

## It's Broken, fix it

David Maker

Key words, Mandelbrot set, Dirac equation, Metric

Abstract In that regard Dirac in 1928 made his equation(1) flat space(2). But space is not in general flat, there are forces.

So over the past 100 years people have had to try to make up for that mistake by adding ad hoc convoluted gauge force after gauge force until fundamental theoretical physics became a mass of confusion, a train wreck, a junk pile. So all they can do for ever and ever is to rearrange that junk pile with *zero actual progress* in the most fundamental theoretical physics\* ,.. forever. We died.

By the way note that Newpde(3)  $\gamma^\mu \sqrt{\kappa_{\mu\mu}} \partial\psi/\partial x_\mu = (\omega/c) \psi$  is NOT flat space (4) so it cures this problem (5).

### References

(1)  $\gamma^\mu \partial\psi/\partial x_\mu = (\omega/c) \psi$

(2) Spherical symmetry:  $(\gamma^x \sqrt{\kappa_{xx}} dx + \gamma^y \sqrt{\kappa_{yy}} dy + \gamma^z \sqrt{\kappa_{zz}} dz + \gamma^t \sqrt{\kappa_{tt}} dt)^2 = \kappa_{xx} dx^2 + \kappa_{yy} dy^2 + \kappa_{zz} dz^2 - \kappa_{tt} dt^2 = ds^2$   
 $\kappa_{xx} = \kappa_{yy} = \kappa_{zz} = \kappa_{tt} = 1$  is flat space, Minkowski, as in his Dirac equation(1).

(3) Newpde:  $\gamma^\mu \sqrt{\kappa_{\mu\mu}} \partial\psi/\partial x_\mu = (\omega/c) \psi$  for e,v. So we didn't just drop the  $\kappa_{\mu\nu}$  (as is done in ref.1)

(4) Here  $\kappa_{oo} = 1 - r_H/r = 1/\kappa_{rr}$ ,  $r_H = (2e^2)(10^{40N})/(mc^2)$ . The  $N = \dots -1, 0, 1, \dots$  fractal scales (next page)

(5) This Newpde  $\kappa_{ij}$  contains a Mandelbrot set(6)  $e^2 10^{40N}$  Nth fractal scale source(fig1) term (from eq.13) that also successfully **unifies theoretical physics**. For example:

For  $N = -1$  (i.e.,  $e^2 \times 10^{-40} \equiv Gm_e^2$ )  $\kappa_{ij}$  is then by inspection(4) the Schwarzschild metric  $g_{ij}$ ; so we just derived General Relativity and the gravity constant G from Quantum Mechanics in one line Wow  
For  $N = 1$  (so  $r < r_c$ ) Newpde zitterbewegung expansion stage explains the universe expansion (For  $r > r_c$  it's not observed, per Schrodinger's 1932 paper.).

For  $N = 1$  zitterbewegung harmonic coordinates and Minkowski metric submanifold (after long time expansion) gets the De Sitter ambient metric we observe (D16, 6.2).

For  $N = 0$  Newpde  $r = r_H$   $2P_{3/2}$  state composite  $3e$  is the baryons (sect.2, partII) and Newpde  $r = r_H$  composite e,v is the 4 Standard electroweak Model Bosons (4 eq.12 rotations → appendix A)

for  $N = 0$  the higher order Taylor expansion(terms) of  $\sqrt{\kappa_{ij}}$  gives the anomalous gyromagnetic ratio and Lamb shift *without* the renormalization and infinities (appendix D3): This is very important

So  $\kappa_{\mu\nu}$  provides the general covariance of the Newpde. Eq. 4 even provides us space-time r,t.

So we got all physics here by *mere inspection* of this (curved space) Newpde with no gauges!

We fixed it.

So where does that Newpde come from that fixed it? We just do **what is simplest** (let Occam be your guide), just **postulate 1**: the physics (Newpde) will then follow, top down:

So this Occam's razor *simplicity* requirement motivates every step. We later *derive* from our postulate 1 the eq.11 real eigenvalues (Hermitian) operator formalism so we can thereby define the **limit 1** as  $1 \pm \text{uncertainty}$  and so (an observable) indistinguishable from 1 since it is inside the uncertainty bounds. Note also an 'observable' implies an 'observer'.

## Postulate 1

and *define limit 1* ( $\equiv 1 \pm \text{uncertainty}$ )

abstract Let Occam be your guide to get physics top down, So startout simplest with **Postulate 1**  
The simplest algebraic definition of **1** is  $z=zz$  so *define limit 1* as  $z=zz+C$  for small constant  $C$

‘constant’ defined as  $\delta C=0$ ;

‘small’ defined as  $\|C\| < 1$

solution of  $z=zz$  is  $z=1,0$ ;

**Postulate 1** ( i.e.,  $z=zz$ ) requires *some*  $C=0$  (so  $z=1,0=z'$ ) in the solution set of  $z'=z'z'+C$ (eq1)

so  $z=0=z_0=z'$  To find *all*  $C$  substitute  $z'$  on left (eq.1) into right  $z'z'$  repeatedly and get iteration  $z_{N+1}=z_N z_N - C$ . Constraint  $\delta C=0$  requires we reject the  $C$ s for  $-\delta C = \delta(z_{N+1} - z_N z_N) = \delta(\infty - \infty) \neq 0$ . The  $C$ s that are left over define the **Mandelbrot set**  $C_M$ . eg.,  $\delta z' = 10^{40N} \delta z$ ,  $N=1$  fractal scale ( $\equiv$  observer).  
 $z=1$  in  $z'=1+\delta z$  in eq.1 get  $\delta z + \delta z \delta z = C$  (3) so  $\delta z = (-1 \pm \sqrt{1 + 4C})/2 = dr + idt$  if  $C < -1/4$  (complex) (4)

$z=1$  in  $z'=1+\delta z$  in eq1 gives for *required*  $N=1$  (so  $|\delta z| \gg 1$ ) and  $\delta C=0 = \delta(\delta z + \delta z \delta z) = \delta \delta z (1 + \delta z)$   
 $+ \delta \delta z (\delta z) + (\delta z) \delta \delta z \approx \delta(\delta z \delta z) = 0$  (plug in eq.4)  $= \delta[(dr + idt)(dr + idt)] = \delta[(dr^2 - dt^2) + i(dr dt + dt dr)] = 0$  (5)  
 $= 2D$  (Minkowski metric,  $c=1$ )  $+ i$  (Clifford algebra  $\rightarrow$  eq.7a) ( $\equiv$  Dirac eq)

Factor eq.5 real  $\delta(dr^2 - dt^2) = \delta[(dr + dt)(dr - dt)] = 0 = [\delta(dr + dt)](dr - dt) + (dr + dt)[\delta(dr - dt)] = 0$  (6)

so  $-dr + dt = ds$ ,  $-dr - dt = ds \Rightarrow ds_1 (\rightarrow \pm e)$  Squaring & eq.5 gives circle in  $e, v$  ( $dr, dt$ ) 2<sup>nd</sup>, 3<sup>rd</sup> quadrants (7)

so  $dr + dt = ds$ ,  $dr - dt = ds$ ,  $dr \pm dt = 0$ , light cone ( $\rightarrow v, v$ ) in *same*  $e, v$  ( $dr, dt$ ) plane 1<sup>st</sup>, 4<sup>th</sup> quadrants (8)

so  $dr + dt = 0, dr - dt = 0$  so  $dr = dt = 0$  vacuum (9)

Quadrants give *positive* scalar  $dr dt$  of eq.7 (if *not* vacuum) imply the eq.5 *non* infinite extremum  
*imaginary*  $\equiv dr dt + dt dr = 0 \equiv \gamma^i dr^j dt + \gamma^j dt^i dr = (\gamma^i \gamma^j + \gamma^j \gamma^i) dr dt$  so  $(\gamma^i \gamma^j + \gamma^j \gamma^i) = 0$ ,  $i \neq j$  (from *releq4*  $\gamma^j \gamma^i = 1$ ) (7a)

Thus from eqs 5, 7a:  $dr^2 - dt^2 = (\gamma^r dr + i \gamma^t dt)^2$

**Both  $z=0, z=1$**  together using orthogonality to get (2D+2D curved space). Thus  $(z=1) + (z=0) = (dx_1 + i dx_2) + (dx_3 + i dx_4) \equiv dr + i dt$  given  $dr^2 - dt^2 = (\gamma^r dr + i \gamma^t dt)^2$  if  $dr^2 \equiv dx^2 + dy^2 + dz^2$  (orthogonality) so that  $\gamma^r dr \equiv \gamma^x dx + \gamma^y dy + \gamma^z dz$ ,  $\gamma^i \gamma^j + \gamma^j \gamma^i = 0$ ,  $i \neq j$ ,  $(\gamma^i)^2 = 1$ , rewritten ( $\kappa_{ii}$  from  $N=0$   $C_M$  perturbation of  $N=1$  eq.7) as  $(\gamma^x \sqrt{\kappa_{xx}} dx + \gamma^y \sqrt{\kappa_{yy}} dy + \gamma^z \sqrt{\kappa_{zz}} dz + \gamma^t \sqrt{\kappa_{tt}} dt)^2 = \kappa_{xx} dx^2 + \kappa_{yy} dy^2 + \kappa_{zz} dz^2 - \kappa_{tt} dt^2 = ds^2$ . Multiply both sides by  $1/ds^2$  and  $\delta z^2 \equiv \psi^2$  use operator eq.11 inside brackets ( ) get  $4D \gamma^\mu (\sqrt{\kappa_{\mu\mu}}) \partial \psi / \partial x_\mu = (\omega/c) \psi$   
 $\equiv$  **Newpde** for  $e, v$ ,  $\kappa_{00} = 1 - r_H/r = 1/\kappa_{rr}$ ,  $r_H = e^2 \times 10^{40N}/m$  ( $N = -1, 0, 1, \dots$ ). Also  $C_M/\xi = r_H = \text{small } C$  so big  $\xi = \gamma$  boost so  $z=zz$  so **postulate 1**. So we really did just postulate 1. So **Postulate 1**  $\rightarrow$  **Newpde**

**Applications** of  $N=0$   $r=r_H$ : **Newpde** composite  $3e$   $2P_{3/2}$  state = baryons and the 4 **Newpde**  $e, v$  (quadrant) rotations are the 4  $W^+, \gamma, W^-, Z_0$ , SM Bosons. Also  $N=-1$  is GR & big  $\gamma = \xi = \tau + \mu$  from  $C_M$   
So “postulate 1” gives **eq1** (i.e., all of physics) and real#math, everything. See davidmaker.com

**postulate 1** and define **limit1** ( $\equiv 1 \pm \text{uncertainty}$ )

**define limit1** Algebraic definition of 1 is  $z=zz$  so **limit 1** is defined as  $z=zz+C$  for small constant C  
 'small' defined as  $\|C\| \ll 1$   
 'constant' defined as  $\|C\|=0$   
 solution to  $z=zz$ :  $z=1,0$

**Postulate 1** ( $z=zz$ ) requires some  $C=0$  (so  $z=1,0 = z'$ ) in the solution set of  $z'=z'z'+C$  (**eq1**)  
 So plug  $z=1,0$  into **eq1** (use  $\|C\|=0$ )  
 into **eq1** iteration (to get all C) get 2D Mandelbrot (fractal scale N)  
 into **eq1** get 2D Dirac ( $(N=1) \equiv \text{observer}$ )  
 4D Newpde using orthogonalization (with small C implied)

so  $z=0$   
 $z=1$   
**both**

Summary **eq1 so** (it is just eq1)  
 $z=0$   
 $z=1$   
**both** therefore **postulate 1  $\rightarrow$  Newpde** (So we get all of physics (davidmaker.com) and 1U algebra and Real#math (1 iteration is Cauchy) everything) that is physical and nothing else.

## Part I FOREWORD (Referencing eq.16 and composite 3e)

Maker's New Pde Implies The Strong Interaction Without A Host of Assumptions

I am writing in support of David Maker's new generalization of the Dirac equation.(New pde)

For example at his  $r=r_H$  Maker's new pde  $2P_{3/2}$  state fills first, creating a 3 lobed shape for  $\psi^*\psi$ .

At  $r=r_H$  the time component of his metric is zero, so clocks slow down, *explaining the stability of the proton*. The 3 lobed structure means the electron (solution to that new pde) spends 1/3 of its time in each lobe, *explaining the multiples of 1/3e fractional charge*. The lobes are locked into the center of mass, can't leave, *giving asymptotic freedom*. Also there are 6 2P states *explaining the 6 quark flavors*. P wave scattering *gives the jets*. Plus the S matrix of this new pde gives the W and Z as resonances (*weak interaction*) and the Lamb shift but this time without requiring renormalization and higher order diagrams. Solve this new pde with the Frobenius solution at  $r=r_H$  and get the hyperon masses. Note we mathematically *solved* the new pde in each of these cases, *we did not add any more assumptions*. In contrast there are many assumptions of QCD (i.e., masses SU(3), couplings, charges, etc.,) versus the one simple postulate of Maker's idea and resulting pde.

Many assumptions are in reality a mere list of properties. One assumption means you actually understand the phenomena.

Dr. Jack Archer  
 PhD Physicist

## Concerns the e,v composite Standard electroweak Model and 3e composite

### Physics Theories Interconnected In Maker Theory

A cosmologist has probably asked: What is dark energy? What is the source of the dipole moment in CMBR? Why is gravity only attractive? A particle physicist has probably wondered: Why is the core of the SM a left handed Dirac doublet? What is the source of the nuclear force? Is gauge invariance needed? David Maker has derived a generalized Dirac equation that answers all of these questions. Furthermore, his theory shows that all of these questions are intimately connected.

Dr. Jorge O'Farril PhD  
 In Particle Physics Theory

## Physics Implications of the Maker Theory (Referencing eq.16)

“People work with a Hamiltonian which, used in a direct way, would give the wrong results, and then they supplement it with these rules of subtracting infinities. I feel that, under those conditions, you do not really have a correct mathematical theory at all. You have a set of working rules. So the quantum mechanics that most physicists are using nowadays is just a set of working rules, and not a complete dynamical theory at all. In spite of that, people have developed it in great detail. “

This sharp criticism of modern quantum field theory is quoted from a talk by Paul Dirac that was published in 1987, three years after his death: see Chapter 15 of the Memorial Volume “Paul Adrian Maurice Dirac: Reminiscences about a Great Physicist”, edited by Behram N.

Kursunoglu and Eugene Paul Wigner (paperback edition 1990). Richard Feynman too felt very uncomfortable with “these rules of subtracting infinities” (renormalization) and called it "shell game" and "hocus pocus" (wikipedia.org “Renormalization”, Oct 2009). Even more recently, Lewis H. Ryder in his text “Quantum Field Theory” (edition 1996, page 390) lamented “there ought to be a more satisfactory way of doing things”.

[The third term in the Taylor expansion of the square root in equation 9  $\gamma^\mu (\kappa_\mu) \partial \psi / \partial r = (\omega/c) \psi$  gives the equation 6.12.10 and so the Lamb shift and equation 8.4 gives anomalous gyromagnetic ratio so we do obtain the QED precision but without the higher order diagrams and infinite charges and masses]

In his highly critical talk Dirac went on to say:

“I want to emphasize that many of these modern quantum field theories are not reliable at all, even though many people are working on them and their work sometimes gets detailed results.” He stressed the fundamental requirement to find a Hamiltonian that satisfies the Heisenberg equation of motion for the dynamic variables of the considered system in order to obtain the correct quantum theory. After all, it was this kind of approach, not invoking the correspondence principle to classical mechanics, that led him to discover the relativistic spinor wave equation of the electron that carries his name! The underlying question here is, of course, how to modify the Hamiltonian of that original Dirac equation to incorporate a dynamical system with electromagnetic fields. As wikipedia.org, under the entry “Dirac Equation”, put it (Oct 2009): “Dirac's theory is flawed by its neglect of the possibility of creating and destroying particles, one of the basic consequences of relativity. This difficulty is resolved by reformulating it as a quantum field theory. Adding a quantized electromagnetic field to this theory leads to the theory of quantum electrodynamics (QED).” But it is just this simple additive modification of the Hamiltonian based on the correspondence principle that violates the Heisenberg equation of motion and, therefore, had been rejected by Dirac.

Dirac concluded his talk with these words:

“I did think of a different kind of Hamiltonian which is in conformity with the Heisenberg equations, but ... it has not led to anything of practical importance up to the present. Still, I like to mention it as an example of the lines on which one should seek to make advance. ... I shall continue to work on it, and other people, I hope, will follow along such lines. “

Unfortunately, nobody seemed to have listened, instead everybody continued to believe that renormalizing away those awkward infinities is the only available answer and blindly followed in the steps of QED in formulating other quantum field theories, such as those for the weak and the strong forces. This has led to a hodgepodge of complex mathematical acrobatics including

the proliferation of string theories for quantum gravity and the attempts to construct a comprehensive matrix string theory (M-theory, supposedly a “theory of everything”), theories that require an unreasonable number of dimensions. Dirac would despair!

But eventually, an outsider has been looking back and took Dirac seriously. Joel David Maker, over the past two decades, has been formulating a new theory totally based on the fundamental principles laid out by Dirac. He was able to derive a new Hamiltonian for the Dirac equation to incorporate the electromagnetic (EM) field. In order to achieve this task, he basically had to create a new general relativity (GR) for the EM force by postulating that there is only one truly fundamental elementary particle, the electron - all other particles are derived from it. Maker expresses this postulate mathematically by a basic EM point source that is an observable quantum mechanical object. He then argues that the equivalence principle for an EM force from such a point source does, in fact, hold, since one has to deal with only one value of charge, namely, the electron charge. Hence, he is able to apply Einstein’s GR formalism to this simple EM point source. A new ambient metric results in which the Dirac equation needs to be imbedded, leading to a modification of the Hamiltonian that is by no means additive but is GR covariant and satisfies the requirement of the Heisenberg’s equation of motion.

Note: [the 3<sup>rd</sup> term in the Taylor expansion of the square root (see 6.12.1(Lamb shift), eq.8.4 (anomalous gyromagnetic ratio) in eq.2 pde  $\gamma^t \sqrt{(\kappa_{rr})} \partial \psi / \partial r = (\omega/c)$  (1.11) contains the high precision QED results otherwise only obtainable by gauges, higher order diagrams and renormalization.]

An important ingredient of this new ambient metric is the existence of an EM Schwarzschild radius for the postulated single point source generating an electron event horizon that is directly related to the classical electron radius. It also leads to the revolutionary concept of fractal event horizons that envelope each other with deep implications for the self-similarity of the physics at different scales. Our observable physics is, however, limited to the region between the electron (more generally, Dirac particle) horizon and the next larger scale horizon, the cosmological horizon. Perturbations from higher-order scales can, however influence observations in our observable region.

Maker’s fundamentally new approach, by including the concept of observability, naturally unifies general relativity with quantum mechanics and makes GR complete (i.e. ungauged), a result, Einstein had been striving for, but was unable to achieve. In addition it provides the precision answers of QED (such as a accurate value of the Lamb shift) and other quantum field theories in a direct way without higher-order Feynman diagrams and/or renormalization. Solutions of the new GR covariant Dirac equation for the region outside the electron event horizon produce the needed physics for EM forces, QED corrections, and weak forces. Solutions for a composite Dirac particle evaluated near its event horizon (which, in a composite system, needs to be a “fuzzy” horizon and, hence, some inside observation becomes possible) provide an understanding of leptons and hadrons (baryons and mesons) as electronic S,  $2P_{3/2}$  states of the multi-body Dirac particle: For example, S-states are interpreted as leptons, hybrid SP2 states as baryons. Quarks are not separate particles but are related to the three-fold lobe structure of  $2P_{3/2}$  at  $r=r_H$  states in this model, providing an explanation of the strong forces. Gravity is derived, as a first-higher-order effect, from the modification of the ambient EM metric by the self-similar radial expansion dynamics at the cosmological scale. This first-higher-order effect, also provides an understanding of the lepton mass differences; by including the perturbation from the next self-

similar larger-scale dynamics (those of a “super cosmos”) the finiteness of neutrino masses are explained as tiny contributions from such a second-higher-order effect. Amazingly, Maker was able to deduce all these results from a basic simple postulate, namely, the existence of a single observable EM point source, which - within the formalism of Einstein’s general relativity - defines a new ambient metric.

Thus, with his radically new thinking, Maker has proven the correctness of Dirac’s lines of approach to the Hamiltonian problem. Dirac believed in the power of mathematical beauty in the search for a correct description of our observable physical world: “God used beautiful mathematics in creating the world” (thinkexist.com, Oct 2009). Beautiful mathematics it is indeed!

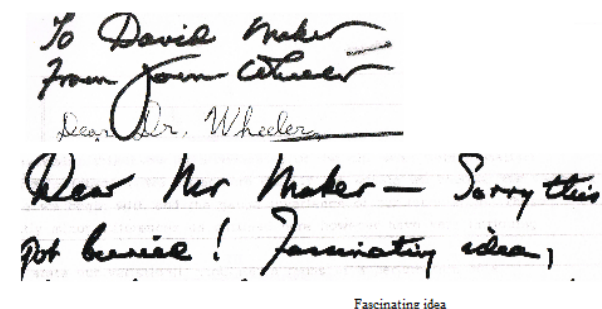
Reinhart Engelmann, Oct 2009

Maker, *Quantum Physics and Fractal Space Time*, volume 19, Number 1, Jan 1999, *CSF*,

### concerns the fractal cosmological implications

The above reference is a publication in a refereed journal of an article on the universe as a particle in a fractal space time. Here these (fractal) objects are the result of circle mappings onto Z plane Riemann surfaces, separated by nontrivial branch cuts (see preface below). The  $dr+dt$  extrema diagonals on this Z plane translate to pde’s for leptons in the  $ds$  extrema case and for bosons in the  $ds^2 (=dr^2+dt^2)$  extrema case each with its own “wave function”  $\psi$ .

I attended the U.Texas for a while and as a teaching assistant I shared the mailbox rack with people like Weinberg and Archibald Wheeler. So one day on looking over at Wheeler’s a few mailboxes over on an impulse I plopped in a physics paper on this subject. Wheeler responded later in a hand written note that what I had done was a ‘fascinating idea’.



To David Maker  
From John Wheeler  
Dear Mr. Wheeler  
Dear Mr Maker - Sorry this  
not better! Fascinating idea!

Fascinating idea

He apparently took this fractal idea seriously because 8 years later he organized a seminar at Tufts U. (1990) on a closely related concept: “the wave function of the universe” (the universe in his case as a Wheeler De Witt equation boson wavefunction). Allen Guth and Stephan Hawking also attended.

## Derivation of the New Pde From the Postulate Of 1

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Ch.2 1U1 List-define Math, and eq.1 iteration Mandelbrot set Fractalness

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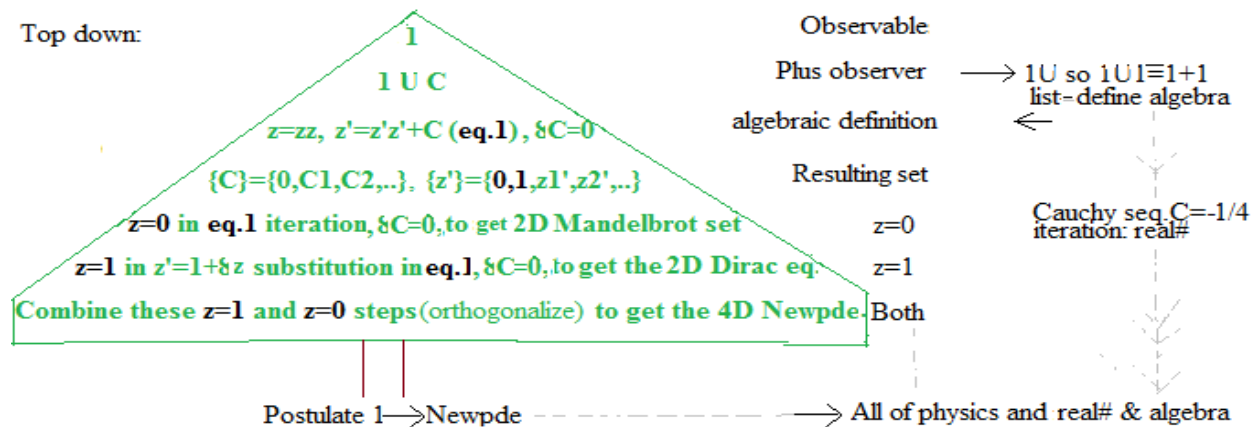
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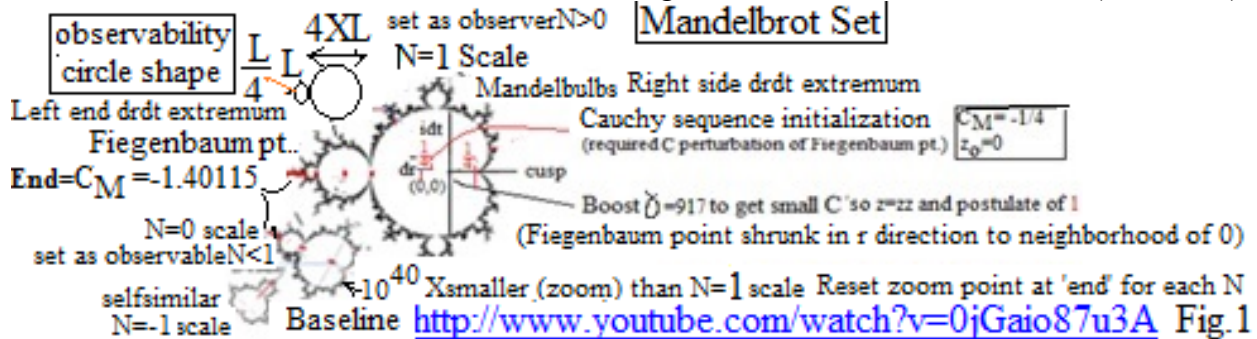
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**I Math Details of Postulate 1** and **define limit 1** ( $\equiv 1 \pm \text{uncertainty}$ )  
 abstract Let Occam be your guide to get physics top down, So startout simplest with **Postulate 1**  
 The simplest algebraic definition of **1** is  $z=zz$  so **define limit 1** as  $z=zz+C$  for small constant  $C$   
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 $z_{N+1}=z_N z_N - C$ . Constraint  $\delta C=0$  requires we reject the  $C$ s for  $-\delta C=\delta(z_{N+1}-z_N z_N)=\delta(\infty-\infty) \neq 0$ . The  $C$ s  
 that are left over define the **Mandelbrot set**  $C_M$ . eg.,  $\delta z'=10^{40N}\delta z$ ,  $N=1$  fractal scale( $\equiv$ observer)



$z=1$  in  $z'=1+\delta z$  in eq.1 get  $\delta z+\delta z\delta z=C$  (3) so  $\delta z=(-1 \pm \sqrt{1+4C})/2=dr+idt$  if  $C < -1/4$ (complex) (4)

$z=1$  in  $z'=1+\delta z$  in eq1 gives for *required*  $N=1$  (so  $|\delta z'| \gg 1$ ) and  $\delta C=0=\delta(\delta z+\delta z\delta z)=\delta\delta z(1+\delta\delta z(\delta z)+(\delta z)\delta\delta z \approx \delta(\delta z\delta z)=0$ =(plug in eq.4)= $\delta[(dr+idt)(dr+idt)]=\delta[(dr^2-dt^2)+i(dr dt+dt dr)]=0$  (5)

=(Minkowski metric, c=1)+i(Clifford algebra→eq.7a) (≡Dirac eq)  
 Factor eq.5  $\delta(dr^2-dt^2)=\delta[(dr+dt)(dr-dt)]=0=[\delta(dr+dt)](dr-dt)+[(dr+dt)\delta(dr-dt)]=0$  (6)  
 so  $-dr+dt=ds, -dr-dt=ds \Rightarrow ds_1(\rightarrow \pm e)$  Squaring & eq.5 gives circle in  $e, v$   $(dr, dt)$  2<sup>nd</sup>, 3<sup>rd</sup> quadrants (7)  
 &  $dr+dt=ds, dr-dt=ds, dr+dt=0$ , light cone ( $\rightarrow v, v$ ) in same  $e, v$   $(dr, dt)$  plane 1<sup>st</sup>, 4<sup>th</sup> quadrants (8)  
 &  $dr+dt=0, dr-dt=0$  so  $dr=dt=0$  defines vacuum (9)  
 Quadrants give *positive* scalar  $drdt$  of eq.7 (not eq.9 vacuum) imply eq.5 *non* infinite extremum  
*imaginary*  $=drdt+dtdr=0 \Rightarrow \gamma^i dr \gamma^j dt + \gamma^j dt \gamma^i dr = (\gamma^i \gamma^j + \gamma^j \gamma^i) drdt$  so  $(\gamma^i \gamma^j + \gamma^j \gamma^i)=0, i \neq j$  (from reeq.4  $\gamma^i \gamma^i=1$ ) (7a)  
 We square eqs.7 or 8  $ds_1^2=(dr+dt)(dr+dt)=(-dr-dt)(-dr-dt)=[dr^2+dt^2]+(drdt+dtdr)$   
 $=ds^2+ds_3=ds_1^2$ . **Circle** $=\delta z=dse^{i\theta}=dse^{i(\Delta\theta+\theta_0)}=dse^{i((\cos\theta dr+\sin\theta dt)/(ds)+\theta_0)}$ ,  $\theta_0=45^\circ$  ( $\delta z$  in fig.7). We  
 define  $k \equiv dr/ds, \omega \equiv dt/ds, \sin\theta=r, \cos\theta=t, dse^{i45^\circ} \equiv ds'$ . Take ordinary derivative  $dr$  (since (flat space)

$$\text{of 'Circle'} \frac{\partial \left( dse^{i\left(\frac{rdr}{ds} + \frac{tdt}{ds}\right)} \right)}{\partial r} = i \frac{dr}{ds} \delta z \text{ so } \frac{\partial (dse^{i(rk+wt)})}{\partial r} = ik\delta z, \quad k\delta z = -i \frac{\partial \delta z}{\partial r} \quad (11).$$

(So given  $\delta z \equiv \psi, F \equiv k$  then from eq.11  $\langle F \rangle^* = \int (F\psi)^* \psi d\tau = \int \psi^* F \psi d\tau = \langle F \rangle$ . Therefore  $k$  is Hermitian). Also from right side real# Cauchy seq. starting at  $-1/4$  iteration, is the same as the the Mandelbrot set iteration(7), Ch.2, sect.2, with small  $C$  limit making *real eigenvalues* (eg., noise) likely. Thus the Mandelbrot set iteration here did double duty also as proof of the real number eigenvalues in eq.11. The observables  $dr \rightarrow k \rightarrow p_r$  condition gotten from eq.11 **operator formalism**(10) thereby converts eq.7-9 into Dirac eq. pdes (4X Circle solution in left side fig.1 also implies observability). Thus our title 'postulate 1 (observable)' implicitly contains the eq.11 QM definition of observability. Cancel that  $e^{i45^\circ}$  coefficient ( $45^\circ=\pi/4$ ) then multiply both sides of eq.11 by  $\hbar$  and define  $\delta z \equiv \psi, p \equiv \hbar k$ . Eq.11: the familiar  $p_r \psi = i\hbar \frac{\partial \psi}{\partial r}$  (11). Repeat eq.3 for the  $\tau, \mu$  respective  $\delta z$  lobes in fig.6 so they each have their own neutrino  $\nu$ .

### Mandelbrot set iteration is at $-1/4$ extremum is also a Cauchy sequence giving the real# $\delta$

On the right end minimum of the  $\|C\|$  maxima extremum of the Mandelbrot set we get the Mandelbrot set iteration formula starting from extremum  $z_0=0, C_M=-1/4$  that is *also* uniquely a Cauchy sequence(2) of rational numbers (since the sequence started with a rational number  $-1/4$ ) then  $-1/4=0 \times 0 - 1/4; -3/16=(-1/4)(-1/4)-1/4$ , etc., with limit 0 that implies that 0 in our (later) small  $C$  uncertainty neighborhood limit application region has a nonzero probability of being a real number  $dr$  so we have **real eigenvalues** (in  $dr$  and so  $k$  in eq.11) for our later small  $C$  limit neighborhood (sect.3.1). Also since right side extremum  $-1/4 \geq C$  (in  $rel\delta z' = rel \frac{\delta z}{\gamma} = \frac{C_M}{\gamma}$

$$\frac{rel \frac{-1 \pm \sqrt{1+4C}}{2}}{\gamma} = \frac{dr}{\gamma}) \text{ and } \gamma dt = dt' \neq 0 \text{ so the Hamiltonian (operator) exists and so } N=0 \text{ observability}$$

### $\delta C=0$ Extremum on Circle 4X sequence shapes (fig1) In Mandelbrot set pulls it out of zoom clutter because of the above 4X circle observability sequence

$\delta C=0$  gives that  $45^\circ$  extreme but it also applies to *local* constants (extremum peaks and valleys) because  $\delta C = \left(\frac{\partial C}{\partial r}\right)_t dr + \left(\frac{\partial C}{\partial t}\right)_r idt = 0$ . So for that fig.1 4X sequence of circles  $drdt = darea_M \neq 0$  (so eq.11a observables) the real  $\delta C=0$  extremum given the decreasing circle radius sequence  $\lim_{m \rightarrow \infty} \frac{\partial C}{\partial area_m} dr_m = K \times 0 = 0$  (since  $dr_\infty \approx 0$ ) at Feigenbaum point  $=f^\alpha = (-1.40115, i0) = C_M \equiv \text{end}$ . So random circles in the zoom don't do  $\delta C=0$ . Note if a circle (or many circles) is



rotated (U), translated (D), shrunk (S) equally in both dimensions (i.e.,  $(\partial x^j / \partial x'^k) f^j = f'^k \equiv \begin{bmatrix} f_{1N} \\ f_{2N} \end{bmatrix} = S_N \begin{bmatrix} U_{11} & U_{12} \\ U_{21} & U_{22} \end{bmatrix} \begin{bmatrix} f \\ 0 \end{bmatrix} + \begin{bmatrix} D_{1N} \\ D_{2N} \end{bmatrix}$ ) it is still a circle, eq.11 still holds, so *it's still an observable* as seen in the N fractal scale zoom. Thus you can pick out from that zoom these fig.1 Mandelbrot set extremum 4Xdiameter circles as the only **observables** and  $\delta C=0$  extremum geometry in all that clutter. Reset the zoom, restart at such  $S_N C_M = 10^{40N} C_M$  in eq.13.

**1b z=1,z=0 steps combined** (on Circle with small C boost):

**Postulate 1** also implies a small C in eq.1 which thereby implies a (Minkowski metric Lorentz contraction(9))  $1/\gamma$  boosted frame of reference(fig.6) in the eq.3  $C=C_M/\gamma \equiv C_M/\xi_1 = \delta z' = \Delta$  for next small smaller fractal scale  $N_{ob} < 0$  so  $\delta z' \ll 1$  (composite 3e: sect.2 and PartII). For  $N=0$  eq.5 (which is true only for  $N>0$ ) and so eq.7 is not quite true (and  $\delta z$  in eq.11 perturbed). But we keep  $\delta ds^2=0$  (circle) in eq.5, on the 4X circles so we must have an angle perturbation of big  $N=1$  dr,dt for  $\theta_0=45^\circ$  on above **ds Circle** and so a slightly modified eq.7

$$(dr - \delta z') + (dt + \delta z') \equiv dr' + dt' = ds \quad (12)$$

**$N_{ob}=0$  extremum eq.12 rotations** (observer at  $N=1$ , eq.7  $dr+dt=ds$  constraint)

Recall for  **$N_{ob}=0$**  (observer at  $N=1$ ) and eq. 7  $dr+dt=ds$  the r,t axis' are the max extremum for  $ds^2$ , and the  $ds^2$  at  $45^\circ$  is the min extremum  $ds^2$  so each  $\Delta\theta = \pm 45^\circ$  is pinned to an axis' so extreme  $\Delta\theta \approx \pm 45^\circ = \delta z'$ . So in eq.12 the 4 rotations  $45^\circ + 45^\circ = 90^\circ$  define 4 Bosons (appendix A).

