MATHEMATICAL AND THEORETICAL PHYSICS FEASIBILITY DEMONSTRATION OF THE FINITE NINE DIMENSIONAL VORTICAL MODEL IN FERMIONS

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Abstract [b]:

In 2011, Neppe and Close proposed a broad model for reality—the Triadic Dimensional Distinction Vortical Paradigm (TDVP). TDVP proposes that the finite is made up of distinct parts. These are contained within a continuous infinite reality. TDVP postulates that the finite consists of 9 dimensions, and vortical / spin movements occur across these dimensions. [1; 2]

The Cabibbo mixing angle is an empirically derived angle in Theoretical Physics, and it cannot be derived from the standard particle physics model by just applying 3 dimensions of space and one moment in time (3S-1t)

In this paper, we test two related hypotheses on the mathematical derivation of the Cabibbo mixing angle:

1. It can be derived only from a nine-dimensional mathematical model.

2. It supports the TDVP hypothesis that the finite reality consists of a 9 dimensional vortical (spinning) model.

We demonstrate that there is a solid mathematical basis for demonstrating a 9-dimensional finite spin model. 2 lines of evidence exist:

1. A brief non-specific one where one can extrapolate upwards and downwards applying rotation from 9 dimensions to /and from 1 dimension and demonstrate the same asymmetric findings.

2. A detailed mathematical derivation explaining why the mixing angle of fermions, exemplified by the Cabibbo angle in quarks, is approximately 13.04 degrees: It requires a 9-dimensional spin model to demonstrate it. This very specific and profoundly important finding resolves a puzzle that has mystified scientists for 50 years.

We derive the mixing angle by applying a 9-dimensional rotational model,

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[b] Readers may find the more general footnotes valuable to peruse. The more technical ones are directed towards mathematicians and physicists.

Close ER, Neppe VM: Mathematical and theoretical physics feasibility demonstration of the finite nine dimensional vortical model in fermions.

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extrapolating through dimensions. We utilize the Bohr radius (radius of the Hydrogen atom), radians and the Lorentz correction as the electron velocity is close to the velocity of light. We demonstrate the angle is 13.032 degrees. This cannot be derived by using a conventional Standard Model of Physics with 3 dimensions of space and one point in time. Nor can the Cabibbo angle figure be calculated applying anything but a 9 dimensional model suggesting that models with <9 or >9 finite dimensions are incorrect. Moreover, the requirement of spin rotation suggests that models involving folding dimensions are also falsified.

Prior to developing this demonstration explaining the Cabibbo mixing angle, we had developed the Triadic Dimensional Distinction Vortical Paradigm [1;2] (TDVP)[c]. In TDVP, we postulate that finite reality is in 9 dimensions, and this involves a vortical model [d]. This demonstration supports these hypotheses. It does not, however, say anything about the nature of any of the specific dimensional STC substrates [e], namely those of Space [f], Time [g] and "Consciousness" [h].

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[c] *Triadic Dimensional-Distinction Vortical Paradigm (TDVP)*
- *Triadic* Space, Time and broader 'Consciousness' tethered together
- *Dimensions* of extent involving mathematical *distinctions*
- *Vortices* interfacing across dimensions (indivension)
- *Paradigm* (Metaparadigm /Theory of Everything) across the sciences and mathematics with unification of the infinite and finite resulting in the philosophical model of Unified Monism.

[d] TDVP also proposes 10th plus (transfinite) dimensions and that all of reality is unified with finite discrete contained in the continuous infinite:

10th plus dimension: A postulated 10th transfinite series of dimensions, predominantly containing C-substrate qualities, with or without S and T substrates (though still linked to S and T by tethering across dimensions).

Finite: Limited extent in space, time or consciousness: discrete, discontinuous, countable set of values subreality.

Infinite: (TDVP) Limitless, unbounded, continuous, without end subreality in Space, Time and Consciousness (C-) Substrates. *Interfaces with finite* and though largely unknown, it obeys the laws of nature.

[e] *STC:* Space, time and "consciousness": specifically, S, T and C-substrates (S, T and C). *Substrate:* The source of all *distinctions of extent and content*: There is STC: a Space substrate, a Time substrate and a special kind of substrate of "Consciousness" (C-substrate).

[f] *Space:* (S) Volumetric extent including the dimensions of height, depth, and width (reflects three variables of extent with an interval metric) within which physical reality manifests.

[g] *Time:* (T) Duration of *finite* moments perceived together as past, present and future and an *infinitely* continuous substrate. In finite reality, this encompasses three proposed dimensions of extent encompassing all lower-dimensional realities and events and necessarily moving through space and consciousness.

[h] *Consciousness:* The everyday use of the concept of "consciousness" has varied. It has traditionally been the most difficult of all terms to describe. We define it very precisely, applying it in the broadest sense in TDVP: The most subtle of the STC triad without which reality would have no meaning: "Consciousness" is a broad, unified, general term for a unit describing both infinite conscious meaningful information and finite awareness and responsiveness (because of this we use the term *C-substrate* to ensure this conceptual unification; we can also refer to *"paradigmatic consciousness"*).

There are four elements to consciousness as defined in TDVP:
- A basic consciousness level always exists in *everything* inanimate or animate as everything contains the *most fundamental discrete finite physical meaning* linked in extent with space and time, and in content with mass and energy. We call this Quantal (or more broadly "Qualit") Consciousness: The term "quantum" is used specifically to describe mass and energy, not purpose or meaning; the term "qualit" is a broader term meant to include quanta plus the more subtle qualitative aspects of consciousness.

The theoretical background to this calculation applies the mathematical methods in the TDVP model namely, the Calculus of Distinctions, Dimensional Extrapolation and the concept of Indivension. We use the term "Indivension" to describe the fragmentary view we are afforded through the limitations of our physical senses and their physical extensions. We introduce the calculus of distinctions and the process of dimensional extrapolation as tools used to reveal the mathematical and multi-dimensional nature of reality. Finally, we show how the fermion mixing angle (such as the Cabibbo angle) can be derived from the consciousness-based theory we call the Triadic Dimensional distinction Vortical Paradigm (TDVP).

This mathematical derivation has enormous implications for the future of appreciating our reality:

1. *It supports the feasibility of our finite reality being a 9-dimensional spin (vortical) reality.*
2. *It implies that most of our finite reality is hidden because we are limited to what we experience in 3 dimensions of space and 1 point in time (3S-1t).* [i]
3. *The awareness suggests a potential to apply higher dimensional realities for future research.*
4. *Additionally, this finding supports several TDVP mathematical constructs:*
   - *the basic TDVP 9 dimensional finite spin model,*
   - *dimensional extrapolation and related dimensionometry,*

- In all sentient beings, consciousness also involves various levels of awareness and responsiveness in the final common pathway—*neurological consciousness* reflecting a product of the functioning brain and nervous system, a biochemical-electrical admixture occurring in restricted 3S-1t.
- This is always linked with *psychological elements*. Depending on one's orientation, the psychological may or may not involve an addition to the neurological biochemical-electrical consciousness. Nevertheless, it still involves the brain as an endpoint, but while it may be controversial, we must allow the possibility that there may be situations where it could also have components that derive in location from outside the brain.
- Additionally, there may be varying levels of a separate transfinite discrete meaning (*Transfinite Consciousness*) and deriving from an unending continuous information repository resulting in meaning in the infinite (*Metaconsciousness*). We refer to this combination as "*Higher Consciousness*" because the two elements are largely inseparable. Higher Consciousness may not be experienced almost at all by many living sentient beings, or may be accentuated by such *states* as dreams or meditation, or may occur as a trait in, for example, mystics. It could be argued to be pertinent linked with other traits such as in near-death descriptions.

Therefore, C-substrate defines a unit always made up of quantum plus meaning (collectively together called "qualits"), of psychological and neurological consciousness in sentient beings, and of possible transfinite discrete and metaconscious continuous meaning linked with various levels of the continuous unending information repository in the infinite. In TDVP, consciousness always exists as a unit as a meaningful unit underlying every aspect of reality. By contrast, the philosophical term "consciousness" appears more imprecise and ambiguous as it depends on the specific philosophical, mystical or theological model.

[i] *3S-1t*: Our conventional scientific reality (what, we, as living sentient beings experience)—3 dimensions of space (length, breadth, height) (3S) and 1 moment in time (1t) (the "present"), 1T is 1 broader time dimension with past, present and future; D is non-specific for dimensions; 3D = 3 dimensions; 9 dimensions are abbreviated 9D or 9-D.

- *the idea of our 3S-1t reality being relative and not absolute,*
- *concepts of orthogonality at higher dimensions, and*
- *the application of the calculus of distinctions.*

5. *Furthermore, our derivation applying 9D vortical spin:*
   - *consolidates the pertinence of spin,*
   - *the application of relativity corrections in electrons,*
   - *conservation of angular momentum, and*
   - *the technique of applying LFAF[j].*
6. *It provokes serious questions about the concept of finite reality, including that some dimensions that may be hidden from us in our restricted 3S-1t sentient experience.*
7. *It confirms the derivation of the same approximate Cabibbo mixing angle of 13.032 degrees for mixing angles linked with electron spin.*
8. *It broadens the Cabibbo concept of weak universality by hypothesizing that all discrete phenomena result from specific dimensional extensions of the same elementary pattern inherent in the multi-dimensional substrate of reality.*

Furthermore as extensions to the initial calculations, we can draw further important conclusions.

9. *Our calculations supports the finding of electron shape not being uniformly spherical: This is a strong conclusion because otherwise certain calculated velocities in our analysis would exceed the velocity of light.*

These findings because of their breadth could generate several novel ideas for testing and application.

Keywords:
3S-1t, 9-dimensional rotational model, 9 dimensions, angle, angular momentum, asymmetry, Bohr radius, Cabibbo angle, Close, consciousness, corrections, degrees, dimensional extrapolation, dimension, dimensionometry, dimensional substrates, electron, Fermat's last theorem, finite reality, future, folding dimensions, Heisenberg Uncertainty Principle, hidden reality, higher dimensional realities, Hydrogen atom, Lorentz correction, mixing angle, Neppe, quarks, research, spin rotation, falsification, feasibility, LFAF, mathematics, normal distribution, orthogonality, radian, radius, relative reality, rotation, space, spin, Standard Model of Physics, TDVP, time, Triadic Dimensional Distinction Vortical

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[j] *LFAF*: Lower-Dimensional Feasibility, Absent Falsification (Philosophy of Science approach to proof); the basis for including logically feasible concepts in hypotheses that may not be falsifiable in 3S-1t. This is applicable at all dimensional levels.

Paradigm, UM, Unified Monism, velocity of light, vortex, vortical model.

Introduction [k]

There are certain unexplained mysteries in Quantum Mechanics. Important examples include intrinsic spin, the Cabibbo mixing angle, and the appearance and disappearance of electrons. We propose that these empirical aspects of quantum physics relate to a bigger picture that may actually be understood and explained in terms of a nine-dimensional rotational model. We present below empirical, theoretical and mathematical evidence supporting a nine-dimensional finite discrete rotational-spin-vortical model.

This requires an understanding of some of the mathematical principles behind the Triadic Dimensional-Distinction Vortical Paradigm of Neppe and Close (TDVP). Dimensional extrapolation allowing movement across dimensions [l] is key. Also important is the conceptual basis of movement and rotation (vortices [m]) and, the inherent Fermat asymmetry[n] that is found at higher than three dimensions. We need to conceptualize the calculus of distinctions, and take into account velocities approaching the speed of light, and, consequently, relativity.

