field that orients the atom in external space the angular momentum in higher orbits can assume only specific orientations that are designated by the *magnetic quantum number* m_l . This splits the energy level of each orbit into additional energy levels according to the strength of the magnetic field, and consequently accounts for *spectral line splitting* known as the *Zeeman Effect*. Additional fine splitting is associated with two discrete complementary *magnetic spin* orientations of the electron designated as *the spin quantum number* m_s . The SC theory has no counterpart for these two magnetic quantum numbers in magnetic fields. Without the magnetic field the orientation of the atom and electron is not specific with respect to experiment.

It also becomes apparent that *historic integration* is the reason why Shrödinger’s wave equation tells us that the probability density of finding the electron in a given position is determined by the *square* of the wave function, $|\Psi|^2$, not by the wave function itself. The accepted explanation is that mass is a form of energy and since the wave function, Ψ , represents the wave field of the particle of mass m , the product $\Psi \Psi^*$ may be thought of as including an equivalent energy density, known as the complex conjugate, Ψ^* , associated with the mass. This is clearly in accord with System 3. The equivalent energy density to the particulate mode is the conjugate quantum mode. Together they define a primary interval of time expressed by their historically integrated product $\Psi \Psi^*$.⁶

The Quantum Jump Postulate of the Bohr Atom:

As stated before, Bohr had also postulated that the emission or absorption of light that gives rise to spectral lines occurs when the electron makes a sudden quantum jump from one stable orbit to another. He insisted that the jump is sudden and that the frequency of the energy emitted or absorbed is given by the Planck-Einstein formula

$$\Delta E = hf \tag{V-9)}$$

where ΔE is the energy difference between orbits. The total energy of an orbiting electron is the sum of its kinetic energy, and its potential energy. The kinetic energy is

$$KE = \frac{1}{2}mv^2 = \frac{e^2}{8\pi\epsilon_0 r_n} \tag{V-10)}$$

The potential energy in the Coulomb field of the proton nucleus is

$$PE = -eV(r_n) = -\frac{e^2}{4\pi\epsilon_0 r_n} \tag{V-11)}$$

The potential energy is negative because it requires energy input to raise the electron to each higher orbit. The proton and electron are in a mutually bound state. The total energy in orbit n is

$$KE + PE = -\frac{e^2}{8\pi\epsilon_0 r_n} = -\frac{me^4}{8\epsilon_0^2 h^2 n^2} = -\frac{E_0}{n^2} \tag{V-12)}$$

Bohr’s theory was extended by Sommerfeld, Dirac, Pauli, and others, who added quantum numbers to explain spectral lines and their

fine structure more accurately, then the Schrödinger wave equation, incorporating all factors into the wave function, became accepted as a standard procedure. This sums up the theory of the atom as it developed from ideas first advanced by Neils Bohr, while showing that the most basic assumptions in evolving the quantum perspective of the atom were generally consistent with System 3.

Other Considerations:

Initially, however, Bohr used a more circuitous route in arriving at his theory, involving what he called the *principle of correspondence*.⁷ This principle requires that the dynamics of the atom or other system, according to quantum theory, must agree with the classical description of the system for very large quantum numbers. One problem with this is that the quantum and classical descriptions of the atom do not converge to correspond within five percent until the principal quantum number n is greater than 30. The radius of the thirtieth orbit is nine hundred times greater than the radius of the first orbit and atoms this large are not encountered.

There are other points that merit reflection. For example, if we restrict our observations locally to one isolated atom of elemental hydrogen and insist that universal influences have no bearing, then we deprive ourselves of any stable reference in space or time. If there is no operating field that is spatially contextual to each and every atom, then there is no way to distinguish between the orbiting motion of an electron and the spin of the nucleus.

How then can one equate a centripetal force to the Coulomb force as in equation V-2? How can one assign the angular momentum equivalent to $nh/2\pi$ as in equation V-4, or compute the kinetic energy as in equation V-10, if there is no universal referent to implicitly determine on behalf of the atom the relative orbital motion or spin? Experimental physicists find it necessary to employ a magnetic field as a context.

In System 3 one universal set coheres with all particular sets at once. A referent is implicitly given because each particular set is synchronously related to all particular sets, however spatially isolated they may appear to be locally. There is a relationship between the internal space of the atom and external space associated with a preponderance of synchronicity in the universe as a whole. This is distinct from the perspective of experimental physics under contrived circumstances in a laboratory concerned with local influences. Nevertheless the latter perspective takes place within the context of the primary projection of space and time consistent with System 3.

Experimental results should be interpreted within this overriding context not vice-versa.

The Primary Interval of Time:

The primary interval of time is directly related to the fact that the orbital angular momentum in the first orbit of hydrogen is zero, since one orbit is equivalent to one quantum jump in position, whether in the SC model or QM model.

The primary interval of time T_p is thus given by

$$T_p = \frac{2\pi r_1}{v_1} = 1.519 \times 10^{-16} \text{ seconds} \quad \text{V-13)}$$

where v_1 is the velocity of the electron in the first orbit, determined by solving equation V-4.

If the internal space of the atom is to be consistent with external space the primary interval of time must allow all parts of the largest atom to be fully in communication with itself. We know for example that Rutherford propelled alpha particles through the inner space of atoms. This requires that the primary interval must be sufficiently long to allow light to circumscribe the largest orbital shell of hydrogen as if an atom of this size constituted a maximum event horizon that is fully coherent. This does not mean that the spherical photon energy shells of an atom are scribed in external space. They are spontaneously formed along with electron and proton and they *define* three dimensional space. There must nevertheless be a mutually consistent relationship between internal spherical space and external linear space, albeit irrational. This requires that the T_p primary interval is equivalent to the time it requires light to circumscribe an orbit of maximum radius n , such that

$$T_p = \frac{2\pi r_1}{v_1} = \frac{2\pi r_1 n^2}{c} \quad \text{V-14)}$$

where c is the speed of light. It follows that

$$n = \sqrt{\frac{c}{v_1}} = \sqrt{\frac{2.99792 \times 10^8}{2.1884 \times 10^6}} = 11.7 \approx 12 \quad \text{V-15)}$$

This indicates that the twelfth orbit of atomic hydrogen approximately defines the maximum dimensions of a fully coherent excited atom,⁸ although higher rapidly transient energy levels may allow

electrons to produce weak spectral lines. Higher orbits become exponentially closer together toward the ionization limit.

By equation V-4 electrons in the twelfth orbit move with a velocity of 1.8228×10^5 m/s, thus taking $T_n = 2.6258 \times 10^{-13}$ seconds to go around once, or $1728=n^3$ primary intervals of time. In general, electrons in orbit n require N_p primary intervals of time to circumscribe their orbit where N_p may be called the *principal orbital rate*. Thus

$$N_p = \frac{T_n}{T_p} = \frac{(2\pi r_1)^2 n^4 m}{nh} \times \frac{h}{(2\pi r_1)^2 m} = n^3 \quad \text{V-16)}$$

There are other factors to consider in heavier elements due to contractions in space- time related to fusion processes that will be introduced below.