But for  $45^\circ - 45^\circ$   $N_{ob} < 0$  then contributes so you also have other (smaller) fractal scale extreme  $\delta z'$  (eg., tiny Feigenbaum pts so  $N=1$   $dr=r$ , for  $N_{ob} < 0$ ) so metric coefficient  $\kappa_r \equiv (dr/dr')^2 = (dr/(dr - (C_M/\xi_1)))^2 = 1/(1 - r_H/r)^2 = A_1/(1 - r_H/r) + A_2/(1 - r_H/r)^2$ . The partial fractions  $A_i$  can be split off from RN and so

$$\kappa_r \approx 1/[1 - ((C_M/\xi_1)r)] \quad (13)$$

( $C_M$  defined to be  $e^2$  charge,  $\gamma \equiv \xi_1$  mass). So:  $ds^2 = \kappa_r dr'^2 + \kappa_{oo} dt'^2$  (14)

From eq.7a  $dr' dt' = \sqrt{\kappa_r} dr' \sqrt{\kappa_{oo}} dt' = dr dt$  so  $\kappa_r = 1/\kappa_{oo}$  (15)

We can then do a rotational dyadic coordinate transformation of  $\kappa_{\mu\nu}$  to get the Kerr metric which is all we need for our applications(9).

Recall from eqs5,7a that  $dr^2 - dt^2 = (\gamma^r dr + i\gamma^t dt)^2$

**Both  $z=0, z=1$**  together using orthogonality get (2D+2Dcurved space) . So  $(z=1)+(z=0) = (dx_1 + i dx_2) + (dx_3 + i dx_4) \equiv dr + i dt$  given  $dr^2 - dt^2 = (\gamma^r dr + i\gamma^t dt)^2$  if  $dr^2 \equiv dx^2 + dy^2 + dz^2$  (orthogonality) so that  $\gamma^r dr = \gamma^x dx + \gamma^y dy + \gamma^z dz$ ,  $\gamma^i \gamma^j + \gamma^j \gamma^i = 0$ ,  $i \neq j$ ,  $(\gamma^i)^2 = 1$ , rewritten (with curved space  $\kappa_{\mu\nu}$  eq.13-15)  $(\gamma^x \sqrt{\kappa_{xx}} dx + \gamma^y \sqrt{\kappa_{yy}} dy + \gamma^z \sqrt{\kappa_{zz}} dz + \gamma^t \sqrt{\kappa_{tt}} i dt)^2 = \kappa_{xx} dx^2 + \kappa_{yy} dy^2 + \kappa_{zz} dz^2 - \kappa_{tt} dt^2 = ds^2$ . Multiply both sides by  $1/ds^2$  and  $\delta z^2 \equiv \psi^2$  use operator equation 11 inside brackets ( ) get curved space 4D

$$\gamma^\mu (\sqrt{\kappa_{\mu\mu}}) \partial \psi / \partial x_\mu = (\omega/c) \psi \quad (16)$$

**≡Newpde** for  $e, v, \kappa_{oo} = 1 - r_H/r = 1/\kappa_r$ ,  $r_H = e^2 X 10^{40N}/m$  ( $N = -1, 0, 1, \dots$ ). Also  $C_M/\xi = r_H = \text{small } C$  so big  $\xi = \gamma$  boost so  $z = zz$  so **postulate 1**. So we really did just postulate 1. **So Postulate 1 → Newpde**

\*  $C_M/\xi_1$  is  $\xi$  small C boost for  $z = zz$  so postulate 1 from Newpde  $r = r_H$   $2P_{3/2}$  stable state. See fig6. The 4 eq.12 Newpde  $e, v$  rotations at  $r = r_H$  are the 4  $W^+, \gamma, W^-, Z_0$  SM Bosons (appendix A).

So Penrose's intuition(6) was right on! There *is* physics in the Mandelbrot set, all of it.

## 2.1 Oscillation of $\delta z (\equiv \psi)$ on a given fractal scale

From Newpde (eg., eq.1.13 Bjorken and Drell)  $i\hbar \frac{\partial \psi}{\partial t} = \frac{\hbar c}{i} \left( \alpha_1 \frac{\partial \psi}{\partial x^1} + \alpha_2 \frac{\partial \psi}{\partial x^2} + \alpha_3 \frac{\partial \psi}{\partial x^3} \right) + \beta mc^2 \psi = H\psi$ . For electron at rest:  $i\hbar \frac{\partial \psi}{\partial t} = \beta mc^2 \psi$  so:  $\delta z = \psi_r = w^r(0) e^{-i\varepsilon_r \frac{mc^2}{\hbar} t}$   $\varepsilon_r = +1, r=1,2; \varepsilon_r = -1, r=3,4$ .): This implies an oscillation frequency of  $\omega = mc^2/\hbar$ . which is fractal here. So the eq.12 the  $45^\circ$  line has this  $\omega$  oscillation as a (that eq.7-9  $\delta z$  variation) rotation. On our own fractal cosmological scale we are in the expansion stage of one such oscillation. Thus the fractalness of the Newpde explains cosmology. The next higher cosmological scale is independent (but still connected by superposition of speeds implying a separation of variables result:  $i\hbar \frac{\partial \psi}{\partial t} = \beta \sum_N (10^{40N} (\omega t)_{\varepsilon+\Delta\varepsilon}) \psi = \beta \sum_N (10^{40N} m_{\varepsilon+\Delta\varepsilon} c^2/\hbar) \psi$ ). By the way fractal scale  $N=1$  the  $45^\circ$  small Mandelbulb chord  $\varepsilon$  (Fig6) is now, given this  $\omega$ , getting larger with time so  $t \propto \varepsilon$ . So cosmologically for stationary  $N=1$   $\delta z = \sqrt{\kappa_{00}} dt = e^{-i\varepsilon_r \frac{mc^2}{\hbar} t} \rightarrow e^{i(\varepsilon+\Delta\varepsilon)}$  (17) This  $N=0$  and  $N=-1$   $\delta z$  is the source of the small rotation in eq.12. Later we see that high energy scattering drives the  $\delta\delta z$  term ( $/ds$ ) to the big  $\Delta 45^\circ$  extreme (so preferred) jumps (appendixA).

**2.2 N=0 small C boost so postulate observable 1 (e)** Postulate 1 (observable) requires that  $C \approx 0$  in equation 1. Recall eq.3  $\delta z + \delta z \delta z = C$ . So for  $N=1$   $|\delta z| \gg 1$  so  $\delta z \delta z = C$ . Given eq.3 for  $N=0$   $|\delta z| \gg |\delta z \delta z|$ ,  $C \approx \delta z$  sect.1 for  $N=0$ . Note also our above circle e electron  $\Delta\varepsilon$  intersection ground state is at  $45^\circ$  ( $2^{\text{nd}}$  &  $3^{\text{rd}}$  quadrants is from minimum  $ds^2$ ). Following the energy increase for Newpde states  $\mu 1S_{1/2}$  then is not a constant in time because of eq.12 angle Newpde zitterbewegung variable contribution (sect.2.1) to the  $\delta z$  chord perturbation of the  $45^\circ$  (fig6 below.) The  $68.7^\circ = \text{Arctan}(\delta z/C_M)$  is from eq.4 quadratic equation at the Fiegenbaum point. (so it gives our *fundamental* (excited state Mandelbulb) mass  $\tau 2S_{1/2}$  that never changes allowing us to normalize it to 1). Next is the Newpde composite  $3e 2P_{3/2}$  state at  $r=r_H$ . with its quantized B flux giving a large  $\gamma$  for each of the 2 positrons. Since the S and P states don't interact these states are degenerate giving the same reduced mass for each  $(\tau + \mu)/2 = \gamma m_e + \gamma m_e = m_p$ . Note also that the *real* component of eq.5 is the Minkowski metric implying these  $\gamma$  boosts. For  $N=1$  eq.3 implies  $C = \delta z \delta z / \xi$  so that  $1/\delta z \delta z = 1/(\text{Mandelbulb radius})^2 = \text{mass}$  (from fig6). or as fraction of  $\tau$ , electron  $\Delta\varepsilon = .00058$  (18)

But  $\gamma$  (observer)  $= \gamma$  (observable) so for the  $N=0$  observable we got the  $\gamma$  from the  $N=1$  observer case in  $r_H = C_M/\gamma = C_M/\xi = C$  for small  $C$  and so postulate 1.

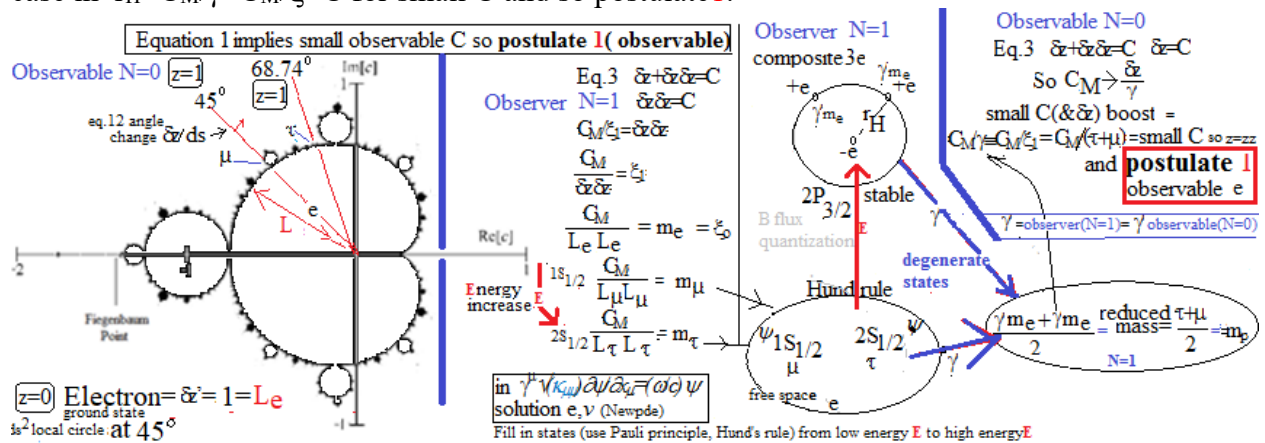


Fig.6 Conclusion

So the **small C** at the end was required. So we really did just **postulate 1**

So we just do *what is simplest* (let Occam be your guide), just **postulate 1**: the physics (Newpde) will then follow, top down:

\* **Ultimate Occam's Razor** (observable)

It means here *ultimate* simplicity, the *simplest* idea imaginable. So for example  $z=zz$  is *simpler* than  $z=zzzz$ . Therefore **1** in this context (uniquely algebraically defined by  $z=zz$ ) is this ultimate Occam's razor **postulate** since 0 (also from  $z=zz$ ) postulates literally *nothing*.

**3e Stability:**  $\gamma$  must be stable to keep  $C$  small so to have “permanently” postulated 1. In that regard we can actually calculate  $m_p$  from the quantization of the magnetic flux  $h/2e=\Phi_0=BA$ ..Also using the Mandelbrot set (fig.6)  $2m_p=\tau+\mu+e=\xi_1$  (18) written as  $e^{i(\varepsilon+\Delta\varepsilon)}$  (eq.D9 , eq17 outside  $r_H$  in D18 hence the ‘i’) This relation with  $h$  just sets the  $h$ . and the location of object B sets the actual magnitude of  $m_e$ .(eq.D9). *Stability* is also implied by  $(dt')^2=(1-r_H/r)dt^2$  since clocks stop at  $r=r_H$ . That 3<sup>rd</sup> mass also reverses the (possible) pair annihilation with virtual pair creation inside the  $r_H$  volume given  $\sigma=\pi r_H^2\approx(1/20)$  barns which is the reason why only composite 3e gives stability and not other larger composites(except multiples of 3e itself i.e., nucleons). Note here we also derived baryon physics ( $m_p$ ). See Chapters 8,9,10 Frobenius series solution. partII This composite 3e stability then makes this small  $C$  limit always true and so our **postulate1** always true. **We really did just postulate 1 !**

### 2.3 Left end small $drdt$ (eq.6) extremum **Fiegenbaum point** Fractalness

The Fiegenbaum point (11a) is the only part of the Mandelbrot set we use. At the Fiegenbaum point (imaginary) time  $X10^{-40}=\Delta$  and real  $-1.40115$ . Since  $|C_M|>>0$  in eq.2 postulated eq.1  $z=zz$  implies a boosted SR Lorentz transformation universal reference frame to random (since this transformation cancels noise  $C$  in eq.2, fig6), small  $C_M$  subset  $C\approx\delta z'$  (from eq.3) =real distance =real $\delta z/\gamma=1.4011/\gamma=C_M/\gamma\equiv C_M/\xi_1$  using large  $\xi_1$ . Note at the Fiegenbaum point distance  $1.4011/\gamma$  shrinks a lot but time  $X10^{-40}\gamma$  doesn't get much bigger since it was so small to begin with at the Fiegenbaum point. Eq.1 then means we have Ockam's razor optimized **postulated 1**. Given the New pde  $r_H$  we only see the  $r_H=e^2 10^{40N}/m$  sources from our  $N=0$  observer baseline. We never see the  $r<r_H$  <http://www.youtube.com/watch?v=0jGaio87u3A> which explores the Mandelbrot set interior near the Fiegenbaum point. Reset the zoom start at such extremum  $S_N C_M=10^{40N} C_M$  in eq.13. The splits are in 3 directions from the orbs. There appear to be about 2.5 splits going by each second (given my PC baud rate) and the next Mandelbrot set comes up in about 62 seconds. So  $3^{2.7\times 62}=10^N$  so  $172\log 3=N=82$ . So there are  $10^{82}$  splits. So there are about  $10^{82}$  splits per initial split. But each of these Mandelbrot set Fiegenbaum points is a  $C_M/\xi\equiv r_H$  in electron (eq.13 above). So for each larger electron there are  **$10^{82}$  constituent electrons**. Also the scale difference between Mandelbrot sets as seen in the zoom is about  **$10^{40}$ , the scale change** between the classical electron radius and  $10^{11}ly$  with the  $C$  noising giving us our fractal universe.

Recall again we got from eq.3  $\delta z+\delta z\delta z=C$  with quadratic equation result:

$\delta z = \frac{-1\pm\sqrt{1-4C}}{2}$ . is real for noise  $C<1/4$  creating our noise on the  $N=0$  th fractal scale. So  $1/4=(3/2)kT/(m_p c^2)$ . So  $T$  is 20MK. So here we have *derived the average temperature of the universe* (stellar average). That  $z'=1+\delta z$  substitution also introduces Lorentz transformation rotational and translation noise that does not effect the number of splits, analogous to how a homeomorphism does not change the number of holes (which is a Topological invariant).

So the excess C noise (due to that small C' boost) causes the Fiegenbaum point neighborhood internal structure to become randomized (as our present universe is) but the number of electrons ( $10^{82}$ ) remains invariant. See appendix D mixed state case2 for further organizational effects.  $N=r^D$ . So the **fractal dimension**=  $D=\log N/\log r=\log(\text{splits})/\log(\#r_H \text{ in scale jump})$   
 $=\log 10^{80}/\log 10^{40}=\log(10^{40})^2/\log(10^{40})=2$ . (See appendix E for Hausdorff dimension & measure) which is the same as the 2D of eq.4 and the Mandelbrot set. The next smaller (subatomic) fractal scale  $r_1=r_H=2e^2/m_e c^2$ ,  $N=0$ th,  $r_2=r_H=2GM/c^2$  is defined as the  $N=1$  th where  $M=10^{82}m_e$  with  $r_2=10^{40}r_1$  So the Fiegenbaum pt. gave us a lot of physics:  
 eg. **#of electrons in the universe, the universe size, temp.**

**2.3 Results:** What makes this all work is (**Postulate 1**→Newpde). Postulate 1 is the simplest idea imaginable: a Occam's razor *optimized* theory. We *also* get the *actual* physics with the Newpde (Therefore the usual postulating of hundreds of Lagrange densities, free parameters, dimensions ,etc., is senseless.).

For example (appendixC) *Newpde composite 3e*  $2P_{3/2}$  at  $r=r_H$  is the proton: That B flux quantization(C3) implies a big proton mass implying high speed  $\gamma=917$  positrons and so the Fitzgerald **contracted E field lines are the strong force**: we finally understand the strong force! So these two positrons then have big mass *two body* motion(partII) so **ortho(s,c,b) and para(t) excited (multiplet) states** understood. Eq.12 implies *Composite e,v* at  $r=r_H$  is **the electroweak SM** (appendixA) **Special relativity** is that Minkowski result. **With the Eqs.16  $\psi$**  (sect.B3) **we finally understand Quantum Mechanics** for the first time and eq.4 **gave us a first principles derivation of r,t space-time** for the first time. That Newpde  $\kappa_{\mu\nu}$  metric (In eq.14), on the  $N=-1$  next smaller fractal scale(1) so  $r_H=10^{-40}2e^2/m_e c^2\equiv 2Gm_e/c^2$ , is the Schwarzschild metric since  $\kappa_{00}=1-r_H/r=1/\kappa_{rr}$  (15): **we just derived General Relativity(gravity) from quantum mechanics in one line**. The Newpde zitterbewegung expansion component ( $r<r_c$ ) on the next larger fractal scale is the universe expansion: **we just derived the expansion of the universe in one line**. The Newpde appendix C derivation of those precision QED values (eg.,Lamb shift sect.C1) allow us to **abolish the renormalization and infinities**. So there is no need for those many Lagrangian density postulates anymore, just postulate 1 instead

**Postulate 1 (observable)**

**So observer 1UC $\equiv$ 1+C thereby defining(deriving) set theory**

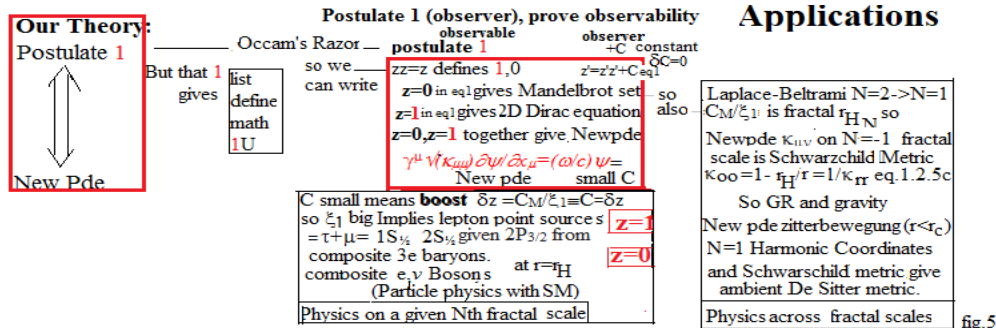
**1U**

**Real# Mathematics from Postulate 1**

The postulate 1 also gives the *list-define* math (B2) *list* cases  $1\cup 1\equiv 1+1\equiv 2$ , *define*  $a=b+c$  (So no other math axioms but 1.) and Cauchy sequence proof (2)of real number eigenvalues (sect.2.1)from the Mandelbrot set iteration formula. That means the **mathematics and the physics** come from (**postulate 1**→Newpde): *everything*. Recall from eq.7 that  $dr+dt=ds$ . So combining in quadrature eqs 7&11  $SNR\delta z ((dr/ds+dt/ds)\delta z=((dr+dt)/ds)\delta z=(1)\delta z$  (11a,appendF) and so having come *full circle* back to postulate 1 as a real eigenvalue ( $1\equiv$ Newpde electron). So we really do have a binary physics signal. So, having come *full circle* then:

**(postulate 1 $\Leftrightarrow$  Newpde)**

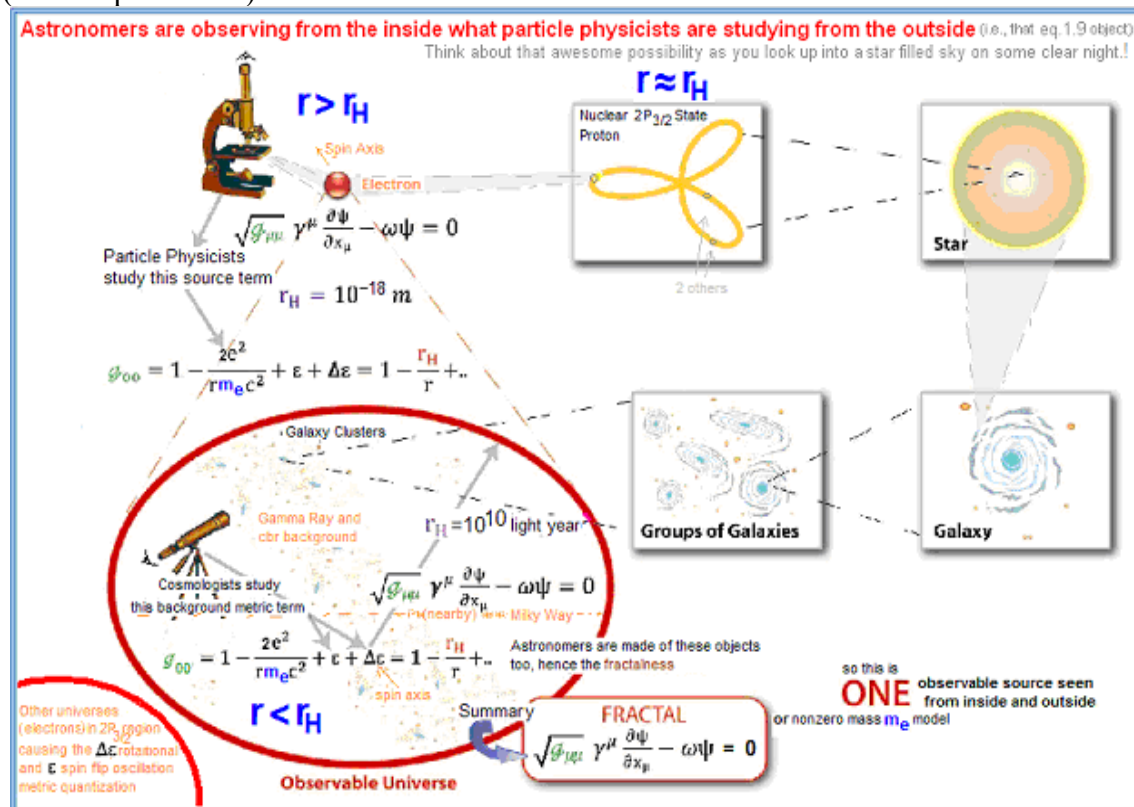
**Mathematical Notion (of postulate 1 $\Leftrightarrow$ Newpde)**



## Intuitive Notion (of postulate 1 $\Leftrightarrow$ Newpde)

The Mandelbrot set introduces that  $r_H = C_M / \xi_1$  horizon in  $\kappa_{00} = 1 - r_H / r$  in the Newpde, where  $C_M$  is fractal by  $10^{40} \times$  scale change (fig.2) So we have found ([davidmaker.com](http://davidmaker.com)) that: Given that fractal selfsimilarity astronomers are observing from the inside of what particle physicists are studying from the outside, that **ONE** New pde e electron  $r_H$ , **one** thing (fig.1). *Everything* we observe big (cosmological) and small (subatomic) is then that (New pde)  $r_H$ , even baryons are composite 3e. So we understand, *everything*. This is the only Occam's razor optimized first principles theory

**Summary:** So instead of doing the usual powers of 10 simulation we do a single power of  $10^{40}$  simulation and we are immediately back to where we started! Think about that as you gaze up into a star filled sky some evening! We really then understand how there could ONE object (that we postulated).





(↑lowest left corner) Object B caused perturbation structure jumps: void→galaxy→globular,,etc.

## References

(6) Penrose in a utube video implied that the Mandelbrot set might contain physics. Here we merely showed how to find it. For example the (fractal Mandelbulb neighborhood area  $|\text{drdt}| > 0$  of the) Feigenbaum point is a subset (containing that  $10^{40}$  Xselfsimiilar scale jump: Fig1)

(7) Cantor: Ueber die Ausdehnung eines Satzes aus der Theorie der trigonometrischen Reihen, “Ueber eine elementare Frage der Mannigfaltigkeitslehre” Jahresbericht der Deutschen Mathematiker-Vereinigung.” Mandelbrot set iteration sequence  $z_n$   $C_M = -1/4$ ,  $z_0 = 0$  same as Cauchy seq. since it begins with rational number  $-1/4$ , allowing the (C’ uncertainty) dr neighborhood of 0 to have a nonzero probability of being a real number and thereby giving real eigenvalues to the equation 11 operator formalism after the small C’ boost to get observability around  $\text{dr}=0$ .Sect.3.1.

## (12)Equation 12 implications for Rotation

Recall from sect.1 eq.3 that  $\delta C = \delta(\delta z + \delta z \delta z) = \delta \delta \delta z(1) + \delta \delta z(\delta z) + (\delta z)\delta \delta z = \delta C = 0$  so C is split between  $\delta \delta z$  noise and  $\delta z \delta z$  classical invariance  $\text{ds}^2$  proper time.

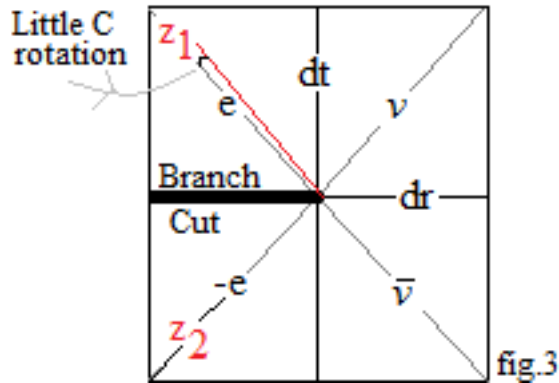
Recall at  $N=0$  the  $N=1$   $|\delta z| \gg 1$  &  $C_M \gg 1$ . So  $\delta z \delta z \approx C_M$  there so equation 5 holds then. But  $\frac{\delta z'}{\text{ds}} = \pm 45^\circ$  ( $\pi/4$ ) extremum at  $N=0$  (SM) and  $N=-1$  (GR) is also a solution for observer  $N=1$ .

So as the  $\gamma$  boosted observer  $\delta z/\gamma$ ,  $C/\gamma$ , gets smaller than the huge  $N=1$  scale (so higher energy, smaller wavelength, beam probes)  $\delta \delta z(1)/\text{ds}$  noise angle gets relatively larger (relative to  $\delta(\delta z \delta z)/\text{ds}$ , sect.1) until finally the next smaller  $N=0$  (and next smaller one after that,  $N=-1$ ) is fractal scale is that sect.1 big angle  $\pm 45^\circ$  required extremum solution (Recall ‘extremum’s are our solutions.)  $45^\circ = \pi/4 \approx 1 \approx \delta z'/\text{ds}(\text{observable}) = C_{\text{Mend}}/\text{ds} = \theta$  (in equation 12). So here all four  $\theta \pm 45^\circ \times 2$  rotations of **Composite e,v** implied by eq.12. So we have the  $N=0$ ,  $N=-1$  solutions for  $\delta z'$  angle perturbation of  $N=1$ . Observer  $\gamma =$ . Observable  $\gamma$  So

## I→II, II→III, III→IV, IV→I rotations in eq.7-9 plane Give SM Bosons

For  $z=0$   $\delta z'$  is big in  $z'=1+\delta z$  and so we have again  $\pm 45^\circ$  min ds and so two possible  $45^\circ$  rotations so through a total of two quadrants for  $\pm \delta z'$  in eq.12. one such rotation around an around a axis (SM) and the other around a diagonal (SC). Note in fig.3 dr,dt is also a rotation. and so has an eq.11 rotation operator observable  $\theta$ . Thus from equation 11 for ( $\theta$ ) angle rotations  $\theta \delta z \equiv (\text{dr}/\text{ds})\delta z = -i\partial(\delta z)/\partial r$  for the first  $45^\circ$  rotation. So we got through one Newpde derivative for each  $45^\circ$  rotation. For the next  $45^\circ$  rotation in fig.4 it is then a second derivative  $\theta \theta \delta z' = e^{i\theta p} e^{i\theta'} \delta z = e^{i(\theta p + \theta')} \delta z = (\text{dr}/\text{ds})((\text{dr}/\text{ds})\text{dr}') = -i\partial(-i\partial(\text{dr}'))/\partial r \partial r = -\partial^2(\text{dr}')/\partial r^2$  large angle rotation in figure 3. In contrast for  $z=1$ ,  $\delta z'$  small so  $45^\circ$ - $45^\circ$  small angle rotation in figure 3 (so then  $N=-1$ ). Do the same with the time t and get for  $z=0$  rotation of  $45^\circ + 45^\circ$  (fig.4) then  $\theta \theta \delta z' = (\text{d}^2/\text{dr}^2)z' + (\text{d}^2/\text{dt}^2)\delta z'$  (A1)





for  $45^\circ-45^\circ$

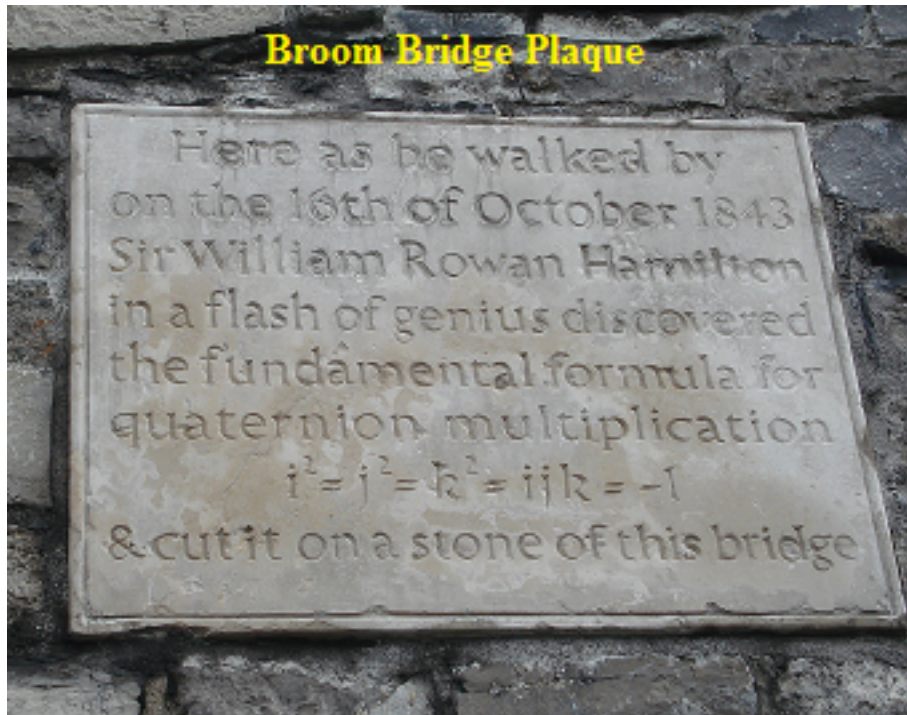
Note also the para two body spin states  $\Delta S = \frac{1}{2} - \frac{1}{2} = 0$  (sect.4.5, pairing interaction).

Note we also get these Laplacians characteristic of the Boson field equations by those  $45^\circ+45^\circ$  rotations so eq.16 implies Bosons accompany our leptons (given the  $\delta z'$ ), **so these leptons exhibit "force"**.

#### Newpde $r=r_H, z=0$ , $45^\circ+45^\circ$ rotation of composites $e, v$ implied by Equation 12

So  $z=0$  allows a large  $C$   $z$  rotation application from the 4 different axis' max extremum (of eq.16) branch cuts gives the 4 results:  $Z, +W$ , photon bosons of the Standard Model. So we have derived the Standard Model of particle physics in this very elegant way (from the four axis'). You are physically at  $r=r_H$  if you rotate through the electron quadrants (I, IV).of eq.7-9. So we have large  $C_M$  dichotomic  $90^\circ$  rotation to the next Reimann surface of eq.12, eq.A1  $(dr^2+dt^2)z''$  from some initial extremum angle(s)  $\theta$ . Eq.12 solutions imply complex 2D plane Stern Gerlach dichotomic rotations using eq.A1 thereby using Pauli matrices  $\sigma_i$  algebra, which maps one-to-one to the quaternion algebra. Using eq.12 we start at some initial angle  $\theta$  and rotate by  $90^\circ$  the noise rotations are:  $C=\delta z'' = [e_L, \forall_L]^T \equiv \delta z'(\uparrow) + \delta z'(\downarrow) \equiv \psi(\uparrow) + \psi(\downarrow)$  has a eq.12 infinitesimal unitary generator  $\delta z'' \equiv U = 1 - (i/2)\epsilon n^* \sigma$ ,  $n \equiv \theta/\epsilon$  in  $ds^2 = U^t U$ . But in the limit  $n \rightarrow \infty$  we find, using elementary calculus, the result  $\exp(-(i/2)\theta^* \sigma) = \delta z''$ . We can use any axis as a branch cut since all 4 are eq.16 large extremum so for the 2<sup>nd</sup> rotation we move the branch cut  $90^\circ$  and measure the angle off the next diagonal since Pauli matrix dichotomic rotations are actually axis rotations, leaving our  $e$  and  $v$  directions the same. In any case  $(dr+dt)z''$  in eq.16 can then be replaced by eq.A1  $(dr^2+dt^2+..) \delta z'' = (dr^2+dt^2+..) e^{\text{quaternion} A}$  Bosons because of eq.A1.

A2 Then use eq. 12 and quaternions to rotate  $\delta z''$  since the quaternion formulation is isomorphic to the Pauli matrices.  $dr' = \delta z'_r = \kappa_r dr$  for **Quaternion**  $A$   $\kappa_{ii} = e^{iA_i}$ .



**Appendix A Quaternion** ansatz  $\kappa_r = e^{iA_r}$  instead of  $\kappa_r = (dr/dr')^2$  in eq.14.  $N=0$ .

A1 for the eq.12: large  $\theta = 45^\circ + 45^\circ$  rotation (for  $N=0$  so large  $\delta z' = \theta r_H$ ). Instead of the equation 13,15 formulation of  $\kappa_{ij}$  for small  $\delta z'$  ( $z=0$ ) and large  $\theta = 45^\circ + 45^\circ$  we use  $A_r$  in  $dr$  direction with  $dr^2 = x^2 + dy^2 + dz^2$ . So we can again use 2D ( $dr, dt$ )  $E = 1/\sqrt{\kappa_{00}} = 1/\sqrt{e^{iA_i}} = e^{-iA/2}$ . The 1 is mass energy and the first real component after that in the Taylor expansion is field energy  $A^2$

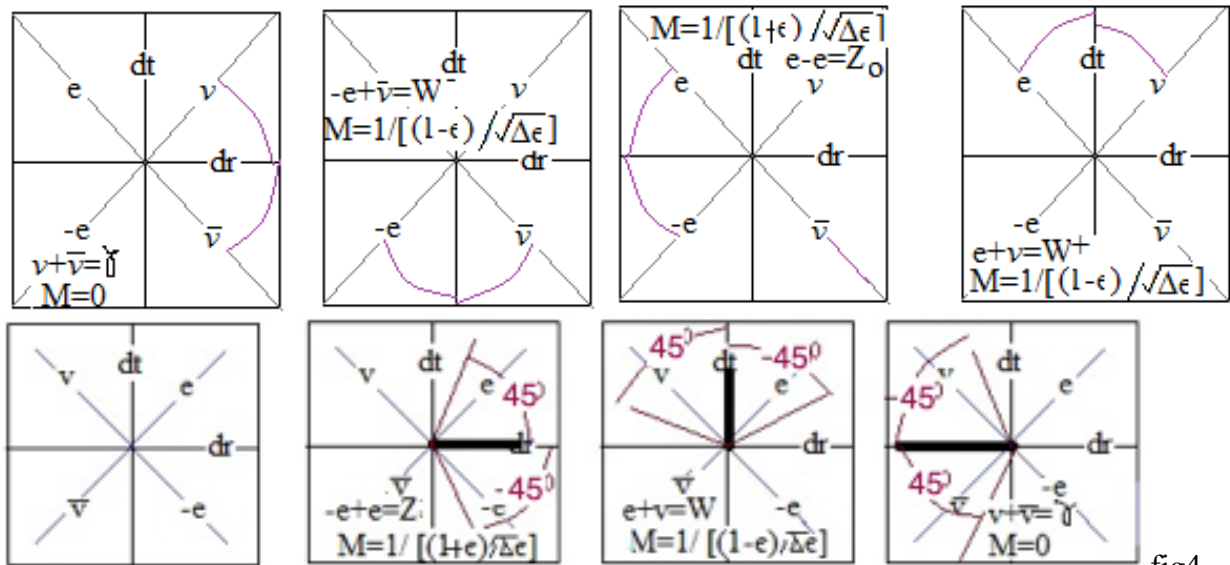


Fig.4 applies to eq.9  $45^\circ + 45^\circ = 90^\circ$  case: **Bosons**.

