# The Hexorthogonal Geometry of Subclassical Space

## 1. Introduction

The Impressionist Theory of Everything (IToE) is an examination of a diverse variety of theoretic arguments and empirical structures that show paradox is legitimately a generic and systemic mechanism in the universe. The key element of this model is based on the logical imperative found in the Russell's paradox, called *R*. The Russell set, *R*, is an object having paradoxical properties, and these are given clear mathematical and geometrical interpretations under IToE.

The term *formalism* is used in a general context to describe any and all theoretic, and consistent representations of Nature. Each formal description applies some system of rules for relationship and identity for the given structure. Each formal description is also necessarily incomplete in its singular reflection of Nature, and the mechanism responsible is paradox. This concept goes back to the key finding of IToE, that the universe, as a minimum, is composed of a fundamental dualism of observational perspectives – each perspective, is singularly incomplete in respect to the content of the dualism.

This model combines an orthogonal and an hexorthogonal geometry. As described above, each a singular format, and together, they from a dualism that cannot be formally represented in a single principle. Each is an absolutely unique observational perspective. The first is a space that is observationally open (classical), and the second is a space that is observationally closed (nonclassical). Each construction is a legitimate alternative way to construct a space, yet their properties are mutually paradoxical. For the geometric description, two paradoxical arrangements (one open to observation and one closed) exist, and the description of their individual properties is discussed in Chapter 1.4, <u>Two Geometric Spaces, One Roof: the Local and Nonlocal Structure of the Unit Circle</u>. The key element identified is that two geometries are members of the same space, but each is fundamental and absolute for its properties. This dualistic relationship of property cannot be simplified because the mechanism of the relationship is paradox. Identification and discussion of this arrangement is the central underlying theme in all papers on IToE.

In the subclassical geometry for the model in IToE, the orthogonal and hexorthogonal geometries appear as concentric eccentric, respectively. This paper discusses the eccentric geometric of the hexorthogonal format from the following aspects:

1. Three trigonometric values within the model
2. The origin of the value of pi ($\pi$)
3. Application of IToE to the Euler series for the value of $\pi$
4. The nature of space and time
5. Heisenberg's uncertainty principle and $\pi$ in empirical structures

**2. The evolution of primordial cycle**

Under the Impressionist Theory of Everything (IToE), the concept of a primordial cycle is identified that evolves based on a self-referential force, or pressure, and a dualistic structure of accumulation for the location of the Russell set, *R*. The object *R* has structural presence and is also the mechanism of change in all phenomena (see Chapter 1.6, Primordial Cycle). The term *singularism/dualism* describes the format of the superposed composite referred to above as well as the method of accumulation for the mechanism of change. The fundamental features of this process of development are defined in Chapter 1.5, The Cross-Dimensional Development of Angularity. The key process described by the model is the development of shape at the subclassical level and its culmination in the emergence of a simple point location at the classical level.

The unusual nature of the structure found at the subclassical level is that it contains extension and complexity, yet it is not classically observable. In other words, subclassical space must generate a level of complexity before the observable can emerge as classical. The first part of this process is the outward development of a curvilinear boundary, and the second is the evolution of the linear directions (vectors) of the space. The orthogonal structure (shape) of space is conceived to change at the subclassical level as the space develops to the emergence of the classical plane.

Thus under IToE, orthogonality is not simply a background structure for describing the property of space, but must develop in a cross-dimensional process. The classical observer cannot observe any part of this structure unless it is collapsed (transformed into a classical format). The growth of complexity is both a process of development and frame of reference for how the transformation between a nonclassical and classical space is constructed.

The classically hidden orthogonal structure of the subclassical plane can be thought of as the support for a canopy. This complex structure necessarily has internal extension, which supports the canopy. Once this support exists classical space emerges as a single point. Outward linear extension can then project from this single point. It is important to understand that this process applies to every location within the universe across all space and time. In other words, it is a generic and systemic mechanism. The key factor of paradox is responsible for an imbalance that is displayed by singular location and identity in the universe.

**3. Development of the subclassical canopy**

The canopy described above is classically interpreted as a point, but subclassically consists of complex curvilinear and linear structure. These structures are separated by dimensional boundaries formed in the process of the development of the space. In the first stages of this development, two dissimilar structures are produced that have separate ½-spin and ½-orbit properties. These objects serve to close a null state domain that is then centrally contained. The combination of the two objects, one of orbit and one of spin or rotation, is interpreted classically as the inner shell in Figure 1. From the point of return-to-origin identified for the inner shell, linear shape develops and forms the supports that hold open the circumference d(6). In classical terms, d(6) is a point.