Moreover, we need to motivate that a nine-dimensional model works, but not a ten or eight or any other integer dimensional model. We provide here a basis for this, while being aware that TDVP recognizes the finite discrete elements (such as 9 dimensions) with an interfacing higher transfinite reality and an infinite

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[k] This article published in the Dynamic International Journal of Exceptional Creative Achievement (DIJECA) has been guest edited by the noted Dimensional Biopsychophysicist, Dr Adrian Klein in Israel. It has gone through a detailed multiple peer review process because the three components to this article, namely the Theoretical Physics, the Mathematics, and the theory behind the finite TDVP model implying Dimensional Biopsychophysics were all formidable challenges. Consequently, numerous referees were used. DIJECA was a logical journal because this article in the current format is so multidisciplinary that it would not fit well into specialized journals in any of these disciplines. DIJECA is a closed journal (see 5eca.com) which involves more peer refereeing than almost any other journal. In this instance, Dr Klein was invited to be the Guest Editor, because the usual Editor is Dr Vernon Neppe. The broadest portrayal of the area of TDVP is in the Neppe-Close book, Reality Begins with Consciousness: A Paradigm Shift That Works. [1; 2]

[l] *Dimension*: Non-congruent, non-parallel extensions measurable in terms of variables of extent (in the calculus of distinctions) such as Space, Time and (dimensional) Consciousness. Operationally, in the Euclidean framework, convenience, dimensions are defined as orthogonal to each other and can be characterized in degrees of freedom. A continuous distinction that can be measured in units of extent. These interact together forming different domains with specific properties.

[m] *Vortex*: A dynamic moving curvilinear manifold multi-dimensional distinction of any open or closed form, including spherical, ovoid, helical or spiral forms (adjective: vortical).

[n] *Fermat's Last Theorem (FLT)*: No three positive integers a, b, and c can satisfy the equation $a^n + b^n = c^n$ for any integer value of n greater than two. Pierre De Fermat first stated this mathematical theorem in 1637. As an esoterica, a proof of this famous theorem was first published by Ed Close in 1977 in an appendix to a little read published book [3]. It had gone through two mathematics departments at the time, but not received formal peer review and was not further pursued. Then in 1993 Andrew Wiles formally submitted a different and lengthy formal solution [4]. FLT has proven very useful in TDVP for demonstrating that there are mathematical asymmetries beyond three dimensions, especially in mathematical calculations involving spin and vortices.

continuity that contains all these finite discrete quanta (or "qualits" [o] so that "consciousness" is recognized, as well).

More specifically, we present, for the first time, a most remarkable mathematical derivation: We demonstrate how the fermion mixing angle (such as the Cabibbo angle) can be derived from a 9-dimensional spin model preliminarily strongly demonstrating the feasibility of TDVP [5]. We originally postulated that TDVP contains a 9-dimensional finite vortical reality in late 2011. [p]

Dispelling the weirdness of Quantum Physics

In 1971, Werner Heisenberg quoted Niels Bohr as saying: *"Those who are not shocked when they first come across quantum theory cannot possibly have understood it!"* [6] Richard Feynman, in his popular lectures on quantum physics, while talking about the double-slit experiment, famously said *"I think I can safely say nobody understands quantum physics!"*[7] Once, when asked to explain properties of one-half spin particles (fermions), Feynman said: *"I couldn't reduce it to the freshman level. That means we really don't understand it."* [8] This view that quantum physics really cannot be understood is often parroted by physicists today. They say things like: *"Quantum physics is just weird. Get used to it! Just accept that that's the way it is."*

With all due respect to Niels Bohr, Richard Feynman and ranks of university physicists, Quantum Physics seems weird only if you can't see beyond 3S-1t and doggedly believe that "consciousness" has nothing to do with it. With Dimensional Extrapolation[q] in the context of the nine-dimensional model of TDVP, we can now explain quantum physics observations like the double-slit experiment, intrinsic particle spin, and the Cabibbo "mixing angle" [r] perfectly well with straight-forward logic and mathematics. [12]

Theoretical Background Principles to Deriving the Mixing Angle

We report some basic principles, many derived from TDVP, to assist with background here. This background gives insight into our thinking and application

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[o] *Qualit:* Qualit is a speculative hypothetical term made up of discrete quisits (in Space), chronits (in Time) and conscits (in Consciousness). Qualits are like quanta plus "consciousness" (quanta plus conscits).

[p] In writing in Reality Begins with Consciousness, First Edition and on a Radio Program (Coast to Coast) before an audience of millions. We make this point because the Cabibbo 9-D derivation was not a post hoc calculation that fitted, but specifically was testing a proposed hypothesis.

[q] *Dimensional Extrapolation (DE):* A mathematical term for the logical extension of a known parameter or parameters facilitating the process of moving to and from higher dimensions. An iterative logical operation based on the natural correlation between number fields and multi-dimensional domains of extent. DE is most easily calculated bottoms-up, starting at lower dimensions and extrapolating to the higher ones, but can also be reversed.

[r] *The Cabibbo angle* represents the rotation of the mass f vector space formed by the mass eigenstates into the weak eigenstate vector space formed by the weak eigenstates. The rotation angle is $\theta C = 13.04° \pm 0.05°$ [9]. It also reflects the probability that one flavor of quark (either down or strange) will change into another flavor (up) under the action of the weak force. [10; 11]

of principles, sometimes new, such as dimensional extrapolation, dimensions, calculus of distinctions and indivension. [1; 13]Importantly, even if any of these points are refuted, this does not refute the mathematics behind deriving the fermion mixing angle (such as Cabibbo angle) calculation that follows: This is derived from a 9 dimensional spin reality. But these TDVP principles allow insights into our thinking relating to how mixing angles are explained and justified related to intrinsic spin and angular momentum.

Dimensional Extrapolation.

Dimensional extrapolation allows us to combine what is normally thought of as a geometric procedure with the mathematical logic of the calculus of distinctions to determine the mathematical nature of multi-dimensional domains. The dimensions of reality can be explored mathematically by the process of "*dimensional extrapolation*" (DE): a unitary vector, defined in a one-dimensional domain is rotated about its origin and projected into the two-dimensional domain. Maintaining the same origin, this process is repeated until the fourth dimension is reached, where the unitary projection domain, in order to reach a point outside of the 3-S domain must be represented by an imaginary number. This is consistent with Minkowski's representation of time as the fourth dimension [14]. All points located in the 4-D, 5-D and 6-D domains are found to be congruent with the field of real and imaginary numbers. Continuing in this way, we find that the number field of domains 7, 8 and 9 require complex number representation.

"Dimensional Extrapolation" (DE) is therefore an iterative logical operation based on the natural correlation between number fields and multi-dimensional domains of extent. Dimensionometric mathematical invariances existing between dimensional domains are identified, first in one-, two- and three-dimensional domains; and then, using these invariances, the natural correlations between number fields and spatial domains are extrapolated into domains of more and more dimensions. Relative to quantum mechanical observations, the 4-D domain is the most fundamental where the points are either real or imaginary in time.[s]

The natural correlations between combinatorial fields of real, imaginary and complex numbers prove to be valid for four-, five-, six-, seven-, eight-, and nine-dimensional domains. In the CoD [t] and Dimensional Extrapolation, the description is of the form "$a+bi$" [u]. Importantly, too, if you have n dimensions, you must have an n+1 dimension in order to observe the apparent dimensional warping of reality.

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[s] Interestingly, in the current mainstream paradigm, t is usually represented by real numbers, and by imaginary units only in relativistic equations. The imaginary factor is usually dropped in non-relativistic computations.

[t] *Calculus of distinctions: (CoD)*: Well-defined logical and mathematical operations involving distinctions. Particularly relevant to TDVP are distinctions of content, extent and impact. CoD was developed by Ed Close who was later assisted by Vernon Neppe.

[u] where "a" is a real integer, and can be positive, negative or zero, and "b" reflects integers, as well.

This creates a situation where each dimensional domain is more than the sum of its parts. Dimensionometrically, DE can be applied mathematically in both Euclidean and non-Euclidean ways.

DE consists of a series of theorems that we've developed with appropriate mathematicological proofs: All forces that act over distance in any number of dimensions are the results of the interaction of additional "higher" dimensions. Effectively, for example, in DE, we can conceptualize all three dimensions of a 3D box (domain) from the fourth dimension. Moreover, higher dimensions always impact the lower dimensional domains: *There are an infinite number of lower dimensional domains that can fit into even one dimensional domain higher*, because we can, e.g., create an infinite number of points (0 dimensions), parallel lines (1 dimension), planes (2 dimensions) and volumes (3 dimensions), ad infinitum.

DE requires that the complex numbers of variables of 3C extrapolate elements of both space and time with the "consciousness" as, mathematically, complex numbers include both real numbers (Space) and imaginary numbers (Time). We have derived that extrapolation beyond nine dimensions yields hypercomplex unitary projections and variables (awaiting review). We postulate that DE beyond 9D, might also even incorporate transcendental numbers e.g., π, e and $e^{\pi \cdot \sqrt{n}}$ (for any positive integer n). Their applications in TDVP are yet to be determined.

Reverse Dimensional Extrapolation

DE is often calculated bottoms-up, starting at lower dimensions and extrapolating to the higher ones, but that reflects an upward process; there is also a downward DE process. In this, we approach DE by developing a top-down model conceptualizing dimensions from beyond the currently known domains. We call this process *"Reverse Dimensional Extrapolation"* (RDE). RDE is a conceptual aid for visualizing the dynamic relationship of dimensional domains from the top down: i.e. from the 10th plus dimensions (transfinite domain), through rotation and projection. This approach has been useful when we've worked theoretically e.g. on the intrinsic spin of fermions.

Dimensional extrapolation and (vortical) spin

The application of dimensional extrapolation involves executing multiple rotations and projections from dimension to dimension. As an example, when we move from 2 dimensions (e.g. a table-top) to 3 dimensions (e.g., the domain of the complete table), we rotate into the next dimension and extend a unitary projection to define measurements in the next additional dimension. Similarly, we can then go on to 4 dimensions, 5 dimensions and so forth.

However, when we examine our 9 dimensional spin model, we take into account that there is no rotation to the first dimension, only a projection from 0-D to 1-D: This is different from all other dimensions as 0 is a point and DE from that domain just requires projection.

The Calculus of Distinctions (CoD)

The *"Calculus of Distinctions"* is a system of logic dealing with distinctions which may be drawn in any number of dimensions. The CoD involves well-defined logical and mathematical operations involving the drawing of distinctions, constituting the most basic concept underlying all logic and mathematics. Particularly relevant to TDVP are distinctions of content, extent and impact. CoD was developed by Ed Close, later assisted by Vernon Neppe. [1; 2; 15-19]

Distinctions and dimensions

"Dimensions" are measured using variables of *extent*, and the *contents* of an n-dimensional distinction are measured in units of content, and units of content per unit of extent express the strength or *density* of the distinction. *"Distinctions"* are the basis of all conceptualizations, perceptions, observations, measurements, and knowledge, and the calculus of distinctions is logically prior to enumeration and equivalence, the basis of all conventional mathematics. Because of this, the calculus of dimensional distinctions is a powerful tool used to evaluate and extend all mathematical procedures.

Indivension

"Indivension" is a new term used to describe the limited or partial view of reality afforded sentient beings through their physical senses and extensions of them. Indivension is the process involving fluctuating STC—mainly "consciousness" (C-substrate) domains of "zillions" (N^n) of individual-units and extrapolation. These portray unique or common transdimensional (often transfinite) relative experiential realities. Indivension occurs through the interaction of vortical distinctions (New term derivation: Individual-units; dimensions). Indivension describes the process of moving across, between and within dimensions, and interfacing across different levels of individual-units. It also describes the limited, relative and fragmented views of reality afforded by the physical senses of different sentient beings.

