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Is the Mathematics of the Universe—Quantum, Classical, Both or Neither? A Geometric Model

Douglas Chesley Gill

Independent Researcher, Midland, Canada
Email: Douggill921@gmail.com

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Abstract

Is the mathematical description of the Universe quantum, classical, both or neither? The mandated assumption of rationalism is that if an argument is inconsistent, it is flawed for a conclusion. However, suppose the structural basis of the Universe is fundamentally inconsistent. In that case, paradoxes in the frameworks of logic and mathematics would not be anomalies. A geometric model with a counter-rational framework of inconsistent relationships is applied to analyze Hardy's paradox, the fine structure constant, and the general relationship between the correlated quantum and classical EPR-type structures. The model conjectures that the well-studied paradoxes found in theoretical arguments and empirically in EPR phenomena are not anomalies and instead point to a new framework for modelling universal structures that incorporates inconsistency.

Keywords

Hardy's Paradox, Fine Structure Constant, Coupling Constant (e), EPR Phenomena, Bell's Theorem, Universal State, Paradox, Russell's Paradox

1. Introduction

This study is a further analysis of material combined from two previous papers (Gill, 2023a; Gill, 2023b) that conjectures a geometric model of a universal state representing an infinity. The model's validation is based on examining its internal structure and predicting the reason for the divergence between the theoretical values and experimental data for Hardy's paradox. The fine structure constant is also placed in the geometric framework to resolve the mystery surrounding its function and numerical value in subatomic phenomena. The principal claim of the model is that mathematical formalism places dimensional levels on a fixed and consistent basis for formal representation using the power function, and this does not account for the native dimensional inconsistency found in the root structure of universal states.

The presence of paradox in all forms of logic represents the last barrier to unifying our concepts on a universal basis. In pure logic, Russell's paradox contains the general structure captured in the linguistic paradoxes of myriad other examples, including the Liar and Barber paradoxes (*Russell's Paradox*, 2023; *Liar Paradox*, 2024; *Barber Paradox*, 2024). In all such examples, the self-reference created in forming a universal statement for the property of a structure devolves into a dualism of segments having common membership to the "parent" framework but, in the same instance, are paradoxical between themselves, for their individual meanings.

An example is found in the diverse framework of humor. What did the Zen master say to the hotdog vendor? Answer: "Make me one with everything." The element of paradox in this statement is not trivial. Instead, it contains the hidden structure of Russell's paradox, in which two statements, as siblings, have membership in a parent statement that defines both siblings. Yet, the siblings do not share a common meaning between themselves.

The same issue found in Russell's paradox for undecidability applies to formal mathematical arguments that refer to a universal state as an infinity. Two examples are Cantor's diagonal slash argument and Goedel's incompleteness theorems.

In Cantor's argument, the theoretical listing of the natural numbers between zero and one in an infinite column is found to be missing natural numbers generated on the column's diagonal. As for Russell's paradox and the humor example, the universal state in the column devolves into two frameworks that have paradoxical relationships for the property of the natural numbers (*Cantor's Diagonal Argument*, 2024).

Goedel's first incompleteness theorem defines the limit to formulating a rational statement that contains a reference to infinity.

> "The first incompleteness theorem states that no consistent system of axioms whose theorems can be listed by an effective procedure (i.e., an algorithm) is capable of proving all truths about the arithmetic of natural numbers. For any such consistent formal system, there will always be statements about natural numbers that are true, but that are unprovable within the system (*Gödel's Incompleteness Theorems*, 2024)."

For both Cantor's and Goedel's arguments, the parent state that represents both segments unitarily is "imaginary". The geometric model's conjecture is that paradox is a systemic mechanism in the Universe and based on our current understanding, the Universe is the largest example of Russell's paradox in a physical manifestation.

1.1. The Geometric Model's Basis

The geometric model represents a generic universal state in a two-dimensional framework. Its development schema is based on a thought experiment using the general principles of emergent self-organization and stationary action (*Thought*

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Experiment, 2024; *Self-organization*, 2023; *Stationary-action Principle*, 2024). The schema for the sequenced development of its structure is presented in (Gill, 2023b, p. 591) but is not crucial to justifying its mathematical basis, which stands on its own.

The geometric model's foundation adopts the novel concept that examples of paradoxical inconsistencies found in logic, mathematics, and physics are not anomalies and, instead, point to a fundamental basis for the properties of all states that display absolute universality in their structures.