The Bohr model of the atom accounted for the main spectral lines of atomic hydrogen and some spectral lines of other elements. The theory evolved into a full wave-mechanical treatment formalized by the Schrödinger wave equation, incorporating the treatment of fine structure and attempts to cope with the complex structure of higher elements.

De Broglie’s Wave Equation:

Conjugate identities between space and quantum frames and their historic integration have been unwittingly employed in the derivation of some of our most fundamental formulae of physics. This can be demonstrated if we carefully examine Louis de Broglie’s method in arriving at his wave equation of matter. His thoughts are clearly presented in a tribute to him on the fiftieth anniversary of the discovery of the wave nature of the electron⁹ as follows:

...I was led to define an internal rest frequency f_0 of the particle, connected with the energy m_0c^2 of the rest mass by the relation

$$hf_0 = m_0c^2 \quad \text{V-17)}$$

De Broglie substituted the rest energy of a particle for electromagnetic energy E in Planck’s law, $E=hf$. This specifies what is already intimated in Planck’s law, that the rest frequency of a particle is a measure of the recurrence of space frames in System 3 as this primary activity relates to electromagnetic frequency. This is the same for all particles in the same inertial system.

This led me to think of the particle as being like a little clock in motion. I was then greatly smitten with the fact that the transformation formula of a wave according to Lorentz is

$$f = \frac{f_0}{\sqrt{1 - \frac{v^2}{c^2}}} \quad \text{V-18)}$$

and the transformation formula for the frequency of a clock, translating the famous “retardation” of clocks in motion is

$$f = f_0 \sqrt{1 - \frac{v^2}{c^2}} \quad \text{V-19)}$$

Two perspectives are introduced by the two transformation formulae, one from the outside (eq. V-18), and one from the inside (eq. V-19), corresponding to space and quantum frames respectively, the latter being the conjugate reciprocal of the former. A significant point here is that a primary interval of time is defined by one recurrence from a timeless quantum frame to a particle space frame. Together they define the primary interval of time. The quantum frame is orthogonal to the space frame in the same way that external space is orthogonal to the internal space of the atom.

Intrigued by this difference I asked myself how a particle similar to a little clock should be displaced in its wave in such a manner as to remain incorporated in the wave, that is to say, in such a manner that its internal phase remains constantly equal to that of the wave.

This question is about how the oscillations of a moving particle between space and quantum frames remain synchronous with respect to an external observer and stationary frame of reference.

Applying this picture, albeit a little too schematically, to the simple case of a plane monochromatic wave being propagated along the x-axis I was led to write for the variation $d\phi$ of the phase of this wave

$$d\phi = 2\pi \left(f dt - \frac{dx}{\lambda} \right) = 2\pi \left(\frac{f_0}{\sqrt{1 - v^2/c^2}} dt - \frac{dx}{\lambda} \right) = \frac{2\pi}{h} \left(\frac{m_0 c^2}{\sqrt{1 - v^2/c^2}} dt - h \frac{dx}{\lambda} \right) \quad \text{V-20)}$$

The motion of the particle relative to a stationary observer, implied by the coordinate system, tends to open synchronous gaps in particle space frames because light can not fully bridge quantum jumps in position from frame to frame. Since light defines external space with respect to each atom, this introduces synchronous distortions between particle and observer. By applying the transformation formula for a wave (eq. V-18), the relative frequency of the particle is increased to effectively close the gaps. This indicates a *relative* omission of space frames in the inertial system of the *observer*. Some of the observer's space frames are lost in the synchronous gaps of the particle.

This can be seen by examining the terms of equation V-20 closely. The fdt term gives the phase of waves for both particle and observer if the particle is at rest. The difference in phase due to the particle's motion is given by dx/λ . The only wavelength λ that can be ascribed to the moving particle is each quantum jump in position as perceived by a stationary observer, but dx relates to a displacement along the stationary coordinate system. The ratio dx/λ is therefore a measure of the relative skipping of space frames between particle and observer. This is compensated for by applying the transformation formula to the fdt term.

De Broglie continues:

...and for the variation in the interval of time dt of the internal phase of the particle being displaced along the x -axis with speed v

$$d\phi_i = 2\pi f_0 \sqrt{1 - v^2/c^2} dt = \frac{2\pi}{h} m_0 c^2 \sqrt{1 - v^2/c^2} dt \quad \text{V-21)}$$

Since the internal phase of the particle includes the relative frequency of particle quantum frames, there can be no observations of relative motion. The dx/λ term is thus given no quantum counterpart. This requires that the particle quantum frames associated with the observer's skipped space frames must accumulate in the Void.

It is the reciprocal transformation formula, equation V-19, that reconciles internal phase relations accordingly. When this frequency is translated into the rest mass equivalent of quantized energy, by substitution from Equation V-17, the result indicates a relative skipping of particle quantum frames with respect to the observer. This requires the quantum sequences of the particle to accumulate in the *Void (the sensorium)*, relative to the observer, since particular sets are timeless in the quantum mode. The skipping of the observer's space frames is thus

complemented by a relative accumulation of quantized energy associated with the particle. This is apparent as an increase in its relativistic mass.

De Broglie next performs a second order historic integration, since the Lorentz transformations derive from a first order historic integration as demonstrated in Chapter IV. He equates the external space frame side that is associated with the external motion of the particle with the internal space and conjugate quantum frame side. The latter compensates for relative external space-time motion with relative accumulated quantum frames:

...on combining $d\phi = d\phi_i$ with $dx = vdt$

$$\frac{m_0 c^2}{\sqrt{1 - v^2/c^2}} - m_0 c^2 \sqrt{1 - v^2/c^2} = \frac{m_0 v^2}{\sqrt{1 - v^2/c^2}} = \frac{h\nu}{\lambda} \quad \text{V-22)}$$

is obtained, whence for the momentum p of the particle

$$p = \frac{m_0 v}{\sqrt{1 - v^2/c^2}} = \frac{h}{\lambda} \quad \text{V-23)}$$

Thus two fundamental relations of Wave Mechanics have been found, $E = hf$, $p = h/\lambda$ associating with them the image of a localized corpuscle which is displaced in the wave along one of it's rays yet remaining constantly in phase with it. This was the concrete image I had when I had the first idea of Wave Mechanics. Perhaps I didn't explain this sufficiently thoroughly in my thesis, but I emphasize that it was this which guided me.