The above description is a classically biassed depiction because circumference is, itself, a classical structure. Furthermore, an infinite structure of shape not limited to a two-dimensional plane is contained and hidden within this circumference. Please see 1.5, The Cross-Dimensional Development of Angularity for further discussion of the development of this space.

The way structure develops under IToE, once the classical plane has emerged as a point, mirrors the same geometric structure contained within the subclassical space of the classical point. This is a very important principle. It explains how subclassical structure is superposed in what we observe as change at the classical level.

**4. Placement of null state portions within the subclassical space**

Note: Some of the information in this section is taken from Chapter 1.4, Two Geometric Spaces, One Roof: The Local and Nonlocal Structures of the Unit Circle, which describes the relationship between the concentric and eccentric spaces of the Impressionist Theory of Everything model.

*Null states* are spaces, locations, or identities that are not defined in classical terms. The result is that, for the geometric interpretation of a space that contains null states, there is a classical confusion for where these null states should be placed. This gives rise to the two geometric interpretations for the same subclassical space under IToE.

The first version of this subclassical space is based on the complex unit circle (described by the *Wessel-Argand-Gauss plane*). This structure is the concentrically based form. The second version of the subclassical plane is the hexorthogonal arrangement of the complex unit circle, which has the property of eccentricity. A nontransformable relationship for properties exists between these two formats of the same space. The concentrically based space contains mathematically correct locations and geometrically discontinuous directions. The directions are discontinuous because each one contains null locations that disrupt the path of the classical observer. In complementary fashion, the eccentrically based space (the hexorthogonal version) is not mathematically correct for its structure, however, the directions (nonclassical vectors) identified within it are continuous. In the eccentric structure all the null states of the subclassical plane have been centrally collected (see Figure 1 in Chapter 1.4, Two Geometric Spaces, One Roof: The Local and Nonlocal Structures of the Unit Circle).

The term *hexorthogonal* indicates that there is an orthogonal structure of six directions, not four. The term *ortho* is used in the most general sense of the word taken from its Greek origin meaning *adjacent* or *correct*. Thus the minimum number of adjacent directions required to specify the properties of the hexorthogonal space is six. These directions project to form the final canopy (represented as d(6)), the linear superposition of the individual and infinitely symmetrical subclassical structures d(1) through d(5) described in Chapter 1.5, The Cross-Dimensional Development of Angularity.

Please note that the hexorthogonal structure is ortho only to the limit of the two-dimensional plane. This is because the Impressionist Theory of Everything (IToE) is the study of how dimensional structure develops. Structure beyond the two-dimensional plane cannot be interpolated from the hexorthogonal structure in Figure 1.

**5. Three trigonometric values defined under IToE**

The directions and locations found within the d(6) shell (Figure 1) are very unusual. The horizontal and vertical directions of the space are not rotational copies of direction in the space. Rather, the directions and locations that are copies project around the circumference d(6). There are six locations and directions.

Thus in the space of the subclassical plane in Figure 1, classical relationship between the identified locations and their directions is not found because the orthogonal directions (required to classically specify such relationships) are missing. This domain is defined only in rotational terms by the identified points joined around the circumference. This does not mean that mathematical and geometric significance is precluded, but that the relationships are not consistent with our classical bias that they should apply to a common structure. Rather, there are two structures and they are not members of themselves. This is also the description of the Russell set.

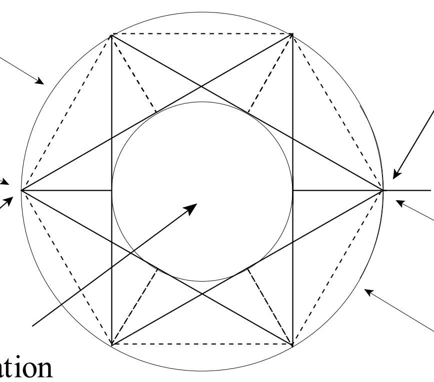



**Figure 1.** The interior structure required to support the canopy or shell of a classical point is illustrated. The internal structure is subclassical. In 360°, there are six locations on the circumference. The space is hexorthogonal. This structure is displayed in a classical format, i.e. all the contributing dimensional levels are contained on a fixed, composite plane.