Consciousness

"Consciousness" in TDVP is a broad, general term describing both infinite conscious meaningful information and finite awareness and responsiveness. These range from the discrete finite physical meaning at inanimate levels and extend to

transfinite continuous interactions, and modulated in sentient beings in the brain. Quantal (qualit), psychological, neurological, transfinite and metaconscious levels are pertinent in TDVP, plus philosophical aspects. (In the broadest sense as used in TDVP) Consciousness refers to the most subtle of the STC triad without which reality would have no meaning.

Classical particle physics applies the idea that reality is made up of building blocks rather like a house is made up of bricks, planks, nails and mortar. [20; 21] Ironically, "atom-smashers", e.g., from the cyclotron, to the Large Hadron Collider (LHC) [9; 22] are, in most cases, actually *creating* the particles they seek to study. [9] Paradoxically, the Einstein-Bohr debate over the nature of reality was resolved by Bell's inequality [23-25], the Aspect experiment and subsequent more and more refined experiments [23-25]. These demonstrate that the fields, waves and particles identified in the experiments of modern physics *may be created by the conscious choices of experimental observation and measurement.* This resolution of the Einstein-Bohr debate may be seen to contradict a strictly materialistic orientation as the basis for explaining reality.

The justification of specifically seeking a 9 dimensional finite spin model
In 2011, Neppe and Close proposed a broad model for reality—the Triadic Dimensional Distinction Vortical Paradigm (TDVP). TDVP proposes that the finite, made up of distinct parts is contained within a continuous infinite, broader reality. [2] The finite consists of 9 dimensions and that vortical / spin movements occur across these dimensions. However, the proposed 9-D model would not differentiate any specific substrates, such as Space, Time or Consciousness, all of which are postulated in TDVP.

In this paper, we test the hypothesis that one empirically derived angle in Theoretical Physics, namely the Cabibbo mixing angle, that cannot be derived from the standard particle physics model of 3 dimensions of space and one moment in time (3S-1t), can be derived only from a nine-dimensional mathematical model as proposed by the finite 9-D spin reality hypothesized in TDVP model.

The posited 9-D model
Based on the solid justifications of the TDVP model [2, 26] thus far, we have hypothesized that the objects of reality are, or can be under certain *finite* conditions, nine-dimensional: Elementary particles should thus be regarded as nine-dimensional objects and dimensional extrapolation shows that a nine-dimensional object will require an additional 180 degrees of rotation, in effect, an

additional ½ unit of angular momentum to return to the same quantum state with respect to the 3S-1t reference frame of observation. Certain elementary particles are said to have intrinsic "spin" of ½. [27; 28] Transitions from one spin ½ particle to another in a particle accelerator may result in changes in size, mass and spin velocity but, in keeping with the universal law of conservation of mass and energy, angular momentum will always be conserved. [29] Because of the limitations of our physical senses, we are normally only aware of the 3S-1t portions of the vortical forms originating in the space, time and consciousness (STC) substrates. The dimensions of reality can be explored mathematically by dimensional extrapolation.

　　We have proposed that the substrate itself is conscious and the source of all distinctions making up finite reality. [1; 13] The logical patterns of these distinctions are described by the calculus of dimensional distinctions, a mathematical/logical tool developed by Close. [16; 17] These new concepts are all pertinent in our mathematical derivations because we justify our consciousness in 3S-1t, and consequently, also in regard to the derivation of the mixing angle.

Applying these TDVP mathematical principles to a 9D finite reality

　　Our current experience reflects the fragmentary view we are afforded through experiencing or conceptualizing only specific collections of dimensions—dimensional domains. In our current experience, as living human beings on earth, we are the limited in our dimensional domains to a *restricted 3S-1t* reality of our physical senses and their physical extensions. We see to a limited degree where we cannot "see" infrared and ultraviolet rays. We "hear" too in a restricted wave length range. Technology, like X-rays and radio waves can extend our restrictions.

　　However, the calculus of distinctions and the process of dimensional extrapolation are used as tools to reveal the mathematical and multi-dimensional nature of reality. We can theoretically *perceive, conceptualize and interpret* moving across, between and within many dimensions. But these dimensional transitions are individual and require a *subjective experiential* process. We, theoretically, call this process *"indivension"* (from *indiv*idual and dimension) where we, individuals, or units of our individuality (individual-units) such as our culture could transition across dimensions.   Even though we may be *experiencing* (by consciousness 1C or more than one consciousness dimension) the restricted dimensional domain of length, breadth and height (3D space = 3S) and one moment in time (1t), we can conceptualize that these restrictions may also allow us not to directly experience other components of a broader finite reality: There may be more to our world than this 3S-1t-1+C reality experience, with far more dimensional domains that we cannot generally access. This would create a wider world experience, perhaps of 9 finite dimensions all combined together as a single

broader reality of distinct discrete measures of the extent of space, time and consciousness (a 9D finite reality), all communicating with each other by a spinning, vortical mechanism (applying "indivension). In TDVP we propose such a finite 9D, spinning reality as part of an even broader reality that includes the infinite continuity containing all these discrete 9D finite units and an even higher 10th plus dimension of theoretically infinitely countable extension of discrete reality into the transfinite.

Pertinence of the calculus of distinctions in these calculations: The calculus of distinctions is particularly important in this paper because even though we are demonstrating the derivation of a 9 dimensional spin finite reality, this still has to be relative to our current subjective experience, which is our Standard 3 dimensions of space and a moment in time. These can be portrayed in the context of Euclidean mathematics applying "real numbers" for dimensions, as opposed to models that can be proposed along non-Euclidean bases where Time would be portrayed by imaginary numbers, and "Consciousness" by a combination of imaginary and complex numbers. Therefore the mathematics below is Euclidean and involves real numbers.

Moreover, this is further justified by using specifically the 3S-1t basis for calculations is that empirically the calculations of the Cabibbo angle were based on real number derivations. There the vortical motion of the elementary particles through nine-dimensional reality would still be based on calculations relative to 3S-1t.

Pertinence of dimensional extrapolation in these calculations: Once the derivation of figures for spinning dimensions is obtained, it actually involves a simple final stage multiplication to obtain 9 dimensions, and this can be compared with the previously empirically derived reality of the Cabibbo angle, and with spinning through other dimensions. There had to be a mathematical technique to spin across such dimensions and dimensional extrapolation is a logical mathematical technique to use.

In this paper, we concentrate purely on this measurable 9D spin reality. We specifically demonstrate how the Cabibbo mixing angle can be derived from the consciousness-based theory we call the Triadic Dimensional distinction Vortical Paradigm (TDVP).

The nine dimensions and beyond
The first nine dimensions

We have mathematically portrayed these first 9 dimensions as S3 (3 dimensions of Space), (3 of Time), C3 (3 of "Consciousness") with real, imaginary and complex numbers respectively. Complex numbers reflect literally a complexity, where all of the lower dimensional representations of the real and imaginary are contained within the higher level complex numbers.

The transfinite (10th plus) dimensions

The situation becomes even more complicated applying "10 plus" (transfinite) dimensions, These potentially higher domains of "hypercomplex" numbers "contain" these lower 9 dimensions. At these transfinite levels, separating one dimension from another is theoretical and, most likely, purely conceptual.

Similarly, the differentiation of interval from ordinal becomes less meaningful. This is so as the distance within dimensions, even of space (e.g. height), becomes so linked with the time and consciousness substrate dimensions that the sheer complexity does not allow "interval" measure recordings—so all dimensions can only be measured in extent by "ordinal" measures.

Pertinent rotation physics

Certain elementary particles like electrons and quarks exhibit an intrinsic spin of ½. To understand what this means, it is necessary to take into account [30]:

- Max Planck's discovery that matter and energy occur only in multiples of basic units or quanta [31]; thus rotation will always be in multiples of ½, angular momentum will always be in multiples of $h/2\pi$, and

- According to the resolution of the Einstein-Bohr debate and the Copenhagen interpretation of QM, elementary phenomena do not exhibit specific physical characteristics like mass, size and spin until they register as observed or measured phenomena. [32; 33]

Angular momentum

Upon being brought into manifestation as an object in 3S-1t by observation and measurement, an elementary particle will be spinning in one plane, where it will have a specific quantized angular momentum [28; 34], depending upon its mass, radius and spin velocity. The plane of rotation is determined by the experimental set-up for observation. In particle accelerators, it will always be perpendicular to the direction of the magnetic field [34] that accelerates the particle; and the quantum state of the particle with respect to the reference frame of measurement [29] will be the same after one complete rotation, or after any integral number of complete rotations. [27; 28]

3S-1t, 9 D and elementary particles

Applying the implications of the resolution of the Einstein – Bohr debate [23; 24; 32; 35-37], we assume that the structure of perceived reality, appearing in the 3S-1t sub-domain of 9-D reality, consists of patterns brought out of the potential of the Space, Time and Consciousness substrate by observation and measurement. These patterns include the dynamic vortical forms of elementary particles and their combinations making up the atoms of the elements of the periodic table.

We have shown, in an earlier paper[8], applying Fermat's Last Theorem and "reverse" or downward dimensional extrapolation, we can see how the symmetry of four elementary particles is broken to produce one proton and one electron. In this discussion, we focus on this simplest atom, the Hydrogen atom. This consists of four elementary particles: An electron circling a nucleus which contains two up quarks and a down quark. There are, therefore, four distinctions drawn in the Hydrogen atom from the substrate of reality: three quarks and an electron.[v] Per the Copenhagen interpretation [38; 39], they have no discrete localized existence [33; 40-42] until observed and measured. [20; 43]

The pertinence of the hydrogen atom

The Hydrogen atom is the simplest stable atom (atomic number of 1) reflecting the combination of quarks at the most fundamental level, with 1 electron, and 1 proton made from two up quarks and a down quark. [28; 44] Close derived the form and structure of the hydrogen atom from the calculus of distinctions and dimensional extrapolation.

This application of the calculus of distinctions and dimensional extrapolation is the logical starting point of the periodic table of elements and the basis of the description of additional finite distinctions in particle physics.[w]

New and Remarkable Related Evaluations in Quantum Theory

While we focus on the Cabibbo finding which dilutes all else because of its 9 dimensional finite vortical implications for reality, we mention briefly a result that is still remarkable, in itself, and appears to be a major contribution: *extrapolation upwards to and downwards from 9 dimensions produces the same asymmetry.* We are busy investigating a third area as well [x], have done preliminary analyses [y,z] and

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[v] Based on the current knowledge of quantum mechanics at this time, fermions should have the same mixing angle calculation because they exhibit the same half-spin properties. The electron, like the quark, is a fermion.

[w] Why Hydrogen? In chemistry, the proton refers to the hydrogen ion, H+. A hydrogen ion has no electrons and corresponds to a bare nucleus, consisting of a proton (and 0 neutrons for the most abundant isotope protium 1 1H). The proton has a "bare charge" with only about 1/64,000 of the radius of a hydrogen atom, and so is extremely reactive chemically. The free proton reacts immediately with the electron cloud of any available molecule. [28; 44]

[x] *The Bell Distribution Curve Theory of Electron Rotation:* This is an unproven postulate reflecting another unsolved mystery: Why do empirical observations find that electrons seem to not be detected and then reappear? These involve transitions states between "on" and "off". [45] Because the electron clouds rotate around the nucleus, they appear to have achieved a stability in which the balance of electrons moving away is the same as the electrons

proposed a formula that apparently solves this dilemma, and with it, we have also postulated some remarkable and novel implications. [aa,bb]

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moving inward. But why do careful measures at times not locate this cloud? Experimental data demonstrate both "first order" phase transitions and also "second order" transitions. Simulations show behavior that conforms to the "generic power law" fitting the data [22; 45]. We postulate that the "mystery" of the observation about why electrons in 3S-1t appear to disappear and reappear is because of vortical rotation on the electron axes. Consequently, we cannot always register such events in 3S-1t because we propose that vortical rotation camouflages them.

