Contact: lkcl@lkcl.net Date: 01 Feb 2017 Updated: 01 Feb 2017
Ref: vixra:1701. Revision: v0 DRAFT STATUS

Abstract

The Extended Rishon Model is currently in continuous development, expansion and clarification, yet with nothing found that is contradictory to its initial foundations as of over three decades ago. However there are a series of recurring themes that have a large body of evidence to support, some less-well-confirmed themes and a body of hypotheses that need significant further exploration. This document - which will be continuously revised - therefore keeps track of the different categories in order to avoid repetition, and to make it much easier for others to understand the Extended Rishon Model.

Contents

1 Introduction

Let $\tau = 2\pi$! [18] As explained in the Abstract, this document is divided into sections with: first an overview of each section at its corresponding level of "statistical correlation" (from highest to lowest level of empirical confirmation) but without significant or comprehensive justification, followed by a more thorough explanation and in-depth analysis of each.

The sections are divided down as follows:

- High degree of certainty "Fundamentals". For this category there will be a significant degree of independent corroboration from a wide range of independent sources. That is not to say that it is absolutely 100% certain (certainty being a pathological state).
- High degree of certainty "Implications". These follow on from the "fundamentals" but are sufficiently large as to warrant their own section.
- Medium degree of certainty. For this category there will be at least one source that supports the hypothesis, but that further exploration is still underway.
- Low degree of certainty. This category primarily contains working hypotheses, intuitive reasoning and work-in-progress for which no or very little evidence has yet been found (or explored). This is one of the most useful parts of this document as it acts as an ongoing up-to-date archive of references that require active investigation.

It is *particularly* important to note that in each section, the summary statements *must* be preceded by the qualifying section's preconditions. It is most emphatically **not** the case that the statements (declarations) are made as either fact or "laws", on the basis that to do so is to be "certain", making it pathologically impossible to revise (or rework).

1.0.1 Key equations

$$E_{\hat{x}} = E_{0\hat{x}} e^{-i(kz-\omega t+\psi_{\hat{x}})} \tag{1}$$

$$E_{\hat{x}} = E_{n\hat{x}} e^{-i(kz/2)} e^{-i(-\omega t/2)} e^{-i(\theta/2)} \tag{2}$$

where $-\omega t/2$ is the rotation over time of the elliptical polarization axis, and where the relationship between each of the particle's elliptical polarisation axes may be expressed as:

$$E_{n\hat{x}} = E_{0\hat{x}} e^{-i(\theta)}, \theta = n\tau/12 \tag{3}$$

1.0.2 Key diagrams

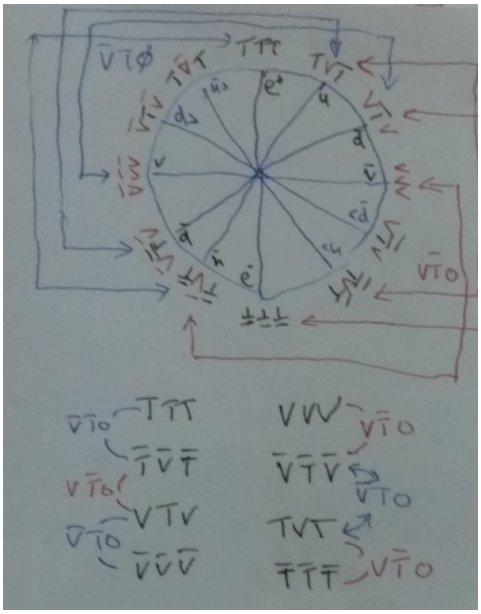

Figure 1: Right-chiral V$\overline{T}$0 Phase Transforms

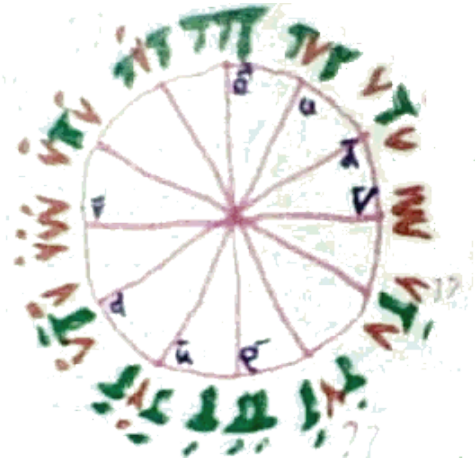

Figure 2: Twelve Rishon positions

1.1 High degree of Certainty, Fundamentals

This section's declarations are preceded by the qualifying condition "The working hypothesis which has a large degree of independent corroborative evidence to support is:" which is left out from each statement so that it does not detract from each. As it is such a huge list, the fundamentals are covered first.

1. Rishons do not exist per se but, after summing them up, the total Tohu and Vohu may be used to "map" (as a unit-vector in the complex numberspace with T representing real and V representing imaginary) onto a phase diagram, best represented by a gaussian exponential $exp(-i\phi\tau)$ where ϕ is integer increments from 0 to 11 (see figure 2 and equation 3). Thus we may never see an individual Rishon but the terminology and insight remains fundamental and mathematically valid when the Rishons are joined together into their triplets as a very important reminder and representation of the phase angle from which they are derived.
2. Hypercolour is a convenient reminder of the "braiding order" of the photons, to represent three key points on the phases that must remain in sync, such that during superimposition the end result is a uniform (unit vector) pattern.
3. Whilst right-chiral up and down are at 1 and 8 'o'clock respectively, left-chiral up and down are at -1 and -8 'o'clock (which map to 11 and 4 'o'clock respectively). Likewise with the left-chiral corresponding anti-particles. Thus we have a natural and complete representation not only for the base quarks and the neutrino and electron as well as all anti-particles but also the handed-ness of all the same, as well.
4. The equations used to express elliptically-polarised mobius light (see equation 1) is a strong fundamental basis for representing Rishon "triplets", that occurs in the field of optics as well as Friedmann-Robertson-Walker spacetime and more recently in Joy Christian's EPR-Bell proof, as SU(2)xU(1)xU(1). It is characterised by a double exponential function (Christian's EPR-Bell Equation 81) where the first part contains an angle that is half that of the second (thus creating and representing the mobius characteristics and simultaneously providing a strong mathematical foundation and basis for spin half).
5. Rishons "triplets" - the base 12 particles - superimpose through the application of Jones Calculus to factorise out a common exponential base that is *identical* to the second part of the double-exponential from its constituent triplets corresponding equation(s), leaving a *static* (unchanging) phase angle in the first part that is, through Jones Calculus and thanks to the unique characteristics of gaussian exponentials (including modulo τ arithmetic), tantamount to the *summation* of the vectors in the complex number field... **BUT**...
6. ...again thanks to the unique properties of gaussian exponential mathematics when applied to mobius topology, it is an unfortunate but extremely elegant mathematical coincidence that the summation of the vectors, for all legitimate compound particles, *happens* to coincide with a phase angle on the Rishon phase map of figure 2. This very (unfortunate) elegant mathematical coincidence explains both why there are only 12 valid Rishon Triplet phases, but also why not only all researchers who have explored the Rishon Model have not been able to find a (complete) guage group onto which to map the Rishon Model to date (incuding the author), but also, as outlined in Joy Christian's paper, why proponents of the Standard Model have missed this crucial insight as well. Everyone is summing the vectors representing "charge" instead of summing the *phase angles* (in a mobius topology): an insight that has misled researchers to explore SU(3)xU(1) extensively instead of the much simpler and much more elegant SU(2)xU(1)xU'(1).
7. Maxwell's Equations (or an improved derivation thereof, candidates include the O(6) Clifford-based equations derived by John Williamson) apply as the fundamental underlying basis for both the internals of particles as well as the interaction with all matter and all photons, because particles *really are* just photons. There *really is* nothing in the universe except photons, where it just so happens that some of those photons have managed to get themselves into infinitely frictionlessly mobius-ly-looped elliptically-polarised (and for compound cases, superimposed and phase-harmonic) configurations, representing a perfect positive-feeback (and thus self-stabilising) energy-conserving **non-radiating** counterbalance between the torsional field (Orbital Angular Momentum as the elliptical polarisation axis of each component rotates on its mobius path), Anglular Momentum, and the resultant E.M. field both inside their orbital radius as well as out, obeying nothing more complex than Maxwell's Equations, through and through. The first person in the world to properly explore (and solve) such configurations to within 10 decimal places of current experimental uncertainty is Dr Randell Mills.