### 5.1 The subclassical, nondistributive structure and the values that are derived

The directions and locations within Figure 1, which support the outer circumference, define the transformation that applies when this rotational domain (defined by its circumference) is interpreted as a distributed relationship of parts. This transformation requires reference to the six objects and their ortho nonclassical vectors that form the canopy of the circumference, d(6). In this transformation, that which is inherently rotational (not expressed as the distributive relationship of parts) is expressed as distributive. The set of mathematical relationships that define this structure in purely classical terms on the flat plane are the trigonometric functions. The three trigonometric values that are appropriate to the dimensional complexity of the geometric model are:

$$\cos(30)^2 = 0.75 \qquad \cos(45)^2 = 0.50 \qquad \cos(60)^2 = 0.25. \tag{5.1}$$

The values displayed on the left denote distributive structures because, by definition of the cosine function, they represent the ratio of the adjacent side over the hypotenuse for the right triangle. Thus, the values are established based on classically distributed values across the two sides of the right triangle.

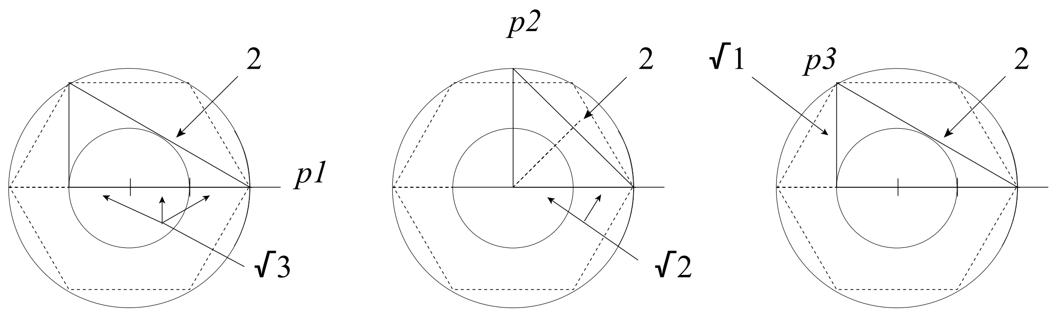
The above values for the cosine function are derived from the special cross-dimensional frame of reference of the Impressionist Theory of Everything (IToE). In IToE, an important distinction applies for assignment of value to the vectors found in the subclassical hexorthogonal space of Figure 1 because, at the subclassical level, the relationship between the geometric and mathematical description of a structure is disrupted. The basis of this disruption is defined by the key factor of IToE that, in any form it takes, the description transcends a single frame of reference for calculative rationalism. Specifically in the case of the vectors within the hexorthogonal space, the magnitude of vectors is not based simply on length because the relationship between geometry and mathematical value is disrupted. Rather, two new critical factors determine the value of each linear direction found in this subclassical space as it transforms to the classical level. These are:

1. How many dimensional boundaries the nonclassical vector crosses: The number of boundaries, not length, determines the value of the vector;

2. Whether or not the nonclassical vector has a net neutral direction across dimensional boundaries within the space: If direction is not neutral, then the value that applies also contains a dimensional transformation. This is analogous at the classical level to the

dimensional transformation $a$ to $a^2$. However in this case, the space is subclassical, and if there is a net dimensional transformation then it is $a$ to $\sqrt{a}$ (see Figure 2).




(adjacent/hypotenuse)$^2$ (based on values determined under IToE)

| | | |
|---|---|---|
| $\sqrt{3}/2 = 0.87$ | $\sqrt{2}/2 = 0.71$ | $\sqrt{1}/2 = 0.50$ |
| $(0.87)^2 = 0.75$ | $(0.71)^2 = 0.50$ | $(0.50)^2 = 0.25$ |
| $= \cos(30)^2$ | $= \cos(45)^2$ | $= \cos(60)^2$ |

**Figure 2.** These structures explain the trigonometric transformation (rotational to linear) for the rotated positions $p1$, $p2$, and $p3$ in terms of the cross-dimensional model of IToE. The hypotenuse is the only dimensionally neutral plane. All others project from an emergent classical location (on the circumference) to an inner, dimensionally-subclassical boundary. The angle of the hypotenuse is limited by the horizon to the inner shell under the two-dimensional model of IToE.

The full range of values for the cosine function over 180 degrees cannot be derived because of the inherent dimensional restriction of the geometric model. Specifically, the central null domain represents an horizon for angularity in this limited two-dimensional structure. Finally, it is noted that the values are not determined from a single location. Each location is a unique perspective on the nature of the subclassical plane, which explains why the points $p1$, $p2$, and $p3$ are rotated around the circumference. Specifically, this is in keeping with the concept that, in the subclassical space, distributive relationships do not apply. In other words, the rational relationship for the whole is not distributive from any single location, and each location contains a unique perspective.