[y] Applying mathematical calculations, we first examined a torus and then a sphere. But both calculations were falsified: The effect is therefore neither a direct torus-like nor a spherical effect. However, mathematically, and also linked possibly with quantum uncertainty such as in Heisenberg's Uncertainty principle [6], and given the "normal distribution" expected in fundamentally subatomic data, we postulated a rotation on an axis based on the "Bell" normal distribution curve. Importantly, this postulate, in itself, suggests a solution to an ostensibly unsolved quantum mechanics problem: The new model proposed, namely *Bell curve rotation associated with vortical spin,* would have important implications in explaining the conundrum in quantum chromodynamics of particles only sometimes appearing. When we account for angular momentum and mass inertia, our hypothesis was that the "normally distributed" Bell curve generates probabilistic results: Specifically, the electron cloud appears to have the shape and mass distribution of two three-dimensional Bell curves on opposite sides of the plane of rotation, the "second" symmetrically mirroring the reflection of the "first". These conceptually would be like Mexican sombreros with the axes of rotation through their apices. The Quantum Split of energy is influenced by inertia with angular velocity and radians changes, the outcome may considerably change with shape of spin.

[z] If the electron cloud rotates on its axis, the findings might support the fundamental basis of the TDVP vortical spin concept, even at the subatomic half-spin level (fermions like leptons and quarks, as well as possibly baryons). This hypothesis is mathematically still tentative at this point and being tested. If the hypothesis of vortical spin camouflaging the electron cloud turns out to be true, irrespective of findings of how this occurs (whether or not it is the Normal Bell curve or other specific mechanism), we speculate that this hypothesis might a be relevant in other areas:

- with other spins as in bosons like mesons (spins 0, 1, 2); and
- be particularly applicable to the Dimensional Extrapolation model: In lower dimensions, we observe only incomplete data from higher dimensions (e. g., when transposing planar oblique slices on an MRI onto non-oblique ones, some data is not observed in each 2D picture.)
- in the context of the mixing angle analysis, the possibility exists that the exact angle calculated from the probability matrix is a reflection of the actual mixing angle produced by the combination of intrinsic spin and conservation of total angular momentum in the free electron. It could be possible, but the hypothesis is still unproven, that electron spin rotation on its own axis might explain the probabilistic variations in this mixing angle linked with intrinsic and extrinsic electron spin and the magnetic moment. It should be noted that negation of this hypothesis does not destroy the findings on the fermion mixing angle—this hypothesis is an aside, adding information to a related, but another element in quantum mechanics that has not been solved. Consequently, whether or not this hypothesis is proven, our calculations for a fermion mixing angle like the Cabibbo angle still remain solid—this would just be icing on the cake.

[aa] We cannot "prove" this using conventional Quantum Mechanics because some calculations generate "impossible" velocities above the speed of light, though it may be balanced by symmetrically equivalent negative velocities below the light speed. But physics does not allow this theoretical construct: We have discussed this in more detail in our further paper [46] where we propose a solution as well as in *Space, Time and Consciousness* [12] or in *Beyond Einstein* [47]

Applying our philosophy of science principle of lower dimensional feasibility—absent falsification (LFAF) [5], we are able to test the hypothesis that there are 9 vortical finite dimensions. If we found this so (and we do), this would support our 9-D finite spin model of TDVP: It would be a falsifiable hypothesis, Moreover, if it is found to be true, then a finite 9D spin reality would be feasible [5].

We briefly mention first the dimensional extrapolation asymmetrical model:
The top-down and bottoms-up 9 dimensional models show the same asymmetrical result.

Revisiting the concepts of vortices and Dimensional Extrapolation, we can mathematically demonstrate the broader validity of the 9 dimensional mathematical model by showing how the spins of subatomic particles demonstrate the same asymmetrical result from top-down (Dimensions 9 to 1) or bottoms-up (from Dimensions 1 to 9). This in itself is a remarkable finding.[cc] This does not specify the number of space, time or "consciousness" dimensions. We discuss this further in *Space, Time and Consciousness*[12] and in *Beyond Einstein*[47].

To clarify this idea further, in the TDVP model, we conceptualize "tethering" of Space, Time and "Consciousness" [dd]. This tethering allows for linkages at every dimensional domain level. So, technically, we project not just 9 sequential dimensions. TDVP allows for tethering at any points of linkage. But it does not necessarily require that tethering to be "located" at the finite 9D level. The tethering[ee] allows inseparable and complex mathematical linkages within,

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[bb] The difficulty encountered is briefly the following: There must theoretically be an equilibrium because there are "electron clouds" with rotational forces counterbalancing. We would expect counterbalancing positive and negative forces otherwise there would be utter chaos in the universe. This is what we find, however there is a problem: in one of the calculations the speed of light is exceeded, balanced by a velocity slightly lower than that of light. So it works out except, of course, that our conventional thinking in physics says this is impossible. Whereas we do not want to change conventional physics thinking, it is possible that if indeed there is a 9-dimensional reality, that we should be saying *"the velocity of light is the highest velocity possible relative to 3S-1t reality"*. If indeed, there is more than one dimension of time, then there may need to be an adjustment relative to other dimensional domains. But this is not necessarily required here and not the most parsimonious explanation by any means. Instead, we have proposed a solution to this conundrum which involves *changing the electron shape:* This would not require modifying the velocity of light. [46-52]. We have derived a specific complex mathematical equation so that this is not only theoretical and we report it elsewhere. [12, 46]

[cc] Mathematically, this asymmetry could be predicted given Fermat's Last Theorem, as soon as one moves beyond three dimensions. Fermat's Last Theorem is not used directly in the Mixing Angle derivation calculations.

[dd] *Dimensional Domain (also called "Domain")*: A contiguous collection of perceived or conceptualized distinctions of extent; in our living sentient reality it usually is 3S-1t(-1c). When conceptualizing a 9-dimensional finite reality it could be any set or subset of dimensions, for example, 3S-3T-3C or even, theoretically, 2S-1T-6C .

[ee] *Tethering:* In TDVP, all of space, time and "consciousness" (S, T and C) are *tethered*—they are fundamentally *inseparably attached* together at one or more *roots*. Though these roots may be limited to one or a few communication source attachments of S, T and C with each other, yet this still results in a *relative non-local (network) linkage* at every dimensional level. Effectively, even at the subatomic level space, time and "consciousness" always co-exist *together* immediately, always, originally and eternally across space, time and

between and across all of a postulated composition of the 9 dimensions. [ff]

We now present the model that potentially changes our world-view to a 9D spin finite reality. If justified, and the data below are cogent, no longer can we claim that reality is purely 3S-1t.

The Cabibbo mixing angle: A major 9D justification of our TDVP model.

The historic challenge

One of the earliest challenges we had to face to our TDVP model, was submitted by an astronomer. He argued that only when we could justify the Cabibbo angle, would he take the TDVP model seriously. He pointed out that though Quantum Physicists knew what the angle was (approximately 13.04 degrees), no scientist had ever been able to justify why this strange size of the mixing angle was what it was. It did not make sense. There was no basis for it in the Standard Model of Particle Physics. Our initial response was that a metaparadigm applied process and procedure, not content. Therefore, this question was outside the scope of a so-called "theory of everything". If the model proved to be valid, such content verification would come later.

Nevertheless, we were challenged because no-one had ever justified why quarks exhibit the calculated Cabibbo angle of 13.04 degrees. It remained a scientific mystery. Could it be that by directly applying the theory behind TDVP, we could justify the Cabibbo and equivalent fermion mixing angles? We now appear to have solved it, strongly supporting the TDVP 9 finite dimensional spin model of reality. Of course, we also describe the 10 plus transfinite dimensions, but the mathematical focus here is purely on the finite reality.

Background

Some background: In 1963, Italian physicist Nicola Cabibbo, introduced the concept of a particle "mixing angle" to help explain what was perceived as the

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meaning. Consequently, tethering is unlike a wave traveling even at light speed: the communication is instantaneous. The tethering implies that S, T and C always remain *linked*, across, between and within *all dimensions*. The tethering may be either tight (with many roots or even a source) or loose with more subtle connections. However, when loose, the linkage still exists, because even any ostensible separation still exhibits an always profound communication of all of the STC components: No time delay is involved as it is not a wave: effectively there is "immediate" relative non-local communication at every level: It is there—tethering does not move through space, time or meaning or "physically link". Metaphors like "balloon on a string" or "boats moored to the pier" assist the linkage idea, but they greatly mislead because they reflect *3S-1t local space-time linkage* descriptions whereas tethering involves multidimensional relative non-local STC communications.

[ff] We have elsewhere proposed that the first 9 the dimensions S3- T3-C3. However, we cannot portray a sequence of S1 then S2 then S3 then T1 as the "fourth dimension" or C1 as the "seventh". Our TDVP model is far more complex than that, and exact numbering is conceptual. However, this conceptual model of numbers or order of S, T and C dimensions, for example, S3, C3, and T3 is not specifically demonstrated by this asymmetric finding. We can only say that it could potentially be any number of S, T or C dimensions (but not 0 of any).. .

weak interaction of elementary particles [11]. This was later called the Cabibbo angle (θC). Cabibbo explained 2 related but somewhat contradictory concepts, namely the idea that:

1. elementary particles (quanta) are separate finite objects, each with its own unique mass, size and angular momentum, that exist independent of observation or measurement. This is basic to classical physics (including relativity).
2. these quanta may change (or decay in collider EM fields) from one to another, depending upon their orientation as they combine to form more complex particles, under the influence of the so-called "weak force". This stems from quantum mechanical experiments that suggest that the potential "substance" of reality may manifest as matter or energy (particle, wave or field) depending upon how we choose to observe it.

Both of these particle physics ideas ignore the role of "consciousness" suggested by quantum experimental results.

Cabibbo noticed patterns in the way elementary particles decayed from one type to another and postulated *"weak universality"* to explain the similarity in the weak interaction between different elementary particles. Weak universality means that all elementary particles, including electrons and quarks, transition from one to another under certain conditions. With the identification of three generations of quarks[28; 53], called up/down, charmed/strange and top/bottom, this has been said to explain two related observations:

1. The transitions between up and down quarks ($u \leftrightarrow d$), between electrons and electron neutrinos ($e \leftrightarrow \nu_e$), and between muons and muon neutrinos ($\mu \leftrightarrow \nu_\mu$) have similar probabilities of occurrence.
2. The transitions with change in strangeness ($\Delta S = 1$) have occurrence probabilities equal to 1/4 of those with no change in strangeness ($\Delta S = 0$).

This proposes a similarity between different generations of particles in the weak interaction coupling strength of any of the up-type quarks to all the down-type quarks [gg, 10 hh]

Cabibbo's second observation implied a mixing angle, θC (now known as the Cabibbo angle) between down and strange quarks. [28; 53]So this means that the Cabibbo angle is an accurate measure of the probability that one flavor of quark (either down or strange) will change into another flavor (up) [10]under the influence

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[gg] 3 quarks coupled: Is that linked with $3^2 = 9$. Is that coincidental or logical for a 9-dimensional spin model that seems to work?
[hh] Quark *mixing angles* are represented by rotation angles $= N(N - 1)/2$.

of the weak force. [ii]

    When the relative probability of the transition from one type of spin ½ particle i, to another, j, is represented by $|Vij|^2$, the relative probability that up quarks decay into down and strange quarks can be represented mathematically by:

$$d' = V_{ud}d + V_{us}s,$$
similarly, $s' = V_{cd}d + V_{cs}s,$
which in Matrix notation becomes:
$$\begin{bmatrix} d' \\ s' \end{bmatrix} = \begin{bmatrix} V_{ud} & V_{us} \\ V_{cd} & V_{cs} \end{bmatrix} \begin{bmatrix} d \\ s \end{bmatrix},$$

where Vij represents the probability that the quark of i flavor decays into a quark of j flavor. This 2 × 2 rotation matrix is called the Cabibbo matrix. When the Vij are determined from experimental data, θC is found to be 13.04±0.05°. Or, algebraically (trigonometrically):

$$d' = \cos\theta_c d + \sin\theta_c s;$$
$$s' = -\sin\theta_c d + \cos\theta_c s. \qquad \text{where } \theta_C \text{ is the angle of rotation.}$$

Therefore, when the V_{ij} is determined from best empirical data, θ$_C$ the value of the Cabibbo angle lies between **12.99°** and **13.09°** within measurement error.