8. The non-radiating condition is **absolutely critical**. Any mathematical equation (for example the Schroedinger Equation unless $v <<< c$) which is attempted to be applied in *any* theory of particle physics that may be demonstrated and proven to be "leaking energy" is **by definition** a completely invalid basis on which to model particles. Particles do not "leak" energy: they remain stable without dissipating. This is an undisputable undeniable fact. Conservation of Energy is an undisputable undeniable fact. Particles simply do not vanish into thin air through dissipation of their internal energy. The Schroedinger Equation in particular is completely invalid to use as the basis for a model of particles because, if particles are photons travelling at the speed of light, $v = c$ and it goes rapidly downhill from there.

1.2 High degree of Certainty: Implications

From the fundamentals of the preceding section, the following (increasingly derivative) logical implications follow. They also are precededed by the same qualifying statement as the preceding section.

1. Through the superposition capacity of the underlying mobius elliptically polarised E.M. field equations, compound particles such as the neutron, proton, pion (including the ρ pion which is a 4-way superposition of up and down quarks), mesons, muon - *literally every single particle including gluons and Bosons* - may simply be represented by the superposition of Rishon Triplets, as long as the end product fits onto one of the major compass points (representing +/-1 electrical or +/-1 magnetic charge). The exception to this observation appears to be Baryons (the pion family) which may be both +/-1 electrical *and* +/-1 magnetic charge, simultaneously.
2. Even the larger quarks (charm, strange, bottom, top) may be demonstrated to be the superposition of Rishon Triplets in different configurations. The configurations currently noted so far include two (pions), three (proton, neutron, charm, strange and bottom), four (ρ pion), five (ultra-quarks - see below - and "top") and "stacked" combinations thereof which *also* conform (so far) to the two and three superposition layouts. Ultimately these then simply represent "harmonics" of the underlying elliptically-polarised phase-coherent photon(s). It really is all rather simple and *does not need* anything more complex to map quite literally every aspect of the entire range of particles.
3. The superconducting electron may also be viewed as being simply a double-harmonic of a "stacked" (phase-coherent) pair of electrons-as-Rishon-Triplets. This explains J Hirsch's observation that a superconducting electron's radius is *larger* than a normal electron, as well as providing a natural explanation for electron "Cooper pairs". It's just an excited state (with spin 0) which is absolutely critical to being able to "run the gauntlet" of alternating N-S / S-N electrons in a superconducting material. The change in mass compared to an independent pair of normal electrons may be attributed to the reduction in torsional energy (the reduced Orbital Angular Momentum - reduced turning rate - of the photon(s) on the mobius "strip". As may be seen in Carl Diether and Joy Christian's paper, torsional energy is proportional to $1/r^6$ where r is the radius of the particle.
4. The superposition results *automatically* in the expansion of the radius of the whole to accommodate and counterbalance the increased energy as contributed by the Torsional, E.M. and rotational energy, in a way that is mathematically equivalent and identical to electron covalence "shells".
5. Electron "shells" are therefore simply a special case where the radius of the electron has quite literally expanded right out to its "shell" orbital radius.
6. From the above, it may be logically concluded that there is **no such thing as a gluon**. There is however such a thing as an "ultra-ultra-ultra-short-lived pion" of varying types (which, through the unfortunate use of the "gluon" nomenclature, have all been completely overlooked), with a lifespan measured in a few multiples of a Compton wavelength, or, that, by a mathematically elegant "fluke", that pion (of whatever type) may be viewed as being the phase-differential between a pair of quarks (of any type whose Rishon phase vectors sum to a total identifying as "pion") or that pion may be viewed as being "continuously and seamlessly created and immediately destroyed within a spectactularly-short timeframe".
7. Also from the above, it may be logically concluded that there is **no such thing as a W, Z or Higgs Boson**. There is however a pair of ultra-quarks, corresponding to a five-way superposition of the appropriate up and down quarks, with estimated "bare" masses somewhere around the 16.5 GeV mark, from which two different charged particles are made named ultra-pions that are mistakenly given the names "W+" and "W-", as well as two neutrally-charged particles which are both mistakenly named

"Z", as well as two leptons ultra-neutron and ultra-proton which, from koide-like mass analysis happen to correspond to the two Higgs candidates at 126.0 and 125.3 GeV respectively.

8. Also from the above, it may be logically concluded that there is **NO SUCH THING as a "Weak Force"**. However the same may just as emphatically *not* be said of the "Weak Interaction", for which there is a very reasonable explanation that comes down to the way in which the (mistakenly-named) W and Z Bosons are constructed. It really is Maxwell's equations (placed into the context of Special Relativity) all the way down.
9. Also from the above, it follows that there is **no reason to have a "Strong Force"**. The Strong Force may be mathematically derived from the fact that the superposition of the quarks results in phase-cancellation (lessening) of the individual quark's E.M. field (and influence), and thus that Laplace's equation may be easily and effectively be deployed. It *really is* Maxwell's Equations all the way down.
10. Conservation of energy is **absolute** and paramount, giving rise to some rules known in Extended Rishon Model terminology as $VT0$ "Phase Transforms" (see figure 1). These transformations are *required* to be carried out in simultaneous (opposing) pairs. If not, the end result is (with the obvious exception being the kinetic energy of the particles themselves also has to be conserved) the emission of a gamma photon as the sole exclusive alternative means by which energy may be conserved if the VT0 "matched pair" rule is violated.
11. There is **no such thing** as "Particle Decay". There is however a concept known as "Phase Transformations" where the superposition of what amounts to "pions" (aka "gluons") results in two Rishon Triplets (actually four due to the VT0 transforms requiring to be carried out in matched, sign-opposing pairs) undergoing simultaneous Energy-conserving "phase shifts". The "superpositions" of the Triplets in effect becomes an *actual* (permanent) summation, cancelling out the existence of the two (four) former Triplets and replacing them with two (four) alternatives that happen to differ in their Rishon Phase-diagram angle by exactly one positive and one negative phase-difference of $\tau/12$ between each Triplet-pair, respectively. Any phase-shift beyond that $\tau/12$ boundary appears to be either outright impossible or just plain fantastically improbable.
12. This *also* applies just as well to the left-chiral quarks, but the rules for left-chiral quarks differ solely in that the sign of the Vohu (magnetic, complex/imaginary) portion is *mirror-imaged*. Thus we have a natural and logical explanation as to why left-chiral and right-chiral "decay" may not mix: there does not exist a phase-transformation that can "jump the gap" over such a massive phase differential in one single "decay". Over-simply put: the phase angle of left-chiral up minus the phase angle of say right-chiral down is not $\tau/12$. Therefore left-chiral and right-chiral may not interact in decay. You do one or the other, not both, because they *really are* actual different particles. It's really that simple.
13. An incredibly important aspect of the application of Conservation of Energy to the intermediate "decay" particles when a W (or Z) Boson is involved is that, because the W (and Z) Bosons are in effect themselves constructed from five pions which happen to come to a total of *four* separate, distinct and simultaneous (energy-conserving, zero-sum, balanced) matched $VT0$ phase-transforms, there is a *single pair* of quarks as a discrepancy left over, bringing the total to *twelve* matched up and down quarks and anti-quarks, sum total charge of all twelve quarks being *exactly* zero electrical *and* magnetic charge (thus fulfilling the Law of Conservation of Energy). Summary of the consequences of this rather comprehensive statement: **W and Z Boson creation is ALWAYS matched by a corresponding oppositely-charged pion** noting and stressing that there are *two* different types of Z Boson that correspond *directly* to ultra-flavoured versions of the pion0-uu (up-anti-up) and pion0-dd (down-anti-down).
14. Thus it is **NOT** the case that "Charge is Conserved via the intermediary decay particles". This is a fundamental misunderstanding that stems from the (quite reasonable but) mistaken "vector summation" approach taken throughout the history of development of *all* the particle physics models to date, but characterised in particular in the current version of the Standard Model by its complete and comprehensive lack of rules that do not - and cannot in their current form - take into account the "magnetic" aspect represented by Vohu.
15. Instead, it is the **surrounding space around the particle** that has a "memory" or "imprint" of the particle's E.M. field, in a completely valid (or perhaps identical) analogous way to that of the "memory effect" of water molecules. The *surrounding space*, being an E.M. field, imposes *directly* onto the chaotic mess of the intermediate particles, forcing them to conform to a configuration that is as close to the original particle(s) as possible. Thus, whilst **charge** is not conserved in the intermediary particles

themselves (because charge is instead conserved by and in effect *stored in* the **surrounding space** whilst the intermediary particles **must** obey first and foremost the Law of Conservation of Energy), characteristics such as *leptop number* and *spin* most definitely *are* (conserved).