The relationship of the vectors in the hexorthogonal geometry and the complementary trigonometric values, illustrated in Figure 2, speak for themselves in demonstrating the presence of fundamental dualism. The dualism is that there are two ways to construct the space of linear ortho directions within the unit circle. The first is the classical method represented in the trigonometric functions. These functions are constructed on a fixed dimensional plane. The second is the cross-dimensional method that is a key concept of the Impressionist Theory of Everything (IToE). In this perspective, spaces must build their dimensional complexity across absolutely fundamental and distinct ortho structures that are nevertheless parts of a common space. The feature and mechanism that holds the shapes distinct and separately fundamental in the common domain is paradox.

### 6. The subclassical structure of *pi* : Its transformation from rotational to linear

The Impressionist Theory of Everything (IToE) concerns the transformations that occur as a space develops its dimensional complexity. An Impressionist perspective is required to understand the nature of this process, and it is not based in calculative rationalism because there is no fixed and preexistent background in which to place objects to show their rational relationship. Rather these relationships must develop, and the boundary across each of the stages to this development is paradox. The clues that establish the important role of paradox in Nature come from the examination of such fundamental structures in Nature, both at the empirical and theoretic level.

The constant $\pi$ provides the precise factor of equivalence for the transformation between equivalent rotational and linear structures. There are as many expressions of this type of transformation as there are phenomena. Under the terms of IToE, an observationally closed domain (in linear terms) is opened to its interior. The constant of this transformation, pi ($\pi$), is an irrational number with the approximate value (to seven decimal places) of 3.1415993.

The value of $\pi$ is necessarily irrational because the relationship between this linear format of statement for value and the structure itself, which is rotational, is paradox. There is no rational basis on which to establish a certain observable value. This is one more expression of the fundamentally paradoxical relationship between contained and noncontained domains described in IToE

**7. The ortho structure of objects and directions within $\pi$**

The unusual hexorthogonal structure identified in Figure 1 consists of objects (or sites) and directions (or vectors). For the outer shell, the point of emergence of classical location, there is a minimum of 6 ortho objects, and each object reflects a minimum of 3 directions around the structure of the outer circumference. These directions form the equilateral triangle to each site on the outer circumference. There is also a single horizontal plane having two directions and there are two classically orthogonal orientations for this plane, the horizontal and vertical. Note: Only one of these directions, the plane in the direction of the *x*-axis, is shown in Figure 1.

The origin of the value of *pi*, (to the limit of accuracy of the two dimensions of the model) can be placed within the hexorthogonal geometry as follows:

| | | |
|---|---|---|
| 6 (subclassical objects) × 3 (directions) | = 18 directions | (hexorthogonal and eccentric) |
| + | | |
| 1 (classical point) × 4 (directions) | = 4 directions. | (classical and concentric) |
| 7 (objects) | 22 (directions) | |

$$22/7 = 3.14... \approx \pi \qquad (7.1)$$

There are 22 directions (vectors) distributed among 7 objects. An approximate value of *pi* is established by the ratio of the number of objects to the number of directions linearly displayed in the overall structure. This includes:

1. the number of objects and directions linearly superposed within the canopy of the fundamental subclassical object, and

2. the number of potential real planes and their directions in a single point. There are two potential real planes at 90 degrees, and each of these has two directions at 180 degrees.

The total value of vectors and objects (22/7) represents the minimum number of components that contribute to the rotational structure of a domain closed to observation as hexorthogonal, and the same rotational structure represented as open to observation at the classical level.

**7.1. The accuracy of this two-dimensional representation of $\pi$**

| | | | |
|---|---|---|---|
| The value of $\pi$ established under IToE (22/7) is: | | 3.1428571... | |
| The value of $\pi$ calculated to 7 decimal places is: | | 3.1415926... | |
| Difference | = | 0.0012645 | (7.2) |

As with all representations of $\pi$, the value established is only as good as the refinement of the number of terms that have been accounted for. In the classical interpretation, this refinement is the number of decimal points calculated under some procedure. In the model of the Impressionist Theory of Everything (IToE), this accuracy is dependant on the dimensionality of the subclassical space represented or accounted for. In this case the model of IToE is a first principle, and it is bound to the two-dimensional plane. Thus, the accuracy for the value of $\pi$ represented in IToE is limited by the detail of structure that can be found in just two dimensions.

In a dimensionally more complex model, more directions and sites would contribute, and the value established for π would be more accurate. However, this format of representation is neither possible nor desirable for IToE. Of note, directions and sites that contribute beyond the limit of the two dimensional plane are relatively small; they are contained as relatively small corrections that would appear if the internal structures within the six points on the circumference were opened in a dimensionally more complex model. Thus, the value established by 22/7 is roughly accurate, although in a dimensionally more complex model the ratio of directions to objects would change.

