



Atoms & Space-Time



MindReach Library

Inroads to the Cosmic Order

Summary Introduction:

The following verbal summary is a self-consistent analysis that is consistent also with the most fundamental mathematical relationships of the atom.

It will be necessary to refer to the drawing of [System 3](#) on the website. System 3 consists of a Space Frame that illustrates one particular atom and a Quantum Frame that illustrates the same atom as a quantized bundle of equivalent energy. All particular atoms synchronously appear and disappear with oscillations back and forth between Space Frames and Quantum Frames. This defines a discontinuous universe. Since the Quantum Frames are timeless the Space Frames close ranks to present the appearance of continuity to space and time, called the integrated fabric of space-time.

The Quantum Frames are spatially indeterminate and collectively they constitute a timeless field of energy quanta called the Void. The Void is also referred to as the Quantum Sensorium. It is orthogonal to space-time and being timeless it spans and integrates history.

It is possible to intuitively perceive that the quantum frame is the inverse of the space frame in the sense that it is orthogonal to the integrated fabric of space-time. In that special sense it does not exist in space-time even though it is real and has real effects. It represents a periodic discontinuity in the integrated fabric of space-time, the period being associated with a primary interval of time. This discontinuity is related to Planck's universal quantum of action, designated as h .

Introductory Note:

From the diagram of [System 3](#) it can be seen that each Frame is made up of a Universal Term interacting with a Particular Term, the latter being representative of many of its kind. Each Term is made up of a Set of three Centers, the Universal and Particular Sets being self-similar in character.

A Center as it relates to an atom is defined as an active interface between a common inside in light and a common outside in darkness. Light and darkness are used in this context since they are observable phenomena that exemplify the active and passive aspects of the creative process. Light refers to all electromagnetic energy and its derivatives, such as virtual images that occur in the higher Systems. Because active interfaces exhibit an active common center in light they are called Centers to simplify descriptive language.

An active interface is not a static boundary between designated entities since the word entity itself implies a boundary that defines it in some way. The active interface IS the entity. What we observe in phenomenal experience is active processes across active interfaces between a common inside

and a common outside. The active energy processes occur in efflux from inside to outside. The common inside and outside are shared by all phenomena. This is a primary condition for there to be such a thing as Universal Wholeness that can provide for coherent meaning of diverse phenomena. The nature of the common inside and outside becomes progressively elaborated upon by the higher Systems.

Centers can actively relate to one another in a variety of ways through the efflux and reflux of light energy as illustrated in the diagrams and as described below. The System explores and meaningfully integrates all possible ways that Centers can relate to one another with respect to a common inside and outside. In System 3 there are four possible ways that three Centers can relate to one another, each way being called a Term. They interact in pairs to define the Space Frame alternating with the Quantum Frame.

The System is therefore inherently all embracing. It does not make a priori assumptions about the nature of space and time, the characteristics of which emerge with the synchronous projection of atoms in the explanations that follow.

It is in the nature of the System that it must find confirmation in phenomenal experience of some kind. In a scientific context, empirical evidence is essential to intuitively understanding it, and vice versa. This is implicit in the methodology of the System. The System is not a logical construction erected as a superstructure on axiomatic principles and yet it is logically self-consistent. Not only can it find confirmation in the public domain but also in personal experience that can transcend reason and the discursive intellect.

System 3, Atoms from the Outside and Aristotelian Identity in Space-time:

In the diagram of [System 3](#) one can associate Centers 1, 2, & 3 with the photon, electron, and proton, respectively in a single primary atom of hydrogen. The relationship between the three Particular Centers of each Particular Set is intimate in a cosmic sense, since it is prescribed by a single archetypal Universal Set common to all hydrogen atoms. The Universal Set cannot exist separately in the integrated fabric of space-time. It is confined within the three Particular Centers of each atom, similar to quarks, intimately linking the Particular Centers up in pairs. Because the Universal Set is self-similar to all Particular Sets all atoms of hydrogen are identical. The identity of each is defined by its relationship to the common archetypal energy pattern. All atoms are indistinguishable energy quanta in the unified field of the Void, and they are separate physical things that define material existence in the integrated fabric of space-time.

Each hydrogen atom thus exists as an intimately bound unit that is spatially distinct and separate from other identical atoms on the space frame side of the diagram. On this side of the [System 3](#) diagram one hydrogen atom is separate from but identical in character to every other. Since our ordinary spatial perceptions are confined to this side of the diagram we can equate one hydrogen atom to another in the traditional Aristotelian way, that is, $A=A$.

In a more comprehensive sense Centers 1, 2 and 3 can be associated with Idea, Routine and Form respectively. These three words take on the broadest possible meaning in a general context and they become focused differently according to the circumstances in which they are applied. Nevertheless, there is a common significance to the words that prevails across a broad spectrum of circumstance.

For example an Idea entertained in the human mind gives direction to Routines of muscular action that result in a specific Form consistent with the Idea. One may have an Idea to draw a picture using a pencil and paper. The Routines that one employs result in a Form to the picture that is consistent with the Idea. We expend energy (derived from the sun) in drawing the picture (which will be called efflux designating an outflow of energy originating from the Idea) and that energy becomes invested

through our Routines in the Form of the picture. We also get visual feedback (called reflux designating an inflow of light energy back from the picture on the page). The reflux recreates the Idea in the “inner space” of our minds in a way that is self-consistent with the Idea originally conceived. All conscious human activity conforms to this archetypal pattern, in which there is a unique universal set of Centers 1, 2 & 3 that intimately binds the three particular Centers into a common result. If we draw two pictures the same, we can equate one to the other and say $A=A$.

We are each like human atoms, mutually distinct and different, yet also the same, since we each independently relate to our common humanity. The biological organization of all living creatures conforms to the same pattern (A general description of how it works in biology is given in Fisherman’s Guide.). In this context we can equate one ape or one elephant to another ape or elephant. All particular creatures of a species are identified by their common relationship to the universality of their species. That is how we identify a particular human or individual animal. Nothing that exists in space-time is unique unless it is the last living member of a dying species. Implicit in the identity $A=A$ is a fundamental ontological relationship between the universal and particular aspects of all being. This is prescribed as a fundamental relativity principle by System 2 which transcends and subsumes System 3. (The relationship of universals and particulars has been a philosophical issue throughout the history of human thought.)