16. If a near-match configuration end-result set of byproducts may not be found within a time-frame sufficient for the surrounding space to retain the "memory", particularly in the more complex phase-transform arrangements involving multiple simultaneous $VT0$ transformations taking place, it simply all begins to fall apart, resulting in the "branching" (alternative byproducts). In extreme cases it all goes to hell in a handbasket, the elliptical polarisation mobius-loop characteristics are lost, the end result being that a straight-line photon is emitted as a "discrepancy". This aspect of the Standard Model is deemed to be valid, and there is no conflict betweeen the Extended Rishon Model and the Standard Model in regards to particle "decay" byproduct "branching".

1.3 Summary of High degree Certainty statements

This is a huge body of very bold statements and implications, which makes it all the more important to qualify them as *not* being "Laws" or as (yet) fully-corroborated. They are however reasonably corroborated in multiple independent ways, none of which contradict either the statements or the implications, but instead strengthen them and increase the probability of the theory being sound... without actually providing a full formal mathematical proof.

The trail of derivation began with the initial Rishon Model, and was followed up by expansion into the "levels" which were later clarified as being superpositions under an expanded radius. The phase diagram was added recently after a breakthrough insight based on Jones Calculus. That was then followed by learning that SU(2)xU(1) groups had been explored in-depth in the late 1970s and early 1980s, but that these were abandoned in favour of SU(3)xU(1).

Joy Christian's insight from his EPR-Bell proof that SU(2)xU(1) is equivalent to SU(3) but, crucially, respects and formally recognises that critical and fundamental mobius topology which, it is suspected, be the key to unifying the insights of the Extended Rishon Model and the Standard Model as it currently stands, in combination with a recent discovery of a mathematical paper that shows Jones vectors to be directly equivalent to a spinor on a Poincare sphere in SU(2) [7].

It's a long trail that is near-excruciatingly painful to follow in its level of detail (particularly the phase transforms) but is logically consistent... just not yet "formally" complete.

1.4 Medium degree of Certainty

This section's declarations are preceded by the qualifying condition "The working hypothesis which has a reasonable degree of independent corroborative evidence or self-consistency to support is:" which, again, is left out from each statement so that it does not detract from each.

1. In phase transforms, the matched pair of gluons (aka ultra-short-lived pions) resonate at the same frequency (wavelength i.e. radius) as the particle from which they originated, so may **not** mix directly with particles of different "families" (different radii). However once they have coalesced into actual pions, they may lose some of their energy or gain it (in the form of momentum or reduction of momentum), reduce (or increase) radius accordingly and thus "jump family levels" so to speak. It would appear however that there *may* result in the creation of particles which have a large (temporary, excited) radius, that is then shrunk and imparts a corresponding velocity as a result. This is a very recent insight so is still under investigation.
2. There *may* be some form of flavour-oscillation going on between W Bosons and their corresponding oppositely-charged pion, similar to the bottom-strange dual-oscillation.
3. The puzzle of the neutrino may potentially be explained by its lack of electrical charge (but presence of magnetic / imaginary charge) allowing it to drop to a fantastically-low radius (with enormous angular momentum as a result). That does **not** prohibit it from being expanded out to a much larger radius if it is incorporated into or interacts with other particles.

1.5 Low degree of Certainty

This section's declarations are preceded by the qualifying condition "The working hypothesis which has a low degree of independent corroborative evidence or self-consistency to support, but is worth documenting and

pursuing is:" which, again, is left out from each statement so that it does not detract from each. One aspect of these statements is: they are ridiculously difficult to prove **or disprove**. Some things however can actually be tested or analysed.

1. Vohu conveys "magnetic field" presence as in accordance with Maxwell's Equations. Both the neutron and the neutrino have "magnetic" presence (charge). Therefore, it may reasonably but tentatively be suggested that *anti-neutrinos orbit neutrons in shells in exactly the same way that electrons orbit protons.* This has huge follow-on implications.
2. If it is reasonable to assume that neutrinos orbit neutrons in shells the anti-neutrinos would do so by "jumping" to a larger radius in *exactly* the same way that electrons also jump (spread) to a larger radius, swapping enormous angular momentum for radius in the process.
3. The age-old perspective of magnetic "flux" would therefore potentially and ironically be correct: anti-neutrinos would "jump" in the direction of the "flux", being the "conveyors" of magnetism. Their ability to jump flavour (energy level) could be an important means of conveying more energy than otherwise anticipated (reducing temperature in the process).
4. The mass of the neutron therefore *might* be mistakenly incorporating a single anti-neutrino in its orbital (single, first) shell.
5. The anti-neutrino's tendency to fluctuate, *if* it is orbiting a neutron, *could* be responsible for the neutron's instability.
6. It *might* be the case that neutrons don't like being "magnetic ions" (in effect magnetic monopoles) so are unstable as a result, trying (unsuccessfully) to "steal" anti-neutrinos from the surrounding space and failing to find the required energy to do so. If they did succeed it would be at the expense of creating a neutrino in the surrounding neighbourhood, which would quickly get very unhappy and destabilise the neutron... this is highly speculative however.
7. A very careful and comprehensive analysis of the properties of all known elements, laying out "shells" according to the number of neutrons instead of number of protons, then paying careful attention to their magnetic properties, *might* show some correlation with the tentatively proposed neutrino "shell" concept. Diamagnetism and other properties in particular.
8. If neutrinos do indeed orbit neutrons in shells then two neutrons which successfully find anti-neutrinos (which, as we know, is incredibly hard to do if they mostly travel at the speed of light), should bond together, creating neutron-neutron: a fantastically-stable, electrically-neutral, magnetically-neutral, non-reactive, non-interacting compound. Sounds pretty much like "Missing / Dark Matter", doesn't it?

2 Expansion on High-certainty Fundamentals statements

2.1 Rishons do not actually exist but need to be respected

It was a long, long time - thirty one years - before the author realised that Rishons are a sort-of mathematical coincidence, whilst, at the same time, is very important to respect both the phase diagram and the vector (sum or superposition). The initial insight that allowed the author to independently derive the Rishon Model back in 1986 was the question as to why quarks would *only* have non-unit charges. Being immersed in A-Level physics and maths it was natural to surmise that Tohu would represent electrical charge (or the real plane) and that Vohu would represent magnetic charge (the imaginary plane).

What the author did *not* know back in 1986 was all the things about I/Q polarisation of radio waves (photons), that the polarisation and the E.M. field could be represented in the complex numberplane, although the local Ham Radio operators at the school led to some minor exposure to the concept. So all that came later.

After reading Ido Kaminer et al's work in the field of optics, John Williamson's paper, as well as the work of Dr Randell Mills on GUTCP, and the 2015 experimental-based publication and confirmation of Freund's elliptically-polarised "Mobius Light" work dating back to 2008 and before, the idea that the Rishons would map directly to a unit vector being rotated in the complex numberplane *really* should have occurred a lot sooner than it actually did.

So where we have to respect Rishons is that they have *two* relevances: firstly in their sum totals to 1, 0 or -1 (if we wish to be specific that is for Tohu: more accurately i, 0 and -i apply for Vohu), and secondly in

them *simultaneously* representing 30 degree multiples away from their respective axis in the real and complex numberplane, respectively. As explained later this is a very important and beautifully elegant mathematical coincidence that comes down to a combination of the trigonometric properties of an equilateral triangle and the additional properties of gaussian exponential operations under a mobius topology.

2.2 The reminder of Hypercolour

During the hypercolour analysis an attempt was made to "spin" three quarks (Rishon Triplets) through a 360 revolution, keeping equal-coloured Rishons in close proximity as they rotated. After only 180 degrees it was noted that a naive 2D rotational arrangement simply wasn't going to work: the hypercolour (proximity test) wouldn't match up. That was where the breakthrough insight of the possibility of a mobius configuration came from. With a mobius configuration, the proximity of similarly-coloured Rishons would remain close.

This analysis provided an independent if rather unusual confirmation of the characteristics of elliptically-polarised mobius light as a potential candidate. So whilst, again, it may be concluded that Rishons do not actually exist "per se", there is a constant reminder of our need to respect that which they represent.

2.3 Chirality 'o'clock

The phase map threw up four anomalous (empty) positions that, after a little thought, were clearly the left-chiral quarks. The Rishon "Group" analysis paper covered (using python2) some rotation and other transformations that confirmed the unique nature of the twelve phase positions, as well as (very importantly) confirming the various identities including the fact that the neutrino does not have a "handed-ness" variant (or that they are synonymous).