    In 1964, experimental data implied that in certain cases, asymmetric weak-force transitions could occur and conservation of Charge times parity, previously thought to be required as part of the law of conservation of mass and energy, was not conserved. Observing that the CP-violation could not be explained in a four-quark model, Kobayashi and Maskawa generalized the Cabibbo matrix into the Cabibbo–Kobayashi–Maskawa matrix (or CKM matrix) to keep track of the weak decays of the three generations of quarks:

$$\begin{bmatrix} d' \\ s' \\ b' \end{bmatrix} = \begin{bmatrix} V_{ud} & V_{us} & V_{ub} \\ V_{cd} & V_{cs} & V_{cb} \\ V_{td} & V_{ts} & V_{tb} \end{bmatrix} \begin{bmatrix} d \\ s \\ b \end{bmatrix}.$$

    The Cabibbo angle, reflecting what was later discovered as the mixing angle for up, down, charm and strange quarks, is thus derived from a sub-set of the CKM

[ii] Strange quarks (s quarks) are found in hadrons, such as kaons (K), strange D mesons (D s), Sigma baryons (Σ), and other strange particles. Like all quarks, the strange quark is an elementary fermion with spin-1/2, and experiences all four fundamental interactions: gravitation, electromagnetism, weak interactions, and strong interactions. [54]

matrix representing the rotation of the mass eigenstate [jj] vector [kk] space formed by the mass eigenstates into the weak eigenstate vector space formed by the weak eigenstates. Additional mixing angles for the other transitions are derived from the CKM matrix. The specific values of the angles, however, are not predicted by the standard model. They are calculated from the values of Vij, which are experimentally determined. There is no generally accepted theory that explains why the measured values are what they are.

In this paper, we broaden the concept of weak universality to hypothesize that all discrete phenomena result from specific dimensional extensions of the same elementary pattern inherent in the multi-dimensional substrate of reality.

The Cabibbo angle was therefore derived using vector analysis and empirical measurements of the probability of occurrences of elementary fermion particles, including quarks and electrons.[ll] Based on repeatable experimental data, this analysis yielded $\theta C = 13.04 \pm 0.05°$ [10, 11]. This reflects a measure of the probability that one flavor of quark (either down or strange) will change into another flavor (up) under the action of the weak force, preserving parity and angular momentum. [mm]

From the time of Cabibbo, in 1963 [nn], there has been a debate amongst physicists why this particular angle was formed[oo] because it could not be derived

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[jj] "Eigen" from the German word meaning "own" or "defining property" refers to a value of a variable in an equation that gives a solution that complies with the conditions that define the particle or system being described by the equation. An "eigenstate" refers to such a state, and in quantum physics, this is a state of a quantized dynamic system (as an atom, molecule, or electron) in which one of the variables defining the state (such as spin, energy or angular momentum) has a determinate fixed value. We therefore can refer to "eigenvalue"; or alternatively, if this relates to vectors, to "eigenvectors". If this is a square matrix as with the Cabibbo mixing angles, the vectors would be 2 x 2.

[kk] *"Vector"* refers to a quantity that has both direction and magnitude, e.g. force or velocity. Vectors are often represented by an arrow. This is in contrast with *"scalar"* quantities which have no direction. *"Tensors"* are geometric objects describing the linear relations between vectors, scalars, and other tensors. Tensors can be represented as multi-dimensional arrays of numerical values.

[ll] Of course, the basis of trigonometry is the Pythagorean theorem, which is basic to many mathematical calculations and we have applied it in TDVP, particularly in a special way in considering dimensions, dimensional extrapolation dimensionometry, and orthogonality of higher dimensions. This may be an illustration of how we can still apply the basics even in the most complex of areas: Effectively, there are always new applications for fundamentals.

[mm] In 1963, when Nicola Cabibbo developed the "mixing angle", the terminology did not refer to "quarks" yet. Murray Gell-Mann had coined the term in 1963 [55], but it didn't come into general usage until he and George Zweig formally proposed a "quark model" to explain the behavior of hadrons in 1964. [56; 57]

[nn] Cabibbo knew of Gell-Mann and later Zweig's work, which was an effort to explain the charge, parity and angular momentum of hadrons like protons and neutrons in terms of three smaller particles. Gell-Mann and Zweig's work, and Cabibbo's mathematical description of the interaction of these three more elementary particles in the form of a two-by-two matrix were purely theoretical.

[oo] It really wasn't until 1968 that experimental evidence appeared in data from the Stanford linear accelerator [58] to support the idea that protons were composed of three smaller components. (Incidentally, Richard Feynman originally called these particles "partons" though "quarks" won out.) [27].

from the standard model. The Cabibbo angle has mystified both theoretical and experimental physicists for 50 years.[pp]

The Cabibbo angle was the first version of the "Cabibbo–Kobayashi–Maskawa" (CKM) matrix for quarks. When Cabibbo first derived the matrix for the mixing angle of fermions, the third generation of quarks were unknown, so the matrix was a 2x2 square matrix. 2x2 refers to the four-element size of the square matrix describing the rotation (by the Cabibbo angle) from the Eigenstate of one quark to the Eigenstate of another.[qq] The Cabibbo angle is the angle of rotation between the Eigenstate vectors of, for example, an up quark and a down quark.

The term "two by two" comes from the algebraic description in two equations of two parameters, *position and momentum*, which according to the Heisenberg uncertainty principle necessarily involves uncertainty [6]. The Eigenstate function describes it as a fixed 2 x 2 matrix. It is a 2 x 2 matrix containing two simultaneous equations describing the position and momentum of the up and down quark. With the Cabibbo angle, we are still referring to 2 particles and the angle between the eigenstates of 2 particles. The 2 x 2 Cabibbo matrix is therefore a sub-set of the 3 x 3 CKM matrix that describes the weak force for all three generations of quarks. We can extract several 2 by 2 matrices out of the 3 by 3. The probability and the shift in *position and momentum* represents 2 by 2 in the context of the fermion mixing angle.

There is no "CP-violating complex phase" in the Cabibbo 2 x 2 square matrix. [rr] The currently best known values for the Cabibbo angle "mixing" angle is $\theta_{12} = 13.04 \pm 0.05°$ (Cabibbo angle location in Wolfenstein matrix).[ss] When we refer, here, to the " Fermion Mixing Angle" (which has been exemplified by the Cabibbo data on quarks), it refers to *the mixing angle for all fermions, including*

[pp] For example, "At this time, there is no generally accepted theory that explains why the measured values are what they are" and "the specific values of the angles are *not* a prediction of the Standard Model. " [10; 11; 28; 59; 60]

[qq] An Eigenstate of a particle is represented by a vector describing a definite position and a definite angular momentum. This is why the rotational matrix for two quarks is a 2x2 matrix. But quantum mechanical theory says that a particle does not have specific angular momentum and position until it is observed and measured. It has only probability distributions described by the Schrödinger wave equation [61; 62] or Heisenberg's probability matrix [6]. So the Cabibbo angle is the angle between the vectors describing the probable Eigenstates of two different elementary particles.

[rr] The other components of the matrix (3*3) involve the Standard Model case ($N = 3$), where there are three mixing angles and one CP-violating complex phase. The CP ("change parity") violation has been observed in experimental data, but is puzzling: It might possibly imply a time reversal and/ or the effects of the extra dimensions that are being ignored in the Standard Model. This is part of a broader "Maki–Nakagawa–Sakata" matrix and actually affects the behavior of all leptons, not just neutrinos. [63]

[ss] For the standard parameters, other "mixing" angle examples are $\theta_{13} = 0.201 \pm 0.011°$ [neutrinos], $\theta_{23} = 2.38 \pm 0.06°$, and $\delta_{13} = 1.20 \pm 0.08$ rad but these are not based on the fermion (e. g. Cabibbo type) matrix.

electrons.[9] [tt] We have chosen to analyze electrons as representative of half-spin fermions [uu] because they should have the same mixing angle as other (half-spin) fermions, namely the Cabibbo angle (as also exemplified by quarks).[vv] Indeed, this is testable by calculation, and we proceed to do this calculation: The "should have" then becomes "part of our hypothesis".

There is no generally accepted theory that explains why the measured values are what they are. In this paper, we will show how the Cabibbo mixing angle can be derived from our consciousness-based theory that we call the Triadic Dimensional distinction Vortical Paradigm (TDVP).

The literature on the Cabibbo angle is limited. Of about 200 articles with elements of derivation, there are none that demonstrate the Cabibbo angle of 13.04±0.05 degrees. Most of the literature is indirect discussing the CP contradictions [43], or how to justify the 2*2 matrix and the 3*3, or the links with the broader CKM matrices[65]; or applying other particles; none deal with dimensions per se though there are clues. For example, another Close [66] points out the discrepancies in the Standard Model, the vector model links other angles like the Weinberg [67]

There are few books of theoretical physics that even discuss this. One such is Martin's and even then only briefly. [28] Martin points out how the Cabibbo mixing calculations can incorporate suppressed delays participating in the weak interactions via linear combinations applying the lepton quark asymmetry to doublets allowing new vertices to be generated. Applying the 13.04 value allow the previously forbidden decays with a suppressed sin squared (theta C) factor of about 0.05. [28]

Historically in 1971, 7 fundamental fermions were known: 4 leptons v_e, e^-, v_μ and μ^- of the 4 leptons (with electrons and neutrinos), and the three quarks (up,

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[tt] Consequently, we have referred in this paper to "mixing angle", such as the Cabibbo angle or to the "fermion mixing angle". There is no reason to doubt that this mixing angle is the same namely as the original 13.04 ±0.05 degrees, which is based on empirical data and then trigonometrically derived. When we refer to Cabibbo's actual work we will talk specifically about the Cabibbo angle, although our custom has been to generalize "fermion mixing angle" to Cabibbo angle.

[uu] A fermion is any particle that has an odd half-integer (like 1/2, 3/2, and so forth) spin. Quarks and leptons, as well as most composite particles, like protons and neutrons, are fermions. We are restricting our discussion of mixing angles to particles with half (½) spin. These include leptons and quarks, not necessarily Baryons where the spin is more variable (so 3/2 or 5/2). A lepton is an elementary particle which does not undergo strong interactions, but is subject to the Pauli exclusion principle. [64] The best known of all leptons is the electron. Electrons govern nearly all of chemistry because they are found in atoms and are directly tied to all chemical properties. This is why we analyze electrons here.