Inner Space and Outer Space:

By way of introduction then we can say that Centers 1, 2, 3 correspond to photon, electron, proton respectively and that they also correspond in universal ways to Idea, Routine, and Form. In what follows it will prove advantageous to think of a primary atom of hydrogen in this way. The hydrogen atom will be considered as primary to the physical creation.

Electrons and protons can be independently identified when they become removed from the “inner space” in which they are intimately bound together within the atom. They derive from the atom, not vice versa. Theoretically there are an infinite number of energy levels or orbits that the electron can occupy in relation to the proton inside the atom. Each higher energy level diminishes quickly in relative magnitude approaching zero at infinity. Since the energy level in the first orbit is -13.6 electron volts, this amount of photonic energy absorbed by the atom becomes the energy of ionization beyond which the electron and proton become free from their mutually bound state within the atom. They escape the inner space of the atom and become free to move independently in the external space between atoms.

The energy of ionization is the amount of photonic energy that defines the maximum “inner space” of the atom. The spatial projection of a whole atom is quantized in each Primary Interval of Time defined by the successive recurrence of each space frame. When electron and proton exist independently beyond this limit, they remain linked by photonic energy. They are still intimately coalesced as photonic energy that is integral with the photonic energy interface C1 of the Universal Set within each Quantum Frame. ([System 3](#)) This means that the Universal Set now has to span one or more primary intervals of time to link up electron and proton. In this way light, expressed as the energy of ionization, defines the inner spherical space of the atom. Light also defines the outer linear space that interconnects all physical matter in the integrated fabric of space-time. Where there is no light there is no space. There is a black hole.

Linear electromagnetic waves are generated by electron quantum jumps in successive space frames from excited orbits within the inner space of the atom back to lower energy orbits. No particulate motion is allowed within one Space Frame. so the jump occurs from one space frame to a succeeding frame. The energy emitted lights up and interconnects the external universe by defining external space that is generally flat, but with curvatures conditioned by high relative motions and concentrations of high-density matter.

High relative motions introduce relative space frame skipping accounting for relativistic effects between different inertial systems. High density matter consists of fused atoms that concentrate space by occupying less space than un-fused atoms. One atom of helium defines less than half the space of two atoms of hydrogen. Atoms thus have an independent relationship to the light that defines space. That is why the speed of light is universal. Relative patterns of angular motion together with the related fusion of atoms have the effect of introducing relativistic curvatures in the integrated fabric of space-time.

Electromagnetic fields are generated by the photonic energy that must span a succession of space frames to link free electrons to their proton partners, since they are beyond the reach of light in a single frame that defines a primary interval of time. Nevertheless, the electron, proton and photon remain intimately bound in the timeless quantum frame that spans and integrates history. The linking by the universal set is stretched out as a polarization on the space frame side and can reach to the ends of space and time. In so doing it creates the electromagnetic field.

Triadic Identities Inside the Atom:

Let us look more closely within one atom represented on the space frame side (bottom part of the System 3 diagram). The three particular centers, which we can designate P1, P2, P3, are spatially closed and are thus identifiable by experiment in the right circumstances as separate three-dimensional things with independent but mutually related qualities. Within the atom each has a separate but intimate relationship with the other two, since they are linked up in pairs by the single but open set of universal centers, which we can designate as U1, U2, U3. Open Centers are archetypal and do not exist as separate entities in space-time. They are confined within closed Particular Centers which have separate spatial identities in space-time. (Closed particular Centers always occur as an intimately bound triad and this can happen in a variety of ways in the higher Systems that relate to living biological systems.)

The universal set is an archetypal energy pattern that is common to all hydrogen atoms (similar to a genotype). These open centers transcend the limitations of the integrated fabric of space-time since they influence its very nature without existing as separate space-time entities. Although they transcend space-time in this sense, they can also have explicit space-time influences. For example they account for quantum correlation and electromagnetic fields.

If we look closely at the space frame side of the [System 3](#) diagram we see that P1, P2, P3 are separate and distinct, while U1, U2, U3 are not. U1 is inside U2 and it represents a common center within each of P1, P2, P3. U1 relates out through U2 from within each of P1, P2, and P3, and in doing so defines a subjective aspect residing within each Particular Center. At the same time U3 is perceptually transposed (facing in the opposite direction) with respect to U1 and U2 and it is also confined within each of P1, P2, P3. But it relates back in the opposite countercurrent direction across the "inner space" within the atom between P1, P2, P3. In this way it defines an objective external aspect to each closed Particular Center even while it binds them intimately together in the inner space of the atom. Together this intimate relationship constitutes a single spatially distinct atom that acts like an indivisible particle of matter.

The countercurrent relationships defined by U1, U2, and U3 between P1, P2, P3 involves a transfer of electromagnetic energy in efflux and reflux. (It is convenient to use these common dictionary words as general indicators of all processes that are structurally similar but with differences in character when it comes to biological systems.) Energy flows from U1 through U2 to leave each particular center (efflux) only to enter U3 in the adjacent particular center across the inner spaces between P1, P2, P3. There is reflux back in the countercurrent direction between each pair of particular centers. These countercurrent relationships must follow pair by pair in the same direction, since no particular center can have two universal centers within it. The universal set is unique. The way the space frame side of the [System 3](#) diagram is drawn this linking up is shown in a

counterclockwise direction in relation to efflux.

The subjective to objective identities of the Universal Term in the Space Frame defines each Particular Center as spatially distinct with a closed energy interface. The electron, proton and photon thus assume separate physical identities by being intimately linked up in pairs by the Universal Term. These three mutually reinforcing identities in pairs is called a Triadic Identity.

Spatially distinct and therefore closed Centers only occur as Triadic Identities. No other combination of Centers than three can produce spatially distinct material things that we can be identified in space-time. The higher systems delineate more elaborate ways that this can work in living organisms, however.

