

# Networked Entangled Higgs Mechanisms, Dark Matter / Energy, Fractal Cosmology

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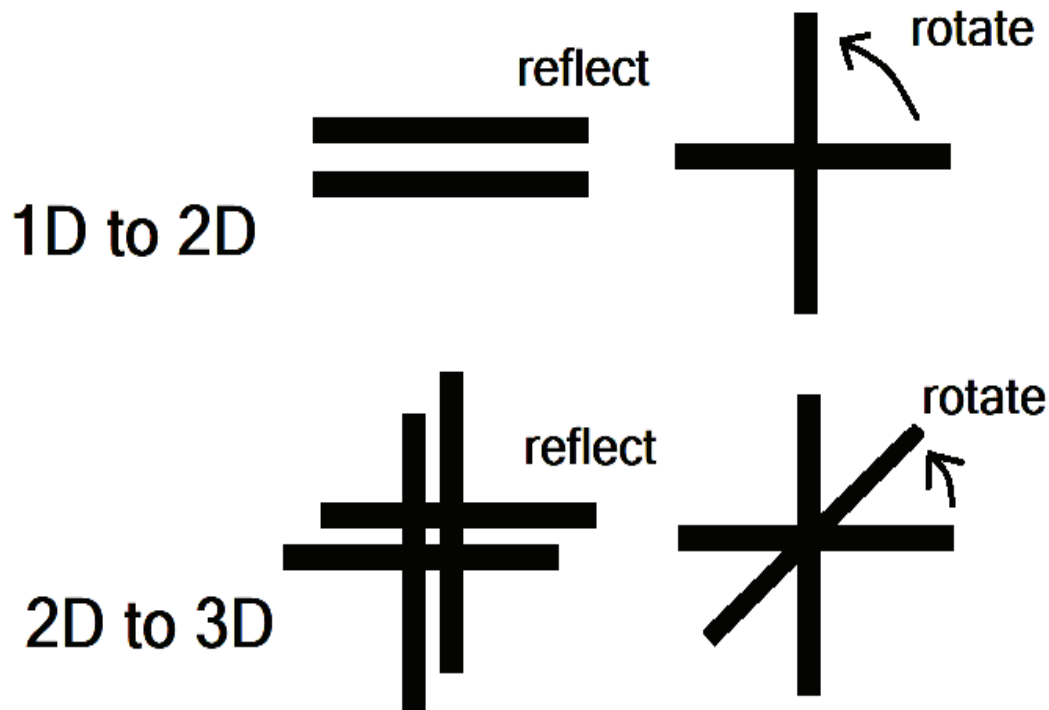
## Abstract

Vector current and axial current theory (M. Gell-Mann) is an important foundation of quantum chromodynamics (QCD) and the Standard Model of Particle Physics.<sup>1</sup> This paper extends vector current and axial current theory to networked Higgs mechanisms. These networked Higgs mechanisms provide a basis for "timing fast and slow periodicities" and "state flipping". The theory here (G. 't Hooft) is that "timing periodicities", and "state flipping", are important foundations of entanglement, dark matter, and bridging that which is quantum to that which is classical.<sup>2</sup> Timing periodicities at the quantum level is in turn based on the theoretical concept of quantum clocking within a time-invariant dynamical system (Wilczek), which in this paper comes in the form of projective elliptics.<sup>22-23</sup>

Coincident with confirmation of the Higgs boson at the Large Hadron collider (LHC), scientists proposed, as a next big step, the Circular Electron Positron Collider (CEPC) to be completed in 2030.<sup>3-4</sup> Much like the search for the Higgs drove the LHC, the search for dark matter will drive CEPC. **This paper predicts a dark matter portal, and associated dark matter / energy, at the MeV, below electro-weak, scale.** The Beyond the Standard Model Physics Working Group, and others, theorize that "... a viable possibility (for dark matter) is so called hidden sector physics, that comprises new particles with masses below the electro-weak (EW) scale that couple very weakly to the Standard Model (SM) world via portals".<sup>5-8</sup>

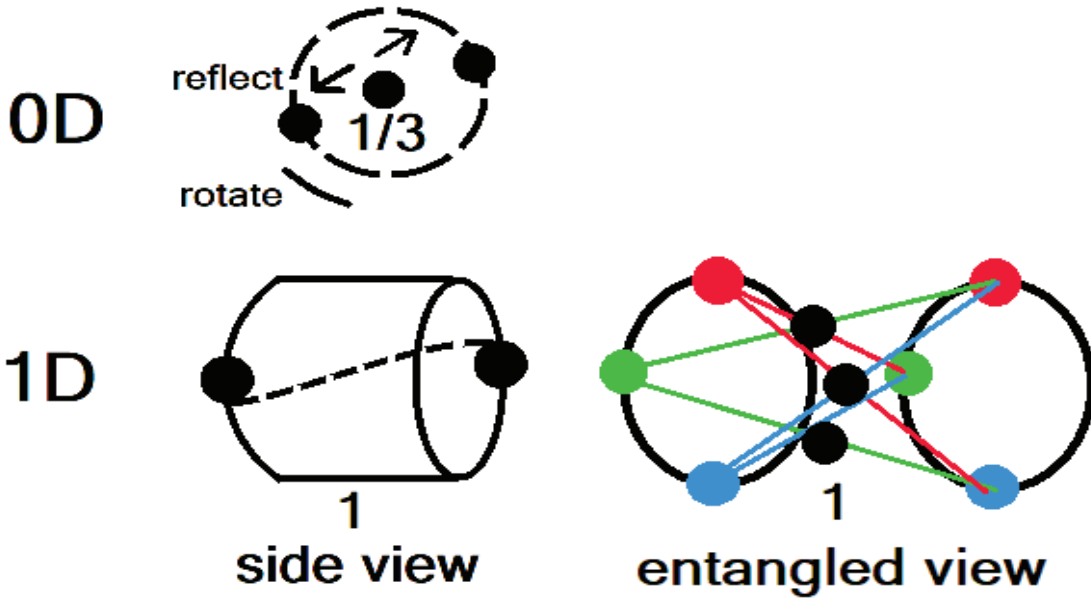
## INTRODUCTION: REFLECT / ROTATE DIMENSIONALITY, THE BROADER CONTEXT OF VECTOR AND AXIAL CURRENTS:

In the purest sense the universe, starting from a pre-big-bang 0D singular point, is about creating 1D to 2D to 3D dimensionality. Increasing dimensionality, again in the purest sense, is an Object / Image reflect followed by a rotate process as shown in the following diagram. **The hypothesis here is that a vector current is at a deeper level a dimensional reflect current, and an axial current is at a deeper level a dimensional rotate current.**



## 1D to 3D CHANGING DIMENSIONALITY REFLECT / ROTATE PROCESS

Reflect / rotate for 0D to 1D is shown in the following separate diagram, because there are quantum level nuances. The first nuance is that the Pauli exclusion principle prohibits an entangled system from being in the same quantum state at the same time. The second nuance is that at 0D there is no directionality such that the reflect is net-sum-zero bidirectional. The third nuance is that at 0D there is no area to rotate in, such that all rotation is pure spin angular momentum, as opposed to orbital angular momentum which infers mass (i.e. this is pre-mass). Therefore the initiating reflect / rotate at 0D creates "3" quantum states sharing time, call it "minus\_T, Time, plus\_T", in the same 0D quantized dimensional state. **The main hypothesis here is that the initiating reflect / rotate / minus to plus time quantized dimensional process at 0D provides a template for subsequent fundamental probability driven processes.** In fact conceptually 0D represents the "Higgs Mexican Hat" from a different perspective. The "2 of 3" rotating quantum states are in the hat brim and represent **bounded probabilistic momentum**. The "1 of 3" quantum states in the middle is at the hat top and represents **bounded probabilistic position**. Having the Pauli exclusion principle built in from the 0D onset is very important because it presumes "2" level entanglement free of "thermalization", "measurement interference", "environmental leakage", ... and computation that is based on **bounding position and momentum**.



## 0D to 1D

# CHANGING DIMENSIONALITY REFLECT / ROTATE PROCESS

Subsequent to 0D, 1D has directionality embodied in the "2" parallel lines as shown in the side view. These "2" parallel lines are thus "entangled" both by reflection, rotation, and the time taken to reflect / rotate. This is quantum computation (black dots), and the basis for Information Complete Quantum Theory (ICQT).<sup>10</sup> Conceptually this is "2" entangled analogic polarized photons, and means that downstream processes are actually entangled networked processes involving reflection, rotation and time. This infers entangled networked processes are also associated, at higher dimensionality and non-zero mass, with "2" entangled spin up spin down electrons. Mass of course, infers that part of pure spin angular momentum is apportioned to elliptic orbital angular momentum. In fact since all Standard Model particles except bosons are spin 1/2 angular momentum, the amount apportioned to orbital angular momentum is 1/2, and all that is needed is a "2nd" entangled mass to go elliptical with "2" entangled foci. The major hypothesis here is that elliptics are a macro scale manifestation of the Pauli exclusion principle. At 2D Keplers 2nd law kicks in bounding position and momentum. At 3D Keplers 3rd law kicks in relating to periodicity and time. Entanglement means processes involving probabilities are joint probability processes, with Object / Image reflect at the higgs and matter / anti-matter perhaps being the most notable manifestations of this. This is an important nuance because single wave probability processes are plagued by discontinuities and infinities that defeat downstream networked Higgs mechanisms.

Figure 0.0 is a semi-log plot of particles in the Standard Model, with charge on the vertical axis and mass / energy on the logarithmic (base 10) horizontal axis. Notice that there is a lot of information squeezed into Figure 0.0. Fortunately large computer screens with lots of pixels and ZOOM capability are up to the task of working with this information. Charge on the vertical axis represents reflection. Spin, representing rotation, is spread across the entirety of Figure 0.0 in the form of the "plottable mass / energy" spin 1/2 and spin 1 particles in the Standard Model. Gluon and hypothetical graviton particles have no definitive mass / energy, and are therefore not directly "plottable", though later semi-log graphical plots of networked processes are indicative of "symbolic plottables".

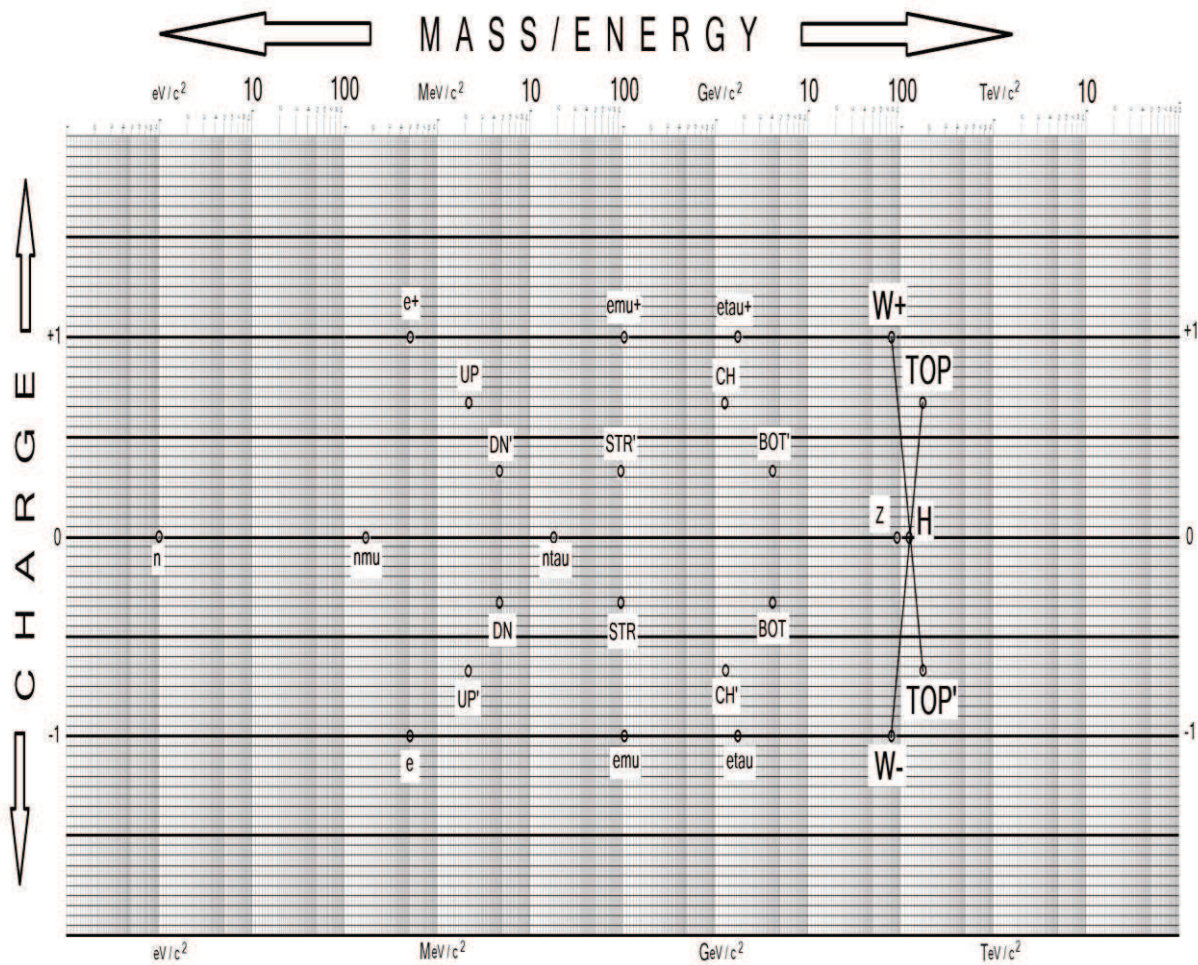


Figure 0.0 Charge versus  $\log_{10}$  Mass / Energy

At the right of Figure 0.0 "2" black lines cross at Higgs H. Connectedness and crossings are indicative of joint probabilities. Actually on ZOOM this crossing is just slightly upstream from Higgs H. **The hypothesis here, and in many graphical plots to follow, is that near misses in networked flow lines are actually indicative of localized energy flow**



processes. In fact, since many of these connected crossings involve matter / anti-matter flow lines, the near misses may be why matter exists at all and hasn't been totally obliterated by anti-matter. At Higgs H, if path H to  $W^+$  represents a  $1H$  vector current, then path H to TOP represents a  $2/3H$  axial current, or  $1/3H$  short of  $1H$ . The hypothesis here is that this crossing at H represents  $0D$  to  $1D$ , and the first manifestation of the template for Higgs processes. The further hypothesis is that the  $1H$  and  $2/3H$  are related to the Higgs field and a networked Higgs mechanism.