The geometric model's rationale examines the relationship between correlated quantum and classical states, as Einstein, Podolsky, and Rosen first argued in their EPR discussions (*Einstein-Podolsky-Rosen Paradox*, 2024). In the EPR paradox, parts normally discrete for separation in time and space display unitary, entangled cohabitation in a single state from the perspective of classical observation.

An example is found in the half-silvered mirror experiment in which the classical orthogonality of the (x, y) coordinate structure is transformed dimensionally downward to a nonclassical one-dimensional framework of (x, iy), where (i) is the imaginary square root of minus one. By dividing the unitary state of the photon across two orthogonal paths, the dimensional structure of time is removed. The path structure becomes a simultaneous and stationary state in which the relationship between the (x, iy) axes is imaginary (Penrose, 1994, pp. 264-265). This parent-sibling relationship precisely mirrors the structure of Russell's paradox.

1.2. The Counter-Rational Construction of the Geometric Model

An equivalent basis of entanglement found in EPR structure is created in the geometric model by entangling the nonfungible property of "vector identity" with the fungible property of "magnitude". Magnitudes for the vector segments in the geometry are all assigned the value (1). This is similar to removing the time separation between classical locations of EPR structure. In other words, vector locations are "simultaneous-like" in magnitude, and in EPR structures, spatial separations are simultaneous in time. The operational "trick" in creating the one-dimensional basis is to remove the rational relationship in which the segments have separate identities in a classical framework.

Figure 1 is a pared-down version of the geometric structure presented in Section 5. The counter-rational structure of vector and magnitude identities is justified by calculating the vectors' cosine squared identities.

Two separate dimensional frameworks cohabitate the geometry by entangling linear magnitude and vector identity. The EPR-like framework transforms the vectors downward to a one-dimensional basis, and the square root function applies to each segment. The hypotenuse consists of two segments, beginning and ending, on the same dimensional level, and the square root cancels. The geometry counterintuitively (paradoxically) opens dimensional boundaries in an inconsistent framework to formal mathematics.

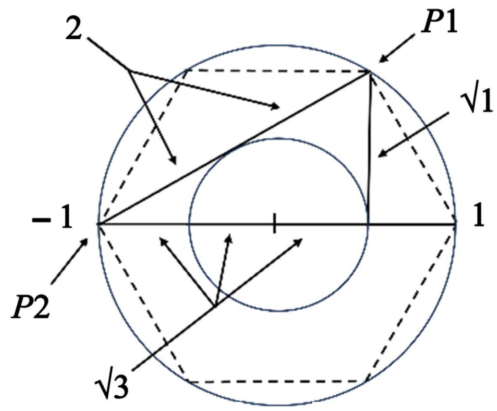

Figure 1. Entangled vector-magnitude identities in the geometric model.

There is no formal justification for the values and the combinations of square root and nonsquare root identities assigned to the vector segments in the triangle. However, the results obtained for the cosine squared identity in the formal method (in Section 1.4) and the inconsistent basis (in Section 1.5) are the same, which strongly validates the methodology.

The Right Triangle Calculator calculates the linear values for the adjacent sides to the right triangle on the Cartesian plane (*Right Triangle Calculator*, n.d.). The diameter of the geometry for the outer circumference is assigned the value 4, and the portion that applies in the geometry is 3. The sides of the 30-60-90 triangle are 3, 1.732, and 3.464.

1.3. Calculations in Mathematical Formalism

$$P1\text{ - }\cos^2(60) = (1.73205/3.4641)^2 = 0.25 \tag{1}$$

$$P2\text{ - }\cos^2(30) = (3/3.4641)^2 = 0.75 \tag{2}$$

1.4. Calculations Using Entangled Identities

$$P1\text{ - }\cos^2(60) = \left(\sqrt{1}/2\right)^2 = 0.25 \tag{3}$$

$$\text{P2 - }\cos^2(30) = \left(\sqrt{3}/2\right)^2 = 0.75 \tag{4}$$

2. The Geometric Model Applied to Hardy's Paradox

Hardy's paradox is a thought experiment (*Thought Experiment*, 2024) proposed by Lucien Hardy in which a particle and its antiparticle may interact without annihilating each other (*Hardy's Paradox*, 2023). Aharonov et al. (2002) calculated the quantum-level probabilities, and Lundeen and Steinberg performed an experimental demonstration, "Experimental joint weak measurement on a photon pair as a probe of Hardy's paradox" (Lundeen & Steinberg, 2008).