All of this falls directly out of the mobius topology, so one of the tasks on the TODO list is to gain access (somehow) to the papers that were published as far back as 1978-1985 as related to the SU(2)xU(1) guage group... or to find someone to work with to re-derive them, paying special close attention to the mobius characteristic.

2.4 The recurrent theme of Double-gaussian exponentials

The recurrence of the mobius double-gaussian exponentials across the field of optics and in particle physics is really quite high, which really should have been a huge clue all along.

Following a trail of leads provided independently by Professors Qiu-Hong Hu and G Poelz respectively, the first occurrence of "mobius" characteristics (not that the author identified them as such at the time) was in Ido Kaminer's work on non-paraxial gaussian beam superposition solutions. Ido and his team noted that the phase of *all* of the constituent parts rotated by *half* the angle of their curvature, which was interpreted to be a good candidate onto which to map the characteristic of "spin half".

In retrospect, looking right now at the wikipedia page on Jones calculus, section "Axially rotated elements" it is blindingly-obvious that elliptically-polarised circularly-looped light would also display mobius characteristics: it's *right there*: axial rotation by $\theta/2$ is performed by a simple 2D rotation matrix involving θ, **not** $\theta/2$.

Joy Christian's EPR-Bell proof has a critical equation 81 which is the multiplication of two exponentials. It is preceded by a very important and insightful paragraph that helps understand what is going on in a geometric (3 dimensional) sense. The paragraph *following* it allows us to then understand why it is that each of the particles, having initiated from a *different* position on the phase map, are *unique* and thus completely different from each other. Thus we can say that the "Group" for the Extended Rishon Model has been found, and it is SU(2)xU(1), which is very very fortunate because that's the one that was proposed in 1961, for which Sheldon Lee Glashow, Abdus Salam and Steven Weinberg received the 1978 Nobel Physics prize.

However to be absolutely honest, without detracting in any way from the importance of Group Theory (in particular because of its extreme effectiveness in predicting "branching") it really does appear to be much simpler to follow the application of Maxwell's Equations in the field of optics as a way to comprehend what is going on. The only down-side is: the only person who has successfully solved Maxwell's Equations (from a Classical perspective) for these kinds of elliptical topological configurations involving circular loops of elliptically-polarised light is Dr Randell Mills, and even there, the configurations that he solved are (in essence) restricted to the electron, the neutrino, the proton and the neutron, which was (and is) the primary focus of his life's work.

Within his work there is a cursory exploration of the proton that makes sense as a way to accurately derive the proton (and then the neutron) anomalous magnetic moment, but it is nothing like as bare-bones first principles as the work covering the neutrino and the electron. The reason is: very simple: even Dr Mills has been seduced by the concept of gluons, and he hasn't explored it because he didn't need to as a way to justify the commercial investment in Hydrino production and experimental confirmation.

It is also worthwhile remembering that U(1) is directly represented by a single gaussian exponential, and that there is also a huge recurrence of single exponentials right across the board. It would be foolish to ignore all these hints.

2.5 Rishon Triplets and Jones Calculus

The superposition of the elliptically-polarised mobius light was noted from Dr Randell Mill's work, and was found by accident after trying to make sense of Freund's equations. The following question was asked: if it is reasonable to assume that photons may superimpose without self-destructing (becoming the sum of their superposition as a single entity), where, according to the experiments in "Braided Light" it is indeed perfectly reasonsalbe to make that assumption; if it is further reasonable to assume that, as part of the superposition, the radius would remain the same, the rate of rotation remained the same, the phase separation (rotation about the Z axis if we assume the photons to be orbiting in a circle confined to the XY plane) between them remained constant at all times, and the number of twists (one) as each photon arrangement did so *also* remained the same, then could there be some sort of mathematical magic that allowed the photons (particles) to have their E.M. fields be at right-angles to each other, as well as "sum" to something sensible instead of something mathematically completely bonkers, completely unstable and impossible to fathom, all at the same time?

The answer it turns out was yes, but only under some very special circumstances that happened to *only* apply to Mobius-style gaussian exponential configurations, which also by a complete fluke happened also to map to *exactly* the rules that had previously been derived for the VT0 phase transforms, which was a huge relief as it was a bit of a concern that that might not be the case.

2.6 The elegant and unfortunate mathematical accident

The expression for one particle using equation 3 may be substituted into the other particle's equation 2, then some amazingly simple gaussian exponential refactorisation results in an equation where the second exponent part is identical to that of the two contributing ones which are undergoing the "superposition" to create this new third equation.

The first part of that new third equation has a new "static" term which is the *sum of the two contributing* E_0 *vectors* plus a term that is twice the difference between the two phases. This is very very important and it is why the Rishon Model's derivation must be respected and not ignored. The "rules" of particles have to respect *both* the phase angle *and* the superposition of the vectors, making it a near-impossibility to satisfy if it wasn't for the unique mathematical properties of gaussian exponentials under a mobius topology. Along the way we also collected an insight as to why there are only 12 fundamental particles (12 "starting" phases), which from an intuitive perspective may be understood as being related to the fact that $2cos(60) = sin(60)$, $2sin(30) = 1$ and so on, so when unit vectors at such angles are summed, they happen to fall onto to 1, -1 or 0 in either the horizontal (complex) or vertical (real) space as well. This simply *does not work* for any angles other than 30 or 60.

In retrospect, when looking at other models involving the original Rishon Model, in fact not only that but when considering pretty much every single model of particle physics that the author has ever encountered, they *all* are based purely on the superposition (sum) of vectors. Charge must *sum* to +1, 0 or -1. I do not know of a *single* other theory of particle physics which maps onto the complex numberplane in some form which requires that *both* the phase has to match *and* the vectors (generated from the exact same map that created the phase) also have to sum to a sensible value that has some logical and direct correlation with some aspect of an actual particle.

2.7 It's Maxwell's Equations and Photons all the way down

To really understand this perspective, it's necessary to comprehensively dive into Dr Randell Mill's work for the months that it will, of necessity, take, to absorb the full implications of a lifetime's work that is published in a whopping 1800 page volume.

Once that's been done to the extent to which the reader can cope without their head unscrewing, John Williamson's paper may also be read, noting in particular that, after providing a model and a solution for the electron in O(6) space involving a special application of Clifford Algebra that "folds" back to 3 dimensions for a fundamental reworking of Maxwell's Equations, he notes in passing that if you change the phase angle of the modelled (electron) by 90 degrees its primary EM "presence" is in the *magnetic* domain.

However, lacking the (unbelievably comprehensive and consistent) analysis carried out by Dr Randell Mills in the 3D space using the "original" Maxwell's Equations, John makes the incorrect assumption that due to its huge mass, this strange particle might be a "W Boson" rather than a neutrino. The difference here is that Dr Randell Mills, in the section in GUTCP on the neutrino, notes that the whilst the neutrino's angular momentum is absolutely enormous, the radius is tiny. We may logically conclude that whilst John also correctly noted the huge angular momentum, he did not notice (or explore) the greatly-reduced radius, because his model does not have, as a fundamental basis (as do none of the models based on or around the Standard Model) a "nonradiating" condition with which to directly and explicitly work, to derive the boundary conditions needed to solve the particle model's final radius (note that mass equates to radius, and the Millenial Prize for explaining the mass gap is still outstanding). Thus, John's modelling misses the critical importance of the balancing act (Torsion or "Helical Orbital Angular Momentum"), with E.M. field, with angular momentum and so on that Mills applies to simple and spectacular effect.

Whilst the exact mathematical solutions and framework are still being sought by the author, the fact that Dr Randell Mills has been so successful at deriving the electron mass to within 10dp from first principles with *absolutely no reference whatsoever to Quantum Mechanics* is simply an absolutely jaw-dropping mathematical achievement and inspiration. However it is very very unfortunate that Dr Mill's primary focus is hydrinos: he has cut a path through the necessary mathematics, leaving behind an absolutely tantalising trail of breadcrumbs which it is terribly frustrating for the author to not be able to pick up and follow.

Therefore, looking at different directions and avenues simultaneously, the work of Joy Christian and Fred Diether were encountered: two papers which offer some clues and possible mathematical frameworks to explore: Friedmann-Robertson-Walker spacetime, SU(1)xU(1)xU(1) groups, Einstein-Cartan-Sciama-Kibble theory of gravity and many more, which give a different perspective from that of the field of optics and the (direct, classical) application of Maxwell's Equations, only to find that it is the same thing just in different words. For example: what comes from optics and is named "Helical Orbital Angular Momentum" is the same thing that ECSK theory names "Torsion".