### THE BIG PICTURE, CROSSOVERS:

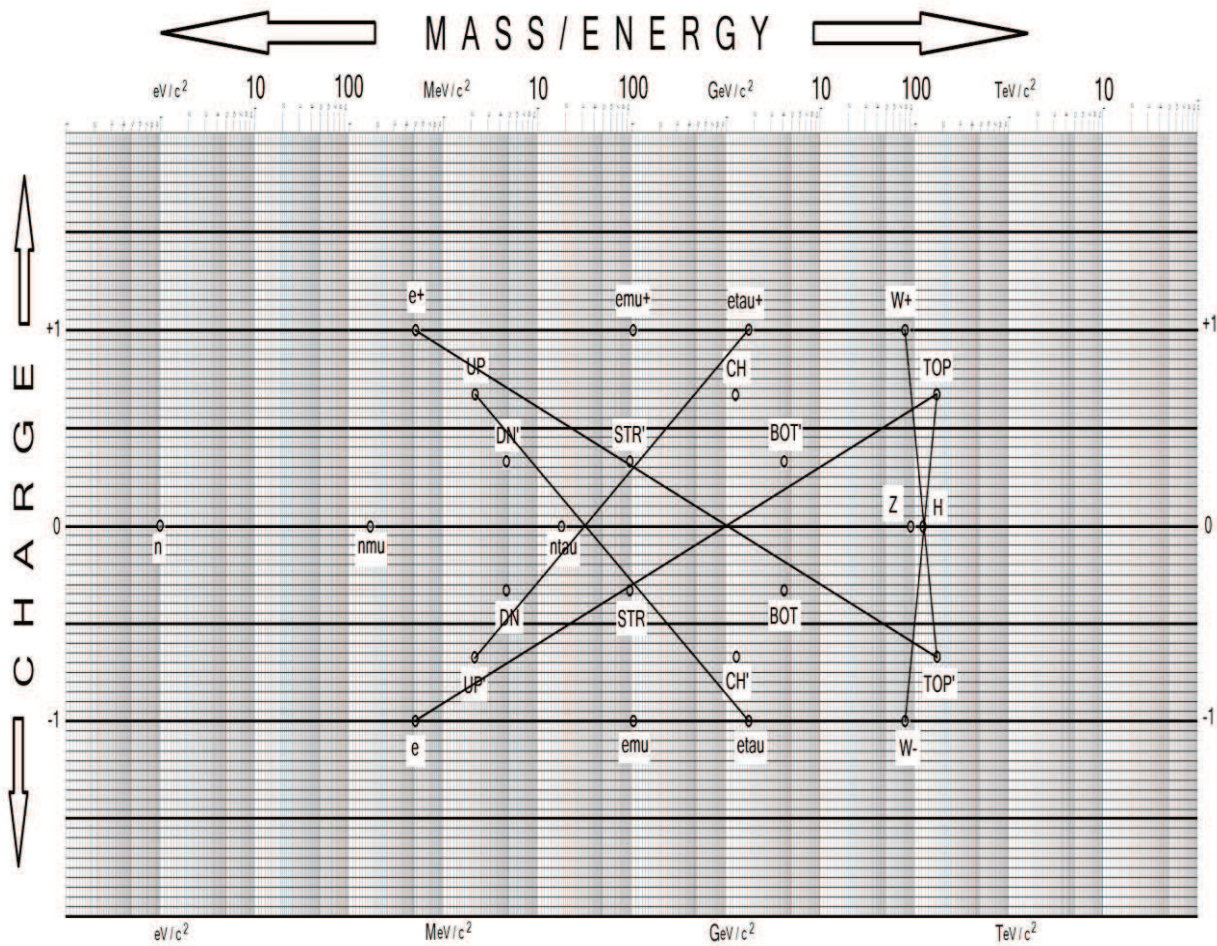


Figure 1.0 - The Big Picture, Crossovers

As stated previously there is a lot of information squeezed into Figure 1.0. Throughout the rest of this paper I will ZOOM in to make graphical plots easier to view. Figure 1.1 is Figure 1.0 ZOOMed with the neutrino on the far left cropped out.



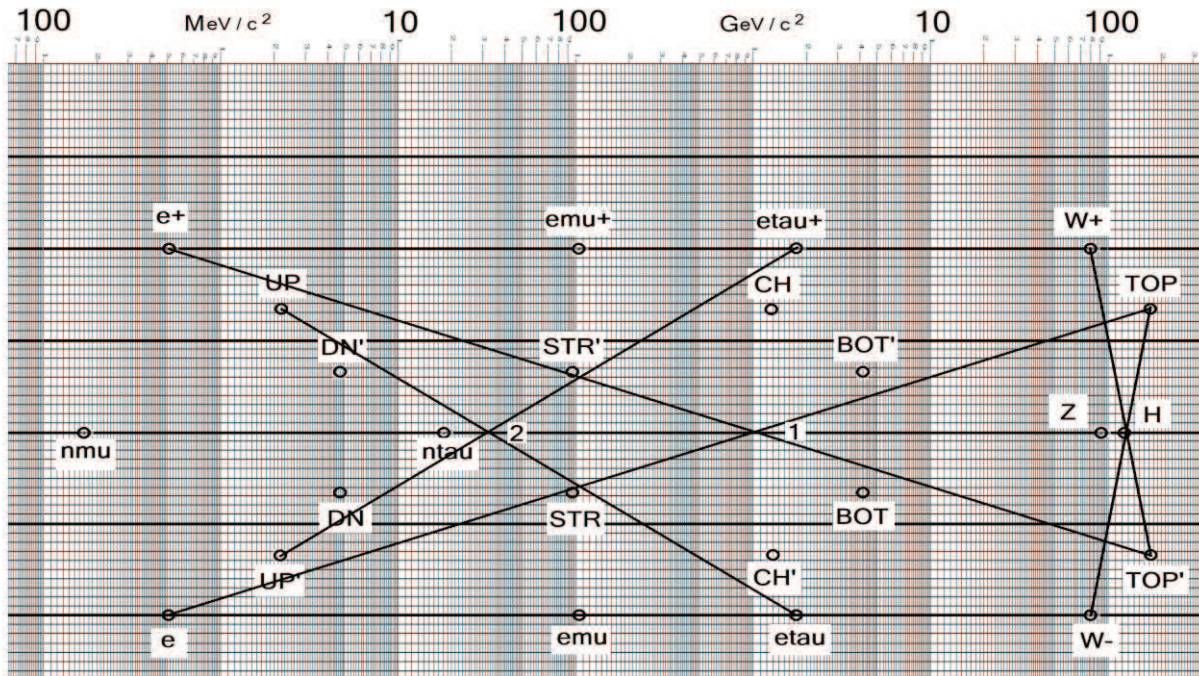


Figure 1.1 - The Big Picture ZOOMed, neutrino n cropped

Notice that 2 sets of black lines have been added. Stable physical ground states are achieved by energy flows to lower mass / energies, which means generalized flow in the plots proceeds from right to left. The longer set of lines connects big mass TOP and antimatter TOP' quarks at the right to small mass electron e- and antimatter positron e+ at the left. The shorter set of lines connects big mass etau+ and etau- at the right to small mass UP and antimatter UP' quarks at the left. We already discussed the line crossing at the Higgs. In this next right to left process 4 additional important line intersections occur at 1, 2, STR', and STR. These intersections are associated with "2" phenomena.

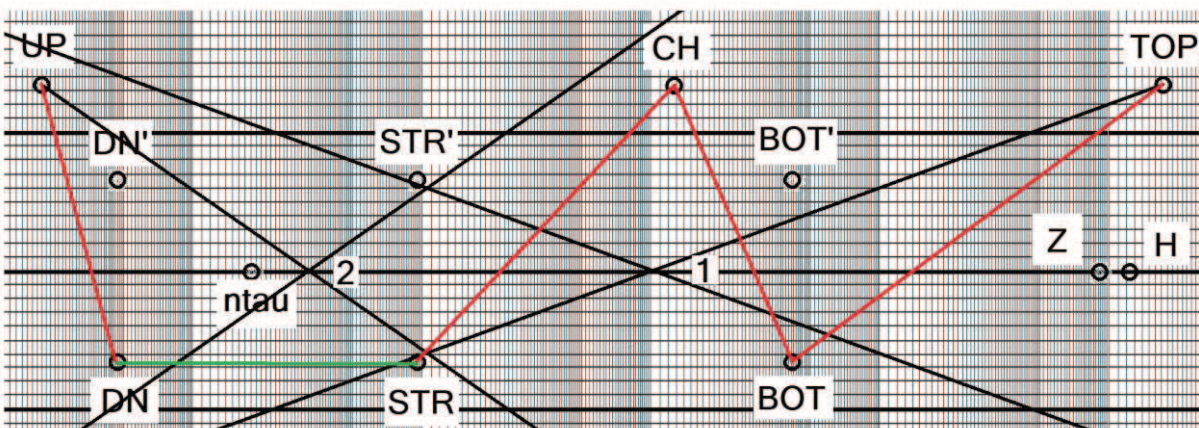


Figure 1.2 Crossover

**The first phenomenon is "crossover".** Notice that in Figure 1.2 the path towards lowered mass and stability for quarks (red line) starts at TOP and moves thru all quarks until "crossover" between STR and DN (green line) before ending at UP (red line). Patterned expectations would be for the up quark to have a mass higher than the down quark, but the up quark in fact has a mass that is lower than the down quark. **In effect the vector / axial currents have become a "chiral" current indicative of networked bounding, computation, and information.** Moreover the difference in mass between DN and UP represents a "crossover" mass roughly equivalent to the mass of "5" electrons (.51 MeV/c<sup>2</sup> each). This will become important later on.

**The second phenomenon** is the fact that the 4 lines involve 3 generations of quarks but only 2 generations of electrons, as emu is missing from the big picture processes. **The hypothesis here is that there is an anomaly at emu that pertains to other big picture processes to be discovered.**

The long black lines intersecting at "1" extend over a large mass / energy / momentum range and thus require more force to bound down to a given geometry. In fact intersection "1" is just upstream of proton mass / energy 938.27 MeV/c<sup>2</sup> and neutron mass / energy 939.57 MeV/c<sup>2</sup>. Most of the mass in protons and neutrons comes from momentum dominated gluons. **This enables a plottable at intersection "1" for the gluon and strong nuclear force SNF. Bounding at "1", then comes in the form of QCD and color confinement.**

The black lines intersecting at "2" are some 3 orders of magnitude shorter, in terms of mass / energy than the gluon / SNF lines intersecting at "1". Less force is thus required to bound down to a given geometry. Less clear is just what intersection "2" can be associated with. **Intersection "2" happens to be 11.6 MeV/c<sup>2</sup> to the right of ntau. This is the mass / energy equivalent of the neutron, which conceptually is the quantum level big mass (b.m.) of an emergent gravitational force and the theoretical graviton G. Bounding at "2" then, comes in the form of gravitational force, and it is much weaker, though conceptually related to the strong nuclear force SNF.**

## **BIG MASS, NEUTRON 11.6 MeV/c<sup>2</sup> :**

Single proton no neutron hydrogen is by far the most abundant element in the universe. Finding neutron equivalent energy in particle network flows (intersection "2") is a big deal. Being centrally located in the network, it can flow in a gravitational G oriented direction via decay into single proton no neutron hydrogen. At the gravitational extreme it flows into neutron stars and black holes. Alternatively it can flow in a strong nuclear force SNF oriented direction, not decay, and add neutrons to a nucleus (intersection "1"). If it flows in the SNF direction and does decay it can build the heavier elements in the periodic table by adding protons to the nucleus in a process known as "neutron capture".<sup>19</sup>



## "PLOTTABLES" - gluon, big mass, center of mass:

Figure 2.0 expands concepts from the Figure 1.1 Big Picture with "plottables". At the right where intersection "1" was, a "plottable" nucleus, or NUC, has been added over proton mass / energy  $938 \text{ MeV}/c^2$  and neutron mass / energy  $939 \text{ MeV}/c^2$ . Since these mass / energies are roughly 99% gluon mass / energies, a "symbolic" gluon has been plotted at NUC. In this sense a gluon is less of a position bounded phenomenon (i.e. point particle) and more of a momentum bounded phenomenon (i.e. coupled energy flows).

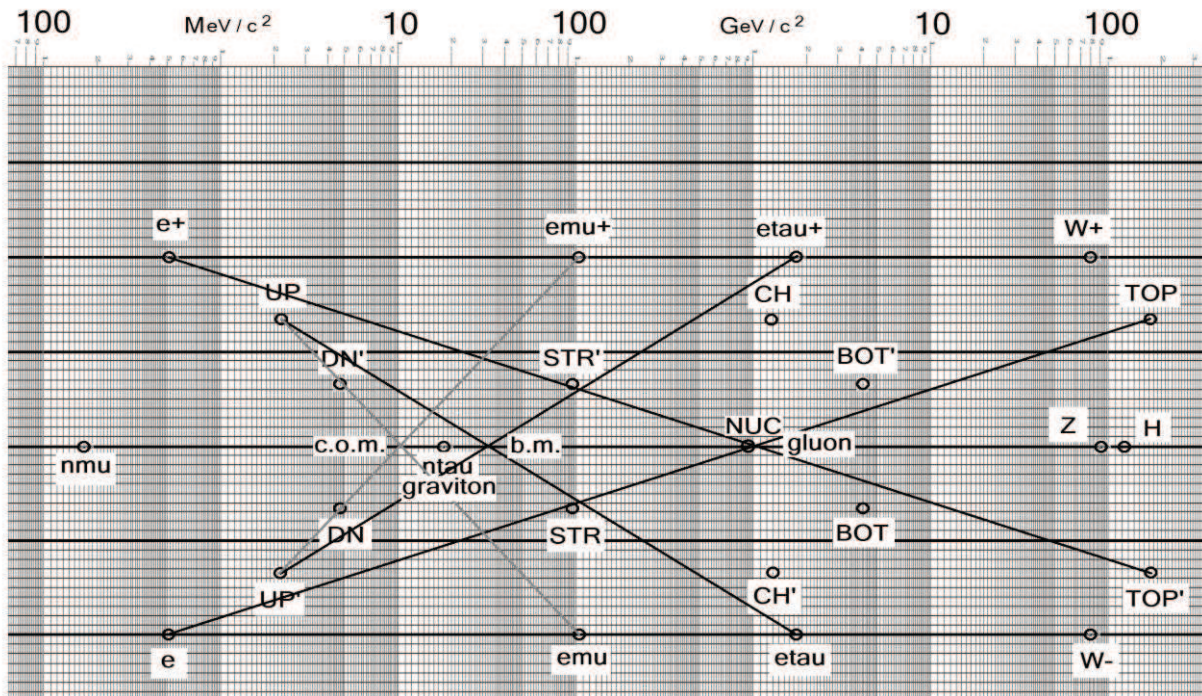


Figure 2.0 "Plottables" - gluon b.m. c.o.m.

Towards the middle where intersection "2" was, a "plottable" big mass, or b.m., has been added. Recall that b.m is offset  $11.6 \text{ MeV}/c^2$  (mass / energy of a neutron) to the right of ntau. This represents an emergent quantum level gravitational big mass.

Prior to this we had "2" sets of "2" intersecting black lines involving e and etau. In Figure 2.0 we involve emu by adding a set of "2" gray lines UP\_DN'\_emu- and UP'\_DN\_emu+. These lines intersect 0 charge at  $10.35 \text{ MeV}/c^2$ , which happens to be the center of mass between the UP\_DN\_UP proton ( $9.1 \text{ MeV}/c^2$ ) and DN\_UP\_DN neutron ( $11.6 \text{ MeV}/c^2$ ). Thus a "plottable" center of mass, or c.o.m. has been added. There is an important nuanced difference between b.m. big mass and c.o.m. center of mass. Big mass b.m. is an offset potential energy from ntau whereas center of mass c.o.m. is an actual energy, meaning a process taking time has taken place. **The**



hypothesis here is that the b.m. / c.o.m. process is gravitation, hence a "symbolic" graviton has been plotted at ntau. The further hypothesis is that the emu to c.o.m. networked connection underlies the physics behind the violation of lepton universality at emu.

### NETWORKED HIGGS, FIXED 83:100 ASPECT:

Figure 3.0 adds additional lines to the big picture. At the right we have brought back the Higgs related lines discussed earlier. Notice that H\_W+ and H\_W- are now coded brown. These are standard Higgs lines of length 1H. There is an important "aspect ratio" nuance to the length of these lines. More specifically one order of magnitude on the horizontal mass / energy equals 83% of 1 charge on the vertical. This is a bit like maintaining aspect ratio 4:3 or 16:9 on a video. If aspect ratio is not maintained the picture is squeezed in one direction and stretched relatively in the other. In this case the aspect ratio is 83 horizontal :100 vertical. All underlying research semi-log plots are true to this aspect, ratio. The semi-log plots appearing in this paper are however, stretched and squeezed somewhat to fit on a page.