## 8. Containment and noncontainment

The terms *containment* and *noncontainment* define the two observational perspectives to rationally construct the fundamentally paradoxical domains referred to in the model of the Impressionist Theory of Everything (IToE). These terms do not allow resolution of the presence of paradox, but do permit a statement of the nature of the relationship that applies between the components to the given paradoxical structure. In other words, the sense in which rationalism cannot handle the presence of paradox can be given a rational format. That which is not rationally included (as contained in any singular rational perspective) is defined as noncontained. The basis of relationship for this noncontained structure to that which is singularly rational is paradox, and together the two domains form a common space. This space is *R*.

This is a difficult concept to understand because there is no directly rational structure that links the two concepts in the model of IToE. In their simplest format, these two perspectives of containment and noncontainment reflect the separately logical placements of the Russell set: One in which *R* is found within itself and one in which it is not. Each is legitimate but their relationship is not.

Since the critical component of paradox for the dichotomy of singularism/dualism is always central across the concept that separates contexts of containment and noncontainment, sense can only be made of the structure if a consistent frame of reference for containment and noncontainment is maintained. This allows the observer to at least understand that if a singularism is the perspective viewed, then a hidden dualism applies that cannot be rationally integrated. The observer's singular perspective refers to two equally applicable conditions: It either contains a fundamental dualism that is not observable, or it does not contain a fundamental dualism accounted for through some appropriate mechanism of change.

### 8.1 Accumulation by containment

The term *superposition* has the common language meaning that new structure becomes layered on existing structure as a domain grows. This process of layering can conceivably take different forms, which in its simplest perspective is just stratification. Under IToE, the process of superposition has two formats and neither is a simple stratification. In IToE, as cycle proceeds, complexity is subsumed on the parts that previously existed. There are two forms to be identified for this process, superposition that is operationally contained for each exiting location, and superposition that is not contained by the individual previously generated locations. The format of superposition by containment is as follows:

The value of $\pi$ establishes some important series. One of these was discovered by Leonard Euler in 1740.[1] This series is:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $\pi^2/6$ = | 0 + | 1 + | 1/4 + | 1/9 + | 1/16 + | 1/25 + ... | = 1.644934... | | (8.1) |
| cycle | null | 1 | 2 | 3 | 4 | 5 | ... | | |

The process in Equation (8.1) is depicted as a series of cycles, and under IToE represents the bifurcation of potential as the hidden structure of the state develops by containment of the

[1] Dunham, 1994: p. 57.

action at each existent location. It will be remembered that the mechanism and pressure for this process of growth is paradox. On the left side of Equation (8.1), this potential is represented singularly (as contained), and on the right it must develop over sequence or cycle. The future cycles are hidden to the observer for their affect on the size of the initial state and are observationally noncontained.

The structure represented on the right in series (8.1) is one of structural containment because the total value generated depends on the engagement of all parts equally for the development of the state. The process affects both the number of groupings across the divider (|) and the number of objects or locations in each such grouping. Thus primordial cycle, which is represented as (*), becomes superposed and accumulates.

(a) the growth of values for cycles:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $n^2$ | = | null | 1 | 4 | 9 | 16 | 25 | ... |
| cycle $n$ | = | 0 | 1 | 2 | 3 | 4 | 5 | ... |

======

(b) contribution of the parts for growth of value for cycle:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $n^2$ | = | * | ** \| ** | *** \| *** \| *** | **** \| **** \| **** \| **** | ... |
| cycle $n$ | = | 1 | 2 | 3 | 4 | ... |

If units of $n$ are periods of time $t$, then $t^2 = d$ (4.2)

**Illustration 1.** Euler's series is illustrated and the manner in which superposition applies is represented in (b). This is accumulation by containment at each existent location.

For example at cycle 2, primordial cycle has bifurcated from cycle 1 such that the value of cycle in cycle 1 (having value 1) becomes a value of 2. Also at each object of cycle that is found in cycle 2, an internal bifurcation has occurred. The result is that each of the two superposed cycles in cycle 2 contains 2 cycles. The sum is 4. Working backward, the primordial cycle 1, which is symbolically represented as (*), contains a hidden structure of superposition of two cycles and each of these (one hidden and one displayed) contains two cycles.