Thus there are many different candidate approaches to achieve the same end-goal, all of them ultimately based on Maxwell's Equations, due to the fact that Yang-Mills *is* a generalisation of Maxwell's Equations, moving them to the frequency domain (Quantum Mechanics) to do so, but fantastically-complicating the entire mathematical space in the process whilst at the same time draining *all* intelligence resources (and funding) from further exploration in the original (classical) space.

The defining "dividing" point was the "Ring Model" as far back as 1913, when Bohr came out with his model of the atom. Very few people remained focussed on the Ring Model, and it really was not until Dr Randell Mills provided a clear solution for a Special Relatitvity correction of the radius of particles that are derived from first principles using Maxwell's Equations that anything remotely bearing a resemblance to the "Ring Model" would actually make any sense or be accepted in any way, shape or form today, given the significant advances made in particle physics theory over the past century.

About the only other person the author has encountered who has worked on an alternative theory that mentions a Special Relativity related orbital radius correction is McMahon, although this avenue has not been explored at all: it is mentioned purely in passing.

2.8 The nonradiating condition

It cannot be overemphasised enough how absolutely fundamental and critical the nonradiating condition is. First raised as the basis of the Ring Model, Dr Randell Mills is the only person to provide an explanation that the author can comprehend as to why the Schroedinger Equation breaks down and is, plain and simple, completely wrong. In a special section in his work he goes to some lengths to explain it clearly, noting that there are multiple ways in which the Schroedinger Equation may be demonstrated to be invalid, and presenting formally just the one needed to prove the point.

In discussions with others (anonymous) it was noted however that the Schroedinger Equation seems to hold true when $v <<< c$, just as Newton's Equations of motion (actually probably Euler's Equations which are accidentally attributed to Newton) are only correct for $v <<< c$.

That aside: it's really rather simple. Particles do not just evaporate into thin air. They don't spontaneously explode into a cloud of lethal X-rays. They don't "deflate" over time. The energy within them *remains* within them, and in fact particles actually *actively resist* (reject) any attempts to provide them with extra energy, or "decay" as a result, or in the case of electrons, jump "shells" if the input of energy is too great for their current stable configuration (witness LEDs and solid state physics as a result).

We can therefore quite freely make the following strongly-worded statement: **Any mathematical or theoretical model which blatantly ignores this evidence presented to us is, *by definition*, categorically and fundamentally fatally flawed**.

In essence: by following the extreme effectiveness to which Dr Mills puts nonradiating to good effect, using it as a boundary condition to satisfy Maxwell's Equations and derive numbers that are accurate to 10dp of real-world measurements, the importance of the nonradiating condition has been very deeply imprinted into the author's tiny brain. However without having first read G Poelz's work on the nature of the electron, where Poelz also notes the importance of ensuring that synchotronic radiation not "leak" (his term for the nonradiating condition), that realisation would have taken a bit longer than it really should.

In summary, then: there are at least three separate independent directions from which the importance of nonradiating has been thoroughly explored, in relation to particles: The Ring Model, G Poelz's paper, and Dr Randell Mill's GUTCP. There are likely to be many more, but it is worth noting that the one particle physics theory that does *not* make special mention, emphasis or explicit use in any way of the nonradiating condition is: The Standard Model. A side-effect of this lack of explicit mention is that it is causing people in both the mainstream *and* non-mainstream scientific communities to make mistakes by omission.

3 Expansion on High-certainty Implications statements

3.1 It's all superposition. Nothing special

If we may reasonably assume that superposition is possible (Jones Calculus of mobius-elliptically polarised light showing us how), then there really is no need for anything particularly special. However in order for the particle to not be ripped apart immediately, the superposition vector needs to map to a unit or a zero charge in the electrical and the magnetic field.

The only other rule appears to be that the angle of the E_0 vector (and thus the entire mobius path) of each constituent particle must *also* be on a major compass point relative to all other constituent particles taking part in the superposition. In other words, the mobius strips must be either at right-angles to each other or properly superimposed or directly opposed.

In terms of harmonic oscillation in the context of E.M. fields this rule makes perfect sense: right-angles means that the E.M fields are orthogonal, and thus may co-exist - simple as that. The less stable particles have constituent contributions that superimpose on a 180 or a 0 degree angle.

3.2 Yes even the larger quarks

The larger quarks appear to be the superposition of the base Rishon Triplets to create a superposition vector that is *not* on a major compass point (unit electrical or magnetic charge). Thus it is simply not stable on its own and must further be part of a composite particle.

3.3 And the superconducting electron

The fascinating thing about superconducting electrons is not so much the electrons themselves but the conditions under which they are forced into existence. One such configuration is for the surrounding electrons in their covalent shells to be fixed into alternating spin-up followed by spin-down (N-S, S-N) arrangements in each alternate layer of the lattice of atoms.

Dr Randall Mills puts it rather well in different words:

> *To conserve the electron's invariant angular momentum of $\hbar$, flux is linked by each electron in quantized units of the magnetic flux quantum, and the basis of superconductivity is a correlated flow of an ensemble of individual electrons such that no energy is dissipated (i.e. superconductivity arises when the lattice is a band-pass for the magnetic field of an array of magnetic dipoles; therefore, no energy is dissipated with current flow).*

In other words, the regular surrounding lattice-arrangement of N-S S-N electrons creates a huge "No Magnetic Entry" sign on the door where the electrical current (the electrons) would normally be jumping from atom-to-atom in the "holes" of the shells. Rather than just "give up", two electrons *team up* (where Dr Mills seems to be implying that the possibility exists for *more* than two).

Here is where the author's perspective differs from Dr Randell Mills. I suspect that the electrons go into a "double-harmonic" waveform i.e. that the two electrons simply superimpose but at 180 degrees to each other. The result is an expanded radius with "spin zero" and other characteristics that alow them to successfully negotiate the zero-magnetic channel.

3.4 Superposition automatically increases the particle radius

This statement comes from a few independent sources. Firstly: J Hirsch's observations on superconducting electrons, which he notes have a larger radius. We surmise that two electrons (aka "Cooper Pairs") simply "team up" i.e. superimpose at 180 degrees, to create that all-important "zero spin" and magnetically-neutral larger-radius particle.

Secondly: we have the very very simple and obvious hint: energy is proportional to radius. If there's more energy (in the form of more photons superimposing), the radius automatically increases to accommodate the increase. This basic assumption is then utilised by Dr Mills to good effect throughout the entirety of his work, providing answers that match to within 10dp for fundamental particles and only beginning to reduce accuracy to around 7dp for huge atoms with atomic number around the 100 mark.

3.5 Electrons in shells are higher-order harmonics, too

Again: it is reasonable to assume that the radius of the electron orbital shell is as large at is is *because* the electron has expanded outwards to such a huge extent that the atoms it orbits are simply *within its field*. This does not make much sense until we view the electron as simply comprising photon(s) in a unique and very special configuration of Maxwell's Equations. Again, Dr Mills puts it best and to good effect.

3.6 There is no such thing as a gluon

Wherever the gluon is mentioned, it's in context of two things: first, an incredibly short life-span and second, two particles are mentioned whose charges and other aspects, when subtracted from each other, **always** come out to be **exactly** those of one of the pions. Logivally, therefore: If it looks like a pion, smells like a pion, and has the characteristics of a pion, it's probably a pion.

Take for example the internals of the proton. It's understood that the proton comprises two up quarks and one down quark, where "gluons" hold together the up-to-the-down, the down-to-the-up and the up-to-the-up (followed of course in the Standard Model by then more gluons holding those gluons together, and then those gluons holding those gluons together and so on). However what is the difference between an up and a down quark? It's a pion. What is the difference between an up and an up quark? Another pion. So we could either say "there's a gluon holding the up and the up together"... *or* we could say that "Between the up and the up quark a fantastically-short-lived anti-up/anti-up pion continually exists as a permanent standing-wave "phase-differential" between those two up quarks".

This is a matter of perspective but it is a crucial one that provides a much higher level of discernment into what's actually going on inside of particles. Not least is that the use of the word "gluon" *completely* overlooks and prevents and prohibits the possibility of even *considering* the existence of no less than *eight* separate and distinct "types" of gluons, including those from both left and right chiral handedness pions. This would seem to be a really rather glaring oversight on the part of the Standard Model.