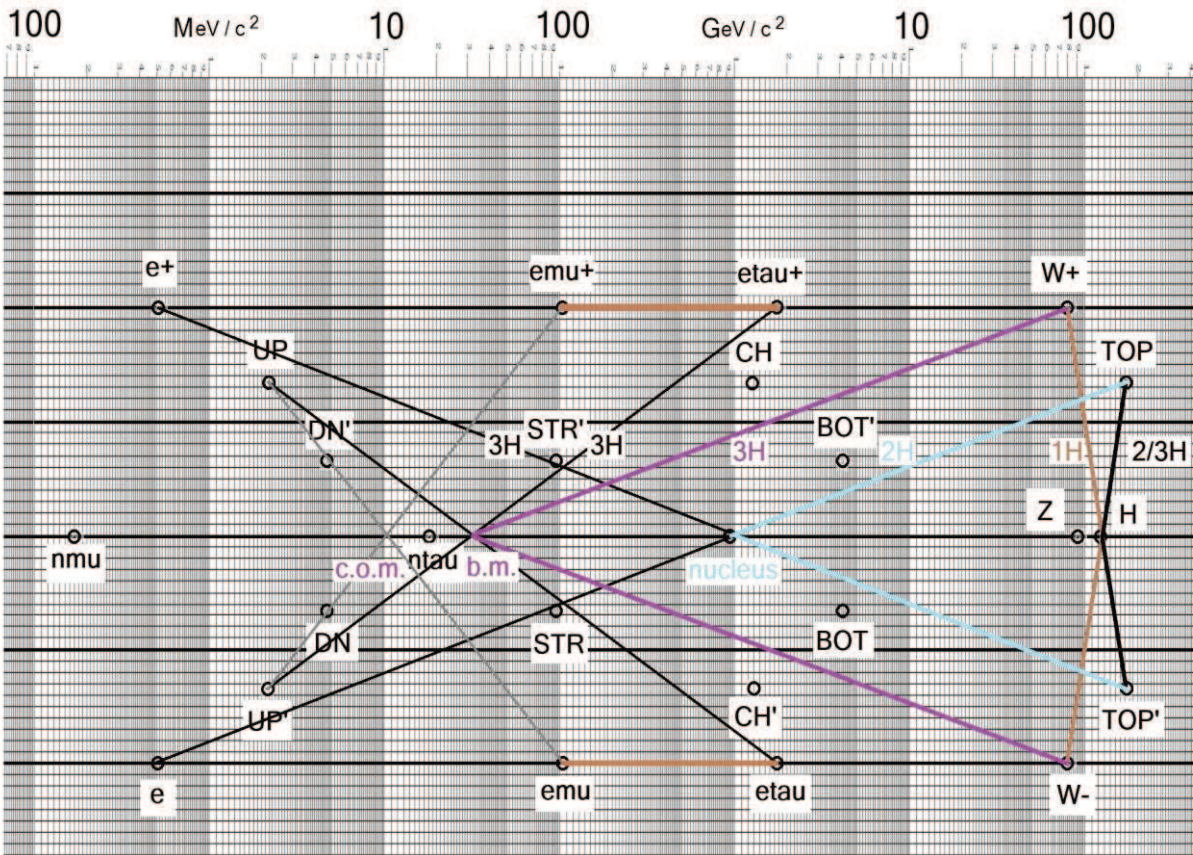


Figure 3.0 Networked Higgs

Notice that there is another set of "2" brown 1H lines  $\epsilon^+$  and  $\epsilon^-$ . In fact in subsequent discussions many "H" related standard lines "pop out" due to the 83:100 aspect. If Figure 3.0 was altered in the vertical or horizontal without maintaining 83:100 aspect, lines with a large horizontal aspect would not be visually the same length as lines with a large vertical aspect. Follow-on researchers cannot achieve the same "standard H line" results visually unless they maintain a semilog mass / energy to charge aspect ratio of 83:100 (measurement / gauge invariance). A fixed 83:100 aspect is the basis for "3" major hypotheses.

1: Since we are dealing with mass / energy ( $E=mc^2$ ) and standard length straight lines on a semilog plot, a fixed aspect is related to why the speed of light has a limit, with all the relativistic affects that come with it.

2: Obverse to 83:100 is 17:100, which infers a 1/6 charge related periodicity. This would be a "timing fast periodicity" in relation to a 1/3 timing slow periodicity.<sup>2</sup> In fact these 1/6 and 1/3 periodicity factors become more evident in following discussions.

3: Since standard H lines can go totally horizontal mass / energy or near totally vertical charge there can be a " mixed networked morphing" between mass / energy and charge.

## 2H AND 3H:

Figure 3.0 also has a set of aqua 2H TOP\_nucleus and TOP'\_nucleus lines and purple 3H W+\_b.m. and W-\_b.m. lines. The hypothesis here is that this associates 2H with lineal bounding as in QCD color confinement, gluons, and strong nuclear force. The further hypothesis is that 3H is then associated with areal bounding as in elliptical confinement, gravitons, and gravitational force. These 2H and 3H lines are parallel inferring they are related dimensional processes.

## 1H, 2H, 3H AND PHYSICAL CONSTANTS:

The speed of light "c", Planck's constant "h", and gravitational constant "G", are "3" major physical constants, all of which can be expressed generically in terms of length L, time T, and mass m as follows:

$$c = L/T$$

$$h = L^2m/T = L/T * Lm$$

$$G = L^3/T^2m = L/T * L^2/Tm$$

Notice that all "3" constants can be expressed in terms of a standard length L per time T ( $=c$  =light speed ). Further notice that there is a progression in the remaining terms after L/T is factored out. Planck's constant h takes on a lineal mass aspect whereas gravitational constant G takes on an area per time-mass aspect. **The hypothesis here is these constants are related to 1H, 2H, and 3H respectively.**

All "3" constants show up in the formula for Planck time, which is the time it takes for light to travel one Planck length:

$$\text{Planck time } t_p = (((h * G) / c^5))^{1/2}$$

The further hypothesis here is that 1H, 2H, and 3H provide standard timing mechanisms such as those available through elliptics. The  $c^5$  factor points specifically towards 5H and "projection elliptics", as will be discussed in later sections.

## 1H, 2H, 3H AND PERIODICITY:

Kepler's third law states that the **square** of the elliptical orbital period is proportional to the **cube** of the semi-major axis of its orbit. The longer elliptical semi-major axis (running from center to foci to longer side of ellipse) can be viewed as being more lineal than the shorter elliptical semi-minor axis (running center to shorter side of ellipse). Thus an elliptical orbital periodicity embodies both a lineal and area periodicity and in the process gives "2" entangled foci. **The hypothesis here is that this all relates to 1H, 2H lineal gluon periodicity, and 3H area graviton periodicity. This also relates to the holographic principle where 3D information (cube) is stored on a 2D surface (square). In a larger sense this relates to projective elliptics which has 3D and 6D aspects.**

## BOUNDING, THE GPS MODEL:

GPS (Global Positioning System) uses 4 satellites to bound position, 3 to get the actual position and a 4th satellite to "time synch" all satellites which corrects for relativistic effects. If there is an innate perfect periodicity between satellites, as in exactly synchronized elliptical orbits, the 4th satellite for time synch, in the spirit of minimalist ground state thinking, is not required. With perfect time synch, bounding momentum for a **single body** requires two point particle sets of coordinates over time. Thus with perfect timing 6 satellite readings are required to bound single body position plus momentum.

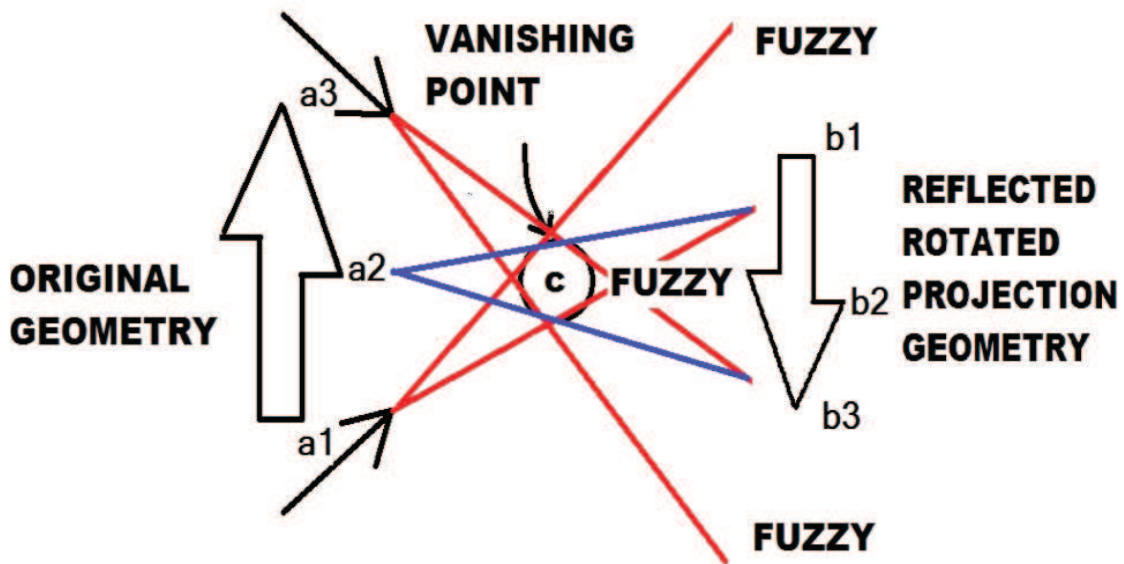
Bounding position plus momentum for **two bodies** in a jointly probabilistic quantum entangled system state is a bit more nuanced. The nuance does not come into play until the 6th satellite used to finalize bounding on the second jointly entangled bounded entity. At this 6th satellite we bump up against the Pauli exclusion principle. **The hypothesis here is that to bound both the position and momentum of two bodies in a jointly probabilistic quantum entangled system state (as in strong nuclear force or**



gravity), one must in effect use 5 "analogic satellite readings" at one level, and a 6th "analogic satellite reading" at a sub level. At the core, GPS is projection elliptics.

## PROJECTION ELLIPTICS BASICS:

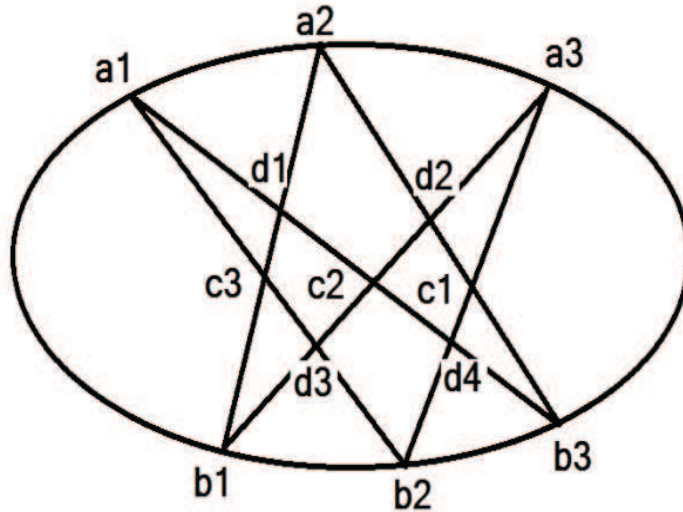
The following diagram depicts the basics of projection using the pinhole camera. This diagram is analogic to Figure 1.1 The Big Picture. First of all it is Object / Image oriented as in Matter / Antimatter. Secondly it involves both reflection and rotation as in charge and spin. Thirdly it involves an "aperture area c" where crossing energy currents (light) are focused variably over space (position dominated sharp to momentum dominated fuzzy image) and time (shutter speed). Aperture area c is analogic to STR and STR', where aperture function is essentially to focus variably total angular momentum between "areal confined" elliptical orbital gravitational spin and spin that is "more lineal confined".



### **PIN HOLE CAMERA PROJECTION GEOMETRY - FUZZY**

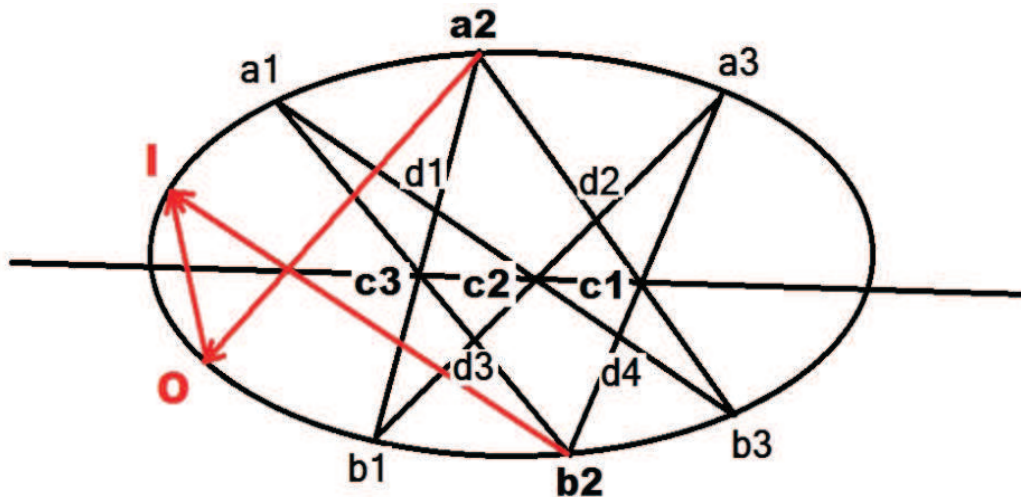
The following diagram depicts Pascal's projection ellipse. which is analogic to the "6 satellite" GPS model discussed earlier for bounding both position and momentum, If a1 a2 a3 and b1 b2 b3 are orbiting electrons the projective lines represent spin up spin down electron flipping photons. Without getting into too much detail, this infrastructure first of all offers periodicity and timing about the ellipse itself. Secondly, everything remains connected by forces at d1 d2 d3 d4 despite any myriad of angular spacial transformations in the middle. Thirdly it offers object / image mirroring betwixt a1 a2 a3 on the top half and b1 b2 b3 on the bottom half. Finally it offers chirality dynamics at c3 c2 c1 in the middle where 1/3 2/3 split ensures optimal 1-point position and 2-point momentum bounding.



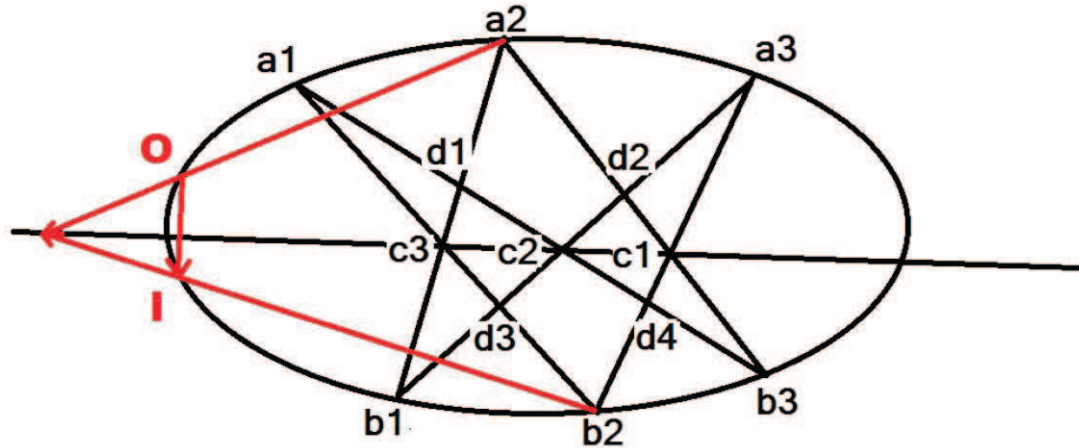


**PASCAL'S PROJECTION FROM CONICAL SECTION - ELLIPSE  
TO COLLINEAR c3 c2 c2 FROM 6 POINTS ON ELLIPSE**

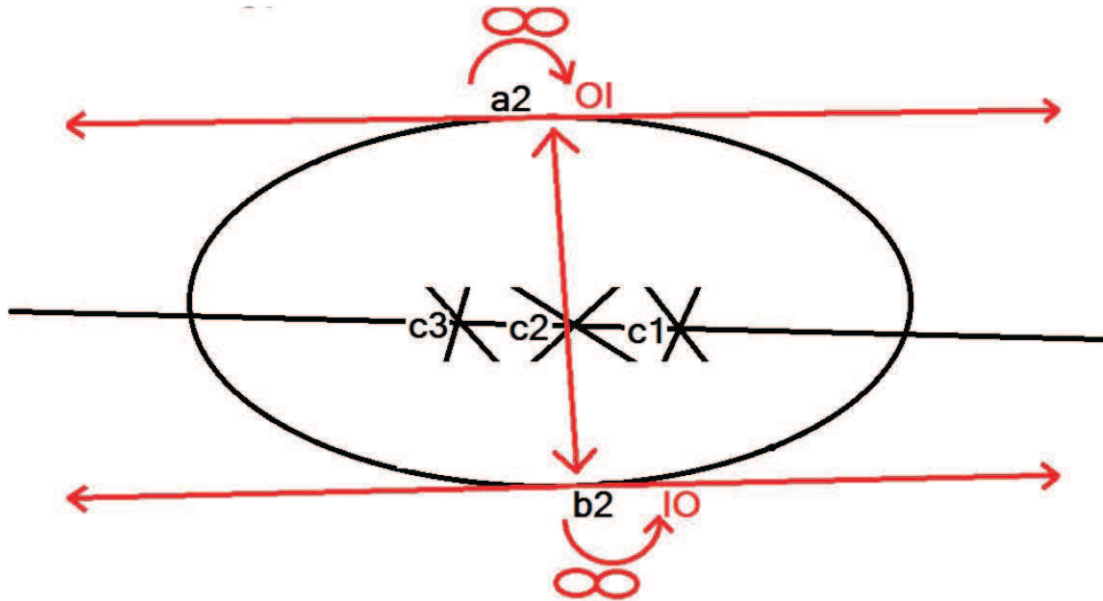
The following three diagrams depict an important feature of the projection ellipse, which is object "O" and image "I" dynamics. In the first of three diagrams red O-I is in the locality of the originating projection ellipse. A major nuance here is that locality can be a position dominated elliptical orbit or a "fuzzy" momentum dominated "Rydberg" elliptical orbit. In the second of three diagrams O-I moves away from the O-I locality and flips to I-O in terms of spin, polarity, and time entanglement. In the third of three diagrams the entanglement continues out to infinity, and is indicative of "spooky action at a distance". The hypothesis here is that long distance entanglement is a projective line phenomenon.