A2 These quadrants were defined in eq.7-9 and used in eq.12. The Appendix A4 derivation applies to the far right side figure. Recall from eq.12  $z=0$  result  $C_M = 45^\circ + 45^\circ = 90^\circ$ , gets Bosons.  $45^\circ - 45^\circ =$  leptons. The  $v$  in quadrants II (eq.5) and III (eq.9).  $e$  in quadrants I (eq.7) and IV (eq.7). Locally normalize out  $1+\epsilon$  (appendix D). For the **composite**  $e, v$  on those required large  $z=0$  eq.9

rotations for  $C \rightarrow 0$ , and for stability  $r=r_H$  (eg., for  $2P_{1/2}$ ,  $I \rightarrow II$ ,  $III \rightarrow IV$ ,  $IV \rightarrow I$ ) unless  $r_H=0$  ( $II \rightarrow III$ )  
Example:

**A4 Quadrants II→III rotation** eq.A2  $(dr^2+dt^2+..)e^{\text{quaternion } A}$  =rotated through  $C_M$  in eq.16.

example  $C_M$  in eq.A1 is a  $90^\circ$  CCW rotation from  $45^\circ$  through  $v$  and antiv

$A$  is the 4 potential. From eq.9b we find after taking logs of both sides that  $A_0=1/A_r$  (A2)

Pretending we have a only two  $i, j$  quaternions but still use the quaternion rules we first do the  $r$

derivative: From eq. A1  $dr^2\delta z = (\partial^2/\partial r^2)(\exp(iA_r+jA_0)) = (\partial/\partial r)[(i\partial A_r/\partial r + \partial A_0/\partial r)(\exp(iA_r+jA_0))]$   
 $= \partial/\partial r[(\partial/\partial r)iA_r + (\partial/\partial r)jA_0](\exp(iA_r+jA_0)) + [i\partial A_r/\partial r + j\partial A_0/\partial r]\partial/\partial r(\exp(iA_r+jA_0)) +$   
 $(i\partial^2 A_r/\partial r^2 + j\partial^2 A_0/\partial r^2)(\exp(iA_r+jA_0)) + [i\partial A_r/\partial r + j\partial A_0/\partial r][i\partial A_r/\partial r + j\partial/\partial r(A_0)] \exp(iA_r+jA_0)$  (A3)

Then do the time derivative second derivative  $\partial^2/\partial t^2(\exp(iA_r+jA_0)) = (\partial/\partial t)[(i\partial A_r/\partial t + \partial A_0/\partial t)$   
 $(\exp(iA_r+jA_0))] = \partial/\partial t[(\partial/\partial t)iA_r + (\partial/\partial t)jA_0](\exp(iA_r+jA_0)) +$

$[i\partial A_r/\partial t + j\partial A_0/\partial t]\partial/\partial r(\exp(iA_r+jA_0)) + (i\partial^2 A_r/\partial t^2 + j\partial^2 A_0/\partial t^2)(\exp(iA_r+jA_0))$   
 $+ [i\partial A_r/\partial t + j\partial A_0/\partial t][i\partial A_r/\partial t + j\partial/\partial t(A_0)] \exp(iA_r+jA_0)$  (A4)

Adding eq. A2 to eq. A4 to obtain the total D'Alambertian  $A_3+A_4=$

$[i\partial^2 A_r/\partial r^2 + i\partial^2 A_r/\partial t^2] + [j\partial^2 A_0/\partial r^2 + j\partial^2 A_0/\partial t^2] + ii(\partial A_r/\partial r)^2 + ij(\partial A_r/\partial r)(\partial A_0/\partial r)$   
 $+ ji(\partial A_0/\partial r)(\partial A_r/\partial r) + jj(\partial A_0/\partial r)^2 + ii(\partial A_r/\partial t)^2 + ij(\partial A_r/\partial t)(\partial A_0/\partial t) + ji(\partial A_0/\partial t)(\partial A_r/\partial t) + jj(\partial A_0/\partial t)^2$  .

Since  $ii=-1$ ,  $jj=-1$ ,  $ij=-ji$  the middle terms cancel leaving  $[i\partial^2 A_r/\partial r^2 + i\partial^2 A_r/\partial t^2] +$

$[j\partial^2 A_0/\partial r^2 + j\partial^2 A_0/\partial t^2] + ii(\partial A_r/\partial r)^2 + jj(\partial A_0/\partial r)^2 + ii(\partial A_r/\partial t)^2 + jj(\partial A_0/\partial t)^2$

Plugging in A2 and A4 gives us cross terms  $jj(\partial A_0/\partial r)^2 + ii(\partial A_r/\partial t)^2 = jj(\partial(-A_r/\partial r))^2 + ii(\partial A_r/\partial t)^2$

$=0$ . So  $jj(\partial A_r/\partial r)^2 = -jj(\partial A_0/\partial t)^2$  or taking the square root:  $\partial A_r/\partial r + \partial A_0/\partial t = 0$  (A5 )

$i[\partial^2 A_r/\partial r^2 + i\partial^2 A_r/\partial t^2] = 0$ ,  $j[\partial^2 A_0/\partial r^2 + i\partial^2 A_0/\partial t^2] = 0$  or  $\partial^2 A_\mu/\partial r^2 + \partial^2 A_\mu/\partial t^2 + .. = 1$  (A6)

A4 and A5 are **Maxwell's equations** (Lorentz gauge formulation) in free space, if  $\mu=1,2,3,4$ .

$$\square^2 A_\mu = 1, \quad \square \cdot A_\mu = 0 \quad (A7)$$

The Lorentz gauge is the only gauge hence it is **no gauge** at all and we have avoided the Maxwell overdeterminism problem (8eq., 6 unknowns  $E_i, B_i$ ). Must use Newpde 4D orthogonalization here

Amplitudes of physical processes in QED in the noncovariant Coulomb gauge coincide with those in the covariant Lorenz gauge. The Aharonov–Bohm effect depends on a line integral of  $A$  around a closed loop, and this integral is not changed by  $A \rightarrow A + \nabla\psi$  which doesn't change  $B = \nabla \times A$  either. So formulation in the Lorenz gauge works.

## A5 Other $45^\circ+45^\circ$ Rotations (Besides above quadrants II→III)

For the **composite e,v** on those required large  $z=0$  eq.12 rotations for  $C \approx 0$ , and for stability  $r=r_H$  for  $2P_{1/2}$  ( $I \rightarrow II$ ,  $III \rightarrow IV$ ,  $IV \rightarrow I$ ) unless  $r_H=0$  ( $II \rightarrow III$ ) are:

**Ist→IInd quadrant rotation** is the  $W^+$  at  $r=r_H$ . Do similar math to A2-A7 math and get instead a Proca equation The limit  $\varepsilon \rightarrow 1 = \tau$  (D13) in  $\xi_1$  at  $r=r_H$ . since Hund's rule implies  $\mu = \varepsilon = 1S_{1/2} \leq 2S_{1/2} = \tau = 1$ . So the  $\varepsilon$  is negative in  $\Delta\varepsilon/(1-\varepsilon)$  as in case 1 charged as in appendix C1 case 2.

$E = 1/\sqrt{(k_{00})} - 1 = [1/\sqrt{(1-\Delta\varepsilon/(1-\varepsilon)-r_H/r)}] - 1 = [1/\sqrt{(\Delta\varepsilon/(1-\varepsilon))}] - 1$ .  $E_t = E + E = 2/\sqrt{(\Delta\varepsilon/(1-\varepsilon))} = W^+$  mass.

$E_t = E - E$  gives E&M that also interacts weakly with weak force.

**IIIrd →IV quadrant rotation** is the  $W^-$ . Do the math and get a Proca equation again.

$E = 1/\sqrt{(k_{00})} - 1 = [1/\sqrt{(1-\Delta\varepsilon/(1-\varepsilon)-r_H/r)}] - 1 = [1/\sqrt{(\Delta\varepsilon/(1-\varepsilon))}] - 1$ .  $E_t = E + E = 2/\sqrt{(\Delta\varepsilon/(1-\varepsilon))} = W^-$  mass.

$E_t = E - E$  gives E&M that also interacts weakly with weak force.

**IVth → Ist quadrant rotation** is the  $Z_0$ . Do the math and get a Proca equation.  $C_M$  charge cancelation. D14 gives  $1/(1+\varepsilon)$  gives 0 charge since  $\varepsilon \rightarrow 1$  to case 1 in appendix C2.

$E = 1/\sqrt{\kappa_{00}} - 1 = [1/\sqrt{(1-\Delta\varepsilon/(1+\varepsilon)-r_H/r)}] - 1 = [1/\sqrt{(\Delta\varepsilon/(1+\varepsilon))}] - 1$ .  $E_t = E + E = 2/\sqrt{(\Delta\varepsilon/(1+\varepsilon))} - 1 = Z_0$  mass.  $E_t = E - E$  gives E&M that also interacts weakly with weak force. Seen in small left handed polarization rotation of light.

**IInd→IIIrd quadrant rotation** through those 2 neutrinos gives 2 objects.  $r_H = 0$

$E = 1/\sqrt{\kappa_{00}} - 1 = [1/\sqrt{(1-\Delta\varepsilon/(1+\varepsilon))}] - 1 = \Delta\varepsilon/(1+\varepsilon)$ . Because of the  $\pm$  square root  $E = E + -E$  so E rest mass is 0 or  $\Delta\varepsilon = (2\Delta\varepsilon)/2$  reduced mass.

$E_t = E + E = 2E = 2\Delta\varepsilon$  is the pairing interaction of SC. The  $E_t = E - E = 0$  is the 0 rest mass photon Boson. Do the math (eq.A2-A7) and get Maxwell's equations. Note there was no charge  $C_M$  on the two  $\nu$  s. Note we get SM particles out of composite e,  $\nu$  using required eq.9 rotations for

## A6 Object B Effect On Inertial Frame Dragging (from appendix D)

The fractal implications are that we are inside a cosmological positron inside a proton  $2P_{3/2}$  at  $r=r_H$  state. The cosmological object (electron) we are inside of is a positron and call it object A which orbits electron object B with a given distant  $3^{rd}$  object C. Object B is responsible for the mass of the electron since it's frame dragging creates that Kerr metric  $(a/r)^2 = m_e c^2$  (D9) result used in eq.D9. So Newpde ground state  $m_e c^2 \equiv \langle H_e \rangle$  is the fundamental Hamiltonian eigenvalue defining idea for composite e,  $\nu$ ,  $r=r_H$  implying Fermi 4 point  $E = \int \psi^\dagger H \psi dV = \int \psi^\dagger \psi H dV = \int \psi^\dagger \psi G$  Recall for composite e,  $\nu$  all interactions occur inside  $r_H$   $(4\pi/3)\lambda^3 = V_{r_H}$ .  $\frac{1}{V^{1/2}} = \psi_e = \psi_3 \frac{1}{V^{1/2}} =$

$$\psi_\nu = \psi_4 \text{ so } 4pt \iiint_0^{r_H} \psi_1 \psi_2 \psi_3 \psi_4 dV = 2G \iiint_0^{r_H} \psi_1 \psi_2 \frac{1}{V^{1/2}} \frac{1}{V^{1/2}} V \\ \equiv \iiint_0^{r_H} \psi_1 \psi_2 G \equiv \iiint_0^{r_H} \psi_1 \psi_2 (2m_e c^2) dV_{r_H} = \iiint_0^{r_H} \psi_1 (2m_e c^2) \psi_2 dV_{r_H} \quad (A8)$$

## Application of Eq.A8 To Ortho states (created by that $2P_{3/2}$ 2body motion at $r=r_H$ )

The composite  $3e$  ortho state (partII) operator adds spin (eg., as in  $2^{nd}$  derivative eq.A1) so  $2^{nd}$  derivative  $\Sigma((\gamma^\mu \sqrt{\kappa_{\mu\mu}} dx_\mu) - i\kappa)(\gamma^\nu \sqrt{\kappa_{\nu\nu}} dx_\nu + i\kappa)\chi = \Sigma((\gamma^\mu \sqrt{\kappa_{\mu\mu}} dx_\mu) - i\kappa)\psi$  so  $\frac{1}{2}(1 \pm \gamma^5)\psi = \chi$ . In that regard the expectation value of  $\gamma^5$  is speed and varies with  $e^{i3\phi/2}$  in the trifold. The spin  $1/2$  decay proton  $S_{1/2} \propto e^{i\phi/2} \equiv \psi_1$ , the original ortho  $2P_{1/2}$  particle is chiral  $\chi = \psi_2 \equiv \frac{1}{2}(1 - \gamma^5)\psi = \frac{1}{2}(1 - \gamma^5 e^{i3\phi/2})\psi$ . Initial  $2P_{1/2}$  electron  $\psi$  is constant. Start with initial ortho state  $\chi$ . These  $\gamma^5$  terms then modify equation

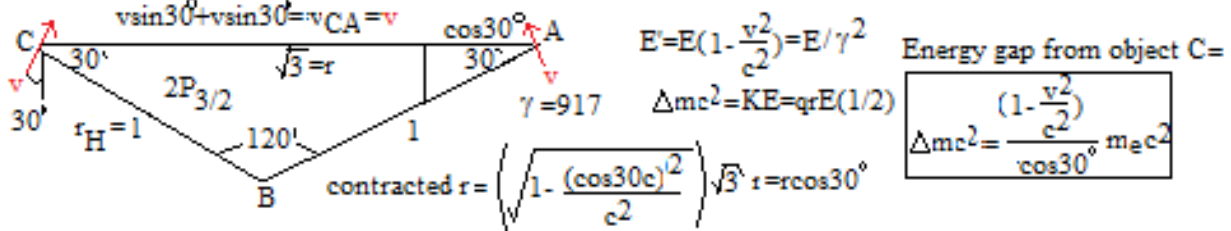
$$A8 \text{ to read } = \iiint_0^{r_H} \psi_1 \psi_2 (2m_e c^2) dV_{r_H} = \iint \psi_{S1/2}^* (2m_e c^2 V_{r_H}) \chi dV_\phi = K \int \langle e^{i\frac{\phi}{2}} [\Delta\varepsilon V_{r_H}] \left( 1 - \gamma^5 e^{i\frac{3\phi}{2}} \right) \psi \rangle d\phi = K G_F \int \langle e^{i\phi/2} - \gamma^5 i e^{i(4/2)\phi} \rangle d\phi = K G_F \left( \frac{2e^{i\phi}}{i} \Big|_0^{2\pi+C} - \frac{2\gamma^5 e^{i4\phi}}{i4} \Big|_0^{2\pi+C} \right) =$$

$k(1/4 + i\gamma^5) = k(.225 + i\gamma^5 0.974) = k(\cos 13^\circ + i\gamma^5 \sin 13^\circ)$  **deriving the 13° Cabbibo angle**. With previously mentioned CP result (direct evidence of fractal universe) get CKM matrix.

## A7 Object C Effect on Inertial Frame Dragging and $G_F$ found by using eq.A8 again

**Review of  $2P_{3/2}$**  Next higher fractal scale ( $X10^{40}$ ), cosmological scale. Recall from D9  $m_e c^2 = \Delta\varepsilon$  is the energy gap for object B vibrational stable iegenstates of composite  $3e$  (vibrational perturbation  $r$  is the only variable in Frobenius solution, partII Ch.8,9,10) proton. Observer in objectA. From fig.7  $v \sin 30^\circ + v \sin 30^\circ = v$ . From fig 7  $r^2 = 1^2 + 1^2 + 2(1)(1)\cos 120^\circ = 3$ , so  $r = \sqrt{3}$ .

.866=cos30°. The E field in the forward or backward direction of the CA line (the weakest) due to a charge moving away is  $E'=(1-v^2/c^2)E=(1/\gamma^2)E=(1/917^2)E$  (from Feynman's lectures) where  $E=q/r^2$ . For circular motion in the proton around the central electron  $\frac{mv^2}{r} = qE$  **so that**  $\Delta mc^2 = KE = \frac{mv^2}{2} = q r_{CA} E_{CA} \frac{1}{2} = ((1/\gamma^2)q^2/r_{CA})(r_{CA}))^{1/2} = (1/\gamma^2)q(q/1^2))(1)^{1/2}/r_{CA} = ((1/\gamma^2)/r_{CA})[(qE_{AB}r_{AB})^{1/2}] = ((1/\gamma^2)/r_{CA})(m_e c^2) = \Delta mc^2$  in summary =object C scissors eigenstates.



### Multiple Applications Of The eq.B6

## Ultrarelativistic Object B Also Source Of The Mexican Hat Potential

So from the fractal theory object B has to be ultrarelativistic ( $\gamma=1836$ ) for the positrons to have the mass of the proton. So the time behaves like  $mc^2$  energy: has the same gamma:  $t \rightarrow t_0/\sqrt{(1-v^2/c^2)}=KH$  since energy  $H=m_0c^2$  has the same  $\gamma$  factor as time does. So in the  $e^{iHt}$  of object B the  $Ht/\hbar=(H/\sqrt{(1-v^2/c^2)})t_0/Kt_0=KH^2=\phi^2$ . Define  $\phi=H\sqrt{K}$ . Note also ultrarelativistically that  $p$  is proportional to energy: for ultrarelativistic motion  $E^2=p^2c^2+m_0^2c^4$  with  $m_0$  small so  $E=Kp$ .

$\phi' = p(t) = e^{iHt/\hbar} |p_0\rangle = \cos(Ht/\hbar) = \exp(iH^2 t_0 / K t_0) = \exp(i\phi^2) = \cos(\phi^2) = \phi' = 1 - \phi^4/2$ . Thus for a Klein Gordon boson we can write the Lagrangian as  $L = T - V = (d\phi/dx)(d\phi/dx) - \phi'^2 = (d\phi/dx)(d\phi/dx) - \phi'^2 = (d\phi/dx)(d\phi/dx) - i(1 - \phi^4)^2$ . Thus we define this Klein Gordon scalar field  $\phi$  by itself from:

$$D_\mu \phi = \left[ \partial_\mu + igW_\mu t + ig' \frac{1}{2} B_\mu \right] \phi$$

$$A_\mu = \cos\theta_W B_\mu + \sin\theta_W W_\mu^1$$



$$Z_\mu = -\sin\theta_W B_\mu + \cos\theta_W W_\mu^1$$

The left handed doublet was given by the fractal theory (section 4.4)

$$l_e = \begin{pmatrix} \nu_{EL} \\ e_L \end{pmatrix}$$

W is needed in W +B to bring in the epsilon ambient metric mass.

Need to add the second term to the Dirac equation to give the electron mass.

$$\Lambda L_e = e_R i \gamma^\mu (\partial_\mu - i g' B_\mu) e_R - f_\mu (l_e \phi_e + e_R \phi l_e)$$

Recall section 4.9 ambient metric requires division by  $(1+\varepsilon+\Delta\varepsilon+r_H/r)$  to create the nontrivial ambient metric term  $1\pm\varepsilon$ .

$\psi(t)=e^{iHt}\psi(t_0)=e^{i(1+\varepsilon+\Delta\varepsilon)^2 t}\psi(t_0)$ . See partIII

## A8 Derivation of the Standard Model from Newpde but with No Free parameters

Since we have now derived  $M_W$ ,  $M_Z$  and their associated Proca equations, and Dirac equations for  $m_\tau, m_\mu, m_e$  etc., and  $G, G_F, k_e^2$  Maxwell's equations, etc. we can now write down the usual Lagrangian densities that implies these results. In the formulation  $M_Z=M_W/\cos\theta_W$  you can find the Weinberg angle  $\theta_W$ ,  $\sin\theta_W=e/g$ ,  $g'\cos\theta_W=e$ ; solve for  $g$  and  $g'$ , etc., We will have thereby derived the standard model from first principles (i.e.,postulate1). **It no longer contains free**

## Appendix B

### B1 List-Define Mathematics from postulate 1 (Part2 for details) Ultimate Occam's razor (observable)

Note an ultimate Occam's razor[*observable*(1) requires an *observer*(C)] i.e.,just  $1\cup C\equiv 1+C$ . So union  $\cup$  came out of the observable component of the postulate.  $N=0$  **postulate 1** can also be used in a list-define math to get the *real number* algebra (without all those many Rel#math axioms).Eg.,  $1\cup 1\equiv 1+1$  (B2,Ch.2).

Postulate 1 (observable) So observer  $1\cup C\equiv 1+C$ .  $z=zz$  has both 1,0 as solutions so defining negation  $\sim$  with  $0=1-1$  Thus we can define intersection with  $\sim((A\cup B)\sim B\sim A)\equiv A\cap B$ . So we have intersection  $\cap$  so we have derived set theory.

So we have derived set theory, not postulated it. But in postulate 1  $z=zz$  why did 0 come along for the ride? There is a deeper reason in set theory. Note  $\emptyset$  and 0 aren't really new postulated 'observables' since they are literally postulating "nothing".

The null set  $\emptyset$  is the subset of every set. In the more fundamental set theory formulation

$$\{\emptyset\}\subset\{\text{all sets}\}\Leftrightarrow\{0\}\subset\{1\} \text{ since } \emptyset=\emptyset\cup\emptyset\Leftrightarrow 0+0=0, \{\{1\}\cup\emptyset\}=\{1\}\Leftrightarrow 1+0=1.$$

So list  $1\cup 1\equiv 1+1\equiv 2$ ,  $2\cup 1\equiv 1+2\equiv 3$ ,...all the way up to  $10^{82}$  (see Fiegenbaum point) and **define** all this list as  $a+b=c$ , etc., to create our algebra and numbers which we use to write [equation 1](#)

$z=zz+C$ ,  $\delta C=0$  for example. Recall every set has the null set as a subset. So from above set  $\{1\}$  ( $\xi_1$  for  $z=1$ ) has the 0 ( $\xi_0$  for  $z=0$  ground state) as a subset. So  $\xi_1=\xi_{2S1/2}+\xi_{1S1/2}+\xi_0=\tau+\mu+m_e$ .(B1)

**2 N=0 Small C boost circle observables.** Note that **real** component of eq.5 is Minkowski metric implying possible Lorentz transformation Fitzgerald contraction  $C/\gamma$  boosted C frames of reference. From eq.3 for  $N=0$ :  $C\approx\delta z$  and  $C\rightarrow C/\gamma=C_M/\gamma\equiv C_M/\xi$ . So from eq.3 for  $N=0$  in eq.12  $C_M/\xi=\delta z$  (eq.17)

$(C_M/\xi=\delta z\delta z$  for  $N=1)$  . So  $\delta C_M=0=\delta\delta z\xi+\delta\xi\delta z=0$  ( $N=0$ ). If  $z=0$  then  $\delta z'=-1$  (in  $z'=1+\delta z$ ) is big for  $N=0$ . In  $\delta C_M=0=\delta\delta z\xi+\delta\xi\delta z=0$  for  $\xi$  small then  $\delta\xi$  has to be small and so  $\xi$  is stable, electron  $\xi_0=\Delta\varepsilon$ . For  $z=1$  then  $\delta z$  is small on the  $N=0$  fractal scale thus  $\delta\xi$  and  $\xi$  are both big so unstable



and large mass. Everything, including that small mass stable  $\xi_o = \Delta \varepsilon$  electron, must have that large  $\xi$  in its  $r_H = C_M / \xi$  or not postulate 1 even though its  $\kappa_{oo} = e^{ii\Delta \varepsilon}$ . If it is not consistent with postulate 1 it does not exist.

Recall  $N > 0 \equiv$  observer. The Laplace Beltrami method (D4) gives what the  $N > 1$  observer sees *we see* (huge  $N=1$  cosmological motion) so we see it.

## Appendix C Stability of small C limit

### N=0 Magnetic Flux Quantization For Current Around Loop

Our Newpde II  $\rightarrow$  III quadrant eq.12 rotations (appendix A4) gave us Maxwell's equations and E&M so we can apply B fields here. We also derived quantum mechanics from that Circle equation (giving eq.11). Thus we can have quantization of the B field flux  $\oint \vec{B} \cdot d\vec{A} = \Phi_0 N$ . Just above (and below) the coil plane toward the edge of the coil the B direction changes and the magnitude of B goes up. So some  $\vec{B} \cdot d\vec{A} = \Delta \Phi$  minimum deviation from  $B dA$  for some constant  $|d\vec{A}|$  above the coil plane. Given B is perpendicular to  $dA$  at the center and the radius  $r_H$  of the coil cancels out (eq.2 below) this  $\Delta \Phi$  flux could be over the center where the relevant  $\gamma$  is needed. Thus we must write  $\Sigma \Delta \Phi = \Phi = BA = B \pi r_H^2$  with the B at the center of the coil for  $z=0$  (appendix). So effective  $r_H$  slightly bigger (making B smaller) but  $r_H$  cancels anyway. So

$$BA = \left( \frac{\mu_0 i}{2r_H} \right) \pi r_H^2 = \Phi_0 (\#2P_{3/2} \text{lobes}). \quad (1)$$

Also  $r_H = e^2 / m_e c^2$ ,  $q/t = i$ .  $q = e = 1.6 \times 10^{-19}$  C,  $\Phi_0 = \text{NIST: } 2.067833848 \times 10^{-15} \text{ Wb}$ ,  $1/\gamma$  dilation of  $r_H$  but it and  $r_H$  get canceled out here. The time  $t$  dilation  $\gamma$  remains in the current 'i' moving frame of reference. Recall that for circular motion:  $c = D/t = 2\pi r_H / t$  so:

$$t = \frac{2\pi r_H}{\gamma c}, \text{ so } i = \frac{e}{\left( \frac{2\pi r_H}{\gamma c} \right)}$$

$$BA = \frac{\mu_0 i}{2r_H} (\pi r_H^2) = \frac{\mu_0}{2r_H} \left( \frac{e}{\left( \frac{2\pi r_H}{\gamma c} \right)} \right) (\pi r_H^2) = \Phi_0 N = \frac{h}{2e} (3 \text{lobes} \times 2 \text{Positron Motion}) \quad (2)$$

$B = \mu_0 i / 2r_H$  is the minimum B inside the loop, and given  $r_H$  cancels out in eq.2, can be taken as a variational principle optimization of the energy  $B^2$ .

Each of the 2 positron flux contributions around the circle ( $N_1=2$ ). But each positron moves through all 3  $2P_{3/2} = N_2$  lobes. So doing the cancelations in eq.2:

$$\gamma (\mu_0 / 4) e c = (h / 2e) (2 \text{positrons} \times 3 \text{lobes}). \quad (3)$$

So

$\gamma (\mu_0 / 4) e c = (h / 2e) 6$ , But there already is a populated state (Hund's rule)  $1S_{1/2} (\mu) = .1125 = \mu/P$  so we add it in (For example recall in the hydrogen atom that the 1S states fill before the 2P states.).

So:

$$\gamma = \frac{h}{2e} 6(1 + \mu) \frac{1}{\frac{\mu_0}{4} e c} \quad (\text{Note that 4 cancels the 4 in } \mu_0 = 4\pi \times 10^{-7} \text{ Wb-m/Amps.})$$

$$\gamma = \frac{2.0678 \times 10^{-15} (6)(1 + \mu)}{\pi \times 10^{-7} 1.6 \times 10^{-19} 3 \times 10^8} = \frac{1.2407 \times 10^{-14} \times (1.11255)}{1.5086 \times 10^{-17}} = \frac{1.38034 \times 10^{-14}}{1.5086 \times 10^{-17}} = 915 \quad (4)$$

We must add in the  $3 \times .511 = 1.533$  for the 3 electrons

$$915 + 1.533 = 916.533$$

$2P_{3/2}$  at  $r = r_H$  implies also twice our 2 positron  $\gamma$  result will be the proton mass.

$$2(916.533) m_e c^2 = 1.50087 \times 10^{-10} \text{ J} = 937 \text{ Mev}$$

Finally we must add that 1Mev binding energy between that  $\mu$  and the (Fitzgerald contracted) net +e positrons and electron (Fitzgerald contracted to a point Coulomb source) from axial frame of reference (sect.10.5) and get 938.23Mev.

Actual proton mass= 938.272Mev= $m_p$ .

An exact answer!

938.272Mev= $m_p$  **Therefore we have derived the mass of the proton from first principles.**

Small C (Part II) of this book starts out with this result.

## Appendix D digital analogy of this theory

**Review** This is an Occam's razor *optimized* (i.e., ( $\delta C=0$ ,  $\|C\|=\text{noise}$ ))

POSTULATE OF **1**

So

$z=zz$  (2) is the algebraic definition of **1**,o and add real constant C (i.e.,  $z'=z'z'$ ,  $\delta C=0$ ) (1))

**Digital communication analogy:** Binary ( $z=zz$ ) 1,0 signal (Boolean algebra) with white noise  $\delta C=0$  in  $z'+C=z'z'$ . Recall the algebraic definition of 1 is  $z=zz$  which has solutions 1,0.(eq.11a)

Also you

could say white noise C has a variation of zero ( $\delta C=0$ ) making it easy to filter out (eg., with a Fourier cutoff filter).

So you could easily make the simple digital communication analogy of this being a binary ( $z=zz$ ) 1,0 signal with white noise  $\delta C=0$  in  $z'+C=z'z'$ .

(However the noise is added a little differently here ( $z+C=zz$ ) than in statistical mechanics (eg., There you might use deconvolved signal=convolution integral [(transfer function)signal]dA)). where the 'signal' actually would equal  $z+C$  So this is not quite the same math as in statistical mechanics.)

## Ch.2 Details of List define Mathematics and Fractalness

### 2.1 List- Define Mathematics (continuation of section 1 appendix B)

Postulate **1** (observable) So observer **1**  $1 \cup C \equiv 1+C$ .  $z=zz$  has both 1,0 as solutions so defining negation  $\sim$  with  $0=1-1$  Thus we can define intersection with  $\sim((A \cup B) \sim B \sim A) \equiv A \cap B$ . So we have intersection  $\cap$  so we have derived set theory.

Because of our postulate of **1** we can then *list* all cases such as  $1 \cup 1 \equiv 1+1 \equiv 2$  and define  $a+b=c$ . Note along the way we have defined union and so define set theory as well.

## The Progressive "List" Origin Of Mathematics

Microcosm Math 3 Numbers (allowed by finite precision)	Cosmic Math $10^{82}$ Numbers
$1 \cup 1 \equiv 1+1 \equiv 2$	$1+1 \equiv 1*2$
$1 \cup 2 \equiv 1+2 \equiv 3$	$2+2 \equiv 2*2$
Defines $A+B \equiv C$	Defines $A*B \equiv C$ That being eq.2 Finite precision $\equiv$ noise $> 0$
Eq.2 can now define 0 with $0*0=0$	
Use 0 to define subtraction with	
$1-1 \equiv 0$	
$2-2 \equiv 0$	
$3-3 \equiv 0$	
Defines $\delta C=0$ That being Eq.1 in this particular microcosm.	

Note there are no axioms for defining relations  $A+B=C$  or  $A*B=C$ , just the list above those relations.

Fig.7 in that particular microcosm. There are no postulated rings or fields here either.

Recall section appendix B. We use 3 number math to progressively develop the 4 number math etc., eg.,  $2+2=4$ ., so yet another list. Go on to define division from  $A*B=C$  then  $A \equiv B/C$ . So the method is List-define, list-define, list-define, etc., as we proceed into larger and larger microcosms. There are no new postulates (axioms) in doing that. It follows from our generation of those 6 Clifford algebra cross terms one after the other and that sequence of 4D electrons, the objects we are counting. We require integers and so no new axioms. Note C implies finite precision and we can always multiply a finite precision number by a large enough integer to make a finite precision number an integer in any case. So we also have our required integers here. So we don't need any more axioms such as Peano's mathematical induction or ring and field axioms. We generate each microcosm number and algebra with this list define method until we reach  $10^{82}$  (sect.2).

Subtraction  $a-b=c$ :

List

$1-1=0$  (is defined as the null (0)set here).

$1+1=2$  from earlier.

$2-1=1$  etc., etc

Define  $a-b=c$

So you can define subtraction with a list-define procedure as well.

## Definitions Of Cantor's Cauchy Sequence And The Mandelbrot Set

### Set Theory Review

#### Null Set $\emptyset$ Review

We postulated 1 observable. But an observable 1 requires an observer C so we have  $1 \cup C$  and thus we have *derived set theory* from the postulate of 1 (observable).

In the context of set theory the null set  $\emptyset$  is the subset of every set. Note  $\emptyset$  and 0 are not new postulates because in that case they would be postulating "nothing".

So here you postulate {One real set} which automatically has the null set as a subset.

Note we earlier developed the whole numbers from  $1 \cup 1 \equiv 1+1$ , in the context of set theory. But  $\emptyset \cup \emptyset = \emptyset$  is the only property of the null set  $\emptyset$  we use and of course it is isomorphic to  $0 \cup 0 \equiv 0+0=0$  the *only* property of 0 we need in the development of the whole numbers.

Note also the null set is the lack of anything and so is 0.

Note the  $z_1 = z_\infty$  at  $C \rightarrow 0$  gives  $z = zz + C$  which does correspond with the 1 set ( $1 = 1X1$ ) and null set dichotomy of set theory given also that  $0 = 0X0$ . Also the Mandelbrot set sequence gives the Cauchy sequence of the real set.

So this {one real set} starting point maps (uniquely) directly to the **Mandelbrot set**.

Why  $\min(z-zz) > 0$ ? **Completeness and Choice** (since that implies  $z$  is a real number)

The Feigenbaum point sits on the negative  $r$  axis so equation 1 can be rewritten as  $z = zz + C$ ,  $\delta C = 0$ ,  $C < 0$  which is the same as  $\min(z-zz) > 0$ . Yes, ONE indeed is the simplest idea imaginable. But unfortunately we have to complicate matters by algebraically defining it as universal  $\min(z-zz) > 0$  and so as the two most profound axioms in **real#** mathematics:

"completeness" ( $\exists$  **minsup**) and "choice" (Here the choice function is  $f(z) = z-zz$ ). But here they are mere definitions (of "min" and " $z-zz$ ") since  $z = zz$ , so no  $1z = z$  field axiom for multiple  $z$ , implies our one  $z$  (See  $z \approx 1$  result below.). We did this also because that list-define math (appendix C PartI) *replaces the rest* (i.e., the order axioms, mathematical induction axiom (giving **N**) and the rest of the field axioms); Thus we have algebraically defined the **real numbers** thereby implying the usual Cauchy sequence of rational numbers definition of the **real#**  $z$ .

By the way that 'incompleteness theorem' of Godel is thereby negated by our *single* pick of (axiom of choice) choice function  $f(z) = zz - z$  (in association with our list-define mathematics definition defining the rest.) and incompleteness of the real numbers is negated by the "completeness" (minsup) of real number mathematics above which here are not axioms but a restatement of what we mean by  $\min(zz-z) > 0$  which itself is taken to be a restatement of the postulate of real 1. So in conclusion the postulate of real 1 negates Godel's incompleteness theorem, makes it wrong.

Also given our  $z = zz$  and the list define math definitions we no longer need the rest of the field axioms, order axioms and mathematical induction axiom (giving **N**)

But 1,0 can define the binary system and so the rest of the real numbers through the union of eq.1.11. (See appendix D). eq.1.16a defines the finite +integer *list* (i.e.,  $1 \cup 1 \equiv 1 + 1 \equiv 2$ )--

*define* (i.e.,  $A + B = C$ ) math *required for* the algebraic rules underpinning eq.1 **without any added postulates** (axioms). Also

*list*  $2 * 1 = 2$ ,  $1 * 1 = 1$  *defines*  $A * B = C$ . Division and **rational numbers** defined from  $B = C/A$ .