3.7 There is no such thing as a W, Z or Higgs Boson

The author freely admits to being pedantic here but with the Bosons being assumed to be a guage "force", as opposed to being separate particles in their own right, the author is left with very little choice but to give alternative nomenclatures to the particles that fit precisely with the masses of the W, Z and the two Higgs candidates.

It is *suspected* that the original work for which Glashow, Salam and Weinberg were awarded the 1979 Nobel Prize is perfectly correct, with one notable exception: the number of rotations in SU(2)xU(1) i.e. in effect the number of powers to which the exponential is raised (modulo τ) which of course would *not be noticed* because

anything that's on a multiple of τ which is then raised to any arbitrary number of powers is of course zero, in modulo τ arithmetic. So if the W and Z Bosons comprise in effect five superimposed pions, four of which are *entirely neutral*, it would be perfectly reasonable to empirically derive guage equations that looked absolutely correct but *entirely* missed out the neutral constituent contributions, furthermore coming up with the *right answer* as far as mass and other characteristics were concerned.

Thus, by giving the W, Z and the two Higgs Bosons alternative names (ultra-pions, ultra-proton and ultra-neutron) it helps avoid the confusion caused by several decades of usage that has unfortunately become entrenched as "fact", as taught in Universities, on Wikipedia and standard textbooks.

3.8 There is no such thing as the "Weak Force" (Interaction's okay)

This one's really very simple. If the W, Z and Higgs Bosons may be identified to comprise superimposed quarks, they're not a separate force: they're particles. It's really that straightforward. However what is less straightforward is the Weak "Interaction", which is felt to be completely valid, and down to the nature of the pion, the ultra-pions (W and Z Bosons), shape of the two Higgs Bosons and the startling similarity between the neutron, proton and ultra-quark layouts from which the four Bosons are made.

More than that: if we regard particles as being superpositions of underlying Rishon Triplets (representations of elliptically-polarised light), and that the end-result is a form of "orbital shell" that will project out beyond its radius and could potentially "jump" to a larger radius (with more triplets aka quarks involved in the resultant harmonic arrangement) if encouraged to do so and given enough energy to sustain such an arrangement even for a brief period of time, then it begins to make an intuitive kind of sense that similar-structured particles could, under the right circumstances, flip between arrangements much more easily than those with less similar internal structures (less "resonance" in common, if you will).

Bear in mind that the difference between an up quark and a down quark is only a difference of 1/3 of each of Tohu and Vohu. Bear in mind that the ultra-quark is *five* quarks, in effect being an up (or down) quark with a pair of neutral pions superimposed over the top of it (made from the opposite type of the first quark). Bear in mind that it doesn't actually take very much energy (relative to the actual size of the Bosons) to bring pions into existence. Bear in mind also that VT0 phase transforms (see below) occur in energy-conserving pairs that don't take much energy to make happen. Bear in mind that the universe is viewed as creating "virtual particles" all the time, and that it would not be unreasonable for such "virtual particles" to "team up" so to speak, if the circumstances were right. If the W and Z Bosons are made up in effect of the superposition of a total of *five* pions each, where, when you look at them closely you find that the neutron or the proton is buried *inside* them, and much of our universe is *made* from neutrons and protons, such that the surrounding space would be resonating with an E.M. field that has a near-identical sub-structure to the two Bosons, it's really not hard to see why the W and Z Bosons can pop into existence far easier than their total energy would tend to otherwise support. It's now known for example that protons, when passing in close proximity "feel" each other through the interchange of Bosons.

The only major anomaly here (despite it being the addition of six sets of pions to surround each of the three corresponding quarks in the case of each of ultra-neutron and ultra-proton) is the two Higgs Bosons. The author has yet to successfully manage to use ultra-neutron or ultra-proton in *any* phase-transform diagram as an intermediary, despite its clear (short-term) stability and possibility of existing within the Extended Rishon Model. What *has* been successfully done is to use the W and Z Bosons (caveat: see below) as intermediaries, although it is regularly necessary to deploy well-known Feynmann time-reversal tricks to do so, in particular for the well-known neutron "decay".

3.9 There is no need for a "Strong Force" (Maxwell's is okay)

Straight out of Dr Randell Mill's paper, it is pretty clear that the "Strong Force" simply does not exist, neither does it need to be invented:

> *The bonding in multi-nucleon nuclei involves the superposition of the quark and gluon functions of the constituent nucleons to form the nuclear version of atomic orbitals wherein the gluons provide the central force and the quarks comprise the two-dimensional current-density surfaces. The nuclear bonding gives rise to spherical shells comprising equipotential minimum-energy surfaces as a linear combination of the nucleons. For example, the deuterium nucleus is a minimum energy superposition of a neutron and a proton. Thus, the deuterium quark/gluon function is a spherical coordinate orbitsphere solution of Laplace's equation*

Orbitspheres are defined as being the set of Great Circles that the charge of the particle(s) are uniformly distributed across. Note the mention of Laplace's Equations, as being the the balance-point (zero-charge) sum of a series of electrical potentials. Thus, what is mistakenly believed to be the "Strong Force" is simply the "zero-balance of electrical charge", in a near-identical way to electron orbital shells.

The whole reason why the "Strong Force" was invented is simply because it never occurred to anyone to use plain Maxwell's Equations. That having been said: Dr Randell Mill's work is not absolutely accurate: it's good to around 8 decimal places but there is a discrepancy that tells us that there is more yet here to be explored. Regardless: it is not unreasonable to conclude that if solving Laplace's equation get you to within 8dp of the right answer, complicating matters by pretending there's a separate "force" is easily eliminated with Occam's Razor.

Being kinder to the people without whose fantastic work it would not be even possible to *make* such a strong statement, the "Strong Force" may historically be viewed in the same light as Newton's (Euler's) equation for Kinetic Energy, as being a successful approximation (or substitute) under certain conditions.

3.10 Conservation of energy is Absolute: VT0 Phase Transforms

if there is ever going to be an inviolate "Law" in the Universe, it's that Conservation of Energy is absolute. However, the fascinating thing about such a "Law" is that if two identical opposite-typed particles happen to get created which happen also to travel in equal and opposite directions with equal energy, equal mass and equal (but opposing) velocity, then bizarrely and paradoxically, the "Absolute" Law of Conservation of Energy is preserved!

The reason why comes down to the fact that, if particles are purely photons, then two photons which happen to have the exact opposing waveform with the exact same phase, frequency and magnitude *are* in fact obeying this law because they sum *exactly* to zero. What happens to those two particles (photons) *after* they are created is a different story but here, again, because they are heading in opposite directions they will encounter other parts of the universe and so will encounter and interact with different particles. We can however quite reasonably say that if we knew the *exact* phase, magnitude and frequency of *all* particles and photons in the *entire* universe, their grand total would sum to exactly *zero*. It's an impossible task but a reasonable deduction.

VT0 Phase Transforms (right-chiral transforms are shown in figure 1), are in effect the creation of a pair of equal and opposite matched types of "gluons" (not really: they're matched ultra-short-lived pions) which absolutely and without any doubt or exceptions of any kind obey the Law of Conservation of Energy, summing precisely and exactly to zero sum total energy due to their identical phase, magnitude, frequency but opposing sign, and identical momentum (including angular momentum) but with opposing velocity.

These "gluon pairs" (aka pion pairs) allow two pairs of Rishon Triplets to *simultaneously* undergo a phase-shift to an *alternate* pair of Rishon Triplets that differ solely and exclusively by one thirty degree rotation (one "clock position") each. One pair may phase-shift clockwise whilst the other *must* phase-shift anti-clockwise. But, more than that, if we superimpose the two particles in each pair (summing their Rishon-triplet vectors) in both *before and after the transformation*, there must only be a difference of 1/3 Vohu and 1/3 Tohu between them. It's complicated but makes perfect sense: if you look at any of the pions and take their Rishon-triplet vectors those *also* differ by 1/3 Vohu and 1/3 Tohu. This rule applies to left-chiral as well as right-chiral except that Vohu is mirror-imaged (inverted) - see further below as to why.

Ultimately though it comes down to the conservation of energy. It's very very important to note: the equal and opposite frequency and angular momentum has some very important implications, which the author is slowly beginning to understand enough to be able to explain (in the medium-certainty category). A summary would be that particles have to phase-shift in symmetrical ways, and that the phase-shifts may only occur between particles of similar radius (energy).