**PASCAL'S PROJECTION OF OBJECT "O" AND IMAGE "I"  
TO COLLINEAR c3 c2 c1 HORIZON FROM a2 and b2**



**PASCAL'S PROJECTION OF OBJECT "O" AND IMAGE "I"  
 INTERSECTION WITH c3 c2 c1 SHIFTED OUTSIDE ELLIPSE  
 OBJECT "O" CROSSES OVER IMAGE "I", ARROW FLIPS**



**PASCAL'S PROJECTION - INFINITY CROSSOVER**

Notice also that in this third of three diagrams the projective lines go parallel out to infinity and are opposite in time, with one going clockwise and one going counter clockwise. If Object is an electron, O / I flipping means photons. If photons speed away from the ellipse at the speed of light and go "flat" parallel at infinity they will appear to accelerate away from the ellipse as if propelled by some dark energy. Thus the major hypothesis here is that dark energy is related to projection phenomenon. Projective elliptics embodies AdS/CFT correspondence. The major advantage projection elliptics has over holography is it is an immersive 6-axis degrees of freedom virtual reality, or VR.<sup>10</sup>



## HORIZONTAL HOP MYSTERY:

Figure 4.0, Horizontal Hop Mystery, adds more important lines to Figure 3.0 Networked Higgs. Actually the lines have an arc in them to create the term "hop", which helps distinguish these lines from all prior lines. Notice that along the horizontal charge 0 line there are "4" hops with "2" hops on the right coded orange and "2" hops on the left coded red.

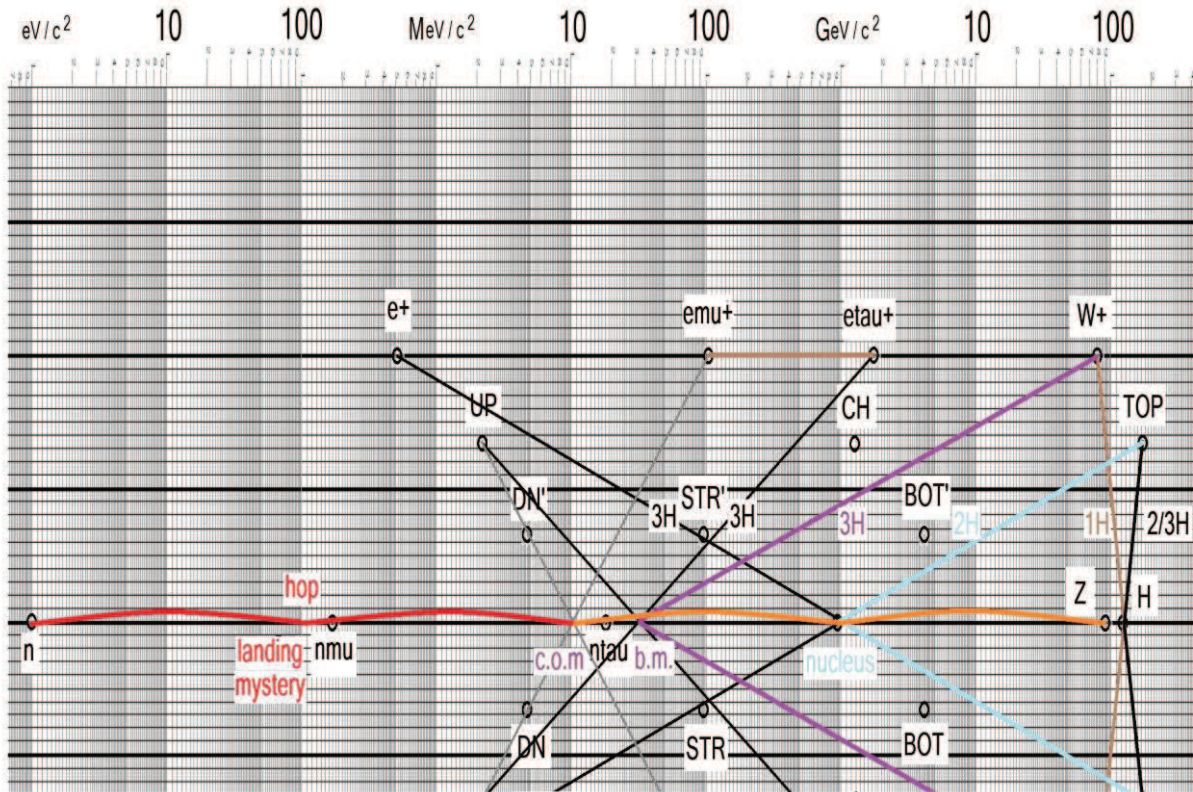


Figure 4.0 Horizontal Hop Mystery

All hops are  $1 \frac{5}{8} H$ . Starting at the far right, hop landings are at Z, nucleus, c.o.m., and at n at the far left. All of these are points of significance except hop landing mystery which is a slight displacement to the left of nmu, as is c.o.m. a slight displacement to the left of ntau.  $1 \frac{5}{8} H$  gives these lines a "mixed networked morphing" 67:100 aspect ratio with respect to 83:100 aspect ratio 2H (morphing factor 2 divided by  $1 \frac{5}{8}$ ). This infers a  $\frac{1}{3}$  charge related slow periodicity. The  $\frac{1}{3}$  certainly fits hop landing associated n-nmu-ntau, c.o.m.-ntau-b.m., proton-neutron-gluon, and  $W^+ \_Z \_W^-$ . Notice that ntau appears in "2" of these triadics. The 90 degree horizontal to vertical "twist" in going from n to Z fits projective ellipse dynamics, which is a subject for another paper. The hypothesis here, as stated in the abstract, is that having fast and slow periodicities, and time-invariant quantum clocking, is important in bridging that which is quantum with that which is classical.<sup>2, 22, 23</sup>



## MORE 1H, MYSTERY AT emystery:

Figure 5.0 depicts 20 brown 1H line segments, 4 of which (H\_W+ H\_W- etau+\_emu+ etau-\_emu-) have been discussed previously.

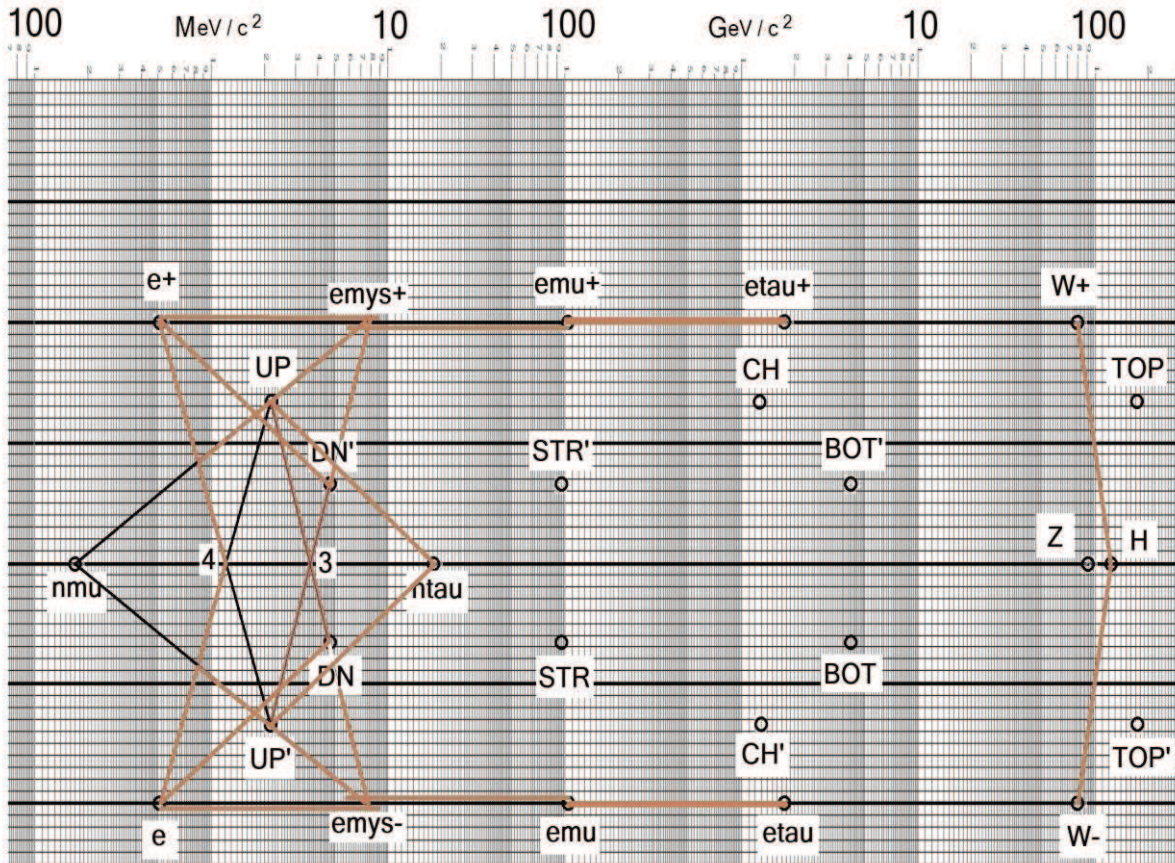


Figure 5.0 More 1H, Mystery at emystery

Notice that we have added a 4th electron, **emystery**, between  $e$  and  $emu$  at  $7.7 \text{ MeV}/c^2$ . Without emystery there would be a significant symmetry breaking gap from  $e$  to  $emu$ . A "plottable" emystery at  $7.7 \text{ MeV}/c^2$  is made more "plottable" by intersecting 1H lines connecting to / thru  $nmu$ ,  $UP$ ,  $DN$ ,  $UP'$ , and  $DN'$ . In actuality, "3" of the "4" intersecting 1H brown lines at emystery are 5% short of 1H, with only the connection to intersection 3 being a full 1H. **The hypothesis here is that this 5% short of 1H at "plottable" emystery is related to the 5% of the mass / energy in the universe being ordinary matter.**

Further notice that there are "2" new key charge 0 line intersections 3 at  $3.7 \text{ MeV}/c^2$  and 4 at  $1.2 \text{ MeV}/c^2$ . What is the possible significance of these intersections? **The hypothesis here is that the energy levels at intersections 3 and 4 are indicative of an "electron confinement" process associated with emystery. The  $3.7 \text{ MeV}/c^2$  energy level at 3 is "8" electron masses displaced from emystery mass / energy  $7.7 \text{ MeV}/c^2$ , and "2" electron masses displaced from  $DN$  quark mass / energy  $4.7 \text{ MeV}/c^2$ . The  $1.2 \text{ MeV}/c^2$  energy level at 4 is "2" electron masses displaced from  $UP$  quark mass  $2.2 \text{ MeV}/c^2$ .**



## FRACTIONAL 1H LINES, GAP, AND PARALLEL LINES:

Can we have fractional 1H line segments? All black line segments on prior Figure 5.0 are fractional 1H lines. Related to this is the very interesting straight line connecting  $n\mu$  to  $emys+$  as depicted in Figure 5.1. This is a  $1\frac{2}{3}H$  line of 4 segments with one of the segments being a "narrow gap" between "2" parallel lines. The "2" parallel lines connect the electron at one end, UP and DN quarks in the middle, and  $n\tau$  at the other end. If the "narrow gap" is left out the  $1\frac{2}{3}H$  line is a  $1\frac{5}{8}H$  line indicating  $\frac{1}{3}$  slow periodicity. Just to the right of this  $1\frac{2}{3}H$  straight line we have orange and red line segments that are also collectively  $1\frac{2}{3}H$ . Again, if the "narrow gap" is left out this is a  $1\frac{5}{8}H$  line indicating  $\frac{1}{3}$  slow periodicity. **The hypothesis here is that this gap / parallel line area represents a "plottable" process area for protons, inclusive of electron spin-up spin-down and diphoton processes.**

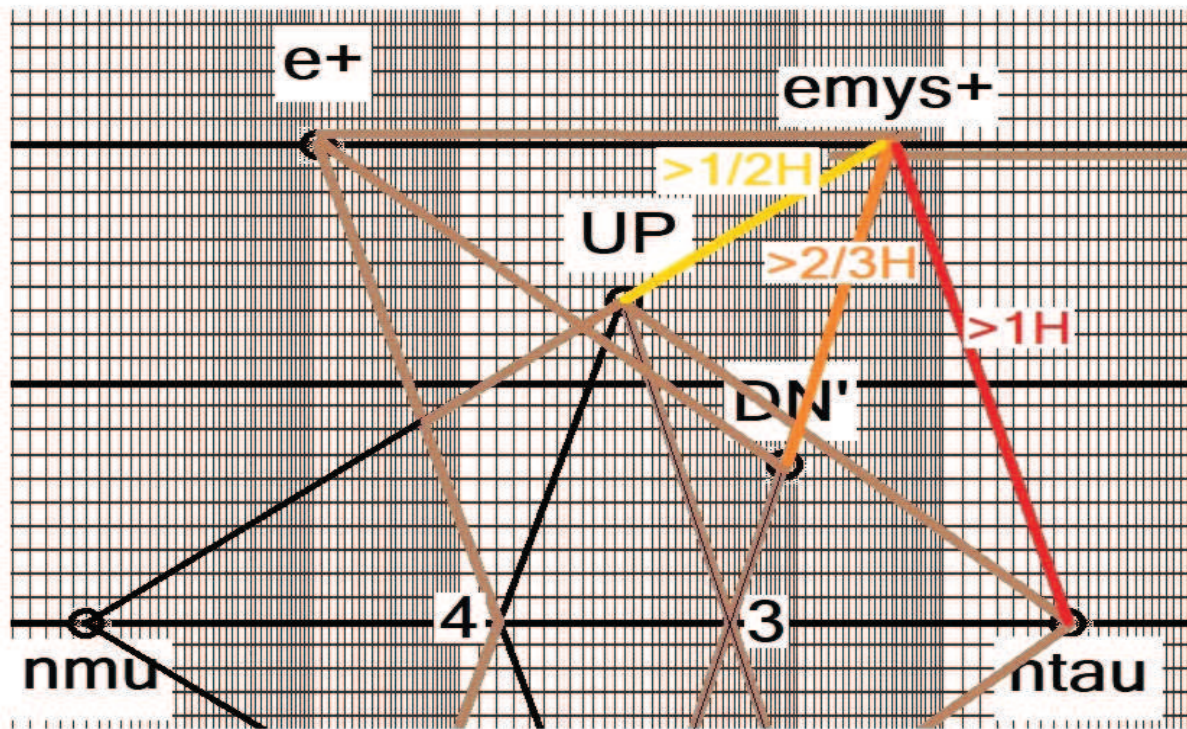


Figure 5.1 Fractional 1H lines, gap, and parallel lines

Notice that in Figure 5.1, in addition to the "2" gap parallel lines already mentioned, we have additional sets of parallel lines. Both sets of parallel lines intersect at 3 and 4. One set of "2" parallel lines slopes from lower left to upper right. Another set of "3" parallel lines slopes from lower right to upper left, with the 3rd parallel line being the red 1H line running  $n\tau$  to  $emys+$ .