We repeat with the list  $3 * 1 = 3$ , etc., with the Clifford algebra terms satisfaction keeping this going all the way up to  $10^{82}$  and start over given the above fractal result given the  $r_H$  horizons of eq.1.18. This list-define method replacing the usual ring and field algebraic formalism

Note the noise  $C$  guarantees limited precision so we can multiply any number in our list with the above trifurcation number integer  $10^{82}$  to obtain the integers in which iteration of the new pde into the Klein Gordon equation gives us quantization of the Boson fields.

Cantor also used that binary number diagonal to prove the uncountability of the real numbers (with the  $r_H$  horizon from the the fractalness the observability counting limit is  $10^{82}$ ). further illustrating the importance of the binary numbers in the development of the real numbers.

**Uniqueness Of These Operator Solutions:** Note the invariant operator  $\sqrt{2} = ds$  here. So the eq.1.1.15 operator invariant  $ds^2$  and eq. 7, eq.8  $\sqrt{2}ds \equiv \delta z_M = dr \pm dt$  is the **operator** (eq.16) solution  $\delta z_M$  (so *not* others such as  $ds^3$ ,  $ds^4$ , etc., which would then imply higher derivatives, hence a functionally different operator.

## Origin Of Mathematics List-define, List-Define→ $10^{82}$ Derivation Of Mathematics Without Extra Postulates

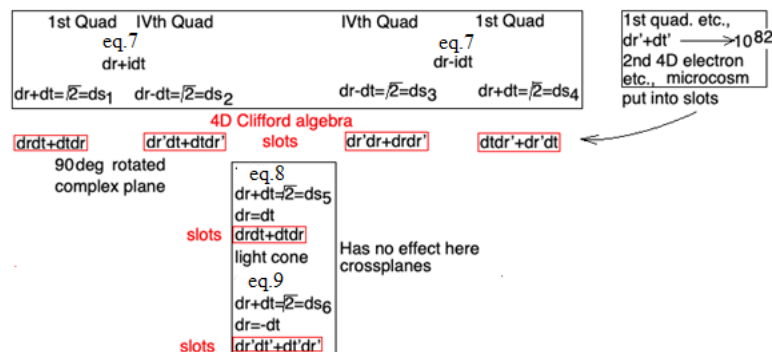


Fig.6 These added cross term eq.11a objects (1.11) extend eigenvalue equation 11 from merely saying  $1+1=2$  all the way to the number  $10^{82}$ .

From section 1 we generate 6 cross terms directly from one application of eq.1a that may or may not be the ones required for our 4D Clifford algebra. To get precisely the 6 cross terms of a 4D Clifford algebra we had to repeatedly plug into eq.2 the associated  $dr, dt$  of the required cross term  $drdt+dt dr$ . Note **by doing this we include the two  $v$  fields in the definition of the electron!** electrons and so a sequence of electrons. We thereby generate the universe! Thus we have derived the below progressive generation of list-define microcosms in eq.1.11a. We then plug that into eq.1.24 as sequence of electrons. This allows us to use eq.11a to go beyond 1U1, beyond 2 to 3 let's say. So we can then define  $1 \cup 1$  from equation eq.11  $\delta z_M$  just like postulate 1 was defined from  $z=zz..$ . So consistent with eq.11a and eq.1 we can then develop +integer mathematics from 1U1 beyond 2 because of these repeated substitutions into eq.11a using a list-define method so as not to require other postulates. So by deriving the 6 crossterms of one 4D electron we get all  $10^{82}$  of them! So just multiply any number (given our limited precision) by  $10^{82}$  and it becomes an integer implying all integers here. Given the  $\psi$ s of equation 16 for  $r < r_c$  (So a allowed zitterbewegung oscillation thus SHM analogy) we can then redefine this integer  $N-1$  also as an eigenvalue of a coherent state Fock space  $|\alpha\rangle$  for which  $a|\alpha\rangle=(N-1)|\alpha\rangle$ . Also recall eigenvalue  $1 \cup 1$  is defined from equation 11a. Note  $10^{82}$  limit from above. Any larger and it's back to one again. But in this process we thereby create other eq.11a terms for other electrons and so build other 4D.

Recall section 1. We use 3 number math to progressively develop the 4 number math etc., eg.,  $2+2=4$ ., so yet another list. Go on to define division from  $A*B=C$  then  $A=B/C$ . So the method is List-define, list-define, list-define, etc., as we proceed into larger and larger microcosms. There are no new postulates (axioms) in doing that. It follows from our generation of those 6 Clifford algebra cross terms one after the other and that sequence of 4D electrons, the objects we are counting. We require integers and so no new axioms. Note  $C$  implies finite precision and we can always multiply a finite precision number by a large enough integer to make a finite precision number an integer in any case. So we also have our required integers here. So we don't need any more axioms such as Peano's mathematical induction or ring and field axioms. We generate each microcosm number and algebra with this list define method until we reach  $10^{82}$  (sect.2).

### Our Limit Definition (eg., in the Cauchy Sequence)

In section 1 you notice (attachment) our **numbers** are also eigenvalues (observables) in eq.11a and also **are the # of electrons**. But there is no observation possible through the fractal  $r_H$

horizons in eq.2 (and sect.2.5) and  $10^{82}$  is the maximum such number inside  $r_H$  ( $C_M$ ). Also all small limits are then only to the next smaller fractal baseline ( $C_{M-1}$ ) horizon and no farther. *This is stated several places in the paper* (eg., definition paragraph first page).

So since our numbers here are observables and so **all limits**, big and small, are limited by these fractal scales (eg., instead of limit  $x \rightarrow 0$  we have limit  $x \rightarrow \Delta$  where  $\Delta$  is the next smaller fractal scale.). This makes it so there is only one thing we are postulating, **1**, the electron given by eq.2 (see the inside-outside comment in the summary below).

So these limits (eg., for the Cauchy sequences) are all required by the postulate of **1**.

You could call them "fractal based limits" if you like. Recall that: given a number  $\varepsilon > 0$  there exists a number  $\delta > 0$  such that for all  $x$  in  $S$  satisfying

$$|x - x_0| < \delta$$

we have

$$|f(x) - L| < \varepsilon$$

Then write  $\lim_{x \rightarrow x_0} f(x) = L$

Thus you can take a smaller and smaller  $\varepsilon$  here, so then  $f(x)$  gets closer and closer to  $L$  even if  $x$  never really reaches  $x_0$ . "Tiny" for  $h \rightarrow L_1$  and  $f(x+h) - f(x) \rightarrow L_2$  then means that  $L = 0 = L_1$  and  $L_2$ . 'Tiny' is this difference limit.

### **Hausdorf (Fractal) s dimensional measure using $\varepsilon, \delta$**

Diameter of  $U$  is defined as

$$|U| = \sup\{|x - y| : x, y \in U\}. \quad E \subset \cup_i U_i \quad \text{and} \quad 0 < |U_i| \leq \delta$$

$$H_\delta^s(E) = \inf \sum_{i=1}^{\infty} |U_i|^s$$

analogous to the elementary  $V = U^s$  where of  $s=3$ ,  $U=L$  then  $V$  is the volume of a cube  $\text{Volume} = L^3$ . Here however 's' may be noninteger (eg., fractional). The volume here would be the respective Hausdorf outer measure.

The infimum is over all countable  $\delta$  covers  $\{U_i\}$  of  $E$ .

To get the Hausdorf outer measure of  $E$  we let  $\delta \rightarrow 0$   $H^s(E) = \lim_{\delta \rightarrow 0} H_\delta^s(E)$

The restriction of  $H^s$  to the  $\sigma$  field of  $H^s$  measurable sets is called a Hausdorf s-dimensional measure.  $\text{Dim } E$  is called the Hausdorf dimension such that

$$H^s(E) = \infty \text{ if } 0 \leq s < \text{dim} E, \quad H^s(E) = 0 \text{ if } \text{dim } E < s < \infty$$

So if  $s$  implies a zero  $H$  or infinite  $H$  it is not the correct dimension. This rule is analogous to the definition of the (fractal) Mandelbrot set itself in which a  $C$  that gave infinity is rejected by the definition  $\delta C = 0$  we can model as a binary pulse ( $z = zz$  solution is binary  $z = 1, 0$ ) with

**$zz = z(1)$  is the algebraic definition of **1** and can add real constant  $C$  (so  $z' = z'z' - C$ ,  $\delta C = 0$**

## **2.2 The isolated lemniscate Mandelbrot Set implied by the circle (eq.11) observability**

In section 1 we got the Circle  $dr^2 + dt^2 = ds^2$  and so *observability* of eq.11. So including *observability only* we could have instead postulated  $1^2 = 1^2 1^2$  or  $C_{N+1} = C_N C_N + C$ .  $C = C_1 = dr^2 + dt^2$ ,  $C_0 = 0$  instead of the more general  $z = zz$  ( $1 = 1X1$ ) implying  $z_{N+1} = z_N z_N + C$ . This gets the lemniscate sequence and so just the bare bones Mandelbrot set without all the flourishes of the smaller scale versions of  $z_{N+1} = z_N z_N + C$ .

Note then *observability* thereby implies *only* the basic Mandelbrot set structure and so not all the other parts, the flourishes, of that zoom. Thus for *observability* the  $\|CM\|$  **extremum really is at**



the **Feigenbaum point** (and  $-1/4$ ) for all fractal scales. So a given **Mandelbrot set is an observable!!** (irregardless of the clutter it resides in)

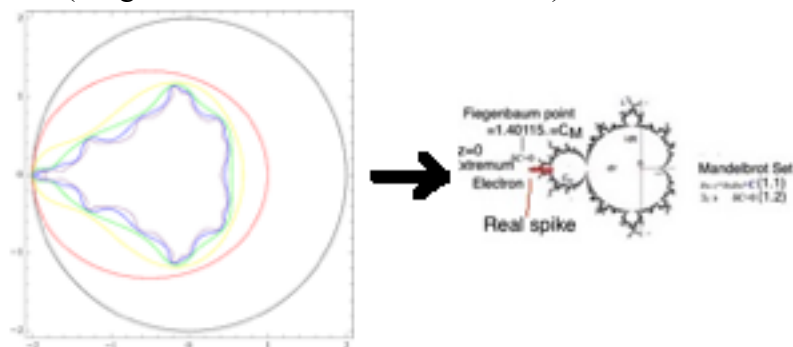


fig.7

point  $C_M$ .

From the sect.1 Circles resulting in the ‘observability’ of eq.11 these  $z=0$  lemniscates constructed from these circles give  $\delta z=r_H=CM10^{40N}/\xi_1=\Delta$  perturbations to  $C$  and so  $\Delta$  perturbations to  $z=0$  from eq.3. So  $z=0 \rightarrow z=0+\Delta$ . (2.2.1)

Fig.7 Lemniscate sequence (Wolfram, Weisstein, Eric)  $C_{N+1}=C_N C_N + C$ .  $C=C_1=dr^2+dt^2$ ,  $C_0=0$ .

After an infinite number of successive approximations  $C''=C'C'+C=C_M^2$

Mandelbrot calls  $C_M$  the ER, Escape Radius (see Muency).

These lemniscate circles (eq.11) underly the connection of the core Mandelbrot set structure to observability through our postulate (Ultimate Occam’s Razor (observable)). But on any specific scale only the 4X Mandelbulb circles are actually observable because of the horizons  $r_H$  so we only pick these out of the zoom. Note an:

### 2.3 section 2 addendum $C_M$ Fractal Consequences

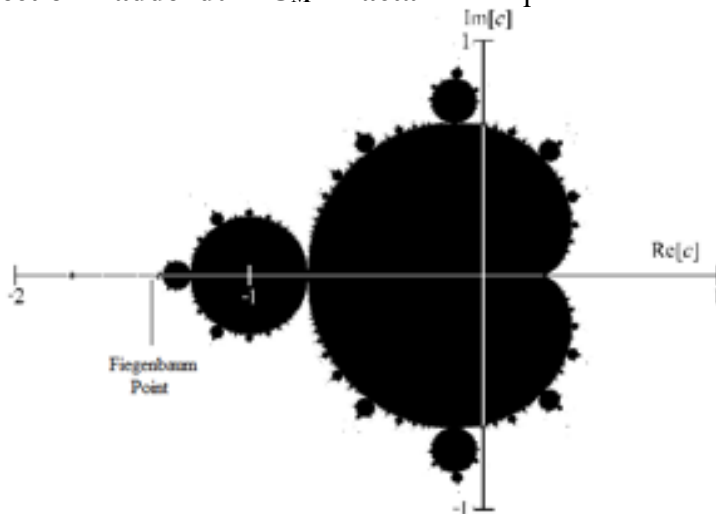


fig. 9

Note that the center of mass(COM, fig.9) is at the (negative inverse of the) golden mean  $-0.618033.. (= -1/\phi)$  and is also a solution of our equation 2 written as  $z=zz-1$ . So  $C=-1$ .  $-1$  is right in the middle of the biggest circle above. Given this goofy  $(-1/\phi)$  is also at the average of the Mandelbrot set the golden mean seems to be connected to the Mandelbrot set. But this result doesn’t mean anything because we need the  $\delta C=0$  extremum at the Feigenbaum point= $-1.40115..$ , (and  $C=-1/4$ ) not the average position of the Mandelbrot set.

### 2.3 {{neighborhood $C_M\} \cap \{-r \text{ axis}\}} -dr$ Fractal Branch Cut

Recall section 1 and the derivation of the fractal space time. So there is more to these 2D complex number solutions to eq.3 than just irrational and rational numbers, there is also this underlying space-time fractal structure  $\{\text{neighborhood}\{C_M\} \cap \{-r \text{ axis}\}\}$  that contains even fewer elements than the rational numbers and which only “exists” when the “fog” is not thick, i.e. when  $C$  goes to 0. It permeates all of space and yet has zero density. It is a very mysterious subset of the complex plane indeed.

Note to be a part of what is postulated (eq.3)  $C \rightarrow 0$  we must be in the neighborhood of the tip of the horizontal Mandelbrot set  $dr$  axis with extremum given by the circle lemniscate fig.7. But from the perspective (scale) of this  $N+1$  th scale observer one of the  $10^{40}X$  smaller ( $N$ th fractal scale)  $45^\circ$  rotated Mandelbrot sets (fig.8) is still near his own  $dr$  axis putting it within the  $\varepsilon, \delta$  limit neighborhoods of  $C \rightarrow 0$  of eq.2. Thus in this narrow context we are allowed the  $45^\circ$  rotations to the extremum directions of the solutions of equation 2. Thus we also have the Riemann surfaces of fig.4 if we continue our rotations beyond  $360^\circ$ . Our  $C$  increases (eg.,  $C \rightarrow 0$ ) discussed later sections are also all in this  $N$ th fractal scale context. For example eq. 7 is then reachable on the  $N$ th fractal scale ( $r > r_H$ ) as a noise object ( $C > 0$ ). So 8 at  $135^\circ$  must then also result from noise ( $C > 0$ ) introduction and so from that first fractal jump rotation in the 2D plane. Later we even note a limit on  $C$  (sect.4.3.1).

## 2.4 Fourier Series Interpretation Of $C_M$ Solution

Recall from equation 7 that on the diagonals we have particles (and waves) and on the  $dr$  axis where  $C=0$  only waves, see A1 Recall 2AC solution  $dr=dt, dr=-dt$  gives 0 as a solution and so  $C=0$ . But in equation 2 for  $C \rightarrow 0$   $\delta z=0, -1$ . So eq.3 implies the two points  $\delta z=0, -1$ . So for waves to give points implies a Fourier superposition of an infinite number of sine waves and so wave lengths. In terms of eq.7 these are solutions to the Dirac equation and so represent fractalness, smaller wave lengths inside smaller wavelengths. So it is fractal.

### S states

Need boosted  $C$  small in  $z=zz+C$  or the postulate of 1 does not hold. So need boost so  $C_M/\xi_1=C$  is small so with  $\xi_1$  big with  $\xi_0$  stable core (electron) mentioned above..

For  $z=1$   $\xi_1$  is big so  $\tau, \mu, e$  can be free S states (since  $\xi_1=\tau+\mu+e$  is still in denominator of the  $C=C_M/\xi_1$  for each of  $\tau, \mu$  and  $m_e$  so  $C$  is still small for each. This same effect also makes leptons (nearly) point sources whereas baryons are not (with their much larger  $r_H$  radius

## 2.5 Observer-object alternative way (to iterating eq.2) to understand fractalness

Recall also that eq.7 has two solution and associated two points one of which we define as the observer. In the new pde:  $\sqrt{\kappa_{\mu\mu}}\gamma^\mu\partial\psi/\partial x_\mu=(\omega/c)\psi$  16, (given that it requires these two points), we *allow the observer to be anywhere*. So just put the observer at  $r < r_H$  and you have derived your fractal universe in one step without iterating eq.2 as we did at the outset. To show this note from equations 14 we have the Schwarzschild metric event horizon of radius  $R \equiv 2Gm/c^2$  in the  $M+1$  fractal scale where  $m$  is the mass of a point source. Also define the null geodesic tangent vector  $K^m$  to be the vector tangent to geodesic curves for light rays. Let  $R$  be the Schwarzschild radius or event horizon for  $r_H=2e^2/m_e c^2$ . Thus (Hawking, pp.200) in the case that equation applies we have:  $R_{mn}K^m K^n > 0$  for  $r < R$  in the Raychaudhuri ( $K_n$ =null geodesic tangent vector) (4.5.1) equation. Then if there is small vorticity and shear there is a closed trapped surface (at horizon distance “ $R$ ” from  $x$ ) for null geodesics. No observation can be made through such a closed trapped surface. Also from S.Hawking, *Large Scale Structure of Space Time*, pp.309...instead he will see O’s watch apparently slow down and asymptotically (during collapse) approach 1 o’clock...”. So  $g_{rr}=1/(1-r_H/r)$  in practical terms never quite becomes singular and so we cannot

observe through  $r_H$  either from the inside or the outside (space like interval, not time like) as long as the bigger horizon  $r_H$  is isolated (for nearby object B there is some metric perturbation). Note we live in between fractal scale horizon  $r_H=r_{M+1}$  (cosmological) and  $r_H=r_M$  (electron). Thus we can list only two observable (Dirac) vacuum Hamiltonian sources (also see section 1).

$H_{M-1}$  and  $H_M$

But we are still entitled to say that we are made of only ONE “observable” source i.e.,  $r_H$  of equation 13 (which we can also observe from the inside (cosmology) and study from the outside (particle physics). Thus this is a Ockam’s razor optimized unified field theory using:

**ONE** “observable” source

of nonzero proper mass which is equivalent to our fundamental postulate of equation 1. Metric coefficient  $\kappa_r=1/(1-r_H/r)$  near  $r=r_H$  (given  $dr'^2=\kappa_r dr^2$ ) makes these tiny  $dr$  observers just as big as us viewed from their frame of reference  $dr'$ . Then as observers they must have their own  $r_{HS}$ , etc. . You might also say that the fundamental Riemann surface, and Fourier superposition are therefore the *source* of the “observer”.

Recall we get  $\min(zz-z)>0$  from that and 1 as a explicit real observable which goes back to the implicit real observable 1 we started with.

## 2.6 Observer (humanity) Implications

Dr.Murayama (P5 head) says that “particle physics is really at the heart of what we are, why we are. We would like to understand why we exist, where we came from,”: so this junkpile is who we are? (Given the mainstream results) Sadly yes. But from our above Occam’s razor point of view, absolutely not.

Eq.4 just above gives you space time  $(r,t)$ , required by physical reality (creation) and eq. 4 is clearly dependent on that  $C=C_M$  Mandelbrot set.

But the Mandelbrot set  $C_M$  depends on that interesting connection with  $\infty-\infty$  in above equation 3. Normally in physics an infinite quantity is really just a very large quantity, but not here: we actually connected to infinity! Thus Creation itself is caused by *this* (eq.3) extremely sublime *relation with  $\Delta$ infinity!* So we understand creation at the deepest possible level..

Understanding creation itself makes life worth living, makes humanity *unique* among all physical things.

Also since Newpde equation 16 is essentially all there is there is then also the above (sect.2.5) anthropomorphic (i.e., observer) based derivation of that fractalness using equation 7 that requires both the observer and object to solve eq.5. (Postulate 1 and so equation 5 is not solved unless **both parts** of equation 7 hold). There is then a powerful ethics lesson that comes out of this result (eg.,negation of solipsism (of sociopathology) partV): ethical equality of observer and observed (i.e.,golden rule).

Also the postulate of 1 reminds us of Paul Tillich’s ‘One’ ultimate truth, ground of being.

So we just found that “life is worth living” and “reason to act ethically” (but cautiously toward solipsists (sociopaths) who consider themselves the only observers), so be kind: These are unexpected but wonderful results coming out of the **postulate 1**  $\rightarrow$  Newpde.

## Ch.3 Quantum Mechanics Is The Newpde $\psi$ (for each N fractal scale)

### Ultimate Occam’s razor (observable)

Note an ultimate Occam’s razor[*observable*(1) requires an *observer*(C)] i.e., it is just **1**+C.

So this bracketed Occam’s razor *simplicity* requirement motivates every step. Thus\* we merely

**Postulate 1** with the *simplest* algebraic definition of  $1 = zz$  (Thus  $z=1,0$ ) and most simply add the  $C$  in  $z'=z'z'+C$  with the *simplest*  $C$  a (at least local) constant ( $\delta C=0$ ). Note the infinite number of unknown  $z', C$  (in  $z'=z'z'+C$  **eq.1**) and the single *known*  $C=0$  (since  $z=zz+0$  was postulated so  $z=1,0 \in \{z'\}$ ) that at least allows us to plug that  $z=1,0$  in for  $z'$  in  $z'=z'z'+C$ . So  $z=0=z'=z_0$  in the iteration of **eq.1** using  $\delta C=0$  **generates** the (2D)Mandelbrot set  $C=C_M=\text{end}^{**}$  (Need iteration to get all the  $C$ s because of the  $\delta C=0$  (appendix),  $\text{end}=10^{40N}$  X fractal scales)  $z=1, z'=1+\delta z$  substitution into **eq.1** using  $\delta C=0$  ( $N>0 \equiv \text{observer}$ ) gets eq5 so 2D Dirac eq.(e,v) (Eq.5 gives the Minkowski (flat space) metric, Clifford algebra  $\gamma^i$  and eq.11 **in one step.**) These two  $z=1$  and  $z=0$  steps together (4D  $z=1$   $\gamma^i$  orthogonality) get the curved space  $2D+2D=4D$  **Newpde** (3) and thus the 4D universe, no more and no less. So **postulate 1**  $\rightarrow$  **Newpde!!!** (**Newpde:**  $\gamma^\mu \nabla(\kappa_{\mu\nu}) \partial\psi/\partial x_\mu = (\omega/c) \psi$ ,  $\kappa_{00}=1-r_H/r=1/\kappa_{rr}$ ,  $r_H=(2e^2)(10^{40N})/(mc^2)$ .  $N=..-1,0,1,..$ fractal)

Summary:  $1+C$

$1+C$

Thus

**Postulate 1**  $z=zz+0=\text{algebraic definition } 1$ . So  $z=1,0$ . Add (at least local) constant  $C$  ( $\delta C=0$ ) giving  $z'=z'z'+C$  (1). Note infinite number of  $z'$  ( $z'_i$ ) and  $C$  ( $C_i$ ) in equation 1. Given  $z=1,0$  are postulated then the  $C$  and  $z'$  in equation 1 are:

$$\{C\}=\{0, C_1, C_2, C_3, \dots\}, \{z'\}=\{1, 0, z'_1, z'_2, z'_3, \dots\}$$

Thus we can plug  $1,0$  for  $z'$  into  $z'=z'z'+C$  **eq.1** to find obviously  $0=C$  and  $z'=1,0$  are solutions.

But  $z=0$ ,  $\delta C=0$  requires that you also iterate  $z'=z'z'+C$  to get ALL solutions  $C$  resulting in that  $2D \{C\}=\{C_M\}$  Mandelbrot set. Next plug in  $z'=1+\delta z$  into **eq.1** and get the 2D Dirac equation. These  $z=1, z=0$  steps both together get the  $2D+2D=4D$  **Newpde**

## Implications for QM

### 3.1 Quantum Mechanics Is The Newpde $\psi$ (for each $N$ fractal scale) Quantum Mechanics Is The Newpde $\psi$ (for each $N$ fractal scale)

The numerical value of  $\psi=\delta z$  comes from the Newpde (eq.16) with the normalization properties and the probability density definition of  $\delta z$  coming directly from the postulate of 1.  $C$  comes from both  $ds^2$  invariance and noise as shown in sect.1.

Recall the solution to (postulate 1)  $z=zz$  is  $1,0$ . In  $z=1-\delta z$ ,  $\delta z^* \delta z$  is (defined as) the probability of  $z$  being  $0$ . Recall  $z=0$  is the  $\xi_0=m_e$  solution to the new pde so  $\delta z^* \delta z$  is the probability we have just an electron (sect.3). Note  $z=zz$  also thereby conveniently provides us with an automatic normalization of  $\delta z$ . Note also that  $(\delta z^* \delta z)/dr \equiv \psi^* \psi$  is also then a one dimensional probability 'density'. So Bohr's probability density "postulate" for  $\psi^* \psi (\equiv (\delta z^* \delta z)/dr)$  is derived here. It is not a postulate anymore. (So Bohr was very close to the postulate of 1 using  $z=zz$  here.)

Note the electron eq.7 has *two* parts (i.e.,  $dr+dt$  &  $dr-dt$ ), that solve eq.3 *together*, same kind of  $\delta(p_A-p_B)$  conservation relation as between Alice and Bob; signal, idler, Bell's stuff. We could then label these two parts *observer* and *object* with associated eq.7 wavefunctions  $\delta z \equiv \psi_1$ ,  $\delta z \equiv \psi_2$ . So if there is no observer eq.7 (So no  $\psi_1$ ) then eq.3 doesn't hold at all and so there is no object "observed" wavefunction.  $\psi_2$ . Thus the object wave function  $\psi_2$  "collapses" to the wavefunction 'observed'  $\psi_2$  (or eq.5 and so **postulate 1** does not even hold), if "observed"  $\psi_1$  exists. Then apply the same mathematical reasoning to every other  $\delta(p_A-p_B)$  situation and we

will also have thereby derived Bell's theorem and its general cases. Thus we derived the Copenhagen interpretation of Quantum Mechanics QM mathematically, from eq.16 and so first principles **postulate 1**, not from the usual hand waving arguments.

Also with eq.7 first 2D solution there is no new pde and so no wave function. The other solution to 1.11 adds the other 2D (observer) and so we get the eq.16 new pde and thereby its wave function. So we needed the observer to “collapse” the wave function. This is the proof of the core part of the Copenhagen interpretation. Eq.7 gives the probability density  $\delta z^* \delta z$  (another component of the Copenhagen interpretation so we have a complete proof of the Copenhagen interpretation of quantum mechanics here. Note adding 2D eq.12  $\delta z$  perturbation gives 4D  $(dx_1+idx_2)+(dx_3+idx_4) \equiv dr+idt$  given (eqs5,7b)  $dr^2-dt^2=(\gamma^r dr+i\gamma^t dt)^2$  if  $dr^2 \equiv dx^2+dy^2+dz^2$  so that  $\gamma^r dr \equiv \gamma^x dx + \gamma^y dy + \gamma^z dz$ ,  $\gamma^i \gamma^j + \gamma^j \gamma^i = 0$ ,  $i \neq j$ ,  $(\gamma^i)^2 = 1$  (B2), rewritten (with eq14)  $(\gamma^x \sqrt{\kappa_{xx}} dx + \gamma^y \sqrt{\kappa_{yy}} dy + \gamma^z \sqrt{\kappa_{zz}} dz + \gamma^t \sqrt{\kappa_{tt}} idt)^2 = \kappa_{xx} dx^2 + \kappa_{yy} dy^2 + \kappa_{zz} dz^2 - \kappa_{tt} dt^2 = ds^2$ . Multiply both sides by  $1/ds^2$  &  $(\delta z/\sqrt{dV})^2 \equiv \psi^2$  and using operator eq 11 inside the brackets( ) get

**Newpde**  $\gamma^\mu (\sqrt{\kappa_{\mu\mu}}) \partial \psi / \partial x_\mu = (\omega/c) \psi$  for  $e, \nu$ ,  $\kappa_{00} = 1 - r_H/r = 1/\kappa_{rr}$   $r_H = e^2 X 10^{40N}/m$  ( $N = -1, 0, 1, \dots$ ) (16)

Recall from appendix A  $dr^2+dt^2$  is a second derivative *operator* wave equation(A1), that holds all the way around the circle(even for the eq.10 vacuum solutions), gives waves. In eq.12, error magnitude C (sect.2.3) is also a  $\delta z'$  angle measure on the  $dr, idt$  plane. One extremum  $ds$  ( $z=0$ ) is at  $45^\circ$  so the largest C is on the diagonals ( $45^\circ$ ) where we have eq.4 extremum holding: particles. So a wide slit has high uncertainty, so large C (rotation angle) so we are at  $45^\circ$  (eg., particles, eq.16 photoelectric effect). For a *small slit* we have less uncertainty so smaller C, not large enough for  $45^\circ$ , so only the *wave equation* A1 holds (small slit diffraction). Thus we derived wave particle duality here.

Recall wave equation eq.A1 iteration of the New pde with eq.11 operator formalism. So  $dr/ds=k$  in the sect.1  $\delta z=ds e^{i\theta}$   $\theta$  exponent then becomes  $k=2\pi/\lambda$ . Multiplying both sides by  $\hbar$  with  $\hbar k \equiv mv$  as before we then have the DeBroglie equation that relates particle momentum to wavelength in quantum mechanics. Equation 8a (sect.1) then counts units N of  $(dt/ds) = \hbar/\hbar c k$  on the diagonal so that  $E=p_t = \hbar \omega$  for all energy components, universally. Thus this eq.11a counting N does not require the (well known) quantization of the E&M field with SHM. First, set the unit of distance  $r_H$  on our baseline fractal scale: (eq.1  $N=0$ . See figure 1 attachment.).The lemniscate Mandelbrot set formulation allows only these finite extremum.

### 3.2Fractal Planck's constant

Recall that  $Gm_e^2/ke^2 = 6.67 \times 10^{-11} (9.11 \times 10^{-31})^2 / 9 \times 10^9 \times 1.6 \times 10^{-19} = 2.4 \times 10^{-43}$ .  $2.4 \times 10^{-43} \times 2m_p/me = 2.4 \times 10^{-43} \times (2(1836)) = 2.2 \times 10^{-40}$ . We rounded this to  $10^{-40}$  which was read off the Mandelbrot set (observable circle) **zoom** as the ratio of the two successive Mandelbrot set lengths. Next plug this result into the uncertainty principle  $\Delta x \Delta(mc) \geq \hbar$ . There is a  $\delta z$  for the  $N=0$  fractal scale so why not a  $\delta z$  for the  $N=1$  fractal scale and an associated uncertainty principle  $10^{40} \Delta x)(10^{80} m_e c) = \hbar 10^{120}$ . ?

**N=1 Uncertainty Principle** Fractal universe implies  $(10^{40} \Delta x)(10^{80} m_e c) = \hbar 10^{120} \propto (\text{energy density}) (1/f)$  accounting for that  $10^{120} \times$  discrepancy in the qed cosmological constant  $\Lambda$  (energy) with GR's (See also sect.7.6.). So for huge fractal scale  $N=1$  then is the  $\Delta x = 10^{11} \text{LY}$  electron,  $.5 \text{Mev}$  ( $X 10^{82}$ )  $= \Delta \epsilon$  in the uncertainty principle so at  $N=1$ , in  $dt'^2 = \kappa_{00} dt^2$ . But  $\sqrt{\kappa_{00}} = \text{boost}$  on  $dt$  zitterbewegung oscillation  $\kappa_{00} = \text{Re} e^{i\Delta \epsilon}$ ; for this electron  $N=1$  object from the Newpde.  $\Delta \epsilon = \text{electron mass relative to tauon } \tau$ .  $\epsilon = \mu$  is at its maximally symmetric value of 0 in the halo, local free space approximation, in  $R_{22} = \sinh \mu$  (see D15 for nonlocal). Also for  $\Delta x$  of object C

(A7) there is the uncertainty principle (the next smaller) perturbation  $\Delta E = .7\text{eV}$  so  $\Delta r = 10^5 \text{ LY} = (.7\text{eV}/.5\text{Mev})10^{11}$ , the size of a galaxy. Note also that  $mv^2/r = kGM/r$  comes from a field with local narrowing plate symmetry so that  $r$  cancels out so only  $|v|$  independent of distance  $r$  allowing us to set  $g_{00} = \kappa_{00}$  (with that  $\kappa_{00} = e^{i\Delta\phi}$ , partIII) that shape results in orbital stability so  $\delta(1/\sqrt{\kappa_{00}}) = \delta E = 0$ . So  $\delta|v| = 0$  there. So a mixed state pancake shaped  $1S_{1/2}$  state uncertainty cloud in the plane of the galaxy provides gravitational stability for planar structures of this size since it implies the nearly flat  $m\alpha r$  plate circular symmetry  $g_{00} = \kappa_{00}$  case in the halo and so metric quantization stability for this shape. (see partIII). Other shapes can exist but they are not as stable and so eventually the  $m\alpha r$   $1S_{1/2}$  state prevails. Note (from partIII)  $100\text{km/sec}$  is this  $S$  state metric quantization,  $200\text{km/sec}$   $P$  state (barred spiral) metric quantization (so internal square symmetry). Also note the implied sharp cut off of a given  $v$  at some  $r$  (eg., Centaurus A pancake, Andromeda halo  $\{v\}$  jump down Rubin data). If the galaxy pulls in so much mass that its  $\Delta r$  gets too large ( $> (10^5 \text{ LY})N$ ) the above  $\Delta r = 10^5 \text{ LY}$  is no longer realized and so the  $1S_{1/2}$  state and its  $2P$  harmonics is gone and so the pancake cylindrical symmetry (shape) goes away and so  $g_{00} \neq \kappa_{00}$  and so the pancake shape (metric quantization) *stability goes away* and so this flat spiral shape disappears and we only have a high entropy elliptical (galaxy) shape left with high  $g_{00} = \kappa_{00}$   $v$  around *any* plane. Recall  $10^{2N}$  meric quantization **generated from** this  $10^6$  galaxy bubble  $\kappa_{00} = e^{i\Delta\phi}$  term in partIII. with each of these regions also a stable uncertainty principle  $\Delta r$  region given the associated  $\Delta m$  masses in that exponent of  $\kappa_{00}$ . Thus we also got metric quantization (structure stability) for protostar nebula  $= 10 \times 10^1 \text{ LY}$ , globular cluster-dwarf galaxy  $= 10 \times 10^2 \text{ LY}$ , **galaxy**  $= 10 \times 10^4 \text{ LY}$ , Local group  $10 \times 10^6 \text{ LY}$ , giant bubbles  $10 \times 10^8 \text{ LY}$

So we have explained, with this Planck's constant analysis, why both the universe and (the evolution of) galaxies exist! Also we have shown that Planck's constant is fractal!

So given all these properties of eq.11 New pde  $\psi$  *we really have derived Quantum Mechanics*.

So we have explained, with this Planck's constant analysis, why both the universe and (the evolution of) galaxies exist! Also we have shown that Planck's constant is fractal!

### Thermodynamics

Note that a "single state  $\delta z$  per particle" comes out of 1 particle per  $\delta z$  state per solution in 11 and eq.16. So the number of ways  $W$  of filling  $g_i$  single states with  $n_i$  particles is  $g_i! / (n_i! (g_i - n_i)!)$  thereby giving us  $k \ln W \equiv S$  and so thermodynamics.

