Abstract DEFINITION OF OBSERVABLE 1

A Hermitian **operator** has real eigenvalues and so is called an observable.

postulate observable 1

⇓

list-define math (from 1, sect.4)

⇓

$z=zz$ algebraic definition of 1 is the small C limit of

$z=zz+C,\ \delta C=0, C<0$ (1) needed to define observable 1 (so real eigenvalue)

⇓ ⇓

Plug left side $z$ of eq.1 into right side $zz$ repeatedly and use $\delta C=0$ and get **Mandelbrot set** iterations from $z_o=1$

Cauchy seq subset generates real# 1

Fiegenbaum pt. subset from Clifford alg

| Plug $z=1+\delta z$ into eq.1 and get:

$\delta(\delta z+\delta z\delta z)=0$

Im=Clifford Alg, Real=SR→

**operator** formalism

so Dirac eq.(flat space)

⇓ ⇓

**new pde** $\gamma^\mu\sqrt{(\kappa_{\mu\mu})}\partial\psi/\partial x_\mu=(\omega/c)\psi$ (Curved space, Generally covariant, fractal) .

The Hermitian ***operator*** $((dr+dt)/ds)\psi=1\psi=-i\hbar d\psi dr+i\hbar d\psi/dct$ on this $\psi$ defines **observable** 1

Note all we did here was to *define* observable 1 (So needed real also.)

But by writing out this definition of observable 1 we also inadvertently derived *both* real# math and physics from the **postulate** of 1. (Backups below and at davidmaker.com)


**1)Introduction**

1 is the simplest idea imaginable. But 1 is not just a squiggle written on a piece of paper. For the **postulate** of 1 to be meaningful 1 must be observable: an idea everyone can understand. A Hermitian **operator** is an observable so has real eigenvalues. So all I did then was to define **observable1**.

Note real (i.e., Cauchy seq.of rational #) and observable (i.e.,Hermitian **operator** on $\psi$) are rigorously defined and so the resulting new pde $\psi$ is rigorously derived. So our '1' is meaningful (so observable, not just a written squiggle) so:

Summary: **Postulate** 1 (and get math and physics).

2) **Details of above derivation of the new pde that defines real observable**

So we just **postulate 1**, the simplest idea imaginable, and then use that list-define method , that uses this 1, to develop the algebra tools(sect.4) we need to define real observable. In that regard the simplest algebraic definition of 1,0 is $z=zz$ which is the small C limit of

$$z=zz+C,\ \delta C=0,\ C<0 \qquad (1)$$

needed to define real **observable** 1.

(A) Substitute $\mathbf{z}=1+\delta z$ into eq.1 and get $\delta(\delta z+\delta z\delta z)=0$ (2). (gets Dirac eq. "*observables*")

(B) Substitute the left side $\mathbf{z}$ of $z=zz+C$ back into the right side $zz$ of eq.1 repeatedly and use $\delta C=0$ and get the Mandelbrot set (fractal) iteration formula for some $C_M$.(containing subsets of Cauchy sequences for *real*#). Other substitutions into eq.1 than A&B do not lead to "real" to '*real*' '*observable'*

## 2.1 Derivation of new pde

(A)So from eq.2 ($\delta z$-K)+$\delta z\delta z$=C (constant C and K) which is a quadratic eq. with in-general complex solution $\delta z = dr + idt$. Plug that back into eq.2 with $K=\delta z$ to initialize to flat space and get $\delta(dr^2+i(drdt+dtdr)-dt^2)=0$ since $dr^2-1^2dt^2=ds^2$ is special relativity (Minkowski metric given $1^2$=natural unit constant speed$^2\equiv c^2$) invariance. The imaginary extremum is the Clifford algebra $dr'dt'+dt'dr'=\gamma^r dr\gamma^t dt+\gamma^t dt\gamma^r dr=0$ since $2drdt\neq 0$ here for NONvacuum. Factor the real component and get 5 equations (eg.,**e**; dr+dt=ds,dr-dt=ds (3),etc.,dr-dt in IV quadrant so ds>0. e=electron=only nonzero proper mass. (Complex *unknown* K for $K\neq\delta z+\delta z'$ ($\delta z'$)perturbation adds 2 degrees of freedom.). **We just derived special relativity here!**

Square eq.3 to get $+ds^2=(dr+dt)^2=(dr^2+dt^2)+drdt+dtdr$ implying $dr^2+dt^2=ds^2$ circle invariance at 45° since dr+dt and drdt+dtdr (cross term) are invariant. So $\delta z=dse^{i\theta}=dse^{i((\sin\theta dr+\cos\theta dt)/ds)}$. Take the r derivative, define $dr/ds\equiv k$, $\sin\theta\equiv r$, $\delta z\equiv\psi$ and multiply both sides by $i\hbar$ and define momentum $p\equiv\hbar k\equiv\xi v$ to get the operator formalism $p_r\psi=-i\hbar\partial\psi/\partial r$ (so *observables* p). All three invariances imply the Dirac equation for **e**,$\nu$. **We just derived quantum mechanics here**! Clifford algebra small drdt area extremum is then the real# line drdt Mandelbulb Fiegenbaum pt. $C_M$. on the *real* axis were the Mandelbrot iteration sequence has that Cauchy seq.subset. giving the real numbers. Postulate 1 (eq.1) then requires a new (boost) frame of reference to give small fractal baseline $\delta z'\equiv C_M/\gamma\equiv C_M/\xi\equiv r_H=C$. So $K\neq\delta z+\delta z'$ perturbation of flat space eq.3: $(dr-\delta z')+(dt+\delta z')=ds\equiv dr'+dt'$ rotation (3) since ds invariant. Defining $\kappa_{rr}\equiv(dr/dr')^2=1/(1-r_H/r)+.$, $r\equiv dr$, in the Minkowski metric $ds^2=dr'^2+dt'^2+.$,and using invariance $drdt=dr'dt'=\sqrt{\kappa_{rr}}dr\sqrt{\kappa_{tt}}dt$, we obtain $\kappa_{rr}=1/\kappa_{tt}$ and thereby **get 4D GR** math. So the Fiegenbaum point neighborhood perturbation rotations $\theta$ and Dirac equation give that **new pde** $\gamma^\mu\sqrt{(\kappa_{\mu\mu})}\partial\psi/\partial x_\mu=(\omega/c)\psi$ with that fractal $r_H$ (by$10^{40}$X scale change). Hermitian operators on these new pde $\psi$s are the observables.

## 3) Applications Of The New pde

That *new pde* z=0, **4** (2X45°) rotations for composite e,$\nu$ implies the Z,$W^\pm$,$\gamma$ , the **4** Bosons of the Standard electroweak Model SM (PartI) and so **Maxwell's equations** and **Proca** equation. *New pde* z=0 $2P_{3/2}$ flux quantization composite **3e** results in rapid e motion Fitzgerald contraction of E field lines giving the **strong force** and so (the much larger mass) **baryons** (partII). The iteration of the new pde on the next higher fractal scale generates the Schwarzschild metric (i.e.**, gravity**) and so general covariance. So **we just derived general relativity (GR) from quantum mechanics in one line!**

Recall the *new pde* zitterbewegung oscillation on the next higher $10^{40}$X larger fractal scale. With us being in the expansion stage of the oscillation for $r<r_c$ this then **explains the expansion of the universe**.

Many *new pde* experimentally testable predictions (eg., differential cross-section peak for 21Tev p-p collisions, totem results,..etc..,) are contained in partI, partII, partIII.

### 3.1) Note The Square Root In New pde $\gamma^\mu\sqrt{(\kappa_{\mu\mu})}\partial\psi/\partial x_\mu=(\omega/c)\psi$

For z=1 the 3rd order term in the Taylor expansion of the two square roots $\sqrt{\kappa_{\mu\mu}}$ in the *new pde* gets the Lamb shift (2) and anomalous gyromagnetic ratio respectively thus eliminating the need for renormalization and the resulting infinite charge, infinite mass, infinite vacuum density, etc.. Thus these square roots **cause theoretical physics to give right answers again** (Infinite everything is 0% right).

## 4) **Real Analysis From Only The Postulate 1**

Recall one of our two goals was to define the real numbers from one simple postulate1. To do that we had to define observable 1. Here we mention the details of developing the algebra (eg.,required for eq.1) such as the list-define method (in the above flow chart).
Given this (postulate) 1 we can use *list-define* (*list* the many instances of a relation e.g., start with **1**∪1≡ 2 , then *define* them all as relation a+b=c) math(appendix C PartI) to *replace* those famous order axioms, mathematical induction axioms (giving **N**) and the field and ring axioms to generate the numbers N and the algebra of eq.1. Also the (postulate of 1) restatement: $z=zz+C, \delta C=0, C<0$. (eq.1) is the same as min(**z-zz**)>0. So the well known (axiom of) completeness ∃**min**sup is provided by the **min** and the (axiom of) "choice" function is f(z)=**z-zz**.
We thereby demonstrate that we get the (also required) Completeness and Choice(1) as well from the postulate of 1. Also, as we saw, by plugging in the left side z into the zz of the right side of eq.1(which also comes from the **postulate** of 1 via the *list-define* method) repeatedly and use that δC=0 we generate the Mandelbrot set iteration from $z_o=1$ also a Cauchy sequence of rational numbers that generates the real number 1 and $C_M=\pm$smallrational#<¼ (see sect.1.2.1 boost) .
Here we thereby have that simplest imaginable idea of postulate 1 generating *only* the real number mathematics and observable physics (e.g.,we got 4D) *without* any other postulates! Otherwise we would also have those many axioms of mathematics to account for as well. 1 is *THE* single Occam's razor postulate meaning we have 'figured it out', Jackpot! (i.e., as in sect.3)

**Conclusion**: Intuitive notion of the **Postulate** of ONE.
Given the fractalness astronomers are observing from the inside of what particle physicists are studying from the outside, the $r_H$ of that ONE *new pde 'object'* we first postulated. So we look at big and small scales and all we see is that **ONE** nonzero proper mass e (even baryons are 3**e**).

## References


(1) Royden, '**Real Analysis',** Pearson modern classics
(2) Bjorken and Drell, '**Relativistic Quantum Fields'**


## **FOREWORD** (Referencing eq.1.2.7 and 3e composite)

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.
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 assyptotic 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.1.2.7**)

"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 $\gamma^r\sqrt{(\kappa_{rr})}\partial\psi/\partial r=(\omega/c)\psi$ 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 3rd 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 $\gamma^r\sqrt{(\kappa_{rr})}\partial\psi/\partial r=(\omega/c)$ (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 2P3/2 at r=rH 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!

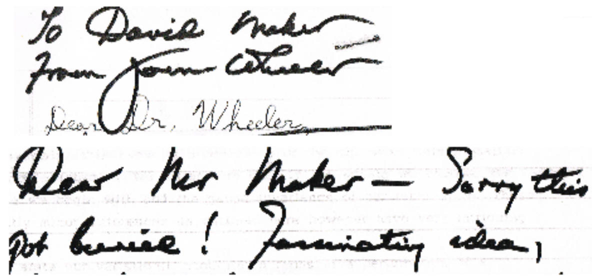
Reinhart Engelmann, Oct 2009

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 Reimann 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 Dr. Wheeler
Dear Mr Maker — Sorry this got hurried! 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.

## Table of Contents



Rewrite eq.1.1.1;1.1.2 as the more familiar operator formalism

**Sect.1** Note the algebraic definition of 1,0 is zz-z=0 as a limit of (given real observability)

$$z=zz+C, \ (1.1.1) \quad \delta C=0, \ C<0 \qquad (1.1.2)$$

Plug z=1+δz into eq.1.1.1 get (1+δz)-(1+δz)(1+δ)=C (1.1.3) and so δzδz+δz+C=0 (1.1.4)

Solving quadratic eq. 1.1.4 we get: $\delta z=[-1\pm\sqrt{(1-4C)}]/2$. For now allow C>¼ δz=dr+idt (1.1.5)

(So we derived `space-time.`). Plug 1.1.4 into eq. 1.1.2 $\delta C=\delta(\delta z-K)+\delta(\delta z\delta z)=0$ (1.1.6)

1.1.2 δz=K →flat

We can then always add a (given constant C) in general complex K in δ(δz-K+δzδz) =0 to use K=δz to initialize to local flat (making the K≠δz+δz' cases perturbations in this formulation) since $0+\delta(\delta z\delta z)=\delta[(dr+idt)(dr+idt)]=\delta(dr^2+i(drdt+dtdr)-dt^2)=0$ is Minkowski (C is real to have real $C=C_M$ in sect.1.2) since we postulated real 1). Also since K is complex for unknown K≠δz+δz' perturbation ir (K) merely adds 2 degrees of freedom as in 2⊕2 (Note then 4D keeps $C=ds^2$ invariant even if K≠δz).

Given δ(δz-K)=0 and eq.1.1.5 $\delta(\delta z\delta z)=\delta[(dr+idt)(dr+idt)]=\delta(dr^2+i(drdt+dtdr)-dt^2)=0$ (1.1.7)

Next factor the real component of 1.1.7.

$\delta(dr^2-dt^2)=\delta[(dr+dt)(dr-dt)]=\delta(ds^2)=[[\delta(dr+dt)](dr-dt))]+[(dr+dt)[\delta(dr-dt)]]=0$ (1.1.10)

Solve eq. 1.1.10 and get (→±e) $dr+dt=\sqrt{2}ds$, $dr-dt=\sqrt{2}ds$, $\equiv ds_1$ (1.1.11) I,IV +ds

(→light cone $v$) $dr+dt=\sqrt{2}ds$, $dr=-dt$, (1.1.12) II

" " $dr-dt=\sqrt{2}ds$, $dr=dt$, (1.1.13) III

(→vacuum) $dr=dt$, $dr=-dt$ (1.1.14) dt=0=dr

Equation 1.1.10 gives Special Relativity(SR) $ds^2=dr^2-(1)^2dt^2$ (note natural unit *constant* $1^2$ ($\equiv c^2$) in front of the $dt^2$). Thus K=δz initializes to locally flat space if also C is real. Note our quadrants were chosen so that ds>0 giving us observability since the later operator formalism at 45° which also implies that if either dr or dt is zero then everything is zero and we have our "vacuum" solution 1.1.14 and so not observable.

Note also **Imaginary** component= $ds_3 \equiv$ (***drdt+dtdr***)=0 (1.1.8)

Note our previous quadrant choice of dr,dt makes drdt+dtdr and so $ds_3$ positive or zero with zero being the extremum given eq.1.1.8 are finite extremums since $\delta\infty$ is undefined. But since dr, dt (in scalar 2drdt) is not 0 if not eq.1.1.14 vacuum then:

$$drdt+dtdr=0 \quad (1.1.9)$$

implies the imaginary extremum is a Clifford algebra (since we assume we are not in the eq.1.1.14 vacuum where drdt=0 is not the eq.1.1.14 vacuum as in )$dr'dt'+dt'dr'\equiv\gamma^1dr\gamma^2dt+\gamma^2dt\gamma^1dr=2drdt(\gamma^1\gamma^2+\gamma^2\gamma^1)=0$ so $\gamma^i\gamma^j+\gamma^j\gamma^i=0$, $(\gamma^k)^2=1$ ($(\gamma^k)^2=1$ from real component of eq.1.1.7). Also the invariants $ds_1$ and $ds_3$ imply a third invariant.

## Third Invariant

In their respective quadrants all are +ds. Also recall the previous two invariants of $ds_1$,$ds_3$.. We square $ds_1^2=(dr+dt)(dr+dt)=dr^2+drdt+dt^2+dtdr=[dr^2+dt^2]+(drdt+dtdr)\equiv ds^2+ds_3=ds_1^2$. Since $ds_3$ (from 1.1.9, is max or min) and $ds^2$ (from 1.1.10) are invariant then so is $ds^2=dr^2+dt^2=ds_1^2-ds_3$ as in figure 1 for all angles from the axis extremum. $ds^2$ is our 3rd invariant. (Note all three of these invariants $\partial ds/\partial z=0$ are satisfied at the Fiegenbaum point, $v$ also at the limacon end, sect.1.2). Note in fig.1 min ds is at 45°. So ds is diagonal.

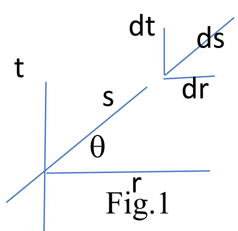
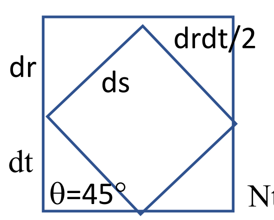


Fig.1



Nth fractal scale

Minimum $ds^2=dr^2+dt^2$ so at 45°: $\delta z=dse^{i\theta}=dse^{i(\Delta\theta+\theta_o)}$, $\theta_o=45°$ (1.1.14)

Note in fig.1 45° is always measured from extremum axis'(also in fig.4). So for variation Δθ $\delta z=dse^{i\theta}=dse^{i(\Delta\theta+\theta_o)}=dse^{i((\cos\theta dr+\sin\theta dt)/(ds)+\theta_o)}$, $\theta_o=45°$. (1.1.15) So θ=f(t). $\delta z=dse^{i(45°+\Delta\theta)}$. In eq.1.15 we define k≡dr/ds, ω≡dt/ds, sinθ≡r, cosθ≡t. $dse^{i45°}=ds'=ds$. Then

eq.1.15 becomes $\delta z=dse^{i(\Delta\theta)}=dse^{i\left(\frac{\sin\theta dr}{ds}+\frac{\cos\theta dt}{ds}\right)}$ so $\frac{\partial\left(dse^{i\left(\frac{rdr}{ds}+\frac{tdt}{ds}\right)}\right)}{\partial r}=i\frac{dr}{ds}\delta z$ so

$$\frac{\partial\left(dse^{i(rk+\omega t)}\right)}{\partial r}=ik\delta z \quad (1.1.15a)$$

$k\delta z=-i\frac{\partial\delta z}{\partial r}$ Multiply both sides by ħ. ħk≡mv=p since k=dr/ds=v/c=2π/λ (1.1.15b)

from eq.1.15 for our unit mass $\xi_s\equiv m_e$. δz≡ψ,(eq.6.6.1) Note we also derived the DeBroglie wavelengthλ=h/mv (<F>*= ∫(Fψ)*ψdτ=∫ψ*Fψdτ =<F> Hermitian).

$p_r\psi = -i\hbar\frac{\partial\psi}{\partial r}$ which is the observables $p_r$ condition gotten from that eq.1.1.15 circle. (1.1.16)
**operator formalism** thereby converting eq.1.1.11, 1.1.12, 1.1.13 into Dirac eq. pdes.
Note these $p_r$ operators are Hermitian and so we have 'observables' with the associated eq.1.11-1.13 Hilbert space **eigenfunctions δz** (=ψ). δz (in z=1-δz) is the probability z is o (see appendix D).
We derived QM here.
Note rotation to 45° for min $ds_3$ in figure 1 on the eq.1.1.14 circle.

**1.1.3 Origin Of Math from Eigenvalue of δz**: Since ds∝dr+dt can make (dr+dt)/ds a integer:
**2δz**≡ (1∪1)δz≡(1.11+1.11)δz≡((dr+dt)+(dr-dt))/(k'ds)))δz≡-i2(ds/ds)∂(δz)/∂r≡-i2∂(δz)/∂r (1.1.16a)
=(integer)k)δz.
So from eq.1.16a we obtain the eigenvalues of: δz=0,-1 making our z=1+δz eq.1 **real numbers 1,0 =z (binary qubit) also observables. So we have come full circle and so use this result to develop the list-define algebra** required to use eq.1-1.2. eg.,"list" as in 1+1=2, 2+1=3; "define" a+b=c replacing the usual field axioms, order axioms and mathematical induction axiom (that merely gives **N**). See appendix C, Part I. Note this third invariant ds also *gives us the quantum mechanics* operator formalism (eq.1.1.16). See appendix D.