Also in Figure 5.1 we have very significant connections of parallel lines into  $emys+$ . The red line from  $n\tau$  to  $emys+$  is slightly more than 1H. The orange line from DN' to  $emys+$  is slightly more than  $\frac{2}{3}H$ . The yellow line from UP to  $emys+$  is slightly more than  $\frac{1}{2}H$ . These lines total slightly more than  $2\frac{1}{6}H$ .



## DARK MATTER PORTAL AT emystery AND D.M. 2 1/6:

Figure 6.0 adds "4" black lines to Figure 5.0, a dark matter portal in red at emys, and dark matter 2 1/6 in red at charge 2 1/6 and mass / energy  $770 \text{ MeV}/c^2$  where the "4" lines intersect. This mass / energy is "2" orders of magnitude greater than the  $7.7 \text{ MeV}/c^2$  mass / energy at emystery. In the middle all "4" lines run thru electrons. At the bottom the "3" lines on the left terminate at the "3" neutrinos. At the right the 4th line terminates at BOT after passing betwixt the BOT' and CH.

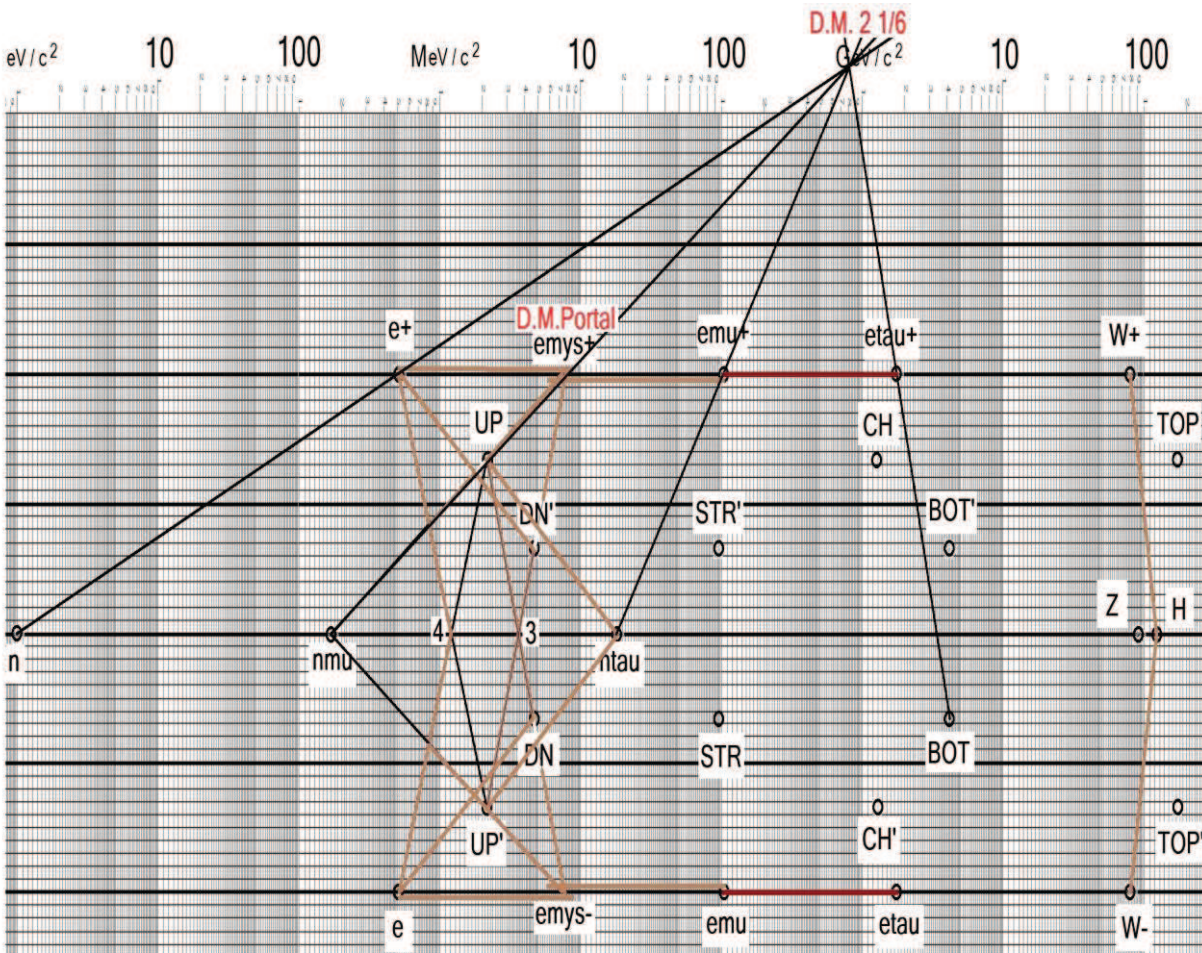


Figure 6.0 Dark Matter Portal, Dark Matter 2 1/6

Recall that intersection "3" has the mass of "8" electrons associated with it and intersection "4" has the mass of "2" electrons associated with it. Both intersections "3" and "4" network through emys to D.M. 2 1/6, hence the tag D.M. portal at emys. **The hypothesis here is that D.M. portal at emys represents both an ordinary matter associated "2" electrons and a total dark matter / emu / etau associated "8" electrons, with "6" of these "8" electrons indicating "electron confinement" and projective elliptics (as per GPS discussions).**



## 2H - 3H AT W, PORTAL:

Figure 7.0 adds a 5th line intersecting at D.M. 2 1/6. This aqua line is 2H and comes from W+. As it turns out the line coming from emystery to D.M. 2 1/6 is also 2H, so this line has been recoded to 2H aqua as well. **The hypothesis here is that dark matter connections to W+ are justified by 2H connectivity.** Furthermore recall that, as shown, W+ has 3H purple connectivity to the b.m. side of the "plottable" graviton. Thus, since dark matter is also related to gravity, weak nuclear force W has deep networked connectivity with gravity.

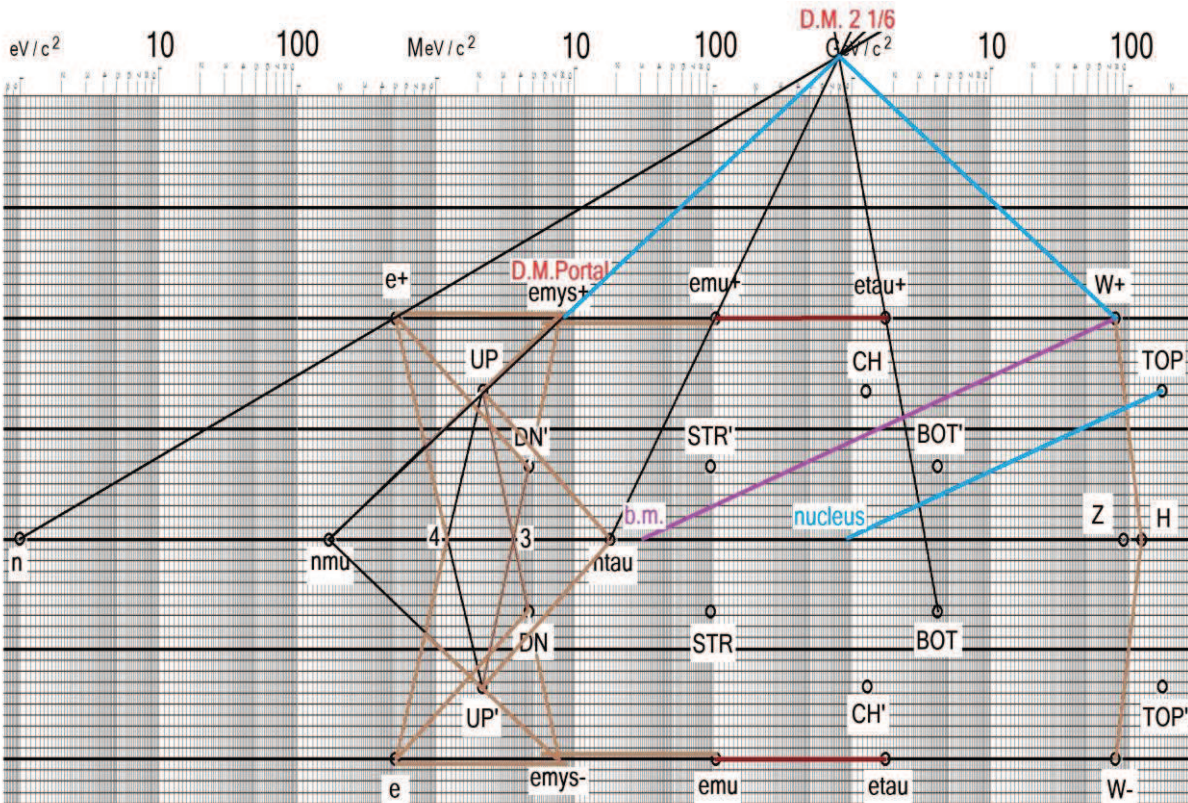


Figure 7.0 2H - 3H at W

If emys is a portal a legitimate question is what does a portal look like? Quite simply a portal looks like a network hub with many intersecting line segments. This portal look is shown by e, UP, ntau, emys D.M. Portal, and D.M.2 1/6. Of these portals, emys D.M. Portal and D.M. 2 1/6 are associated with dark matter. A further observation is that of the "3" ordinary matter portals ntau represents the largest mass / energy of "3" generations whereas e and UP represent the smallest mass / energy of "3" generations. **The hypothesis here is that ntau is an information related portal process whereas e and UP are physical related portal processes such that the entropy flows to stability are opposite.** This means ntau and gravity are related to information and entanglement.



One final observation is that there are "3" ordinary matter portals but only "2" dark matter portals. The hypothesis here is that all portal developments are downstream of major H processes coming off of W. Pathing off of W thru dark matter are aqua 2H, hence "2" dark matter portals. Pathing off W thru ordinary matter are purple 3H, hence "3" ordinary matter portals.

## "PLOTTABLE" RYDBERG, MORE 2H, ELLIPTICS:

Figure 8.0 expands on the prior figure. First notice that at the lower left "plottable" rydberg energy appears in red at charge 0 along with "5" new aqua 2H lines. Rydberg energy is essentially the energy level at which outer electron cloud orbits approximate gravitational elliptical orbits because inner electrons shield the effect of inner protons. In other words gravity comes to the fore, as it also does for neutrino's at charge 0. Take note that the "5" new aqua lines involve intersections 4, 3, and emys, all of which are associated with electrons as discussed previously.

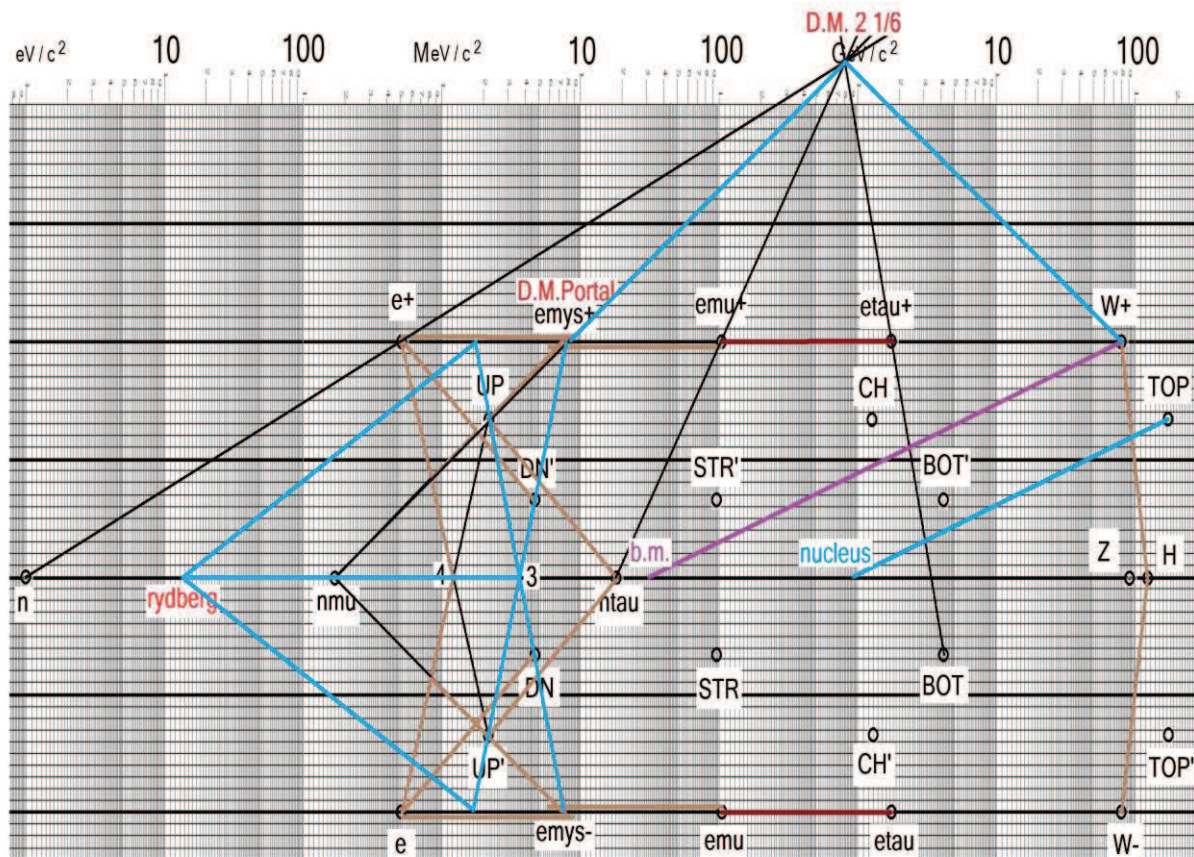


Figure 8.0 "Plottable" rydberg, more 2H, elliptics



## 2H NUCLEUS CONNECTIONS, COLOR CONFINEMENT:

Figure 9.0 adds "3" new aqua 2H lines to the prior figure. One of these lines runs horizontal at charge 0 from nucleus, through ntau, and on to intersection 3. At intersection 3 this new line meets the aqua 2H line from rydberg, thus a 4H line in total. The other "2" new aqua 2H lines at nucleus run to emys+ and emys- respectively. Thus between rydberg and nucleus at charge 0 we have a total of "8" new aqua 2H lines. **The hypothesis here is that all this 2H 83:100 aspect networked structure from between rydberg and nucleus, along with the 1 5/8 H hop 67:100 related lines, is representative of "projective elliptics" supporting 1/6 fast (a1a2a3 b1b2b3) and 1/3 slow periodicity (c3c2c1). Charge 2 1/6 then represents "2" ellipse halves in networked electron / photon projective dynamics. Furthermore this networked structure is representative of quantum color confinement and gravitational electron confinement bounding both position and momentum.**