### 3.3 The Most General (noise) Uncertainty C In Eq.1 Is Composed Of Markov Chains

This final variation wiggling around inside  $dr =$  error region near the Fiegenbaum point also implies a  $dz$  that is the sum of the total number of all possible individual  $dz$  as in a *Markov chain* (In that regard recall that the Schrodinger equation free particle Green's function propagator mathematically resembles Brownian motion, Bjorken and Drell) where we in general let  $dt$  and  $dr$  be either positive or negative allowing several  $\delta z$  to even coexist at the same time (as in Everett's theory and all possible paths integration path integral theories below). Recall  $dt$  can get both a  $\sqrt{(1-v^2/c^2)}$  Lorentz boost (with the nonrelativistic limit being  $1 - v^2/2c^2 + \dots$ ) and a  $1 - r_H/r = \kappa_{00}$  contraction time dilation effects here. In section 2.2.6 we note that for a flat space Dirac equation Hamiltonian the potentials are infinite implying below an unconstrained Markov chain and so unconstrained phase in the action So  $dt \rightarrow dt\sqrt{(1-v^2/c^2)}\sqrt{\kappa_{00}}$ .  $r_H = 2e^2/(m_e c^2)$ . We also note the alternative (doing all the physics at the point  $ds$  at  $45^\circ$ ) of allowing  $C > C_1$  to wiggle around instead between  $ds$  limits mentioned above results in a Markov chain.

$dZ = \psi \equiv \int dz = \int e^{id\theta} dc = \int e^{idt/so} dc = \int e^{idt/\sqrt{(1-v^2/c^2)}\sqrt{\kappa_{00}}/so} ds' ds..$  In the nonrelativistic limit this result



thereby equals  $\int e^{ik} e^{ikdt(v^2-k/r)} = \int e^{ik[(T-V)dt]} ds' ds \dots = \int e^{iS} ds' ds \equiv dz_1 + dz_2 + \dots \equiv \psi_1 + \psi_2 + \dots$  many more  $\psi$ s (note  $S$  is the classical action) and so integration over all possible paths  $ds$  not only **deriving the Feynman path integral but also Everett's *alternative*** (to Copenhagen) many worlds (i.e., those above many Markov chain  $\delta z_i = \psi$ s in  $\int dz = \psi \equiv \psi_1 + \psi_2 + \dots$ ) interpretation of quantum mechanics where the possibility of  $-dt$  allows a pileup of  $\delta z$ s at a given time just as in Everett's many worlds hypothesis. But note equation 9 curved space Dirac equation does not require infinite energies and so unconstrained Markov chains making the need for the path integral and Everett's many worlds mute.: We don't need them anymore. Thus we have derived both the Many Worlds (Everett 1957) and Copenhagen interpretations (Just below) of quantum mechanics (why they both work) and also have derived the Feynman path integral.

In regard to the Copenhagen interpretation if we stop our J.S.Bell analysis of the EPR correlations at the quantum mechanical  $-\cos\theta$  polarization result we will not get the nonlocality (But if instead we continue on and (ad hoc and wrong) try to incorporate hidden variable theory (eg., Bohm's) we get the nonlocality, have transitioned to classical physics two different ways. We then have built a straw man for nothing. Just stick with the  $\hbar \rightarrow 0$ , Poisson bracket way. So just leave hidden variables alone. The Copenhagen interpretation thereby does not contain these EPR problems. And any lingering problems come from that fact that the Schrodinger equation is parabolic and so with these noncausal instantaneous boundary conditions. But the Dirac equation is hyperbolic and so has a retarded causal Green's function. Since the Schrodinger equation is a special nonrelativistic case of the Dirac equation we can then ignore these nonlocality problems all together. You take a Log of both sides and use Stirling's approximation and you get the Fermi Dirac distribution for example.

### 3.1 NONhomogeneous and NONisotropic Space-Time

$N=0$  observer from equation 3 solution eq.4 we note that this theory is fundamentally 2D. So what consequences does a 2D theory have? We break the 2D degeneracy of eq. 7 at the end by rotating by  $C_M$  (fig.6) and get a 4D Clifford algebra. Recall 7 and 8 are dichotomic variables with the noise rotation  $C$  going from eq.7 at  $45^\circ$  to eq.8 at  $135^\circ$ .

Recall eq.7 implies simultaneous eq.7+eq.7 are  $2D \oplus 2D = 4D$ . But single eq.7 plus single eq.8 are *not* simultaneous so are still 2D. So this theory is still 2D complex  $Z$  then. Recall the  $\kappa_{\mu\nu} = g_{\mu\nu}$  metrics (and so  $R_{ij}$  and  $R$ ) were generated in section 1.

In that regard for 2D for a homogenous and isotropic  $g_{ij}$  we have identically  $R_{\mu\mu} - \frac{1}{2} g_{\mu\mu} R = 0$  (3.1.1  $\equiv$  source  $= G_{00}$  since in 2D  $R_{\mu\mu} = \frac{1}{2} g_{\mu\mu} R$  identically (Weinberg, pp.394) with  $\mu=0, 1 \dots$  Note the **0** ( $=E_{total}$  the energy density source) and we have thereby proven the existence of a net zero energy density vacuum. Thus our 2D theory implies the vacuum is really a vacuum! It is then the result of the fractal and 2D nature of space time!

A ultrarelativistic electron is essentially a transverse wave 2D object (eg., the  $2P_{1/2}$  electron in the neutron). In a isotropic homogenous space time  $G_{00}=0$ . Also from sect.2 eqs. 7 and 8

occupy the same complex 2D plane. So eqs. 7+8 is  $G_{00} = E_c + \sigma \cdot p_r = 0$  so  $E_c = -\sigma \cdot p_r$

So given the negative sign in the above relation the neutrino chirality is left handed.

But if the space time is not isotropic and homogenous then  $G_{00}$  is not zero and the neutrino gains mass.

Note thereby the neutrino bares some similarities to the muon in that its mass changes with time (as the universe expands) just as the muon's does and both are spin  $1/2$ . The electron is also similar at least with respect to spin  $1/2$ . Thus we can have degeneracies in some observables.

Also recall you need the whole Hamiltonian of both mass energy and charge-field energy  $E$  (in  $H\psi=E\psi$ ) in the development of the Clebsch Gordon coefficients (in small  $C$  boost  $r_H=C_M/\xi =e^2 10^{40N}/\xi$  =charge/mass in  $\kappa_{00}=1-r_H/r$  in Energy= $E=1/\sqrt{\kappa_{00}}$ ). Recall you need at least one level of degeneracy for this Clebsch Gordon para and ortho method to work.(either charge(and so field energy) or mass energy) .

### 3.1 Casimir Effect

Also for this complex space  $2D \ 0=G_{00}=E_e+\sigma\bullet p_r$  for two nearby conducting plates the low energy neutrinos can leave (since their cross-section is so low) but the E&M ( $E_e$  standing waves) has to remain with some modes (from the  $\nu$  and anti  $\nu$ ), not existing due to not satisfying boundary conditions, because of outside  $\Delta E$  ground state oscillations implying less energy between the plates and so a attractive force between them (We have thereby derived the Casimir effect).

*Thus the zero energy vacuum and left handedness of the neutrino in the weak interaction are only possible in this 2D equation 4 Z plane.* If the space-time is not isotropic and homogenous the neutrino must then gain mass  $m_0$  (see section 3.3 for what happens to this mass) and it becomes an electron at the horizon  $r_H$  if it had enough kinetic energy to begin with. It changes to an electron by scattering off a neutron with at  $W^-$  and  $e^-$  resulting along with a proton. So the neutrino transformed into an electron with other decay products. Recall that the electron eq.7 and the neutrino eq.8 are dichotomic variables (one can transform into the other,sect.2) and can share the same spinor as we assumed in section 2. The neutrino in this situation is left handed.  $\gamma^5$  is the parity operator part of the Cabibbo angle calculation.

### 3.2 Helicity Implications 2D Isotropic And Homogenous State

From eq.11  $p_x\psi = -i\hbar\partial\psi/\partial x$ . We multiply equation  $p_x\psi = -i\hbar\partial\psi/\partial x$  in section 1 by normalized  $\psi^*$  and integrate over the volume to *define* the expectation value of operator  $p_x$  for this *observer* representation:

$$\langle p, t | p | p, t \rangle \equiv \int \psi^* p \psi dV$$

(implies Hilbert space if  $\psi$  is normalizable). Or for any given operator 'A' we write in general as a definition of the expectation value:

$$\langle A \rangle = \langle a, t | A | a, t \rangle \quad (3.2.1)$$

The time development of equation 16 is given by the Heisenberg equations of motion (for equation 16. We can even define the expectation value of the (charge) chirality in terms of a generalization of eq.16 for  $\psi_e$  spin  $\frac{1}{2}$  particle creation  $\psi_e$  from a spin 0 vacuum  $\chi_e$ . In that regard let  $\chi_e$  be the spin0 Klein Gordon vacuum state in zero ambient field and so  $\frac{1}{2}(1 \pm \gamma^5)\psi_e = \chi_e$ .

Thus the overlap integral of a spin  $\frac{1}{2}$  and spin zero field is:

$$\langle \text{vacuum helicity of charge} \rangle \equiv \int \psi_e^* \chi_e dV = \int \psi_e^* \frac{1}{2}(1 \pm \gamma^5) \psi_e dV \quad (3.2.2)$$

So  $\frac{1}{2}(1 \pm \gamma^5)$ =helicity creation operator for spin  $\frac{1}{2}$  Dirac particle: This helicity is the origin of charge as well for a spin  $\frac{1}{2}$  Dirac particle. See additional discussion of the nature of charge near the end of 3.2 Alternatively, in a second quantization context, equation 3.3.2 is the equivalent to the helicity coming out of the spin 0 vacuum  $\chi_e$  and becoming spin $\frac{1}{2}$  source charge with  $\frac{1}{2}(1 \pm \gamma^5) \equiv a^\dagger$  being the charge helicity creation operator.

The expectation value of  $\gamma^5$  is also the velocity. Also  $\gamma^i$  ( $i=x,y,z$ ) is the charge conjugation operator. 3.1.3 Note from section 3.1.1 the field and the wavefunction of the entangled state are related through  $e^{i\text{field}}=\psi$ =wavefunction.  $\gamma^r \sqrt{(\kappa_{rr})} \partial/\partial r (\gamma^r \sqrt{(\kappa_{rr})} \partial\chi/\partial r = 0$  where  $\psi = (\gamma^r \sqrt{(\kappa_{rr})} \partial\chi/\partial r$  and

$\frac{1}{2}(1\pm\gamma^5)\psi=\chi$ .  $\langle\gamma^5\rangle=v=\langle c/2\rangle=c/4$  So  $1\pm\gamma^5=\cos 13.04\pm\sin 13.04$ ,  $\theta=13.04=\text{Cabbibo angle}$ . Here we can then normalize the Cabibbo angle  $1\pm\gamma^5$  term on that 100km/sec object B component of the metric quantization. We then add that CP violating object C 1km/sec as a  $\gamma^5 X\gamma^i$  component. You then get a normalized value of .01 for CKM(1,3) and CKM(3,1). The measured value is .008.

## Review

### Vacuum eq.10

Recall some solutions to eq.10 gives us a vacuum solution as well. Also recall eq.1, 3 are 2D. Recall the  $\kappa_{\mu\nu}$ ,  $g_{\mu\nu}$  metrics (and so  $R_{ij}$  and  $R$ ) were generated in above section 2 (eqs.14,15). In that regard for 2D for a homogenous and isotropic  $g_{ij}$  we have identically  $R_{\mu\mu}-\frac{1}{2}g_{\mu\mu}R=0 \equiv \text{source} = G_{00}$  since in 2D  $R_{\mu\mu}=\frac{1}{2}g_{\mu\mu}R$  identically (Weinberg, pp.394) with  $\mu=0,\dots$ . Note the 0 ( $G_{00}=E_{\text{total}}$  the energy density source) and we have thereby proven the existence of a net zero energy density eq.9 vacuum. Thus our 2D theory implies the **vacuum is really a vacuum**.

### Left handedness

From sect.1 eqs.7 and 8 and 9 are combined. Note also from section 1.4 C rotation in a homogenous isotropic space-time. So eqs. 7+8 =  $G_{00}=E_e+\sigma\bullet p_r=0$  so  $E_e=-\sigma\bullet p_r$ . So given a positive  $E_e$  (AppendixB) and the negative sign in the above relation implies the neutrino chirality  $\sigma\bullet p$  is negative and therefore is left handed.

### 3.3 Nonhomogenous NonIsotropic Mass Increase For eq.7

But a free falling coordinate system in a large scale gravity field is equivalent to a isotropic and homogenous space-time and so even in a spatially large scale field the neutrino has negligible mass if it is free falling.

To examine the effect of all three ambient metric states 1,  $\epsilon$ ,  $\Delta\epsilon$  we again start out with a set of initial condition lines on our figure 3. In this case recall that in the presence of a nonisotropic non homogenous space time we can raise the neutrino energy to the  $\epsilon$  and repeat and get the muon neutrino with mass  $m_{0\nu}=(3\text{km}/1\text{AU})m_e=.01\text{eV}$  (for solar metric inhomogeneity. See Ch.3 section on homogenous isotropic space time). So start with eq. 2AII singlet filled  $135^\circ$  state  $1S_{1/2}$ . In that well known case  $E=\sqrt{(p^2c^2+m_o^2c^4)}=E=E(1+(m_o^2c^4/2E'))$ .  $E'\approx E\approx pc\gg m_o c^2$ ;  $\psi=e^{i(\omega t-kx)}$  with  $k=p/\hbar=E/(\hbar c)$ . Set  $\hbar=1, c=1$  so  $\psi=e^{i(\omega t-kx)}e^{ixm_o^2/2E'}$ . So we transition through the given  $\psi_{e\nu}, \psi_{\mu\nu}, \psi_{1\nu}$  masses (fig.6, section 6.7) as we move into a stronger and stronger metric gradient. (strong gravitational field)  $=\psi$  electron neutrinos can then transform into muon neutrinos. Starting with a isotropic homogenous space time in the ground state we then we go into steeper metric gradients in a inertial frame as seen from at constant metric gradient and higher energies thereby the rest of the states fill consecutively. We apply this result to the derivation of the eq.7+7+7 proton in section 8.1, starting out with infinitesimal eqs. 8+8+8 mass and going into the region of high nonisotropy, non homogeneity close to object B, thereby gaining mass in the above way. This process is equivalent to adding noise C to eq.8.

## Chapter 4 Simultaneous (union) Broken 2D Degeneracy $C_M$ rotation of eq. 7 Implies $2D\oplus 2D=4D$

### 4.3 2 Simultaneous Equations 16: $2D\oplus 2D$ Cartesian Product, Spherical Coordinates and $\sqrt{\kappa_{\mu\nu}}$

Note adding 2D eq.12  $\delta z$  perturbation gives 4D  $(dx_1+idx_2)+(dx_3+idx_4)\equiv dr+idt$  given (eqs5,7b)  $dr^2-dt^2=(\gamma^r dr+i\gamma^t dt)^2$  if  $dr^2\equiv dx^2+dy^2+dz^2$  so that  $\gamma^r dr\equiv\gamma^x dx+\gamma^y dy+\gamma^z dz$ ,  $\gamma^i\gamma^j+\gamma^j\gamma^i=0$ ,  $i\neq j$ ,  $(\gamma^i)^2=1$  (B2), rewritten (with eq14)  $(\gamma^x\sqrt{\kappa_{xx}}dx+\gamma^y\sqrt{\kappa_{yy}}dy+\gamma^z\sqrt{\kappa_{zz}}dz+\gamma^t\sqrt{\kappa_{tt}}idt)^2=\kappa_{xx}dx^2+\kappa_{yy}dy^2+\kappa_{zz}dz^2-\kappa_{tt}dt^2=ds^2$ . Multiply both sides by  $1/ds^2$  &  $(\delta z/\sqrt{dV})^2\equiv\psi^2$  and using operator eq 11 inside the brackets ( ) get **Newpde**  $\gamma^\mu(\sqrt{\kappa_{\mu\mu}})\partial\psi/\partial x_\mu=(\omega/c)\psi$  for  $e, v$ ,  $\kappa_{00}=1-r_H/r=1/\kappa_{rr}$   $r_H=e^2X10^{40}N/m$  ( $N=-1,0,1..$ ) (16)  $=C_M/\xi_1$  (from\* eq.13)  $C_M$ =Fiegebaum point. So: **postulate1** $\rightarrow$ **Newpde.** syllogism Note from eq.1.11 the  $(dr,dt;dr'dt')$  has two times in it so can be rewritten as

$$\begin{aligned} (dr,rd\theta,r\sin\theta\omega dt,cdt) &\equiv (dr,rd\theta,r\sin\theta d\phi,cdt) \\ dr=dr &\text{ gives } \gamma^r[\sqrt{(\kappa_{rr})}dr]\psi = -i\gamma^r[\sqrt{(\kappa_{rr})}(d\psi/dr)] = -i\gamma^x[\sqrt{(\kappa_{rr})}(d\psi/dr)] \\ rd\theta=dy &\text{ gives } \gamma^\theta[\sqrt{(\kappa_{\theta\theta})}dy]\psi = -i\gamma^\theta[\sqrt{(\kappa_{\theta\theta})}(d\psi/dy)] = -i\gamma^y[\sqrt{(\kappa_{\theta\theta})}(d\psi/dy)] \\ r\sin\theta d\phi=dz &\text{ gives } \gamma^\phi[\sqrt{(\kappa_{\phi\phi})}dz]\psi = -i\gamma^\phi[\sqrt{(\kappa_{\phi\phi})}(d\psi/dz)] = -i\gamma^z[\sqrt{(\kappa_{\phi\phi})}(d\psi/dz)] \\ cdt=dt'' &\text{ gives } \gamma^t[\sqrt{(\kappa_{tt})}dt'']\psi = -i\gamma^t[\sqrt{(\kappa_{tt})}(d\psi/dt'')] = -i\gamma^t[\sqrt{(\kappa_{tt})}(d\psi/dt'')] \end{aligned} \quad (4.3.1)$$

For example for the old method (without the  $\sqrt{\kappa_{ii}}$  for a spherically symmetric diagonalizable metric):

$ds^2=\{\gamma^x dx+\gamma^y dy+\gamma^z dz+\gamma^t cdt\}^2=dx^2+dy^2+dz^2+c^2dt^2$  then goes to  $ds^2=\{\gamma^x[\sqrt{(\kappa_{xx})}dx]+\gamma^y[\sqrt{(\kappa_{yy})}dy]+\gamma^z[\sqrt{(\kappa_{zz})}dz]+\gamma^t[\sqrt{(\kappa_{tt})}dt]\}^2=\kappa_{xx}dx^2+\kappa_{yy}dy^2+\kappa_{zz}dz^2+c^2\kappa_{tt}dt^2$  and so we can then derive the same Clifford algebra (of the  $\gamma$  s) as for the old Dirac equation with the terms in the square brackets (eg.,  $[\sqrt{(\kappa_{xx})}dx]=p'_x$ ) replacing the old  $dx$  in that derivation. Also here there is a spherical symmetry so there is no loss in generality in picking the  $x$  direction to be  $r$  at any given time since there is no  $\theta$  or  $\phi$  dependence on the metrics like there is for  $r$ . If the two body equation 7 is solved at  $r\approx r_H$  (i.e., our  $-dr$  axis,  $C\rightarrow 0$  of eq.3) using the separation of variables and the Frobenius series solution method we get the hyperon energy-charge eigenvalues but here from first principles (i.e., our postulate) and not from assuming those usual adhoc qcd gauges, gluons, colors, etc. See Ch.8-10 for this Frobenius series method and also see Ch.9. Also  $E_n=\text{Rel}(1/\sqrt{g_{00}})=\text{Rel}(e^{i(2\varepsilon+\Delta\varepsilon)})=1-4\varepsilon^2/4+..=1-2\varepsilon^2/2\equiv 1-\frac{1}{2}\alpha$ . Multiply both sides by  $\hbar c/r$  (for 2 body S state  $\lambda=r$ , sec.16.2), use reduced mass (two body  $m/2$ ) to get  $E=\hbar c/r+(\alpha\hbar c/(2r))=\hbar c/r+(ke^2/2r)=QM(r=\lambda/2, 2 \text{ body S state})+E\&M$  where we have then derived the fine structure constant  $\alpha$ .

#### 4.5 Implications of $g_{00}=1-2e^2/rm_e c^2=1-eA_0/mc^2 v^0$ In The Low Temperature Limit Of Small Noise C

For  $z=0$   $\delta z'$  is big in  $z'=1+\delta z$  and so we have again  $\pm 45^\circ$  min  $ds$  and so two possible  $45^\circ$  rotations so through a total of two quadrants for  $\pm\delta z'$  in eq.12. one around a axis (SM, appendix A)) and the other around a diagonal (SC), the two electron Boson singlet state in the 1st and 4<sup>th</sup> quadrants which is the subject of this section...

In fig.2 IVth quadrant could also be a negative velocity electron. So combinations of negative and positive velocity electron (Cooper pairs) are also solutions to eq.1, 2. Solution to eq..3  $z=zz+C$  (where  $C$  is noise),  $z=1+\delta z$  is:

$\delta z = \frac{-1\pm\sqrt{1-4C}}{2}=dr+idt$ . But if  $C<1/4$  then  $dt$  is 0 and **time stops** for eq.7. Note eq.7 has two counterrotating opposite velocity (paired) simultaneous components  $dr+dt$  and  $dr-dt$ . Note electron scattering by Cooper pairs is time dependent so the scattering stops and so electrical resistance drops, and so superconductivity ensues, at small enough noise  $C$  or  $v^2$  in  $Adv/dt/v^2$  below.

Or we could as the mainstream does just postulate ad hoc creation and annihilation operators (Bogoliubov) for the Cooper pairs that behave this way and give an energy gap.

In any case *the time stopping because the noise C is small (in eq.1) is the real source of superconductivity.*

### Geodesics

Recall equation 4.3.  $g_{00} = 1 - 2e^2/rm_e c^2 \equiv 1 - eA_0/mc^2 v^0$ . We determined  $A_0$ , (and  $A_1, A_2, A_3$ ) in appendix A4, eq.A2. We plug this  $A_i$  into the geodesics

$$\frac{d^2 x^\mu}{ds^2} = -\Gamma_{\nu\lambda}^\mu \frac{dx^\nu}{ds} \frac{dx^\lambda}{ds} \quad (4.5.1)$$

where  $\Gamma_{ij}^m \equiv (g^{km}/2)(\partial g_{ik}/\partial x^j + \partial g_{jk}/\partial x^i - \partial g_{ij}/\partial x^k)$

So in general 
$$g_{ii} \equiv \eta_{ii} + h_{ii} = 1 - \frac{eA_i(x,t)}{m_\tau c^2 v^i}, i \neq 0, \quad (4.5.2)$$

$A'_0 \equiv e\phi / m_\tau c^2$ ,  $g_{00} \equiv 1 - \frac{e\phi(x,t)}{m_\tau c^2} = 1 - A'_0$ , and define  $g'_{\alpha\alpha} \equiv 1 - A'_\alpha / v_\alpha$ , ( $\alpha \neq 0$ ) and

$g''_{\alpha\alpha} \equiv g'_{\alpha\alpha} / 2$  for large and near constant  $v_\alpha$ , see eq. 14 also. In the weak field  $g^{ii} \approx 1$ . Note  $e=0$  for the photon so it is not deflected by these geodesics whereas a gravity field does deflect them. The photon moves in a straight line through a electric or magnetic field. Also use the total

differential  $\frac{\partial g_{11}}{\partial x^\alpha} dx^\alpha = dg_{11}$  so that using the chain rule gives us:

$$\frac{\partial g_{11}}{\partial x^\alpha} \frac{dx^\alpha}{dx^0} = \frac{\partial g_{11}}{\partial x^\alpha} v^\alpha = \frac{dg_{11}}{dx^0} \approx \frac{\partial g_{11}}{\partial x^0}.$$

gives a new  $A(1/v^2)dv/dt$  force term added to the first order Lorentz force result in these geodesic equations (Sokolnikoff, pp.304). So plugging equation 4.5.2 into equation 4.5.1, the geodesic equations gives:

$$\begin{aligned} -\frac{d^2 x^1}{ds^2} &= \Gamma_{11}^1 v_1 v_1 + \Gamma_{12}^1 v_1 v_2 + \Gamma_{13}^1 v_1 v_3 + \Gamma_{10}^1 v_0 v_1 + \Gamma_{21}^1 v_2 v_1 + \Gamma_{22}^1 v_2 v_2 + \Gamma_{23}^1 v_2 v_3 + \Gamma_{20}^1 v_2 v_0 + \\ &\Gamma_{31}^1 v_3 v_1 + \Gamma_{32}^1 v_3 v_2 + \Gamma_{33}^1 v_3 v_3 + \Gamma_{30}^1 v_3 v_0 + \Gamma_{01}^1 v_0 v_1 + \Gamma_{02}^1 v_0 v_2 + \Gamma_{03}^1 v_0 v_3 + \Gamma_{00}^1 v_0 v_0 = \\ &\frac{g^{11}}{2} \left( \frac{\partial g'_{11}}{\partial x^1} \right) v_1 + \frac{g^{11}}{2} \left( \frac{\partial g'_{11}}{\partial x^2} \right) v_2 + \frac{g^{11}}{2} \left( \frac{\partial g'_{11}}{\partial x^3} \right) v_3 + \frac{g^{11}}{2} \left( \frac{\partial g'_{11}}{\partial x^0} \right) v_0 + \\ &\frac{g^{11}}{2} \left( \frac{\partial g'_{11}}{\partial x^2} \right) v_2 - \frac{g^{11}}{2} \left( \frac{\partial g'_{22}}{\partial x^1} \right) v_2 + 0 + 0 + \frac{g^{11}}{2} \left( \frac{\partial g'_{11}}{\partial x^3} \right) v_3 + 0 - \frac{g^{11}}{2} \left( \frac{\partial g'_{33}}{\partial x^1} \right) v_3 + 0 + \\ &\frac{g^{11}}{2} \left( \frac{\partial g'_{11}}{\partial x^0} \right) v_0 + 0 + 0 - \frac{g^{11}}{2} \left( \frac{\partial g'_{00}}{\partial x^1} \right) v_0 + O\left(\frac{A_i dv}{v^2 dt}\right) = v_2 \left( \frac{\partial g''_{11}}{\partial x^2} - \frac{\partial g''_{22}}{\partial x^1} \right) + v_3 \left( \frac{\partial g''_{11}}{\partial x^3} - \frac{\partial g''_{33}}{\partial x^1} \right) + \\ &\left( \frac{\partial g''_{11}}{\partial x^\alpha} v_\alpha + \frac{\partial g''_{11}}{\partial x^0} v_0 \right) - \left( \frac{\partial g''_{00}}{\partial x^1} \right) v_0 + O\left(\frac{A_i dv}{v^2 dx}\right) \approx - \left( \frac{\partial g''_{00}}{\partial x^1} \right) v_0 + v_2 \left( \frac{\partial g''_{11}}{\partial x^2} - \frac{\partial g''_{22}}{\partial x^1} \right) + v_3 \left( \frac{\partial g''_{11}}{\partial x^3} - \frac{\partial g''_{33}}{\partial x^1} \right) \\ &+ O\left(\frac{A_i dv}{v^2 dt}\right) \approx \frac{e}{m_\tau c^2} \left( -\vec{\nabla} \phi + \vec{v} X (\vec{\nabla} X \vec{A}) \right)_x + O\left(\frac{A_i dv}{v^2 dr}\right). \end{aligned}$$

Thus we have the *Lorentz force equation* form

$\left( -\left( \frac{e}{m_e c^2} \right) \left( \vec{\nabla} \phi + \vec{v} X \left( \vec{\nabla} X \vec{A} \right) \right) \right)$  plus the derivatives of  $1/v$  which are of the form:  $A_i(dv/dr)_{av}/v^2$ . This

new term  $A(1/v^2)dv/dr$  is the pairing interaction (4.5.3). This approximation holds well for nonrelativistic and nearly constant velocities and low B fields but fails at extremely low velocities so it works when  $v \gg (dv/dA)A$ . This constraint also applies to this ansatz if it is put into our Maxwell equations in the next section. Recall at the beginning of the BCS paper abstract the authors say that superconductivity results if the phonon attraction interaction is larger than the electrical repulsion interaction

Given a stiff crystal lattice structure (so  $dv/dr$  is large also implying that lattice harmonic oscillation isotope effect in which the period varies with the (isotopic) mass.) this makes the pairing interaction force  $A_i(dv/dr)_{av}/v^2$ . The relative velocity “v” will then be small in the denominator in some of the above perturbative spatial derivatives of the metric  $g_{\alpha\alpha}$  (e.g., the  $1/v$  derivative of  $H_2$   $(A/v^2)(dv/dr)_{av}$ . This fact is highly suggestive for the velocity component “v” because it implies that at cryogenic temperatures (extremely low relative velocities in normal mode antisymmetric motion) new forces (pairing interactions?) arise from the above general relativity and its spin 0 (BCS) and spin 2 states<sup>i</sup> (D states for  $CuO_4$  structure). For example the mass of 4 oxygens ( $4 \times 16 = 64$ ) is nearly the same as the mass of a Cu (64) so that the SHM dynamics symmetric mode (at the same or commensurate frequencies) would allow the conduction electrons to oscillate in neighboring lattices at a relative velocity of near zero (e.g.,  $v \approx 0$  in  $(A/v^2)(dv/dr)_{av}$  making a large contribution to the force), thus creating a large BCS (or D state) type pairing interaction using the above mechanism. Note from the  $dv/dt$  there must be accelerated motion (here centripetal acceleration in BCS or linear SHM as in the D states) as in pair rotation but it must be of very high frequency for  $(dv/dr)_{av}$  (lattice vibration) to be large in the numerator also so that v, the velocity, remain small in the denominator with the phase of “A” such that  $A(dv/dr)_{av}$  remain the same sign so the polarity giving the A is changing rapidly as well. This explains the requirement of the high frequency lattice vibrations (and also the sensitivity to valence values giving the polarity) in creating that pairing interaction force. Note there should be very few surrounding  $CuO_4$  complexes, just the ones forming a line of such complexes since their own motion will disrupt a given  $CuO_4$  resonance, these waves come in at a filamentary isolated sequence of  $CuO_4$  complexes passing the electrons from one complex to another would be most efficient. Chern Simons developed a similar looking formula to  $A_i(dv/dr)_{av}/v^2$  by trial and error. This pairing interaction force  $A(dv/dt)/v^2$  drops the flat horizontal energy band (with very tiny variation in energy) saddle point (normally at high energy) associated with a particular layer down to the Fermi level making these energies (band gaps) large and so allowing superconductivity to occur.

### Twisted Graphene

Monolayer graphene is not a superconductor by the way.

But what about two layers? For example a graphene bilayer twisted by 1.1deg rotation creates a quasi Moire' pattern with periodic hexagonal lattice.

It is amazing that in this Moire pattern for each hexagonal structure there are carbons far apart inside the hexagon and carbons close together around the edge of the hexagon making these two groups of carbon atoms distinguishable in terms of their bonding lengths.

So how many high density carbons are in the less dense region of the hexagon?

$3+4+5+6+5+4+3=30$ . How many carbons are in the more dense region of the Moire pattern hexagon boundary?  $5 \times 6 = 30$  again. So these two groups have the same aggregate mass (but are distinguishable) just like the 4 Os and one Cu in the cuprates.



So if you twist one layer of graphene that is on top of another layer by 1.1deg it should become a superconductor. And it is.

This pairing interaction force also lowers the energy gap to near the Fermi level.

$\delta z = [-1 \pm \sqrt{1-4C}]/2$ . If  $C < 1/4$  there is no time and the and so  $dt/ds=0$  and so the scattering Hamiltonian is 0. Thus there is no scattering and so no electrical resistance.

This is the true source of superconductivity.

#### High Pressure

The main constituent of these high pressure superconductors is hydrogen.

Chemical bonding strengths change under high pressure so at some given pressure you would expect the heavier element (eg., nitrogen or sulfur) to behave dynamically as though it was a multiple of the mass of hydrogen since all nuclei are ALMOST a multiple of the mass of hydrogen ANYWAY. Thus at some given pressure you are going to have an antisymmetric normal mode (so relative  $v=0$ ) of some integer numbers of hydrogens in that  $F = A dv/dt/v^2$  term.

So if you have N hydrogens with just ONE other lower nucleus atomic mass m it just takes a small change of the bonding to create that effective mass relation  $Nh=m$  (where N is a integer) since the atomic weight m is ALMOST a multiple of h anyway. That antisymmetric normal mode oscillation is then realized. Pressure changes would provide that bonding alteration. For higher mass nuclei added binding energy mass energy starts making integer N harder to realize.

A highly electronegative atom, like that sulfur, would also provide the 'A' in  $A dv/dt/v^2=F$ . The lattice interaction provides the  $dv/dt$ .

Recall the pairing interaction  $F=A(dv/dt)/v^2$ . (1)

For a superconductor the same effective masses, including the effects of the bonding with the upper and lower layers, contribute to effective masses moving in the antisymmetric mode so that makes the relative velocity of the two masses  $v=0$  which means that quantum fluctuations are small.

The mainstream is very close to this phenomenology in it's pnictide analysis.

They just use different words for the same thing. For example they call these quantum fluctuations 'nematic'.

They also define nematic QCP: the Quantum Criticality Point

At  $v=0$  critical nematic fluctuations are quenched at high  $T_c$ . The mainstream goes further and states that this QCP is where the (orbital) Order, Fermi liquid and nematic states all meet. So at QCP that  $v=0$  and so we have the critical temperature superconductivity molecular concentrations. Also high pressure quenches these fluctuations thereby making  $v$  small.

So the mainstream seems surprisingly close to understanding the (pairing interaction) effects of equation 1. But yet without equation 1 they will never understand the source of the pairing interaction, they will be forever guessing.

#### 4.6 Summary of Consequences of the Uncertainty In Distance (separation) C In $-\delta z = \delta z \delta z + C$ eq.3

1) C as width of a slit determines uncertainty in photon location and resulting wave particle duality (see above section 4.3.8).

2) C is uncertainty in separation of particles which is large at high temperatures. Note degeneracy repulsion (two spin  $1/2$  can't be in a single state) is not necessarily time dependent and is zero only for bosons. Also given the already extremely small Brillouin zone bosonization separation (see equation 4.3 for pairing interaction source) then C is small so not much more is needed for C to drop below  $1/4$  to the r axis for Bosons. Thus time axis  $\Delta t=0$  so  $\Delta v=a\Delta t=0$ . (note

relative  $v$  is big here. Therefore there is no  $\Delta v$  and so no force ( $F=ma$ ) associated with the time dependent acceleration 'a' for this Boson flowing through a wire with the stationary atoms in the wire. So there is no electrical resistance to the flow of the Bosons in this circuit and we have therefore derived superconductivity from first principles. But there is a force between electrons in a pairing interaction (that creates the Boson) because  $v$  between them is so small. Use pairing interaction force  $mv^2/r$  between leptons from sect.4.8:  $F_{\text{pair}}=A(dv/dt)/v^2$  is large. Recall that a superfluid has no viscosity. But doesn't viscosity constitute a force  $F$  as well ( $F/m=a$  in  $dv=adt$ ) and isn't helium 4 already a boson so that when  $C$  drops below  $1/4$  then  $dt$  drops to zero as well? So superfluidity for helium 4 is also a natural outcome of a small  $C$ .

At low temperatures you start seeing some of the same phenomena you see in high energy physics (at high temperatures) such as this fractional charge. There is a reciprocity between high energy and low energy physics. That pairing interaction force  $A(dv/dt)/v^2$  that gets larger as  $v$  (temperature) in the denominator gets smaller. These forces get into the new pde and play a similar role to the high energy forces.

3)  $C$  is separation between particle-antiparticle pair (pair creation). For  $C < 1/4$  we leave the  $135^\circ$  and  $45^\circ$  diagonals jump to the  $r$  axis and simple  $ds^2$  wave equation dependence (Ch1, section 2). Thus we have derived pair creation and annihilation. The  $dt$  is zero giving no time dependence thus stable states. On the superconductivity we derived the pairing interaction (eq.4.5.3) and superfluidity (sect.4.6). So for two paired leptons (via the pairing interaction) the Hamiltonian of each one is then a function of both wavefunctions:  $\hbar \partial \psi_1 / \partial t = u_1 \psi_1 v_2 \psi_2$  and  $\hbar \partial \psi_2 / \partial t = u_2 \psi_1 + v_2 \psi_2$  which gives the superconductivity. See Feynman lectures on superconductivity.