Electronic Charge in Stable Orbits:

By looking at the Universal Set it can be seen that there is a subjective to objective energy imbalance between U1 and U3 across U2, since U2 is an active interface between them that objectively faces U3 outside it and has U1 within it. Another look at the diagram will show that the objective relationship between U2 and U3 coincides with the same objective relationship between the electron P2 and the proton P3, but not between P1 and P2, or between P3 and P1. U2 is aligned with P2 and U3 with P3 only across the inner space between electron and proton. This indicates that the subjective to objective energy imbalance imposed by the Universal Set across U2 and thus between electron P2 and proton P3 is directly associated with the electronic charge between the electron and the proton as mediated by photonic energy.

The attraction between electron and proton does not result in electromagnetic radiation within the inner space of the atom because no particulate motion takes place within a single space frame. All relative motion can only occur between space frames as sudden jumps in position. The electron can not lose energy and fall into the proton.

The [System 3](#) diagram also indicates that the photon Center P1, with U1 inside it, is uniquely defined as having a universal center consistent with itself. Although the electron P2 and proton P3 also have U1 within them they have reciprocal relationships to the particular photon P1 with which they are intimately bound. As pointed out above, the particular and universal Centers 1, 2 and 3 also represent Idea, Routine and Form in a more comprehensive sense that applies to biological organization and human behavior, as well as to atomic structure.

So we can see that within one atom, the photon P1, with U1 inside it, relates in efflux to the electron P2 through the universal Routine interface U2 of P1. At the same time the universal Form interface U3 within the electron P2 relates back in reflux to the photon P1. In this way it is photonic energy that determines the Form of electronic Routines that predominate within the atom. Photon energy becomes invested in the orbital mechanics of the electron from space frame to space frame. In doing so the electron must relate to the "inner space" of the atom defined by photonic energy.

We know of course that the spectral lines of hydrogen are directly related to the allowable orbits of the electron and their energy levels, but now we can begin to see an ontological reason for it that can further clarify why. There must be a whole number of quantum jumps in electron position around each orbit that encloses the inner space of the atom as defined by the photon. There is no such thing as half a jump. The quantum jumps in position thus correspond to the de Broglie wave length of the electron in each orbit. The wave motion of the electron is the jumps back and forth between frames.

Electron Orbits in Relation to the Proton and Photon:

The universal Form of the electron P2 is identified by its relationship with the photon P1 (and U1 inside it). But the electron also has universal photonic energy U1 within it. This photonic content of

the electron must be associated with its mass and it relates in efflux through its Routines toward the Form of the proton P3. So its successive quantum jumps in position must orbit the recurrent position of the proton from space frame to space frame. The latter must remain essentially at the center of the inner space defined by photonic energy in each space frame. The Proton in turn relates in efflux to the Photon to establish this. As a result its mass is much greater than that of the electron, 1836 times greater according to empirical measurements.

The electron P2 is also the closed Routine interface of the particular set, the proton being the closed Form interface of the particular set. This indicates that the Routines within the atom are focused predominantly in the electron while the mass is focused predominantly in the Form of the proton. The illustration of the space frame side of [System 3](#) does not provide a physical picture of the atom directly but it does indicate how the atom must be organized as an ontological unit since System 3 exhausts all possible relationships between three centers as an elaboration of System 2 consistent with experience and the empirical evidence.

We can also see that the proton, P3 with U1 inside it, relates in efflux through the universal Routine interface U2 within it to the universal Form interface U3 of the photon P1. The photon relates back to the proton in reflux through its universal Form interface U3. In this way the Form of the photon interface P1 is specified as a closed energy shell with respect to the Routine interface of the proton. The proton is at its center, consistent with the way electron orbital Routines relate to the proton.

The photon P1 which is uniquely defined by photonic energy U1 within it, consistent with itself, thus prescribes the inner space of the atom and the orbital routines of the electron around the proton. The ontological organization of this triadic identity is thus reinforced by the countercurrent relationships taken in pairs between photon, electron and proton, consistent with the empirical evidence.

The inverse relationship of the photon to the electron as compared to the proton is also consistent with their opposite charges. While the electron and proton are invested with mass the photon is uniquely defined by a universal center the same as itself and displays no mass. In this respect photonic energy, in itself, characteristically defines space, not mass. This is the Idea that becomes invested in the Form of the atom as a unit of matter through these organizational Routines.

Significance of the Triadic Identity:

The proton is classified as a baryon in the family of hadrons and is thought to consist of two "up" quarks and a "down" quark confined within it. This begs a correspondence to the Universal Centers. U1 and U2 relate in efflux (up) to the photon and U3 relates in reflux (down) back to the electron. (Although the electron has the same universal centers within, it does not relate in efflux to the photon, but vice versa.)

The only other long lived particles known in the universe are the neutron and the neutrino. Descriptions of how they may relate to the fusion and decay of heavier atoms are given in Science & Cosmic Order. All other particles are highly transient homologues of [System 3](#), and higher systems. There is no conclusive evidence, and to my mind no convincing evidence, that they are in any way fundamental to the creation of the universe. An origin to the universe is an inherent contradiction when space-time is defined by its material content.

It can be seen that the triadic identity is a complex of interacting processes that on the one hand define photon, electron, and proton in the inner space of the atom and on the other hand define the whole atom as an indivisible unit in the external space. External space is also defined in relation to the inner space of the atom. Light comes to us as the efflux of electromagnetic energy from quantum jumps of excited electrons back to lower orbits that define the active energy interface of individual atoms as indivisible particles of matter. Since light can only travel a discrete distance in a primary interval of time, this defines space in relation to each atom.

Moreover the triadic identity applies to biological processes and the synchronous integration of human activity. While the language used to describe these other processes takes on different nuances of meaning according to the particular circumstances it nevertheless retains a universal significance.

These characteristics of the triadic identity render it difficult to access with mathematical language although some aspects of the identity allow mathematical expression, as in quantum chromodynamics. In my view however an accurate and comprehensive mathematical generalization of the complete identity is not possible. There are other flies in the ointment. The triadic identity described defines only the space frame side of System 3, not the quantum side. System 3 also subsumes all higher systems and is itself subsumed by the lower systems. Since the System itself defines the nature of space and time, and the meaning implicit in language, mathematics cannot assume a more fundamental embrace sufficient to express it. Mathematical identities derive from the System as an expression of the cosmic order, not vice versa.