## 1.2 Mandelbrot Set.

Iterate to get Cauchy sequence. So real1
Just plug the left side z in z=zz+C back into each z on the right side eq.1.1.1 and get z'=z'z'+C since z'≡(zz+C)=z. $z_1$=1 instead of 0 with the two $C_M$s chosen to give the upper and lower components of the Cauchy sequence. It is the Mandelbrot set displaced by -1. So you can repeat this step with this new z'=z'z'+C. We get the iteration $z_{N+1}=z_Nz_N+C_M$ with $\delta C=\delta(z_{N+1}-z_Nz_N)=0$ () then implying this choice of $C_M$ defines the Mandelbrot set since δ(∞-∞) cannot be zero. Our z=zz postulate in eq.1.1.1 has solutions 1,0 and first term in the iteration is z=$z_1$. But z=$z_1$=0 will be used here (z=1 as $\xi_1$ is discussed below). One such sequence $z_N$ generated from this Mandelbrot set definition also provides a Cauchy sequence $z_N$ of rational numbers that shows that 1 is a *real* number(2). You can then use appendix B2 to define the real number *algebra* by rigorously defining min and zz-z. Note all three of these invariants ∂ds/∂z=0 are satisfied at the Fiegenbaum point.

**Clifford Algebra +Mandelbulbs Implies Fiegenbaum point Making K≠δz**
Scalar component of eq. 1.1.8 δ(**2drdt**)=0 implies smallest area real C extremum Mandelbulb which is the Fiegenbaum point C= $C_M$ subset of the Mandelbrot set

### 1.2.1 A Moving Observer Frame of Reference Is Also Implied by Postulate 1

But $C_M$ is big ($|C_M|$=1.4011..) so we need a new reference frame to get small C≈0 of postulate 1 (eq.1.1.1). Define $r'_H$=δz=$C_M$/1 so we (as a Fitzgerald contraction 1/γ) boost $r'_H$=boost (as in the p=ξv=(1/γ)(dr/ds) definition 1.1.15b) $C_M/1≡C_M/γ≡C_M/\xi_1$≡C to get small C≈0 (if $\xi_1$ is big) and so get the postulate of 1 in eq.1.1.1 (This is just the tangential instantaneous rotating frame of reference of the spin½ eq.1.2.7 new pde.). Also for the next smaller fractal baseline δz>>δzδz in eq.1.1.4 so δz≈C
z≈1 $C_M$=ξδz', δz' in z=1+δz' is small so $\xi_1$ is big.
z≈0 $C_M$=ξδz', δz' in z=1+δz' is big so $\xi_o$ is small.
z≈0 $\delta C_M$= δ(ξC)=δ(ξδz)=$\delta\xi_o\delta z+\xi_o\delta\delta z$ so $\delta\xi_o$ is small so small $\xi_o$ is stable ground state of the new pde.
z≈1 $\delta C_M$= δ(ξC)=δ(ξδz)=δξδz+ξδδz so ξδδz is small and $\delta\xi_1$ can be big so $\xi_1$ can be unstable

So $C=C_M/1$ making the stable 1 the stable $\xi_o$. $\delta\xi$ is then big so $\xi_1$ unstable and also $\xi=\xi_1$ is large and its $\Delta E=1/\sqrt{\kappa_{oo}}$ is also our ambient metric $\kappa_{oo}$ ($=1-(a/r)^2-r_H/r$) term and so must split due to the rotational and vibrational metric quantization of object B in the Kerr metric $(a/r)^2$ term in the ambient metric. So we have three S=½ new pde objects (each with its own sect.1.1 neutrino and its own Reimann surface.) constituting $\xi_1=\xi_t+\xi_u+m_e$ in the new pde for r large with $\xi_t$, $\xi_u$ excited states of boosted $m_e$.
The $(\xi_1)/2=m_p$ reduced mass is the L=1 rotational $2P_{3/2}$, $r=r_H$ state (r small) is state with the m= ½+½ of the two positrons canceling the L=1 angular momentum.
So $\xi_1=\xi_3+\xi_2+\xi_o\equiv\tau+\mu+m_e\equiv1+\varepsilon+\Delta\varepsilon$ and so we also have $3C_M$ for $\xi_1$. So for z=1

$$r_H=\Sigma C_M/(\xi_3+\xi_2+\xi_o)\equiv \Sigma C_M/\xi_1 \qquad (1.2.0)$$

Thus we have added perturbation $\delta z'\approx C_M/\xi\equiv r'_H$ on eq.1.1.13 constrained by the eq.1.1.6 circle
For small $r=r_H$ (and same $\xi_1$) the rotational reduced mass $\xi_1/2=m_p$ is derived in part II from the B flux quantization and Meisner effect.

### Fiegenbaum Point

Go to http://www.youtube.com/watch?v=0jGaio87u3A to explore the Mandelbrot set near the Fiegenbaum point. 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
$3^{2.7X62}=10^N$ so 172log3=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 $C_M/\xi\equiv_H$ in electron rq.9 (eq.1.2.7 below). So for each larger electron there are **$10^{82}$ constituent electrons** (that result from the amazing equation). 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 giving us our fractal universe.
Given the solution 1.1.5 $\delta z=\frac{-1\pm\sqrt{1-4C}}{2}$. is real for noise C<¼
creating our noise on the N+1 th fractal scale. So $¼=(3/2)kT/(m_pc^2)$. So T is 20MK. So here we have *derived the average temperature of the universe* (stellar average). $N=r^D$ . So the **fractal dimension=** D=logN/logr=log(splits)/log(#$r_H$ in scale jump) $=\log10^{80}/\log10^{40}$ $=\log((10^{40})^2)/\log(10^{40})=2$ .
which is the same as the 2D of eq.1.1.5 just below and the Mandelbrot set. The next smaller (subatomic) fractal scale $r_1=r_H=2e^2/m_ec^2$, N-1th, $r_2=r_H=2GM/c^2$ is defined as the Nth where $M=10^{82}m_e$ with $r_2=10^{40}Xr_1$

## z=0, z=1 $\delta K\neq\delta z$ generally

### 1.2.2 $K\neq\delta z$

Recall $(dt+dr)^2=dr^2+dt^2+drdt+dtdr=ds^2=dr^2+dt^2+0$. Recall small $\delta z$, so small K, $C\approx\delta z-K$ in eq.1.1.4 $K\equiv x+iy$ in eq.1.1.4 also adds 2 more degrees of freedom since K can be complex and *non*locally is a free parameter. Recall that $\delta[(dr+idt-K_r-K_i)+dr^2-dt^2+i\delta(drdt+dtdr)]=0$. In section 1.1 $dr+idt-K_r-K_i=0$ for flat space initialization.
**4degrees of freedom** in 2 spatial dimensions in **rectangular** coordinates
Here $\delta z\neq K$ so given complex unknown K we have 2 additional degrees of freedom $|K-\delta z'|\equiv dx'+dy'$ added to $\delta z$ to have dx',dy',dz' behave the same for orthogonal $dr^2=dx^2+dy^2+dz^2$ so $(dr'+dt')^2=((dx'+dy'+dz')+dt')^2=dr^2+dt^2+0=ds^2$ since dr'dt'+dt'dr'=0
We convert to dx,dy,dz, dt by $(dx'+dy'+dz'+dt')^2=(\gamma^x dx+\gamma^y dy+\gamma^z dz+\gamma^t dt)^2=dr^2+dt^2=ds^2$ (1.2.0)
to keep $ds^2$=C constant implying that $\gamma^\mu\gamma^\nu+\gamma^\nu\gamma^\mu=0$, $\gamma^\mu\gamma^\mu=1$.

**4degrees of freedom** in 2 spatial dimensions in **polar** coordinates
Or we just add those 2 new parameters in a
**2D** rotation at 45° $(dr-\delta z')+(dt+\delta z')\equiv ds$ (eg.,$\Delta\theta,\Delta r$) (1.2.1)
(since ds in invariant).
In that regard in a moving frame of reference boost dt (recall $3\xi_o$ gets heavier right up to $\xi_1$) also changes so $\arctan(dr/dt)\equiv\theta$ changes so $\theta$ gets larger and larger in $e^{i\theta}$ (sect.1.1.3) and passes by(successive branch cuts and so $\xi_2$ and $\xi_3$ and their respective neutrinos (eq. 1.1.10-1.1.13) (in their assigned quadrants) each having it's own Reimann surface. These are the families of the 3 leptons with their associated Reimann surface neutrino. $\xi_o=\Delta\varepsilon=m_e$ is the stable ground state for all three states for large r and so independent Hamiltonian (and momentum) operators $H\psi=E\psi$. From eq.1.1.19 $\Sigma C_M/\xi_1\equiv r'_H$ in $\kappa_{oo}=1-r'_H/r$ for z=1, $C_M/\xi_o\equiv r_H$. for z=0. So small $\delta z$ implies a $\Delta\theta$ in $C_1$ Eq.1.1.14 $\delta z=dse^{i(45°+\Delta\theta)}$ rotation occurs here implying that the eq.1.1.4 associated infinitesimal uncertainty $\pm C_M/\xi_1=\delta z$ cancel to rotate at $\theta\approx45°$:

$$(dr-\delta z)+(dt+\delta z)=(dr-(C_M/\xi_1))+(dt+(C_M/\xi_1)) =\sqrt{2}ds= dr'+dt'$$

= 2 rotations from ±45° to next extremum (appendix AI below). (1.2.1a)
This also keeps $ds_1$ invariant so keeping the eq.1.1.10 ds invariance. Note that by keeping dt not zero we have *already* put in background white noise (since then C>¼ in eq.6 & eq.1.1.4) into eq.1.1.11-1.1.13
Recall $z\equiv1+\delta z$ so if z=0 then $0=1+\delta z$ so $|\delta z|$ is big in $C_M=\xi(\delta z-K)$ so $\xi$ is small
So for z=0 rotations $\xi$ is small so big $C_M/\xi_o$ (also $\delta\xi=0$ so stable, electron, sect1.2.4) from A1 $\theta=C_M/ds\xi_o=45°+45°=90°$. In contrast for z=1 $\xi_1$ big so $\theta=45°-45°\approx0$ since small $\delta z=C_M/\xi_1$.
Define $\kappa_{rr}\equiv(dr/dr')^2=(dr/(dr-(C_M/\xi_1)))^2 =1/(1-r_H/r)^2 =A_1/(1-r_H/r) +A_2/(1-r_H/r)^2$
The $A_I$ term can be split off from RN as in classic GR and so $\kappa_{rr}\approx1/[1-((C_M/\xi_1)r))]$ (1.2.2)
From partial fractions where N+1th scale $A_1/(1-r_H/r)$ and Nth$=A_2/(1-r_H/r)^2$ with $A_2$ small here.
So we have a new frame of reference dr',dt'. So real eq.1.1.10 becomes:

$$ds^2= \kappa_{rr}dr'^2 +\kappa_{oo}dt'^2 +.. \quad (1.2.3)$$

So a new frame of reference dr',dt'. Note from 1.1.8 $dr'dt'=\sqrt{\kappa_{rr}}dr\sqrt{\kappa_{oo}}dt=drdt$ so $\kappa_{rr}=1/\kappa_{oo}$(1.2.4)
We do a rotational dyadic coordinate transformation of $\kappa_{\mu\nu}$ to get the Kerr metric which is all we need for our GR applications. Note on the N+1th fractal scale $\kappa_{\mu\nu}$ is the ambient metric.
So we derived General Relativity (eqs.1.2.1,1.2.2,1.2.3) by the $C_M$ **rotation** *of special relativity* (eq. 1.1.10) which shows why we said **K≠δz** implies 4D curved space.

### 1.2.3 Relation Between The Nth And N+1th Fractal Scale (Reduced Mass) Metrics $\kappa_{\mu\nu}$
Recall the well known additional $(a/r)^2$ Kerr metric term as in $\kappa_{oo}=1-(a/r)^2-2GM/(c^2r)$ in the N+1 fractal scale. Also in the Nth scale reduced mass system $\xi_1/2=m_p$. We can then do our scale transformation from one reduced mass system to another avoiding many complications. So multiply $\kappa_{oo}\approx[1-(C_M/(\xi_i r))]$ by $1-\varepsilon$ to then get $[1-\varepsilon-\Delta\varepsilon-C_M/(\xi_o r)]$ and then we are required to normalize (section 1.2) by $1-\varepsilon$ which is then in the reduced mass $m_p$ system (partII). Given the spin½ selfsimilarity the Kerr metric exists but is a mere observed perturbation due to inertial frame dragging observable only due to a nearby object B. So we have two equal masses on the N+1th fractal scale, hence we can use the reduced mass just as we do with the $m_p$. We can then do our scale transformation from one reduced mass system to another avoiding many complications. So multiply $\kappa_{oo}\approx[1-(C_M/(\xi_i r))]$ by $1-\varepsilon$ to then get $[1-\varepsilon-\Delta\varepsilon-C_M/(\xi_o r)]$ and then we are required to normalize (section 1.2) by $1-\varepsilon$ for local 2D isotropic homogenous space-time which is then in the reduced mass $m_p$ system (partII). Given reduced mass systems for both the

larger and smaller fractal scales **to jump to the next fractal scale electron we then merely multiply $C_M/\xi_o$ by $10^{40}$**. So $\kappa_{oo}=1-\varepsilon-\Delta\varepsilon-(10^{40}C_M/\xi_o)/r$ so that $-\varepsilon-\Delta\varepsilon\rightarrow(a/r)^2$, $M=10^{80}m_e$, $10^{40}2e^2/m_ec^2=10^{40}C_M/\xi_o\rightarrow 2GM/c^2$. So $r_H\rightarrow r_H10^{40}$, $\kappa_{oo}=1-\varepsilon-C_M/\xi_o)/r\rightarrow 1-(a/r)^2-r_H/r\rightarrow 1-\xi_1-(C_M/\xi_1)/r$, N+1th fractal scale, and causing $1/m\rightarrow m$ (since $r_H=2e^2/m_ec^2\rightarrow 2GM/c^2$) defining G.

**Object B Operator formalism In the New Pde eq.1.2.7**

The object B Kerr metric contribution determines mass. So $\kappa_{oo}=1-(C_M/\xi_1)/r=1-C_M/(1+\varepsilon-\Delta\varepsilon)/r$ is the same thing as the Kerr metric $\kappa_{oo}=1-\varepsilon-\Delta\varepsilon-C_M/\xi_o r=\kappa_{oo}=1+(a/r)^2-C_M/(\xi_{\Theta M}r)$ if for normalized $E_e=1/\sqrt{\kappa_{oo}}-\varepsilon-\Delta\varepsilon$ if ε and Δε are separate QM operators (eg., ε operates only on it's own PE and ε and not on Δε).

**1.2.4 4D and eq.1.2.2 in eq.1.1.11**

Note from the distributive law square 1.11: $(dr+dt+..)^2=dr^2+dt^2+drdt+dtdr+..$But Dirac's sum of squares=square of sum is missing the cross term drdt+dtdr requiring the $\gamma^\mu$ Clifford algebra. So this is the same as if those cross terms drdt+dtdr=0 as in eq.1.1.9. So equation 1.1.9 with 4D 1.1.11, automatically implies a Clifford algebra $\gamma^\mu\gamma^\nu+\gamma^\nu\gamma^\mu=0$, $(\gamma^\mu)^2=1$. From eq.1.1.9 there is also the covariant coefficient $\kappa_{\mu\mu}(\gamma^\mu)^2=\kappa_{\mu\mu}$. So after multiplying both sides by $\delta z\equiv\psi$ causes the **4D** operator equation 1.1.16 to cause eq.1.1.11$\rightarrow ds=(\gamma^1\sqrt{\kappa_{11}}dx_1+\gamma^2\sqrt{\kappa_{22}}dx_2+\gamma^3\sqrt{\kappa_{33}}dx_3+\gamma^4\sqrt{\kappa_{44}}dx_4)\delta z$

$$\rightarrow \quad \gamma^\mu\sqrt{(\kappa_{\mu\mu})}\partial\psi/\partial x_\mu=(\omega/c)\psi \qquad \textbf{(1.2.7)}$$

$\omega\equiv m_Lc^2/h$. Eq.1.2.7 is our new 4D pde which implies eigenfunctions δz (=ψ) and with $C_M>0$ gets leptons for z=1,0 and also 1.1.12 (ν pinned to the light cone so $C_M=\varepsilon/r_H=0$). For z=0 3e see PartII (in sect.1.2 we show that the Standard electroweak Model comes from the composite of e,ν at $r=r_H$ and in partII we show that the $2P_{3/2}$ particle physics at $r=r_H$.

Add ground state energy Δε to $r_H/r$ for **r=large**

**Inverse Separability implying Nth scale operator formalism and frames of reference forces**

So there exists a eq.1.2.7 $(\gamma^\mu\sqrt{(\kappa_{\mu\mu})}\partial\psi/\partial x_\mu=(\omega/c)\psi)_N$ on every Nth fractal scale ($10^{40}$X larger than a given previous fractal zitterbewegung scale $r_H$) with an individual separate horizon $r_{HN}$ barrier to observability (sect.2.5) between every two such space-like scale intervals given. $\kappa_{oo}=1-r_{HN}/r$. Given these independent 1.2.7 equations, as in the usual differential equation separability, we can invoke a "inverse separability" $\psi_{point}=\psi_N*\psi_{N+1}*\ldots*\psi_\infty$. given the usual zitterbewegung $\psi=e^{i(mc^2/\hbar)t}\equiv e^{i\xi t}\equiv e^{i(\varepsilon+\Delta\varepsilon)}$ (sect.1.2) $\Delta\varepsilon=\xi_o$ with $e^{i(\varepsilon+\Delta\varepsilon)}{}_N$ the asymptotic ψ value (i.e.,r→∞). Also note the $\sqrt{\kappa_{oo}}$ multiplier in equation 1.2.7: Thereafter after normalizing each ψ*ψ to 1 as usual we have: $\prod_N(\kappa_{oo}(\psi^*\psi)_N=\prod_N(\kappa_{oo}(\psi^*\psi)_N)=\prod_N(\kappa_{ooN})=e^{i(\varepsilon+\Delta\varepsilon)}{}_{N*}e^{i(\varepsilon+\Delta\varepsilon)}{}_{N+1**}$.(1.2.31).

The frame of reference provided by each ψ gives our forces (eg., sect.7.3).