Theoretical Values by Aharonov et al. (Lundeen & Steinberg, 2008, p. 3):

For cohabitation on the inner paths, 0.

For cohabitation on the outer paths, −1.

Experimental Values (Lundeen & Steinberg, 2008, p. 3):

For cohabitation on the inner paths, 0.245.

For cohabitation on the outer paths, −0.759.

Probability Values Based on the Geometric Model (Gill, 2023b, p. 594):

For cohabitation on the inner paths (geometric $P1$), 0.25.

For cohabitation on the outer paths (geometric $P2$), −0.75

Hardy's paradox analyzes the quantum cohabitation of a particle and its antiparticle on four possible paths when they may exit simultaneously at dark ports in the structure. In Lundeen and Steinberg's modified experiment, entangled photons replace the particle and antiparticle framework. The geometric model considers the data when both photons cohabitate on inner or outer paths.

The calculation at $P2$ projects from the negative side of the x-axis in the geometry, and the minus sign applies to the cosine squared value. The significant divergence between the theoretical calculations and the experimental results suggests that something is not accounted for in the formal mathematical framework. The geometric model resolves the issue by predicting the experimental data in which vector and magnitude discrete identities are entangled as a unitary state.

Entangled Frameworks in Hardy's Paradox and Bell's Inequality

Hardy's paradox and Bell's inequality (Bell's theorem) have the same general structure: Their quantum states each display two degrees of freedom on a quantum basis (*Bell's Theorem*, 2024).

For Bell's inequality, photons in the twin state are separately measured for the correlation between their polarizations at calcite crystals rotated to give a 60-degree angle between them (Herbert, 1985, pp. 221-224). The angular rotation between the photons represents an opening of the quantum state's complexity, and the 60-degree angle is the "pure" form in the display of two degrees of freedom.

For Hardy's paradox, the cohabitations analyzed in the geometric model are ($F1$) and ($F2$):

Framework ($F1$)—inner paths formal value (0) and experimental (0.245).

Framework ($F2$)—outer paths formal value (−1) and experimental (−0.759).

The waveform of Hardy's paradox, for ($F1$) and ($F2$), is entangled in the same framework as the rotational quantum relationship in Bell's inequality. For both experiments, the states' null values are opened to the first level of their internal complexity on a pure basis in two degrees of freedom.

For Bell's inequality, the null value is established when the two crystals are misaligned by 90 degrees. The agreement between the polarizations is cancelled and becomes orthogonal.

A different framework for the null value of ($F1$) to ($F2$) applies to Hardy's paradox. The theoretical null value between the outputs is that ($F1$) has the value (0) and ($F2$) has the value (−1). However, this does not account for the entanglement of the two outcomes for two degrees of freedom. Instead, the correct experimental outcomes are found to be (0.245) and (−0.759).

Both experiments open the pure waveform to display the first level of the internal complexity in two degrees of freedom, and the respective pure null values are not observed. In the geometric model, this is represented by the rotations at $P1$ and $P2$.

3. Hardy's Paradox, Bell's Theorem, and EPR Experiments

A useful framework to conceptualize the transformation between correlated quantum and classical states is to visualize the process as a "projection" that transforms one dimensional level onto another and simultaneously retains the property of each in the conjoined state of both. EPR experiments, Bell's theorem, and Hardy's paradox fit this framework.

Hardy's paradox and EPR experiments have opposite directions for observing a quantum state. In Hardy's paradox, using the experimental technique of weak measurement, the classical observer collects data within the waveform structure without causing it to collapse. The observer can directly observe the quantum state in its native dimensional framework.

For EPR structures, the opposite perspective of observation applies in which the waveform is projected onto the classical framework of time and discrete spatial separations. In the double-slit experiment (Double-slit Experiment, 2024), the photon is projected through two openings onto a screen. In the half-silvered mirror experiment, it is projected onto orthogonal paths.

As discussed above, in the mathematical description of the half-silvered mirror experiment, the unitary state is conserved when projected into the "nonnative" classical framework of orthogonal paths by removing the dimensional level of time that would otherwise separate them in a classical basis.

Bell's theorem represents a third observational technique in which the classical and quantum frameworks cohabitate simultaneously in the experimental structure, and each openly retains its dimensional framework. Two photons are entangled for their polarizations and display a quantum probability structure at discrete locations in a classical background.