Then for cycle 3, the same process occurs. One cycle is added to the structure of cycle 2 ([2] + [2]) with the result that there are 3 objects of cycle in cycle 3 ([3] + [3] + [3]). Also, each of these three sets of 3 has internally inflated across cycle 2 to cycle 3, so that each group contains an added level of location, which is 3. The total is 9 objects in superposition. In this manner, the summation of cycle adds to itself to produce a complex domain of objects.

$$[\ast\ast\underline{\ast} \mid \ast\ast\underline{\ast}]_{object} + \cancel{[\ast\ast\underline{\ast}]}_{object} \quad \rightarrow \quad [\ast\ast \mid \ast\ast]_{object}$$

backwards in time

**Illustration 2.** The structure of cycle 2 is derived by working backwards in time. There are 2 groups of objects (square brackets) and the second one (with strikeout) is imaginary (hidden) in cycle 2. Also, each group within these two groups has an imaginary (hidden) object (underlined). Subtracting the marked objects, the total number of nonimaginary objects in cycle 2 is 4.

Working backwards for cycle 3, the single object (called cycle 2) must have had a single hidden cycle, and each object within those cycles must have had a hidden cycle (see Illustration 2). All cycles require that the same rule be applied for inflation to the next cycle. The objects act as a single, superposed object growing under the pressure of paradox.

As successive terms (cycles) are added, the total value approaches the limit of (3.1415926...)/6 at each observed site. Each cycle can be thought of as location for observation of the state as it accumulates. Thus after 4 cycles of the original null domain, there are a total of 16 objects contained in the single observational perspective of cycle 4, and the observer observes the state from the location of one object which is 1/16 of the total state that is observed.

### 8.2 Euler's series and gravitational acceleration

The series discovered by Euler illustrates the same number pattern that arises in motion under gravitational acceleration when an object falls in a straight plane. Place a ball at the top of a sloping gutter. Release the ball and mark of its location after one unit of time. Now mark off the entire gutter in lengths equal to this first unit. Release the ball again and record where it is after each unit of time. After $n$ units of time the descending ball is exactly at the mark numbered $n^2$ regardless of the angle of the gutter. By the end of 4 seconds (4 cycles), the number of units of distance that have accumulated to the observational perspective of an observer is 16, and for cycle 5, it is 25. The units of distance to the units of time obey Euler's series.

Equation (8.1) tells us that an object, $\pi^2$, exists that is composed of six sites. The object is the same as in Figure 1. The individual sites identified as $\pi^2/6$ are the six hexorthogonal objects around its outer circumference. Each one of these six sites is a single location for bifurcation of the state. This process of bifurcation occurs because of the mechanism of paradox. In other words, the state must grow (inflate) because any single location is paradoxical to proper, or complete, containment of the state. A process of cycle occurs that results in the series on the right side of Equation (8.1). As the state bifurcates by cycle, the position of the observer, which is established by the value of the first cycle, becomes a successively smaller part to the total accumulation.

For example, the term 1/9 represents the fact that in cycle 3 the object observed is a 1/9-object in a collection of 9 objects. This process of bifurcation is nonconstrained in the empirical action of gravitational acceleration. In other words, the full potential for the development of $R$ is expressed without limitation. The original primordial and singular cycle (*) has become superposed to form a composite state. The original potential, which was initially hidden to observation, has not changed. Rather, the observational perspective of the observer to this unchanging potential has become smaller.

The important point is that cycle *n* accumulates as ($n^2$) for the accumulation of superposition by containment, and this is the same process as the accumulation of [distance/time] for gravitation. The mechanism behind this process of gravitational acceleration is paradox. We have placed a fundamental classical force in Nature within the context of the Impressionist Theory of Everything (IToE). The classically based process of gravitational acceleration has been shown to have a hidden nonclassical structure because it is linked to the hexorthogonal object in Figure 1.

**8.3. Accumulation by noncontainment**

A reciprocal process can be identified for the superposition of primordial cycle as a function of noncontainment. The series that applies is the accumulation of cycle *n* as the superposition of ($1/2^n$).

$$(1/2^n) = 1 + 1/2 + 1/4 + 1/8 + 1/16 + 1/32 \ldots = 2.0 \qquad (8.2)$$

| | | | | | | |
|---|---|---|---|---|---|---|
| cycle | 0 | 1 | 2 | 3 | 4 | 5... |

(a) the growth of values for cycles:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $2^n$ = | 1 | 2 | 4 | 8 | 16 | 32 | ... |
| cycle *n* = | 0 | 1 | 2 | 3 | 4 | 5 | ... |

======

(b) contribution of the parts for growth of value for cycle:

| | | | | | | |
|---|---|---|---|---|---|---|
| $2^n$ = | * | * \| * | ** \| ** | **** \| **** | [********] x 2 | ... |
| cycle *n* = | 0 | 1 | 2 | 3 | 4 | ... |

**Illustration 3.** The series of accumulation by the mechanism of noncontainment is illustrated. The manner in which superposition applies is represented in (b). This is accumulation by containment at each existent location. The vertical bar ( | ) indicates the division across the doubling action for the previous object. Thus, (**|**) in cycle 2 is (****) in cycle 3 and doubles.