This inverse separability makes the rectangular method apply to all fractal at once

**Object B And Kerr Contribution from 6.4.16 $\kappa_{oo}=1-r_H/r\rightarrow 1-(a/r)^2-r_H/r=1/\kappa_{rr}$ from eq.1.2.4**

$(a/r)^2=\Delta\varepsilon/(1-\varepsilon)$. Note from Kerr metric contribution eq. 6.4.16 given space-like $r_H$ barrier separations the operators (sect.2.5) are on quantities only within a given fractal scale. If a locally homogenous space-time (where tiny Δε background metric change my still be nonzero.) we can normalize out the 1-ε. Here Δε is N+1 th and $r_H$ Nth so as an operator equation: $\Delta\varepsilon(r_H\psi_N)=0$, $r_H(\Delta\varepsilon\psi_{N+1})=0$, etc. (partIII) in:

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

(1.2.32)

And since Δ $(=r^2-2mr+a^2)$ is also in the denominator of the Kerr metric $\kappa_{rr}$ we still have eq.1.2.4 $\kappa_{oo}\approx 1/\kappa_{rr}$

Add zero point energy state ε to $r_H/r$ for **r=r$_H$** 1.2.33

**summary**

z=1 gives the $r\to\infty$ formulation $r_H$=CM/m. z=0 gives the $r=r_H$ rotational reduced mass formulation $r_H=C_M/m_e-C_M/m_e+C_M/m$ to be consistent with $C\to\infty$ with m=mt+mu+me in the new pde. For z=0 you calculate the $r=r_H$ rotational reduced mass $m_p=m/2$ (using flux quantization) which for z=1 is then $C_M/m=r_H$ in koo=1-rH/r. So $E_e=m/\sqrt{(\kappa_{oo})}-m_e=V$. Take the third order Taylor expansion term to get ΔV

We earlier derived for the new pde (above) $\Sigma C_M/\Sigma\xi_i=r_H$ for free space fundamental $\tau+\mu+m_e=\xi_1$ 3 free leptons for **r=large,** With same (required) $\xi_1$ and simple deflation to $r_H$ (**r=r$_H$**) and rotation to B flux quantized Φ=h/e we describe baryons, the **r=r$_H$** solution to the new pde. Given the Meisner effect two terms in $C_M/\xi_o-C_M/\xi_o+C_M/\xi_1$ are equal. The Meisner effect arises because of periodic virtual annihilation (PartII) inside $2P_{3/2}$ at $r=r_H$ and so a change in current in Faraday's law. So the new pde describes both free leptons ($r\to\infty$) and baryons ($r\approx r_H$). That Meisner effect cloud is the pions (partII). So add zero point energy state ε to $r_H/r$ for $r=r_H$. For 2P3/2 state. (for $2P_{1/2}$ the Es are separate and so Taylor expansion term ε/2 gets added). Recall from section 1.2, (eq.1.2.0) that:

$$\begin{pmatrix} C_1 \\ C_2 \end{pmatrix} = \xi_1 \begin{pmatrix} \delta z_1 \\ \delta z_2 \end{pmatrix}$$

Starting with $\tau+\mu+m_e=\xi_1$ we (more generally) rotate to the B flux quantization Φ=h/e plus deflation of $\begin{pmatrix} \delta z_1 \\ \delta z_2 \end{pmatrix}$ to $r_H$ all the while conserving required $\xi_1$ mass energy

Rotateδz+deflateδz= $\begin{bmatrix} \xi_{11} & \xi_{12} \\ \xi_{21} & \xi_{22} \end{bmatrix} \begin{pmatrix} \delta z_1 \\ \delta z_2 \end{pmatrix} + \begin{bmatrix} -\lambda & 0 \\ 0 & -\lambda \end{bmatrix} \begin{pmatrix} \delta z_1 \\ \delta z_2 \end{pmatrix} = \xi_1 \begin{pmatrix} \delta z_1 \\ \delta z_2 \end{pmatrix}$

$$\begin{bmatrix} \xi_{11}+\lambda & \xi_{12} \\ \xi_{21} & \xi_{22}+\lambda \end{bmatrix} = \xi^2 - \xi Tr(M) + \det(M) = \xi_1$$

Partial fractions with 2 body ε Meisner effect implies the first two fractions have the same magnitude and so fix the value of rotation $\xi_{ij}$, deflation λ and so (determinant) M: $r_H$= $\frac{C_M+C_M+C_M}{\xi_1} = \frac{C_M}{x^2+x(tr)+C} = \frac{C_M}{\xi_o} - \frac{C_M}{\xi_o} + \frac{C_M}{\xi_1}$ in $\kappa_{oo}$ and so the energy $1/\sqrt{\kappa_{oo}}$. (1.2.30)

So we have that baryon 3e composite. Note $\Sigma C_M/\xi_1 \equiv C$ makes C small in eq.1.1.1 preserving the postulate of 1 also.

**Back To r→∞ Electron Hamiltonian From 6.6.15 Add Δε/(1+ε)**

We can rewrite eq.1.2.8 and 1.2.32 for the electron assuming ambient (Kerr) metric (so $\kappa_{oo}=1/\kappa_{rr}$) as:

$$E_e = \frac{tauon + muon}{\sqrt{1 - \frac{\Delta\varepsilon}{1+\varepsilon} - \frac{r_{H\prime}}{r}}} - (tauon + muon + PE\tau + PE\mu.) \qquad \kappa_{oo} = 1 - \frac{\Delta\varepsilon}{1+\varepsilon} - \frac{r_{H\prime}}{r}$$

Note for electron motion around hydrogen proton $mv^2/r=ke^2/r^2$ so $KE=\frac{1}{2}mv^2=(\frac{1}{2})ke^2/r$ =PE potential energy in PE+KE=E. So for the electron (but not the tauon or muon who are not in this orbit) $PEe=\frac{1}{2}e^2/r$. Note also all we did in 1.2.8 is to write the hydrogen energy and pull out the electron contribution. So from 1.2.9: $r_{H'}=(1+1+.5)2e^2/(m_\tau+m_\mu+m_e)/2=2.5e^2/(m_pc^2)$.

**Variation δ(Eψ*ψ)=0 At r=n$^2$a$_o$**

Next note the $\psi_{2,0,0}$ eigenfunction variation in energy is equal to zero at maximum $\psi^*\psi$ probability density where for the hydrogen atom is at $r=n^2a_o=4a_o$. Also $m_Lc^2 =(m_\tau+m_\mu+m_e)=2m_pc^2$ normalizes $\frac{1}{2}ke^2$:

$$E_e = \frac{tauon + muon + m_e}{\sqrt{1 - m_ec^2 - \frac{r_{H\prime}}{r}}} - (tauon + muon + PE\tau + PE\iota) =$$

$$2(m_\tau c^2 + m_\mu c^2)\frac{1}{2} + 2\frac{2.5e^2}{2r(m_Lc^2)}m_Lc^2 - 2\frac{3}{8}\left(\frac{2.5e^2}{rm_Lc^2}\right)^2 m_Lc^2 + \frac{2m_ec^2}{2}$$

$$-2(m_\tau c^2 + m_\mu c^2)/2 - 2\frac{e^2}{2r} - 2\frac{e^2}{2r}$$

$$= \frac{2m_ec^2}{2} + 2\frac{e^2}{4r} - 2\frac{3}{8}\left(\frac{2.5}{rm_Lc^2}\right)^2 m_Lc^2 = m_ec^2 + \frac{e^2}{2r} - 2\frac{3}{8}\left(\frac{2.5e^2}{rm_Lc^2}\right)^2 m_Lc^2$$

So: $\Delta E_e=2\frac{3}{8}\left(\frac{2.5}{rm_Lc^2}\right)^2 m_Lc^2 =$

$$\Delta E = 2\frac{3}{8}[\frac{2.5(8.89X10^9)(1.602X10^{-19})^2}{(4(.53X10^{-10}))2((1.67X10^{-27})(3X10^8)^2}]^2(2(1.67X10^{-27})(3X10^8)^2$$

$=hf=6.626X10^{-34}$ 27,360,000 so that f=27MHz Lamb shift.
The other 1050Mhz comes from the zitterbewegung cloud.

**Using Separability of eq.1.2.7 to get Gyromagnetic Ratio**

After separation of variables the "r" component of equation 1.2.7 can be rewritten as:

$$\left[\left(\frac{dt}{ds}\sqrt{g_{oo}}\,m_p\right)+m_p\right]F - \hbar c\left(\sqrt{g_{rr}}\frac{d}{dr}+\frac{j+3/2}{r}\right)f = 0 \quad (1.2.10)$$

$$\left[\left(\frac{dt}{ds}\sqrt{g_{00}}\,m_p\right)-m_p\right]f + \hbar c\left(\sqrt{g_{rr}}\frac{d}{dr}-\frac{j-1/2}{r}\right)F = 0 \quad (1.2.11)$$

Comparing the flat space-time Dirac equation to equations 1.2.10 and 1.2.11

$$(dt/ds)\sqrt{\kappa_{oo}}=(1/\kappa_{00})\sqrt{\kappa_{oo}}=(1/\sqrt{\kappa_{oo}})=\text{Energy}=E \quad (1.2.12)$$

Using the above Dirac equation it is easiest to find the gyromagnetic ratios gy for the spin polarized F=0 case. Recall the usual calculation of rate of the change of spin S gives $dS/dt\propto m\propto gyJ$ from the Heisenberg equations of motion. We note that $1/\sqrt{g_{rr}}$ rescales dr in $\left(\sqrt{g_{rr}}\frac{d}{dr}+\frac{J+3/2}{r}\right)f$ in equation 1.2.10. 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 $1/\sqrt{g_{rr}}$ and set the numerator equal to 3/2+J(gy), where gy is now the gyromagnetic ratio. This makes our equation 1.2.10 compatible with the standard Dirac equation allowing us to substitute the gy into the standard $dS/dt\propto m\propto gyJ$ to find the correction to dS/dt. Thus again:

$[1/\sqrt{g_{rr}}](3/2 + J)=3/2+Jgy$, Therefore for J= ½ we have:

$$[1/\sqrt{g_{rr}}](3/2+\tfrac{1}{2})=3/2+\tfrac{1}{2}gy= 3/2+\tfrac{1}{2}(1+\Delta gy) \quad (1.2.13)$$

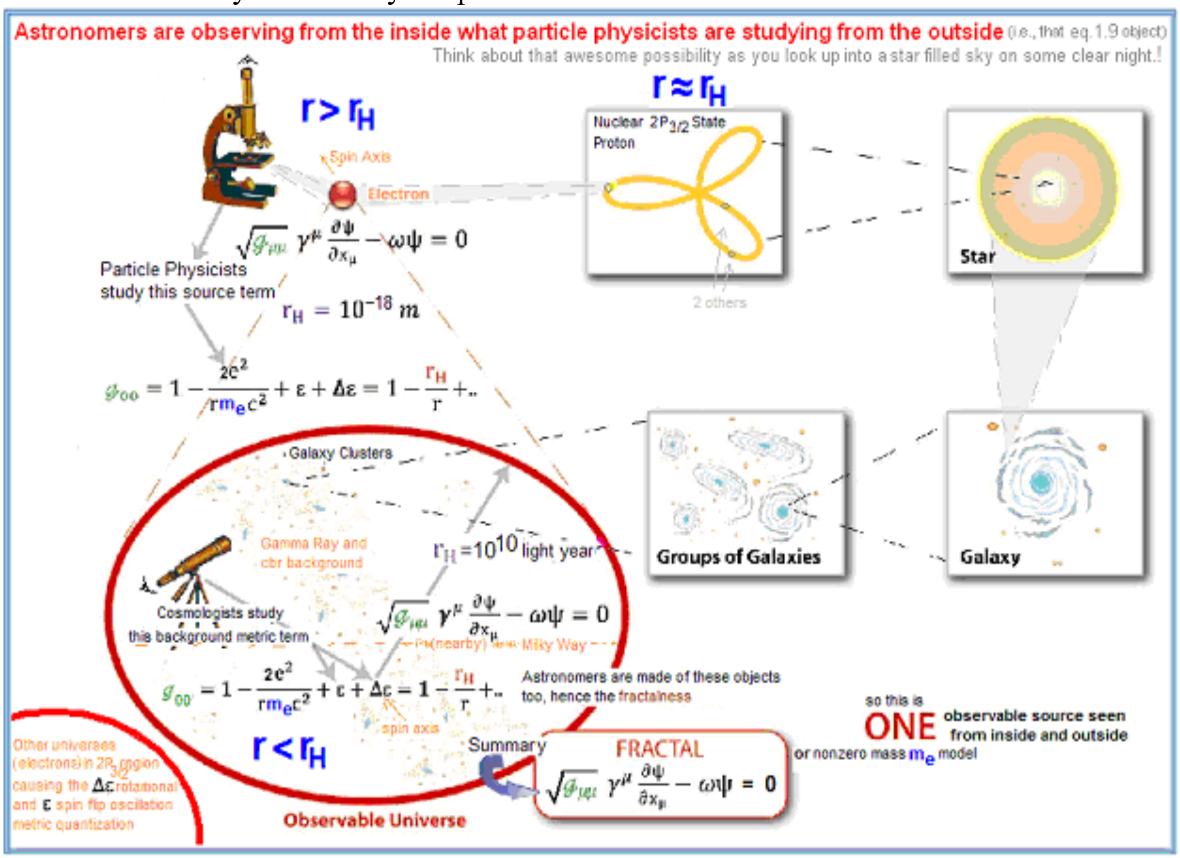
Then we solve for gy and substitute it into the above dS/dt equation.

**S States**: Noting in equation 1.2.13 we get the gyromagnetic ratio of the electron with $g_{rr}=1/(1+\Delta\varepsilon/(1+\varepsilon))$ and $\varepsilon=0$ for electron. Thus solve equation 1.2.13 for $\sqrt{g_{rr}}=\sqrt{(1+\Delta\varepsilon/(1+\varepsilon))}= \sqrt{(1+\Delta\varepsilon/(1+0))}= \sqrt{(1+.0005799/1)}$. Thus from equation 1.2.13

$[1/\sqrt{}(1+.0005799)](3/2 + ½)= 3/2 + ½(1+\Delta gy)$. Solving for $\Delta gy$ gives anomalous gyromagnetic ratio correction of the electron $\Delta gy=.00116$.
If we set $\varepsilon\neq 0$ (so $\Delta\varepsilon/(1+\varepsilon)$) instead of $\Delta\varepsilon$) in the same $\kappa_{oo}$ (in equation 1.2.8a) in eq.1.2.7 we get the anomalous gyromagnetic ratio correction of the muon in the same way.

**SUMMARY**

Given the fractalness astronomers are observing from the inside of what particle physicists are studying from the outside, that ONE new pde electron $r_H$ of eq.1.2.7, one thing.
The universe really is infinitely simple.




References


(1) Penrose in a utube video implied that the Mandelbrot set might contain physics. Here we merely showed how to find it. The fractal neighborhood of the Fiegenbaum point is a subset. In fact all we done here is to show how to obtain physics from the Mandelbrot set.

(2) 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 sequence $z_n$ same as Cauchy seq.$z_n$ so real1.


## 1.**2.2 z=1 Charge Associated With These Two Eigenfunctions** (since $\varepsilon=C_M$ not 0)

One result is that from eq.1.1.18 we have nonzero $\varepsilon$ in $(dr-\varepsilon)\equiv dr'$
So from 1.1.19: $ds^2=dr'^2+dt'^2=dr^2+dt^2+dr\varepsilon/2-dt\varepsilon/2-\varepsilon_1^2/4$ (1.2.6)
From eq.1.1.12 the neutrino is defined as the particle for which $-dr'=dt$ (so can now be in 2nd quadrant dr', dt' fig.2 can be negative) so $dr\varepsilon/2-dt\varepsilon/2$ has to be zero and so $\varepsilon$ has to be zero therefore $\varepsilon^2/4$ is 0 and so is pinned as in eq.1.1.12 (*neutrino*). $\delta z\equiv\psi$. So on the light cone

$C_M=\varepsilon=mdr=0$ *and so the neutrino is uncharged and also massless in this flat space.* Also see Ch.2 for nonflat results.

1.1.11: Recall eq.1.1.11 electron is defined as the particle for which $dr\approx dt$ so $dr\varepsilon/2-dt\varepsilon/2$ cancels so $\varepsilon_1$ ($=C_M$) in eq.1.1.16 can be small but nonzero so that the $\delta(dr+dt)=0$. Thus dr,dt in eq. 1.1.11 are automatically both positive and so can be in the *first quadrant*. 1.1.11 is *not* pinned to the diagonal so $\varepsilon^2/4$ (and so $C_M$) in eq.1.1.22 is not necessarily 0. So *the electron is charged* since $C_M$ is not 0. This then explains the positioning of the +e,-e, ν vectors in figure 2.

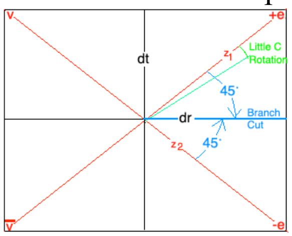


fig.2

Note for finite C in 1.1.17 we also **break** the **two** 2D **degeneracies (**in eq.1.1.11) giving us our **4D.**

**A2 z=0 Implies Large $\Delta\theta=C_M/\xi_o$ extremum to extremum Rotation In The Real Plane:**

Recall all observable z satisfy eq.1.1.15 so that $z\propto e^{i\theta}$. Eq.1.1.14 a 45° rotation $\delta z_p\delta z= e^{i\theta p}e^{i\theta}=\delta z'=e^{i(\theta p+\theta)}=-i\partial z/\partial r$ , So a 45°+45° rotation gives: $\delta z_p\delta z'= e^{i\theta p}e^{i\theta'}=\delta z''=e^{i(\theta p+\theta)}=-i\partial^2 z/\partial r^2$ . z=0 implies a rotation $C_M/\xi_o$ that we must rotate by $\theta=C_M$ that adds a spin½ (since it goes through a 45° lepton) and then $-C_M$ subtracts it using eq.1.1.4. For example start at 0° and rotate through $+45°=C_M$ through the 1st quadrant (electron) $dr+dt=\sqrt{2}ds$ in fig.1, fig.3 and get: +45°, $[(dr+dt)/(ds\sqrt{2})]z=z_{1,r}+z_{1,t}$.. Do $z_{1,r}$ and $z_{1,t}$ separately. $\delta z_p\delta z= e^{i\theta p}e^{i\theta}=\delta z'=e^{i(\theta p+\theta)}=-i\partial z/\partial r$ , $\delta z_p\delta z'= e^{i\theta p}e^{i\theta'}=\delta z''=e^{i(\theta p+\theta)}=-i\partial^2 z/\partial r^2$ So just for $z_{1,r}$: $z_{1,r}=-idz/dr$ (partial derivatives). Then do the $-C_M$ rotation:

So S=½+½=1 making z=0 real Bosons, not virtual. Note we also get the Laplacians characteristic of Bosons by those 45°+45° rotations so eq.1.1.4 implies Bosons accompany our leptons, so they exhibit "force". Note 2 small C rotations for z=1 can't reach 90° 2 particles. So it stays leptonic. With eq.1.1.4 and eq.1.1.1 we then have eigenfunctions z. This time however *all* variations δC=0 (even the 45° rotation to branch cut extremum) are realized and so have real (stable electron) particles instead of virtual(transitory).