The System can nevertheless give ontological significance to quantitative measurements and direction to mathematical predictions in appropriate circumstances. In this way it can offer valuable direction to research efforts that is not otherwise available at present. Later we will see how the mathematics that is most fundamental to the structure of the atom fits the way the System works and how it can offer new avenues to explore.

The Quantum Frame:

[System 3](#) involves the synchronous transformation back and forth between space frames and quantum frames. Space frames consist of atoms, atomic particles, and electromagnetic fields all integrated into a coherent and apparently seamless fabric of space-time by electromagnetic waves emitted from excited atoms, primarily in suns. Light links everything up by defining the external space between particles of matter. It does not travel through an a priori concept of space or a spacetime continuum as a thing in itself. Light defines external space by its action relative to the primary projection of atoms and their inner space. Since its transmission relates to the primary projection of each individual atom, the speed of light is universal with respect to each atom irrespective of their relative motion with respect to one another. Electromagnetic radiation is omnipresent in the universe except in black holes. Space itself is an intimate mix of light and darkness. It appears as darkness except where light interacts with itself as particulate matter to generate space frames in a holographic cosmic movie.

Between each integrated space frame in which all atoms are linked by light there is a timeless quantum frame in which each physical atom becomes a packaged bundle of photonic energy that is spatially indeterminate. Each photonic bundle is the formless energy equivalent of an atom. It is a potential atom, the Idea potential of an atom if you like, and it cannot be specifically identified. Because the quantum frames are timeless, successive space frames close ranks to present the impression of spatial and temporal continuity to the physical universe. Although the universe gives the appearance of being seamless there are synchronous discontinuities in it that quantize the transmission of light and all particulate matter. Space and time are themselves quantized so that we cannot speak in this context of a spacetime continuum, only of the integrated fabric of space-time. (The hyphen is used in the latter expression to distinguish it from the former.)

The wave-particle duality of quantum mechanics derives from the transformations back and forth between space frames, (with a limited duration defined by the action of light), and timeless quantum frames. There is no particulate motion within one space frame. There is only the electromagnetic activity that projects it. Relative motion results from a series of quantum jumps in position through a succession of still frames. The projection of space-time is thus analogous to a holographic cosmic movie. The integrated spatially indeterminate field of quantum frames is referred to as the Void. It

may also be called the quantum sensorium since it operates like a master memory bank that can span space and time, and from which successive space frames are recalled into Form through a recurrent Routine of transformation back and forth from emptiness to form. The Void is a field of quantized energies that exists orthogonal to the integrated fabric of space-time. In rare instances it can be experienced directly by humans. There are references to it in all spiritual traditions especially in the East (not all of them are authentic). It can also be subject to misinterpretation after the fact, because there is nothing specific in the pure "Being Experience" of the Void, awe inspiring though it is. It embraces all in a state of formless being. We will focus however on the scientific aspects as it relates to System 3.

Transformation from Space Frame to Quantum Frame:

In the transformation from the space frame side of [System 3](#) to the quantum frame side (top part of the diagram) several things happen to both the Particular and Universal Centers. The changes that occur in the particular set P1, P2, P3 are generally the inverse of those that occur to the universal set U1, U2, U3. This is understandable since the universal set is confined within all particular sets on the space frame side whereas it is integral with all particular sets on the quantum frame side. In this integral sense all particular sets are contained within the unique universal set in the quantum frame. The quantum frame is unity. This includes all the atoms in the universe. Although we will be looking at just one atom, the pattern of transformation is synchronously the same for all atoms in relation to the single universal set that spans the whole of space and time. As we shall see later the universal set integrates history.

The Transformation of the Particular Set to the Quantum Frame:

Let us examine the particular set first. On the space frame side the three centers of one particular set P1, P2, P3 are spatially closed and intimately bound by the universal set confined within them. In transforming to the quantum frame the spatially closed photon center, P1, makes what is called a perceptual transposition. It turns around or inverts with respect to P2 and P3. In the space frame P2 and P3 are outside P1, all three being closed centers separate from one another within the atom. When P1 perceptually transposes it becomes an open center that now contains P2 and P3 that also become open centers without spatial form. P2 and P3 still face one another but close the inner space between them like a face to face union that is called coalescence. They are married in an intimately bound state in mutual efflux through to the inside of one another that is mutually shared as the inside of P1 that now relates in efflux to a universal outside.

The universal outside is not space. It is outer darkness. Outer darkness is indefinable except in its passive relationship to the action of light in efflux through an active interface between them. In phenomenal experience we see neither the universal inside nor the universal outside, but only active energy processes across an active interface between them. (Note: Perceptual transpositions work in a variety of different ways in the higher systems.)

In contrast with the quantum frame, the space frame of one atom relates P1, P2, P3 in efflux to one another within the inner space that is implicitly defined for the atom by photonic energy. In their mutually bound state they do not relate directly to the external space between atoms. There is no universal outside on the space frame side. Space is defined by photonic energy as internal space distinct from external space.

In the quantum frame the efflux out through P1 derives from the coalescence of the combined efflux from P2 and P3 that close together face to face. Efflux from each relates directly to the inside of the other, such that they share a common inside. Their mutual inside becomes the inside of the open photon interface P1 that now relates in efflux to a universal outside. (The organization of this open particular set can be seen in the top part of the [System 3](#) diagram.) The atom thus becomes a coalesced unit of photonic energy. It becomes the quantum energy equivalent of one whole atom. The inside and outside of all three particular centers is simultaneously realized. It is a timeless

relationship. In other words the internal and external aspects of an atom become an eternal bundle of energy. The inside and outside of things no longer exists in space or time. The origins or ends of space and time lose all significance. Space and time as we experience them in the integrated fabric of space-time are suspended in the Void. There is only a limitless timeless field of pure being that is spatially indeterminate. The pure experience of the Void is truly awesome.

The Transformation of the Universal Set to the Quantum Frame:

In the space frame the universal set is confined within the particular centers of the particular set. U1 is inside U2 and both are within each particular center in turn, relating in efflux to U3 within the adjacent particular center such that it relates back in reflux. The universal centers thus relate in efflux from P1 to P2 to P3, in that order, and in reflux back in reverse order. (If the order of efflux and reflux is reversed it results in degenerate anti-matter as described in Science & Cosmic Order.) (see [System 3](#))

U1 is inside U2 which faces U3 on the space frame side. The three universal centers are confined within the particular centers of each atom. The open Idea interface U1 is subjective to the Routine interface U2 which objectively faces the Form interface U3. The particular centers are linked up in this way across the inner space of the atom. It is this universal relationship that defines a subject aspect relative to an objective aspect for each particular center. Subjective and objective are not assumed as given axioms or a priori qualities.