The series in Illustration 3 is one of noncontainment and can be understood by again examining the manner in which the process of accumulation occurs (see Illustration 3). At the end of cycle 1, one object of cycle has inflated to two objects of cycle. Thus, the first cycle has doubled, but each object in the doubling does not internally add an object, as was the case for the superposition of ($n^2$). So, although the relationship of adjacent cycles is a doubling, all sites do not contain the mechanism of bifurcation. The object [*|*] in cycle 1 does not add an object in cycle 2 to become the object [***], but rather remains [**].

**8.4 The series $2^n$ and the flow of time**

Euler's series based on $n^2$ identifies the property of classical space that is the growth or inflation of distance. Under IToE, this action is a process of cycle. The object of cycle is a primordial object, *R*, which inflates as cycle proceeds. The mechanism is paradox. The bifurcation process applies to each object in the space at both the individual and group levels. Because of the format of growth, the process is considered contained for each existent location.

The same property of growth, or inflation, from an initial state and its terminal value over cycle has also been identified for ($2^n$). The difference between the two formats of cycle for accumulation of *R* is that the growth of cycle for ($2^n$) is by noncontainment. This is because the mechanism of bifurcation applies only to the largest division of dualism identified in the current cycle of the state. The individual superpositions of *R* do not, themselves, bifurcate. The effect is that the process of change is not identified as an individual object that grows in its domain.

Instead, each location of *R* retains its size, and size for the domain increases only for the largest distinction of boundary for the state.

When the process of bifurcation is observed, a recognizably continuous and discrete domain such as distance is not produced. The observer senses only that an initial or current value of *R* applies and change is an element outside of the current observed and initial value for the state. This is directly attributable to the fact that the bifurcation process is a doubling in which the singular objects within the dualism do not replicate and the process of growth in superposition is external to the position of the observer.

In complementary terms to the growth of distance, the property of growth in this format has strong similarity to the property of time. The process of change, which is reflected in the previous and future values of the overall state, is not reflected in the size of the object that is defined as the *present*. In the framework of Illustration 3, on each cycle the observer remains anchored to a site defined as a single symbol (*) and this is true to our sense for the growth of time. The observer has no sense that a process of accumulation is occurring because the basis of accumulation is noncontainment of domain. The observer remains anchored in one location, the present, and is not included in the frame of reference that establishes the process of growth.

This structure is not directly displayed in the geometry of the hexorthogonal space found in Figure 1, but it is represented in the fact that a second ortho structure (a second unit circle) exists that is imaginary. Since the vertical axis of the structure in Figure 1 has only one real axis (in the horizontal direction), we can speculate that the second space has its real axis rotated at 90 degrees. As these two structures bifurcate, they do so under the terms of reference of noncontainment found for time.

### 8.5 The combination of series $n^2$ and $2^n$: The growth of space-time

In the above argument, two series based on the summation of $1/n^2$ and $1/2^n$ for cycle ($n$) have been compared. In this comparison, complementary structures are respectively found for the property of containment and noncontainment. These terms arise naturally in IToE.

The structure in Euler's series is contiguous and of containment. In space-time this is specifically the growth of distance as gravitational force is expressed. The mechanism of growth is contained in each singular site. In the second series, based on $1/2^n$, the development of domain over sequence of cycle is not a process that applies to each singular site but rather one that applies to the grouping of sites as a dualism. Thus, the mechanism of development is not contained in each site. It is the noncontained growth of the second series that is responsible fo the fact that we perceive time to pass but in the same instance do not find it to accumulate as a real structure. Thus, the past is imaginary (noncontained) in terms of the present.

The dualism in formats for accumulation of value over accumulation of cycle fits the model of IToE in that they are paradoxical for their properties. All that remains is to define how they are contained as a singularism. The combined domain is space-time and we can look for commonality between this simple model and what is observed for space-time. The infinite value for the summation linked to the growth of space is (1.644934...) and the summation linked to the growth of time is (2.0).