Herbert (1985, pp. 215-227) explains that the basis of classical relativity theory is that all locations in the universe are local and distinct, in which the speed of light limits the connection between them. Bell's theorem tests this hypothesis by analyzing the polarization attribute between two entangled particles at separate locations in classical space.

> Under the misalignment of each particle by 30 degrees, the error rate between them is more strongly correlated than predicted by classical probability and is a single, unmediated, mixed-phase waveform. The experiment indirectly proves that despite the unquestioned accuracy of relativity theory in its realm, classical relativity can never explain any system that obeys the laws of quantum mechanics.

The important takeaway from the half-silvered mirror experiment and Bell's inequality is that a quantum basis is projected and conserved in a classical "background". Two mutually inconsistent frameworks—paradoxical to each other for the structure of time across spatial separation—are simultaneously superimposed.

For Bell's inequality, measuring the correlation of the polarizations between the particles does not require the collapse to random polarizations because the classical basis is only a background to the quantum state. Classical probability has not failed; it just does not apply.

> Herbert (1985, p. 220) explains that, as in the case of the EPR paradox, it's important to realize what Bell did not do. He did not discover an experimental situation in which nonlocal interactions are directly observed. Instead, he invented a simple argument based on experimental results that indirectly demonstrated the necessary existence of nonlocal connections.

In all the experiments examined, quantum and classical elements are superimposed as "siblings" in a "parent" state of both, and the paradoxical relationship between the siblings' frameworks is not an anomaly but rather appropriately paradoxical.

In formal mathematics, dimensional levels are necessarily grouped in a consistent framework by the power function. However, under the geometric model, that does not account for their inconsistent root structure. Each dimensional component in the geometry represents an infinity in the growth of the self-emergent complexity of the universal state.

Therefore, the only way to interpret the sibling dualisms discussed above as universal is that although each sibling framework has internal consistency, their relationship in the parent structure of both is inconsistent. The parent state becomes the collection of both paradoxically conjoined parts. This is an adapted version of Russell's paradox. The paradox of the argument is that the siblings are contained within a structure that defines them as members having the common property that they do not have a common property.

4. The Fine Structure Constant (Alpha)—Quotations

The fine structure constant has been the subject of mystery since its discovery (*Fine-structure Constant*, 2024).

> It was named by Arnold Sommerfeld, who introduced it in 1916 when extending the Bohr model of the atom. α quantified the gap in the fine structure of the spectral lines of the hydrogen atom, which had been measured precisely by Michelson and Morley in 1887 (*Arnold Sommerfeld*, 2024).

The following quotations convey the significance of the fine structure constant:

Areeba Merriam:

> The fine-structure constant is a special number in physics that shows up in many places. It doesn't have any units or dimensions, and it seems to control a really important interaction in the universe. It tells us how strong

charged particles interact with each other through electromagnetic force. That number is 0.00729735256—approximately 1/137. This is the fine structure constant, and it appears everywhere in our equations of quantum physics, and we're still trying to figure out why. There's no obvious reason that these various ratios of properties should all work out to be 1/137, or 137 to some power. It's clear the number is trying to tell us something important about the universe (Merriam, 2023).

M.H. MacGregor:

The mystery about α is actually a double mystery: The first mystery—the origin of its numerical value $\alpha \approx 1/137$—has been recognized and discussed for decades. The second mystery—the range of its domain—is generally unrecognized (MacGregor, 2007).

Wolfgang Pauli:

When I die my first question to the Devil will be: What is the meaning of the fine structure constant (*Fine-structure Constant*, 2024)?

Richard Feynman:

Richard Feynman, one of the originators and early developers of the theory of quantum electrodynamics (QED), referred to the fine-structure constant in these terms:

There is a most profound and beautiful question associated with the observed coupling constant, e-the amplitude for a real electron to emit or absorb a real photon. It is a simple number that has been experimentally determined to be close to 0.08542455. (My physicist friends won't recognize this number, because they like to remember it as the inverse of its square: about 137.03597 with an uncertainty of about 2 in the last decimal place. It has been a mystery ever since it was discovered more than fifty years ago, and all good theoretical physicists put this number up on their wall and worry about it.)

Immediately you would like to know where this number for a coupling comes from: is it related to pi or perhaps to the base of natural logarithms? Nobody knows. It's one of the greatest damn mysteries of physics: a magic number that comes to us with no understanding by humans. You might say the "hand of God" wrote that number, and "we don't know how He pushed His pencil." We know what kind of a dance to do experimentally to measure this number very accurately, but we don't know what kind of dance to do on the computer to make this number come out-without putting it in secretly (*Fine-structure Constant*, 2024)!