By combining equations V-20 and V-21 external space frames and reciprocal space and conjugate quantum are equated relative to stationary coordinates that reflect synchronous relations between observer and particle. This corresponds to historic integration on historic coordinates as outlined in Chapter IV. Skipped space frames of the observer due to particle motion equate to timelessly accumulated quantum frames of the particle.

The derivatives of time, dt , thus cancel out. The expressions of rest energy $m_0 c^2$ likewise vanish. In the final form, the equation states that the kinetic momentum of a particle is equal to the quantum of action,

h , divided by the distance it is displaced λ in a primary interval of time, with respect to the observer.

This wavelength represents each electron quantum jump. Since there must be a whole number of jumps around each atomic orbit this accounts for Bohr's Angular Momentum Postulate. It applies equally well to relative motions of neutral atoms.

A strange implication of de Broglie's wave equation is that the complementary skipping of observer space frames and accumulation of particle quantum frames is completely independent of the relative rest mass of the observer. A human individual is the equivalent of the universe as dominated by cyclic patterns of momentum that are hierarchically ordered from galactic to stellar to planetary levels.

This confirms the view that there is a universally synchronous and timeless present that relates independently to each atom of particulate mass.¹⁰ This requires that there must be a preponderance of synchronicity in the universe as a whole. It also confirms the view that relativistic phenomena are dependent on the perspective of the *observer*. This latter is not just an arbitrary affair where the vantage point of observation can be hypothetically switched to that of a moving particle. This relativistic assumption cannot correctly be employed to deduce a spacetime continuum that ignores hierarchies implicit in the cosmic order. Atoms don't have eyes to scan the heavens as humans do.

This human capacity implicitly incorporates billions of years of stellar and biospheric evolution within the galaxy, implicating tier upon tier of historic integration associated with dynamic cycles within cycles cascading from galactic to stellar to planetary levels. On a cosmic level the creative process subsumes and integrates a hierarchy of quantized memories spanning space and time in the Void. Patterns of celestial dynamics relate to the preponderant patterns of history together with the need for these patterns to be reconciled with the synchronous projection of the material content of the universe at large. Like Einstein, Planck, and Schrödinger, Louis de Broglie was not happy with the direction that quantum mechanics took.

The Neutron:

Remember that the universal set is open and thus unconstrained by spatial limitations while tunneling through the particular centers, linking them up in pairs in the space frame. In the neutron this linking up is in clockwise direction because of the perceptual transposition of the *Universal Electron Center UC2*. Figure V-1 compares with Figure III-3, except that the universal electron center UC2 is perceptually transposed.

The proton Form interface UC3 is now subjective to the electronic Routine UC2 which now relates internally to the photon energy shell UC1 that defines the coherent Idea of the neutron. See Figure V-1.

While introducing the neutron in Chapter III it was pointed out that the Idea associated with the Form UC3 of the proton can feed back from within the Routine electron interface UC2 to an objective identity with the photon Idea interface UC1.

The analogy of a painting was used. The Form of the completed painting feeds back to a passive observer to evoke the Idea implicit in the painting's Form. Likewise the photon energy shell of the primary hydrogen atom collapses to a passive identity with the proton Form within the universal electronic interface. This defines its Form within the subsuming context of a whole atom. The quantized photo-electric Form of the proton becomes spatially specified in the neutron space-frame. The neutron can be said to simulate the Idea of the proton in the same way that Form of the painting can simulate the Idea implicit within it via electronic feed back. The Idea implicit in the Form is *re-generated*.

The Neutron as a Regenerative Mode of System 3:

It will be said that the neutron is the *regenerative mode* of an atom essential to nucleosynthesis. The fused atom is the alternate *expressive mode* of System 3. The nuclear binding focus of the two modes mutually alternate in a reciprocal manner, within the subsuming context of the primary projection of hydrogen such that nucleons are bound in pairs. This is indicated by empirical evidence as well as by the System. The strong force is limited to the spatial dimensions of a nucleon and falls off sharply at greater distance. This requires a large contraction in space as defined by a neutron over that defined by the photon energy shell of a neutral atom. This large contraction in space takes place within the subsuming context of an atom.

The neutron is an essential nuclear component of the higher elements. It internally simulates the spatial integration of a primary atom as a nucleon. Since it integrates the spatial distinction between photon, proton and electron as one particle it provides an inner reference for the nuclear fusion of spatially separate primary atoms, even though internal particle distinctions collapse in a neutron. The neutron can also play a regenerative role in the primary projection of hydrogen. About .02 % of normal hydrogen is deuterium. Tritium is extremely rare and radioactive.

In a primary hydrogen atom the universal photon interface is subjective to the electron interface that relates objectively to the universal proton interface as illustrated in Figure III-3.