Whereas the transformation of the particular set to the quantum mode involves the perceptual transposition of the Idea (photon) interface P1, the transformation of the universal set involves the perceptual transposition of the Form interface U3. The Form interface U3 that specifies a form to each of the particular centers in the space frame turns around to contain U1 and U2 in the quantum mode. It turns outside in, so to speak, not inside out. It contains all particular sets in the quantum frame whereas it was contained by them in the space frame mode.

In the quantum frame efflux through the universal centers proceeds from U1 which is a universal center of light, progressively out through Routine U2 and Form U3 to a universal outside in darkness. The three universal centers assume their universal significance as Idea, Routine and Form, in that order. This is the same order in which the particular centers P1, P2, P3 are linked up in the space frame. In the quantum frame the universal set thus relates to each particular set in a symmetrically inverse manner to the way that it relates to each particular set in the space frame.

The Transformation of the Universal Set Back to the Space Frame:

There is a time-like significance to the way that the universal set works in the quantum frame even though the Void itself is timeless. Efflux from the universal inside U1 proceeds through U2 thence through U3 to the universal outside. We already know this. Ideas become translated into explicit Forms via Routines. When we make anything the idea comes first. We cannot say precisely what the idea consists of, or precisely where it comes from. We wonder about something and the idea comes. It comes from the Void as an energy complex that directs subsequent action, that is, the routine of making it. Then along comes the form of the finished article as a result of exercising the routine. In this time-like sense the Idea of a drawing a picture comes first. It gives direction to the Routines involved in the process of drawing. Those Routines give direction to the Form of the finished drawing. The sequence is universal as it relates to the potential Idea. We know we will always have to exercise a routine of some kind to achieve the form. In the special case of the physical universe the universal set embraces all physical being.

The Void is the quantized energies of all atoms as formless bundles of photonic energy P1 coalesced with P2=P3 inside. Collectively all the coalesced bundles of photonic energy associated with all the atoms of the universe constitute U1. They are U1. They are the form of the physical universe as a potential idea. They are the universal inside of the universe as it relates to a universal

outside.

So the time-like progression of the universal set in the quantum frame side of the [System 3](#) diagram relates to the progressive translation of the Idea center U1 that constitutes the pure being of the Void through a universal Routine, into a universal Form. The universal Form is the integrated fabric of space-time on the space frame side. It is the integrated Form of the whole universe. This integrated Form of the universe is recalled from the formless Idea implicit in the Void (or the quantum sensorium) via the Routine of transformation from the Void back to Form. Thus even the process of translation from the quantum frame back to the space frame follows the pattern **Idea -> Routine -> Form**, although it works in a manner orthogonal to space-time.

Energy exchanges that involve relative accelerations occur via this Routine of transformation from the Void back to Form. This is developed in S&CO and involves a relative increase in the skipping of atomic space frames with respect to a frame of reference. Relative motions introduce synchronous distortions in the integrated fabric of space-time in a variety of ways with a variety of physical effects. Some of these effects relate to well-known phenomena that otherwise have no convincing or generally accepted explanation.

The transformation back to the quantum frame occurs when light has exhausted its external transmission capacity that defines external space with respect to the inner space of each atom within each integrated space frame. There must be external spatial continuity or we would see it full of black holes. This external transmission capacity is related to the inner space of each atom where a primary interval of time is defined. (Keep in mind that each integrated space frame is a 3D still picture without particulate motion. Only electromagnetic activity occurs in each frame. It is quantum jumps between successive frames that generate relative motions.)

Recurrent Transformations between Space and Quantum Frames:

It is the universal set that regulates the transformations back and forth between quantum and space frames. Although the space frames close ranks there is a discontinuity between them where the quantum frame timelessly intrudes. Although space has every appearance of being continuous in three dimensions it is everywhere full of irrational holes. In addition electromagnetic radiation that defines three dimensional space is likewise discontinuous where quantum frames timelessly intrude. The electromagnetic spectrum is sliced across its entire breadth once every primary interval of time. Even though the EM spectrum consists of a continuous range of frequencies, the EM radiation is transmitted as a series of quantized pulses that we call photonic energy, space frame by space frame.

Max Planck's disturbing "act of desperation" quantitatively expressed this discontinuity with his universal constant, the quantum of action h . The photonic energy of radiation E is equal to h times the frequency. The higher the frequency the higher the electromagnetic photonic energy in each primary interval of time and each primary interval of time is universally constant. A century ago it would have seemed ludicrous to suppose that the whole universe might be discontinuous and synchronous, but that is what Planck's constant directly indicates. There was simply no self-consistent and credible ontological paradigm that could justify such a supposition, so both relativity theory and quantum theory developed side by side on mutually contradictory foundations.

Einstein proposed the special theory of relativity to resolve apparent contradictions that arise in Maxwell's equations between different moving frames of reference, and the measured universality of the speed of light observed in the experiments of Michelson and Morley. He later devised the general theory to show that gravity could be explained by curvatures introduced by concentrations of mass in a presumed spacetime continuum. Even though Einstein made important contributions to the early beginnings of quantum mechanics, it was not recognized that the discontinuity indicated by Planck's constant is inconsistent with the presumption of an a priori spacetime continuum. Einstein

strongly objected to the direction that quantum mechanics later took, a position he maintained until the end of his life. A quote in a letter to a friend the year before he died is noteworthy: **“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 de Broglie Equation:

A decade after general relativity was introduced Louis de Broglie came up with another main cornerstone of quantum mechanics. In developing his insight of a particle as “a little clock in motion in phase with its wave,” he employed the Lorentz transformations of special relativity. He explicitly equated the transformation formula for the retardation of clocks in motion to the transformation formula for the frequency of a wave, also adding a term to the latter for the displacement of the wave along the direction of travel. This led to the result that the momentum “ p ” of the particle is equal to the quantum of action h divided by the wavelength “ L ”. This de Broglie equation $p=h/L$ complements Planck’s equation $E=hf$ as a basis to quantum mechanics. (Where E is the energy of electromagnetic transmission and f is its frequency.)