#### **Alternative Method Of Doing QM: Markov Chains (eg., Implying Path Integral)**

#### **4.7 Markov Chain Zitterbewegung For $r > \text{Compton Wavelength}$ Is A Blob**

Recall that the mainstream says that working in the Schrodinger representation and starting with the average current (from Dirac eq.  $(\hat{p}-mc)\psi(x)=0$ ) assumption and so equation 9 gives  $J^{(+)} = \int \psi^{(+)\dagger} c \alpha \psi^{(+)} d^3x$ . Then using Gordon decomposition of the currents and the Fourier superposition of the  $b(p,s)u(p,s)e^{-ipxu/\hbar}$  solutions ( $b(p,s)$  is a normalization constant of  $\int \psi^\dagger \psi d^3x$ .) to the free particle Dirac equation (1.2.7) we get for the observed current ( $u$  and  $v$  have tildas):

$$J^k = \int d^3p \left\{ \sum_{\pm s} [ |b(p,s)|^2 + |d(p,s)|^2 ] p^k c^2 / E + i \sum_{\pm s, \pm s'} b^*(-p, s') d^*(p, s) e^{2ix_0 p_0 / \hbar} u(-p, s') \sigma^{k0} v(p, s) \right. \\ \left. + i \sum_{\pm s, \pm s'} b(p, s') d(p, s) e^{2ix_0 p_0 / \hbar} v(p, s') \sigma^{k0} u(p, s) \right\} \quad (4.11.4)$$

(2) E. Schrodinger, Sitzber. Preuss. Akad. Wiss. Physik-Math., 24, 418 (1930)

Thus we can either set the positive energy  $v(p,s)$  or the negative energy  $u(p,s)$  equal to zero and so we no longer have a  $e^{2ix_0 p_0 / \hbar}$  zitterbewegung contribution to  $J_u$ , the zitterbewegung no longer can be seen. Thus we have derived the mainstream idea that the zitterbewegung does not exist. But if we continue on with this derivation we can also show that the zitterbewegung does exist if the electron is in a confined space of about a Compton wavelength in width, so that a nearby confining wall exists then.

(3) Bjorken and Drell, *Relativistic Quantum Mechanics*, PP.39, eq.3.32, (1964)

Note negative energy does exist from  $E^2 = p^2 c^2 + m_0^2 c^4$  so  $E = \sqrt{p^2 c^2 + m_0^2 c^4}$  so that  $E$  can be negative (positrons). Note if  $p$  small  $m$  can be negative since  $E=pc$  then. In  $E=mgh + \frac{1}{2}mv^2$  a negative energy  $E$  does indeed create absurd results but not if  $E$  is also negative since the negative sign cancels out.

#### **Derivation Of Eq.1.2.7 From (uncertainty) Blob (reference 1)**

Recall from section 3.4.4 that we can derive the zitterbewegung blob (within the Compton Wavelength) from the equation 1.24. (see reference 2.) Also recall from section 1 that we postulated a blob that was nonzero, non infinite and with constant standard deviation (i.e., we

found  $3 \delta \delta z = 0$ ). But that is the same thing as Schrodinger's zitterbewegung blob mentioned above. So we postulated the electron and derived the electron rotated 7 (i.e., eq.16) from that postulate. We therefore have created a mere trivial tautology.

#### 4.9 Mixed State eq.7+eq.7 Implies There Is No Need For A Dirac Sea

The 1928 solution to the Dirac equation has for the positron and electron simultaneous  $x, y, z$  coordinates (bottom of p.94 Bjorken and Drell derivation of the free particle propagator) creating the need for the Dirac sea of filled states so the electron will not annihilate immediately with a collocated negative energy positron which is also a solution to the same Dirac equation. Recall  $\psi(+)$  and  $\psi(-)$  are separate but (Hermitian) orthogonal eigenstates and so  $\langle \psi(+)|\psi(-) \rangle = 0$  without a perturbation so we can introduce a displacement  $\psi(x) \rightarrow \psi(x+\Delta x)$  for just one of these eigenfunctions. But the mixed state positron and electron separated by a substantial distance  $\Delta x$  will not necessarily annihilate. Note in the eq.7  $2D \oplus 2D$  (i.e.,  $\sqrt{\kappa_{\mu\nu}} \gamma^\mu \partial \psi / \partial x_\mu = (\omega/c) \psi$ ) equation the electron is at  $45^\circ -dr, dt$  and the positron is at  $135^\circ dr', -dt'$  which means formally they are not in the same location in this formulation of the Dirac equation. In that regard note that  $dr/\sqrt{1-r_H/r} = dr'$ ,  $r_H = 2e^2/m_e c^2 = \epsilon$  so that different  $e$  leads in general to different  $dr'$  spatial dependence for the  $\psi(x)$  in the general representation of the  $4 \times 4$  Dirac matrices. So in the multiplication of 4  $\psi$ s the antiparticle  $\psi$  will be given a  $r_H$  displacement  $\Delta r$  ( $dr \rightarrow dr'$  here) by the  $\pm \epsilon$  term in the associated  $\kappa_{\mu\nu}$ . So the  $\psi(+)$  and  $\psi(-)$  in the Dirac equation column matrix will have different  $(x, y, z, t)$  values for the  $\psi(+)$  than for the  $\psi(-)$ . As an analogy an electron in a given atomic state of a given atom can't decay into a empty state of a completely different atom located somewhere else. Thus perturbation theory (eg., Fermi's golden rule) cannot lead to the electron spontaneously dropping into a negative energy state since such eq.7 states are not collocated for a given solutions to a single Dirac equation (other positrons from *other* Dirac equation solutions can always wonder in from the outside in the usual positron-electron pair annihilation calculation case but that is not the same thing). Thus the Dirac sea does not have to exist to explain why the electron does not decay into negative energy.

#### 4.10 No Need for a Running Coupling Constant

If the Coulomb  $V = \alpha/r$  is used for the coupling instead of  $\alpha/(k_H-r)$  then we must multiply  $\alpha$  in the Coulomb term by a floating constant ( $K$ ) to make the coulomb  $V$  give the correct potential energy. Thus if an isolated electron source is used in  $Z_{00}$  we have that  $(-K\alpha/r) = \alpha/(k_H-r)$  to define the running coupling constant multiplier " $K$ ". The distance  $k_H$  corresponds to about  $d = 10^{-18} m = ke^2/m_e c^2$ , with an interaction energy of approximately  $hc/d = 2.48 \times 10^{-8} \text{ joules} = 1.55 \text{ TeV}$ . For 80 GeV,  $r \approx 20$  ( $\approx 1.55 \text{ TeV}/80 \text{ GeV}$ ) times this distance in colliding electron beam experiments, so  $(-K\alpha/r) = \alpha/(r_H-r) = \alpha/(r(1/20)-r) = -\alpha/(r(19/20)) = (20/19)\alpha/r = 1.05\alpha/r$  so  $K = 1.05$  which corresponds to a  $1/K\alpha \approx 1/\alpha' \approx 130$  also found by QED (renormalization group) calculations of (Halzen, Quarks). Therefore we can dispense with the running coupling constants, higher order diagrams, the renormalization group, adding infinities to get finite quantities; all we need is the correct potential incorporating  $\sqrt{\kappa_{00}}$ .

Note that the  $\alpha' = \alpha/(1 - [\alpha/3\pi(\ln \chi)])$  running coupling constant formula (Faddeev, 1981)] doesn't work near the singularity (i.e.,  $\chi \approx e^{3\pi/\alpha}$ ) because the constant is assumed small over all scales

(therefore there really is *no formula to compare*  $\alpha/(r-r_H)$  to over all scales) but this formula works well near  $\alpha \sim 1/137.036$  which is where we used it just above.

#### 4.11 Rotated 1.24 Implies $\kappa_{00}=1-r_H/r \approx 1/\kappa_{rr}$ So No Klein Paradox As Is In The Original 1928 Dirac Equation

Recall that  $\kappa_{rr}=1/(1-r_H/r)$  in the new pde eq.7. Recall that for the ordinary Dirac equation that the reflection ( $R_s$ ) and transmission ( $T_s$ ) coefficients at an abrupt potential rise are:  $R_s = ((1-\kappa)/(1+\kappa))^2$  and  $T_s = 4\kappa/(1+\kappa)^2$  where  $\kappa = p(E+mc^2)/k_2(E+mc^2-V)$  assuming  $k_2$  (ie., momentum on right side of barrier) momentum is finite.. Note in section1  $dr'^2 = \kappa_{rr} dr^2$  and  $p_r = mdr/ds$  in the eq.7+eq.7 mixed state new pde so  $p_r = (\sqrt{\kappa_{rr}})p = (1/\sqrt{1-r_H/r})p$  and so  $p_r \rightarrow \infty$  so  $\kappa \rightarrow \infty$  the huge values of the rest of the numerator and denominator cancel out with some left over finite number. Therefore for the actual abrupt potential rise at  $r=r_H$  we find that  $p_r$  goes to infinity so  $R_s=1$  and  $T_s=0$ .as expected. Thus nothing makes it through the huge barrier at  $r_H$  thereby resolving the Klein paradox: there is no paradox anymore with the new pde. No potentials that have infinite slope. Therefore the new pde applies to the region inside the Compton wavelength just as much as anywhere else. So if you drop the  $\sqrt{\kappa_{rr}}$  in the new pde all kinds of problems occur inside the Compton wavelength such as more particles moving to the right of the barrier than as were coming in from the left, hence the Klein paradox(4).

(4) O.Klein, Z. Physik, 53,157 (1929)

So by adopting the new pde (eq.9 ) instead of the old 1928 Dirac equation you make the Dirac equation generally covariant and selfconsistent at all scales and so find no more paradoxes.

Conclusion

$$\kappa_{rr} = \frac{1}{\kappa_{00}}$$

$$\kappa_{00} = 1 - \frac{r_H}{r}$$

$$\sum_{\mu} \left( \sqrt{\kappa_{\mu\mu}} \gamma^{\mu} \frac{\partial \psi}{\partial x_{\mu}} \right) - \omega \psi = 0 \quad (1.9)$$

$$r_H = \frac{2e^2}{m_e c^2}$$

Solve Directly  
(See Ch.2 Above)

No New Assumptions

Bottom Line

Same experimental results as SM with interesting new physics.

Recall: Solving Directly means Separation of Variable, series solution for  $r > r_H$   $r = r_H$   $r < r_H$

(standard alternative sets  $r_H=0$ )  
Minkowski flat space metric  
Go affine connection zero  
 $g_{xx} = -1, g_{yy} = -1, g_{zz} = -1, g_{tt} = 1$  or  $E^2 = c^2 p^2 + m^2 c^4$

General Covariance put into the (gauge) derivative

But this is also the affine connection !!

$\gamma^{\mu} \partial_{\mu} \psi + i \gamma^{\mu} \omega_{\mu} \psi = 0$   
 $\psi \rightarrow \psi e^{iq\chi(x)}$

pages full of added assumptions for example:

$\frac{\partial}{\partial x^{\mu}} \rightarrow \frac{\partial}{\partial x^{\mu}} + k A_{\mu}$

$SU(2) \times U(1)$ , gauged  $k A_{\mu}$  2 complex potential uses multiple interactions Needs counterterms

Postulated here are **18 quarks** (6flavorsX3colors) phi-4 potential, a multitude of gauges, etc., a alphabet soup of about **50** postulates and 19 free parameters

Pages Full of Added Assumptions

at least a factor of 10 with Supersymmetric partners, new gauge group assumptions, dimensions winding factors, etc. Many more assumptions

Standard Model (SM) of particle physics

A quagmire that has put a halt to the progress of theoretical physics

#### 4.12 Mixed State eq.7+eq.7 $C>1/4$ and $C<1/4$ Implications For Pair Creation And Annihilation

Note

that if  $C<1/4$  in equation 1 ( $dz=(-B\pm\sqrt{(B^2-4AC)})/2A$ ,  $A=1$ ,  $B=1$ ) the two points are close together and time disappears since  $dz$  is then real for the neighborhood of the origin where opposite charges can exist along the  $135^\circ$  line. So we are off the  $45^\circ$  diagonal and therefore the equation 2 extrema does *not* apply. So the eq.7 2 fermions disappear and we have only that original second boson derivative  $\delta ds^2=0$  circle ( $\square^2 A_\mu=0$ ,  $\square \bullet A=0$ ) Maxwell equations. So when two fundamental fermions are too near the origin and so get too close together (ie.,  $dr=dr'$ ,  $dt=dt'$ ) you only have a boson and the fermions disappear. So we have explained particle-antiparticle annihilation from first principles. In contrast two fermions of equal charge require energies on the order of 100GeV to get this close together in which case they also generate bosons in the same way and again the fermions do disappear from existence. You then generate the W and the Z bosons (since above sect.4.11 nonweak field  $k^\nu k_\nu \kappa_{\mu\mu}$ =Proca equation term) .

### Chapter 5 Second Solution $C_M$ Contribution To $\kappa_{\mu\nu}$ Due To Object B

Note we are within the Compton wavelength of the next higher fractal scale new pde (we are inside of  $r_H$ ). Also our new pde does not exhibit the Klein paradox within the Compton wavelength (because of the  $\kappa_{ij}$  s) or anywhere else so our new pde is valid there also. Note for  $r<r_H$  then  $E=\hbar\omega=E=1/\sqrt{\kappa_{00}}=1/\sqrt{(1-r_H/r)}$  and therefore this square root is imaginary and so  $i\omega \rightarrow \omega$  in the Heisenberg equations of motion. Therefore  $r=r_0 e^{i\omega t}$  becomes instead  $r=r_0 e^{\omega t}$  (that accelerating cosmological expansion) which is observable zitterbewegung motion since  $\omega t$  does not cancel out in  $\psi^* \psi$  in that case and again we are within the Compton wavelength and so even according to the Bjorken&Drell PP.39 criteria the zitterbewegung therefore exists. Also note in the above  $\kappa_\pi=1/\kappa_\pi$  we have derived GR from our theory in eq. 13-14a. For loosely bound states (eg.,  $2P_{1/2}$  at  $r\approx r_H$ ) object C contributes a  $\xi_{WZ}$ . (see B4)

### 5.1 The $R_{\mu\nu}$ Is Also A Quantum Mechanical Operator.

Recall section 4 implies General relativity (recall eq.13,14 and the Schwarzschild metric derivation there). Note this all exists in the context of appendix B MandelbulbLepton results. So it is a local metric normalization to get the ambient eq.4 flat background metric. and so equation 1 and observables. Note also in section 1.2 above we defined the quantum mechanical  $[A,H]|a,t\rangle=(\partial A/\partial t)|a,t\rangle$  Heisenberg equations of motion in section 1.2 with  $|a,t\rangle$  a eq.2 (7) eigenstate. Note the commutation relation and so second derivatives (H relativistic eq.2 (7) Dirac eq. iteration 2nd derivative) taken twice and subtracted.  $(\partial A/\partial t)|a,t\rangle$ . For example if 'A' is momentum  $p_x=-i\partial/\partial x$ .  $H=\partial/\partial t$  then  $[A, H]$  so we must use the equations of motion for a curved space. In this ordinary QM case I found for  $r<r_H$  that  $r=r_0 e^{\omega t}$   $H|a,t\rangle=(\partial A/\partial t)|a,t\rangle=(\partial/\partial t)(\partial/\partial x)-(\partial/\partial x)(\partial/\partial t)=p\dot{}$ . But  $\sqrt{\kappa_\pi}$  is in the kinetic term in the new pde with merely perturbative  $t'=t/\sqrt{\kappa_{00}}$ . But using the  $C^2$  of properties of operator A ( $C^2$  means continuous first and second derivatives and is implied in sect.1.1) in a curved space time we can generalize the Heisenberg equations of motion to curved space *nonperturbatively* with:  $(A_{i,jk}-A_{i,kj})|a,t\rangle=(R^m{}_{ijk}A_m)|a,t\rangle$  where  $R^a{}_{bcd}$  is the Riemann Christoffel Tensor of the Second Kind and  $\kappa_{ab}\rightarrow g_{ab}$ . Note all we have done here is to identify  $A_k$  as a quantum vector operator here, which it should be. Note again the second derivatives are taken twice and subtracted looking a lot like a generalization of the above Heisenberg equations of motion commutation relations. Note also  $R^m{}_{ijk}$  could even be taken as an eigenvalue of  $p\dot{}$  since it is zero when the space is

flat, where force is zero. These generalized Heisenberg equations of motion reduce to the above QM form in the limit  $\omega \rightarrow 0$ , outside the region where angular velocity is very high in the expansion (now it is only one part in  $10^5$ ).

## 5.2 Solution To The Problem Of General Relativity Having 10 Unknowns But 6 Independent Equations

From Chapter 4 this zitterbewegung (de Donder **harmonic** motion (2) ) plays a much more important role in general relativity (GR). The reason is that General Relativity has ten equations (e.g.,  $R_{\mu\nu}=0$ ) and 10 unknowns  $g_{\mu\nu}$ . But the Bianchi identities (i.e.,  $R_{\alpha\beta\mu\nu;\lambda} + R_{\alpha\beta\lambda\mu;\nu} + R_{\alpha\beta\nu\lambda;\mu} = 0$ ) drop the number of independent equations to 6. Therefore the four equations (i.e.,  $(\kappa^{\mu\nu}\sqrt{-\kappa})_{,\mu} = 0$ ) of the (zitterbewegung) harmonic condition fill in the four degrees of freedom needed to make GR 10 equations  $R_{\mu\nu}=0$  and 10 unknown  $g_{\mu\nu}$ . We thereby do not allow the gauge formulations that give us wormholes or other such arbitrary, nonexistent phenomena. In that regard this de Donder **harmonic** gauge (equivalent condition) is what is used to give us the historically successful theoretical predictions of General Relativity such as the apsidal motion of Mercury and light bending angle around the sun seen in solar eclipses. So the harmonic 'gauge' is not an arbitrary choice of "gauge". It is not a gauge at all actually since it is a physically real set of coordinates: the zitterbewegung oscillation harmonic coordinates.

(3) John Stewart (1991), "Advanced General Relativity", Cambridge University Press, ISBN 0-521-44946-4

## 5.4. N=0 (eq.13,14,15 give our Newpde metric $\kappa_{\mu\nu}$ at $r < r_H$ , $r > r_H$ )

Found GR from eq.13 and eq.14 so we can now write the Ricci tensor  $R_{\mu\nu}$  (and self similar perturbation Kerr metric since frame dragging decreased by external object B, sect.A6). Also for fractal scale  $N=0$ ,  $r_H = 2e^2/m_e c^2$ , for  $N=-1$ ,  $r'_H = 2Gm_e/c^2 = 10^{-40} r_H$ .

Apply to rotations since a isotropic radial force from an artificial object will have no preferred direction. Rotations at least imply a specific axial z direction.

$ds^2 = \rho^2[(dr^2/\Delta) + d\theta^2] + (r^2 + a^2)\sin^2\theta d\phi^2 - c^2 dt^2 + (2mr/\rho^2)[a\sin^2\theta d\theta - c dt]^2$  Kerr metric (applies to rotations)  $\rho^2(r, \theta) = r^2 + a^2 \cos^2\theta$ ,  $\Delta(r) = r^2 - 2mr + a^2$ .

Next convert to a quadratic equation in  $dt$  ( $Ax^2 + Bx + C = 0$  where  $x = dt$ ). (organize into coefficients of  $dt$  and  $dt^2$ ). The Kerr metric is

$$ds^2 = \rho^2[(dr^2/\Delta) + d\theta^2] + (r^2 + a^2)\sin^2\theta d\phi^2 + (2mr/\rho^2)a^2 \sin^4\theta d\theta^2 - [2(2mr/\rho^2)a\sin^2\theta d\theta c dt] - c^2 dt^2 (1 - 2mr/\rho^2) \quad (1)$$

## Nonzero generic maximally symmetric (MS) ambient metric generated by object B

So start with complete frame dragging suppression eq.13, 15 but with ambient metric (provided by later **perturbation**  $a < r$  **provided by some rotation**) metric ansatz:  $ds^2 = -e^\lambda (dr)^2 - r^2 d\theta^2 - r^2 \sin\theta d\phi^2 + e^\mu dt^2$  so that  $g_{00} = e^\mu$ ,  $g_{rr} = e^\lambda$ . From eq.  $R_{ij} = 0$  for spherical symmetry in free space

$$R_{11} = \frac{1}{2}\mu'' - \frac{1}{4}\lambda'\mu' + \frac{1}{4}(\mu')^2 - \lambda'/r = 0 \quad (5.1.1)$$

$$R_{22} = e^{-\lambda}[1 + \frac{1}{2}r(\mu' - \lambda')] - 1 = 0 \quad (5.1.2)$$

$$R_{33} = \sin^2\theta \{e^{-\lambda}[1 + \frac{1}{2}r(\mu' - \lambda')] - 1\} = 0 \quad (5.1.3)$$

$$R_{00} = e^{\mu-\lambda}[-\frac{1}{2}\mu'' + \frac{1}{4}\lambda'\mu' - \frac{1}{4}(\mu')^2 - \mu'/r] = 0 \quad (5.1.4)$$

$$R_{ij} = 0 \text{ if } i \neq j$$

(eq. 5.1.1-5.1.4 from pp.303 Sokolnikof): Equation 5.1.2 is a mere repetition of equation 5.1.3.

We thus have only three equations on  $\lambda$  and  $\mu$  to consider. From equations 5.1.1, 5.1.4 we



deduce that  $\lambda' = -\mu'$  so that radial  $\lambda = -\mu + \text{constant} = -\mu + C$  where  $C$  represents a possible  $\sim$ constant ambient metric contribution which could be imaginary in the case of the slowly oscillating ambient metric of nearby object B. So  $e^{-\mu+C} = e^\lambda$ . Then 5.1.2 can be written as:

$$e^{-C} e^\mu (1 + r\mu') = 1 \quad (5.1.5)$$

Set  $e^\mu = \gamma$ . So  $e^{-\lambda} = \gamma e^{-C}$  and so integrating this first order equation (equation.5.1.11) we get:

$$\gamma = -2m/r + e^C \equiv e^\mu = g_{00} \text{ and } e^{-\lambda} = (-2m/r + e^C) e^{-C} = 1/g_{rr} \quad (5.1.6)$$

From equation 5.1.6 we can identify radial  $C$  with also rotational Kerr metric oblateness perturbation Mandelbulb component of (5.1.8 below). Mandelbrot set Fig.6 eq.18

$2m/r = r_H/r = C_M/\xi r = e^{-C} = e^{-(\varepsilon + \Delta\varepsilon)} = \tau + \mu + \Delta\varepsilon$  (eq.18). We end up being at the horizon  $r_H$  in equation 5.1.8. So  $2m/r$  is set equal to  $e^C$  in eq. 5.1.6. So at the end, at the horizon  $r_H$ , in eq.5.1.8,  $2m/r$  is set equal to  $e^C = e^{-(\varepsilon + \Delta\varepsilon)}$  in 5.1.6. So  $\kappa_{00} = 1 - e^{-(\varepsilon + \Delta\varepsilon)} \cdot 2m/r$ ; Given external object B oscillating zitterbewegung for  $r < r_C$  then  $e^{-(\varepsilon + \Delta\varepsilon)} \rightarrow e^{-i(\varepsilon + \Delta\varepsilon)}$ , so  $\kappa_{00} = 1 - e^{-i(\varepsilon + \Delta\varepsilon)} \cdot 2m/r$  (5.1.7)

**Perturbative self similar rotation providing the ambient metric generated by object B**

Our new pde has spin  $S$  and so the self similar ambient metric on the  $N=0$  th fractal scale is the Kerr metric which contains those **perturbation rotations** ( $d\theta/dt$  T violation so (given CPT) then

**CP violation)**  $ds^2 = \rho^2 \left( \frac{dr^2}{\Delta} + d\theta^2 \right) + (r^2 + a^2) \sin^2 \theta d\phi^2 - c^2 dt^2 + \frac{2mr}{\rho^2} (a \sin^2 \theta d\theta - c dt)^2$ , (5.1.8)

where  $\rho^2(r, \theta) \equiv r^2 + a^2 \cos^2 \theta$ ;  $\Delta(r) \equiv r^2 - 2mr + a^2$ , In our 2D  $d\phi=0$ ,  $d\theta=0$  Define:

$$\left( \frac{r^2 + a^2 \cos^2 \theta}{r^2 - 2mr + a^2} \right) dr^2 + \left( 1 - \frac{2m}{r^2 + a^2 \cos^2 \theta} \right) dt^2 \quad \theta \neq 0$$

$\rho^2(r, \theta) \equiv r^2 + a^2 \cos^2 \theta$ ;  $\Delta(r) \equiv r^2 - 2mr + a^2$ ,  $r^\wedge \equiv r^2 + a^2 \cos^2 \theta$ ,  $r'^2 \equiv r^2 + a^2$ . Inside  $r_H$   $a \ll r$ ,  $r \gg 2m$

$$\left( \frac{(r^\wedge)^2}{(r')^2 - 2mr} \right) dr^2 + \left( 1 - \frac{2mr}{(r^\wedge)^2} \right) dt^2 + \dots = \left( \frac{1}{(r')^2 - \frac{2mr}{(r^\wedge)^2}} \right) dr^2 + \left( 1 - \frac{2mr}{(r^\wedge)^2} \right) dt^2. \quad (5.1.8)$$

The  $(r^\wedge/r')^2$  term is

$$\frac{(r')^2}{(r^\wedge)^2} = \frac{r^2 + a^2}{r^2 + a^2 \cos^2 \theta} = \frac{1 + \frac{a^2}{r^2}}{1 + \frac{a^2}{r^2} \cos^2 \theta} \approx 1/g_{rr} (\approx g_{00}). \text{ From 5.1.7: } \xi_1 = e^{i(\varepsilon + \Delta\varepsilon)} \text{ for } e^C = e^{i(\varepsilon + \Delta\varepsilon)}$$

$= \tau + \mu + \Delta\varepsilon = \text{zitterbewegung from 5.1.6. } 2m/r + e^C$

$$\left( 1 + \frac{a^2}{r^2} \right) \left( 1 - \frac{a^2}{r^2} \cos^2 \theta \right) + \dots = 1 - \frac{a^4}{r^4} \cos^2 \theta - \frac{a^2}{r^2} \cos^2 \theta + \frac{a^2}{r^2} + \dots = 1 + \frac{a^2}{r^2} (1 - \cos^2 \theta) + \dots$$

$$= 1 + \frac{a^2}{r^2} \sin^2 \theta + \dots \equiv 1 + \frac{a^2}{r^2} u^2 = (5.1.7) = 1 + e^C = 1 + e^{i(\varepsilon + \Delta\varepsilon)} =$$

(Replace  $a^2/r^2$  Kerr object B term with inertial frame 5.1.7 dragging mass  $\xi_1$ . In eq.5.1.8, eq. 17.

Subtract  $2mr/(r')^2 = r_H/r_H$ )

$$1 + \xi_1 - \frac{r_H}{r_H} = 1 + \varepsilon + \Delta\varepsilon + \dots = e^{i(\varepsilon + \Delta\varepsilon)} \quad (5.1.9)$$

So this is a Kerr metric inertial frame dragging suppression due to outside object B of magnitude  $((a/r) \sin \theta)^2 = 1/g_{rr} = e^{i\varepsilon}$  from D7 in the proper frame. In general the closer object B is the larger  $e^C$  is. Inside object A.  $\varepsilon$  changes with time (Mercuron equation D15).

Object B oscillation sound wave observed compression in Shapely, rarefaction in Eridanis.

## 11.1 Is metric quantization possible? So does it have a Hamiltonian?

Recall eq.5.1.9 object B generation in the Kerr metric  $((a/r)\sin\theta)^2 = \Delta\varepsilon$  with outside object B  $r_H$   $\kappa_{00} = e^{i\Delta\varepsilon}$  with inside  $\kappa_{00} = 1 - \Delta\varepsilon$ . Finally in the composite 3e frame of reference  $\Delta\varepsilon \rightarrow \Delta\varepsilon + \varepsilon$  for both in Eg.,  $\kappa_{00} = e^{i(\varepsilon + \Delta\varepsilon)}$  outside object B.

Also recall the fractal separation of variables in the universe wave function  $\Psi$  solution to the **Newpde**:

From separation of variables sect.1:  $\Psi = \Pi \psi_N = \dots \psi_{-1} \psi_0 \psi_1 \dots$

N is the fractal scale. Not also that New pde  $\Delta\varepsilon \equiv H_{\Delta\varepsilon}$  or  $\varepsilon \equiv H_\varepsilon$   $r > r_H$  have nothing to do with each other (like  $H_{SHM}$  &  $H_J$ ) so  $\Delta\varepsilon \psi_N = E \psi_N$  is undefined (just as  $H_{SHM} * H_J$  is undefined). In contrast for  $r_{(\varepsilon, \Delta\varepsilon)} e^{kt} = \psi_{N+1}$  from new pde cosmological  $r_H > r$  there is a common time  $t = t'$  in

$$-i \frac{\partial \left( -i \frac{\partial \psi_{N+1}}{\partial t'} \right)}{\partial t} = \varepsilon \Delta\varepsilon \psi_{N+1}$$

on the zitterbewegung cloud radius expansion (see 7.4.2)  $r_{\Delta\varepsilon \varepsilon} e^{kt} = \psi_{N+1}$  so that  $\varepsilon \Delta\varepsilon \psi_{N+1}$  is defined.

So  $\langle i | \varepsilon \Delta\varepsilon | i \rangle$  (from  $\varepsilon \Delta\varepsilon \psi_{N+1}$ ) is observable and  $\langle i | \varepsilon \Delta\varepsilon | i \rangle$  (from  $\varepsilon \Delta\varepsilon \psi_N$ ) is not observable.

But normally, given space-like  $r_H$  barrier separations, the operators (sect.2.5) are on quantities only within a given fractal scale. Here  $\Delta\varepsilon$  is N+1 th and  $r_H$  Nth so as an operator equation:  $\Delta\varepsilon r_H = 0$  in:

$$E = \frac{1}{\sqrt{1 - \frac{\Delta\varepsilon}{1-\varepsilon} \frac{r_H}{r}}} = 1 - \frac{\Delta\varepsilon}{2(1-\varepsilon)} - \frac{r_H}{2r} + \frac{3}{8} \left( \frac{r_H}{r} \right)^2 + 2 \frac{\Delta\varepsilon}{1-\varepsilon} \left( \frac{r_H}{r} \right) + \dots = 1 - \frac{\Delta\varepsilon}{2(1-\varepsilon)} - \frac{r_H}{2r} + \frac{3}{8} \left( \frac{r_H}{r} \right)^2 + 0 + \dots$$

### Oscillation of $\delta z (\equiv \psi)$ on a given fractal scale

Recall from Newpde (eq. 6.1.8):  $E = \frac{1}{\sqrt{\kappa_{00}}} = \frac{1}{\sqrt{1 - \frac{r_H}{r}}}$ . If  $r < r_H$  E (inside  $r_H$ ) is imaginary. If  $r > r_H$

(outside  $r_H$ ) E is real in  $\delta\varepsilon = e^{iEt}$ . From Newpde (eg., eq.1.13 Bjorken and Drell)

$$i\hbar \frac{\partial \psi}{\partial t} = \frac{\hbar c}{i} \left( \alpha_1 \frac{\partial \psi}{\partial x^1} + \alpha_2 \frac{\partial \psi}{\partial x^2} + \alpha_3 \frac{\partial \psi}{\partial x^3} \right) + \beta m c^2 \psi = H \psi. \text{ For electron at rest: } i\hbar \frac{\partial \psi}{\partial t} = \beta m c^2 \psi$$

so:  $\delta z = \psi_r = w^r(0) e^{-i\varepsilon_r \frac{mc^2}{\hbar} t}$   $\varepsilon_r = +1, r=1,2; \varepsilon_r = -1, r=3,4$ ): Recall from the Mercuron equation 7.4.12 that  $\varepsilon$  carries the time with it and  $\tau$  is normalized ( $\delta z = \psi = \tau + i(\varepsilon + \Delta\varepsilon) + \dots = 1 + i(\varepsilon + \Delta\varepsilon) + \dots = e^{i(\varepsilon + \Delta\varepsilon)}$ ) because it is a constant structure Mandelbulb (at  $68.87^\circ$ ) in the Mandelbrot set (fig.6).

So here N=1 fractal scale (5.1.9, D9) fractal  $e^{-i\varepsilon_r \frac{mc^2}{\hbar} t} \rightarrow e^{i(\varepsilon + \Delta\varepsilon)} \quad (11.1)$

### Examples of this 5.1.7 $e^C$ ambient metric component

#### N=0 Composite 3e

For  $z=0$  just inside  $r_H$ , the two positrons each have constant  $\psi$  (N=0 ch.8,9) inside  $r_H$ . So from eq.5.1.9 divide  $\kappa_{rr}$  by  $1 + \varepsilon + \varepsilon = 1 + 2\varepsilon = e^C$  So  $\frac{1}{\kappa_{rr}} = (1)(1 + 2\varepsilon) \equiv 1 + 2(\varepsilon + \Delta\varepsilon) \quad (5.1.9a)$

Note negative potential energy here. Normalize out the  $\kappa_{00}$  magnetic field by multiplying  $\kappa_{00}$  by  $1 + \varepsilon = e^C$  for the magnetic (see part II flux of B) maximal symmetry

$$\frac{1}{\left( \frac{1+2\varepsilon+\Delta\varepsilon}{1+\varepsilon} - 2m/\xi_0 r \right)} dr^2 + (1 - 2m/r\xi_0) dt^2 = \frac{1}{\left( 1 + \frac{\varepsilon}{1+\varepsilon} - 2m/\xi_0 r \right)} dr^2 + \left( 1 - \frac{2m}{r\xi_0} \right) dt^2$$

$$= \frac{1}{(1 + \varepsilon' - 2m/\xi_0 r)} dr^2 + \left( 1 - \frac{2m}{r\xi_0} \right) dt^2, \quad \varepsilon' \equiv \varepsilon/(1+\varepsilon). \quad (5.1.10)$$

have been working on the ambient metric (very close to and) on either side of  $r_H$  for composite 3e and for  $r \gg r_H$  as well. Just inside  $r_H$  the ground state being a constant  $\psi$  from the Frobenius solution (but object C perturbs it) and the just outside is that Meisner effect pion

cloud(that virtual creation and annihilation being the changing flux source.), so nuclear physics.  
For  $r \gg r_H$  you get qed physics.

Equation D9 provides the contributions from each maximal symmetry epsilon source, the B flux quantization necessarily causes the quantization of the ambient metric. . There appear to be 3 sources, the two positrons (are right on  $r_H$  and so are close to these boundaries) and that huge internal magnetic field. So for the

inside  $1+2\epsilon_p + \epsilon_{dep}$  get added and we normalize for the second positron observer away by dividing by  $1+\epsilon_p$  for that observer.