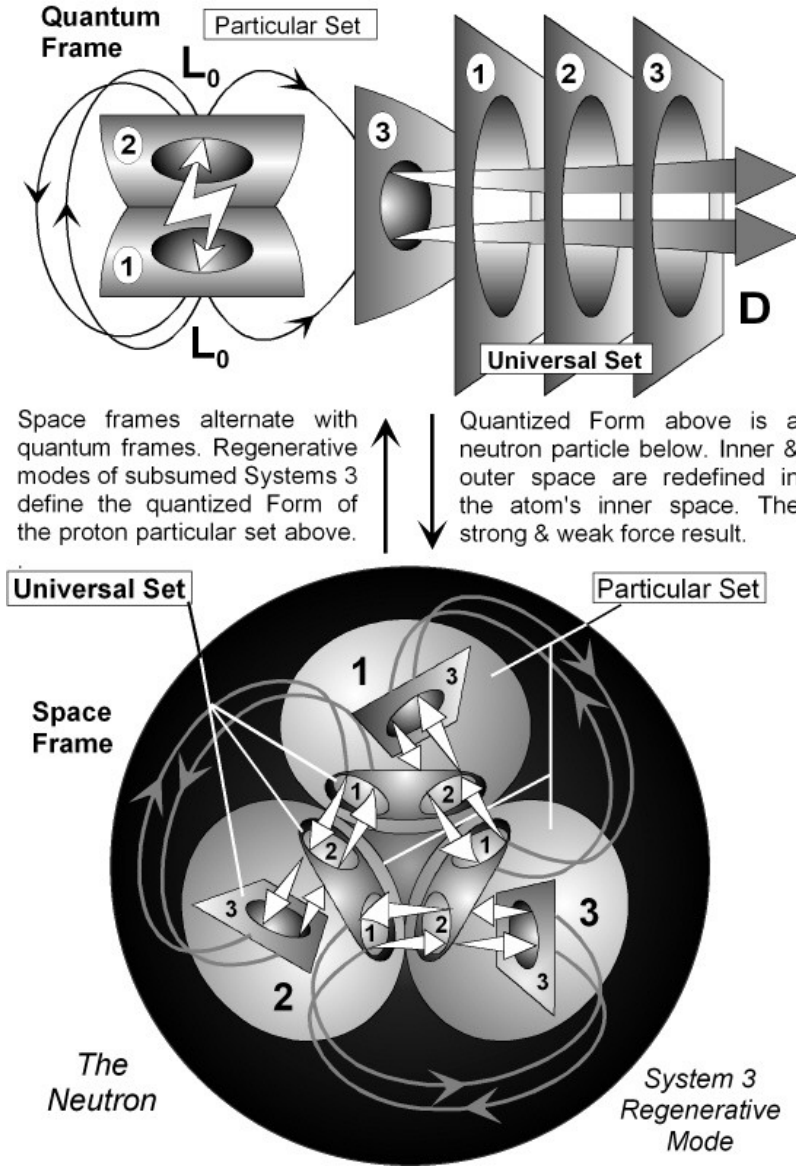


Figure V-1

In the neutron the situation is reversed with respect to the electron as illustrated in Figure V-1. The universal electron interface thus acts as a Janus-faced pivot between the expressive and regenerative

modes of System 3. The universal electron interface has perceptually transposed giving the neutron two down quarks and one up quark. One up quark in a proton has changed to a down quark in the neutron.

The subjective to objective imbalance in the universal set, that is responsible for the charge between electron and proton in Figure III-3, is internalized in Figure V-1 since the electron UC2 faces in a transposed direction back to the photon UC1. The imbalance in the neutron focuses on the Form of the proton as it relates to the photon energy in the bound state of the neutron. It does not focus on the energy imbalance between electron and proton as it does in an atom. This draws the three particular centers together into a tightly bound state as a single particle.

The universal Form interface of the proton feeds back through the Routine electronic interface to an identity with the universal photon Idea of a whole particle in the space frame of Figure V-1. In the quantum frame the particular electron and photon interfaces are coalesced together as one to define the quantization of Form associated with each particular proton. The coalesced electron and photon interfaces *are* the quantization of proton Form in the quantum mode. This photo-electronic quantum equivalent of the proton is the conjugate equivalent of the neutron in the space-frame.

This is a reciprocal perspective to that of the expressive mode where electron, proton, and photon are mutually distinct as a neutral atom although intimately linked. The universal electron interface UC2 acts as axis between these subjective and objective orientations. The regenerative mode of System 3 is thus a secondary elaboration of the subjective orientation of System 2. As such it indicates that a secondary System 3 is superimposed upon the primary projection of space and time as specified by the primary activity of System 3 that projects primary hydrogen atoms.

This secondary System 3 is locally subsumed by the primary System 3 according to local circumstances imposed by the primary projection of hydrogen and celestial dynamics that contract space-time, such as in the centers of stars. The secondary System 3 is essential to the fusion of the heavier elements from primary hydrogen.

The higher Systems likewise have both expressive and regenerative modes that are essential to their operation. This is a very important feature of all the higher Systems. There are also involutory modes to Systems 3 and higher that work in opposition to the evolutionary modes described here.¹¹ In System 3 the involutory mode accounts for anti-matter.

A Common Source of the Strong Force and Weak Force:

The binding energy within the neutron is identified with the weak force associated with decay processes in quantum theory. It is believed to be one of four fundamental forces that spontaneously emerged for unknown reasons from the Big Bang. System 3 indicates it is associated with the perceptual transposition of the universal electron interface UC2. The universal *routine* interface of a neutral atom turns inward to the universal *idea* of unity within the atom, thus bringing the three particular centers together into a common *form*. It is a process that happens in the centers of stars as heavier elements are fused from primary hydrogen. For each heavier atom fused there is a complementary fusion of primary hydrogen into neutrons, thus balancing the subjective and objective orientations.

While the weak force is identified with the perceptual transposition of the universal electron interface UC2 within the neutron, the strong force is identified with the same transposition in the immediate external vicinity of the neutron. This is analogous to the way the inner spherical space of the primary hydrogen atom is defined by the photon energy shell while external linear space is defined in relation to it by the linear transmission of light in a single space frame. Internal versus external space are mutually defined by their mutual relationship.

Within the neutron, however, the spherical space of the atom is contracted nearly 16 orders of magnitude (8.62×10^{15} times). As with the primary atom, the external space of the neutron in each space-frame is defined relative to its internal space. This specifies the reach of its influence as a binding force. It can only bind to nucleons that are immediately adjacent but it does so strongly because of the large contraction of spatial dimension relative to the inner space of a primary hydrogen atom. The external space defined by a neutron within the subsumed inner space of the atom relates to nucleon particles of comparable size.

Defining Cosmic Form, Space and Time:

The neutron specifies particulate Form in space, as opposed to photon energy levels that define relative spatial dimensions in the primary atom. Both specifications are essential for the coherent generation of space as a universally consistent phenomenon. The inner versus outer imbalance across the electronic interface UC2 binds the neutron together. It defines the nature of coherent particulate Form in each space frame, consistent with the photon energy that specifies

coherent dimension in a primary atom. Otherwise there is no universally standard reference for form, space or time.

The fusion of particular sets up the ladder of the elements cannot violate the integrity of any one particular set even though they are spatially integrated as independent atoms. Each particle's Form must have a unique identity within the atom, consistent with the rift in wholeness. Otherwise it can not be identified as a separate thing, just as electrons and protons can not be identified as separate things within a neutron. Two or more particles cannot define the same space and remain separate. This is essential to *Pauli's exclusion principle* and the orderly dispersion of electrons in the periodic table, each with specific quantum number combinations of four basic kinds: principal (n), orbital (l), magnetic (m_l) and spin (m_s).

Nuclear Models:

The perceptual transposition of the universal center 2 in the regenerative mode of System 3 is generally consistent with important features of the potential well model, the liquid drop model and the shell model concepts that are employed to explain the coherence of nucleons in the nucleus. The expressive and regenerative modes of the secondary System 3 offer a more coherent structural insight to nuclear theories.^{12 13}

In summary it can be said from the above assessment that the so-called *strong force*, credited with binding a nucleus together, is associated with the regenerative mode and the perceptual transposition of center 2 of the universal set, as is the weak force. The strong and weak forces are external and internal expressions of the same regenerative mode of a secondary System 3 defined by the neutron and its interactions within the nucleus. The neutron essentially redefines external space in the subsumed environment of a composite nucleus and it is this subsumed definition of space itself that accounts for the strength of the strong force. This also indicates that the strong force is charge independent.

The subsumed space of the neutron that is essential to fusion processes complements and offsets the contractions or curvatures in the integrated fabric of space-time on a cosmic scale as projected by the primary System 3. As mentioned in previous chapters the relative angular motions of galactic and stellar systems involve space-frame skipping at their centers with respect to their peripheries. Neutrons provide a high degree of compensation by the high degree of spatial contraction they provide.