Louis de Broglie said he was “greatly smitten” by the fact that the Lorentz transformation formula for a wave is the inverse of that for a clock. In view of the above description of System 3 we can see an ontological reason why one Lorentz formula is inverted relative to the other. The particle is transforming back and forth between space and quantum frames, the latter being orthogonal to the former. In each space frame the inner space of the atom is also distinct from external space. The cyclic transformation back and forth between atom and energy quantum is associated with the internal frequency of the particle along with all the particles in the universe, like synchronous clocks. Louis de Broglie began by defining an internal rest frequency of the particle connected with energy as $E = hf = mc^2$. There is a clear correspondence to [System 3](#) here.

The particle is moving with respect to an external stationary frame of reference, however, defined by stationary atoms. System 3 tells us that all particulate motion only occurs as quantum jumps in position from space frame to space frame, and all motion is relative. So de Broglie expressed the external variation in wavelength of the moving particle as a ratio dx (for its displacement along the X axis) divided by L (L for wavelength) and used this in his expression for the change in external phase of the moving wave. This ratio however assumes that the wavelength of the stationary particle is the same as the wavelength of the stationary frame of reference. In his expression for the variation of the external phase of the wave de Broglie thus included a term for the displacement of the wave along the X axis relative to the wavelength of the stationary particle and observer. The overall expression included the Lorentz transformation for the change in frequency of a wave moving with speed v relative to a stationary frame of reference, such as a measuring apparatus.

For the variation of the interval of time dt of the internal phase of the moving particle he used the transformation formula for a clock in motion, which is the inverse of that for a wave in motion. He included no term for an internal wavelength (which would lack meaning) focusing instead on the change in the internal interval of time associated with the frequency of the particle as it moves in relation to a stationary external frame of reference.

He then equated the variation in the external phase of the moving wave with the change in the internal phase of the moving clock, and substituted vdt for dx in the expression for the moving wave. The derivatives of time dt cancel out and the expressions of rest energy (rest mass $m \times c^2$) vanish. The expression remaining states that the relativistic momentum of the moving particle is equal to Planck’s constant h divided by the wavelength.

What wavelength? Is it the wavelength of the moving particle or the wavelength of the stationary observer? Or does it matter, since the wavelength is relative to the relationship between a moving

particle and observer? If the particle is not in relative motion the particle would have no momentum and the equation could not be derived.

There must be some ontological significance behind the equation since it is consistent with experiment and has become a foundation stone of quantum mechanics. According to [System 3](#) relative motions introduce space frame skipping between particle and observer. They get out of synch with the primary projection of the universe because light cannot fully bridge the quantum jumps in positions of the moving particle relative to the observer. Little black holes tend to open in the trajectory of the moving particle so the observer's space frames tend to get swallowed in them at intervals relative to the particle. Relative to the observer the particle appears to move in ever shorter quantum jumps the faster it goes, since more and more of the observer's space frames are being skipped relative to it. The faster it goes the more the primary intervals of observer's time that are skipped. So the observer's time is compressed relative to the particle, while the relative space of the moving particle is being contracted in the direction of travel with respect to the observer. There is a corresponding accumulation of timeless quantum frames of the moving particle that do not actualize with respect to the observer. They become an accumulation of energy associated with the moving particle that results in an increase in its relativistic momentum. There is thus a clear ontological reason for why the de Broglie equation works and de Broglie himself glimpsed something of it when he derived his equation. His derivation is given in his own words (fifty years later), describing the ideas that led him, in Chapter IV of *Science & Cosmic Order*. (In later developments de Broglie's "pilot wave" inspired David Bohm's Quantum Potential associated with Schroedinger's wave equation.)

The Vantage Point of the Observer:

Depending on circumstances things with respect to the particle may not change very much. If we exchange the particle for a space ship with people aboard who are able to observe the stationary observer arbitrarily situated on a platform in space, the inverse changes may be apparent to those in the ship, since external space is defined by light in relation to the inner space of the atom. In such a circumstance there may be no way to assign a preferred reference frame to either the space ship or the platform of the observer.

The vantage point of the observer is not necessarily an arbitrary matter as when there is no preferred frame of reference, however. Experience is not normally presented to us in this way. The physical universe exhibits a preponderance of synchronicity in its organization into galaxies, star systems, planets and moons. A pattern of relative rotational motions predominates involving a relative skipping of space frames at their centers with respect to their peripheries that must be reconciled with the synchronous projection of the universe as a whole.

This can involve a variety of effects mediated through the quantum mode on all scales and in extreme cases it results in black holes such as at the centers of galaxies. (Some of these effects are yet to be recognized and this avenue of explanation can be applied to understand others that are known, such as the differential rotation of the sun and the observed inverse distribution of momentum in the solar system, the missing mass needed to account for celestial mechanics generally, and other effects.) There are patterns within patterns within patterns on a cosmic scale that no one can change. Mach's principle is associated with this preponderance of synchronicity that is universally regulated on a cosmic scale.

The concept of simultaneous events also takes on different implications according to System 3. While there remains no way to make measurements of simultaneous events in the integrated fabric of space-time, as relativity theory maintains, this does not mean that simultaneous events do not occur. In a synchronously projected universe its atomic constituents are simultaneous within each primary interval of time with respect to any observer, while taking into account the relativistic skipping of frames in the integrated fabric of space-time. Space-time spans and integrates the

history of space frame skipping accounting for space-time curvatures associated with relative motions and the condensation of matter into the heavier elements in the centers of suns. The sun is still projected synchronously with the observer on Earth, even though it takes eight minutes for the light to reach the observer. The universe shares a common “present” in the timeless quantum frame from which each space frame is recalled to form. (There is much more to this than can be expressed in a very general way in one paragraph.)

As de Broglie's derivation indicates there are inverse relationships that are apparent on a cosmic scale and that involve synchronous transformations back and forth between space and quantum frames. In itself this does not lead to inverse identities in a meaningful way that has practical application for us on the space frame side. However they do become meaningful when there are relative changes spanning a succession of frames and when we seek to historically integrate processes of change in significant ways by applying universal laws and equations.