For just outside the flux is small because of the numerous creation and annihilation events inside and so Faraday's law gives the Meisner effect pion cloud. And the added eq.9.22 pion

For  $z=0$  just outside  $r_H$ , Since randomly the B field disappears ( $dB/dt \neq 0$ ) due to that creation-annihilation we have a Faraday's law Meisner effect. With outside  $r_H$  B results, just divide by  $1+\epsilon$  (5.1.9) for zero point energy  $\epsilon = .08 \pi^\pm$  of eq.9.22 (partII) which has to itself increase and decrease with (see 5.1.9) each of these annihilation events and  $\pi^\pm$  exists just outside  $r_H$  (from our

Frobenius solution):  $\frac{1}{(1+\epsilon''-2m/\xi_0 r)} dr^2 + ((1 - 2m/\xi_0 r)) dt^2 = ds^2$  (5.1.11)

For  $z=0 \rightarrow z=1$   $r > r_H$  then free space boost sect.2  $\xi_0 \rightarrow \tau$ . Define  $\epsilon' \equiv \frac{\epsilon}{1+\epsilon}$ . Must normalize again (for local ambient metric  $\Delta\epsilon$  change contributions) so multiply by  $\frac{1}{1+\epsilon'}$  (see D9 for  $z=1$  outside)

$$\frac{1}{(1+\frac{\Delta\epsilon}{1+\epsilon}-2m/\xi_1 r)} dr^2 + (1 - 2m/r\xi_1) dt^2 = \frac{1}{(1+\frac{\Delta\epsilon}{1+\epsilon}-2m/\xi_1 r)} dr^2 + \left(1 - \frac{2m}{r\xi_1}\right) dt^2 \quad (5.1.12)$$

## 6 N=1 Use Ricci curvature to obtain Newpde comoving internal observer Cosmology

The Laplacian of the metric tensor (in Newpde zitterbewegung harmonic local coordinates whose components satisfy Ricci tensor =  $R_{ij} = -(1/2)\Delta(g_{ij})$  where  $\Delta$  is the Laplace-Beltrami second derivative operator) is not zero and the right side is the metric source. Geometrically, the Ricci curvature is the mathematical object that controls the (comoving observer) growth rate of the volume of metric balls in a manifold in this case given by the New pde source

zitterbewegung. Set the phase so real  $\Delta g_{ii}$  is small at time=0 (big bang from  $r_{bb}$ ) then initial  $\sin\theta_0 = \sin 90^\circ$ . Given the  $\epsilon + \Delta\epsilon$  on the right side of eq.5.1.2 and eq.5.1.9:

$$R_{22} = \frac{1}{2}\Delta g_{22} = e^{i(\epsilon + \Delta\epsilon)} e^{i\pi/2} = \sin(\epsilon + \Delta\epsilon) + i\cos(\epsilon + \Delta\epsilon). \quad (6.1.4)$$

This is Ricci tensor exterior source to the interior ( $r < r_H$ ) comoving metric.

## N=0 Application example: (mentioned on first page)

### Separation Of Variables On New Pde

After separation of variables the "r" component of equation 16 (Newpde) can be written as:

$$\left[ \left( \frac{dt}{ds} \sqrt{\kappa_{00}} m_p \right) + m_p \right] F - \hbar c \left( \sqrt{\kappa_{rr}} \frac{d}{dr} + \frac{j+3/2}{r} \right) f = 0 \quad (6.1.5)$$

$$\left[ \left( \frac{dt}{ds} \sqrt{\kappa_{00}} m_p \right) - m_p \right] f + \hbar c \left( \sqrt{\kappa_{rr}} \frac{d}{dr} - \frac{j-1/2}{r} \right) F = 0. \quad (6.1.6)$$

Using the above Dirac equation component we find the anomalous gyromagnetic ratio  $\Delta g_y$  for the spin polarized  $F=0$  case. Recall the usual calculation of rate of the change of spin S gives  $dS/dt \propto m \propto g_y J$  from the Heisenberg equations of motion. We note that  $1/\sqrt{\kappa_{rr}}$  rescales  $dr$  in

$\left( \sqrt{\kappa_{rr}} \frac{d}{dr} + \frac{j+3/2}{r} \right) f$  in equation . Thus to have the same rescaling of  $r$  in the second term we must multiply the second term denominator (i.e.,  $r$ ) and numerator (i.e.,  $J+3/2$ ) each by  $1/\sqrt{\kappa_{rr}}$  and set the numerator ansatz equal to  $(j+3/2)/\sqrt{\kappa_{rr}} \equiv 3/2 + J(g_y)$ , where  $g_y$  is now the gyromagnetic

ratio. This makes our equation 6.1.5, 6.1.6 compatible with the standard Dirac equation allowing us to substitute the gy into the Heisenberg equations of motion for spin S:  $dS/dt \propto m \propto gyJ$  to find the correction to  $dS/dt$ . Thus again:

$$\begin{aligned} [1/\sqrt{\kappa_{rr}}](3/2 + J) &= 3/2 + Jgy, \text{ Therefore for } J = 1/2 \text{ we have:} \\ [1/\sqrt{\kappa_{rr}}](3/2 + 1/2) &= 3/2 + 1/2 gy = 3/2 + 1/2(1 + \Delta gy) \end{aligned} \quad (6.1.7)$$

Then we solve for  $\Delta gy$  and substitute it into the above  $dS/dt$  equation.

Thus solve eq. 5.1.12, 6.1.7, eq.18 with eq.6.1.1 values in  $\sqrt{\kappa_{rr}} = 1/\sqrt{(1 + \Delta\epsilon/(1 + \epsilon))} =$

$1/\sqrt{(1 + \Delta\epsilon/(1 + 0))} = 1/\sqrt{(1 + .0005799/1)}$ . Thus from equations 6.1.1, 6.1.5, 6.1.7:

$[1/\sqrt{(1 + .0005799)}](3/2 + 1/2) = 3/2 + 1/2(1 + \Delta gy)$ . Solving for  $\Delta gy$  gives anomalous **gyromagnetic ratio correction of the electron**  $\Delta gy = .00116$ .

If we set  $\epsilon \neq 0$  (so  $\Delta\epsilon/(1 + \epsilon)$ ) instead of  $\Delta\epsilon$  in the same  $\kappa_{oo}$  in eq.16 we get the anomalous **gyromagnetic ratio correction of the muon** in the same way.

**Composite 3e: Meisner effect For B just outside  $r_H$ . (where the zero point energy particle eq. 9.22 is  $.08 = \pi^\pm$ ) See 5.1.11**

Composite 3e CASE 1: Plus  $+r_H$ , therefore is the proton + charge component. Eq.6.1.1 & 5.1.11

$1/\kappa_{rr} = 1 + r_H/r_H + \epsilon'' = 2 + \epsilon''$ .  $\epsilon'' = .08$  (eq.9.22). Thus from eq.6.1.7:  $\sqrt{2 + \epsilon''}(1.5 + .5) = 1.5 + .5(gy)$ ,  $gy = 2.8$

**The gyromagnetic ratio of the proton**

Composite 3e CASE 2: negative  $r_H$ , thus charge cancels, zero charge:

$$\begin{aligned} 1/\kappa_{rr} &= 1 - r_H/r_H + \epsilon'' = \epsilon'' \quad \text{Therefore from equation 6.1.7 and case 1 eq.12 } 1/\kappa_{rr} = 1 - r_H/r_H + \epsilon'' \\ \sqrt{\epsilon''}(1.5 + .5) &= 1.5 + .5(gy), \quad gy = -1.9. \end{aligned}$$

the **gyromagnetic ratio of the neutron** with the other charged and those ortho neutral hyperon magnetic moments scaled using their masses by these values respectively.

## C2 Separation of Variables

After separation of variables the “r” component of equation 16 (Newpde) can be written as

$$\left[ \left( \frac{dt}{ds} \sqrt{\kappa_{00}} m_p \right) + m_p \right] F - \hbar c \left( \sqrt{\kappa_{rr}} \frac{d}{dr} + \frac{j+3/2}{r} \right) f = 0 \quad (6.1.5)$$

$$\left[ \left( \frac{dt}{ds} \sqrt{\kappa_{00}} m_p \right) - m_p \right] f + \hbar c \left( \sqrt{\kappa_{rr}} \frac{d}{dr} - \frac{j-1/2}{r} \right) F = 0. \quad (6.1.6)$$

Comparing the flat space-time Dirac equation to the left side terms of equations 6.1.5 and 6.1.6:

$$(dt/ds)\sqrt{\kappa_{00}} = (1/\kappa_{00})\sqrt{\kappa_{00}} = (1/\sqrt{\kappa_{00}}) = \text{Energy} = E \quad (6.1.8)$$

Note for electron motion around hydrogen proton  $mv^2/r = ke^2/r^2$  so  $KE = 1/2 mv^2 = (1/2) ke^2/r = PE$

potential energy in  $PE + KE = E$ . So for the electron (but not the tauon or muon that are not in this

orbit)  $PE_e = 1/2 e^2/r$ . Here write the hydrogen energy and pull out the electron contribution. So in eq.B1

$$\text{and 6.1.8: } r_H = (1 + 1 + .5)e^2/(m_\tau + m_\mu + m_e)/2 = 2.5e^2/(2m_p c^2). \quad (6.1.9)$$

**Variation  $\delta(\psi^* \psi) = 0$  At  $r = n^2 a_0$**

Next note for the variation in  $\psi^* \psi$  is equal to zero at maximum  $\psi^* \psi$  probability density where for the hydrogen atom is at  $r = n^2 a_0 = 4a_0$  for  $n=2$  and the  $\psi_{2,0,0}$  eigenfunction. Also recall eq.B1

$\xi_1 = m_L c^2 = (m_\tau + m_\mu + m_e) c^2 = 2m_p c^2$  normalizes  $1/2 ke^2$  (Thus divide  $\tau + \mu$  by 2 and then multiply the

whole line by 2 to normalize the  $m_e/2$ . result.  $\epsilon = 0$  since no muon  $\epsilon$  here.): Recall in eq.19  $\xi_0$  has

to be pulled in a Taylor expansion as an operator since it a separate observable So substituting

eqs. 5.1.16, 6.1.1 and eq. 5.1.12 for  $\kappa_{00}$ , and B1, 6.1.1 values in eq.6.1.8:

$$\begin{aligned}
E_e &= \frac{(tauon + muon)(\frac{1}{2})}{\sqrt{1 - \frac{r_{H'}}{r}}} - (tauon + muon + PE_\tau + PE_\mu - m_e c^2) \frac{1}{2} = \\
&2(m_\tau c^2 + m_\mu c^2) \frac{1}{2} + 2 \frac{m_e c^2}{2} + 2 \frac{2.5e^2}{2r(m_L c^2)} m_L c^2 - 2 \frac{2e^2}{2r(m_L c^2)} m_L c^2 - 2 \frac{3}{8} \left( \frac{2.5e^2}{r m_L c^2} \right)^2 m_L c^2 \\
&\quad - 2(m_\tau c^2 + m_\mu c^2) \frac{1}{2} \\
&= \frac{2m_e c^2}{2} + 2 \frac{e^2}{4r} - 2 \frac{3}{8} \left( \frac{2.5}{r m_L c^2} \right)^2 m_L c^2 = m_e c^2 + \frac{e^2}{2r} - 2 \frac{3}{8} \left( \frac{2.5e^2}{r m_L c^2} \right)^2 m_L c^2 \\
\text{So: } \Delta E_e &= 2 \frac{3}{8} \left( \frac{2.5}{r m_L c^2} \right)^2 m_L c^2 = (\text{Third order } \sqrt{\kappa_{\mu\mu}} \text{ Taylor expansion term}) = \\
\Delta E &= 2 \frac{3}{8} \left[ \frac{2.5(8.89 \times 10^9)(1.602 \times 10^{-19})^2}{(4(.53 \times 10^{-10}))^2 ((1.67 \times 10^{-27})(3 \times 10^8))^2} \right]^2 (2(1.67 \times 10^{-27})(3 \times 10^8))^2 \\
&= hf = 6.626 \times 10^{-34} \cdot 27,360,000 \text{ so that } f = 27 \text{ MHz Lamb shift.} \\
&\text{The other 1050 Mhz comes from the zitterbewegung cloud.}
\end{aligned}$$

### Why Does The Ordinary Dirac Equation ( $\kappa_{\mu\nu} = \text{constant}$ ) Require Infinite Fields?

Note from section 1.2 that  $\kappa_{\mu\nu} = \text{possibly nonconstant}$ . So it does not have to be flat space, whereas for the standard Dirac equation  $g_{\mu\nu} = \text{constant}$  in eq. 4.2.1. Also eq.16 has closed form solutions (eg. section 4.9), no infinite fields required as we see in the above eq.6.12.1. So why does the mainstream solution require infinite fields (caused by infinite charges)? To answer that question recall the geodesics  $\Gamma^m_{ij} v^i v^j$  give us accelerations, with these  $v^k$  s limited to  $< c$ . Recall  $g_{ij}$  also contains the potentials (of the fields)  $A_i$ . We can then take the pathological case of  $[g^{ij} = [A = \infty$  in the S matrix integral context and  $\partial g_{ik} / \partial x^j = 0$  since the mainstream (circa 1928) Dirac equation formalism made the  $g_{ij}$  constants in eq.4.2.1. Then  $\Gamma^m_{ij} \equiv (g^{km}/2)(\partial g_{ik}/\partial x^j + \partial g_{jk}/\partial x^i - \partial g_{ij}/\partial x^k) = (1/0)(0) = \text{undefined}$ , but *not* zero. Take the  $\partial g_{ik}/\partial x^j$  to be mere 0 *limit* values and then  $\Gamma^{\alpha}_{\beta\gamma}$  becomes *finite* then. Furthermore 9.13 (Coulomb potential) would then imply that  $A_0 = 1/r$  (and  $U(1)$ ) and note the higher orders of the Taylor expansion of the Energy  $= 1/(1-1/r)$  term  $(= 1/r + (1/r)^2 - (1/r)^3 \dots (\text{geometrical series expansion})$  where we could then represent these  $n$ th order  $1/r^n$  terms with individual  $1/r$  Coulomb interactions accurate if doing alternatively Feynman vacuum polarization graphs in powers of  $1/r$ ). Also we could subtract off the infinities using counterterms in the standard renormalization procedure. *Thus in the context of the S matrix this flat space-time could ironically give nearly the exact answers if pathologically  $[A = \infty$  and so we have explained why QED renormalization works!* Thus instead of being a nuisance these QED infinities are a necessity if you *mistakenly* choose to set  $r_H = 0$  (so constant  $\kappa_{ij}$ ).

But equation 16 is not in general a flat space time (i.e., in general  $\kappa_{\mu\nu} \neq \text{constant}$ ) so **we do not need these infinities and the renormalization** and we still keep the precision predictions of QED, where in going from the  $N+1$ th fractal scale to the  $N$ th fractal scale  $r_H = 2GM/c^2 \rightarrow 2e^2/m_e c^2$  See sect.3.9 and Ch.1.2.4 where we calculate the Lamb shift and anomalous gyromagnetic ratio in closed form from our eq.16 energy 1.21:  $E = 1/\sqrt{\kappa_{00}} = 1/\sqrt{(1 - r_H/r + \Delta\epsilon)}$  (Ch.3.9) and the square root in the separable eq.16 (Ch.1.2.4 and section 6.12 for Lamb shift calculation without renormalization.).

## Metric quantization (and C) As A Perturbation Of the Hamiltonian

$$H_0\psi=E_n\psi_n$$

for normalized  $\psi_n$ s. We introduce a strong *local* metric perturbation  $H'=\Delta G$  due to motion through matter let's say so that:

$H'+H=H_{\text{total}}$  where  $H\equiv\Delta G$  is due to the matter and  $H$  is the total Hamiltonian due to all the types of neutrino in that  $H_{M+1}$  of section 4.6.  $H'=C^2$ . Because of this metric perturbation

$\psi=\sum a_i\psi_i$ =orthonormal eigenfunctions of  $H_0$ .  $|a_i|^2$  is the probability of being in the neutrino state  $i$ . The nonground state  $a_i$ s would be (near) zero for no perturbations with the ground state energy  $a_i$  (electron neutrino) largest at lowest energy given for ordinary beta decay for example. Thus the passage through matter creates the nonzero higher metric quantization states (i.e.,  $H'$  can add energy) with:

$$a_k=(1/(\hbar i))\int H'_{lk}e^{i\omega_{lk}t}dt$$

$$\omega_{lk}=(E_k-E_l)/\hbar$$

Thus in this way motion through matter perturbs these mixed eigenstates so that one type of neutrino might seemingly change into another (oscillations).

Note: Need infinities if **flat space Dirac 1928 equation**. For flat space  $\partial g_{ik}/\partial x^j=0$  as a limit. Then must take field  $g^{km}=1/0=\infty$  to get finite Christoffel symbol  $\Gamma^m_{ij}\equiv(g^{km}/2)(\partial g_{ik}/\partial x^j+\partial g_{jk}/\partial x^i-\partial g_{ij}/\partial x^k)=(1/0)(0)=\text{undefined}$  but still implying *nonzero* acceleration on the left side of the

geodesic equation:  $\frac{d^2 x^\mu}{ds^2} = -\Gamma^\mu_{\nu\lambda} \frac{dx^\nu}{ds} \frac{dx^\lambda}{ds}$  So we need infinite fields for flat space. Thus QED

requires (many such) infinities. But we have in general curved space  $g_{ij}=\kappa_{ij}$  in the New pde so do not require that anything be infinite and yet we still obtain for the third order Taylor expansion term of  $\sqrt{\kappa_{\mu\nu}}$  the Lamb shift and anomalous gyromagnetic ratio correction (see above sections C2,C3).

So renormalization is a perturbative way (given it's flat space Dirac equation and minimal interaction gauge origins) of calculating these (above) same, *NON*perturbative results, it's a perturbative GR theory. But renormalization gives lots of wrong answers too, eg.,  $10^{96}$ grams/cm<sup>3</sup> vacuum density for starters. (So we drop it here since we don't need it any longer for the high precision QED results.) In contrast note near the end of reference 5 our  $G_{00}=0$  for a 2D MS. Thus a vacuum really is a vacuum. Also that large  $\xi_1=\tau(1+\epsilon')$  in  $r_H$  in eq.14 is the reason leptons appear point particles (in contrast to the small  $\xi_0$  in the composite 3e baryons).

**6.3 Mixed states of  $\Delta\epsilon$  and  $\epsilon$**  outside  $r_H$  so  $1S_{1/2}$  state within  $r_{HN}$  ( $\Delta x\Delta m_{N=1}c)=\hbar/2$ .  $m_{N=1}=10^{-40}m_e$ . For  $1S_{1/2}$  state  $m_\mu=207m_e$  and so  $\Delta x=10^5$ LY galaxy.  $1S_{1/2}$  state may be flattened since such states are stable since then  $g_{00}=\kappa_{00}$ .

From D13 metric source note  $\Delta\epsilon$  and  $\epsilon$  operators so  $\Delta\epsilon\epsilon$  (operating on Newpde  $\psi_N$ ) is a new state, a "mixed state" that in the next higher scale classical limit then is a grand canonical ensemble with nonzero chemical potential (i.e., a "mixture" of systems). 2nd derivative of  $\cos x=-\cos x$  so  $\Delta g_{00}=-g_{00}=\cos\Delta\epsilon$ . That  $g_{00}=\kappa_{00}$  in the *halo of the Milky Way galaxy* is the fundamental equation of metric quantization for all the multiples of 100 metric quantization, but here for  $r<r_H$ . So in general  $\kappa_{00}=e^{i(me+mu)}$ ,  $m_e=.000058$  is the electron mass (as a fraction of the Tauon mass.) which is the component in the resulting  $m_e, m_\mu$  operator sequence.



**Imaginary part  $R_{22}$**  locally for 2D MS  $R_{00}=\Delta g_{00}=\kappa_{00}(R/2)=\cos\Delta\varepsilon$  gives also the local mixed  $\Delta\varepsilon, \varepsilon$  states of partIII metric quantization. Set  $\cos(\Delta\varepsilon/(1-2\varepsilon))=\kappa_{00}=\mathbf{g}_{00}$ ,  $mv^2/r=GMm/r^2$  so  $GM/r=v^2$  COM in the galaxy halo(circular orbits)  $(1/(1-2\varepsilon))$  term from D9a just inside  $r_H$ ) so **Pure state  $\Delta\varepsilon$**  ( $\varepsilon$  excited  $1S_{1/2}$  state of ground state  $\Delta\varepsilon$ , so not same state as  $\Delta\varepsilon$ )

$\text{Rel}\kappa_{00}=\cos\mu$  from D9

$$\text{Case1 } 1-2GM/(c^2r)=1-2(v/c)^2=1-(\Delta\varepsilon/(1-2\varepsilon))^2/2 \quad (6.3.1)$$

So  $1-2(v/c)^2=1-(\Delta\varepsilon/(1-2\varepsilon))^2/2$  so  $=(\Delta\varepsilon/(1-2\varepsilon))c/2=.00058/(1-(.06)^2)(3\times 10^8)/2=99\text{km/sec}$   
 $\approx 100\text{km/sec}$  (Mixed  $\Delta\varepsilon, \varepsilon$ , states classically here are grand canonical ensembles with nonzero chemical potential.). For ringed (not hub) galaxies the radial value becomes  $100/2=50\text{km/sec}$ .

**Mixed state  $\varepsilon\Delta\varepsilon$**  (Again  $GM/r=v^2$  so  $2GM/(c^2r)=2(v/c)^2$ .)

$$\text{Case 2 } g_{00}=1-2GM/(c^2r)=\text{Rel}\kappa_{00}=\cos[\Delta\varepsilon+\varepsilon]=1-[(\Delta\varepsilon+\varepsilon)^2/2]=1-[(\Delta\varepsilon+\varepsilon)^2/(\Delta\varepsilon+\varepsilon)^2]=1-[(\Delta\varepsilon^2+\varepsilon^2+2\varepsilon\Delta\varepsilon)/(\Delta\varepsilon+\varepsilon)^2]$$

The  $\Delta\varepsilon^2$  is just the above first case (Case 1) so just take the mixed state cross term  $[\varepsilon\Delta\varepsilon/(\varepsilon+\Delta\varepsilon)]=c[\Delta\varepsilon/(1+\Delta\varepsilon/\varepsilon)]/2=c[\Delta\varepsilon+\Delta\varepsilon^2/\varepsilon+\dots\Delta\varepsilon^{N+1}/\varepsilon^{N+1}]/2=\Sigma v_N$ . Note each term in this expansion is itself a (mixed state) operator. So there can't be a single  $v$  in the large gradient 2<sup>nd</sup> case so in the equation just above we can take  $v_N=[\Delta\varepsilon^{N+1}/(2\varepsilon^N)]c$ . (6.3.2)

From eq. D18 for example  $v=m100^N\text{km/sec}$ .  $m=2, N=1$  here (Local arm). In part III we list hundreds of examples of D18: (sun1,2km/sec, galaxy halos m100km/sec). The linear mixed state subdivision by this ubiquitous  $\sim 100$  scale change factor in  $r_{bb}$  (due to above object B zitterbewegung spherical Bessel function resonance boundary conditions resulting in nodes) created the voids. Same process for  $N-1$  (so 100X smaller) antinodes get galaxies, 100Xsmaller: globular clusters, 100Xsmaller solar systems, etc., So these smaller objects were also created by mixed state metric quantization (eq.D18) resonance oscillation inside initial radius  $r_{bb}$ .

We include the effects of that object B drop in inertial frame dragging on the inertial term  $m$  in the Gamow factor and so lower  $Z$  nuclear synthesis at earlier epochs ( $t>18\text{by}$ )BCE. (see partIII) Note there is no Klein paradox at  $r<\text{Compton wavelength}$  in this theory and also Schrodinger's 1930 paper on the lack of a zitterbewegung does not apply to a region smaller than the Compton wavelength. So the above zitterbewegung analysis does apply in that region. The  $\sqrt{\kappa_{00}}=\sqrt{(1-r_H/r)}$  modifies this a little in that from the source equations for  $\kappa_{\mu\nu}$  you also need a feed back since the field itself, in the most compact form, also is a eq.4.4.1.  $G_{00}$  energy density (source).

## 6.10

### Fractal $\delta z$ oscillation

### Comoving Coordinate System: What We Observe Of The Ambient Metric

Recall from Newpde (eq. 6.1.8):  $E = \frac{1}{\sqrt{\kappa_{00}}} = \frac{1}{\sqrt{1-\frac{r_H}{r}}}$ . If  $r<r_H$   $E$  (inside  $r_H$ ) is imaginary. If  $r>r_H$

(outside  $r_H$ )  $E$  is real in  $\delta\varepsilon=e^{iEt}$ . From Newpde (eg., eq.1.13 Bjorken and Drell)

$$i\hbar \frac{\partial \psi}{\partial t} = \frac{\hbar c}{i} \left( \alpha_1 \frac{\partial \psi}{\partial x^1} + \alpha_2 \frac{\partial \psi}{\partial x^2} + \alpha_3 \frac{\partial \psi}{\partial x^3} \right) + \beta mc^2 \psi = H\psi . \text{ For electron at rest: } i\hbar \frac{\partial \psi}{\partial t} = \beta mc^2 \psi$$

so:  $\delta z = \psi_r = w^r(0)e^{-i\varepsilon_r \frac{mc^2}{\hbar} t}$   $\varepsilon_r=+1, r=1,2; \varepsilon_r=-1, r=3,4$ .) So the eq.12 the  $45^\circ$  line has this sinusoidal  $t$  variation on that  $\delta z$  rotation. The next higher cosmological independent (but still connected by superposition of speeds) fractal scale  $N=1$  the  $45^\circ$  small Mandelbulb chord  $\varepsilon$  (Fig6)

is now getting smaller with time  $t \propto \varepsilon$  as in a separation of variables result:  $i\hbar \frac{\partial \psi}{\partial t} =$

$$\beta \sum_N (10^{40N} (\omega t)_{\varepsilon+\Delta\varepsilon}) \psi = \beta \sum_N (10^{40N} m_{\varepsilon+\Delta\varepsilon} c^2/\hbar) \psi \text{ and so for stationary } N=1 \delta Z = \sqrt{\kappa_{00}} dt = e^{-i\varepsilon r \frac{mc^2}{\hbar} t} \rightarrow e^{i(\varepsilon+\Delta\varepsilon)} \quad (18)$$

Recall from the Mercuron equation (7.4.12) that  $\varepsilon$  carries the time with it and  $\tau$  is normalized

$(\delta Z = \psi = \tau + i(\varepsilon + \Delta\varepsilon) + \dots = 1 + i(\varepsilon + \Delta\varepsilon) + \dots = e^{i(\varepsilon + \Delta\varepsilon)} \equiv e^{-i\varepsilon r \frac{mc^2}{\hbar} t})$  because it is a constant structure Mandelbulb (at  $68.87^\circ$ ) in the Mandelbrot set (fig.6). So here  $N=1$  fractal scale (5.1.9) fractal

$$e^{-i\varepsilon r \frac{mc^2}{\hbar} t} \rightarrow e^{i(\varepsilon + \Delta\varepsilon)} \cdot \delta Z = e^{i(\varepsilon + \Delta\varepsilon)} \quad (7.4.13)$$

so  $\delta Z = e^\varepsilon = \text{source} \rightarrow \sinh \varepsilon$ . So  $\delta Z = e^{(i2Ht/\hbar)}$

## 6.14 More Implications of The Two Metrics Of Equation 13 Of 14 and

### Eq.11.2 Gaussian Pillbox Approach To General Relativity

From equation 11.2 the  $\kappa_{00} = 1 - r_H/r$  all the comoving observers are all at  $r = r_H$  so that only circumferential motion is allowed with the new pde zitterbewegung creating some radial motion  $dr'/ds$ . Also  $dr'^2 = \kappa_{rr} dr^2 = [1/(1 - r_H/r)] dr^2$  so that the  $dr'$  space inside this volume is very large. See equation B8 in section B3. The effect of all this math is to flip over  $r_H/r$  in the Schwarzschild metric to  $r/r_H$  in the De Sitter metric (see discussion of eq.11.2) at  $r = r_H$ :

$$ds^2 = -(1 - r^2/\alpha^2) dt^2 + (1 - r^2/\alpha^2)^{-1} dr^2 + d\Omega_{n-2}^2 \quad (6.14.1)$$

which also fulfills the fundamental small C requirement of eq.1.1.14 Dirac equation zitterbewegung (for  $r < r_C$  and  $r \approx r_H$ ) and the eq.5 Minkowski metric requirement for  $\alpha = 1$ . It also

keeps our square root  $\sqrt{\kappa_{00}} = \sqrt{1 - \frac{r_H}{r}} \rightarrow \sqrt{1 - \frac{r^2}{r_H^2}}$  real. Given the geometric structure of the

4D De Sitter submanifold surface we must live on a 4D submanifold hyperspace in this many point limit. So inside  $r_H$  for empty Gaussian Pillbox (since everything is at  $r_H$ )

Minkowski  $ds^2 = -dx_0^2 + \sum_{i=1}^n dx_i^2$

Submanifold is  $-x_0^2 + \sum_{i=1}^n x_i^2 = \alpha^2$

In static coordinates  $r, t$ : (the new pde harmonic coordinates for  $r < r_H$ )

$$x_0 = \sqrt{(\alpha^2 - r^2)} \sinh(t/\alpha): \quad (6.14.2)$$

$$x_1 = \sqrt{(\alpha^2 - r^2)} \cosh(t/\alpha):$$

$x_i = r z_i \quad 2 \leq i \leq n \quad z_i$  is the standard imbedding  $n-2$  sphere.  $R^{n-1}$ . which also imply the De Sitter metric 6.14.3. Recall from eq. 6.13.6

$$ds^2 = -(1 - r^2/\alpha^2) dt^2 + (1 - r^2/\alpha^2)^{-1} dr^2 + d\Omega_{n-2}^2 \quad (6.14.3)$$

$\alpha \rightarrow i\alpha, r \rightarrow ir$  Outside is the Schwarzschild metric to keep  $ds$  real for  $r > r_H$  since  $r_H$  is fuzzy because of objects B and C.

For torus  $(x^2 + y^2 + z^2 + R^2 - r^2)^2 = 4R^2(x^2 + y^2)$ .  $R$ =torus radius from center of torus and  $r$ =radius of torus tube.

Let this be a spheroidal torus with inner edge at so  $r = R$ . If also  $x = r \sin \theta, y = r \cos \theta, \theta = \omega t$  from the new pde

Define time from  $2R = t$  you get the light cone for  $\alpha \rightarrow i\alpha$  in equation 6.14.2.

$x^2 + y^2 + z^2 - t^2 = 0$  of 6.14.1 with also  $(x = r \sin \theta, y = r \cos \theta) \rightarrow$

$(x = \sqrt{(\alpha^2 - r^2)} \sinh(t/\alpha), y = \sqrt{(\alpha^2 - r^2)} \cosh(t/\alpha)), \alpha \rightarrow i\alpha$ . So to incorporate the new pde into the Gaussian pillbox inside we end up with a spheroidal torus that has flat space geodesics.

Note on a toroid surface two parallel lines remain parallel if there was no expansion. So you have a flat space which is what is what is observed. The expansion causes them to converge for

negative t. Note the lines go around the spheroidal toroid back to where they started, have the effect on matter motion of a gravimagnetic dipole field.

You are looking at yourself in the sky as you if you were a baby (370by ago that is). The sky is a baby picture of YOU!

The problem is that you are redshifted out to  $z=\infty$  so all you can see of your immediate vicinity (within 2bly that is) is the nearby galaxy super clusters such as the Shapely concentration and Perseus Pisces with lower red shifts.

So these superclusters should have a corresponding smudge in the CBR in exactly the opposite direction!

### **Comoving Interior Frame that the N=2 observer sees that we see.**

Recall  $N>0 \equiv$  observer. Here we find what that  $N=2$  fractal scale observer sees what we see if  $\sin\mu \rightarrow \sinh\mu$  for  $r>r_H$  going to  $r<r_H$  in  $E=1/\sqrt{\kappa_{00}}=1/\sqrt{(1-r_H/r)}$  since the  $E$  in  $\delta z=e^{iEt} \equiv e^{i\mu}$  and so  $\mu$  then becomes imaginary. Recall limit  $R_{ij}$  as  $r \rightarrow 0$  is the source, where gravity creates gravity in the Einstein equations which becomes the modulation of the DeSitter ball. (6.14.2).

$R_{22}=e^{-\lambda}[1+1/2 r(\mu'-v')]-1$  with  $\mu=v$  (spherical symmetry) and  $\mu'=-v'$ . So as  $r \rightarrow 0$ ,  $\text{Im}R_{22}=$ .

$\text{Im}(e^\mu-1)=\mu+..=\sin\mu=\mu+..$  for outside  $r_H$  imaginary  $\mu$  for small  $r$  (at the source) so  $\sin\mu$  becomes a gravitational source (gravity itself can create gravity as a feedback mechanism). The  $N=2$  observer then multiplies by  $i$   $iR_{22}$ ,  $-\sin\mu$  and  $\mu$  to get  $R_{22}=-\sinh\mu$  to see what the  $N=2$  observer sees that we see inside  $r_H$  so:

$R_{22}=e^{-\lambda}[1+1/2 r(\mu'-v')]-1=-\sinh\mu=(-(e^\mu-e^{-\mu})/2)$ ,  $v'=-\mu'$  so

$e^{-\mu}[-r(\mu')]=-\sinh\mu-e^{-\mu}+1=(-(e^{-\mu}+e^\mu)/2)-e^{-\mu}+1=(-(e^{-\mu}+e^\mu)/2)+1=-\cosh\mu+1$ . So given  $v'=-\mu'$

$e^{-\lambda}[-r(\mu')]=1-\cosh\mu$ . Thus

$e^{-\lambda}r(d\mu/dr)=1-\cosh\mu$

This can be rewritten as:  $e^\mu d\mu/(1-\cosh\mu)=dr/r$  (6.14.4)

The integration is from  $\xi_1=\mu=\varepsilon=1$  to the present day mass of the muon  $=.06$  (X tauon mass).

Integrating equation B from  $\varepsilon=1$  to the present  $\varepsilon$  value we then get:

$\ln(r_{M+1}/r_{bb})+2=[1/(e^\mu-1)-\ln[e^\mu-1]]/2$  (6.14.5)

the equation that gives the comoving observer time evolution of the universe. The equation works near the min of the sinusoidal oscillation where we are slightly inside  $r_H$ .

The radial component  $r=r_{M+1}$  in 6.4.4 is still a function of that  $r_{bb}$  mercuron radius

Also the  $\kappa_{00}=1-r^2/r_H^2$  in 6.14.3 (instead of the external observer  $\kappa_{00}=1-r_H/r$ ) in  $E=1/\sqrt{\kappa_{00}}$  in looking outward (internal observer) at the cosmological oscillation from the inside ( $r<r_H$ ) implies that higher mass for  $N=2$  fractal scale so smaller wavelength and larger energy so larger effect.

So metric jumps with longer the wavelength on our scale imply higher energy cosmological effects that  $N=2$  sees we see si we see it... So on  $N=1$  fractal scale small wavelength cosmological oscillations (eg., object C  $\Delta\varepsilon$  Period=2.5My) have much smaller effects than the larger wavelength oscillations (eg.,  $\varepsilon$  Period=270My).

$g$  factor= $g=e/2m$  and  $w=gB=2\pi f$  with  $f$  the Larmor frequency which is what you use to measure the  $g$  factor(like in MRI)

The anomalous gyromagnetic ratio  $gy=g-2$ .

Note if the mass is decreasing then  $gy$  (and the  $g$  factor) goes up as well.

The difference in  $gy$  between 2023 (FermiLab) and 1974 (CERN) is

$116592059[22]-11659100[10] = 1$  part in  $10^5$  increase which translates to 1 part in  $10^8$

increase in  $g$  since  $g$  is about 2000X larger than  $gy$ . Note  $g$  is increasing corresponding to a

decreasing mass  $m$  in  $g=e/2m$ , by about 1 part in  $10^8$  over 50 years so about **1 part in  $10^{10}$  over 1 year**, our predicted value.

Note the sine wave has a period of 10trillion years and we are now at 370billion years, near  $\theta=-\pi/2$  in  $r=r_0\sin\theta$  where the upswing is occurring and so accelerating expansion is occurring. This is where we start out at in the sect.7.3 derivation. Since the metric is inside  $r<r_H$  it is also a source as we see in later section 5.4

## 7.2 $r<r_H$ $e^{\otimes t}$ -1 Coordinate transformation of $Z_{\mu\nu}$ : Gravity Derived

Summary:

### Fractal Scale Content Generation From Generalized Heisenberg Equations of Motion

Specifically C in equation 1 applies to “observable” measurement error. But from the two “observable” fractal scales (N,N+1) we can infer the existence of a 3<sup>rd</sup> next smaller fractal N-1 scale using the generalized Heisenberg equations of motion giving us

$$(\partial x_{0N})/(\partial x_{0N+1}) (\partial x_{0N})/(\partial x_{0N+1}) T_{00N} - T_{00N} = T_{00N-1} \quad (7.2.3)$$

which is equation 7.4.4 below. Thus we can derive the content of the rest of the fractal scales by this process.