[vv] Fermions obey the Pauli Exclusion Principle. [64] The Austrian physicist Wolfgang Pauli in 1925 elucidated the Pauli exclusion principle. This is an important quantum mechanical principle: No two identical fermions (particles with half-integer spin) may occupy the same quantum state simultaneously. This means that the total wave function for two identical fermions is anti-symmetric with respect to exchange of the particles.

down, strange) *u, d, s.* [28] To complete this symmetry Glashow et al proposed the fourth charm quark, *c,* to solve problems with neutral currents [68] and the first "charmonium" states in 1974, making the measured weak couplings consistent with predictions of lepton-quark symmetry and quark mixing. There are now 6 leptons (tau as well) and 6 quarks top and bottom. The complication now is possible mixing between all three lower quarks (*d, s, b)* and this leads to the CKM matrix but for the first two generations, the changes induced by the more complex mixing of the third generation are very small but the reason for the CP violation in 3*3 matrices. [28]

    The literature on the Cabibbo angle delineates the difficulties. Duret points out the Cabibbo apparent violation of the Standard Model and realized the pertinence of Lagrangian mathematics.[69, 70] Donoghue links up the quark-lepton landscape and raises up other dimensions[71]. Morisi relates the mixing angles to supersymmetry.[72] Azuelos recognizes the vanishing Cabibbo angle[73]. Palmer points out the need for Hamiltonian applications and the complexity of the whole area [74]

    The closest derivation comes is an anonymous blogger (whom we discovered post-hoc) who cites [75] and using similar mathematics comes close to calculating the Cabibbo angle. However, the blogger does not take into account two critical features: 9 dimensional spin with eight rotations, and the Lorentz correction. Moreover, they derived a unit angle 1.47884 which is close but incorrect as a consequence—they claim 13.52 degrees. Based on our derivation below, more correctly uncorrected using and incorrect *9 calculation it would be 13.31—an approximation but not in range—and if we applied our 9D spin correction to what they call the "fictitious universe" (because of the ostensible puzzlement this causes) it would be 11.83 degrees (way off). Similarly, they have the slightly incorrect figure for the Weinberg mixing angle (28.75 degrees) where the Weinberg range is 28.8 to 30 degrees.

    Fritzch has also similarly tried to derive it as well as Yang but such derivation requires Lorentz corections and realization of 9 spin. There are other attempts as well but none succeed as they do not apply a 9D spin derivation with appropriate corrections like Lorentz [65; 67; 76; 77].

    Importantly, there are applications of the Cabibbo angle to any kinds of fermions, not only quarks. For example, even neutrino's and their links to astrophysics, as the solar mixing angle have a complimentarity relation of quarks and leptons and also exhibit maximally the Cabibbo angle.[78]

Hypothesis

We propose the following related hypotheses based on mathematical derivations.

1. The mixing angle of the electron of the hydrogen atom is approximately 13.04 degrees.[ww]

2. The fermion mixing angle is the result of the dynamic rotation of elementary particles as nine-dimensional objects.

3. The Cabibbo type mixing angle, as described by the Cabibbo matrix composed of experimentally determined probability amplitudes, is actually the result of the vortical motion of the four nine-dimensional elementary particles as they are made manifest from the substrates by observation and measurement. We propose that this can be reflected in calculations pertaining to electron motion and spin.

4. We propose specifically a 9D finite spin model based on the TDVP model of 9 finite vortical dimensions. Vortices in this context involve rotational spin across dimensions.

The proposed hypotheses would be supported if two calculations are demonstrated:

a. using the 9 dimensional spin substrates, the mathematical derivation applying dimensional extrapolation demonstrates a result within the 13.04 ± 0.05 degree figure. [xx]

b. any other dimensional hypothesis (such as 8 or 10 or any other number) demonstrates outside this already empirically derived Cabibbo angle range of 13.04 ± 0.05 degrees. This result can easily be differentiated by mathematics, because the *final* calculation of the derived figure is based on a single rotation multiplied by the number of pertinent dimensions.

The mixing angle calculated from 9 dimensions

We perform the mathematics based on the physics appropriate to test this hypothesis. The implications of such a solution reflect an underlying extraordinarily important finding because a nine-dimensional vortical finite reality would change our worldview.

We report here for the first time that the Fermion Mixing Angle can be derived mathematically from TDVP theory, while it cannot be derived from the Standard

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[ww] The Eigenstate 2 x 2 square matrix refers to the analysis of the mixing angle more usually known as the "Cabibbo angle": if we are generalizing to other fermions such as electrons, in our terminology, we more correctly refer to it as "such as the Cabibbo type mixing angle" or "Cabibbo matrix" if we want to emphasize the Eigenstate 2 x 2 matrix.

[xx] The general consensus amongst quantum physicists today is that electrons and quarks are true elementary particles with no smaller subdivisions and no known internal structure. Electrons and quarks, when subjected to observation and measurement, appear to be very different objects, with different sizes, mass and total angular momentum. However, these elementary particles behave as if they were virtual symmetrical point-like objects in collider experiments, and always have multiples of one-half spin. This means they are going to exhibit the same rotational "mixing" angle. Their measurements are artifacts of the limitations of the experimental setup, and they are oriented to the frame of reference chosen by the observer. [32; 79].

Model of Particle Physics. The constants we have utilized in our calculation are well-known. They are accurately determined historically to five or more significant figures. They are logically justified as appropriate for utilization in the derivation of the fluctuating mixing angles that ultimately achieve stability at approximately 13.04 degrees, i.e. the Cabibbo mixing angle. What is new, however, is that we derive the Cabibbo mixing type angle by applying dimensional extrapolation to our 9-dimensional TDVP spin model.

The Cabibbo Mixing Angle mathematics

Overview

Close applied our mathematical technique of dimensional extrapolation to our 9 dimensional (vortical) model of finite reality. He took into account these key, pertinent well-recognized measures, calculated to at least five significant figures. The principle of the conservation of angular momentum allowed calculation of the spinning velocity of a free electron stripped from a Hydrogen atom. With this approach, the velocity, v_e, calculated as 2.9974×10^8 m/sec is a large fraction of the speed of light, requiring relativistic correction by of the Lorentz contraction, Y. We, therefore applied the Lorentz contraction equation formula[yy], $\ell = \ell_O \sqrt{1 - v^2/c^2}$, as the relativistic adjustment to observation and measurement in the mathematical dimensionometry of 3S-1t.[zz]

Application of the Lorentz contraction equation factor accounts for the shortening of the rotational circumference difference for each 90 degree rotation as seen from 3S-1t. From N = 0 to N = 1, there is nothing to rotate because there are no degrees of freedom in zero dimensions. Consequently, in 9-D spin realities, there are only 8 rotations not 9. Applying the Lorentz contraction equation, the contraction for each dimensional rotation is calculated to be a factor of 0.0181006 for each 90-degree rotation, or 1.629 degrees[aaa]. Consequently, this is multiplied by 8, yielding 13.032 degrees, in agreement with what was originally derived experimentally for the Cabibbo angle (13.04 ± 0.05 degrees). Importantly, models of any other number of dimensions fail: Simply, when the final calculation is done, the result is further from the Cabibbo angle and outside the range of its confidence

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[yy] Hendrik Lorentz, in 1892, perceived the "length contraction" in physics as the physical phenomenon of a decrease in length detected by an observer of objects that travel at any non-zero velocity relative to that observer. The "Lorentz contraction" or "Lorentz–Fitzgerald" contraction is usually only noticeable at a substantial proportion of the velocity of light being negligible at every day speeds. The effect becomes dominant as the velocity approaches the speed of light. [80] In this instance, Lorentz made observations about the electron. Effectively, through the retrospectoscope, he reverse engineered, just as we do in Dimensional Extrapolation, and he used his contraction initially as a correction factor. [81].

[zz] ℓ_o is the proper length of the object in its rest frame; ℓ is the observed length in relative motion with respect to the object; v is the relative velocity between observer and moving object; c is the velocity of light.

[aaa] 0.0181006 x 90 = 1.6290 degrees

limits. This motivates our nine dimensional model. This is not post hoc: We postulated a nine dimensional and vortical model well prior to this calculation (in RBC 1ˢᵗ Ed in early 2012). [16]

Orthogonality

The angle for each rotation is required to be 90 degrees. This is because, while rotation *of any angle* out of a spinning plane results in a projection into another plane, when content is involved (e.g., a spinning elementary particle), rotation of any less or any more than 90 degrees leads to destructive instability—it is disruptive and wobbly. Thus, for an n-dimensional elementary particle to exist as a stable physical object in 3S-1t, say an electron, each of the n dimensions must be orthogonal to all of the other dimensions. Applying the Copenhagen interpretation of physics, the plane involved becomes pertinent only when observed and measured.

Importantly, with substantial content, each dimension must become orthogonal to every other dimension because, as soon as there is *content*, there is conservation of angular momentum in 3S- 1t. This, necessarily, requires orthogonal rotation to avoid instability. Any other orientation leads to dissolution of the vortical form in 3S-1t. The use of the Bohr radius (of the Hydrogen atom) is justified because we are using the *measured* value not the expected value. The Bohr radius [bbb] is a finite value brought out of the range of possible values by actual observation and measurement. [ccc]

Calculating relative to our experiential reality of 3S-1t

The calculation is ultimately reflecting the observation of electrons from the *relative* standpoint of 3S-1t even though existing in 9 dimensions. Mathematically, this model continues to obey the interval-ratio scale, the orthogonality rules, and the real number rules as the calculation is relative to the 3S-1t domain. This is even though at the higher finite dimensionalities, imaginary and complex numbers are involved. There is an interval connection of dimensionality extent, but not of the

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[bbb] r_o = the "Bohr radius" of the Hydrogen atom = 5. 2917x10⁻¹¹meter. The Bohr radius is justified because we are using the *measured* value not the expected value. The Bohr radius is a finite value derived out of the range of possible values by actual observation and measurement.
[ccc] The "Bohr atom" is non-relativistic.

ordinal elements of substance content. Where applicable the Lorentz contraction is applied [ddd].

      Whereas we have proposed that ordinal elements are conceptually pertinent going beyond the fourth dimension (time) [1; 2], these only exist as measures of substance of essence.[eee] It is appropriate to analyze this data based on interval measures as this data is relative to our current dimensional domain of our experience, namely 3S-1t.

Radians and angular measures
      We have further used radians as a measure of angles[fff]so as to when appropriate, to facilitate the calculation of the Cabibbo / Fermion mixing angles.[ggg] We apply the conservation of the angular momentum of an electron stripped from a Hydrogen atom and represent the calculations mathematically to five significant decimal places.[hhh]

[ddd] Since the velocities v_e and v_o are large relative to c, the speed of light, the appropriate relativistic corrections must be made to all parameters, with the exception of r_e, which was derived using Lorentz's contraction equation. The relativistic corrections for length and mass are, respectively, L times Y and m divided by Y, where $Y = [1 - v^2/c^2]^{1/2}$, and v is the velocity of the moving object relative to the observer and c = the speed of light. Thus, the relativistically adjusted parameters are $m_e = m_r/[1 - v_e^2/c^2]^{1/2}$, $m_o = m_r/[1 - v_o^2/c^2]^{1/2}$, where m_r = the rest mass of the electron, and $r_o = r_o[1 - v_e^2/c^2]^{1/2}$. The velocities v_e and v_o are not adjusted, since velocity = distance divided by time, and the appropriate Y factors cancel out. Inserting the most accurate values available for r_e, m_r, r_o, m_o, v_o, h, and α, applying these relativistic adjustments and solving for v_e we get $v_e = 2.9974 \times 10^8$ m/s. Using this value in $[1 - v_e^2/c^2]^{1/2}$ to calculate the contraction of the arc of each of the 90° rotations, we get θC = 13.032°. The actual calculations are somewhat tedious and reflected elsewhere.

[eee] The TDVP paradigm recognizes real (space), imaginary (time) and complex numbers ("consciousness") in its first 9 dimensions. As an aside, speculating, when examining the constraints of unitarity of the CKM-matrix formula, the complex numbers form the sides of "unitary" triangles in the complex plane. There are six choices of triangles of two variables and possibly three more independent. This "stretch" could imply nine. The orientation of the triangles depend on the phases of the quark fields. [10; 11; 28; 59; 60] Note that the complex plane mentioned here is an artificial visualization aid routinely used by mathematicians. It is different than the complex number field of the dimensional domains 7 through 9.