The members of the space in each format of accumulation are quanta for location, and their values at infinity are different. Since the quanta of location as distance sums only to (1.644934...) and this is exceeded by the sum of locations as time, 2.0, we can speculate that at some value $n$ for cycle, space as distance can no longer observably accumulate for space as time. Thus, time accumulates in the domain of the observer beyond the accumulation of distance. The future accumulation of distance becomes imaginary. The difference between the two structures is the direct effect of combining the paradoxical formats of accumulation (a fundamental dualism) in a single domain that is space-time.

The simple two-dimensional structure of IToE explains the existence of singularities (black holes) in space-time. The phenomenon is the result of the combining of paradoxical formats of accumulation in a common space. The appearance of $R$ is described as a function of infinitely many cycles.

**9. Planck's constant**

Planck's constant, $h$, is an ideal example of the transformation that applies between an inherently rotational space and its description as a distributive structure of parts. The universal factor of transformation that applies is $\pi$. The relationship of Planck's constant in Heisenberg's uncertainty principle to the distributed parts of (energy x time) and (momentum x distance) illustrates this format (see Equation (9.1)). The parts are distributive by multiplication.
Note: Distance, $d$, is equivalent to a change in position, $\Delta x$. This change in position, $\Delta x$, is then found somewhere within distance, $d$. There is no such thing as a definable position in time, $t$ since time is not definable as stopped. Therefore, $t$ is an approximated distance in time from the outset.

$$\Delta E \, \Delta t \geq h / 2\pi \qquad \text{and} \qquad \Delta x \, \Delta p \geq h / 2\pi \tag{9.1}$$

The constant $h$ (taken to stand for an inherently rotational object) is absolutely closed for the observation of its parts by the classical observer because $h$, having the units of energy x time, specifies two domains for energy. The function of time in this formula is interpreted under the Impressionist Theory of Everything (IToE) as signifying the existence of two absolutely fractured units of energy. They are absolutely fractured on the same basis as the series identified for the bifurcation of time. In other words, each unit is imaginary to the other.

Objects that are fractured in this manner are mutually imaginary in a common space. They are not observationally contained in a common domain and the space is necessarily quantum mechanical (subclassical). Any formula that is to transform the closed space of $h$ to a distributive structure of parts must appeal to the universal factor of $\pi$.

### 9.1. Two formats of nondistributive structure

The alternative to applying π in the creation of a linear space that is equivalent to a rotational space is to form a domain for linear properties in which the linear objects do not have distributive relationship. In this case, the factor of π is not required. This is as found in the relationship of the vectors in the half-silvered mirror experiment (see also Chapter 2.1, The Half-Silvered Mirror Experiment). The logic for the relationship of the parts is nondistributive. In this format, the parts display relationship only to the whole of the structure and to a domain identified as a nonobservable null state. See Herbert, 1985: p.179 for a discussion of distributive and nondistributive logic as displayed in classical and quantum lattices.

Thus in order to convert the domain of $h$ into a rational (distributive) structure of relationships, the number of objects and directions contained in this space, which is absolutely closed to observation, must be accounted for. The relationship of objects and directions is as found in the hexorthogonal geometry of the model to IToE and the resulting constant of this relationship is π.

### 9.2 The factor of change

Having accounted for the conversion of a rotationally closed space to a linear format of objects and directions the observer must still deal with the fact that the space defined is larger than singularly observable. Viewing the change that exists between the objects that form the space rather than the objects themselves, accommodates this. The observer then avoids the issue of the two objects of energy not being common members of a singular classical state.

The two parts of Equations (9.1) also highlight the general concept that when any space of reference is larger than contained singularly to the classical observer, at best only one-half of the structure is singularly observable. If one part is singularly measured to great precision, the other part must be proportionately uncertain. Thus, the objects of a domain that is noncontained to the classical observer have been represented as a contained space with classical formula by,

1. transformation using $\pi$

2. representation of the change between the objects (not the objects themselves)

3. conversion of the nondistributive logic of the closed structure to a distributive format by setting the objects of change as inversely proportional to the constant $h/2\pi$

**10. Conclusion**

The hexorthogonal geometry of IToE has been applied to derive the hidden structure of three trigonometric values and the value of $\pi$, and the transformation necessary for equivalence between closed and open structures has been discussed with reference to Heisenberg's uncertainty principle. The Impressionist Theory of Everything (IToE) is indispensable to understanding the nature of relationships between structures that are observationally closed (subclassical) and observationally open (classical).

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**REFERENCES**

**1.** Dunham, William. 1994. The Mathematical Universe, New York: John Wiley & Sons.

**2.** Herbert, Nick. 1985. Quantum Reality, New York: Doubleday

 