On top of the fractal  $10^{40}X$  smaller coupling G (ref.5) baseline this  $T_{00N-1}$  gives a smaller time dependent coshu coefficient which is what we find here.

### 7.3 Derivation of The Terms in Equation 7.2.3

For free falling frame no coordinate transformation is needed of source  $T_{00}$ . For non free falling comoving frame with N+1fractal eq.1.1.24 motion we do need a coordinate transformation to obtain the perturbation  $\Delta T$  of  $T_{00}$  caused by this motion (in the new coordinate system we also get 5.1.2: the modified  $R_{ij}$ =source describing the evolution of the universe as seen from the outside fractal N+1 scale observer that *he sees that we see*. We got

$\ln(r_{M+1}/r_{bb})+2=[1/(e^\mu-1)-\ln[e^\mu-1]]/2$  in our own coordinate frame). Recall in section 1 the  $N>0$  fractal scale this larger observer *actually sees himself*.



THE DISCOVERY INSTRUMENT

Spectroscopic Slit

Slipher's Spectroscopic Focal Plane Used To Discover The Expanding Universe.  
It is in the rotunda display at Lowell Observatory.

### 7.4 Dyadic Coordinate Transformation Of $T_{ij}$ In Eq. 7.2.3 eq., 14 Frame of Reference

Given N+1 fractal cosmological scale (Who just sees the  $T_{00}$ ) frame of reference we then do a radial dyadic oordinate transformation to *our* Nth fractal scale frame of reference so that

$T_{00} \rightarrow T_{00}' = T_{00} + dT_{00} \equiv T_{00} + G_{00}$  (Section 7.4 attachment).

The Dirac equation object has a radial center of mass of its zitterbewegung. That radius expands due to the **ambient metric expansion** of the next larger N+1th fractal scale (Discovered by Slipher. See his above instrumentation). We define a  $Z_{00}$  E&M energy-momentum tensor 00 component replacement for the  $G_{00}$  Einstein tensor 00 component. The energy is associated with the Coulomb force here, not the gravitational force. The dyadic radial coordinate transformation of  $Z_{ij}$  associated with the expansion creates a new  $z_{00}$ . Thus transform the dyadic  $Z_{00}$  to the coordinate system commoving with the radial coordinate expansion and get  $Z_{00} \rightarrow Z_{00} + z_{00}$  (section 3.1). The new  $z_{00}$  turns out to be the gravitational source with the G in it. The mass is that of the electron so we can then calculate the value of the gravitational constant G. From Ch.1 the object  $dr$  as seen in the observer primed nonmoving frame is:  $dr = \sqrt{\kappa_r} dr' = \sqrt{(1/(1+2\varepsilon))} dr' = dr'/(1+\varepsilon)$ .  $1/\sqrt{(1+.06)} = 1.0654$ . Also using  $S_{1/2}$  state of equation 16

$$\varepsilon = .06006 = m_\mu + m_e$$

From equation 11.4 and  $e^{i\omega t}$  oscillation in equation 11.4.  $\omega = 2c/\lambda$  so that one half of  $\lambda$  equals the actual Compton wavelength in the exponent of section 4.11. Divide the Compton wavelength  $2\pi r_M$  by  $2\pi$  to get the radius  $r_M$  so that  $r_M = \lambda_M/(2(2\pi)) = h/(2m_e c 2\pi) = 6.626 \times 10^{-34} / (9.1094 \times 10^{-31} \times 2.9979 \times 10^8 \times 4\pi) = 1.9308 \times 10^{-13}$

From the previous chapter the Heisenberg equations of motion give  $e^{i\omega t}$  oscillation (zitterbewegung) both for velocity and position so we use the classical harmonic oscillator probability distribution of radial center of mass of the zitterbewegung cosine oscillation lobe. So the COM (radial) is:  $x_{cm} = (\sum x m) / M = \iiint r^3 \cos r \sin \theta d\theta d\phi dr / (\iiint r^2 \cos r \sin \theta d\theta d\phi dr) = 1.036$ . As a fraction of half a wavelength (so  $\pi$  phase)  $r_m$  we have  $1.036/\pi = 1/3.0334$  (7.4.1)

Take  $H = 13.74 \times 10^9$  years  $= 1/2.306 \times 10^{-18}/s$ . Consistent with the old definition of the 0-0 component of the old gravity energy momentum tensor  $G_{00}$  we define our single  $S_{1/2}$  state particle (E&M) energy momentum tensor 0-0 component From eq.3.1  $Z_{00}$  we have:  $c^2 Z_{00} / 8\pi \equiv \varepsilon = 0.06$ ,  $\varepsilon = 1/2 \sqrt{\alpha}$  = square root of charge.

$$Z_{00} / 8\pi \equiv e^2 / 2(1+\varepsilon) m_p c^2 = 8.9875 \times 10^9 (1.6 \times 10^{-19})^2 / (2c^2(1+\varepsilon) 1.6726 \times 10^{-27}) = 0.065048 / c^2$$

Also from equation 16 the ambient metric expansion component  $\Delta r$  is:

$$\text{eq.1.12 } \Delta r = r_A (e^{\omega t} - 1) \quad (7.4.2)$$

To find the physical effects of the equation 11.4 expansion we *must* do a dyadic radial coordinate transformation (equation 7.4.3) on this single charge horizon (given numerical value of the Hubble constant  $H = 13.74$  bLY in determining its rate) in eq.4.2. In doing the time derivatives we take the  $\omega$  as a constant in the linear  $t$  limit:

$$\frac{\partial x^\alpha}{\partial x'^\mu} \frac{\partial x^\beta}{\partial x'^\nu} Z_{\alpha\beta} = Z'_{\mu\nu} \text{ with in particular } Z_{00} \rightarrow Z'_{00} \equiv Z_{00} + z_{00} \quad (7.4.3)$$

After doing this  $Z'_{00}$  calculation the resulting (small)  $z_{00}$  is set equal to the Einstein tensor gravity source ansatz  $G_{00} = 8\pi G m_e / c^2$  for this *single* charge source  $m_e$  allowing us to solve for the value of the Newtonian gravitational constant G here as well. We have then derived gravity for **all** mass since this single charged  $m_e$  electron vacuum source composes all mass on this deepest level as we noted in the section 4.2 discussion of the equivalence principle. Note Lorentz transformation

similarities in section 2.3 between  $r = r_0 + \Delta r$  and  $ct = ct_0 + c\Delta t$  using  $D \sqrt{1 - \frac{v^2}{c^2}} \approx D(1 - \Delta)$  for  $v \ll c$

with just a sign difference (in  $1 - \Delta$ , + for time) between the time interval and displacement D interval transformations. Also the  $t$  in equation 10.2 and therefore 12.3 is for a light cone coordinate system (we are traveling near the speed of light relative to  $t=0$  point of origin) so

$c^2 dt^2 = dr^2$  and so equation 11.4 does double duty as a  $r=ct$  time  $x_0$  coordinate. Also note we are trying to find  $G_{00}$  (our ansatz) and we have a large  $Z_{00}$ . Also with  $Z_{rr} \ll Z_{00}$  we needn't incorporate  $Z_{rr}$ . Note from the derivative of  $e^{\omega t} - 1$  (from equation 11.4) we have slope  $= (e^{\omega t} - 1)/H_t = \omega e^{\omega t}$ . Also from equation 2AB we have  $\delta(r) = \delta(r_0(e^{\omega t} - 1)) = (1/(e^{\omega t} - 1))\delta(r_0)$ . Plugging values of equation 7.4.1 2 and 7.4.2 and the resulting equation 4.7.1 into equation 7.4.3 we have in  $S_{1/2}$  state in equation 4.3:

$$\frac{8\pi e^2}{2(1+\varepsilon)m_p c^2} \delta(r) = Z_{00} = R_{00} - \frac{1}{2} g_{00} R, \quad \frac{\partial x^0}{\partial x^\alpha} \frac{\partial x^0}{\partial x^\beta} Z_{\alpha\beta} = Z'_{00} = Z_{00} + z_{00} \approx \quad (7.4.4)$$

$$\frac{\partial x^0}{\partial [x^0 - \Delta r]} \frac{\partial x^0}{\partial [x^0 - \Delta r]} Z_{00} = \frac{\partial x^0}{\partial \left[ x^0 - \frac{r_m}{3.03(1+\varepsilon)} [e^{\omega t} - 1] \right]} \frac{\partial x^0}{\partial \left[ x^0 - \frac{r_m}{3.03(1+\varepsilon)} [e^{\omega t} - 1] \right]} Z_{00} = z'_{00}$$

$$\left[ \frac{1}{1 - \frac{r_m \omega}{3.03c(1+\varepsilon)} e^{\omega t}} \right]^2 \frac{8\pi e^2}{2(1+\varepsilon)m_p c^2} \delta(r) = \left( \frac{8\pi e^2}{2(1+\varepsilon)m_p c^2} \delta(r) + 8\pi G \left( \frac{m_e}{c^2} \right) \delta(r) \right)$$

(Recall 3.03 value from eq.7.4.1.). So setting the perturbation  $z_{00}$  element equal to the ansatz and solving for G:

$$\begin{aligned} & 2 \left( \frac{e^2}{2(1+\varepsilon)m_p} \right) \left( \frac{r_m}{3.03m_e c(1+\varepsilon)} \right) \omega e^{\omega t} = \\ & \left( 2 \left( \frac{e^2}{2(1+\varepsilon)m_p} \right) \left( \frac{r_m}{3.03m_e c(1+\varepsilon)} \right) \left( \frac{e^{\omega t} - 1}{H_t} \right) \right) \delta(r) = \\ & = 2 \left( \frac{e^2}{2(1+\varepsilon)m_p} \right) \left( \frac{r_m}{cm_e 3.03(1+\varepsilon)} \right) \left( \frac{[e^{\omega t} - 1]\delta(r_0)}{[e^{\omega t} - 1]H_t} \right) = G\delta(r_0) \end{aligned}$$

Make the cancellations and get:

$$2(.065048)[(1.9308 \times 10^{-13} / (3 \times 10^8 \times 9.11 \times 10^{-31} \times 3.0334(1+.0654)))] (2.306 \times 10^{-18}) = \\ = 2(.065048)(2.2 \times 10^8)(2.306 \times 10^{-18}) = \mathbf{6.674 \times 10^{-11} \text{ Nm}^2/\text{kg}^2 \equiv G} \quad (7.4.5)$$

from plugging in all the quantities in equation 7.4.5. This new  $z_{00}$  term is the classical  $8\pi G\rho/c^2 = G_{00}$  source for the Einstein's equations and we have then **derived gravity** and incidentally also derived the value of the Newtonian gravitational constant since from our postulate the  $m_e$  mass (our "single" postulated source) is the *only* contribution to the  $Z_{00}$  term. Note Dirac equation implies +E and -E solutions for -e and +e respectively and so in equation 7.4.5 we have  $e^2 = ee = q_1 X q_2$  in eq.7.4.5. So when G is put into the Force law  $Gm_1 m_2 / r^2$  there is an *additional*  $m_1 X m_2$  thus the resultant force is proportional to  $Gm_1 m_2 = (q_1 X q_2) m_1 m_2$  which is always positive since the paired negatives always are positive and so the gravitational force is always attractive.

Also recall in the free falling frame (So comoving with  $M = m_e$  so is constant) fractal scale for  $ke^2 / ((GM')M) = 10^{40}$  fractal jump,  $ke^2 / (m_e c^2) = ke^2 / (Mc^2)$  is also constant so if G is going up (in 7.4.4) then  $M'$  is going down. Note then  $r_H = ke^2 / (m_e c^2) \rightarrow 10^{40} X r_H = r_H(N+1) = GM'm_e / (m_e c^2) = GM' / c^2 =$  famous Schwarzschild radius.

To summarize we have then just done a coordinate transformation to the moving frame to find the contributing fields associated with the moving frame. Analogously one does a coordinate transformation to the charge comoving frame to show that current carrying wires have a magnetic field, also a 'new' force, around them. Also note that in the second derivative of eq.7.1.2  $d^2 \mathbf{r} / dt^2$



$=r_0\omega^2e^{\omega t}$  = **radial acceleration**. Thus in equations 7.1.4 and 7.1.5 (originating in section 4) **we have a simple account of the cosmological radial acceleration expansion** (discovered recently) **so we don't need any theoretical constructs such as 'dark energy' to account for it.**

If  $r_0$  is the radius of the universe then  $r_0\omega^2e^{\omega t} \approx 10^{-10} \text{m/sec}^2 = a_M$  is the acceleration of all objects around us relative to a inertial reference frame and comprises a accelerating frame of reference. If we make it an inertial frame by adding gravitational perturbation we still have this accelerating expansion and so on. Thus in gravitational perturbations  $na_M = a$  where  $n$  is an integer.

Note below equation 7.4.5 above that  $t = 13.8 \times 10^9$  years and use the standard method to translate this time into a Hubble constant. Thus in the standard method this time translates into light years which are  $13.8 \times 10^9 / 3.26 = 4.264 \times 10^9$  parsecs =  $4.264 \times 10^3$  megaparsecs assuming speed  $c$  the whole time. So  $3 \times 10^5 \text{km/sec} / 4.264 \times 10^3 \text{ megaparsecs} = 70.3 \text{km/sec/megaparsec}$  = Hubble's constant for this theory.

## 7.5 Metric Quantized Hubble Constant

Metric quantization 4.2.3 means (change in speed)/distance is quantized. Given 6billion year object B vibrational metric quantization the radius curve

$\ln(r_{M+1}/r_{bb}) + 2 = [1/(e^\mu - 1) - \ln[e^\mu - 1]]/2$  is not smooth but comes in jumps.

I looked at the metric quantization for the 2.5My metric quantization jump interval using those 3 Hubble "constants" 67, 70, 73.3 km/sec/megaparsec.

Recall that for megaparsec is  $3.26 \text{Megalightyear} = (2.5/.821) \text{Megalightyear}$ .

**But 2.5 million years is the time between one of those metric quantization jumps.**

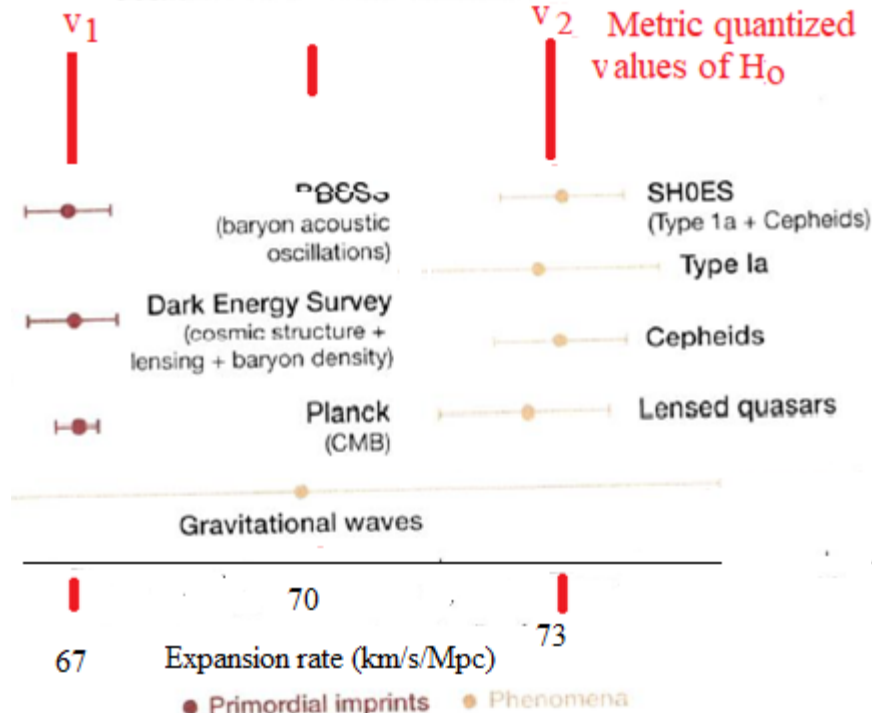
So instead of the 3 detected Hubble constants 67km/sec/megaparsec and 70km/sec/megaparsec and 73.3km/sec/megaparsec we have

81.6km/sec/2.5megaly, 85.26km/sec/2.5megaly, 89.3km/sec/2.5megaly. the difference between the contemporary one, the last and the two others then is

89.3km/sec/2.5megaly - 85.26km/sec/2.5megaly, = **4km/sec/2.5megaly**

and 89.3km/sec/2.5megaly - 89.3km/sec/2.5megaly = **8km/sec/2.5megaly**.

So the Hubble constant, with reference to the 2.5my metric quantization jump time, appears quantized in units of **4km/sec,8km/sec**, etc. Other larger denominator „averages“ are not



accurate. **Hubble Constant Measurements**

## 7.6 Cosmological Constant In This Formulation

In equation 4.6  $r_H/r$  term is small for  $r \gg r_H$  (far away from one of these particles) and so is nearly flat space since  $\epsilon$  and  $\Delta\epsilon$  are small and nearly constant. Thus equation 6.4.5 can be redone in the form of a Robertson Walker homogenous and isotropic space time. Given (from Sean Carroll) the approximation of a (homogenous and isotropic) Robertson Walker form of the metric we find that:

$$\frac{a''}{a} = -\frac{4\pi G}{3}(\rho + 3p) + \frac{\Lambda}{3}$$

$\Lambda$ =cosmological constant,  $p$ =pressure,  $\rho$ =density,  $a = 1/(1+z)$  where  $z$  is the red shift and 'a' the scale factor.  $G$  the Newtonian gravitational constant and  $a''$  the second time derivative here using cdt in the derivative numerator. We take pressure= $p=0$  since there is no thermodynamic pressure on the matter in this model; the matter is commoving with the expanding inertial frame to get the  $a''$  contribution. The usual 10 times one proton per meter cubed density contribution for  $\rho$  gives it a contribution to the cosmological constant of  $4.7 \times 10^{-36}/s^2$ .

Since from equation 7.6.1  $a = a_0(e^{\omega t} - 1)$  then  $a'' = (\omega^2/c^2) \sinh \omega t = a(\Lambda/3) = (\Lambda/3) \sinh \omega t$  and there results:

$$\Lambda = 3(\omega^2/c^2)$$

From section 7.4 above then  $\omega = 1.99 \times 10^{-18}$  with 1 year =  $3.15576 \times 10^7$  seconds, also  $c = 3 \times 10^8$  m/s. So:

$$\Lambda = 3(\omega^2/c^2) = 1.32 \times 10^{-52} /m^2, \text{ which is our calculated value of the cosmological constant.}$$

Alternatively we could use  $1/s^2$  units and so multiply this result by  $c^2$  to obtain:

$1.19 \times 10^{-35}/s^2$ . Add to that the above matter (i.e., $\rho$ ) contributions to get  $\Lambda = 1.658 \times 10^{-35}/s^2$  contribution.

## References

Merzbacher, *Quantum Mechanics*, 2<sup>nd</sup> Ed, Wiley, pp.597

## 7.8

### Summary

The rebound time is 350by =very large >>14by solving the horizon problem since temperatures could (nearly) come to equilibrium during that time (From recent Hubble survey: "The galaxies look remarkably mature, which is not predicted by galaxy formation models to be the case that early on in the history of the universe." "lots of dust already in the early universe", "CBR is the result of thermodynamic equilibrium" requiring slow expansion then, etc.).

Given these protons we *do not require protogenesis* and we also have an *equal number of particles and antiparticles*(proton  $2e^+, e^-$ ; extra  $e^-$ ). The rotation gives us *CP violation* since  $t$  invariance is broken in the Kerr metric. This formula predicts an age of 370by *explaining these early supermassive black holes* (they had plenty of time to accrete) and the thermodynamic equilibrium required to create the *black body CBR*: all these modern cosmological conundrums are solved here

### Also Spherical Bessel Function Oscillation Nodes Inside Mercuron

Given  $\mu$  is the muon mass 7.4.11 in equation 7.4.12 the smallest radius of this oscillation period is about the radius of that Mercuron). Because of object B rotational energy 51 radial oscillation (270My into 14BY) nodes also exist in the Mercuron creating  $(4\pi/3)(51)^3 = 5.5 \times 10^5$  (gravitational wave spherical Bessel function nodes with Mercuron surface boundary conditions creating the) voids we see today. Note these voids thereby have reduced  $G$  in them and are local higher rates of metric  $g_{ij}$  expansion regions.  $GM$  is invariant. The Sachs Wolfe effect then creates the resulting CBR inhomogeneities.

### Fortran Program for Eq.7.4.12 Mercuron

```

program FeedBack
  DOUBLE PRECISION e,ex,expp,rM1,rd,rb,rbb,uu,u11,den,eu1,u
  DOUBLE PRECISION NN,enddd,bb,ee,rmorbb,Ne,rr
  INTEGER N,endd
  open(unit=10,file='FeedBack_m',status='unknown')
  !FeedbackEquation
  !e^udu/(1-coshu)=dr/r
  !ln(rM+1/rbb)+2=[1/(e^u-1)-ln[e^u-1]]2
  e=2.718281828
  u11=.06
  enddd=100
  enddd=endd*1.0
  uu=.06/enddd
  Ne=1000.0
  Do 1000 N=100,1000
  Ne=Ne-1.0
  rr=n/100.0
  rbb=30.0*(10.0**6)*1600.0
  rbb=1.0
  ! rd=2.65*(10**13)
  u=Ne*uu
  eu1=(e**u)-1.0
  ex=(2.0/eu1)-(2.0*LOG(eu1))-2.0
  expp=(ex)
  rM1=(e**expp)*rbb !ln logarithitnm
  rM1=e**ex
  !rMorbb
  !bb=log(ee)
  if (ex.GT.36.0)THEN

```

```

goto 2001
endif
write(10,2000) rr,rM1
1000 CONTINUE
2000 format(f7.2,1x,1x,1x,f60.6)
2001 end

```

$\text{Sin}(1-u)=r$  gives the same functionality as the above program does for  $\mu \approx 1$  the  $\text{sin}(1-\mu)$   
 And the sine:  $\text{sin}(1-\mu) \approx \sinh(1-\mu)$ . For larger  $1-\mu$  ( $r > r_H$ ) we must use  $1-\mu \rightarrow i(1-\mu)$  given sect 5.2  
 harmonic coordinates from the new pde in the sine wave bottom.

### Use muon mass to find our position in the universe at specific time

We derived the Mercuron equation  $\ln(r_{M+1}/r_{bb})+2=[1/(e^m-1)-\ln[e^m-1]]/2$  ( $m$  is the muon mass)  
 above. Note it gives a slow  $r_M$  rise for 360by and then a much faster rise in the last  $10^{10}$  years  
 (Use the 13.7by  $t$  intersection point for local linear). So we see that the muon mass  $m$  is going  
 down with time, about **1 part in  $10^{10}$  over 1 year**, our predicted value.

$g \text{ factor} = g = e/2m$  and  $w = gB = 2\pi f$  with  $f$  the Larmor frequency which is what you use to  
 measure the  $g$  factor (like in MRI)

The anomalous gyromagnetic ratio  $gy = g-2$ .

Note if the mass is decreasing then  $gy$  (and so the  $g$  factor) goes up as well.

The difference in  $gy$  between 2023 (FermiLab) and 1974 (CERN) is

$116592059[22] - 11659100[10] = 1 \text{ part in } 10^5 \text{ increase in } gy$  which translates to 1 part in  $10^8$   
 increase in  $g$  since  $g$  is about 2000X larger than  $gy$ . Note  $g$  is increasing corresponding to a  
 decreasing mass  $m$  in  $g = e/2m$ , by about 1 part in  $10^8$  over 50 years so about **1 part in  $10^{10}$  over  
 1 year**, our predicted value.

Awesome! So Fermi lab just picked up (in 2023) a data point from the Mercuron equation, the  
 respective decrease in mass of the muon!! But the Mercuron equation gives **the evolution of  
 the (N=2) universe ( $r(t)=\text{radius}$ )** as a function of time at the bottom of the sine wave which we  
 can thereby follow by measuring the mass of the muon at given times!

### Oscillation of $\delta z(\equiv \psi)$ on a given fractal scale

Here we multiply eq. 11 result  $p\psi = -i\hbar \partial \psi / \partial x$  by  $\psi^*$  and integrate over volume to define the  
 expectation value:

$$\int \psi^* p_x \psi dV \equiv \langle p_x \rangle = \langle p, t | p_x | p, t \rangle \text{ of } p_x. \quad (7.1.1)$$

In general for any QM operator  $A$  we write  $\langle A \rangle = \langle a, t | A | a, t \rangle$ . Let  $A$  be a constant in time (from  
 Merzbacher, pp.597). Taking the time derivative then:

$$i\hbar \frac{d}{dt} \langle a, t | A | a, t \rangle = i\hbar \frac{d}{dt} \langle \Psi(t), A \Psi(t) \rangle = \left( \Psi(t), A i\hbar \frac{\partial}{\partial t} \Psi(t) \right) - \left( i\hbar \frac{\partial}{\partial t} \Psi(t), A \Psi(t) \right) \\ = (\Psi(t), AH \Psi(t)) - (\Psi(t), HA \Psi(t)) = i\hbar \frac{d}{dt} \langle A \rangle = \langle AH - HA \rangle \equiv [H, A]$$

In the above equation let  $A = \alpha$ , from equation 9 Dirac equation Hamiltonian  $H$ ,  $[H, \alpha] = i\hbar d\alpha/dt$   
 (Merzbacher, pp.597).

The second and first integral solutions to the Heisenberg equations of motion (i.e., above  
 $[H, \alpha] = i\hbar d\alpha/dt$ ) is:  $r = r(o) + c^2 p / H + (\hbar c / 2iH) [e^{(i2Ht/\hbar)} - 1](\alpha(0) - cp/H).$  (7.1.2)

$$v(t)/c = cp/H + e^{(i2Ht/\hbar)}(\alpha(0) - cp/H)$$

Recall from Newpde (eq. 6.1.8):  $E = \frac{1}{\sqrt{\kappa_{00}}} = \frac{1}{\sqrt{1 - \frac{r_H}{r}}}$ . If  $r < r_H$   $E$  (inside  $r_H$ ) is imaginary. If  $r > r_H$

(outside  $r_H$ )  $E$  is real in  $\delta\varepsilon = e^{iEt}$ .

From Newpde (eg., eq.1.13 Bjorken and Drell)  $i\hbar \frac{\partial \psi}{\partial t} = \frac{\hbar c}{i} \left( \alpha_1 \frac{\partial \psi}{\partial x^1} + \alpha_2 \frac{\partial \psi}{\partial x^2} + \alpha_3 \frac{\partial \psi}{\partial x^3} \right) +$

$\beta mc^2 \psi = H\psi$ . For electron at rest:  $i\hbar \frac{\partial \psi}{\partial t} = \beta mc^2 \psi$  so:  $\delta z = \psi_r = w^r(0) e^{-i\varepsilon_r \frac{mc^2}{\hbar} t}$   $\varepsilon_r = +1,$

$r=1,2; \varepsilon_r=-1, r=3,4$ .): This implies an oscillation frequency of  $\omega = mc^2/\hbar$ . which is fractal here. So the eq.12 the 45° line has this  $\omega$  oscillation as a (given that eq.7-9  $\delta z$  variation) rotation. On our

own fractal cosmological scale we are in the expansion stage of one such oscillation. Thus the fractalness of the Newpde explains cosmology. The next higher cosmological scale is

independent (but still connected by superposition of speeds implying a separation of variables

result:  $i\hbar \frac{\partial \psi}{\partial t} = \beta \sum_N (10^{40N} (\omega t)_{\varepsilon+\Delta\varepsilon}) \psi = \beta \sum_N (10^{40N} m_{\varepsilon+\Delta\varepsilon} c^2/\hbar) \psi$ ). By the way fractal

scale  $N=1$  the 45° small Mandelbulb chord  $\varepsilon$  (Fig6) is now, given this  $\omega$ , getting smaller with

time(fig6) so  $t \propto \varepsilon$ . So cosmologically for stationary  $N=1$   $\delta z = \sqrt{\kappa_{00}} dt = e^{-i\varepsilon_r \frac{mc^2}{\hbar} t} \rightarrow e^{i(\varepsilon+\Delta\varepsilon)}$  (7.1.13)

so  $\delta z = e^\varepsilon = \text{source} \rightarrow \sinh \varepsilon$ . Thereafter we have the usual sinusoidal curve 5 trillion year period.

For fractal scale  $N=2$  observer  $e^{i\varepsilon} \rightarrow e^\varepsilon$  in moving to inside  $r_H$ . for the  $N=2$  observer to see what

we see.  $\psi = \delta z =$  vertical axis in below figure. Also an object B accelerational expansion is

occurring right now in a object B 6by zitterbewegung period sound wave.

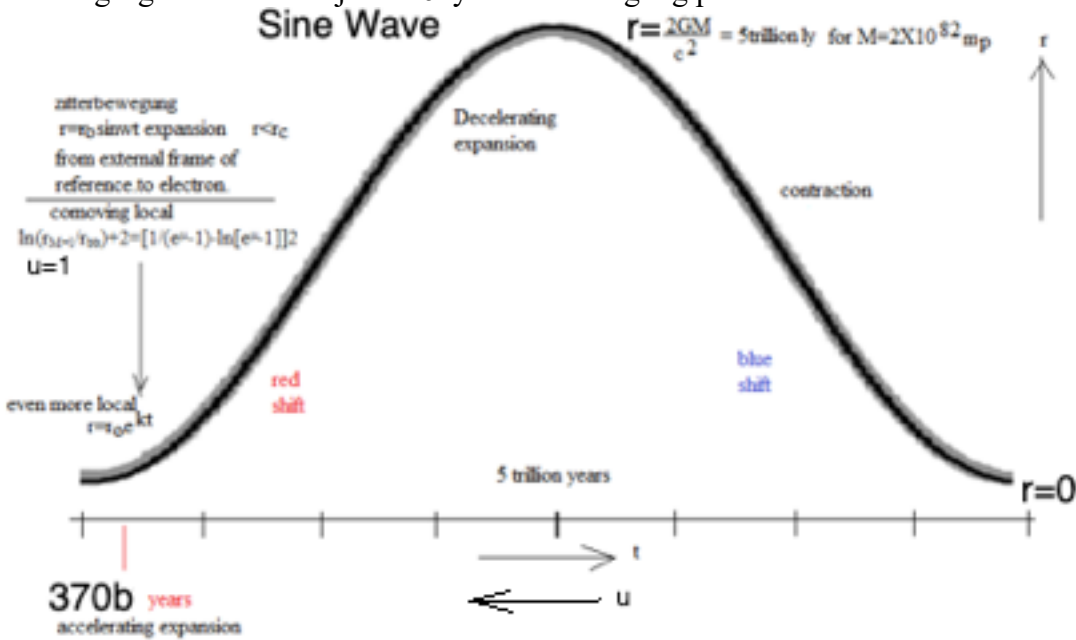


fig.10

### Sine Wave

The 5 trillion years represents the period of object A we are inside. Note approximate exponential curve bottom left. implying our  $\sinh u$  source Laplace Beltrami formulation.

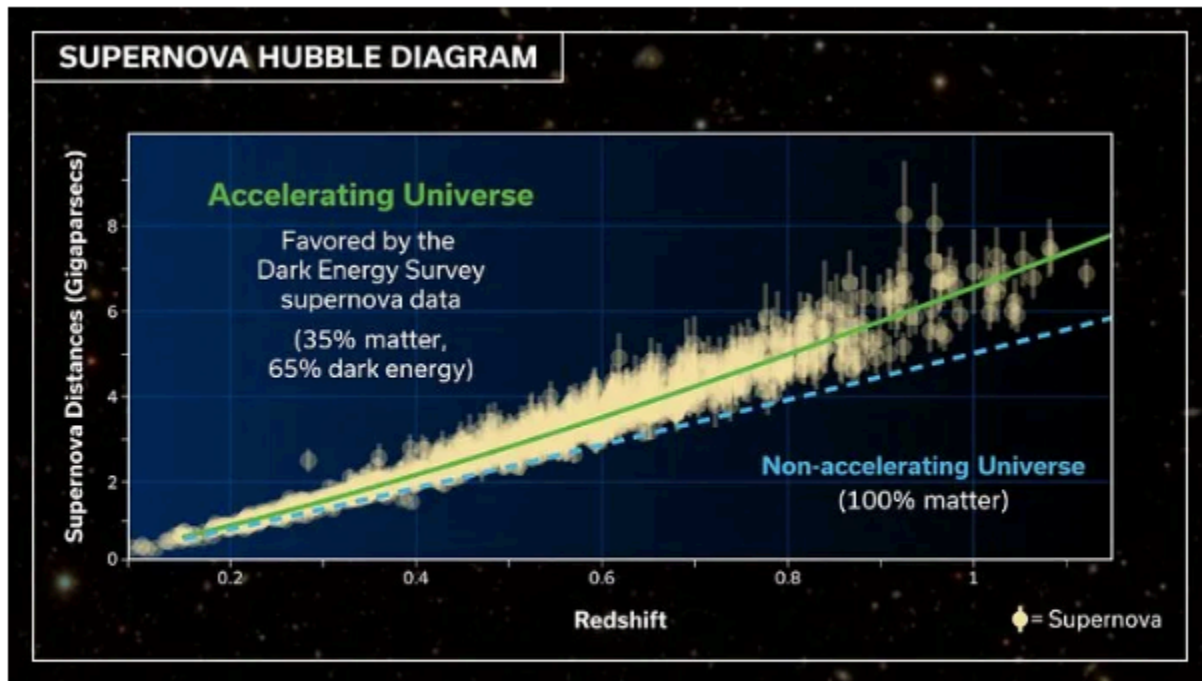
### Average Acceleration

If we assumed a *linear expansion* at constant acceleration 'a' up to 2X our (linear) time\*  $\approx 2 \times 10^{11} y = 2t = 2 \times 10^{11} \times 365.25 \times 24 \times 3600 = 2(3 \times 10^{18}) \text{sec}$  we can then use  $v = at$ . (but our actual

$a=e^{ikt}$  is not linear). From above graph we are also about halfway to the straightline slope  $c$  (We cannot use  $v=c$  anyway here because  $v=at$  is a nonrelativistic relation.). So since we assumed a linear expansion we can use  $a=v/t= 3 \times 10^8 / 3 \times 10^{18} = 10^{-10} \text{m/s}^2 = 1 \text{A/s}^2 = \text{MOND}$  which is approximately what is seen today.  $d=(1/2)at^2$  gives the universe sized  $d$ .

\*actual time is 370by. But his method is still correct since this  $v$  is really about average  $v$  during this 13.7by period. Therefore MOND comes out of the Mercuron equation.

Note the  $a=k^2 e^{kt}$  so the radial acceleration is increasing.  $\ln(r_{M+1}/r_{bb})+2=[1/(e^u-1)-\ln[e^u-1]]/2$   
 $r_{M+1}=(r_{bb})\exp(1/(e^u-1))=\exp(1/u)$ . As  $u$  gets smaller  $r_{M+1}$  gets bigger. Time= $1/u$ ) The data supports this:



A diagram tracing the history of cosmic expansion (Image credit: DES Collaboration)

"There are tantalizing hints that dark energy changes with time.

## 7.10 Construct The Standard Model Lagrangian

Note we have derived from first principles (i.e., from postulate 1) the new pde equation for the electron (eq.7 eq.16, pde for the neutrino (eq.8) Maxwell's equations for the photon, the Proca equation for the Z and the W (Ch.3) and the found the mass for the Z and the W (4.2.1). We even found the Fermi 4 point from the object C perturbations. The distance to object B determines mass and we found that it is equivalent to a scalar field (Higgs) source of mass in sect.4.1.5. We have no gluons or quarks or color in this model but we can at least derive the phenomenology these concepts predict with our eqs 16+16+16 at  $r=r_H$  strong force model (ie., eqs 16+16+16  $r=r_H$ , Ch.9,10)

So from the postulate of 1 we can now construct the standard model Lagrangian, or at least predict the associated phenomenology, from all these results for the as observed on the  $N=1$  fractal scale observing the  $N=0$  fractal scale.  $N$ th fractal scale. Here it is:



<sup>i</sup> Weinberg, Steve, *General Relativity and Cosmology*, P.257