[ffffff] The "radian" ("rad" or superscript [c] for "circular measure") is the natural standard unit of angular measure, used in many areas of mathematics. [82] The radian is the angle of an arc created by wrapping the radius of a circle around its circumference. The radian describes the plane angle subtended by a circular arc as the length of the arc divided by the radius of the arc: it, therefore, represents the ratio of a subtended arc, divided by the radius of a circle. This defines the relationship between the sine and cosine in both derivative and integral identities in calculus: An angle's measurement in radians is numerically equal to the length of a corresponding arc of a unit circle. The magnitude in radians of one complete revolution (360 degrees) is the length of the entire circumference divided by the radius, or $2\pi r /r$, or 2π. Therefore 2π radians is equal to 360 degrees, meaning that one radian is equal to $180/\pi$ degrees equal to 57.29577 degrees reflecting a semi-circle and a right angle (90 degrees) is $90/\pi$ is 28.648.

[ggg] In the instance of the Cabibbo calculation and the Bohr radius: The number of radians in a given number of degrees, without the Lorentz correction would be 0.01745 *90. With 9 dimensions and 8 rotations this would be = 1.5705*8 = 12.564; if there were 9 rotations in 10 dimensions then it would be 14.1345. Effectively, therefore, the Lorentz correction produces a correction of 1.0372 and that correction is critical in because of the closeness of the electron rotation velocity to the speed of light.

[hhh] The conservation of the angular momentum of an electron stripped from a Hydrogen atom is represented mathematically by $r_e m_e v_e = r_o m_o v_o = h/2\pi$, where r_e is the Lorentz radius of the electron, r_o is the radius of the Bohr atom, m_e is the mass of the free electron, m_o is the mass of the electron in orbit around the H atom, v_e is the spin velocity of the free electron, v_o is the velocity of the electron in orbit around the H atom, $h/2\pi$ is the constant

The calculated result for the Cabibbo like mixing angle

Applying the mathematics, we calculate that the mixing Cabibbo-like angle is 13.032 degrees. This is derived from a 9 dimensional vortical model. The exact mathematics is presented in detail elsewhere. [46]

This paper only broadly outlines our finite nine-dimensional model which is pertinent and has mathematico-physical justification.[iii] When a charged particle spins it creates a magnetic moment. The electron has an electrical charge, but the magnetic moment does not affect the calculations of the mixing angle and this is explained in our detailed mathematics.[jjj] The situation is far more complex as Quantum Uncertainty (as in all Quantum Mechanics) must be accounted for, as well as, inter alia, extrinsic and intrinsic electron spin with magnetic moment.

Detail

Important formulae, variables and constants in Hydrogen atom
We focus on the simplest atom, the Hydrogen atom, consisting of four elementary particles: an electron circling a nucleus composed of two up quarks and a down quark.

First, we determine the physical characteristics of the components of the Hydrogen atom based on well-defined constants and the following well-known equations:

1. The centrifugal force equation: $F = mv^2/r$

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converting the angular momentum of the electron to a quantized unit of angular momentum, and $m_e = m_o/\alpha$ (where α is the fine-structure constant). We assume that the force stripping the electron from the H atom is exactly equal to the kinetic energy of the electron, calculated to be $E = \frac{1}{2} m_o v_o^2 = 2.18$ joules or 13.6 Ev, also called the energy of ionization of Hydrogen.

[iii] The preliminary calculations yielding 13.032 degrees have been based on the conservation of angular momentum adjusted for relativistic effects and dimensional extrapolation. Given that it is the spin angular momentum coupled with the intrinsic spin of the free electron that produces the mixing angle called the "Cabibbo angle", there are more elements to consider:

*   Quantum uncertainty must be considered (the Heisenberg Uncertainty Principle [HUP]) [6] The rotation matrix of experimental data from which the Cabibbo angle is calculated is a probability matrix: The values of the individual numbers of the array are averages of many observations. This is, of course, something that must be accounted for in any calculation in Quantum Physics.
*   The angular momentum of the electron in orbit around the nucleus of the Hydrogen atom reflects the magnetic moment resulting from the intrinsic spin of the electron in orbit. This is insignificant relative to the orbital angular momentum, i. e., it is so small that it doesn't show up in five significant figures. Consequently, it should not impact our data.

[jjj] When translated to spin angular momentum in the free electron, the magnetic moment of the electron spinning away from the Hydrogen atom reduces the total angular momentum manifested as spin angular momentum. However this impact, based on our detailed calculations, has been shown not be significant because the Cabibbo and other mixing angles have achieved a relative stability, and if magnetic moment and spin away from the atom were highly significant, it would logically destabilize this quantum system.

2. Wave length of a rotating body = $\lambda = 2\pi r$
3. Coulomb's equation: $F = Kq_1q_2/r^2$
4. De Broglie's wave equation: $\lambda = h/mv$
5. Conservation of angular momentum: $\omega_e I_e = m_o r_o v_o$, where the subscript "*o*" refers to parameters of the electron in orbit around the Hydrogen atom and the subscript "*e*" refers to parameters of the electron free of the Hydrogen atom.
6. Kinetic energy equation: $E = 1/2mv^2$

The pertinent physical parameters are defined as follows:
<u>General</u>
F = force
m = mass
v = velocity
r = radius
λ = wave length
q_i = the charge of a specific particle designated by the subscript i
E = energy
ω = spin velocity
I = inertia

<u>Known Parameters</u>
h = Planck's Constant = 6.6261×10^{-31} joule second
c = velocity of light = 299,792,458 meters per second [kkk]
m_{re} = rest mass of the electron = 9.1094×10^{-31} kg
r_e = radius of the electron = 2.8179×10^{-15} meter (the Lorentz radius)
r_o = radius of the hydrogen atom = 5.2917×10^{-11} meter.
q_e = charge of an electron = 1.6021×10^{-19} joule
K = the Coulomb Constant = 8.9876×10^9 (dimensionless)
π = 3.14159 (dimensionless)

<u>Parameters to be Determined</u>
v_o = velocity of rotation of the electron in orbit around the Hydrogen atom
m_o = mass of the electron in orbit around the Hydrogen atom
m_e = mass of the free electron
v_e = velocity of rotation of the free electron (the spinning velocity of a free electron stripped from a Hydrogen atom) [llll]

[kkk] We use this level of accuracy (nine significant figures) because the length of the meter and the international standard for time are defined based on this light constant.

Determination of the unknown parameters

We determined these parameters mathematically. We summarize our findings here. The detail is to be found in another article specifically on the Cabibbo type calculation. [46]

The key results

These are the key results [46]:

1. We derived v_o as the velocity of the electron in orbit $\lambda = 1$ around the nucleus of the Hydrogen atom, applying four equations and eliminated all variables except v_o: Solving the equation, some variables (λ_o, r_o and m_o) cancelled out in our calculations yielding v_o in terms of well-defined and well-known constants. Substituting in the values of the constants, we obtained: $v_0 = 2.1875 \times 10^6$ m/sec. The centrifugal force in our equations was (of course) equal and opposite to the centripetal force in another equation. This allows the electron to stay in orbit and we could equate these.

2. Since our figure yielded a large fraction of the speed of light, m_o must be corrected for the relativistic effect. Applying the Lorentz transformation: $m_o = m_{er}/[1 - (v_0/c)^2]^{1/2} = 9.1096 \times 10^{-31}$ kg.

3. We checked these results for consistency with empirical data: Using the well known equation for kinetic energy, $E = \frac{1}{2} mv^2$, we calculated the kinetic energy of the electron in orbit and converted it to electron volts. This calculates at 2.1804×10^{-18} joules x $1/1.6021 \times 10^{-19} = 13.61$ Ev. This is in very close agreement with the experimental value of the energy of ionization (the energy required to strip the electron from the Hydrogen atom, leaving a hydrogen ion) of 13.595 Ev. Also, if there are no external forces acting on the electron, the total angular momentum, L, of the electron $= 1.0545 \times 10^{-34}$ J·s.

4. Another check is that this calculates at almost the same figure as the experimentally calculated famous $h/2\pi$: Our calculated value of the angular momentum of the free electron is virtually equal to the basic unit of angular

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[lll] In quantum chromodynamics, the modern theory of the nuclear forces, most of the mass of the proton and the neutron is explained by special relativity. This, along with other facts, justifies our use of the Lorentz contraction in this calculation. The proton mass is about 90 times greater than the sum of the rest masses of the quarks that make it up (the gluons have zero rest mass). However, the *extra energy* of the quarks and gluons in a region within a proton, as compared to the *rest* energy of the quarks alone in the QCD vacuum, accounts for almost 99% of the mass. This may explain why our calculation here must be so precise and to so many decimal places. Lattice QCD provides a way of calculating the mass of the proton directly from the theory to any accuracy.

momentum namely $= h/2\pi = 6.6261 \times 10^{-31}$ joule sec$/2\pi = 1.0546 \times 10^{-34}$ J·s. (We calculated 1.0545×10^{-34} J·s as above).

5. Conservation of angular momentum with a spherical electron requires that $\boldsymbol{\omega_e I_e} = \boldsymbol{m_o r_o v_o}$ where $\boldsymbol{\omega_e}$ is the spin velocity in radians per second and, if electrons are symmetrical with no internal structure, $\boldsymbol{I_e}$ is the moment of inertia of a solid spherical body with uniform mass $\boldsymbol{m_e}$ and radius $\boldsymbol{r_e}$. Additionally, the formula for the moment of inertia of a sphere can be derived by summing the moments of infinitesimal disks about the z axis. [83]

6. Basic to mathematics is that the square root of a complex number is also a complex number [mmm]: This derivation is pertinent because in the first attempt to calculate $\mathbf{v_e}$, the result is a square root of a complex number: The calculated value of the spin velocity ultimately simplifies to: $\mathbf{v_e} = 3.9266 \times 10^9 + 3.9208 \times 10^9 i$ (units used throughout are SI Units, so that the results are in meters per second).

7. We obtained two legitimate solutions of the quadratic equation derived from conservation of angular momentum and relativistic adjustment of mass. The solutions are complex numbers, indicating that the spin velocity of the free electron has one real component in 3S and one imaginary component in 1T, existing at right angles to 3S. [nnn]

Further Discussion
    TDVP and the mixing angles such as the Cabibbo angle
    A fundamental aspect of TDVP involves vortical rotation through nine finite dimensions. A brief demonstration of this 9-D vortical model has been mathematically validated as our predicted numerical result was confirmed: Because

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[mmm] As an aside, clearly polynomial equations have roots in the complex plane: That appears obvious. Mathematicians generalize this to square roots of complex numbers. The solution of a quadratic equation in v_e is the square root of a complex number. It could therefore be assumed that the solution represented by the square root of a complex number can be reduced to an equivalent complex number as opposed to an even "more complicated" numerical expression: Essentially, the set of complex numbers is obviously closed with respect to multiplication. However, the fact that a complex number squared is a complex number, does not necessarily make the converse immediately obvious. For example, an integer squared is an integer, but the square root of an integer is not necessarily an integer: For those who would prefer more detail on this added derivation, we list a solution elsewhere. [Specifically: If $(a + bi)^{1/2} = p + qi$, given specific values of a and b, find p and q]. [46].