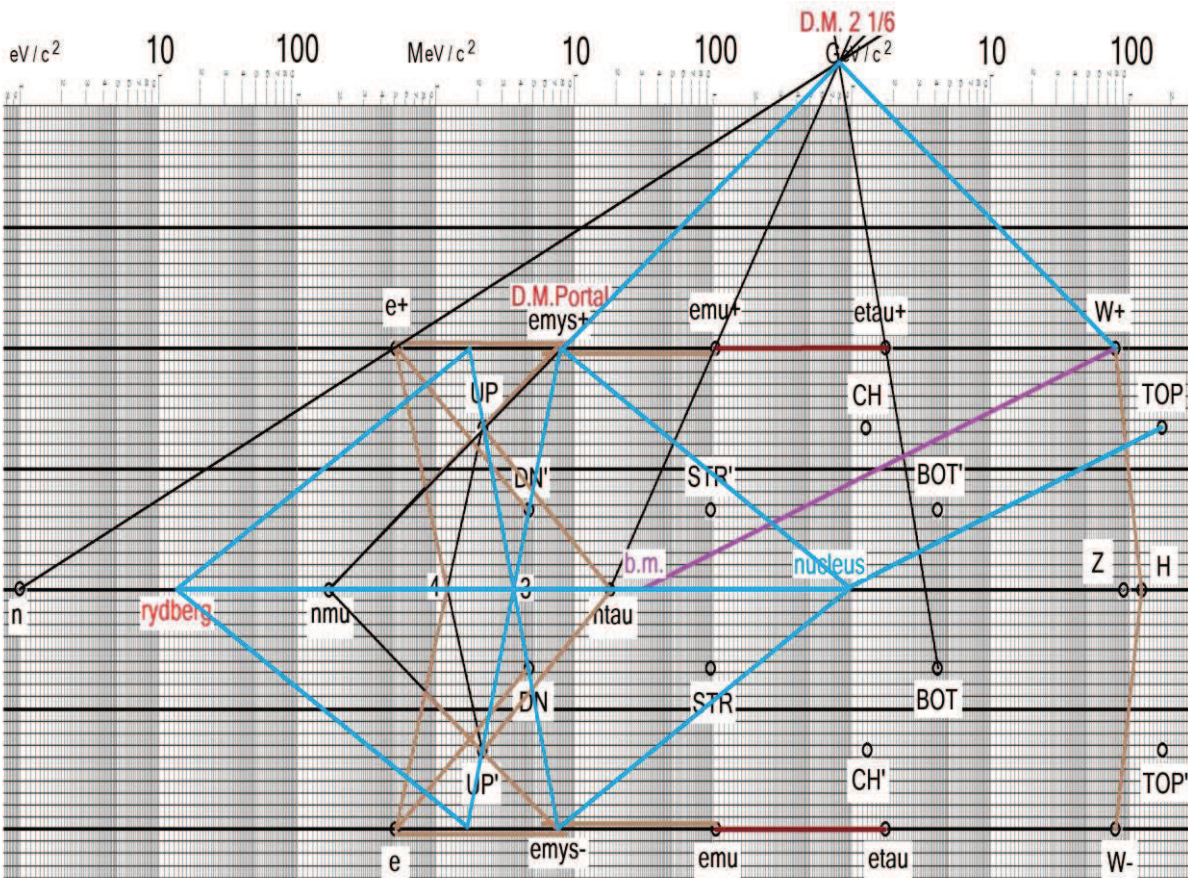


Figure 9.0 2H connections to nucleus, color confinement

## COLOR CONFINEMENT & PROJECTIVE ELLIPTICS:

Figure 10.0 depicts what projective ellipticals might look like for color confinement, which is associated with the hop landing at nucleus ( $r$ = red,  $r'$ =red antired,  $b$ =blue,  $b'$ =antiblue,  $g$ =green,  $g'$ =antigreen)? There is one overall state (called the color singlet state in QCD) for protons and neutrons as follows:

$$(rr' + bb' + gg')/(\text{sq\_root of } 3)$$

In this state there are equal probabilities of being in same color states  $rr'$ ,  $bb'$ , or  $gg'$ . In an elliptical process same color pairings are on the ellipse itself as opposed to being internal to the ellipse at projective line intersections. **The hypothesis here is that Kepler's laws, which deal with gravitational systems, also deal, in part, with more probabilistic quantum systems. Thus since same color pairings are on the ellipse their timing is precise with equal probabilities of being in state  $rr'$ ,  $bb'$ , or  $gg'$ . This is both bounded position and bounded momentum which at the large scale is embodied in modern GPS systems as discussed previously.**

Notice that in Figure 10.0  $rr'$  and  $bb'$  can go internal to the ellipse at the oblong ends whereas  $gg'$  does not. This is a realization of elliptical focal points which in Kepler's laws are related to periodicity and timing about the elliptical perimeter. Thus  $rr'$  and  $bb'$  are more related to bounded momentum which requires an element of time versus  $gg'$  which is more related to center of mass positional bounding.

Beyond the "on ellipse" same color states relating directly to an overall proton / neutron state, there are 8 mixed color "inner ellipse" confined states relating to gluons holding protons and neutrons together. These mixed color states are based on "symbolic" red, green, and blue colors and their corresponding anti-colors as follows:

$$(rg' + gr')/(\text{sq\_root of } 2) \quad -i*(rg' - gr')/(\text{sq\_root of } 2)$$

$$(bg' + gb')/(\text{sq\_root of } 2) \quad -i*(bg' - gb')/(\text{sq\_root of } 2)$$

$$(rb' + br')/(\text{sq\_root of } 2) \quad -i*(rb' - br')/(\text{sq\_root of } 2)$$

$$(rr' - bb')/(\text{sq\_root of } 2) \quad (rr' + bb' - 2gg')/(\text{sq\_root of } 6)$$

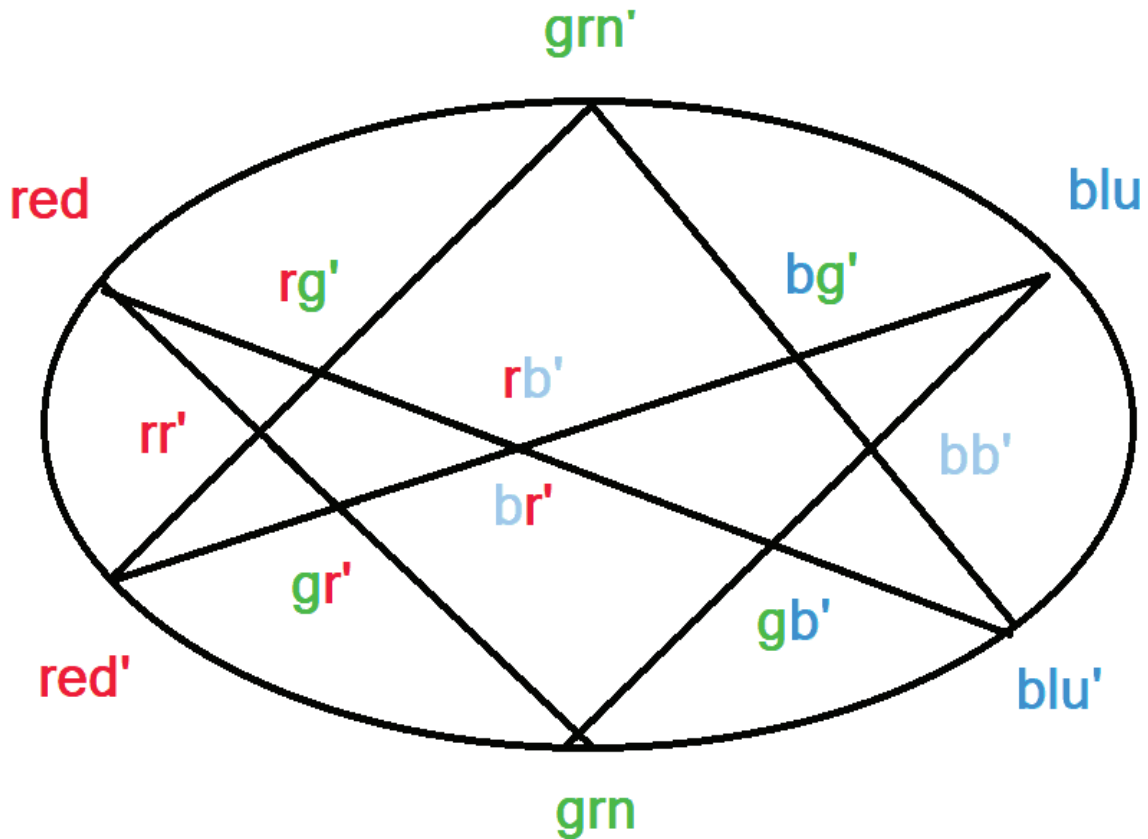


Figure 10.0 Color Confinement Projective Elliptics

Also notice that the first 6 mixed color states are represented at projective line intersections. For example  $rg'$  at the upper left is "confined" inside the ellipse where projective lines off the ellipse from red and  $grn'$  intersect. This is projection geometry and bounds both position and momentum under any myriad of spacial transformations. The "3" non-i terms relate to bounded position and the "3" i terms relate to bounded momentum.

The remaining "2" states relate to photons and electrons which are less bound and can in fact go to networked infinity. Figure 10.1 shows how projection dynamics project a horizontal black straight line through the ellipse center with  $rr'$  at one end and  $bb'$  at the other. On the left the red lines are second line states of  $grn$  and  $grn'$ . The red lines also intersect the horizontal black line at the red dot. The red dot can move out to the ellipse where the top and bottom intersections of the red lines with the ellipse can flip. For electrons this is spin up spin down flipping. For photons this is polarization. Moreover one can take an electron or photon outside the ellipse to infinity where  $rr'$  remains entangled with red  $red'$  in what has been termed "spooky action at a distance". Thus the term  $(rr' - bb')/(\text{sq\_root of } 2)$  is an entanglement term for "2" electrons or "2" photons. The hypothesis here is that the  $(rr' + bb' - 2gg')/(\text{sq\_root of } 6)$  term is an entanglement term "6" colors, or "6" mystery electrons related to dark matter.



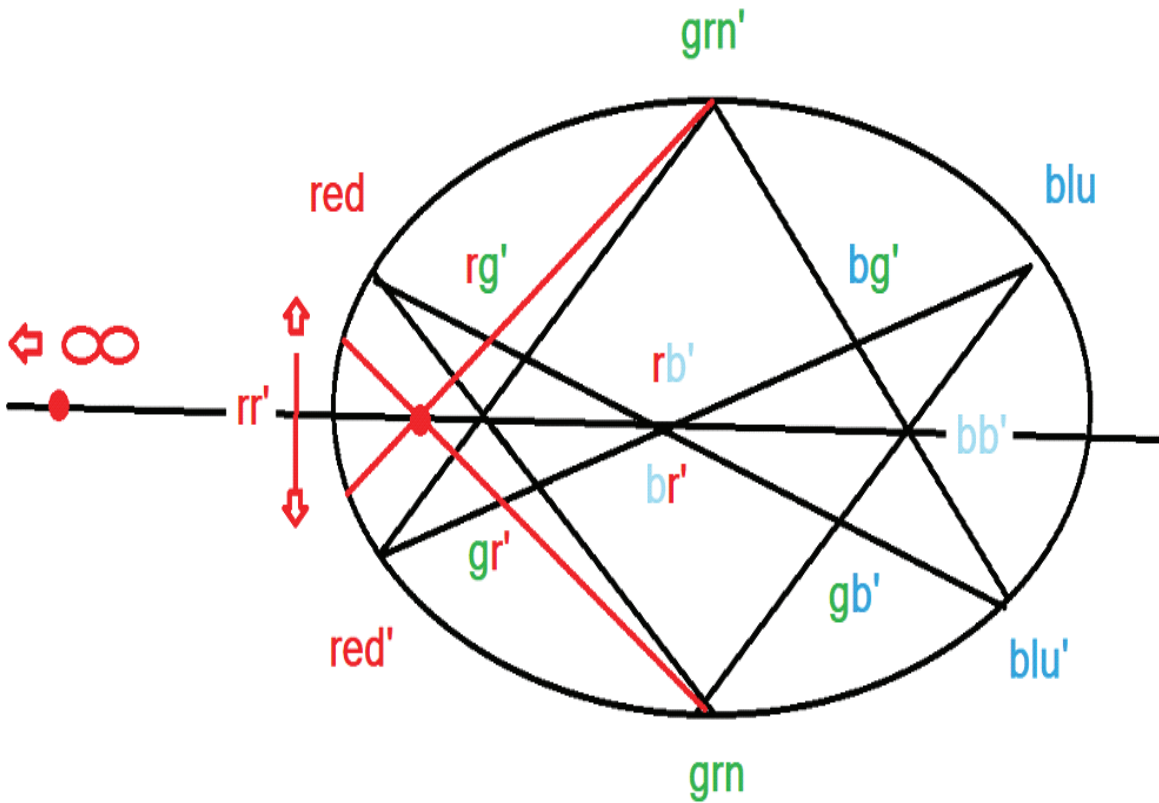


Figure 10.1 Color Confinement Projective Elliptics

## ELECTRON CONFINEMENT & PROJECTIVE ELLIPTICS:

Rydberg orbits go elliptical essentially because charge is removed from the equation, leaving gravity as the dominant force. **The hypothesis here is that this same rydberg, or similar charge neutralizing mechanism, is at work in electron confinement. Furthermore, the mechanism involves standard H lines.** In figure 10.2 we have essentially wrapped the flow lines in prior semilog plots inside an ellipse bound by "6" projective mystery rydberg electrons  $e_{mr}$ . **The hypothesis here is that periodicity on the ellipse itself is 1/6 controlled, whereas periodicity interior to the ellipse is 1/3 controlled. Fast and slow periodicity, quantum clocking within a time-invariant dynamical system, and Object / Image state flipping associated with hop landings h.l., bridges that which is quantum with that which is classical.**<sup>2, 22, 23</sup>

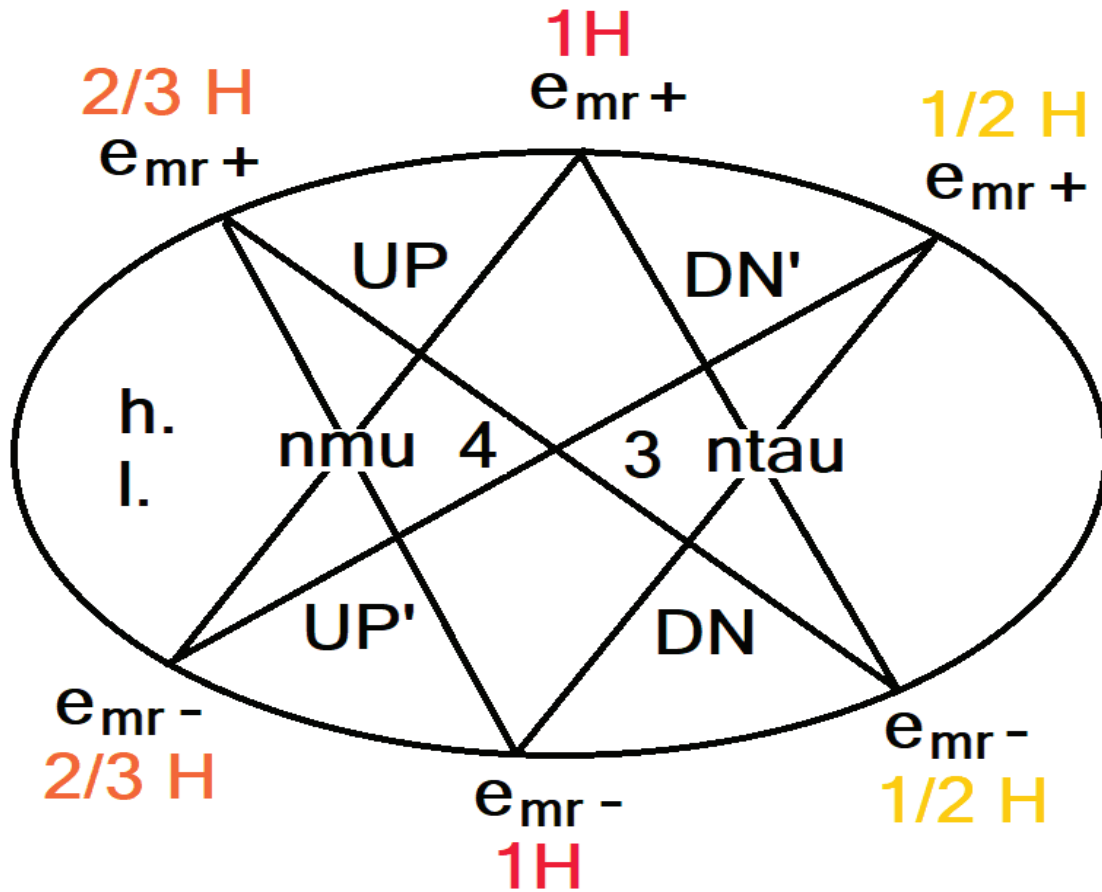


Figure 10.2 Electron Confinement & Projective Elliptics

### ORDINARY & DARK MATTER GRAVITON:

In Figure 11.0 recall that the graviton is centered at  $ntau$  with big mass b.m. on the right and center of mass c.o.m. on the left. The gap from b.m. to c.o.m. happens to be  $1/3H$ . Big mass b.m. is connected by a  $3H$  line to  $W$  which connects to D.M.  $2 1/6$  via a  $2H$  line. Thus on the right there is a networked total of  $5 1/3H$  from  $ntau$  to D.M.  $2 1/6$ .