5. The Fine Structure Constant and the Coupling Constant (e)

The above quotations convey alpha's mystery and importance in subatomic structure. The geometric model conjectures the reason behind alpha's value and its crucial presence in the Universe. Finding agreement with the constant's value also strengthens the claim that the geometric model represents a generic universal state for understanding the structure of diverse phenomena.

The coordinate structure in **Figure 2** is asymmetrical to the outer circumference and counter-rational to the Cartesian plane's concentric orthogonal framework. The *y*-axis of the Cartesian plane is displaced, expanding and opening the lowest dimensional level of the inner circumference's hexagonal state. The space contained within the inner circumference is null except for the *x*-axis, which couples the dipodal sides of the structure.

The geometry describes the root structure of a universal state in which its segments are each dimensional infinities, and the outer circumference is then an infinity of infinities.

Infinities are structures containing a boundary that prohibits conclusion. Examples are found in logical arguments, mathematics, and the issue of defining the boundary of the Universe in physics. Infinity takes two forms: a prohibition on observing the rational relationship of internal elements within a state or a prohibition on formally including elements belonging to the state but prohibited from it (Gill, 2023a).

The geometric model circumvents the problem of containing infinity in its observationally confined two-dimensional structure by replacing the orthogonality of the Cartesian plane with the model's hexagonal coordinate framework.

The companion papers conceptualize the model as a sequence in which complexity develops outwardly from a null condition across dimensional boundaries. However, the model's underlying theory is that the structure's native format is not dependent on time sequencing and is stationary. Working toward the interior, the dimensional structure descends in stages in a quantum-like framework:

1) The first level is a dimensionless point of classical space that is not shown.

2) The inward and dimensionally lower second level opens the classical point as a circumference that encloses the interior complexity of two successively lower dimensions.

3) The six dotted-line vectors form the first lower dimensional level within the circumference joined at their vertices. Each entangles the classically distinct identities of magnitude and vector and is defined as one unit in the new term "vector potential". The identity rotation through the six vectors is used to calculate the value of the fine structure constant.

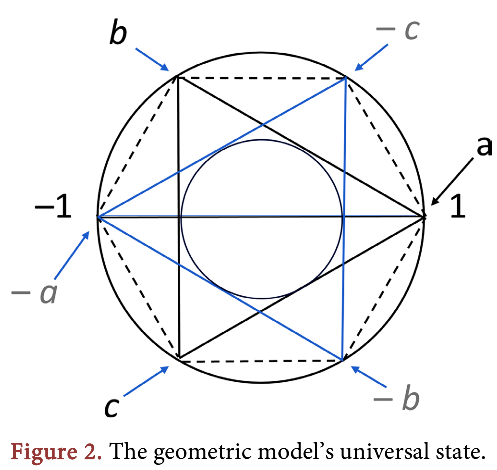

Figure 2. The geometric model's universal state.

4) The next lower-dimensional level is composed of two isosceles triangles. They form six eccentric segments of vector potential that join the outer to the inner circumference and are used to calculate the coupling constant (e).

5) The last dimensional level inward is the circumference of the null state that contains only the x-axis. It strips all dimensional complexity and vector potential from its interior.

5.1. Calculating the Fine Structure Constant's Value

The entanglement of the two defining properties of the Cartesian plane (vector and magnitude) creates a compressed one-dimensional framework. For the following calculations, the vectors of the space are entangled and multiplicatively overlap at the three vertices identified as (a), (b), and (c) of the isosceles triangle at (+1). Three "antivertices" ($-a$), ($-b$), and ($-c$) (in grey) are formed from the dipodal position on the circumference at (−1).

From the position (+1), each of the three vertices, (a), (b), and (c), is a parent to the six sibling vectors (dotted lines) in the identity rotation around the circumference. The combinatorial total of vectors is ($6a$ x $6b$ x $6c = 216$). (5)

The value 216 is the complex vector potential (as a form of "virtual" displacement) contributed by the vectors on the circumference. Of note: The position at ($-1x$) simultaneously represents the same value as negative potential.

Total Vector Potential of the Hexagonal Basis in a Classical Framework:

Alpha is the vector potential between energy states having classical units of measure, and therefore, a transformation is required from the hexagonal basis to the classical framework. In other words, in the classical basis, the potential of the hexagonal structure is captured across fewer units of potential—each with a greater value. The conversion ratio is 4/6.