**1.2.5. Eq.1.2.7 $2P_{½}$ at $r=r_H$, for z=0 and z=0 →z=1 Composites of e,*ν***

So the *large* **C** z rotation application from the 4 different axis' max extremum (of 1.1.15) branch cuts gives the 4 results: Z,+-W, photon bosons of the Standard Model fig.4. So we have derived the Standard Model of particle physics in this very elegant way. You are physically at $r=r_H$ if you rotate through the electron quadrants (I, IV) and not at $r_H$ otherwise. So we have large $C_M$ dichotomic 90° rotation to the next Reimann surface of 1.1.15, eq.0.1 $(dr^2+dt^2)z''$ from some initial extremum angle(s) θ. Eq.1.1.5a solutions imply complex 2D plane Stern Gerlach dichotomic rotations using noise $z''\propto C$ (0.1) using Pauli matrices $\sigma_i$ algebra, which maps one-to-one to the quaternionA algebra. From sect.0, eq.1.2.2 we start at some initial angle θ and rotate by 90° the noise rotations are: $C=z''= [e_L,\nu_L]^T \equiv z'(\uparrow)+z'(\downarrow) \equiv\psi(\uparrow)+\psi(\downarrow)$ has a eq.1.1..2 infinitesimal unitary generator $z''\equiv U=1-(i/2)\varepsilon n*\sigma)$, $n\equiv\theta/\varepsilon$ in $ds^2=U^tU$. But in the limit $n\rightarrow\infty$ we find, using elementary calculus, the result $\exp(-(i/2)\theta*\sigma) =z''$. We can use any axis as a branch cut since all 4 are eq.1.1.15 large extremum so for the 2nd rotation we move the branch cut 90° 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.1.11 can then be replaced by eq.1.1.14, eq..2.10 $(dr^2+dt^2+..)z'' = (dr^2+dt^2+..)e^{quaternionA}$ Bosons because of eq.1.1.15. Then use eq. 2.10 to R rotate: z'':

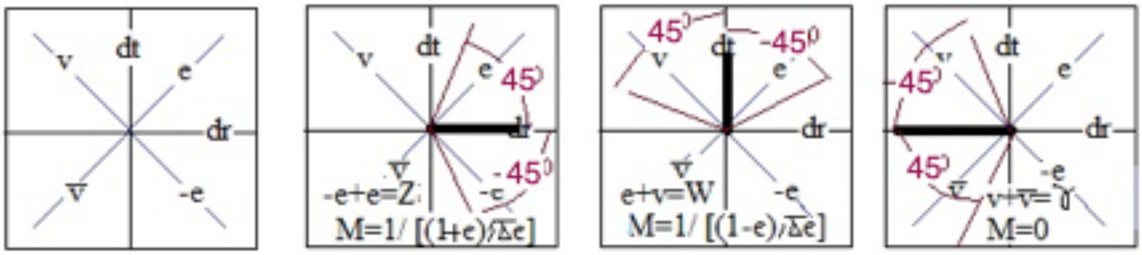



Figure 3. See eq.B4. The Appendix A derivation applies to the far right side figure.
Recall from eq.1.2.1a $C_M$=45+45=90°, gets Bosons. 45-45= leptons.
v in quadrants II(eq.1.1.12) and III (eq.1.1.13). e in quadrants I (eq.1.1.11) and IV (eq.1.1.11).
Locally normalize out 1±ε . For the **composite e,*v*** on those required large z=0 eq.3 rotations for C→0, and for stability $r=r_H$ (eg.,for $2P_{½}$, I→II, III→IV,IV→I) unless $r_H=0$ (II→III) are:
II→III Dichotomic variables→Pauli matrix rotations→z'=$e^{quaternion\ A}$ →Maxwell γ =Noise C blob. See Appendix A for the derivation of the eq.1.1.15 2nd derivatives of $e^{quaternion\ A}$.
I→II, III→IV,IV→I Δε→ε Meisner effect Dichotomic variables→Pauli matrix rotations→z''=$e^{quaternion\ A}$→KG Mesons.
I→II, III→IV,IV→I Δε Dichotomic variables→Pauli matrix rotations→z''=$e^{quaternionA}$, Proca Z,W
Composite 3e: $2P_{3/2}$ at $r=r_H \equiv C_M$ (also stable baryons, partII).

**Appendix B** Quad II→III eq.0.2 $(dr^2+dt^2+..)e^{quaternion\ A}$ =rotated through $C_M$ in eq.1.1.15. example
$C_M$ in eq.0.1 is a 90° CCW rotation from 45° through *v* and anti*v*
A is the 4 potential. From eq.1.2.4 we find after taking logs of both sides that $A_o=1/A_r$
(A1) Pretending we have a only two i,j quaternions but still use the quaternion rules we first do the r derivative:
From eq. 1.2.8 $dr^2\delta z = (\partial^2/\partial r^2)(\exp(iA_r+jA_o)) = (\partial/\partial r[(i\partial A_r\partial r+\partial A_o/\partial r)(\exp(iA_r+jA_o)]$
$=\partial/\partial r[(\partial/\partial r)iA_r+(\partial/\partial r)jA_o)(\exp(iA_r+jA_o))+[i\partial A_r/\partial r+j\partial A_o/\partial r]\partial/\partial r(iA_r+jA_o)(\exp(iA_r+jA_o))+$
$(i\partial^2 Ar/\partial r^2+j\partial^2 A_o/\partial r^2)(\exp(iA_r+jA_o))+[i\partial A_r/\partial r+j\partial A_o/\partial r][i\partial A_r/\partial r+j\partial/\partial r(A_o)]\exp(iA_r+jA_o)$ (A2)
Then do the time derivative second derivative $\partial^2/\partial t^2(\exp(iA_r+jA_o)) = (\partial/\partial t[(i\partial A_r\partial t+\partial A_o/\partial t)$
$(\exp(iA_r+jA_o)]=\partial/\partial t[(\partial/\partial t)iA_r+(\partial/\partial t)jA_o)(\exp(iA_r+jA_o))+$
$[i\partial A_r/\partial r+j\partial A_o/\partial t]\partial/\partial r(iA_r+jA_o)(\exp(iA_r+jA_o))+(i\partial^2 A_r/\partial t^2+j\partial^2 A_o/\partial t^2)(\exp(iA_r+jA_o))$
$+[i\partial A_r/\partial t+j\partial A_o/\partial t][i\partial A_r/\partial t+j\partial/\partial t(A_o)]\exp(iA_r+jA_o)$ (A3)
Adding eq. A2 to eq. A3 to obtain the total D'Alambertian A2+A3=
$[i\partial^2 A_r/\partial r^2+i\partial^2 A_r/\partial t^2]+[j\partial^2 A_o/\partial r^2+j\partial^2 A_o/\partial t^2]+ii(\partial Ar/\partial r)^2+ij(\partial A_r/\partial r)(\partial A_o/\partial r)$
$+ji(\partial A_o/\partial r)(\partial A_r/\partial r)+jj(\partial A_o/\partial r)^2++ii(\partial Ar/\partial t)^2+ij(\partial A_r/\partial t)(\partial A_o/\partial t)+ji(\partial A_o/\partial t)(\partial A_r/\partial t)+jj(\partial A_o/\partial t)^2$ .
Since ii=-1, jj=-1, ij=-ji the middle terms cancel leaving $[i\partial^2 Ar/\partial r^2+i\partial^2 Ar/\partial t^2]+$
$[j\partial^2 A_o/\partial r^2+j\partial^2 A_o/\partial t^2]+ii(\partial Ar/\partial r)^2+jj(\partial A_o/\partial r)^2+ii(\partial Ar/\partial t)^2+jj(\partial A_o/\partial t)^2$
Plugging in A1 and A3 gives us cross terms $jj(\partial A_o/\partial r)^2+ii(\partial Ar/\partial t)^2 = jj(\partial(-A_r)/\partial r)^2+ii(\partial Ar/\partial t)^2$
$=0$. So $jj(\partial A_r/\partial r)^2 = -jj(\partial A_o/\partial t)^2$ or taking the square root: $\partial A_r/\partial r+\partial A_o/\partial t=0$ (A4 )
$i[\partial^2 A_r/\partial r^2+i\partial^2 A_r/\partial t^2]=0$, $j[\partial^2 A_o/\partial r^2+i\partial^2 A_o/\partial t^2]=0$ or $\partial^2 A_\mu/\partial r^2+\partial^2 A_\mu/\partial t^2+..=1$ (A5)

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

$\square^2 A_\mu=1$, $\square\bullet A_\mu=0$ (A6)

**Still ONE Postulated Object**: By the way we note $A_\mu$ (composed of two $\nu$ identified as 1 $\gamma$ in this 90°rotation) also *composes* the z=1 $\kappa_{oo}=1-r_H/r$ virtual particle potential energy ($r_H/r$) of the electron. So we are *still* only postulating that single eq.1.2.7 object by since we must include $\nu$&$\gamma$ in it. We derived the SM here because other derivations similar given their respective fig.4 sources.

Locally normalize out 1±ε . For the **composite e,*ν*** on those required large z=0 eq.3 rotations for C→0, and for stability $r=r_H$ for $2P_{½}$ (I→II, III→IV,IV→I) unless $r_H=0$ (II→III) are:

**Ist→IInd quadrant rotation** is the W+ at $\mathbf{r=r_H}$. Do the append B math and get a Proca equation $E=1/\sqrt{(\kappa_{oo})}-1=[1/\sqrt{(1-\Delta\varepsilon/(1-\varepsilon)-r_H/r)}]-1=[1/\sqrt{(\Delta\varepsilon/(1-\varepsilon))}]-1$. $E_t=E+E=2/\sqrt{(\Delta\varepsilon/(1-\varepsilon))}$=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.

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

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

**IVth → Ist quadrant rotation** is the $Z_o$. Do the math and get a Proca equation. $C_M$ charge cancelation.

$E=1/\sqrt{(\kappa_{oo})}-1=[1/\sqrt{(1-\Delta\varepsilon/(1+\varepsilon)-r_H/r)}]-1=[1/\sqrt{(\Delta\varepsilon/(1+\varepsilon))}]-1$. $E_t=E+E=2/\sqrt{(\Delta\varepsilon/(1+\varepsilon))}-1=Z_o$ 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. $r_H=0$

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

Et=E+E=2E=2Δε is the pairing interaction of SC. The $E_t$=E-E=0 is the 0 rest mass photon Boson. Do the math (eq.A7) and get Maxwell's equations. Mass canceled and there was no charge $C_M$ on the two *ν* s.

Note we get the Standard electroweak Model particles out of composite e,*ν* using required eq.1.2.1 rotations for z=0.

For z=0 composite 3e (For new pde 2P3/2, rapidly moving two positrons, 1 slow electron.) is ortho s,c,b and para t particle physics.

For z=1 the new pde applies to QED with **large r**.

**A2 Derivation of the Standard Model But With No Free Parameters**

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

**A3 2P½ at $\mathbf{r=r_H}$** z=0→z=1 transition occurs when that internal virtual decay event occurs so that there is no Meisner effect ε , just the usual object B background ε. See (6.6.17)

For only a single **electron Δε at $\mathbf{r=r_H}$ in eq.1.1.14 2P½ state** (N neutron) we must then normalize out the 1+ε so $\kappa_{00}=1+\Delta\varepsilon/(1+2\varepsilon)-r_H/r$. For $2P_{½}$ at $r\approx r_H$ (so *not* those ultrarelativistic e+) the $r_H/r_H$ cancels with the 1 and so $\kappa_{00}=\Delta\varepsilon/(1+2\varepsilon)\approx\Delta\varepsilon(1-2\varepsilon)$ or in general: Equipartition of Meisner effect ε energy between the $2P_{1/2}$ and central $2P_{3/2}$ electrons electrons (since they are "identical particles") so $\varepsilon/2$ is with the $2P_{1/2}$ electron at $r=r_H$, thus the W. Thus for $2P_{1/2}$

Meisner+mass= $E=\varepsilon/2+1/\sqrt{\kappa_{00}}= 1/\sqrt{(\Delta\varepsilon(1\pm2\varepsilon))}+\varepsilon/2 =1/[(1\pm\varepsilon))\sqrt{(\Delta\varepsilon)}]+\varepsilon/2 =\xi_W$ (A7)

Eq. A7 gives the W,Z rest masses E. In fact **eq.A7 is the basis for 3 of the 4 rotations of the SM**. So W (right fig.4) is a single electron $\Delta\varepsilon+\nu$ perturbation at $r=r_H=\lambda$ (Since two body $m_e$.): So $H=H_o+m_ec^2$ inside $V_W$. $E_W=2hf=2hc/\lambda$, $(4\pi/3)\lambda^3=V_W$. For the two leptons $\frac{1}{V^{1/2}} = \psi_e = \psi_3, \frac{1}{V^{1/2}} = \psi_\nu = \psi_4$. Fermi 4pt= $2G\iiint_0^{r_W} \psi_1\psi_2\psi_3\psi_4\, dV = 2G \iiint_0^{r_W} \psi_1\psi_2 \frac{1}{V^{1/2}}\frac{1}{V^{1/2}} V =$
$2 \iiint_0^{r_W} \psi_1\psi_2 G \equiv \iiint_0^{V_W} \psi_1\psi_2(2m_ec^2)dV_w = \iiint_0^{V_W} \psi_1(2m_ec^2)\psi_2 dV_w$. (A8)

What is Fermi G? $2m_ec^2(V_W)=.9\text{X}10^{-4}\text{Mev-F}^3=G_F$ **the strength of the weak interaction**.

**A4 Eq.1.21b derivation of DeSitter, SM $\phi^4$ and Part III**: eg., from eq.1.2,5 and eq.1.1.16 and Kerr $\kappa_{00}=1-(a/r)^2-r_H/r_H=1-((dr/ds)r/r)^2-1=((dse^{(i\omega t+kr)}/ds)^2=e^{i2(\omega t+kr)}$. So $E=1/\sqrt{\kappa_{00}}=1/\sqrt{(e^{i2(\omega t+kr)})}=e^{-i(\omega t+kr)}$. So the time component is $E=e^{i\omega t}=e^{i(H/\hbar)t}$ (A9)

in SM $\phi^4$ sombrero section 6.9. $\kappa_{oo}=e^{i2(\omega t+kr)}=e^{-i2(t/\sqrt{\kappa oo}-kr)}= e^{i2((1+\varepsilon/2+\Delta\varepsilon/2)-rH/rH)-kr)}$. (A10a)

So given above operator eq.1.16 input $1+\varepsilon+\Delta\varepsilon$ are pure state operators. Again $r=r_H$ so $\kappa_{00}=e^{-2i(1+\varepsilon/2+\Delta\varepsilon/2-rH/rH)}= e^{-i(\varepsilon+\Delta\varepsilon)}$ for the local ambient metric. For normalized out $\varepsilon$ the cosine expansion gives $\kappa_{oo}=\text{Rel}e^{i\Delta\varepsilon/(1-\varepsilon)}\approx1-(\Delta\varepsilon/(1-\varepsilon)))^2/2+..$ (A11)

The Taylor expansion cross term operator $\varepsilon\Delta\varepsilon$ is the starting point of PartIII. At $r=r_H$ in $\kappa_{00}=1-r_H/r$ in B6a the motion *along* the torus implies $r_H$ numerator is ct=r and so $r=r_H$ for the denominator. The cosine expansion then gives $\kappa_{00}=1-(r/r_H)^2/2$ (A12)

the starting point of the comoving DeSitter global metric derivation of section 6.14.

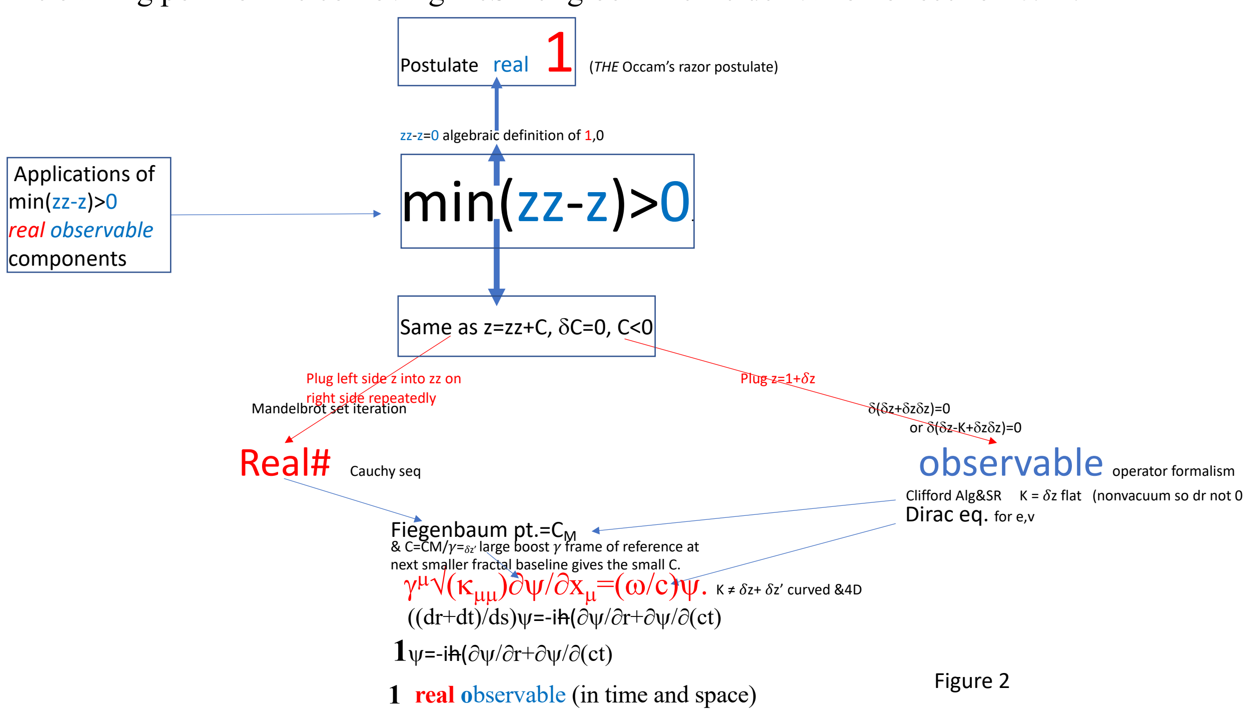


Figure 2

**Appendix B**

**Introduction To** Chapter 6 and **PartII: pure states $\xi_1=1+\varepsilon+\Delta\varepsilon=$ KMQ(sect.1.2)= KE+3$m_e$**

We find in partII that for three 1.2.7 objects, 2e+,1e- at $C_M/\xi_o=r_H$ in $\Phi=BA=B\pi r_H^2$=first B flux quantization level $\Phi=h/2e$ and so **we have the eq.1.2.7** $2P_{3/2}$ **proton** ($r=r_H$) with correct mass, charge and other properties with N the $2P_{½}$. The Paschen Back for the two 2e+ gives the **ortho** (s,c,b) multiplets (with their respective Ξ doublets) and **para** state t with ϒ and H the first Thomas precession perturbations of these two body ortho and para states respectively. The $2P_{3/2}$ state becomes important when we include the smaller central electron motion as well. We then get particle physics in PartII. Note the Frobenius series method applied to each Ξ doublet "ground state" gives the respective multiplets. Also that Frobenius series solution eq.9.22 J=0 zero point energy ε is also the Meisner effect formalism for low impact parameter high energy scattering here so eq.1.2.4 with above $r=r_H$, implies

$\kappa_{00}=1-m_e-(C_M/m_L)/r\rightarrow$ $\kappa_{00}=1-\varepsilon-m_e-(C_M/m_e)/r$ (B1)

Eq. 1.2.4 and B1 is the basis for our PartII three eq.1.2.7 results 2+2+2 =|KMQ|/2. (B2)

**QM**

On the diagonals (45°) we have eq.1.11 holding: particles. Eq.1.1.15 as an operator equation (use 1.1.16) gives waves. A wide slit has high uncertainty, large C so we are at 45°(eg., particles, photoelectric effect). For a *small slit* we have smaller C so we are not large enough for 45° so only the *wave equation* 2.1.1 holds (small slit diffraction). Thus we proved wave particle duality. $\delta z^*\delta z$ is probability density since δz can always be normalized as in $1=\int\delta z^*\delta z dV=\int\psi^*\psi dV$. Also Eq.1.1.11 has *two* parts that solve eq.1.11 together we could label *observer* and *object* with associated 1.11 wavefunctions. So if there is no observer eq.1.1.11 doesn't hold and so there is no object wavefunction. Thus the wave function "collapses" to the wavefunction 'observed' (or eq.1.1.11 does not hold). Hence we derived the Copenhagen interpretation of Quantum Mechanics(QM). dt/k'ds≡ω in sect.1.2 implies in eq.1.1.16 that $E=p_t=\hbar\omega$ for all energy components, universally. But equation 1.2.7 is still the core idea since it creates the eigenfunction δz, directly. So along with eq. 1.1.15, 1.1.21a *we have derived Quantum Mechanics.*

**Appendix C Mathematics Resulting From Postulate of 1**

**Note z=0 is also a solution to z=zz**

So for added z≈0, $z\sqrt{2}=(z+\Delta)\sqrt{2}$ which we incorporate into $\xi\equiv\xi_1\equiv\xi+\xi_o$ where $\xi_o\equiv m_e$ is small. If $\xi=\xi_o$ then $C_M/\xi$ is big and so those big rotations in sect 1.2.