On the left the ordinary matter complex to the left of  $ntau$  is connected to D.M. Portal by  $1/2H$  yellow,  $2/3H$  orange, and  $1H$  red lines. Recall that all these lines are actually slightly greater than  $1/2H$ ,  $2/3H$  and  $1H$ . If yellow  $1/2H$  is extended across the gap at the  $UP$  quark as shown in green, the sum of yellow, orange, and red is  $2 1/3H$ . D.M. Portal is connected to D.M.  $2 1/6$  via a  $2H$  line. Thus on the left there is a total of  $4 1/3H$  from  $ntau$  to D.M.  $2 1/6$ . **The hypothesis here is that  $1H$  on the left (out of  $5 1/3H$ ) essentially goes into the ordinary matter complex.**



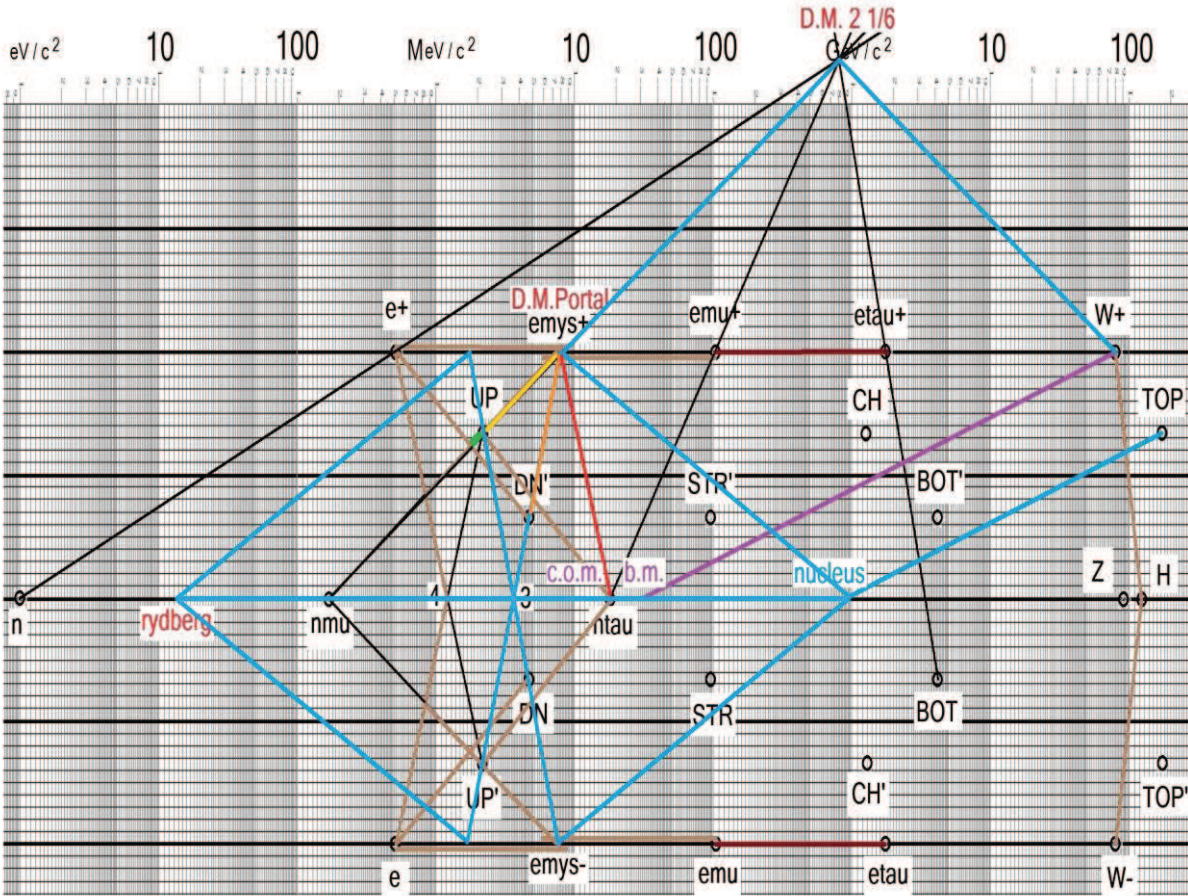


Figure 11.0 Ordinary & Dark Matter Graviton

The further hypothesis here is that if ordinary matter is 4.986% of the mass / energy in the universe, dark matter is  $4.986\% \times 5.333 = 26.590\%$ , with 5.333H being a "mixed networked morphing" factor. Total ordinary plus dark matter is then 31.576%. This is very close to cosmologist's current best estimates of 31.5% +/- 1.3% and implies we can get these numbers with much more precision with new theory.<sup>9</sup>

The total mass / energy of the universe is then  $D.M. \ 2 \ 1/6 \ \text{charge} \ 2.167 \times 31.576\% = 100.001\%$  with 2.167 being a "mixed networked morphing" factor. This raises some new mysteries. Why would we use a multiplier (5.333) related to H in the case of dark matter, and a multiplier of (2.167) related perhaps to both 2H and / or charge 2 1/6 in the case of dark energy? The hypothesis here is that dark energy is different from other energies in nuanced ways, and the nuance perhaps involves elliptical projection geometry as discussed previously.

## DARK ENERGY, ELLIPTICAL PROJECTION GEOMETRICS, COSMOLOGICAL RAMIFICATIONS:

Cosmologists have treated dark energy as a purely physical variable phenomenon with calculations determining that the "curvature" of the universe is flat. This means the universe will not end by collapsing or accelerating into nothingness. But "flatness" can also be treated as a geometric variable phenomenon. The Euler characteristic determines geometric curvature, with a value of 0 being flat curvature. The formula for Euler characteristic uses Vertices, Edges, and Faces of a geometry.

$$\text{Euler Characteristic} = V - E + F$$

For the projection ellipse, counting the ellipse itself as an edge, we have:

$$\text{Euler Characteristic} = 13 - 21 + 8 = 0$$

**The hypothesis here is that elliptical projection geometry can provide another model for cosmologists. Moreover this model, as discussed previously, incorporates an explanation for dark energy.**

Recall that there are hop landing gaps associated with  $n\mu$  and  $n\tau$  respectively. Moreover  $n\tau$  appears to be more directly associated with dark matter and  $n\mu$  appears to be more associated with ordinary matter and associated processes. **The very major hypothesis here is that at the core, dark matter is dark because dark matter elliptical processing is slightly time lagged from ordinary matter elliptical processing.** Optically this is the "pulfrich effect", and it yields 3D elliptical phenomenon. A requisite for this is "2" eyes, or in this case "2" hop landing gaps. In terms of projective elliptics the hop landing gap at  $n\tau$  is object oriented towards the past while the hop landing gap at  $n\mu$  is image oriented towards the present and future. This is probabilistic successive regression, and appears to be "baked in" from the big bang singularity.



## D.M. 2 1/6 MYSTERY:

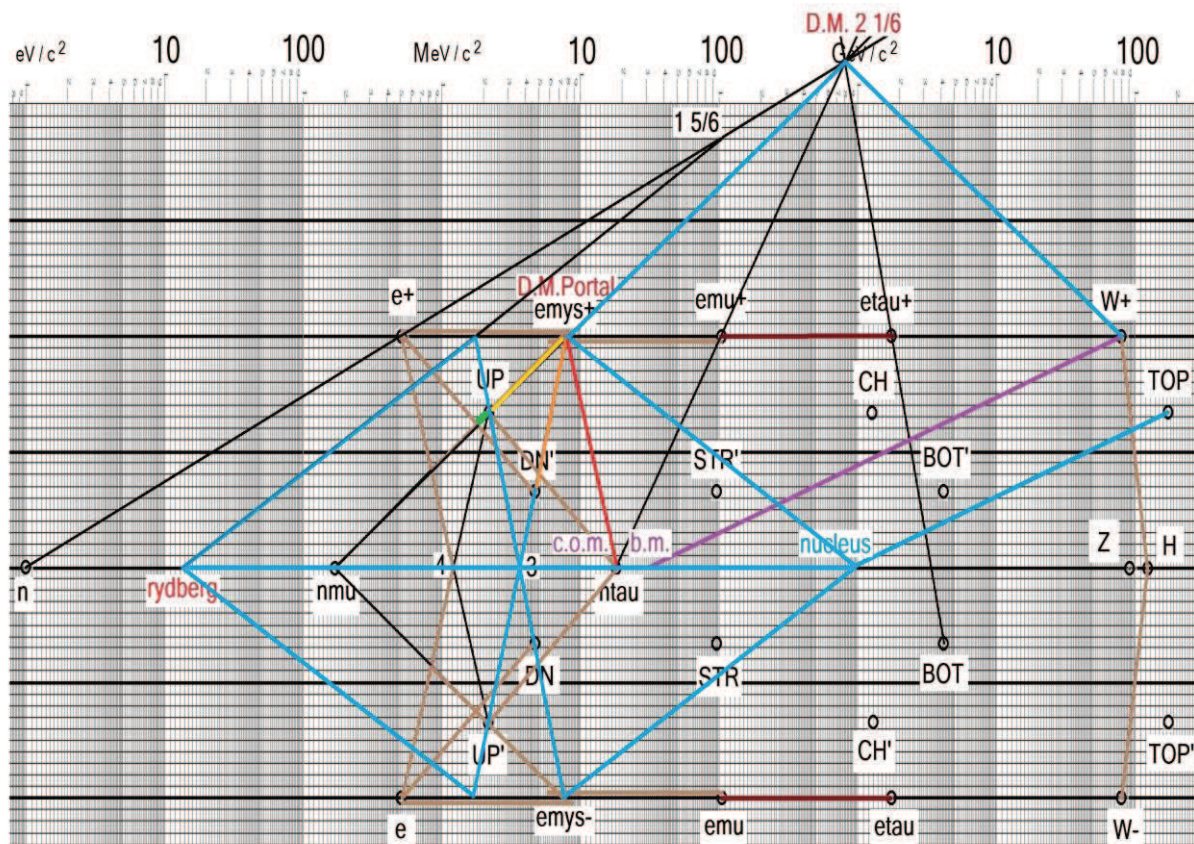


Figure 12.0 Rydberg to 1 5/6

Dark matter does not interact electromagnetically, so what really is a charge, which infers electromagnetic interaction, doing up at D.M. 2 1/6? Notice that in Figure 12.0, D.M. 2 1/6 has five lines coming into it. At the left, if the rydberg line is extended up to "nearly" become the 6th line, it would intersect the  $n_e$  DM 2 1/6 line at the same energy level as  $emu$  and a charge of 1 5/6. The theory here is that this splits the D.M. 2 1/6 realm above charge 1 into "2" realms. The realm to the left is more electromagnetic oriented while the realm to the right is more elliptical angular momentum 2H oriented. In effect the nature of charge has been altered in this mixed dark matter realm. As shown in Figure 13.0, the 2H is allocated towards "2" elliptic halves, the first H being object and second H being time lagged image. This supports electron confinement as discussed previously, which is akin to QCD gluon color confinement extended from that which is lineal to that which is "areal". This is quantum gravity projective elliptics with networked connections to classical gravity. Those networked connections involve 5 of 6 projective points on the ellipse becoming associated with the 5 Lagrangian force balancing points L1-L5 of a classical gravitational system. This may also be related to the  $c^5$  factor in planck time.

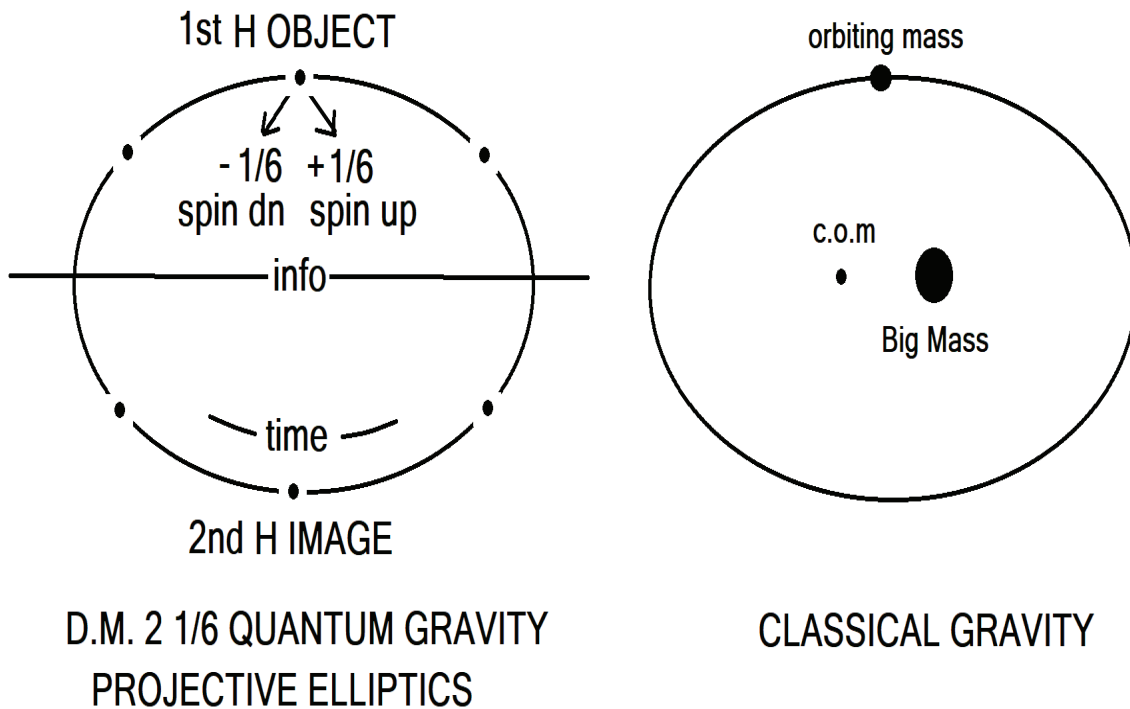


Figure 13.0 Quantum Gravity, Classical Gravity

The Standard Model predicts that the physics for all electrons  $e$ ,  $\mu$ , and  $\tau$  should be the same. This is called Lepton Universality. Recent experiments have showed violations of Lepton Universality at  $\mu$ .<sup>11-12</sup> More specifically the number of muons produced in experiments was fractionally  $1/3$  to  $1/4$  less than the number of electrons produced. The new theory here is, based on Figures 12.0 and 13.0, that a fractional  $1/3$  of  $\mu$  occurrences get entangled with  $\mu$ s and D.M.  $2 \frac{1}{6}$  networked flows as part of quantum gravity projective elliptics.

### POSITION BOUNDING neutrino, 5.33 H, INFORMATION:

The neutrino has thus far been less than central to all network discussions. It so happens that as shown in Figure 14.0, the green line from  $n$  thru  $e$  to D.M.  $2 \frac{1}{6}$  is 5.33 H. Recall that 5.33 or  $5 \frac{1}{3}$  has been central to several prior discussions including the GPS position / momentum bounding model,  $\tau$  networked connections to D.M.  $2 \frac{1}{6}$ , and the percentages of ordinary matter, dark matter, and dark energy in the universe. The theory here is that 5.33 H networked connectivity at  $n$  and  $\tau$  to D.M.  $2 \frac{1}{6}$  are information related with  $n$  being position bounding information and  $n_{\mu} \tau$  being momentum bounding information.