Recent research at the Thomas Jefferson National Accelerator Facility (TJNAF) shows that: *“protons and neutrons in a nucleus can form strongly correlated nucleon pairs. Scattering experiments, where a proton is knocked-out of the nucleus with high momentum transfer and high missing momentum, show that in ¹²C the neutron-proton pairs are nearly twenty times as prevalent as proton-proton pairs and, by inference, neutron-neutron pairs. This difference between the types of pairs is due to the nature of the strong force and has implications for understanding cold dense nuclear systems such as neutron stars.”*¹⁴

Protons and neutrons in the nucleus form a brief pairing with another nucleon, a phenomenon known as a short-range correlation. Previous experiments have shown that roughly one-fifth of nucleons at any one time are in short-range correlations in atoms of this size. This suggests alternate pairing within the nucleus synchronous with alternate expressive and regenerative modes of the secondary System 3. The relationships between nucleons demonstrate a degree of fluidity even though they appear to be tightly packed cheek by jowl in the nucleus.

Problems Implicit in the Semi-Classical Bohr Model:

It’s worth returning again to equation V-6. This formula is written to apply to higher elements in the periodic table by placing the atomic number Z in the denominator so that

$$r_n = \frac{\epsilon_0 h^2}{Z \pi m e^2} n^2 \text{ meters} \tag{V-24}$$

This equation adds the complication that when n=1 in elements higher than hydrogen, take helium for example where Z=2, then r₁ is only one half the size as in hydrogen. On the face of it this seems to require the two electrons in the first orbit to circumnavigate the nucleus more than once in the primary interval of time.

Moreover the two equations V-3 and V-4 no longer agree on how fast the electrons are moving. Equation V-3 says they are moving $\sqrt{Z} = \sqrt{2}$ times faster than in the first hydrogen orbit, whereas equation V-4 says they are moving Z= twice as fast. In heavier atoms the problem escalates proportional to the square root of the atomic number. On the face of it the semi-classical Bohr model runs into insurmountable difficulties in explaining the higher elements, while solutions to Shrödinger’s equation become prohibitively complex.

This warrants some careful reflection from the standpoint of System3.

$$v^2 = \frac{e^2}{4\pi\epsilon_0 mr_n} \quad \text{V-3)}$$

Equation V-3 derives from equating the centripetal force to the Coulomb force. It results in a square relationship indicating that it historically integrates a succession of space frames and conjugate quantum frames. Velocity is a measure of equal relative quantum jumps over a succession of primary intervals of time. It is quantized and thus has a conjugate quantum counterpart that is its reciprocal. Given that these are equivalent when velocity is constant defines a square relationship in the integrated fabric of space-time on historic coordinates (See Chapter IV for historic integration on historic coordinates).

The square of velocity thus indicates its historic integration over any extended interval of time. The Coulomb force is a static force in each space frame that derives from the coalesced unity of electron and proton in the conjugate quantum frame, while the centripetal force required to keep the electron in orbit can only be known over a succession of space frames that reveal its velocity. An historic integration of this kind is thus essential if Bohr's premise of the centripetal force being equal to the Coulomb force is valid.

$$mvr_n = \frac{nh}{2\pi} \quad \text{V-4)}$$

Equation V-4 equates the electron's angular momentum to an integral multiple of $h/2\pi$. It defines the electron's momentum as each quantum jump in position depending on what orbit it is in. Momentum is quantized accordingly. Equation V4 is a definition of momentum as it relates to each equal quantum jump in position in each orbit. It does not implicate historic integration because it applies to each primary interval of time equally and independently.

This means that Equation V3 historically integrates Equation V4. Since the angular orbital momentum of the electron in the first orbit of the primary hydrogen atom is zero it is reasonable to conclude that the electron recurs in each space frame in the same relative location.

Reconciliation of the SC Model:

If we think in terms of classical ideas of continuous motion in continuous space and time there is no resolution to the apparent discrepancy between the two equations in the case of the helium atom. However System 3 requires that we must revise how we think about space and time at the atomic level as well as at the cosmic level. There is

no such a thing as continuous motion. There are only synchronous quantum jumps in relative position. This is true in both the internal and external space of the atom. It is true on every scale of magnitude.

The radius of the first orbit in the Helium atom is contracted by half because the mutual Coulomb force is between two electrons and two protons, not one. The radius is contracted by half because the Coulomb force is doubled. Within the atom we cannot consider the motions of the two electrons separately because they are synchronously projected together in static positions that only change with respect to one another between space frames defined by the primary projection of hydrogen atoms. The fusion of helium takes place within this overriding context and the helium atom as a whole must be synchronous with primary hydrogen.

The secondary System 3 that fuses helium together has an expressive and regenerative mode that alternately relate to the objective and subjective orientations within the subsuming context of the primary System 3. The objective orientation relates to the fused atom as an integral whole. The subjective orientation, the regenerative mode, relates to the strong force binding of the neutron with other nucleons.

Since there are two neutrons and protons there are two ways that this can work in a helium nucleus. The regenerative mode of the secondary System 3 can alternately bind nucleons employing one neutron or the other while the expressive mode remains synchronous with alternate projections of the whole atom along with the physical universe as a whole. This would mean that nuclear binding in the helium atom would lapse briefly in alternate space frames. It would also mean that the secondary projection of the integrated atom as a whole would be skipped in alternate space frames. There is no evidence to indicate this.

This requires that there are two alternate secondary Systems 3 such that they reciprocate, one expressive mode occurring synchronously with the regenerative mode of the other and vice versa. In both alternate space frames only half of the neutrons would be actively binding nucleons in any primary interval of time, since the regenerative mode relates to one neutron. Two reciprocating Systems 3 also provide a means by which mirror symmetries are preserved, accounting for parity. In Helium 3 with only one neutron both secondary Systems 3 relate to the same neutron and still reciprocate in a similar manner.

Correlating Inner and Outer Space-Time:

A universally valid structural basis to the cosmic order requires that there must be a correlation between events in the inner space of the

atom with respect to the external space between atoms on a cosmic scale that is more credible than the supposed existence of probability waves. In other words there must be some coherent consistency between quantum events on a microscopic scale and events on a macroscopic scale. Bohr's initial postulates together with de Broglie's waves were remarkably successful for the hydrogen atom and served as a foundation for the birth of quantum mechanics. In view of this there should be some explanation for the velocity discrepancies of the electrons in the first orbit of helium and in the orbits of heavier elements.