In the more fundamental set theory formulation {∅}⊂{all sets}⇔{0}⊂{1} $=\xi C=z_1$ . So $\xi_o$ acts as 0 in eq.1.1.1 since ∅=∅∪∅⇔0+0=0, {{1}∪ ∅}={1}⇔1+0=1. Thus $z_1=\xi_1=m_L$ contains $z_o\approx 0$ in $\xi_1=\xi+\xi_o$ is the same algebra **as the core idea** of set theory and so of both mathematics and physics (as we saw above).

## C4 Appendix C Definitions Of Cantor's Cauchy Sequence And The Mandelbrot Set

**Set Theory Review**

We postulate a single real set so that the null set ∅ is also a subset (appendix C). Note we have also *defined set theory* and also arithmetic in operator equation 1.16 with simultaneous eq.(1.1.11+1.1.11) and its 1∪1≡1+1 eigenvalues.

**Null Set ∅ Review**

In the context of set theory the null set ∅ is the subset of every set.

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∪1≡1+1, in the context of set theory. But ∅∪∅=∅ is the only property of the null set ∅ we use and of course it is isomorphic

to $0\cup0\equiv0+0=0$ 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 $C\to0$ 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.**

## C5 Why min(z-zz)>0? **Completeness and Choice** (since that implies z is a real number)

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" (∃**min**sup) 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≈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 defiitions 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.,$1\cup1\equiv1+1\equiv2$)--*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.

**Derivation of the real numbers from our postulate of one.**

Recall in section 1 we rewrote the postulate of 1 over and over (defining a sequence) by including the previous z so we could then back out the original postulate of 1 z=zz+C/ξ. Only the Fiegenbaum point then satisfied by the Clifford algebra min drdt min on the real axis our variation $\delta C=0$ in the postulate of 1. But this sequence can also be the Cauchy sequence of rational numbers whose limit defines the real numbers. So **we have derived the real numbers instead of postulating them**.

Real numbers are the core of mathematics (Try balancing your checkbook or measuring a length without them!) and physics. 1 is a real number. The key thing is that we are postulating 1real set, not 1 and a bunch of other stuff.

There are several equivalent ways of defining the real numbers. "Red's set" where z1=1 instead of 0 with the two CMs chosen to give the upper and lower components of the Cauchy sequence. It is the Mandelbrot set displaced by -1

One way is through Dedekind cuts. Another method is to define a number as a "real" number by defining a *Cauchy sequence of rational numbers* (Cantor's method) for which it is a limit.

For example it is easy to define $\pi$ as a real number. You can use the Cauchy sequence $4(-1)^N/(2N+1)$ resulting in $4-4/3+4/5-..=\pi$ . This is a sequence of *rational* numbers with limit $\pi$ which is an irrational number. The union of the set of irrational and rational numbers is the "real " numbers by the way. Note this real number definition *required* that Cauchy sequence of rational numbers.

In contrast the rational number sequence defined by the iteration $z_{N+1}=z_N z_N+C$ (eq.1a); for some C then $\delta C=0$ (eq.1b); $N\rightarrow\infty$, noise $C\rightarrow 0$ defines 1 (and not $\pi$) as a real number for $Z_N=1-z_N$ for $z_1=.9$ or in general $1>z_1>-1$ Solve for C in eq.1.1 and plug that into eq.1b and get $\delta C=\delta(z_{N+1}-z_N z_N)=0$. Note the variation of $\infty-\infty$ cannot be zero so $z_{N+1}$ has to be a *finite* number making eq.1a, 1b the definition of the Mandelbrot set. So the resulting series has to be summable. Thus given $C\rightarrow 0$ and $N\rightarrow\infty$ we *cannot* start the sequence with a number that ends up with a divergent sequence.

So we start with a C in $C\rightarrow 0$ with $z_o$ between -1 and 1 and with C extremely small the $\delta z_{N+1}$ is always a whole number and so rational. So the first number in the sequence is very slightly smaller $\delta z_{N+1}\approx 1$ but is still finite decimal (up to $10^{82}$. See above.) and so rational (eg.,1234/1000=1.234). Plug $\delta z_{N+1}$ back in for $\delta z_N$ ($\delta z_{N+1}=\delta z_N \delta z_N+C$) and repeat until finally $\delta z_\infty=0$. During each such iteration define $z_N=|1-\delta z_N|$ which is the $z_N$ th term in our Cauchy sequence of rational numbers whose limit is 1. Note also that the Mandelbrot set iteration therefore indexes the associated Cauchy sequence. We have thereby found that the eq.1a, eq.1b Mandelbrot set can be used to define the real number 1!).

In the limit $C\rightarrow 0$ (and Mandelbrot set $z_N$) also define $z_\infty\equiv z=zz+C$ eq.1. (Since 1=1X1+0, 0=0X0+0).

You may object that my definition of 1 is missing the identity map. 1X=X. But if 1 is the only number then z=zz IS the only identity map needed

As you can see from the summary 1 is the only number.

Or you may object that other definitions of 1 exist such as $z^4+C=z$ for example. But d(z^x-z) =0 defines extremum x also and 4 is not the extremum that defines 1. x=2 is that (smallest) extremum.

**C5 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. 1.1.11, 1.1.12 $\sqrt{2}ds\equiv\delta z_M=dr\pm dt$ is the **operator** (eq.1.16) 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.

**Appendix D Origin O Mathematics List-define, List-Define→** $10^{82}$ Derivation Of Mathematics Without Extra Postulates

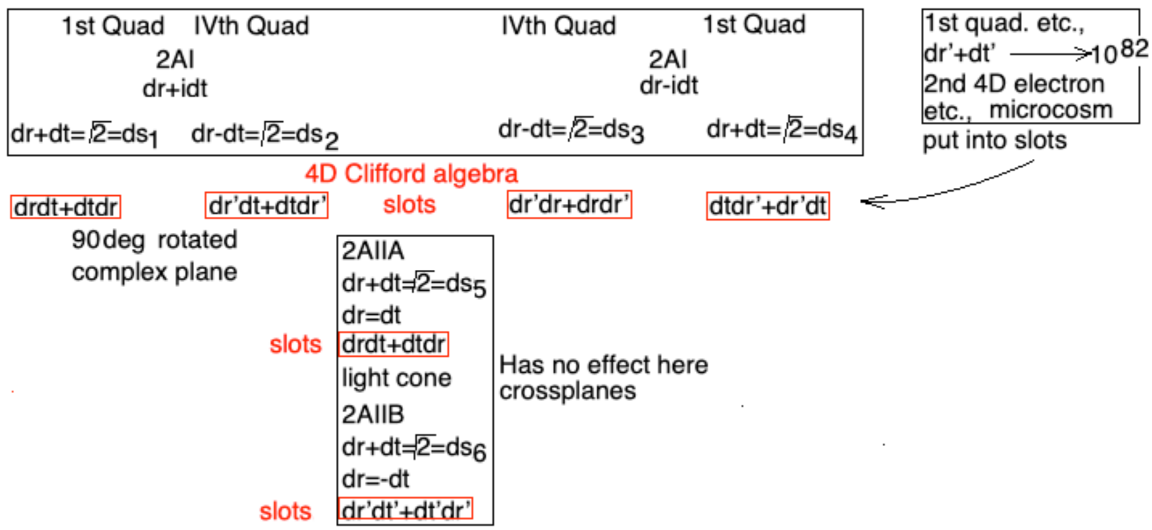



Fig.6 These added cross term eq.1.24 objects (1.11) extend eigenvalue equation 1.15 from merely saying 1+1=2 all the way to the number$10^{82}$.

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.2a the associated dr,dt of the required cross term drdt+dtdr. Note **by doing this we include the two ν 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.1.16a. We then plug that into eq.1.24 as sequence of electrons. This allows us to use eq.1.24 to go beyond 1U1, beyond 2 to 3 let's say. So we can then define 1∪1 from equation eq.1.24 $\delta z_M$ just like postulate 1 was defined from eq.1.3 and eq.1.6. So consistent with eq.1,24 and eq.1.2 we can then develop +integer mathematics from 1U1 beyond 2 because of these repeated substitutions into eq.1.2 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 ψs of equation 9 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 |α> for which a|α>=(N-1)|α>. Also recall eigenvalue 1∪1 is defined from equation 1.16a. Note $10^{82}$ limit from section 6.1. Any larger and it's back to one again. But in this process we thereby create other 1.11 terms for other electrons and so build other 4D . Fig.7

Recall section 1.3. 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 axoms. 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).

**The Progessive "List" Origin Of Mathematics**

**Microcosm Math 3 Numbers** | **Cosmic Math $10^{82}$ Numbers**

(allowed by finite precision)

1 U 1≡1+1≡2 | 1+1≡1*2

1 U 2≡1+2≡3 | 2+2≡2*2

Defines A+B≡C | Defines A*B≡C That being eq.2

Finite precision ≡ noise > 0

Eq.2 can now define 0 with 0*0=0

Use 0 to define subtraction with

1-1≡0

2-2≡0

3-3≡0

Defines δC=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. in that particular microcosm. There are no postulated rings or fields here either.

Fig.7

Recall section 1.3. 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 axoms. 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 1.2 you notice (attachment) our **numbers** are also eigenvalues (observables) in eq.1.1.16 and also **are the # of electrons**. But there is no observation possible through the fractal $r_H$ horizons in eq.2 (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.

**Appendix D Quantum Mechanics**

In z=1-δz δz is (defined as) the probability of z being 0. Recall z=0 is the $\xi_o=m_e$ solution to the new pde so δz is the probability we have just an electron. 1 then is the probability we have the entire $\xi_1$=KMQ complex (sect.1.2.1), that includes the electron (Observed EM&QM, sect.6.12).

Note z=zz also thereby conveniently provides us with an automatic normalization of δz. Note also that (δz*δz)/dr is also then a one dimensional probability 'density'. So Bohr's probability density postulate for ψ*ψ (≡(δz*δz)) is derived here. It is not a postulate anymore. Note the electron observer Eq.1.1.11 (eq.1.2.7) has *two* parts that solve eq.1.1.11 together we could label *observer* and *object* with associated 1.1.11 wavefunctions δz. So if there is no observer eq.1.1.11 then eq.1.1.10 doesn't hold and so there is no object wavefunction. Thus the wave function "collapses" to the wavefunction 'observed' (or eq.1.1.11 does not hold). Hence we derived the Copenhagen interpretation of Quantum Mechanics(QM).

On the diagonals (45°) we have eq.1.11 holding: particles. Eq.1.1.15 as an operator equation (use 1.1.16) gives waves. A wide slit has high uncertainty, large C so we are at 45°(eg., particles, photoelectric effect). For a *small slit* we have smaller C so we are not large enough for 45° so only the *wave equation* 1.2.8 holds (small slit diffraction). Thus we proved wave particle duality. dt/k'ds≡ω in sect.1.2 implies in eq.1.1.16 that $E=p_t=\hbar\omega$ for all energy components, universally. $mv/k=\hbar$ defines $\hbar$ in terms of mass units (1.1.15b). But equation 1.2.7 is still the core idea since it creates the eigenfunction δz, directly. So along with 1.2.7 and appendix E and eq. 1.1.15, 1.1.21a *we have derived Quantum Mechanics.*

**Thermodynamics**

Note that a "single state δz per particle" comes out of 1 particle per δz state per solution in 1.1.16 and eq.1.2.7. So the number of ways W of filling $g_i$ single states with $n_i$ particles is $g_i!/(n_k!(g_i-n_i)!$ thereby giving us klnW≡S and so thermodynamics.

**AppendixE 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 δz 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 $1-v^2/2c^2+\ldots$) and a $1-r_H/r=\kappa_{oo}$ 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 $dt\rightarrow dt\sqrt{(1-v^2/c^2)}\sqrt{\kappa_{oo}}$. $r_H=2e^2/(m_ec^2)$. We also note the alternative (doing all the physics at the point ds at 45°) of allowing $C>C_1$ to wiggle around instead between ds limits mentioned above results in a Markov chain. $dZ=\psi\equiv\int dz=\int e^{id\theta}dc=\int e^{idt/so}dc=\int e^{idt/\sqrt{(1-v^2/c^2)}\sqrt{\kappa oo}/so}ds'ds$.. In the nonrelativistic limit this result thereby equals $\int e^k e^{ikdt(v^2-k/r)}=\int e^{i\int k\int(T-V)dt}ds'ds\ldots=\int e^{iS}ds'ds$ $\equiv dz_1+dz_2+..\equiv\psi_1+\psi_2+.$ many more ψs (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 $\int dz=\psi s\equiv\psi_1+\psi_2+.$) interpretation of quantum mechanics where the possibility of –dt allows a pileup of δzs 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 -cosθ 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 h→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.

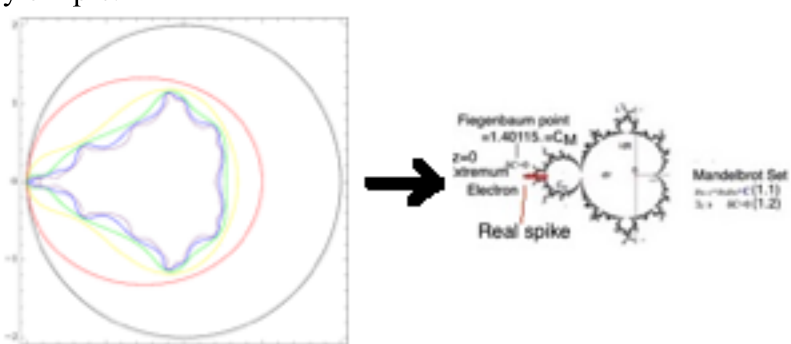
## Ch.2 Details Of The Fractalness

### 2.1 The Mandelbrot Set eq.1.1.1, 1.1.2

C3 **min(z-zz)** ***only*** 'universality' (i.e., only one minC, minz and minzz) along with eq.1.1.1, 1.1.2, 1.1.14 implies a lemniscate sequence**.**

**The C** For |relz|=1

Given |Relz|=1then single minz (at 45°)=-1 in (-1- (-1)(-1))≈-2=**C**=$C_M^2$≡$C_1$ for *single* minz in fig.4. Plug the left side z in eq.1.1.1 into each z in zz on the right side and so start a $C_{N+1}$= $C_NC_N+C_1$ iteration lemniscate **s**equence**.** The N=∞ limit is the Mandelbrot set (1) subset **real**# Fiegenbaum point $C_M$≡ξC (sect.1.2 appendix C) and so also get the fractalness (GR, gravity cosmology). Because of the δ in eq.1.1.6 we can add arbitrary -K to δz in eq.1.1.4. Here δ(δz-K)=0 in eq.1.1.6 to initialize to locally flat space as in 1.1.10 (In sect.1.2 K≠δz). For small δz,C≈ δz in eq.1.1.4 so $C_M$=ξC≈ξδz. So ξ large (in $C_M$=ξδz) and z-zz=C=$C_M$/ξ≈0 so z≈zz and z≈**real**#**1** So we have derived both physics *and* mathematics from the postulate of **1.** The universe indeed is infinitely simple.




point $C_M$.

Fig.4 Lemniscate sequence (Wolfram, Weisstein, Eric) $C_{N+1}$=$C_NC_N$+C. C=$C_1$=$dr^2+dt^2$, $C_0$=0. After an infinite number of successive approximations C"=C'C'+C =$C_M^2$

C that is in the Mandelbrot sequence formula where C is small (since δz<<1 given z≈1). The Mandelbrot set $C_M$ is (and from the postulate δ$C_M$=0), $z_{N+1}$=$z_Nz_N$+$C_M$ (since δ(z'-zz)= δ($z_{N+1}$-$z_Nz_N$)=δ(∞-∞)≠0). C+ΣC'C'=C" ≡$C_M^2$. Mandelbrot calls $C_M$ the ER, Escape Radius (see Muency). To get back eq.1.1.6 we divide both sides by δz*.

$\frac{C+\sum C\prime C\prime}{\delta z*} = \frac{C_M^2}{\delta z*}$. Then define ξ from $\delta z^* = \xi\sqrt{C_{circle}} = \xi C_M$, (The initial circle is radius $C_M$ Fig.4)

$\delta z + \delta z \delta z = \frac{C_M^2}{\delta z*} = \frac{C_M^2}{\xi C_M} = \frac{C_M}{\xi} \approx \delta z$, $\xi\delta z = C_M \equiv e^2$ charge. (C1)

In order to back out $1+\delta z=z$ then so big $\xi \equiv$mass$\equiv\sqrt{2}/\delta z$ since $C_M \approx z\sqrt{2}$. $\delta C_M=\delta\xi\delta z+\xi\delta\delta z=0$ so $\delta\delta z=\delta(i\delta t)=0$ and $\delta\xi\approx 0$ stability.

Note z=0 is *also* a solution to z=zz. So for added $z\approx 0$, $z\sqrt{2}=(z+\Delta)\sqrt{2}$ which we incorporate into $\xi\equiv\xi_1\equiv\xi+\xi_o$ where $\xi_o\equiv m_e$ is small. If $\xi=\xi_o$ then $C_M/\xi$ is big.

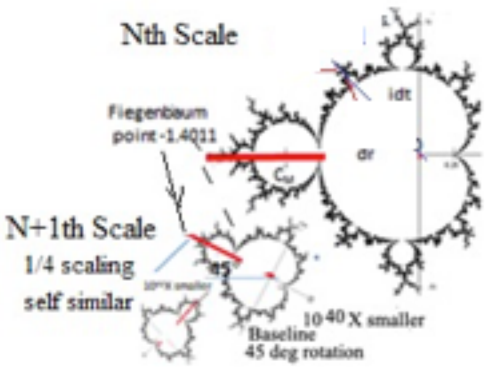



Fig.8

Note at the Fiegenbaum point the Mandelbrot set is $10^{40}$X fractal with a 45° between successive Mandelbrot sets. See youtube http://www.youtube.com/watch?v=0jGaio87u3A

**Observed Selfsimilarity of Mandelbrot Sets On Next Larger (N+1) And Next Smaller (N) Fractal Scales**(we live in between these two scales)at the Fiegenbaum point

**2.2 Fractal** Invariants

Speed of light c is a fractal invariant, stays the same in going from one fractal scale to another since dr and dt (in c=dr/dt) change the same as you go through $r_H$ branch cut . Note nontrivial (eq.1.16a) eignefunction is $\delta z=-1$ for $C\to 0$ so given $z=1+\delta z$ then $\delta z\delta z=(-1)(-1)=drdr=ds^2=1$ in the large N+1 fractal baseline $C\to 0$ limit so since $ds^2$ is invariant for all angles then ds=1 from selfsimilarity of the small Nth and large N+1 th fractal baselines so ds in eq.2 is also a fractal invariant. With c and ds both invariants in eq.1.15 we have 1.15 giving us the Hermitian operators with associated eq,1.24 eigenfunction Hilbert space.