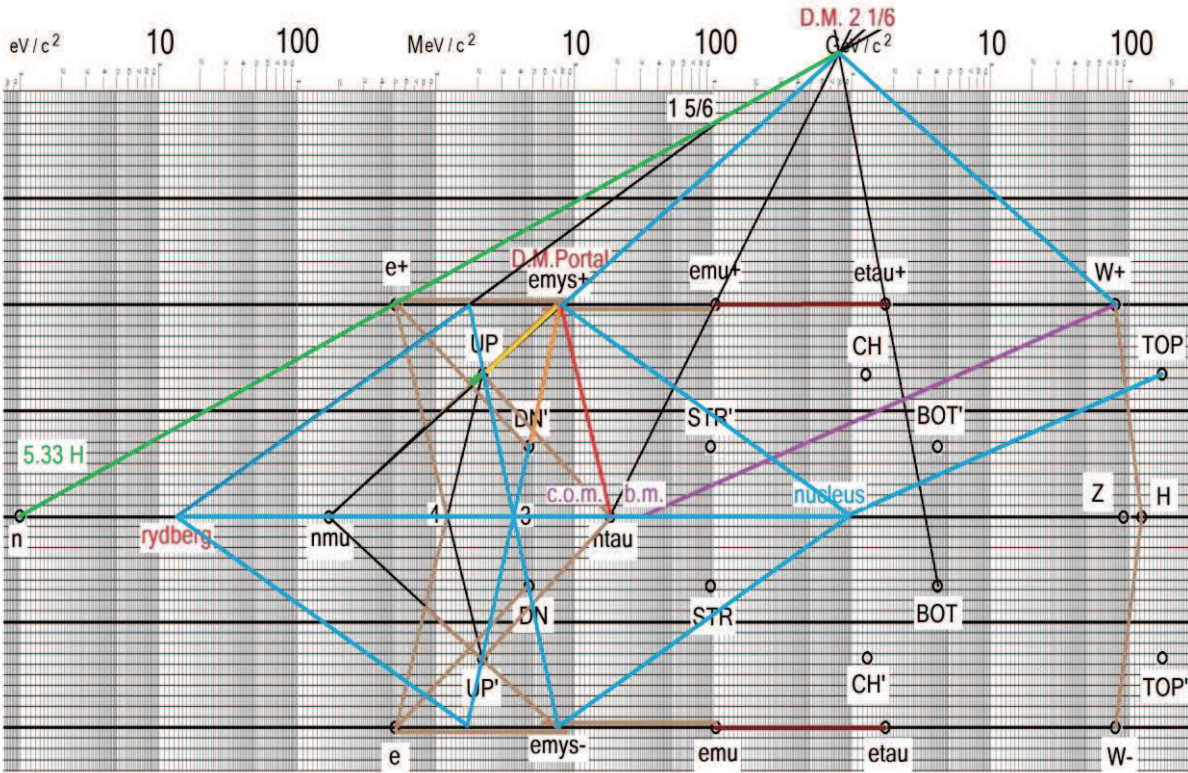


Figure 14.0, Neutrino, 5.33 H, Information

## SIGNIFICANT e / emys / DM 2 1/6 NETWORKED CONNECTIONS:

If experimental scientists were to look for eMys predicted at  $7.7 \text{ MeV}/c^2$  or DM 2 1/6 predicted at  $770 \text{ MeV}/c^2$  what would one look for? The first thing to remember is that many "plottables" are near misses and "downstream" of networked intersections. eMys and DM 2 1/6 are more akin to gluons, which bound momentum in a lineal strong nuclear force sense. eMys and DM2 1/6 together bound momentum in an areal gravitational force sense.

Since gluons bound things together they are usually inseparable from that which they bound. Since the bounding is of a bound momentum nature, free gluons would show up as lineal "downstream" energy flows, or jets. In Figure 15.0 "2" green line segments have been added to the prior Figure from "plottable" nucleus to electron e. These green line segments are  $2 \frac{5}{6}H$  and are associated with the previously discussed Big Picture e\_STR\_nucleus\_TOP line, which is  $4 \frac{5}{6}H$ . Notice that at nucleus, there are also "2" aqua 2H "jets" going to emys. It is most notable that both e ( $2 \frac{5}{6}H$  green) and emys (2H aqua) are equidistant, in terms of H, from both DM 2 1/6 and nucleus.



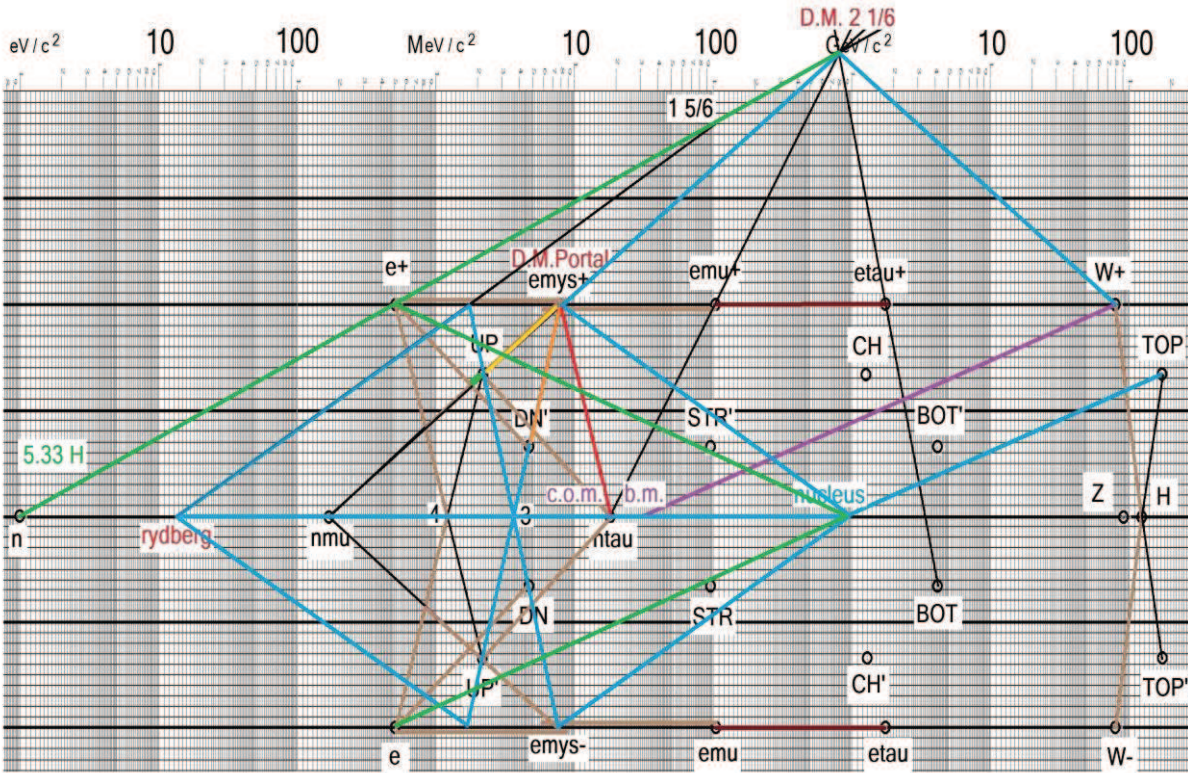


Figure 15.0 Significant e / emys / DM 2 1/6 Networked Connections

DM 2 1/6 has all the appearances of being an originating network hub. Notably, "3" DM 2 1/6 connections involve electrons not counting emys. At the right is the aqua 2H connection to weak nuclear force W, which also has a 3H connection to b.m. neutron energy which is 1/3H distant from center of mass c.o.m. across ntau, for a total networked path length of 5 1/3H. At the left there is a green 5 1/3 H path DM 2 1/6 to rydberg 1 5/6 to e to n. Recall that 5.333 was the multiplier to get percent of dark matter from percent of ordinary matter.

**NETWORKED HIGGS MECHANISMS FOR SINGLE PROTON, NO NEUTRON HYDROGEN, THE MOST ABUNDANT ELEMENT IN THE UNIVERSE:**

All this theoretical discussion about networked Higgs mechanisms means little if it doesn't reasonably and simply offer pathing for single proton, no neutron hydrogen to be networked together. Notice that Figure 15.0 has an aqua 2H line running from emys- to DN to intersection 3 to UP to rydberg line. Assuming emys- is "mixed networked

morphing" chargeless, this pathing would pick up a DN and UP quark with a net charge of plus 1/3. This plus 1/3 charge needs a second plus 2/3 charge UP quark to "equalize" with a -1 charge electron. Fortunately UP is also networked via 1/2 H to emys+, and this is where the second plus 2/3 charge UP quark is picked up before pathing thru intersection 4 to electron e. Obviously there are a myriad of possible networked paths that can be researched across this networked Higgs mechanism landscape.

## CONSLUSIONS, THEORY OF EVERYTHING (T.O.E.):

Many theory supporting hypotheses have been raised in the prior discussions. In the purest sense vector and axial currents are dimensional reflect and rotate currents, with 0D to 1D to 2D to 3D flows being Higgs based mixed networked morphing "H" based joint probability currents. The best geometric background, and model, for these quantum to classical entangled currents is projective elliptics. Projective elliptics bound position, momentum, and time at both pre-mass color confined and post-mass electron confined levels. This could be termed **General Projective Relativity, or GPR**. GPR embodies Object / Image fast 83:100 aspect 1/6 periodicities over "2" elliptic halves with a computational slow 67:100 aspect 1/3 periodicity middle. The Higgs network involves portal emys ( $7.70 \text{ MeV}/c^2$ ), dark matter DM 2 1/6 ( $770\text{MeV}/c^2$ ), and a symbolic graviton centered on ntau. At a cosmological level the relative proportions of ordinary matter, dark matter, and dark energy are explained by the **mixed networked morphing factors 5.333 and 2.167**.

**A great deal of this paper relates to dimensional processes. But what about fractal dimensionality? The fractal dimension measures how repetitively patterned a basic computational process becomes across a small to large spectrum of scales. An example of "fractalness" is the blood circulatory system, which from the smallest capillary to the largest artery exhibits a self similar branching within branching computational process. Fractalness comes with a "space filling locality" physical property. For the blood circulatory system branching within branching is the most efficient physical property for pumping blood from the heart to all parts of the body. Essentially space filling locality makes all parts of the body accessible to the heart as though they were local to the heart. The fractal dimension relates complexity to scale as follows:**

$$\text{fractal dimension} = \frac{\log (\text{complexity dimension})}{\log (\text{scale dimension})}$$

Let's look at fractalness from a cosmological perspective. Let's further assume that at the end of the universe the complexity dimension is 5.333 and the scale dimension is 2.167. These are of course the mixed networked morphing factors related to the Higgs. The calculated fractal dimension at the end of the universe is then 2.164.

This is a most astounding result as the fractal dimension of 2.164, ignoring rounding errors, is equal to the scale dimension of 2.167. Figure 15.0 has "3" sets of lines that embody this astounding result, which is really the biggest of pictures and a theory of everything or TOE, and it relates to Information Complete Quantum Theory ICQT<sup>10</sup>. Starting at DM 2 1/6 (dark matter charge 2 1/6) there is a green line totalling 5.33H going through the electron to the neutrino, with the neutrino representing information. Also starting at DM 2 1/6, there is an aqua 2H line going to W (beta decay producing protons, electrons, and neutrons). Thence at W there is a purple 3H line going to b.m. representing both gravitational big mass and neutron equivalent energy. Thence .33H extends across tau neutrino ntau (information) to c.o.m. representing center of mass both with respect to gravitation and the nucleus. The total for this running line off of D.M. 2 1/6 is also 5.33H. The only missing part yet is connection to the proton and mu neutrino nmu. Again starting at DM 2 1/6 there is an aqua 2H line going to emys D.M. Portal. Thence at emys D.M. Portal this line splits into "3" segments. One running line segment continues onto the mu neutrino nmu (information) while another line segment splits off from emys D.M. Portal to a second connection to ntau (information) representing a second connection to the graviton centered on ntau. Thus the "3" neutrino information complex has a more position aspect n, and a more momentum aspect nmu - ntau. A last line segment splits off from emys D.M. Portal to the UP quark and proton processes. The total for this D.M. 2 1/6 thru emys D.M. Portal running / splitting set of lines is also 5.33H.

Going back to that which is more cosmological, all this means that at the end of the universe the entire scale of the universe has been fractally space filled with complexity having the property of convergent locality. At 2.164 the end fractal dimension is juxtaposed between 2D and 3D, and represents contoured joint probability information with a 2D-3D wormhole architecture. This implies that at the end, information is gravitationally 2D contoured / stored, at the surface of black holes. It also implies that instantaneous wormhole access replaces light access as suns burn out and light transmission ends. Wormhole accessibility is the fractal property of "locality" at work. All of this starts at 0D-1D dimensional processes initiated by a "triadic" Higgs.

What are the chances for experimental evidence backing the new physics discussed in this paper. In fact the INTEGRAL satellite has already found (2004) an excess of 511 KeV gamma rays coming from the "galactic bulge" that is consistent with annihilation of e+e- light dark matter particles in the 1-100 MeV range (emys is at 7.70 MeV).<sup>13</sup> Since then, the failure of the LHC to make any progress with dark matter searches has, along with new possible theories, led to renewed interest in MeV gamma-ray telescopes to advance the initial success shown in 2004.<sup>14</sup>

There are five other theoretical lines of experimental thought that are well aligned with the discussions in this paper. First there is axion like particle, or ALP theory.<sup>15</sup> Second there is 2HDM model triple (3H) and double (2H) Higgs mechanism extensions to



Standard Model theory, though 2HDM models tend to involve greater than MeV level mass / energy.<sup>16</sup> Third there is dark matter interacting with the SM charged leptons through a scalar portal theory.<sup>17</sup> Fourth there is dark neutrino theory related to the rho meson, which is specifically related to DM  $2 \frac{1}{6}$  at 770 MeV.<sup>18</sup> Fifth there is pomeron / odderon (3H) theory related to QDC and gluons.<sup>20-21</sup>

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1. M. Gell-Mann, THE SYMMETRY GROUP OF VECTOR AND AXIAL VECTOR CURRENTS, Physics Vol. 1, No. 1, pp. 63–75, (1964)
2. G. 't Hooft, FAST VACUUM FLUCTUATIONS AND THE EMERGENCE OF QUANTUM MECHANICS, arXiv:2010.02019 (2020)
3. CEPC Study Group, VOL 1, 1809.00285, (2018).
4. CEPC Study Group, VOL 2, 1811.10545, (2018)
5. Beyond the Standard Model Physics Working Group, Physics Beyond Colliders at CERN, arXiv:1901.09966 (2019)
6. X. Calmet, F. Kuipers, Theoretical Bounds On Dark Matter Masses, arXiv:2009.11575 (2021)
7. C. Boehm, X. Chu, J. Kuo, J. Pradler, Scalar Dark Matter Candidates - Revisited, arXiv:2010.02954 (2020)
8. P. Reimitz, MeV astronomy with Herwig?, arXiv:2102.00041 (2021)
9. M. Abdullah, A. Klypin, G. Wilson, COSMOLOGICAL CONSTRAINTS ON  $\Omega_m$  AND  $\sigma_8$  FROM CLUSTER ABUNDANCES USING THE GALWCAT19, arXiv:2002.11907 (2020)
10. Z. Chen, Universal Entanglement and an Information-Complete Quantum Theory, arXiv:1907.13457 (2020)
11. LHCb Collaboration, Test of Lepton Flavor Universality by the measurement of the  $B_0 \rightarrow D^* - \tau + \nu_\tau$  branching fraction using three-prong  $\tau$  decays, arXiv:1711.02505 (2018)
12. Fermilab, The anomalous magnetic moment of the muon in the Standard Model, arXiv:2006.04822 (2020)

13. C. Boehm, D. Hooper, J. Silk, M. Casse, J. Paul, MeV Dark Matter: Has It Been Detected?, arXiv:0309686 (2018 )
14. A. Coogan, A. Moiseev, L. Morrison, S. Profumo, Hunting for Dark Matter and New Physics with (a) GECCO, arXiv:2101.10370 (2021)
15. L. Darme, F. Giacchino, E. Nardi, M. Raggi, Invisible decays of axion-like particles: constraints and prospects, arXiv:2012.07894 (2021)
16. I. Ahmed, F. Khaliq, T. Khurshid, Double and Triple Higgs Boson Production at Future Linear Colliders, arXiv:2003.08193 (2020)
17. K. Ghorbani, Light vector dark matter with scalar mediator and muon g-2 anomaly, arXiv 2104.08840 (2021)
18. M. Svec, SPIN MIXING MECHANISM IN AMPLITUDE ANALYSIS OF  $\pi^-p \rightarrow \pi^- \pi^+ n$  AND A NEW VIEW OF DARK MATTER, arXiv 1411.4468 (2014)
19. A. Choplin, L. Siess, S. Goriely, The intermediate neutron capture process, arXiv:2012.08840 (2021)
20. W. Cosyn, B. Pire, Diffractive rho + lepton pair production at an electron-ion collider arXiv:2103.01411 (2021)
21. H. Chen, W. Chen, S. Zhu, Toward the existence of odderon as a three-gluon bound state, arXiv:2103.17201 (2021)
22. F. Wilczek, Quantum Time Crystals, arXiv 1202.2539 (2012)
23. V. Khemani, R. Moessner, S.L. Sondhi, A Brief History of Time Crystals, arXiv 1910.10745 (2019)