If we consider the reciprocating actions of both secondary Systems 3 each electron relates to *both an expressive and a regenerative mode in each synchronous space frame because of the reciprocal action*. This amounts to a doubling in the projection of internal space and time with respect to the primary projection of space-time as it relates to the whole helium atom in external space-time. This normalizes the velocity of each electron as determined by quantum jumps such that it appears to orbit the nucleus once, not twice, in each primary interval of time, consistent with equation V-4, where there is no historic integration involved.

Equating the Coulomb force to the centripetal force does involve historic integration, however. The Coulomb force is a static force in each space frame because electron and proton are coalesced together as one in the conjugate quantum frame of the same primary interval of time. This is just enough to counterbalance the inertial momentum of the electron as it jumps from space-frame to space-frame around the orbit. If the internal space and time are contracted by half as for equation V-4, they are for equation V-3 as well. This neatly compensates for the halving of the radius due to the addition of the atomic number in the denominator of equation V-24.

In the lithium atom, $Z=3$, three secondary Systems 3 come into play that likewise compensate for apparent discrepancies between equations V-3 and V-4. In beryllium, $Z=4$, four secondary Systems 3 come into play and so on, consistent with the atomic number Z .

The numbers of neutrons increase over the number of protons as the atomic number increases. This is generally recognized as required by the nature of nucleon packing. Neutrons do the bulk of nucleon pairing with protons that holds the nucleus together. They must be adjacent to them to pair, so more are needed to accommodate the needed regenerative modes. This requires that the regenerative modes can relate to different neutrons in different space-frames. Neutrons are sufficiently stable to accommodate this until atomic numbers reach 83. Larger atoms undergo radioactive decay associated with the weak force.

This is reasonably consistent with the TJNAF research. It showed that about twenty percent of the protons or neutrons in carbon 12 with atomic number 6 were paired at any one time. With six secondary Systems 3, only half have regenerative modes at any one time. This means about 3 pairings with respect to 12 nucleons at any one time, or about 25% with respect to neutrons. This suggests a test for the secondary Systems 3 in other elements.

Three Applications of System 3:

A third or tertiary System 3 applies to the chemical binding of the elements. The coherent *idea* of the molecule is dependent upon the atomic sharing of outer orbital electronic *routines* to produce molecular *forms*. This tertiary activity also has a particular quantized mode of ordered energies in which the *routine* and *form* are coalesced within the *idea* of unity as *elements of technique related to valence*. They are recalled to particulate form in a succession of space frames that define molecular combinations. The tertiary System 3 is thus synchronously related to the primary and secondary System 3.

According to System 3 the physical universe is constituted entirely of particulate matter with associated conjugate energy patterns that are integrated via the Void. However, the three related expressions of System 3 don't begin to explore or explain the myriad forms that we see around us. The most common forms of everyday experience clothe themselves in particulate matter, from the solid earth that we stand on to the legions of living forms that it supports. The life forms that we see around us, the grass, the trees, the birds, are all synchronously dependent upon unit building blocks of another order—the eukaryotic cells that work together in harmony to manufacture their organic bulk.

These eukaryotic cells can be seen as elaborate expressions of System 3, giving *forms* to *ideas* through *routines*, as always. The ideas are encoded in the nucleus of the cell, the routines are enacted in the cytoplasm, and the forms are delineated by membrane processes that house the cell and its organelles. But the form of the cell is not itself a physical entity in the same sense that the atoms that constitute it are. The cell is a living chemical factory that physically assembles its own walls and partitions and equipment to conform to the spatial shapes and functions inherent in the form of its own independent design according to its needs. The cell is thus synchronously organized to clothe itself in matter. It has a subsuming relationship to molecular synthesis that requires it to act as an organizing energy pattern.

Nor do complex multi-celled creatures like dogs and cats integrate their hoard of interdependent living processes by accident. It is the *routines* inherent in organs that direct the cells to manufacture the physical body in a coherent *form* consistent with the *idea* implicitly associated with the *host creature*. The host is an *archetypal energy pattern* that specifies the nature of the *idea as a coherent living creature*.

Concluding Remarks:

One can begin to see that the System works tier upon tier to synchronously integrate history, spanning space and time to create the miracle of existence. There are patterns to the pattern. For example System 3 integrates levels in three steps. The primary activity generates hydrogen, then the elements are integrated by a secondary activity, and chemical compounds by a third. In the biological arena the triad is the cell, the organ and the host. System 4 elaborates on the pattern,¹⁵ more specifically delineating how the various processes of the cell, the organ and the host are meaningfully integrated.

Evolving by this perpetual reflux and regeneration of experience up through the levels of sentient awareness that enhance the integration of history we have come to be standing on this planet Earth. A good number of us look around with some sense of amazement that we are here at all, trying to figure out how it happened and wondering what it is all about.

For some of us a simplistic explanation is good enough. It is all just a physical accident without meaning or purpose, and values are an arbitrary human creation, without any transcending basis in reality. But under careful inspection, the evidence for this purely physical paradigm begins to tear rather drastically at the seams. And if truth as a value is itself an arbitrary human creation then our theories about the origin and nature of the universe can have no transcending basis in reality either. The best of our theories must be no more than aberrations of the human mind and a meaningless exercise in futility at that.

No serious student of science really believes that, and yet mainstream science perversely pursues this course. No one can deny the factual knowledge that science has accumulated. It is the currently popular interpretation of the factual evidence that is highly suspect and severely limiting. Pursued to the extreme it leaves us morally bankrupt. That was the nagging concern of men like Einstein, Planck, Schrödinger and de Broglie who were disturbed by the direction that quantum mechanics took.

What has been lacking is a paradigm that can liberate us from a blind belief in a purely physical universe of chance without resorting to an equally blind belief in miracle. We need a pragmatic new paradigm that can make holistic sense of the huge fund of empirical knowledge that traditional approaches to the sciences have accumulated. We need a holistic methodology that can complement traditional approaches and make meaningful sense of the phenomenal world. It can not be a contrived belief system. It must be a System that can facilitate direct intuitive insight into the structural dynamics of the creative process. It must have the potential to expand the horizons of science accordingly.

REFERENCES AND NOTES:

¹ The atomic theory proposed by Leucippus and Democritus in the fifth century BC was not accepted by Aristotle and was forgotten about for two thousand years. The theory was not resurrected until Robert Boyle proposed a corpuscular theory to explain the behavior of gases in the seventeenth century. John Dalton made the modern atomic theory explicit in his work published in 1808, setting out the idea of the elements combining to form molecules, as confirmed experimentally in his Law of Multiple Proportions.

² Rydberg's equation can be written more precisely in the following form:

$$\frac{1}{\lambda} = R \left[\frac{1}{(m + b)^2} - \frac{1}{(n + c)^2} \right] \quad \text{i)}$$

where λ is the wavelength of a spectral line, m and n are integers, and R , b and c are constants. R is called the Rydberg constant and is the same for all spectral lines of the elements, whereas b and c depend upon what series of lines is being measured.