**2.3 $C_M$ Fractal** Consequences

Recall our two sect.I.1 equation i.e.,(eq.1.3) and two unknowns derivation of second unknown $C_M$, our Mandelbrot set along the –dr axis branch cut horizon. Note also measurements are confined inside time-like geodesics inside $r_H$ event horizon boundaries in eq.1.24 so the measured $\delta\delta 1=0$ can then be postulated all over again, given branch cut horizon $r_H$, for $r<r_H$. So on the next higher fractal scale (Ch.2) a second ε can then be rewritten as a $10^{40}$ X larger source. Recall the ξdr mass term in section 2. Also for the (sect.2.4 just below) fractal $\Delta r=10^{40}$X scale jump in $\varepsilon\Delta r^2=(k/\Delta r)\Delta r^2=k\Delta r$ (recall $\varepsilon\equiv 2e^2/m_ec^2$) implying a new mass term $k\Delta r$ (instead of ξdr). So ε goes up by $\Delta r^2=(10^{40})^2=10^{80}$. $\Delta r^2$ becomes the contravariant tensor dyadic Z multiplier in sect 7.4. Note GM then is invariant (constant) as well since ε is. It is well known that information is stored as horizon $r_H$ surface area$=4\pi r_H^2=4\pi(10^{40})^2\approx 10^{81}$ thus giving us our appendix A counting limit. So for single source $((2GM/c^2)/10^{81})=(10^{40}/10^{81})\varepsilon\approx(1/10^{40})\varepsilon$ is an added source term of inverse square law force on each electron(2), hence the gravity in fig.3. Ch.7. So the

radial rate of change of electric field on our own fractal (expanding) scale is the gravity on the next larger fractal scale (fig.3), *one unified* field! Note also we derived the standard model (eq.1.11) gets the strong force section 1.1.11+1.1.11+1.1.11 of Ch.9). See note reference 4 below for the underlying theory. The fractal metric quantization (due to object B) also gives a nonzero $\varepsilon, \Delta\varepsilon$ (fractal) metric quantization mixed states that replaces the need of dark matter (PartIII, Ch.11).

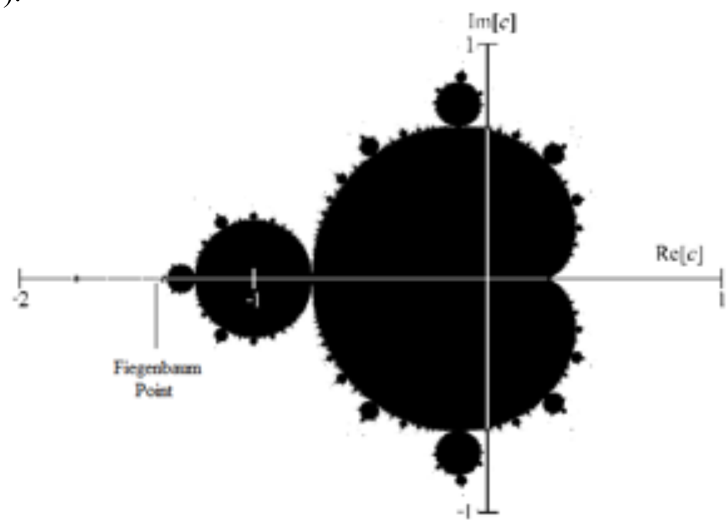



fig. 9

**2.3 {{neighborhood $C_M$}∩{-r 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.2a than just irrational and rational numbers, there is also this underlying space-time fractal structure {neighborhood{$C_M$}∩{-r 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.1.3) $C \to 0$ we must be in the neighborhood of the horizontal Mandelbrot set dr axis. But from the perspective (scale) of this N+1 th scale observer one of the $10^{40}$X smaller (Nth fractal scale) 45° rotated Mandelbrot sets (fig.5) is still near his own dr axis putting it within the $\varepsilon$, $\delta$ limit neighborhoods of $C \to 0$ of eq.2. Thus in this narrow context we are allowed the 45° rotations to the extremum directions of the solutions of equation 2. Our C increases (eg., $C \to 0$) discussed later sections are also all in this Nth fractal scale context. For example eq. 1.1.11 is then reachable on the Nth fractal scale ($r > r_H$) as a noise object ($C>0$). So 1.1.12 at 135° 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 1.1.6 that on the diagonals we have particles (and waves) and on the dr axis where C=0 only waves, see 1.1.15. Recall 2AC solution dr=dt, dr=-dt gives 0 as a solution and so C=0. But in equation 2 for $C \to 0$ $\delta z=0,-1$. So 2AC 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.1.11 these are solutions to the Dirac equation and so represent fractalness, smaller wave lengths inside smaller wavelengths. So it is fractal.

At a glance what is this all about?
It is about the postulate of 1.
It is about that fractal new pde result of the postulate of 1.
It is thereby about figuring the core idea of how the universe works (see “applications” below.).

# Flow Chart

Postulate 1

Postulate real 1 (*THE* Occam’s razor postulate)

$\min(zz-z)>0$ $zz-z=0$ algebraic definition of 1,0. $\min(zz-z)>0$ is our entire theory

Same as $z=zz+C, \delta C<0$

Derive only min(zz-z)>0 real observable component (i.e.,physics) results*.
So must get Cauchy seq and operator formalism components.
Here:

**min(zz-z)>0**

same as z=zz+C, $\delta$C=0, C<0

*If it is not real observable who cares?

1 Postulate real **1** observable (*THE* Occam's razor postulate)

zz-z=0 algebraic definition of 1,0

z=zz+C, $\delta$C=0, C<0

Plug left side z into zz on right side repeatedly

get Mandelbrot set iteration

Plug z=1+$\delta$z

get $\delta(\delta z+\delta z\delta z)=0$ or $\delta(\delta z-K+\delta z\delta z)=0$

Im=Clifford algebra, Real=Minkowski metric SR -> operator formalism so

Dirac eq. for **e**,ν

Real observable

Define **Real#** by Cauchy seq

**observable** (K = $\delta$z flat (nonvacuum so dr not 0))

Fiegenbaum pt.=$C_M$

& C=CM/$\gamma$=$_{\delta z'}$ large boost $\gamma$ frame of reference at next smaller fractal baseline gives the small C.

New pde $\gamma^{\mu}\sqrt{(\kappa_{\mu\mu})}\partial\psi/\partial x_{\mu}=(\omega/c)\psi.$ K ≠ $\delta$z+$\delta$z' curved &4D

$((dr+dt)/ds)\psi=-i\hbar(\partial\psi/\partial r+\partial\psi/\partial(ct))$

$\mathbf{1}\psi=-i\hbar(\partial\psi/\partial r+\partial\psi/\partial(ct))$ Defines observable 1

Figure 2 **1 real observable** (in time and space)

## Applications of new pde (see part I, partII, partIII: davidmaker.com)

The 3rd term in the Taylor expansion of the two square roots in the *new pde* gets the Lamb shift and anomalous gyromagnetic ratio respectively thus eliminating the need for renormalization and the infinite charge, infinite mass, infinite vacuum density, etc.. **causing theoretical physics to give right answers again**
(Infinite everything is 0% right.).

The *new pde* composite e,v gives the Z,W,γ Bosons of the Standard electroweak Model SM (PartI) and so **Maxwell's equations** and the **weak interaction**.
*New pde* composite **3e is the baryons** (PartII) and so **strong force**.
Iteration of the *new pde* on the next higher fractal scale gets the Schwarzschild metric, therefore **gravity**.
Recall the *new pde* zitterbewegung oscillation on the next higher fractal scale. Being in the expansion stage **explains the expansion of the universe**.
Many *new pde* experimentally verifiable predictions (eg., differential cross-section peak for 21Tev p-p collisions) contained in these sections, especially in partIII.

Intuitive notion of the **Postulate** of 1:
Given the fractalness astronomers are observing from the inside of what particle physicists are studying from the outside, that ONE *new pde* object we first postulated.
So we look at big and small scales and all we see is that ONE thing e (even baryons are 3e).

## Why Write min(zz-z)>0?

The list-define method* gives the rings and fields and you get the physics from z=zz+C,$\delta$C=0, C<0. So why do we also write min(**z-zz**)>0? (Which means the same thing.). The answer is that to get real# mathematics you *also* need the axioms of **Completeness and Choice** as is well known. The axiom of completeness ∃**min**sup is provided by the **min** (in **min**(zz-z)>0) and the "choice" function is f(z)=**z-zz.**
**z-zz**=**0** (from min(**zz-z**)>**0**) is also the algebraic definition of 1,o.
So the postulate of real 1 then gives *both* theoretical physics (new pde) *and* real number mathematics *without* any other postulates!
1 is *THE* single Occam's razor postulate meaning we have 'figured it out'.

*list-define math(appendix C PartI) *replaces* the order axioms, mathematical induction axiom (giving **N**) and the field and ring axioms to get the algebra we use in the new pde $\gamma^\mu\sqrt{(\kappa_{\mu\mu})}\partial\psi/\partial x_\mu=(\omega/c)\psi$ .

### 2.5 Observer < $r_H$ Interpretation Of $C_M$ Solution

Since equation 1.1.24 is essentially all there is there is then also anthropomorphic (i.e., observer) based derivation of that fractalness using equation 1.24 there is even a powerful ethics lesson that comes out of this result in partV). Recall that eq.1.11 has two solution planes and associated two points one of which we define as the observer. In the new pde: $\sqrt{\kappa_{\mu\mu}}\gamma^\mu\partial\psi/\partial x_\mu=(\omega/c)\psi$ 1.1.24, (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. In that regard the new pde metric

Note from equations 1.18 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 $r_H=2e^2/m_ec^2$. Thus (Hawking, pp.200) in the case that equation applies we have: $R_{mn}K^mK^n>0$ for $r<R$ in the Raychaudhuri ($K_n$=null geodesic tangent vector) (1.16a) 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 1.1). $H_{M-1}$ 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 2 (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 $\kappa_{rr}=1/(1-r_H/r)$ near $r=r_H$ (given $dr'^2=\kappa_{rr}dr^2$) 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 $r_H$s, etc. . You might also say that the fundamental Riemann surface, and Fourier superposition are therefore the *source* of the "observer". See end of PART III (of davidmaker.com) for the powerful ethics implication of that result (eg.,negation of solipsism since *two* "observers" are implied by the eq.1.11 two simultaneous solutions). If you really wanted to waste time you could also add that the onset of observer consciousness begins that circular reasoning argument at the postulate of real 1. And that conscious life itself was the (circular argument) loop: life observes electrons!.

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 strted with.

2.6 **Illustration Of The fractalness**: Recall our mantra implied by this fractal space time that "Astronomers are observing from the inside of what particle physicists are studying from the outside, ONE thing: the new pde (rotated eq.1.11 = eq.2 electron."; 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). Below is an illustration:

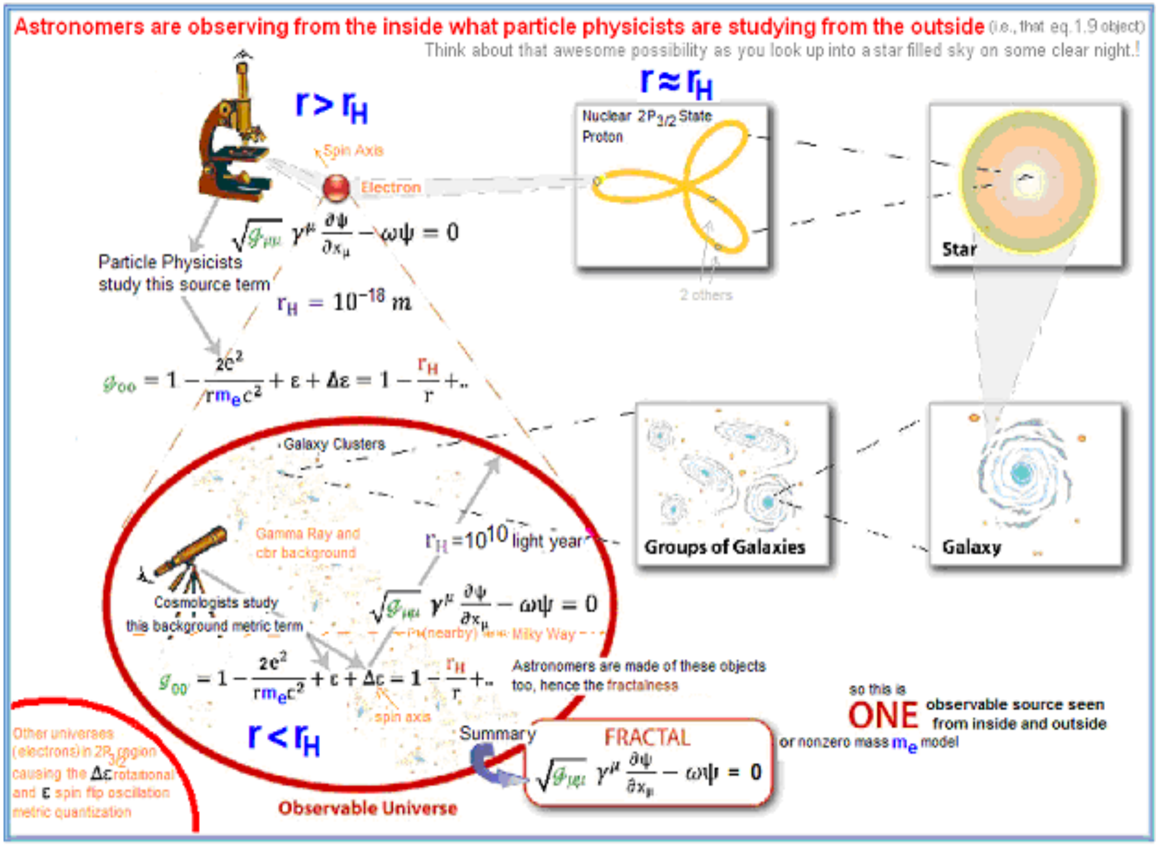


Fig.10

## Ch.3 Equation 1.1.5, **2D** Isotropic and Homogenous Space-Time vs A NONhomogeneous and NONisotropic Space-Time

From equation 1.3 solution 1.5a we note that this theory is fundamentally 2D. So what consequences does a 2D theory have? We break the 2D degeneracy of eq. 1.11 at the end by rotating by $C_M$ (1.16a) and get a 4D Clifford algebra. Recall 1.11 and 1.12 are dichotomic variables with the noise rotation C going from 1.11 at 45° to 1.12 at 135°.

Recall eq.1.11 implies simultaneous eq.1.11+1.11 are 2D⊕2D=4D. But single 1.11 plus single 1.12 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 1.4.

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 ≡source $=G_{oo}$ since in 2D $R_{\mu\mu}=\frac{1}{2}g_{\mu\mu}R$ identically (Weinberg, pp.394) with μ=0, 1... 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 tranverse wave 2D object (eg., the $2P_{1/2}$ electron in the neutron). In a isotropic homogenous space time Goo=0. Also from sect.2 1.11 and 1.12 occupy the same complex 2D plane. So 1.11+1.12 is $G_{oo}=E_e+\sigma\bullet p_r=0$ so $E_e=-\sigma\bullet p_r$

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

**3.1 Casimir Effect**

Also for this complex space 2D $0=G_{oo}=E_e+\sigma\bullet p_r$ 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 *v* and anti *v*), not existing due to not satisfying boundary conditions, because of outside $\Delta\varepsilon$ 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 1.5a Z plane*. If the space-time is not isotropic and homogenous the neutrino must then gain mass $m_o$ (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 1.11 and the neutrino 1.12 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.1.16 $p_x\psi = -ih\partial\psi/\partial x$. We multiply equation $p_x\psi = -ih\partial\psi/\partial x$ in section 1.2 by normalized $\psi^*$ and integrate over the volume to *define* the expectation value of operator $p_x$ for this *observer representation*:

$$< p,t \mid p \mid p,t > \equiv \int \psi^t p\psi dV$$

(implies Hilbert space if $\psi$ is normalizable). Or for any given operator 'A' we write in general as a definition of the expectation value: $< A >=< a,t \mid A \mid a,t >$ (3.2.1)

The time development of equation 1.24 is given by the Heisenberg equations of motion (for equation 1.24. We can even define the expectation value of the (charge) chirality in terms of a generalization of eq.9 for $\psi_e$ spin ½ 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 ½ $\left(1\pm\gamma^5\right)\psi_e = \chi_e$.

Thus the overlap integral of a spin ½ and spin zero field is:

$$\text{<vacuum helicity of charge>} \equiv \int \psi_e^t \chi_e dV = \int \psi_e^t 1/2\left(1\pm\gamma^5\right)\psi_e dV \qquad (3.2.2)$$

So $1/2\left(1\pm\gamma^5\right)$=helicity creation operator for spin ½ Dirac particle: This helicity is the origin of charge as well for a spin ½ 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 spin½ source charge with $½(1\pm\gamma^5)\equiv a^t$ 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 $e^{ifield}=\psi$=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 $½(1\pm\gamma^5)\psi=\chi$. $<\gamma^5> = v = <c/2> = c/4$ So $1\pm\gamma^5 = \cos 13.04 \pm \sin 13.04$, $\theta=13.04$=Cabbibo angle. Here we can then normalize the Cabibbo angle $1+\gamma^5$ 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**

Recall some solutions to 1.10 gives us a vacuum solution as well. Also recall eq.1.1, 1.2 bis 2D. Recall the $\kappa_{\mu\nu}$, $g_{\mu\nu}$ metrics (and so $R_{ij}$ and R) were generated in above section 1.2.5. In that regard for 2D for a homogenous and isotropic $g_{ij}$ we have identically $R_{\mu\mu}-\frac{1}{2}g_{\mu\mu}R=0\equiv$ source $=G_{oo}$ since in 2D $R_{\mu\mu}=\frac{1}{2}g_{\mu\mu}R$ identically (Weinberg, pp.394) with $\mu$=0,... Note the 0 ($G_{oo}=E_{total}$ the energy density source) and we have thereby proven the existence of a net zero energy density eq.2AIII vacuum. Thus our 2D theory implies the **vacuum is really a vacuum.**

**Left handedness**

From sect.1 1.11 and 1.12 and 1.13 are combined. Note also from section 1.4 C rotation in a homogenous isotropic space-time. So 1.11+1.12 = $G_{oo}=E_e+\sigma\bullet p_r=0$ 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 1.12**

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, $\varepsilon$, $\Delta\varepsilon$ 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 $\varepsilon$ and repeat and get the muon neutrino with mass $m_{o\nu}$=(3km/1AU)$m_e$=.01eV (for solar metric inhomogeneity. See Ch.3 section on homogenous isotropic space time). So start with eq. 2AII singlet filled 135° state $1S_{½}$. In that well known case $E=\sqrt{(p^2c^2+m_o^2c^4)}=E=E(1+(m_o^2c^4/2E'))$. $E'\approx E\approx pc>>m_oc^2$; $\psi=e^{i(\omega t-kx)}$ with k=p/h=E/(hc). Set $\hbar$=1,c=1 so $\psi=e^{i(\omega t-kx)}e^{ixmo\hat{}2/2E'}$. So we transition through the given $\psi_{e\nu}$,$\psi_{\varepsilon\nu}$, $\psi_{1\nu}$ 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 1.11+1.11+1.11 proton in section 8.1, starting out with infinitesimal 1.12+1.12+1.12 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 1.12.