[nnn] Because the consequent result indicates a velocity faster than the speed of light, we did further analysis looking for factors that could slow the velocity below c. We considered the electron's dipole magnetic moment, but this did not suffice. We realized that the assumption that the electron is a uniform sphere may be incorrect. We reasoned that if the electron has some other shape, the inertia might be increased to the point that the calculated v_e might not exceed *c*. The clue to resolving this apparent paradox was that a calculated velocity greater than the speed of light was nothing more than a red flag, and that we are able to derive data on the shape of the electron if we do not throw up our hands, saying "this is impossible".

the exact angle was derived, this supports both the fermion mixing angle hypothesis for electrons and the feasibility of our nine-dimensional finite model. Although these results could have been falsified, they were not, being confirmed instead, and the calculation appears accurate. This methodology has, therefore, been justified by the LFAF philosophy of science method in both confirmation of the hypothesis and feasibility. [5]

The fact that we have demonstrated a reason for the fermion mixing angle, like the Cabibbo angle, would purely be a curiosity without these key elements: 9 dimensions (and no others) with vortical reality. The likelihood of such a finding occurring by chance is very low, and further support is provided by the lack of any other dimensional model (e.g., 8 or 10 or 11 or 4 or 3) not working with these calculations. Moreover, the 9 dimensional vortical model is confirmed as a consequence of the hypothesis and is further supported by the TDVP model that finite reality is a 9 dimensional vortical model.

Possible reasons why the exact explanation of the fermion mixing angle (such as Cabibbo) was not previously solved are:

- Apparently no scientists previously examined a 9-dimensional vortical spin model of reality.
- It is very unlikely that the mathematical technique of dimensional extrapolation had been applied before: Indeed, the concept is new, as it was only developed conceptually in late 2011, and mentioned briefly for the first time in the First Edition of our book, *Reality Begins with Consciousness* [2].

We have provided a solution to the scientific conundrum of why the fermion mixing angle (meaning any Cabibbo like) angle is approximately 13.04 ± 0.05 degrees. A possibly more accurate mean figure based on our briefly described calculation is 13.032 degrees, because this is represented mathematically to five significant figures. The following is pertinent:

- Like quarks, the electron of the hydrogen atom exhibits the half-spin property and consequently a mixing angle similar to, if not identical with the Cabibbo angle.
- Given that our calculations were on the simplest atom with one electron, it is very likely we can generalize this calculation to all electrons as they all exhibit the same property.
- Moreover, the derivation of the 13.032 degree figure is the same magnitude and virtually the same numerically as 13.04 ± 0.05 derived for the Cabibbo angle. From this we can generalize that the mixing angle of fermions, be they quarks or electrons, is the same order of magnitude and likely to be equivalent: It is extremely likely that this implies Cabibbo angle equivalence

— quark mixing angle —in both quarks and electrons.
• Most importantly, the application of the fermion mixing angles has been
demonstrated to be applicable in a 9-D spin model.

This conclusion provides critical evidence supporting the validity of our TDVP finite 9 dimensional spin model. Critically, this calculation would be falsified if any other number of finite dimensions were used because the fundamental figure is calculated per spin rotational dimension and only the pre-stipulated hypothesis of 9 dimensions works out.

The theoretical red flag: a peripheral comment
The following discussion does not invalidate the calculations or logic of our derivation. But it suggests that there may be some interesting extra elements that are pertinent to be discussed.

A red flag goes up when we see that the magnitude of the real components of v_e, electron spin velocity, is greater than the speed of light. *Relativity tells us that this is impossible,* since the mass of the free electron, m_e becomes infinitely large as its spin velocity approaches the speed of light. The reaction of physicists since the time of Richard Feynman has been to fall back on the claim that quantum phenomena cannot be explained in "classical" terms. While this may be true, it has become a convenient way to dismiss anything that "doesn't make sense" in the current paradigm. But the discovery of new methods and technology does not invalidate everything that came before. The discovery of the calculus of Newton and Leibnitz, for example, did not invalidate arithmetic. Relativity did not replace Newton's laws, it extended them.

Are electrons uniformly spherical objects?
In this spirit, we will take a different approach: Since all of the assumptions and parameters leading to the superluminal result above are well defined and empirically verified, except the assumption that the electron is a spherical object of uniform density, we are prompted to ask:
Is there anything that we haven't accounted for that might slow the spin resulting from the conservation of angular momentum and prevent it from reaching light speed? [ooo]

[ooo] Effectively, we find that the limiting conditions of $v_e < c$ and $r_e = 2.8179 \times 10^{-15}$m are met when $a^2 + b^2 = 3.7862$ $\times 10^3$ and $v_{e} = 2.9974 \times 10^8$m/sec. By not automatically rejecting a contradictory result, but looking for ways to explain it, we have found a way to logically and mathematically determine the structure of the electron at a scale far below the resolution of our current technology.

Determining the mixing angle

Based on the results of applying the calculus of distinctions and dimensional extrapolation, the most basic distinctions drawn from the space, time consciousness substrate by observation and measurement, known as fermions, are nine-dimensional objects. Their intrinsic spin of "1/2" is explained by dimensional extrapolation and their mixing angle depends upon their orientation to the magnetic acceleration field in the particle accelerator.

Their identification as one type of particle or another, singly or in combination, is thus determined by observation as indicated by the Copenhagen interpretation and experimental data. The appearance of reality as particles or waves is a product of the Indivision or fragmentary perception of the observer. The rotation and projection from dimension to dimension result in a distortion of the angles of perception due to the high rate of spin.

The circumference of each 90 degree rotation, $\pi/2$ radians, is shortened by the Lorentz contraction factor:

$$\Upsilon = (1 - v_e^2/c^2)^{1/2} = [1 - (2.99743343 \times 10^8)^2/(2.99792548 \times 10^8)^2]^{1/2}$$
$$= (1 - 0.999672367)^{1/2} = (0.00032763)^{1/2}$$
$$= 0.018100552$$

Even though dimensional extrapolation is rendered a-temporal by multi-dimensional time, it may be thought of as a process from one dimension to nine, or from nine dimensions to one. In either case, there are eight rotations and the total angle θc is **8 x 90° x 0.018100552 = 13.0324°.**

Further implications

If the calculation holds, and it appears to do so, it also has implications for not only finite 9 dimensional rotational realities as in TDVP, but other key concepts in this paradigm including:

- why and how dimensional extrapolation works: DE is directly demonstrated by the feasibility of these calculations requiring extra dimensions.
- vortical spin (with a stimulating proposal [ppp]) including vortical indivension: This, of itself, provokes another important theoretical model [qqq].
- orthogonality,
- dimensionometry,
- Calculus of Distinctions (CoD) and
- relativity and

[ppp] Our proposal (above) argues that the Bell distribution curve generates probabilistic results that also reflect rotation round a plane.

[qqq] If indeed the figures calculated are correct, it appears that we exceed the velocity of light. This is impossible but we propose the word "relative to our 3S-1t domain experience".

- the Fine Structure Constant.[rrr]

Generalizing to other models?

Can this be applied to other models? Possibly, but only:
  a. if they are 9 finite dimensional models (most String Theory models are not 9 dimensional)
  b. and if they involve rotation and intrinsic spin of fermions (so that, for example, any "folding" multidimensional String Theory models should not apply).
No other well-developed proposed models seem to fit these parameters.
- Pertinent are the various String Theories (usually with 10, 11, 26 or other folded or unfolded dimensions).
- The closest alternative model appears to be the provocative Subquantal Model modified in Klein's 2012 version: This recognizes the logic of a 9 dimensional model, but only briefly: It does not develop the idea in this provisional 2012 document. However, the vortical spin elements and dimensional extrapolation applied to this calculation are not an essential part of the Klein model. [86]

Implications for Space-Time-"Consciousness" (STC) dimensions

    The demonstration specifically of the actual calculation of the fermion mixing angle (as exemplified by the equivalent Cabibbo angle) strongly motivates that our *finite* reality is 9 dimensional and these dimensions are differentiated through spin. However, this finite reality 9-dimensional matrix does not specifically differentiate any configuration of dimensional substrates such as (S3, T3, C3) from say (S5, T4).

    Of course, the TDVP model also includes finite and transfinite elements (the 10th plus dimension) plus the continuity of the infinite reality elements, but our derivation, here, examines purely the finite 9-dimensional spin TDVP reality component.

Perspective

Landmarks

    We have discussed two truly landmark proposals.

[rrr] Arnold Sommerfeld's 1916 Fine Structure constant, α, is a fundamental physical constant of the coupling constant characterizing the strength of the electromagnetic interaction. It is a dimensionless quantity, with a constant numerical value in all unit systems. It is $α = 7.2973525698(24) \times 10^{-3}$ or the famous 1/137 or more correctly 1/137.035999074(44). It can be expressed in terms of other fundamental constants of physics. [84] In this instance, α indirectly comes out in ratios like velocity of the electron round the hydrogen atom and the calculated spin velocity of the electron. The unwritten assumption is that fermions have an intrinsic spin of one half. The probability matrix calculated relates to the influence of one angle to another under the influence of subatomic forces. [84; 85]

- We can reverse extrapolate top-down from 9 dimensions and go bottoms-up from our common 3S-1t reality and demonstrate the same asymmetrical results. This is dealt with only briefly here, being material for later books. [10, 47]

- We can derive the fermion mixing angle from a 9-D finite spin model.

These two definitive findings all support the finite aspect of the 9 dimensional vortical TDVP model.

Potential implications
We suggest two other potential implications:
- If the further electron spin model is correct, that would support the vortical spin model because not only would rotation occur of electrons round the nucleus but the rotation would also be on its axis. This does not require the further explanations we're currently testing: We have proposed that the Bell Distribution curve rotation associated with vortical spin and Dimensional Extrapolation might explain why subatomic particles such as fermions only sometimes appear. However, our mathematics is still in progress and this may or may not be pertinent.
- We broaden the concept of weak universality to hypothesize that all discrete phenomena result from specific dimensional extensions of the same elementary pattern inherent in the multi-dimensional substrate of reality.

The solid mathematical basis derives from the demonstration of the mixing angle by applying a 9-dimensional rotational model, extrapolating through dimensions. Importantly, this calculation cannot be derived by using a conventional Standard Model of Physics with 3 dimensions of space and one point in time. Nor can a Cabibbo angle like figure be calculated applying anything but a 9 dimensional model suggesting that models with <9 or >9 finite dimensions are incorrect. Moreover, the requirement of spin rotation suggests that models involving folding dimensions are also falsified.

It could be argued that this result is purely spurious. This is very unlikely as it was based on a specific model that predicted the results. It therefore reflects the application of science and mathematical theory, and was the confirmation of a testable hypothesis.

Additionally, we predict that other findings that are unexplained in our current scientific paradigm, could be tested for mathematical derivation through a 9 dimensional model, by applying a specific methodology.

Implications for the future

This Cabibbo angle finding has enormous implications for the future of appreciating our reality:

- It implies that most of our finite reality is hidden because we are limited to what we experience in 3S-1t.
- The awareness suggests a potential to apply higher dimensional realities for future research. The most obvious relate to what was previously "science fiction" including space and time travel and communications.
- The awareness suggests a potential to apply higher dimensional realities for future research.
- This finding supports the basic TDVP 9 dimensional finite spin model, dimensional extrapolation and the mathematics of dimensionometry, the idea of our 3S-1t reality being relative and not absolute, concepts of orthogonality at higher dimensions, and the application of the calculus of distinctions.
- Furthermore, it consolidates the pertinence of spin, the application of relativity corrections in electrons, conservation of angular momentum, the technique of applying LFAF.
- It provokes serious questions about the concept of finite reality, and about why some dimensions that may be hidden from us in our restricted 3S-1t sentient experience.
- It confirms the derivation of the same approximate angle of 13.032 degrees for mixing angles for electrons.
- It supports the finding of electron shape not being uniformly spherical: This is a strong presumption because otherwise our analysis would exceed the velocity of light.
- Our findings, because of their breadth, could generate several novel ideas for testing and application.

Effectively, we went searching for an *alligator and we found it (13.032 degrees). But this led to some dinosaurs, too* —not necessarily spherical electrons; extending weak universality; and most importantly a finite 9 dimensional spin reality.[sss]

The pages that follow are for additions and comments during the initial period of this
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