For the hydrogen atom the equation has a simpler form, since b and c are equal to zero:

$$\frac{1}{\lambda} = R \left[\frac{1}{m^2} - \frac{1}{n^2} \right] \quad \text{ii)}$$

If the nucleus is assumed to be infinitely massive for the sake of simplicity, the value of R is given in equation iii) below.

$$R = \frac{2\pi^2 m e^4}{h^2} \quad \text{iii)}$$

To correct for a finite nuclear mass M of a real atom, one must use the reduced mass of the electron and nucleus, given by $(mM/m+M)$, yielding a smaller constant. See Theodor W. Hänsch, Arthur L Schawlow and George W. Series, *The Spectrum of Atomic Hydrogen, The Laureats' Anthology Vol.II*, Scientific American, 1991, republished from *Scientific American*, March, 1979.

- ³ Max Planck expresses this succinctly in *Where is Science Going*, Norton, NY, 1932: "... Anyone who has been seriously engaged in scientific work of any kind realizes that over the entrance to the gates of the temple of science are written the words: *Ye must have faith*. It is a quality which the scientists cannot dispense with. "... The pure rationalist has no place here."
- ⁴ The fact that the relationship of photon, electron and proton *within* a single atom of hydrogen is delineated by the universal set working through a *single particular set* of System 3, places some internal aspects of the atom outside the established laws of physics, as Bohr assumed. The laws of physics are generally formulated to account for phenomena externally *between* particular sets. Quantum mechanics thus runs into difficulties in reconciling events between particular centers within the atom with external events between different particular sets. At the other extreme, on a cosmic scale, the established laws of physics are in trouble again.
- ⁵ The orbital quantum number, l , determines the angular momentum, L , of the atom. The Schrödinger equation gives a different solution than the Bohr SC theory. It is one less than the principal quantum number such that

$$L = \frac{h}{2\pi} \sqrt{l(l+1)} \quad l = 0,1,2,3,\dots,n-1 \quad \text{iv)}$$

The third quantum number, m_l describes the orientation of the angular momentum and is called the magnetic quantum number.

- ⁶ A similar situation arises in electrodynamics where the energy density of an electromagnetic field is proportional to the square of the electric field, not the field itself.
- ⁷ Bohr, N., On the Constitution of Atoms and Molecules, *Phil. Mag.*, **26**,1; 476; 857 (1913).
- ⁸ The discrepancy between 11.7 and 12 may be covered by various factors including elliptical effects of the orbit, collective band widths of spectral lines, Doppler effects, and other factors. The spectral lines become infinitely close together as they converge toward the ionization limit close to the 12th orbit.
- ⁹ W. C. Price, S. S. Chissick, T. Ravensdale, Eds., *Wave Mechanics; The First Fifty Years*, London, Butterworths, 1974.
- ¹⁰ Synchronicity does not imply that simultaneous events can be identified using transported clocks that are dependent upon signals transmitted through space and time to an observer. Neither can simultaneous discrepancies as

measured by clocks be used to conclude that there is no universal synchronicity to the projection of physical events. Synchronicity is an essential condition of the discontinuous projection of space and time if spatial forms are to exhibit any degree of coherence at all.

- ¹¹ There is more on this in Appendix 1 of Fisherman's Guide.
- ¹² The expressive and regenerative modes become more explicit in System 4. System 4 has nine terms which are suggested by homologues of System 3, although they are not the same.
- ¹³ Prominent physicists have commented frequently that they don't understand quantum mechanics, especially those involved in its development. Richard Feynman went so far as to say that no one understands it. The System thus offers some transparency to a subject that is difficult to fathom at best.
- ¹⁴ Published online *Probing Cold Dense Nuclear Matter*, Science Express, May 28, 2008.
- ¹⁵ The particle accelerators of high energy physics have produced an array of short lived particles or resonances, some of which fall into patterns very suggestive of the nine terms of System 4, for example the meson nonet. This does not mean that the patterns associated with these fleeting particles represent a more fundamental level of cosmic organization in the generation of matter. System 4 is an elaboration of the primary activity delineated by System 3. It is not more fundamental but rather a higher System. This directly suggests that the patterns are fleeting harmonics of the higher Systems due to the reflux and dispersion of the large energies attending these collisions. This means they are without fundamental significance in an assumed origin to the universe. They are not fundamental to the architecture of matter.

CHAPTER VI

COSMOLOGY & SYSTEM 3

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 propel 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 and periodically ejected from the black hole center as fresh feedstock for new generations of stars. Direct calculations show 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 sequence by frame sequence 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 and background radiation that offer explanations for other mysterious phenomena.

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 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 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 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 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 Mach's principle.

The centers of galaxies play the role of universal observer since they provide a universal 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.

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

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.

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 $dx=vdt$ 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.

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 contraction of inner space 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 due to their angular velocity. The balance takes a lot of 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 is distinct from gravitational acceleration consistent with Mach's principle. 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.

- j) Neutrons generated by fusion processes provide a high 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 that they regulate the migrations of stars.
- c) The focus in planets is on chemical synthesis and 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.
- 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. At this point the star may possess a degree of radial inertial momentum but the quantum force that regulates migration rate will tend to resist its outward radial migration. 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 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.⁴

6) Solar Space-Time Profile:

- a) Our sun constitutes 99% of the mass of the solar system but only 98% of the angular momentum. This is the opposite to 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 orbital velocity of the sun at its equator, even though there is much less mass involved. The equator of the sun also 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 to the solar mass and the orbital velocity of each of the planets:

• 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 dependent on gravitational contraction 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 Mach's principle 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 $1.4 \times 10^6 \pi / 25 \times 24 \times 3600 = 2.03$ kilometers per second. This represents 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 progressively heavier elements are employed as fuel up to iron. As the star contracts in stages it generates more heat from the gravitational contraction. This proceeds with the fused products of a prior stage acting as fuel for each succeeding stage until the end product of fusion in a star like our sun is iron. The star then shrinks to a white dwarf and cools over time to a dense inactive black dwarf. Stars that are more than a few 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 leave a super-dense neutron star or perhaps a black hole at their center.
- b) 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 six typical elements in the fusion stages will be considered, namely Helium ${}^4\text{He}$, Carbon ${}^{12}\text{C}$, Neon ${}^{20}\text{Ne}$, Magnesium ${}^{24}\text{Mg}$, Sulfur ${}^{32}\text{S}$, and Iron ${}^{56}\text{Fe}$.
- c) The contraction ratios can be computed as follows assuming that atoms above helium near the center of the sun are stripped of their electrons down to the first orbit. The effective volume of the