## Chapter 4 Simultaneous (union) Broken 2D Degeneracy $C_M$ rotation of eq. 1.11 Implies 2D⊕2D=4D

### 4.1 2D⊕2D formulation of 1.11+1.11

To stay within the solutions 1 we note that the *2D degeneracy of eq.1.14 is **broken** by the $C_M$* 2 rotation (eq.1.17) were we use ansatz $dx_\mu\rightarrow\gamma^\mu dx_\mu$ where $\gamma^\mu$ may be a 4X4 matrix and commutative ansatz $dx_\mu dx_\nu=dx_\nu dx_\mu$ so that $\gamma^\mu\gamma^\nu dx_\mu dx_\nu+\gamma^\nu\gamma^\mu dx_\nu dx_\mu=(\gamma^\mu\gamma^\nu+\gamma^\nu\gamma^\mu)dx_\mu dx_\nu$ ($\mu,\nu$=1,2,3,4; $\mu\neq\nu$). So from eq.(2C) $ds^2$ =
$(\gamma^1dx_1+\gamma^2dx_2+\gamma^3dx_3+\gamma^4dx_4)^2=(\gamma^1)^2dx_1^2+(\gamma^2)^2dx_2^2+(\gamma^3)^2dx_3^2+(\gamma^4)^2dx_4^2+\Sigma_{\mu\nu}(\gamma^\mu\gamma^\nu dx_\mu dx_\nu+\gamma^\nu\gamma^\mu dx_\nu dx_\mu)$.
But $\gamma^\mu\gamma^\nu dx_\mu dx_\nu+\gamma^\nu\gamma^\mu dx_\nu dx_\mu=(\gamma^\mu\gamma^\nu+\gamma^\nu\gamma^\mu)dx_\mu dx_\nu$ implying $\boldsymbol{\gamma^\mu\gamma^\nu+\gamma^\nu\gamma^\mu=0}$ **from 1.9** and also $(\gamma^\mu)^2=1$ from 1.15. So the two 1.11 results and 1.9 imply the defining rotation for a 4D Clifford algebra.

So the solution 2 rotation by $C_M$ at 45° (eq.1.15) causes the two simultaneous 1.11 electron terms to have different dr,dt.since the random C can be different in each case. These 2new degrees of freedom for the only particle with nonzero proper mass in this theory are what create the 4D we observe.
The two 2D plane simultaneous solutions of eq.1.11 then imply 2D+2D=4D thereby allowing for a imbedded 3D spherical symmetry. So we can without loss of generality use the Cartesian product (dr,dt)X(dr',dt')=(dr,dt)X(dϕ,dθ) to replace rsinθdϕ with dy, rdθ with dz, cdt with dt"as in $ds^2=-dr^2-r^2\sin^2\theta d^2\phi-r^2d^2\theta+c^2dt^2\equiv-dx^2-dy^2-dz^2+dt''^2$. Note the two r,t and θ,ϕ, sets of coordinates are written self consistently as a Cartesian product (AXB)= (r,t,ϕ,θ) space.where r,t∈A and ϕ,θ∈B. Note the orthogonal space of θ,ϕ with the ϕ=ωt' carrying the second time dependence (note there are two time dependent parameters in (dr,dt)X(dr',dt')). Given the intrinsic 2D applied twice in the Cartesian product the covariant derivative is equal to the ordinary derivative in the operator formalism. Thus here $[\sqrt{(\kappa_{rr})}dr]\psi=-i[\sqrt{(\kappa_{rr})}(d\psi/dr)]$ replaces the old operator formalism result $(dr)\psi=-id\psi/dr$ in the old Dirac equation allowing us to then multiply by the same γ in $\gamma^r[\sqrt{(\kappa_{rr})}dr]\psi=-i\gamma^r[\sqrt{(\kappa_{rr})}(d\psi/dr)]$. So using this substitution we can use the same Dirac $\gamma^x,\gamma^y,\gamma^z,\gamma^t$ s that are in the old Dirac equation.

**4.2 $ds^2=\kappa_{xx}dx^2+\kappa_{yy}dy^2+\kappa_{zz}dz^2+\kappa_{tt}dt^2$ For spherical Symmetry** From Eq.1.19 Pedagogical method of deriving new pde
Here we easily show that our new pde(eq.1.24) is generally covariant since it comes out of this 4D Pythagorean Theorem equation 83.3
$\kappa_{xx}=\kappa_{yy}=\kappa_{zz}=-1,\kappa_{tt}=1$ in Minkowski flat space, Next divide by $ds^2$, define $p_x\equiv dx/ds$, so get

$$\kappa_{xx}p'^2_x+\kappa_{yy}p'^2_y+\kappa_{zz}p'^2_z+\kappa_{tt}p'^2_t=1$$

To get eq.2.1.3 we can then linearize like Dirac did (however we leave the $\kappa_{ij}$ in. He dropped it).
So: $(\gamma^x\sqrt{\kappa_{xx}}p_x+\gamma^y\sqrt{\kappa_{yy}}p_y+\gamma^z\sqrt{\kappa_{zz}}p_z+i\gamma^t\sqrt{\kappa_{tt}}p_t)^2=\kappa_{xx}p_x^2+\kappa_{yy}p_y^2+\kappa_{zz}p_z^2+\kappa_{tt}p_t^2$ (4.2.1)
So just pull the term out of between the two ( ) lines in equation 2.1.3 and set it equal to 1 (given 1*1=1 in eq.1) to get eq.1.24 in 4D and divide by ds

$\gamma^x\sqrt{\kappa_{xx}}p_x+\gamma^y\sqrt{\kappa_{yy}}p_y+\gamma^z\sqrt{\kappa_{zz}}p_z+i\gamma^t\sqrt{\kappa_{tt}}p_t=1$

and multiply both sides of that result by the ψ and write this linear form of equation 1.1.3 as its own equation: $\gamma^x\sqrt{\kappa_{xx}}p_x\psi+\gamma^y\sqrt{\kappa_{yy}}p_y\psi+\gamma^z\sqrt{\kappa_{zz}}p_z\psi+i\gamma^t\sqrt{\kappa_{tt}}p_t\psi=\psi$
Then use eq.4.6. This proves that the new pde (eq.1.24) is covariant since it comes out of the Minkowski metric for the case of r→∞.

**4.3 2 Simultaneous Equations 1.11: 2D⊕2D Cartesian Product, Spherical Coordinates and $\sqrt{\kappa_{\mu\nu}}$**
Note from eq.1.11 the (dr,dt;dr'dt') has two times in it so can be rewritten as (dr,rdθ,rsinθωdt,cdt)≡ (dr,rdθ,rsinθdϕ,cdt)

| | | | |
|---|---|---|---|
| dr=dr | gives | $\gamma^r[\sqrt{(\kappa_{rr})}dr]\psi=-i\gamma^r[\sqrt{(\kappa_{rr})}(d\psi/dr)]=$ | $-i\gamma^x[\sqrt{(\kappa_{rr})}(d\psi/dr)]$ |
| rdθ=dy | gives | $\gamma^\theta[\sqrt{(\kappa_{\theta\theta})}dy]\psi=-i\gamma^\theta[\sqrt{(\kappa_{\theta\theta})}(d\psi/dy)]=$ | $-i\gamma^y[\sqrt{(\kappa_{\theta\theta})}(d\psi/dy)]$ |
| rsinθdϕ=dz | 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" | gives | $\gamma^t[\sqrt{(\kappa_{tt})}dt'']\psi=-i\gamma^t[\sqrt{(\kappa_{tt})}(d\psi/dt'')]=$ | $-i\gamma^t[\sqrt{(\kappa_{tt})}(d\psi/dt'')]$ (4.3.1) |

For example for the old method (without the $\sqrt{\kappa_{ii}}$ for a spherically symmetric diagonalizable metric):
$ds^2=\{\gamma^xdx+\gamma^ydy+\gamma^zdz+\gamma^tcdt\}^2=dx^2+dy^2+dz^2+c^2dt^2$ 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 1.11 is solved at $r \approx r_H$ (i.e.,our –dr axis, $C \to 0$ of eq.1.3) 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 $E_n$=Rel($1/\sqrt{g_{oo}}$)=Rel($e^{i(2\varepsilon+\Delta\varepsilon)}$)=1-4$\varepsilon^{2}$/4+.. =1-2$\varepsilon^2$/2≡1- ½$\alpha$. 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 body S state)+E&M where we have then derived the fine structure constant $\alpha$.

**4.4 Single 1.11 Source Implies Equivalence Principle And So Allows You To Use Metric $\kappa_{\mu\nu}$ Formalism**

Recall that the electrostatic force Eq=F=ma so E(q/m)=a. Thus there are different accelerations 'a' for different charges 'q' in an ambient electrostatic field 'E'. In contrast with gravity there is a single acceleration for two different masses as Galileo discovered in his tower of Pisa experiment. Thus gravity (mass) obeys the equivalence principle and so (in the standard result) the metric formalism $g_{ij\ (eq.7)}$ can apply to gravity.
Note that E&M can also obey the equivalence principle but in only one case: if there is a *single e* and Dirac particle $m_e$ in Eq=ma and therefore (to get the correct geodesics,): Given an equivalence principle we can the write E&M metrics such as rewriting 1.18:

$$\kappa_{oo} = g_{oo}=1-2e^2/rm_ec^2 =1-r_H/r \qquad (4.4.1)$$

(with $\kappa_{rr}=1/\kappa_{oo}$, in section 1.2.5) and so then trivially all charges will have the same acceleration in the same E field. This then allows us to insert this metric $g_{ij}$ formalism into the standard Dirac equation derivation instead of the usual Minkowski flat space-time $g_{ij}$ s (below). Thus by noting E&M obeys the equivalence principle you force it to have ONE nonzero mass with charge. Thus you force a unified field theory on theoretical physics! But eq.1.24 only applies when you have a equivalence principle. So a metric does not exist for eq.1.24 for three or more eq.1.24 objects unless ultrarelativistic motion makes the plates not intersect and so there is the "approximation" of two objects as in part II 1.1.11+1.1.11+1.1.11.

**4.5 Implications of $g_{oo}$ =1-2e$^2$/rm$_e$c$^2$ =1-eA$_o$/mc$^2$v$^o$) In The Low Temperature Limit Of Small Noise C**

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.1.1,1.2. Solution to eq.1.3 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 1.11. Note 1.11 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 electical 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 annhilation 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. $g_{oo} = 1-2e^2/rm_ec^2 \equiv 1-eA_o/mc^2v^o$). We determined $A_o$,(and$A_1,A_2,A_3$) in section 1.4 We plug this $A_i$ into the geodesics

$$\frac{d^2x^\mu}{ds^2} = -\Gamma^\mu_{\nu\lambda}\frac{dx^\nu}{ds}\frac{dx^\lambda}{ds} \qquad (4.5.1)$$

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

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

$A'_0 \equiv e\phi / m_\tau c^2$, $g_{00} \equiv 1 - \dfrac{e\phi(x,t)}{m_\tau c^2} = 1 - A_0^{'}$, 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,,see eq. 1.19 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 $\dfrac{\partial g_{11}}{\partial x^\alpha}dx^\alpha = dg_{11}$ 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:

$$-\frac{d^2x^1}{ds^2} = \Gamma^1_{11}v_1v_1 + \Gamma^1_{12}v_1v_2 + \Gamma^1_{13}v_1v_3 + \Gamma^1_{10}v_0v_1 + \Gamma^1_{21}v_2v_1 + \Gamma^1_{22}v_2v_2 + \Gamma^1_{23}v_2v_3 + \Gamma^1_{20}v_2v_0 +$$
$$\Gamma^1_{31}v_3v_1 + \Gamma^1_{32}v_3v_2 + \Gamma^1_{33}v_3v_3 + \Gamma^1_{30}v_3v_0 + \Gamma^1_{01}v_0v_1 + \Gamma^1_{02}v_0v_2 + \Gamma^1_{03}v_0v_3 + \Gamma^1_{00}v_0v_0 =$$
$$\frac{g^{11}}{2}\left(\frac{\partial g'_{11}}{\partial x^1}\right)v_1 + \frac{g^{11}}{2}\left(\frac{\partial g'_{11}}{\partial x^2}\right)v_2 + \frac{g^{11}}{2}\left(\frac{\partial g'_{11}}{\partial x^3}\right)v_3 + \frac{g^{11}}{2}\left(\frac{\partial g'_{11}}{\partial x^0}\right)v_0 +$$
$$\frac{g^{11}}{2}\left(\frac{\partial g'_{11}}{\partial x^2}\right)v_2 - \frac{g^{11}}{2}\left(\frac{\partial g'_{22}}{\partial x^1}\right)v_2 + 0 + 0 + \frac{g^{11}}{2}\left(\frac{\partial g'_{11}}{\partial x^3}\right)v_3 + 0 - \frac{g^{11}}{2}\left(\frac{\partial g'_{33}}{\partial x^1}\right)v_3 + 0 +$$
$$\frac{g^{11}}{2}\left(\frac{\partial g'_{11}}{\partial x^0}\right)v_0 + 0 + 0 - \frac{g^{11}}{2}\left(\frac{\partial g'_{00}}{\partial x^1}\right)v_0 + O\left(\frac{A_i dv}{v^2 dt}\right) = v_2\left(\frac{\partial g''_{11}}{\partial x^2} - \frac{\partial g''_{22}}{\partial x^1}\right) + v_3\left(\frac{\partial g''_{11}}{\partial x^3} - \frac{\partial g''_{33}}{\partial x^1}\right) +$$
$$\left(\frac{\partial g''_{11}}{\partial x^\alpha}v_\alpha + \frac{\partial g''_{11}}{\partial x^0}v_0\right) - \left(\frac{\partial g''_{00}}{\partial x^1}\right)v_0 + O\left(\frac{A_i dv}{v^2 dx}\right) \approx -\left(\frac{\partial g''_{00}}{\partial x^1}\right)v_0 + v_2\left(\frac{\partial g''_{11}}{\partial x^2} - \frac{\partial g''_{22}}{\partial x^1}\right) + v_3\left(\frac{\partial g''_{11}}{\partial x^3} - \frac{\partial g''_{33}}{\partial x^1}\right)$$
$$+ O\left(\frac{A_i dv}{v^2 dt}\right) \approx \frac{e}{m_\tau c^2}\left(-\vec{\nabla}\phi + \vec{v}X\left(\vec{\nabla}X\vec{A}\right)\right)_x + O\left(\frac{A_i dv}{v^2 dr}\right)$$

. Thus we have the *Lorentz force equation* form

$$\left(-\left(\frac{e}{m_\tau c^2}\right)\left(\vec{\nabla}\phi + \vec{v}X\left(\vec{\nabla}X\vec{A}\right)\right)\right)_x$$

plus the derivatives of 1/v which are of the form: $\mathbf{A_i(dv/dr)_{av}/v^2}$. 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>>(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 H2 $(A/v^2)(dv/dr)_{av}$. 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[i] (D states for $CuO_4$ structure). For example the mass of 4 oxygens (4X16=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 superconducitivity 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*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.

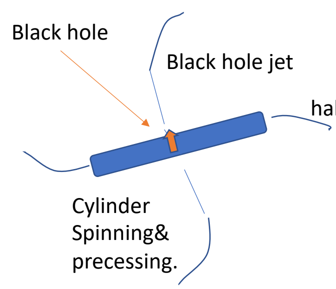
### 4.5.2 Type B Metric Quantization Is Caused By Adv/dt/r$^2$ Pairing Interaction

Type A metric quantization is caused by object B and the $(a/r)^2$ term in sect.6.3 (i.e.,electron mass) Type B metri in the Gaus's law Gaussian pillbox region near the rotating black hole source.vsource. It is a quantization $A(dv/dt)/v^2$ motion on the next fractal scale potential "A" is gravitational.A proper (1.4X) stellar mass black hole v≈c is all there is since nothing can fall into it in a finite amount of time in the inertially dragged frame of reference, so it just gains more and more angular momentum (energy) as material falls in so those ultrarelativistic plates are created. It has to expand ($r=2GM/c^2$) to conserve both energy and angular momentum. Also both dvdt and "A" are large so there is superconductivity (eq.4.5.3) so those ultrarelativistic *plates* move right through each other with plate intersection (lines) being mostly at the equator.(A powerful galactic collision can create other plate planes however). So a flat plate equatorial gravity Gauss's law component kMm/r gravity exists $=mv^2/r$. One of the r s cancel on both sides and so v is independent of r. The motion forms those can-can metric quantization ultrarelativistic D state lobes (seen as 4 radial lines superposed cylindrical can-can symmetry on the equatorial plate here. In our $2P_{3/2}$ state at $r_H$ it is 3 such lines). These 4 lines are visible in X rays at the center of the Andromeda galaxy and as 4 extinction event axis' (~60My apart in 250My orbit) in the Milky Way. But in the finite (small) thickness diffraction lobe of the *plate* the gravity field far from the galaxy hub it still looks like its spherically symmetric so we can still use the Schwarzschild metric $g_{oo}$. there: So you can now set The plates are self attractive due to the rotator oscillator effect of section 7.3 $dt=(r_H/r)\omega r\sin^2\theta d\theta/[c(1-(r_H/r))]$ equation 2. Giving $d^2r/ds^2=(a/r)(v((((V/2GM/c^2)\omega_b\sin^4\theta(d^2\theta/ds^2)/[c(1-(V/2GM/c^2)]$

$$\kappa_{oo}=g_{oo} \qquad (4.5.4)$$

in the galaxy halo (where they should be equal) and we can calculate what v is. That is where partIII of this paper starts out.

X ray through radio wave Image of galaxy Centaurus A




Note solid cylinder moving as unit implied by that of black hole- plate theory

.A proper (1.4X) stellar mass black hole v≈c is all there is since nothing can fall into it in a finite amount of time in the inertially dragged frame of reference in the ergosphere, so it just gains more and more angular momentum (and energy) as material falls in so those ultrarelativistic plates are created. It has to expand ($r=2GM/c^2$) to conserve both energy and angular momentum. Also both dv/dt and "A" are large so there is superconductivity (eq.4.5.3 $A(dv/dt)/v^2$ ) so those ultrarelativistic *plates* move right through each other with plate intersection (lines) being mostly at the equator. The lines. form a flat plate equatorial gravity Gauss's law component kMm/r gravity exists $=mv^2/r$. One of the r s cancel on both sides and so v is independent of r. and so you can then set goo=koo. This flat plate is directly connected to the black hole so if it precesses the plate will precess. The edge of the cylinder is cutoff by the metric quantization jump down. Note in **Centaurus A the plate is precessing as *a unit* as predicted**`.

Note when the black hole has accreted too much mass M rH=2GM/c^2 becomes big (so the black hole density rho=M/[4pi/3)((rH)^3)] goes down) and so the A in my superconductivity pairing interaction force equation F= Advdt/v^2 gets small and so the superconductivity ceases and the galaxy suddenly changes from a disk galaxy spiral to an elliptical galaxy with completely unconstrained stellar orbits.