Atomic Structure and the Primary Interval of Time:

When Niels Bohr, working with Rutherford, proposed his theory of the atom he hypothesized that some of the well established laws of physics do not apply within the atom. This is a remarkable assertion. He followed it up with several precepts for which he had no explanation. He stated that electrons could only exist in certain stationary orbits within the atom and that in this condition they do not radiate away energy which would cause them to slow down and fall into the nucleus. In addition he stated that the angular momentum of the electron must be a whole number multiple of $h/2\pi$. (This indicates that h corresponds in some sense to the radius of a circle, in this case the cyclic recurrence of each space frame.) He also maintained that the centripetal force that holds the electron in orbit is the Coulomb force of attraction between electron and nuclear proton. He further stated that energy emissions from the atom corresponding to discrete frequencies of spectral lines occur as quantum jumps from higher to lower orbits. He insisted that it must be a jump. The electron cannot exist between orbits.

Bohr was forced to make these ontological assumptions in order to fit the evidence and Rydberg's mathematical relationships together into a coherent theory. Later Louis de Broglie showed that his particle waves could explain why only certain orbits are allowed. There must be an integral number of electron wavelengths around each orbit to avoid interference. As pointed out above de Broglie waves are quantum jumps in position of the electron and there is no such thing as part of a jump.

These premises of Niels Bohr are generally consistent with [System 3](#). There is no electron motion with respect to the nucleus within each space frame of the atom, not even orbital motion. Both electron and proton are synchronously transforming back and forth between space and quantum frames. With the recurrence of each space frame the electron makes a quantum jump in position via the quantum frame. It can jump from orbit to orbit according to discrete energy exchanges with external space without traversing the space between orbits. It also jumps in position through successive space frames in order to orbit the proton nucleus. These successive jumps in position correspond to the de Broglie wave length. Since there is no relative motion in the inner space of the atom within each space frame no energy is radiated away. The inner space of the atom is distinct from the outer space.

It is known empirically that the angular momentum of the electron in the first orbit of the hydrogen atom must be zero. This clearly indicates that there is no relative motion of the electron from space frame to space frame and yet its recurrent position in the same place must be equivalent to one revolution of the first orbit in order to generate a centripetal force equal to the Coulomb force with the nucleus. The time that would be required for one such revolution thus defines one primary interval of time. The revolution, however, takes place as a transformation through the Void and back again. The Bohr radius of the first orbit of the hydrogen atom is 5.29×10^{-11} meters and the primary interval of

time works out to be 1.519×10^{-16} seconds. This also means that EM (light) transmission is limited to 4.554×10^{-8} meters in each primary interval of time. Time and space are thus quantized. (Note: The symbol \wedge preceding a number indicates an index. For example, 2^3 indicates 2 cubed or $2 \times 2 \times 2 = 8$. Or $10^{-4} = 1/10 \times 10 \times 10 \times 10 = 1/10,000$.)

Coulomb Force & Centripetal Force:

It is curious that the angular momentum must be a whole number multiple of $\hbar/2\pi$. This implies, in some sense alien to our minds so conditioned with space-time continuity, that the electron in relation to the proton follows a pseudo circular or cyclic path of circumference $2\pi\hbar$ that is also related to centripetal force. The Coulomb force cannot result in action within one space frame since particulate motion cannot occur within one space frame, so it must act via transformation from the quantum mode. Since electron momentum is a function of the de Broglie wavelength and thus with each primary interval of time, this cyclic recurrence can be considered to take place via a complex field orthogonal to the space defined both inside and outside the atom. The complex conjugate of the Schroedinger Wave Equation directly indicates this.

Given that electron and proton have no characteristics that can relate their relative position to one another in the inner space of the hydrogen atom, there is no way to determine relative motion of one with respect to the other inside the atom through a succession of frames without some external frame of reference. The momentum in the first orbit must be zero in a primary hydrogen atom.

The second orbit is different. A discrete quantum of energy must have entered the atom from some direction outside to excite the atom and jump the electron into the second orbit in a succeeding frame. An external reference is provided for quantum jumps to either higher or lower orbits, since the jumps must span and integrate two or more space frames and they relate to external space.

The radii of orbits increase with respect to the radius of the first orbit as the square of the principal quantum number, which is the number of the orbit. The radius of the second orbit is 4 times the radius of the first and so on. But the number of quantum jumps in position around the orbit varies as the cube of the principal quantum number. (See S&CO Pg. 76) There are eight de Broglie wave lengths around the second orbit and it takes eight primary intervals of time for the electron to go around. In the third orbit there are 27, in the fourth 64, and so on.

Other Observations of System 3:

There are a variety of additional observations that may be made about [System 3](#), a couple of which are relevant to purposes here.

It is apparent that there is a minimum limit to the increment of the differential in the calculus, since space and time are not infinitely divisible, a convenient solution to Zeno's paradox. This places limitations on mathematical methods that may be applied to very small scale quantum events. The principle of indeterminacy is related since exact relative position is determined in a single space frame, whereas momentum by its nature can only be measured over a succession of space frames. Momentum and position do not commute for this reason.

Another important feature is a fundamental distinction between the nature of electromagnetic radiation and fields and the nature of gravity. While there are analogies between EM fields and gravity, they derive from the primary projection of space-time in very different ways. Electromagnetic radiation and electromagnetic fields both derive from the intimate processes within each atom, the former defining external space and the latter spanning a succession of space frames. On the other hand [System 3](#) indicates that gravity derives from the integral unity of all matter as quantized energy in the Void, and is thus directly associated with the synchronous projection of the universe from the timeless Void. Since gravitational effects can only be detected through the integrated fabric of space-time, detection methods are dependent on the speed of light. This implicitly means that there

is no experimental way to determine whether gravitational effects are instantaneous via the timeless quantum mode or not, since determination of the effects can not exceed the speed of light that itself derives from the synchronous projection of space-time. Experimental access to the Void is implicitly denied.

Nevertheless gravity is not a force that is transmitted through space-time faster than light. System 3 indicates that it is not transmitted through space-time at all. In the absence of the spacetime continuum presumed by general relativity, System 3 indicates that gravitational effects observed in the integrated fabric of space-time are universally implemented via transformations from the quantum frame to the space frame side in the cosmic projection of matter. Gravitational effects must still take place by relative quantum jumps in position, space frame by space frame and these cannot exceed the speed of light. The universal law of gravitation can be seen to derive from conjugate identities and historic integration as described below, in a manner analogous to Coulomb's Law but for different reasons.