atom is the volume of the first orbit, which is proportional to the inverse of the atomic number cubed times the volume of the first orbit of hydrogen. 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, gives the contraction density as a ratio to primary hydrogen. Since neutrons contract space by a very large factor with respect to the primary hydrogen atom we can double the atomic number for computing contraction ratios for these typical elements. 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 selected 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 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 = $(1/52)^3/56 = 1.27 \times 10^{-7}$
- d) 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 lots of 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 3.93×10^{-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 20,750 hydrogen atom equivalents. Taking 2% of the sun to be carbon this represents a percentage contraction ratio of 41,500 hydrogen atom equivalents.
- e) This means that a total of $75 + 5,888 + 41,500 = 47,463$ hydrogen atom equivalents are contracted into the volume of 100 atoms. There is a gross contraction ratio in our star of $100 / 47,463 = 2.1 \times 10^{-3}$.
- f) Comparing this contraction ratio with that for the galaxy in point 5(d) 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 impells the sun radially outward space frame by space frame. It means there is a higher relative skipping of external space-frames at that point in the galactic radius. But there is a complementary higher relative accumulation of atomic quantum frames associated with the sun that can be translated into a quantum force that acts against the gravitational attraction toward the black hole center.
- g) We can assume a different atomic composition for a more mature star that has used up most of its hydrogen fuel. To demonstrate a principle let us arbitrarily say that it is 20% hydrogen, 25% helium, 20% carbon, 12% neon, 10% magnesium, 9% sulfur and 4% iron. The equivalent hydrogen atoms will be the reciprocal contraction ratio times the percentage composition as follows:
- Hydrogen = $1/1 \times 20 = 20$
 - Helium = $1/3.91 \times 10^3 \times 25 = 6,394$
 - Carbon = $1/4.82 \times 10^{-5} \times 20 = 414,938$
 - Neon = $1/6.25 \times 10^{-6} \times 12 = 1,920,000$
 - Magnesium = $1/3.01 \times 10^{-6} \times 10 = 3,322,259$
 - Sulfur = $1/9.54 \times 10^{-7} \times 9 = 9,433,962$
 - Iron = $1/1.27 \times 10^{-7} \times 4 = 31,496,063$
- h) Total equivalent hydrogen atoms = 46,593,636
- i) The gross accumulated contraction ratio is $100 / 46,593,636 = 2.14 \times 10^{-6}$ which is less than the external contraction of galactic space-time in 5(d) above. There is thus a resultant quantum force acting to reverse the radial migration back toward the galactic

center space frame by space frame. Although the chosen percentage components of the star are purely arbitrary, stars achieve higher concentrations of heavier elements later in their life cycles. The example serves to demonstrate that the gross internal contraction ratios of old stars, especially black dwarfs and neutron stars, can easily exceed the external contraction of space-time in the galactic space-time profile.

- j) These simple calculations 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 theorists 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.⁵

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 isn't 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 is also the regeneration of the primary activity that projects atomic hydrogen from which new generations of stars are born.

In conjunction with the reflux of its material content there is a need to reconcile the emission of energy 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 energies transmitted are themselves phenomena 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.

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 electromagnetic energy, has the effect of concentrating the apparent energy emissions of distant active galaxies 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 man. 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.⁶ Likewise our galaxy may appear to be active or quiescent to a distant observer, depending on our comparative reflux rates.⁷

Different patterns may be possible with elliptical, spiral, bar spiral, and irregular galaxies, and they may 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.

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 simply represents the resultant preponderant synchronicity rate.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 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 creation. Einstein himself questioned the continuum basis of his own theories late in life.⁹ The continuum is 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.

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. Time and again 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. They all in effect made this 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.

REFERENCES AND NOTES:

- ¹ See Chapter V
- ² See Chapter IV
- 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.
- ⁴ See Chapter IV, Figure IV-1
- ⁵ Not all physicists are convinced that galactic red shifts are caused by increasing recessional velocity with distance or that quasars are near the observable limits of the universe. Halton Arp of the Max Planck Institute for Astrophysics in Germany contended for many years that quasars are companions of active galaxies that are much closer to us, despite their high red shifts. Schilling, G., *Quasar Pairs: A Red Shift Puzzle?*, reporting in *Science*, **274**, 1305, 1996.
- ⁶ The Hubble telescope has provided images of what appear to be fragments of galaxies with a red shift of 2.4 corresponding to a distance of 12 billion light years (depending on the Hubble constant that you use). Some theorists are quick to 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.
- ⁷ Most theories of how galaxies formed after the big bang suggest that they started out small, however a group of Caltech researchers (Lu, Wallace, Sargent, Womble and Bartlow) reported in the January 1996 issue of *Astrophysical Journal Letters* that they identified what appears to be a gas-rich spiral galaxy about the size of the Milky Way with a red shift of 4.4. This places it at the edge of the universe right after the big bang, before large spiral galaxies were supposed to be around. Tim Appenzeller, *A Familiar Face for a Distant Galaxy?* reporting in *Science*, **271**, 1996.
- ⁸ 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 galaxy with peaks in the Wilkinson Microwave Anisotropy Probe (WMAP) that sought to detect galactic seeds in the early universe by scanning the microwave background in an area of sky. Verschuur G. L., High Galactic Latitude Interstellar Neutral Hydrogen Structure and Associated (WMAP) High Frequency Continuum Emission, *Astrophysical Journal*, July 23, 2007.

⁹ See Chapter IV, Preamble

A NEW PARADIGM

There have been great changes in attitudes in the last few decades, including a search for an elusive new paradigm that can more coherently and constructively lead us into the future. The current paradigm of science still rests on ideas that emerged in the Golden Age of Greece, and it has been instrumental in accumulating a huge fund of factual knowledge over the past few centuries. At the same time it has done little to advance our understanding of the creative process, or how living systems are organized and integrated. This leaves us struggling with an ever burgeoning volume of facts and fragments to a jigsaw puzzle, without an overall picture to guide us in their assembly into coherent meaning. While the current paradigm has proved effective at seeking out the pieces, it remains inept at putting them together in a way that is consistent with the living world of our common experience.

The alternative paradigm introduced here in Book 1 employs the vast fund of factual evidence in the context of a more fundamental worldview. It draws on the array of scientific facts to lend the basic laws of physics transparency in the light of new insights into the cosmic order. This has profound implications for our view of quantum events, atomic structure, the nature of space-time, and cosmology.

Since a new paradigm must also be expected to embrace the living structure of experience, Book 2 shows how the human nervous system works to integrate meaning, synapse by synapse. It thus shows how intelligent processes are organized and how they evolve to span and integrate events in space and time. New and more fertile horizons are offered to the whole of science, in a way that can breathe life and meaning into our social endeavors. This is not a critique of science, but a science book, based on new inroads into the cosmic order.



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