3.11 There is no such thing as particle "decay"

This is really simple to understand as a misnomer. If particles transform through phase-shifts, allowing them to jump to higher (or lower) energy orbits because ultimately they're photons all the way through, then there's really no such thing as "decay" at all.

3.12 Left and right chiral "decay" has a logical explanation

If we look at the difference in V and T charges between an up and a down quark of the same chirality, the difference is a simultaneous 1/3 T and 1/3 V vector. If we look at the difference in terms of the pion combinations (aka "gluons" - see below) which in effect the VT0 phase-transforms *represent* the matched transfer of pairs of phase-preserving, charge-summing-to-zero-preserving pions, pions themselves have a simultaneous integer (1,0,-1) Tohu and integer-but-imaginary (i, 0, -i) Vohu charge.

Their application (left-chiral to left-chiral) thus transforms left-chiral particles to left-chiral particles *if and only if* the gluons (pions) involved are *also* left-chiral, and likewise in the right-chiral world. So It's really rather straightforward. Put another way: if you try to take a left-chiral quark and apply a right-chiral VT0 phase-transform to it, the end result is a particle that has either a non-integer V or a non-integer T charge. Put another very simple way: you simply cannot phase-transform two sets of particles that differ by such a large phase differential. They're at different points around the phase "clock", they're *literally* different particles, and trying to make them "jump" across such a large (and different) energy gap is a clear and blatant violation of the law of Conservation of Energy. *It. Ain't. Gonna. Happen. Period.*

The Standard Model is incapable of recognising or providing a rational explanation for this phenomena. It is treated as a mystery that is actually really very simple when particles are treated as being phase-harmonic elliptically-polarised mobius light.

3.13 W and Z Boson creation accompanied by opposite-charged pion

This one is a matter of perspective, but comes down to the absolute prioritisation of the Law of Conservation of Energy. The universe simply will not permit - not even for the purposes of "quantum tunneling" - the creation of energy (or charge). Energy may be *borrowed* from somewhere for the purposes of quantum tunneling, but it cannot be created. Thus, it is flat-out impossible for W and Z Bosons to be created - with charge - from out of nowhere.

Instead, the *constituents* of the W and Z Bosons may be created through VT0 phase transforms in equal and opposing matter-antimatter "virtual particle soup" reactions, where it just so happens that, unfortunately, the number of such VT0 phase transforms happens to have *one* pion of identical and equal and opposite charge and type to that of the corresponding W (or Z) Boson aka "ultra-pion" which was simultaneously created.

The word "unfortunately" is used because it is *believed* by the author that the reason why the accompanying pion in any W or Z Boson (aka ultra-pion) "decay" hasn't been spotted is because the size of a W (or Z) Boson is so large relative to that of a pion that, statistically, it's simply not been noticed in the observation of "decay" experiments. Not only that, but due to the empirical data fitting the Standard Model very well, where it has been *assumed* from that empirical data that "charge is conserved", so *nobody is looking*.

With the Standard Model completely overlooking Vohu and its significance (being down to the complex numberplane and its representation of magnetic fields), and in combination with the significance of both phase *and* vector magnitude needing to be respected, without Vohu none of that can even be *deduced*. This is all extremely unfortunate.

3.14 Charge is NOT conserved via intermediary "decay" particles

With the Law of Conservation of Energy being absolute and unbreakable, charge simply cannot be brought into existence without having a direct counter-balancing charge to bring the sum total to zero. This applies in the electrical (Tohu) field *and the magnetic* (Vohu). With the Standard Model failing to recognise the concept of Vohu, it is a very unfortunate mathematical coincidence that the Standard Model fits the observed data perfectly correctly... whilst at the same time completely missing the possibility that matter might be made of elliptically-polarised photons in mobius circular infinite self-stable loops, with all that that may imply.

Put another way:

- Charge before "decay" is X
- Charge after "decay" is also X
- the difference is therefore **ZERO**
- so why the heck would the "conveyers of energy and transformation" have "charge"?
- if the intermediate particles had any "charge" then that "charge" would be **added** to the result.
- This does not happen... therefore the intermediate particles sum total to *ZERO* charge.
- (Paradoxically) QED.

3.15 Charge is instead conserved by the SURROUNDING SPACE

After particles have undergone "decay" into the intermediate particles, the surrounding space is still resonating - still contains an E.M. field imprint - of the particles as they were before the "decay". This "imprint" is what influences the (exact same in many cases) intermediate particles to undergo differing phase-transforms into alternate "decay" byproducts. Thus we may say that it is the "surrounding space" that in effect "stores" the "charge" temporarily, because "charge" is in effect nothing more than a harmonic resonance pattern of E.M. fields.

3.16 "Branching" of "decay" in the Standard Model looks great

The one aspect of the Standard Model which the author considers to be a huge success is that of branching prediction and modelling. There is nothing incompatible between the Standard Model and the Extended Rishon Model in this regard.

4 Expansion on Medium-certainty statements

4.1 VT0 Phase Transforms must respect "family" (energy) levels

This is a very recent insight from re-reading the section above that Conservation of Energy is absolute and inviolate. If that is truly the case, then when a particle begins to jump to an alternative radius in order to accommodate the addition of the VT0 phase-transform pions in order to form a W (or Z) Boson, it is clear that some of those VT0 phase-transform pairs will be at levels with small radii (the lower-level particles such as electron, neutrino and so on), whilst others will be at levels with much larger radii (neutron, proton, and beyond that).

Figure 3: Neutron Stage 1 phase-transformation

Figure 4: Neutron Stage 2 phase-tranformation

It is therefore reasonable to assume that attempts to "match" or "source" VT0 phase transforms from completely different energy levels is flat-out impossible, as this would violate the law of Conservation of Energy. Put another way: a quark which is part of a large radius particle (a neutron) has far more energy than that of an electron, so how on earth would it be possible to undergo phase-transformation? Clearly it would violate the Law of Conservation of Energy to do so. So let's look at the two "stages" of neutron "decay". At first glance it appears that, indeed, for example, $V\overline{T}0^1$ is violating this rule, by being involved in four particles of differing "levels": the neutrino and pion (aka "gluon") at level one, the neutron at level 2, and the W Boson itself at level 3.

However we may think this through and solve the discrepancy with some careful thought. Firstly, we note that the neutrino and neutron do not actually decay together into an electron and a proton: this is a Feynmann style diagram involving time-reversal on the neutrino, such that the two figures below show us the neutron phase-transforming into a neutrino, electron and proton, instead. Bear in mind that time-reversal is involved in the two above diagrams, so it becomes necessary to rewrite these patterns slightly to give a better sense of what's going on.

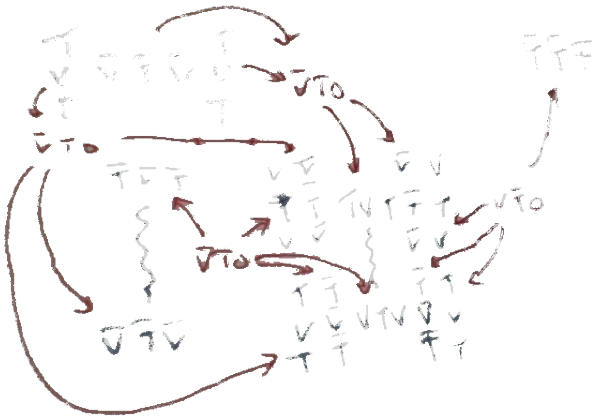

Figure 5: Proton to electron stage 1

The above diagram has a couple of different characteristics from previous ones that have been drawn. Firstly we chose to use a feature of VT0 phase transforms where a single quark results in the triple-production of three others. Bear in mind that it is the *sum total* of the four T/V Rishon vectors that must total 1/3 V and 1/3 T of the required signs. In Computing terminology it is easiest to think of VT0 phase transforms in terms of XOR operations.

Secondly: the radius of the associated pion is displayed at the same size as that of the W Boson, as a 2D way to represent that it does indeed have the same "level" of energy (same frequency), even temporarily. Thirdly (difficult as it is to do) it is assumed that the electron also has a similarly-large radius, but is about to "collapse" to a smaller one and gain a huge amount of kinetic energy in the process.