There are a variety of other phenomena that also indicate a family of quantum forces and effects hitherto unrecognized that are operative via the Void to preserve synchronicity on a cosmic scale. These include the differential rotation of the sun, magnetic pole reversals, the missing mass associated with celestial mechanics, and the apparent prolific energies of distant quasars integrated across a span of billions of years of historic reflux. In telescope images of distant galaxies their history of change must be reconciled with the timeless Void. We share a common synchronous "present" that must integrate the history between then and now.

Conjugate Identities:

Some evidence has been pointed out above for what may be called conjugate identities. In general it may be said that conjugate identities derive from the inverse equivalence between space and quantum frames taken over a succession of recurrent space frames and involving relative motions. Conjugate identities thus involve the historic integration of linear processes in space-time, but taking into account relative quantum effects that are orthogonal to the integrated fabric of space-time.

The inverse equivalence derives from the complex of relationships between particular and universal sets in [System 3](#) that inverts with each transformation between space and quantum frames as described above. Unlike Aristotelian identities, conjugate identities are not a simple relationship between entities perceived in space-time. There are qualitative differences associated with quantitative equivalences across the transformation from space to quantum frames. The integration of this complex relationship can have a variety of effects in the integrated fabric of space-time. Conjugate identities cannot be logically derived from Aristotelian identities without some additional ontological or empirical indication of how to apply them.

The de Broglie equation is a case in point since its derivation involves the mass-energy relationship to the transmission of light in special relativity. The Lorentz transformation formula for the phase change of the external wave is equated to the transformation formula for the phase change of the internal period of a clock in motion, the one being the inverse of the other. The wavelength is created by relative quantum jumps in position that incur space frame skipping. Louis de Broglie took a quantum leap of faith in making the assumptions that he did. His only justification for doing so was an idea of a particle as a little clock in motion.

Space frame skipping is a function of relative velocity (v) in space-time. If space is quantized by the distance that light defines by its transmission in one primary interval of time, then space frame skipping is also a function of the velocity of light. The Lorentz Transformations indicate that the proportion of space frames skipped is a function of $(v/c)^2$. The transformations give the relative proportion of space frames not skipped as the square root of the quantity $1-(v/c)^2$, a quantity I will designate as LT for simplicity in observations that follow.

The transformation formula for the internal frequency of a clock in motion is given by its rest frequency times LT . This is a direct measure of relative space frames not skipped between clock and observer, since the observer can read the clock only as a result of synchronous frames not skipped. However the relative mass of a moving particle = rest mass/ LT . The inverse transformation is used because it is the space frames of the observer, including the stationary surroundings that are skipped relative to the moving particle. The inverse transformation formula is also used for the frequency of a wave for the same reason.

Many observations can be made to indicate how conjugate identities can work in various circumstances. In time a set of general guidelines can emerge that can provide direction to potentially valuable new techniques that can be developed. For example [System 3](#) indicates that there is a quantum energy equivalent of mass, that we can write as $E=m$, where the energy equivalent of mass in the quantum frame is the inverse of mass in the space frame. This has no practical significance in a single space frame relative to a single quantum frame, since we live in the integrated fabric of space-time continuity. But the relation $E=mc^2$ does have practical significance in conjunction with the Lorentz transformations.

This indicates that square of the speed of light c^2 is associated with the historic integration of space-time. Space-time is determined by the integration of successive increments of space, each increment defined by the distance light travels in a single primary interval of time. Each increment is thus like a derivative of space-time defined by light. The historic integration raises the power of c to c^2 , in an analogous manner to the way integration in the calculus works.

Coulomb's Law is related to historic integration. The force exerted between two point-like charges is directly proportional to the product of their charges (a square function if the charges are equal) and inversely proportional to the square of their distance of separation. As noted in the section above describing the primary interval of time the Coulomb force can only act between two or more space frames, so that historic integration is implicitly involved. Although the law was determined experimentally by Coulomb, it is apparent that conjugate identities together with historic integration are both involved since the relationship is associated with the intimately bound electron and proton within the atom and their synchronous recurrence through a succession of space frames.

The Universal Law of Gravitation is likewise related to historic integration. The whole physical universe is integrally unified as energy in the Void. It is also separate particulate matter in the *same* primary interval of time in each Space Frame. Over a succession of space frames Separate Masses are thus historically integrated as indicated by their mutual product being inversely proportional to the square of their separation as defined by light. Space, time, mass and energy as we differentiate them in phenomenal experience become implicitly integrated historically through the medium of the Void.

As mentioned above a variety of other observations may be made concerning conjugate identities and historic integration. Some relate to number theory. Irrational numbers, transcendental numbers, and imaginary numbers can be seen to relate to the recurrence of space and quantum frames as these are reconstructed in human thought and applied to geometry.

Conclusions:

System 3 provides an accurate ontological model of the atom accounting for electronic charge and mass as well as various symmetries implicit in atomic structure. In doing so it defines both an internal space and an external space in relation to the projection of each atom. It explains why the speed of light is universally constant. It defines the Void as a quantum sensorium that is orthogonal to the integrated fabric of space-time. This presents a new theory of quantum relativity as an alternative to special and general relativity in a discontinuous universe. A new approach to

cosmology necessarily follows from the way that System 3 works. [System 3](#) distinguishes between three distinct kinds of identities that apply in different circumstances. In addition to familiar Aristotelian Identities there are also Triadic Identities and Conjugate Identities. The Coulomb force and Gravitational force can be shown to derive from conjugate identities associated with historic integration. Electromagnetic effects are shown to derive from photonic energy spanning successive space frames to maintain the intimate coalescence of electron and proton as elements of quantized energy in the quantum frame (or Void). From similar considerations an analysis of Maxwell's equations can be related directly to atomic structure drawn out beyond the threshold of the ionization energy and thus required to span space and time and integrate history. New approaches are indicated for better understanding a variety of phenomena. This can expand scientific horizons and offer new directions to explore in more meaningful ways.