The Cartesian vector potential is $216 \times 4/6 = 144$. (6)

Alpha is the fundamental unit of vector potential in 144 units that complete the identity rotation in the space of the geometric model defined as an infinity.

$$\text{Alpha} = \left[1_{(\text{fundamental unit of vector potential})} \Big/ 144_{(\text{total vector potential})} \right] = 0.00694444\cdots \tag{7}$$

$$0.00694444_{(\text{geometric})} \Big/ 0.0072973_{(\text{experimental})} = 0.9516451\cdots \tag{8}$$

The agreement between the experimental and geometric values is 95.16 %. The current background temperature of the Universe, at slightly over 2 degrees Kelvin, is a factor in alpha's experimental value and is anticipated to contribute some divergence between the geometric and experimental values (discussed in Section 5.3). However, at approximately 5 percent, the variance is relatively large when comparing the temperature in the early Universe, near 1015 Kelvin, to its current temperature, just over 2 degrees Kelvin.

One conjectured cause for the discrepancy is that the geometric model is limited to a two-dimensional framework and may not account for the refinement of the values above that dimensional level. The mechanism of self-organization is a process across dimensional levels in which a higher dimensional structure beyond the two-dimensional limit is conjectured to exist but is hidden. Other possible factors in the discrepancy are beyond the scope of the geometric model.

5.2. The Coupling Constant (*e*) and Alpha

1) Alpha:

In Illustrated Equation 1 (below), the elementary charge (e), in the numerator, is squared to match the dimensional framework of the units in time, length, and mass in the denominator. Solving the fractional equation for the terms and values on the left side reveals the hidden presence of the unitless number alpha on the right.

FINE STRUCTURE CONSTANT
DIMENSIONLESS

ELEMENTARY CHARGE
TIME² • CURRENT²

$$\alpha = \frac{e^2}{4\pi\,\varepsilon_0\,\hbar\,c} = \frac{1}{137.036\ldots}$$

ELECTRIC CONSTANT
(TIME⁴ • CURRENT²)(LENGTH³ • MASS)

SPEED OF LIGHT
LENGTH/TIME

REDUCED PLANCK CONSTANT
(MASS• LENGTH²)/TIME

Illustrated Equation 1. (Merriam, 2023).

2) The Coupling Constant (e):

The geometric model also represents the vector potential of the coupling constant (e) in its lower dimensional interior.

$$0.0854^2_{(\text{coupling constant }(e)\text{ squared})} = 0.00729_{(\text{alpha})} \tag{9}$$

The experimental fractional value of the coupling constant is (1/11.7068). In the geometric model, there are (12) eccentric vectors—six from each of the two isosceles triangles—projecting from the outer higher dimensional basis to the inner and lower dimensional circumference. Of note, the transformation of vector potential that was required for alpha, of (4/6) in equation (6), is not required for the coupling constant (e) because the lower dimensional framework of the inner eccentric vectors matches the quantum framework of the coupling constant (e).

The fraction (1/12) closely matches the experimental value of the constant. The 12 inner vectors form the identity rotation for the vector potential between the energy levels of the electron orbitals as an infinity.

$$0.08542_{(\text{coupling constant }(e)\text{ experimental})} = 1/11.7068 \approx 1/12_{(\text{coupling constant }(e)\text{ geometric})} \tag{10}$$

Equations (11) and (12) compare the geometric and experimental values for alpha and the coupling constant (e). Both values closely align within (0.0054) and support the conjecture of applying the geometric model to both constants.

For alpha:

$$0.00694444_{(\text{geometric})} / 0.0072973_{(\text{experimental})} = 0.9516451\cdots \tag{11}$$

For coupling constant e:

$$0.080833_{(\text{geometric})} / 0.085424_{(\text{experimental})} = 0.9462 \tag{12}$$

3) In the system of atomic units, which sets e = me = ħ = 4πε0 = 1, the expression for the fine-structure constant becomes α = 1/c (Fine-structure Constant, 2024).

Using the geometrically calculated value for alpha:

$$\alpha = 1/c \parallel c = 1/\alpha \parallel c = 144_{(\text{units of vector potential})} \tag{13}$$

The speed of light is expressed without units as an identity rotation in the geometric model and contains a vector potential of 144 units.