Note however that just as with the prior depictions of Stage 1 and Stage 2, we have not yet included the phase-transforms to cover the neutrino and neutron. This is covered below:

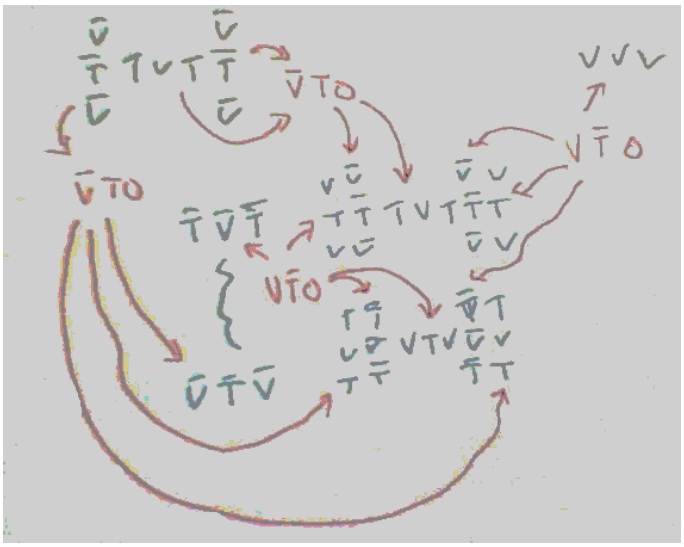

Figure 6: Neutron neutrino stage 2

Here it has been chosen to reverse time so as to emphasise the ultra-pion and pion's similar initial radius, and to emphasise that, again, the anti-neutrino (as with the electron) is created spontaneously as part of the energy-conservation in the creation of the Boson (ultra-pion), quite likely at the same initial radius *as* the ultra-pion, quickly dropping to a smaller radius with a huge kinetic energy impulse as a result. Also, again, a second triple-quark-creation VT0 phase transform has to be used (if one triple-quark VT0 is used then it must be matched by a second opposite matching type of VT0 phase transform).

So it would appear that there could indeed be a rule where the radius (energy level or "family") of the particles as they undergo phase transformation is very very important. It's not possible in other words to just phase-transform from a lower energy (smaller radius) to a higher one (larger radius), nor a higher one to a lower. Only same-level energys may carry out phase-transforms, where it is then *permitted* for the end result to "shed" some of that radius (energy) in the form of straight-line Kinetic Energy.

This goes a long long way towards explaining why the W and Z Bosons (aka ultra-pions) are involved in particle "decay" at all. They're a form of energy-balance "opportunity" so to speak. Everything has to jump to the larger radius in order to have the opportunity to reorganise.

4.2 W Boson (and associated pion) oscillation

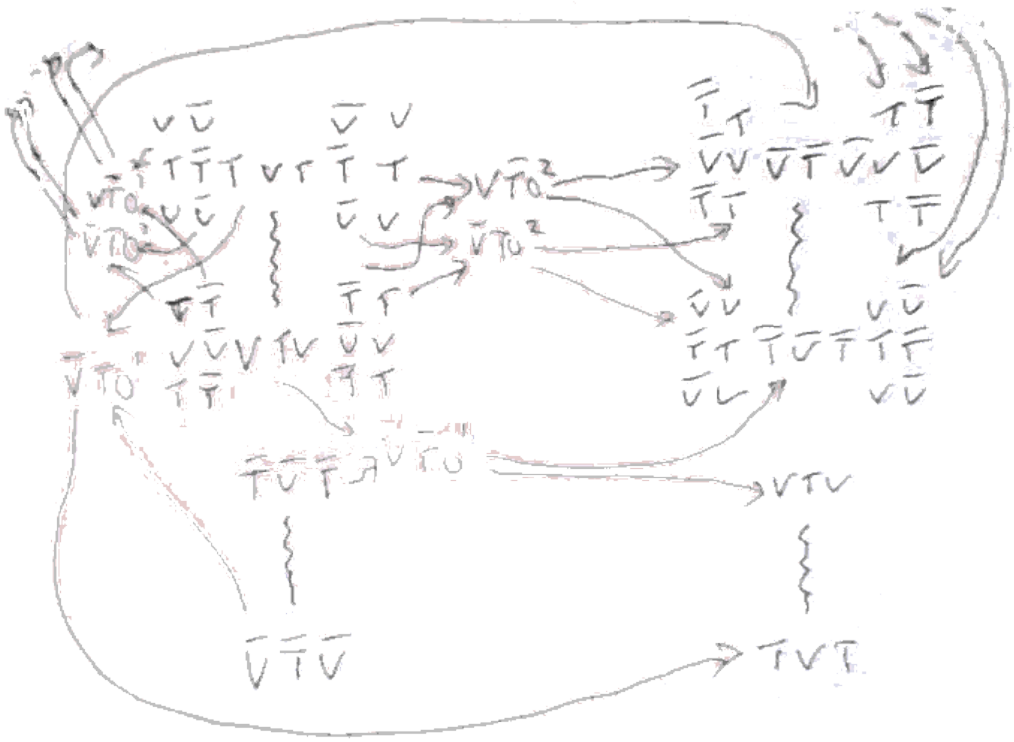

Figure 7: W Boson and associated pion oscillation

Efforts to pin down the neutron "decay" have been irksome to say the least. One of the strange things however is that in making mistakes and using W+ instead of W- (with corresponding oppositely-charge pion) the end result was exactly the same. This led to an investigation to see if it was possible for oscillation to occur between a W+ and pion- to a W- and pion+ and the answer is a definite *yes*. This would tend to tentatively support a rather intriguing (concerning) hypothesis that the observed experimental mass of the W Boson may actually *incorporate* the associated oscillating pion, although before going that far when there is no evidence yet noted to support it, a full investigation of alternative "decay" is going to be needed. The potential for oscillation however does explain quite a lot.

4.3 Neutrino puzzle: interaction expands radius outwards

We may be completely misunderstanding the nature of the neutrino entirely. Almost certainly if, as Dr Randall Mills outlines successfully in GUTCP, its presence is almost entirely in the "magnetic" domain: imagine a radio wave oscillating in the complex (magnetic) field only, but then looped into an elliptically-polarised mobius arrangement: that's quite *literally* the definition of a neutrino.

Now, as noted by Dr Mills, there's virtually nothing to prevent the radius of such an arrangement dropping to a fantastically low value (where mass is directly proportional to radius). However he notes that the orbital angular momentum of a neutrino is disproportionately large (understatement). We surmise, therefore, that the neutrino *can* gain mass... if and *only* if it happens to interact with other matter, expanding its radius outwards in the process. This would go a long way to explaining why neutrinos can be part of a compound quark, as well as being the make-up of the muon-neutrino, and many many other factors that haven't really been properly understood.

Further discussion on this theme, and any follow-up implications, need to be part of the "low" certainty section as by this point they are highly speculative. This particular topic remains here due to Dr Randell Mill's successful derivation of the neutrino mass and angular momentum from first principles. It is however specifically noted that Dr Randell Mills may be incorrect in his assertion that neutrinos *never* interact with matter: we believe that they *may* be able to do so under very specific conditions, but that their nature makes the possibility of "bare" neutrinos achieving such circumstances without assistance just fantastically and ridiculously improbable.

5 Expansion on Low-certainty statements

5.1 Anti-neutrinos in orbital shells around neutrons?

5.2 Doing so by swapping large angular momentum for radius (mass)

5.3 Magnetic "flux" is back in vogue!

5.4 Neutron mass *might* be incorporating the neutrino

5.5 Anti-neutrino fluctuation could be why neutrons are unstable

5.6 Comprehensive periodic table analysis needed

5.7 neutron-neutron as an ultra-stable compound: "Missing" matter?

6 Discussion

TODO: incorporate this

http://www.nbcnews.com/science/science-news/physics-first-light-captured-both-particle-wave-n315936

The thing that is poignantly unfortunate at this stage of development of the Extended Rishon Model is that the author's lack of mathematical formal background and training is sufficiently comprehensive as to be unable to provide the required detailed formal mathematical proofs that would easily satisfy peer-reviewed scientific journals.

Instead, the author has chosen to pursue a breadth-first overwhelmingly comprehensive "corroboration technique" based on their expertise in reverse-engineering ("black-box" knowledge derivation), using techniques that are formally recognised under the nomenclature of "Demster-Shafer" theory as well as the field known formally as "Epistemology".

Over time however the intent is to fill the gaps by sheer bloody-minded persistence, as, despite the lack of formal mathematical training, the author feels that after thirty years of following an intuitive trail which has not had a single piece of contradictory evidence found or presented, there is definitely something to this Model that continues to make it worthwhile pursuing until it is complete.

This document therefore represents a "statement of ongoing work" in an equivalent format to a Wiki but more appropriate to the format of a scientific paper, and will, despite publication, unlike a normal scientific paper but instead more like a Wiki, be under constant revision indefinitely.

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