5.3. The Energy Condition's Effect on the Experimental Value of Alpha

Alpha changes as a function of the energy conditions under which you perform your experiments. This is what the theory of QED shows—that the coupling, that is, alpha, changes depending on the energy of the system. It is indeed very close to 1/137 at about zero Kelvin which is roughly the temperature of the universe. It's a little over 2 Kelvin. In the grand scheme of things, even room temperature, or about 300 Kelvin, is also very low energy. But at very high temperatures like 1015 Kelvin, such as what was present near the time of the Big Bang, it would not be the same as it is today. It would have been around 1/127 or larger, but after a few minutes as temperatures and energies reduced, it would have reached 1/137 as today. This means that alpha was higher in the early history of the universe (Merriam, 2023).

In 2008, Rosenband et al used the frequency ratio of Al+ and Hg+ in single-ion optical atomic clocks to place a very stringent constraint on the present-time temporal variation of α, namely $\Delta\alpha/\alpha$ = (−1.6 ± 2.3) × 10 − 17 per year. Note that any present-day null constraint on the time variation of alpha does not necessarily rule out time variation in the past. Indeed, some theories that predict a variable fine-structure constant also predict that the value of the fine-structure constant should become practically fixed in its value once the universe enters its current dark energy-dominated epoch (*Fine-structure Constant*, 2024).

The geometrically calculated value of alpha is (4.8) percent lower than its experimental value, and the coupling constant (*e*) is (5.4) percent lower. As discussed in Section 5.1, the divergences between the current experimental and geometric values cannot be justified within the scope of the geometric model's basis. However, the two divergent values closely match. Finally, the geometric model's dimensional framework successfully demonstrates the mathematical relationship between both constants at their different dimensional levels (equation 14).

$$(1/12)^2{}_{\text{coupling constant }(e)} = 1/144_{(\text{alpha})} \tag{14}$$

6. Conjectures–Joining the Dots to Classical Space

6.1. Alpha's Nonzero Value

> ……[For alpha] we're now at the bottom of the energy scale, and the fine structure constant has bottomed out at 1/137.035999. But there's no reason that we know of that it shouldn't have dropped to zero rather than stopping at this minimum value—however, we should be glad of this fact, because an alpha equal to zero would mean no electromagnetism, and that would mean no fridge magnets, among other inconveniences like no atoms (Merriam, 2023).

The remaining question is to define why the fine structure constant bottoms out at close to (0.007297…) and, equally, why the coupling constant (e) also bottoms above zero. The identity rotations for alpha and the coupling constant (e) are around the central null state of the inner circumference, which provides the rationale for why the constants do not have a zero value. Zero is undefined in the geometry.

If there were a framework in which zero was defined, then, as predicted in theory, there would be no electromagnetic force between charged particles, no atoms in the Universe, and finally, no order to the Universe at all. The energy transfer structure is balanced outside the null location. From the perspective of the dipodal sides, the structure is adiabatically neutral while allowing separate potentials to exist on each side. The adiabatic process of creating a stationary Universe is discussed in detail in Section 6.5.

6.2. The Russell Set and Self-Organization

In a strictly classical interpretation in which time exists, the geometric model illustrates a process of outward development from a null state through self-organization and stationary action principles. Successive levels of dimensional structure are subsumed as the state's complexity increases (Gill, 2023b).

The geometric model is a "bootstrap" approach that does not require pre-established physical laws and, equally, is not a random process (*Bootstrapping*, 2024). It also eliminates the anthropic conjecture in which there are infinitely many Universes, most of which cannot support structured development, and we exist in one that randomly does (*Anthropic Principle*, 2024).

The argument's rationale is a philosophical extension of the logic in Russell's paradox. Specifically, a structure that is a null state, as a "parent," does not have to be empty. It can contain "sibling" members that do not have joint property. Since they have no common relationship, the siblings do not form a real domain within the parent, and in a rational framework, the interior is empty or "imaginary". This adapted version of Russell's paradox is the basis on which the geometric model develops complexity. The paradox of the argument is that the siblings are contained within a structure that defines them as members having the common property that they do not have a common property. In rational terms, it cannot be stated that the structure (or Universe) exists.

The theoretical conjecture is that in a dynamic framework, the siblings display forces of both repulsion and attraction by their paradoxical association. In straightforward terms, the philosophical argument of Russell's paradox gives the rationale for the framework in which the Universe emerges in two paradoxical frameworks from a null state of nonexistence and remains so in the native form of the parent structure. The geometric model is the realization of how that would work.

6.3. The Category Error—Apples to Oranges

A category error occurs in logic when correlations are asserted that have nothing to do with each other (*Category Mistake*, 2024). In other words, the error begins with a faulty assumption, and the argument is "Apples to Oranges" (*Apples and Oranges*, 2024). The geometric model challenges the rejection of paradox as a mechanism in Nature. The caveat is that logical argument has a limit, falling short of its ability to describe universal structures that inherently embrace an infinity. In other words, using a rational argument for a counter-rational phenomenon is "Apples to Oranges".

6.4. The Cosmic Background Explorer (COBE) Data

> In principle, in an infinite universe, the waves in the cosmic fireball should appear randomly around the sky at all sizes. But, according to the new map, there seems to be a limit to the size of the waves, with none extending more than 60 degrees across the sky.
>
> The effect was first noted as a puzzle in the COBE data, according to Dr. Gary Hinshaw, an astronomer at the Goddard Space Flight Center and a member of the Wilkinson probe team, and now seems confirmed.
>
> If the universe were a guitar string, it would be missing its deepest notes, the ones with the longest wavelengths, perhaps because it is not big enough to sustain them.
>
> "The fact that there appears to be an angular cutoff hints at a special distance scale in the universe," Dr. Hinshaw said (Overbye, 2003).

There are similarities in the COBE data to the structure of the geometric model. The 60-degree cutoff indicates that the Universe's native structure is hexagonal, and the conjecture is that the largest example of the geometric model is the Universe itself. Our classical Universe and our antipodal dark partner are contained in a larger universal and stationary structure of both. The higher dimensional basis of "time" allows the stationary Universe to display its unitary structure separately across discrete locations. Its unitary structure becomes hidden by sequencing in time and the relationship between the past and the future.

6.5. The Adiabatic Process in the Stationary Universe

The adiabatic process is a transformation in an isolated, closed system that does not transfer potential to the outside (*Adiabatic Process*, 2023). For the complexity on the opposite sides of the central null, (sibling −) is "dark" to (sibling +), and in the universal structure that unifies both sides as one, the positive-to-negative relationship cancels the imbalance on each side.

The universal framework is then stationary and adiabatically neutral. The dimensional basis of imaginary time allows the structure to display a sequenced framework of outward growth for what is stationary in its native root basis.

As an aside, the hexagonal framework of the toy model is eerily analogous to what is observed in the form of our Universe for the hidden structure of dark matter (*Dark Matter*, 2024). The toy model conjectures that all the changes we observe in the Big Bang (*Big Bang*, 2023), its cooling, and our very existence are the imbalanced effects observed on our side of the universal structure.

The geometry's format does not allow for the illustration of the state beyond its two-dimensional basis. However, it is built on the concept of self-organization across dimensional boundaries, so the framework is not a final limit to the existence of "hidden" complexity beyond the model's ability to represent it.

7. Conclusion

The geometric structure describes a universal state in a two-dimensional toy model constructed in a fundamental framework of inconsistent segment relationships created by entangling properties of the state. The effect of the entanglement is that the geometric structure is superimposed downward to a one-dimensional framework. The calculations in the geometry of the cosine squared identity using both the formal and inconsistent mathematical formats produce agreement. The validation of the experimental data for Hardy's paradox and the representation of the fine structure constant are strong corroborations of the model.

This paper questions whether the mathematics of the Universe is quantum, classical, both or neither. The answer in the geometric model is that each alternative argument starts from a beginning assumption that hides a larger framework of universality. In other words, rationalism in all its frameworks has a limit that falls short of defining universality. The role of paradox in universal frameworks can be applied to a wide range of philosophical discussions on our place in the Universe.

The Toy Model

Can a simplistic two-dimensional toy model with an inconsistent basis tell us anything about the incredible complexity of the Universe? Toy models are logic devices that represent structures in the simplest form possible, giving the basic framework to approach understanding phenomena in their full complexity (*Toy Model*, 2023). That is the purpose of the geometric model.

There is substantial inductive evidence pointing to paradox and inconsistency as a mechanism in universal structures as infinities, and the Universe is the largest of all such structures. The search for the ultimate theory of everything (*Theory* *of Everything*, 2024) may have no conclusion and hide the Universe's actual form—one based on emergent self-organization and stationary action that does not allow for rational understanding. Nevertheless, even considering that the Universe is based on a framework of inconsistency is only possible through the tremendous breadth of our scientific discoveries.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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