**4.6 Summary of Consequences of the Uncertainty In Distance (separation) C In -δz=δzδz+C eq.1.1.6**

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 ½ can't be in a single state) is not necessarily time dependent and is zero only for bosons. Also given the already extremely small Brillioun 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 ¼ 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: $F_{pair}=A(dv/dt)/v^2$ 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 ¼ 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° and 45° 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 wavefuctions: $\hbar\partial\psi_1\partial/t=u_1\psi_1\ v_2\psi_2$ and $\hbar\partial\psi_2/\partial t=u_2\psi_1+v_2\psi_2$ which gives the superconducitivity. See Feynman lectures on superconductivity.

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

**4.7 Markov Chain Zitterbewegung For r>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. $(\not{p}-mc)\psi(x)=0$) assumption and so equation 9 gives $J^{(+)}=\int\psi^{(+)t}c\alpha\psi^{(+)}d^3x$ . Then using Gordon decomposition of the currents and the Fourier superposition of the $b(p,s)u(p,s)e^{-ipuxu/\hbar}$ solutions (b(p,s) is a normalization constant of $\int\psi^t\psi d^3x$.) to the free particle Dirac equation(1.2.7) we get for the observed current (u and v have tildas):

$$J^k=\int d^3p\{\Sigma_{\pm s}[|b(p,s)|^2+|d(p,s)|^2]p^kc^2/E+i\Sigma_{\pm s,\pm s'}b^*(-p,s')d^*(p,s)e^{2ix\theta p\theta/\hbar}u(-p,s')\sigma^{k0}v(p,s)$$
$$i\Sigma_{\pm s,\pm s'}b(p,s')d(p,s)e^{2ix\theta p\theta/\hbar}v(p,s')\sigma^{k0}u(p,s). \quad (4.11.4)$$

(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 $e^{2ix\theta p\theta/\hbar}$ 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 $E^2=p^2c^2+m_o^2c^4$ so $E = \sqrt{p^2c^2+m_o^2c^4}$ 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 1.1.3 $\delta\delta z=0$). But that is the same thing as Schrodinger's zitterbewegung blob mentioned above. So we postulated the electron and derived the electron rotated 1.1.11 (i.e.,eq.1.24) from that postulate. We therefore have created a mere trivial tautology.

**4.8 2D⊕2D**

Also with eq.1.11 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.9 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.1.11 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.

**4.9 Mixed State 1.1.11+1.1.11 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 1.11 2D⊕2D (i.e.,$\sqrt{\kappa_{\mu\mu}}\gamma^\mu\partial\psi/\partial x_\mu=(\omega/c)\psi$) equation the electron is at 45° -dr,dt and the positron is at 135° 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/√(1-$r_H$/r)=dr', $r_H=2e'e/m_ec^2=\varepsilon$ so that different e leads in general to different dr' spatial dependence for the $\psi(x)$ in the general representation of the 4X4 Dirac matrices. So in the multiplication of 4 ψs the antiparticle ψ will be given a $r_H$ displacement $\Delta r$ (dr→dr' here) by the±ε 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 1.11 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 $\alpha/(k_H\text{-}r)$ 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 $(-K\alpha/r)=\alpha/(k_H\text{-}r)$ to define the running coupling constant multiplier "K". The distance $k_H$ corresponds to about $d=10^{-18}m=ke^2/m_\tau c^2$, with an interaction energy of approximately $hc/d=2.48X10^{-8}$joules= 1.55TeV. For 80 GeV, $r\approx20$ ($\approx$1.55Tev/80Gev) times this distance in colliding electron beam experiments, so $(-K\alpha/r)= \alpha/(r_H\text{-}r) =\alpha/(r(1/20)\text{-}r) )= -\alpha/(r(19/20))=(20/19)\alpha/r =1.05\alpha/r$ so K=1.05 which corresponds to a $1/K\alpha\equiv1/\alpha'\approx130$ 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 $\sqrt{\kappa_{oo}}$.

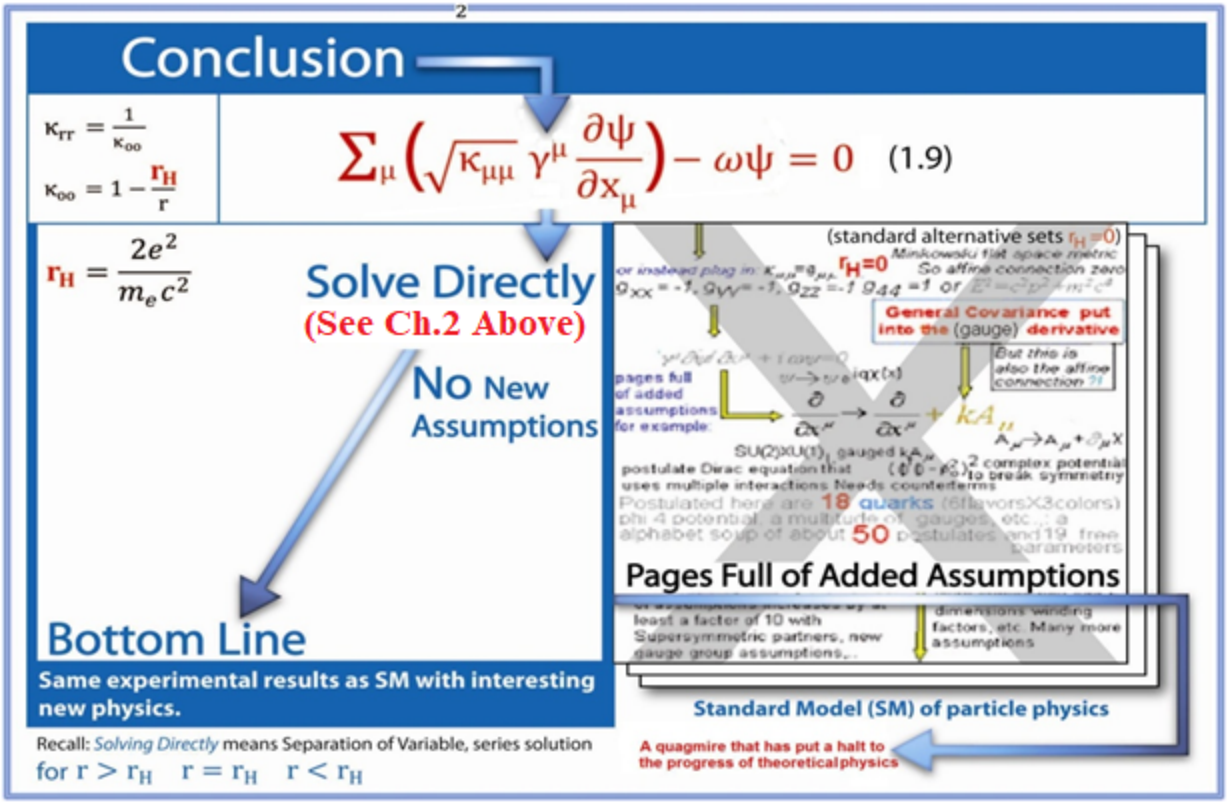
Note that the $\alpha'=\alpha/(1\text{-}[\alpha/3\pi(\ln\chi)]$ running coupling constant formula (Faddeev, 1981)] doesn't work near the singularity (i.e., $\chi\approx e^{3\pi/\alpha}$) because the constant is assumed small over all scales (therefore there really *is no formula to compare* $\alpha/(r\text{-}r_H)$ to over all scales) but this formula works well near $\alpha\sim1/137.036$ which is where we used it just above.

**4.11 Rotated 1.24 Implies $\kappa_{00}=1\text{-}r_H/r \approx1/\kappa_{rr}$ So No Klein Paradox As Is In The Original 1928 Dirac Equation**

Recall that $\kappa rr=1/(1\text{-}r_H/r)$ in the new pde eq.1.11. Recall that for the ordinary Dirac equation that the reflection ($R_s$) and transmission ($T_s$) coefficients at an abrupt potential rise are:
$R_s= ((1\text{-}\kappa)/1+\kappa))^2$ and $Ts=4\kappa/(1+\kappa)^2$ where $\kappa=p(E+mc^2)/k_2(E+mc^2\text{-}V)$ 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 2AI+2AI mixed state new pde so $p_r=(\sqrt{\kappa_{rr}})p=(1/\sqrt{(1\text{-}r_H/r)})p$ 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.




**4.12 Mixed State 1.11+1.11 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° line. So we are off the 45° diagonal and therefore the equation 2 extrema does *not* apply. So the eq.1.12 fermions disappear and we have only that original second boson derivative $\delta ds^2=0$ circle ($\Box^2A_\mu=0$, $\Box\bullet A=0$) 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 $E=\hbar\omega=E=1/\sqrt{\kappa_{oo}}=1/\sqrt{(1-r_H/r)}$ and therefore this square root is imaginary and so $i\omega\rightarrow\omega$ in the Heisenberg equations of motion. Therefore $r=r_oe^{i\omega t}$ becomes instead $r=r_oe^{\omega t}$ (that accelerating cosmological expansion) which is observable zitterbewegung motion since ωt 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 $\kappa_{rr}=1/\kappa_{tt}$ we have derived GR from our theory in eq. 1.17-1.20. For loosely bound states (eg., $2P_{½}$ 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.1.18,1.20 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.1.10 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>=(∂A/∂t)|a,t> Heisenberg equations of motion in section 1.2 with |a,t> a eq.2 (1.11) eigenstate. Note the commutation relation and so second derivatives (H relativistic eq.2 (1.11) Dirac eq. iteration 2nd derivative) taken twice and subtracted. (∂A/∂t)|a,t>. For example if 'A' is momentum $p_x$= -i∂/∂x. H= ∂/∂t then [A, so we must use the equations of motion for a curved space. In this ordinary QM case I found for $r<r_H$ that $r=r_oe^{wt'}$ H]|a,t>=(∂A/∂t)|a,t>=(∂/∂t)(∂/∂x)-(∂/∂x)(∂/∂t)=pdot. But $\sqrt{\kappa_{rr}}$ is in the kinetic term in in the new pde with merely perturbative $t'=t\sqrt{\kappa_{oo}}$. 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 *non*perturbatively with: $(A_{i,jk}-A_{i,kj})$|a,t> $=(R^m{}_{ijk}A_m)$|a,t> where $R^a{}_{bcd}$ is the Riemann Christofell 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 pdot 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 (ie., $(\kappa^{\mu\nu}\sqrt{-\kappa})_{,\mu}=0$) 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

**6.2 $r<r_H$ Observational Evidence For Object B**

Recall there are two metrics in section 3.1 and outside Schwarzschild and inside De Sitter. But because of eq.2AI (and so eq.9 modified Dirac equation) we are in a rapidly rotating object, the electron rotating at rate c (in the fractal theory at least. It is the solution to the Dirac equation eq.9). But because of inertial frame dragging in object A observed spin is extremely small except for a small contribution to reducing inertial frame dragging of object B (section 4.1.2). So the geodesics are parallel (flat space holonomy) just like the cylinder. Inertial frame dragging should not destroy the holonomy, just rotate the cylinder but it stays a cylinder. We can realize that for a spherical metric by maintaining the parallel transport which means the expansion is needed to maintain the cylinder. From our perspective we see a sphere with a flat space. Recall the mainstream guy also said this space is in fact that of a 3D cylinder, which it is.
This 'seeing ourselves' is also predicted by the mainstream stuff too given the observations of the flat space and the requirement of the cylinder topology. But seeing ourselves is so weird to the mainstream that they have postulated a pretzel space instead at large distances.
So the universe is fractal with the (Dirac spinor) the Kerr metric high angular momentum local cylinder near $r_H$ dominates and creates the flat space time associated with a cylinder so that two parallel lines do remain parallel within the time like interval at least. When we look out at the edge of the universe in some specific direction, beyond that space like interval (that we cannot see beyond) we are very nearly (just over the space- like edge) looking at ourselves as we were over 12by years ago. We are looking back in time at ourselves! (in this fractal model).
The hydra-centaurus supercluster of galaxies is about 150MLY away. We would find it by looking in the opposite direction of the sky from where we see it now, it would be a smudge at submillimeter wave lengths.
So create a map of the giant galaxy clusters within 2By of the Milky Way galaxy and invert each object by 180° to find the map of the oldest redshift galaxy clusters
Given 2D piece of paper, you can connect the ends a few different ways by folding it. Connect one of the dimensions normally and you have a cylinder. Flip one edge over >before connecting and you've made a Mobius strip. Connect two dimensions, the top to the bottom and one side to the other, and you have a torus (aka a donut). In our 3D universe, there are lots of options — 18 known ones, to be precise. Mobius strips, Klein bottles and Hantzsche-Wendt space manifolds are all non-trivial topologies that share something in common: if you travel far enough in one direction, you come back to where you started. Bg gravimagnetic dipole from the new pde provides the spherical torus shape for this.
In this fractal universe we do this. In fact there is only one way to do it: in the $r_H$ cylinder region of the Kerr metric near c rotation rate, so the topology is a given.

### 6.3 The Distance Of Object B From Object A Determines Particle Mass

**Introduction** Nth scale is $10^{-40}$X small baseline

Recall that Eq. 1 (with its small C) gave us eq.1.15 at min ds at 45°, for our observables (eigenvalues).
Also eq.1.1 gives $-dr=drdr+C_M$ so for large fractal baseline $C_M\approx|drdr|>>dr$ so that if we define mass $\xi$ from the Mandelbrot set with $\xi\propto\delta z$ then $C_M=<\delta z>+<\delta z\delta z>$ has to equal $\xi dr_N+\xi\xi dr_{N+1}$with resultant $dr_2$ definition from $C_M\equiv\xi dr=\xi(dr_1+dr_2)=\xi dr_N+\xi dr_2$ with $dr_N$ local r.
On the big (cosmological) fractal eq.1.24 baseline both $dr_{N+1}$ and $dr_2$ are large constants (since zz>>z) so we can also define some new constant $\varepsilon$ from $\varepsilon=\xi\xi dr_2$. So $\varepsilon/\xi=\xi dr_2$ with $\varepsilon=\varepsilon_N+\varepsilon_{N+1}$.
$C=\xi dr+\varepsilon/\xi\equiv\varepsilon_1$. So: $\varepsilon=\varepsilon_N+\varepsilon_{N+1}$ in $dr-\varepsilon_1\equiv dr-(\varepsilon/\xi+\xi dr)\equiv dr'$ (4.1)

Also on the big cosmological eq.1.24 object B&A fractal baseline (as sect.6.6 implies) vibrational $m_\tau$ and rotational $m_\mu$ modes so $\xi \equiv m_L = m_\tau + m_\mu + m_e$ for $(a/r)^2$ in the Kerr metric. At $r = r_{HN+1}$ (see Ch.7) then $1-\xi+r_{HN}/r-r_{HN+1}/r=\xi-r_{HN}/r= 1-(m_\mu+m_e)-r_{HN}/r$ and so $(a/r)^2 \to m_\mu$ and $m_\mu$ is the rotational eigenvalue as it must be in the Kerr metric 6.1.1. So from object A&B relative motion $\xi=m_\tau+m_\mu+m_e$. $m_e$ is the ground state. So $\kappa_{00}= 1-\xi-(\varepsilon/\xi)/r \equiv 1-\xi-r_H/r$. So in free space $\xi=m_\tau+m_\mu+m_e=m_L$ is clamped in with the Kerr metric so $r=r_H=2e^2/(m_Lc^2)$ (4.1a)
$\Delta+m_e$ with $m_e$ the ground state and $r_H=\varepsilon/m_L \equiv 2e^2/(m_Lc^2)$ in eq.4.1 below. But a large noise perturbation $d\theta dt$ to the Kerr metric leaves KE=$\Delta$ in the high energy dx/dt terms instead of $(a/r)^2$ and so $\xi=m_e$. Also in the object B Kerr metric also $(a/r)^2 \equiv (\xi r dr/ds)/r)^2=(\xi dr/ds)^2 \equiv \xi$ from 4.1 for the small fractal baseline. So $\xi(dr/ds)=C_M ds/dr \equiv h/\lambda=mv$ (eg., 6.1.3).
Also $r_H=\varepsilon/m_L \equiv 2e^2/(m_Lc^2)$ in eq.4.1 below. $2P_{3/2}$ B flux quantization modifies this (in the Kerr metric) to $r_H=\varepsilon/m_e$ large . See Ch.2, figure 4.
.Also on the big cosmological eq.1.2.7 object B&A fractal baseline (in sect.6.3 implies) vibrational $m_\tau$ and rotational $m_\mu$ modes so $\xi \equiv m_L=m_\tau+m_\mu+m_e = \Delta+m_e$ with $m_e$ the ground state and $r_H=\varepsilon/m_L \equiv 2e^2/(m_Lc^2)$ in eq.4.1 below. So a large noise perturbation just leaves KE=$\Delta$ high energy and $\xi=m_e$. So $r_H=\varepsilon/m_L \equiv 2e^2/(m_Lc^2)$ in eq.4.1 below. $2P_{3/2}$ B flux quantization modifies this (in the Kerr metric) to $r_H=\varepsilon/m_e$ large . See Ch.2, figure 4.
For 2AI we can define $\varepsilon=\xi dr_C$ is the $C_M$ contribution for large C. Thus $(a/r)^2=\xi$ in the Kerr metric because of $\kappa_{oo}=1+\xi dr_C/dr_C-r_H/r=1+\xi-r_H/r$ showing the mass is $\xi$ in $\varepsilon=\xi dr$. is generated form object decrease in inertial frame dragging. Recall appendix B and the derivation of the $10^{81}$ X electron mass there. That implies that our universe is not the only object on the N+1 fractal scale. Since we are at the Fiegenbaum point the fractalness is exact so that there is a 75% chance our object A is one of three such "electrons" inside a proton. Note in sect.2.1 the equilibrium established after the initial slow expansion so that energy density is uniform so that $k(4/3)\pi r^3$**.**
We are located in a huge (rotating) electron Kerr metric object. But if there was no nearby object there would be complete inertial frame dragging. But recalling the large rotating shell approximation of GR (Mach's principle implication) we see that a nearby large object B will reduce the inertial frame dragging and so make the metric a Kerr metric:
Section 3.1 implies a Schwarzschild metric for the outside observer $r>r_H$ for an isolated object (eg., no object B nearby) since that was the assumption made in the derivation. But equation 2A1 (solution to equation 4) leads to equation 1.24 and the new pde. In that equation the object 2A1 electron has spin S, is rotating and can be seen as such if there is an object B nearby (see below). Thus for no nearby object we have the Schwarzschild metric but in general with a nearby object the internal $r>r_H$ sees a rotational (Kerr) metric (so from section 4.1.2 assumed to be a quantum operator) which is given by:

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

where $\rho^2(r,\theta)\equiv r^2+a^2\cos^2\theta$; $\Delta(r)\equiv r^2-2mr+a^2$, Note the oblation term $a^2\cos^2\theta$.
To find the perturbative contribution of Eq.1.1.16 in sect.3.1 to the Schwarzschild metric we note that for near zero rotational speed we can take $d\theta/ds=0$, or just $d\theta=0$. Also for $\theta=90°$ then $\cos 90°=0$, $\rho^2=r^2$. So the above equation becomes

$$ds^2= dr^2/(1-2m/r+(a/r)^2)+r^2d\theta^2+(r^2+a^2)\sin^2\theta(vdt/r^2)^2+ 2a\sin^2\theta d\theta cdt+(2m/r-1)dt^2$$

$$ds^2= dr^2/(1-2m/r+(a/r)^2)+r^2d\theta^2+(r^2+a^2)\sin^2\theta d\phi^2+ 2a\sin^2\theta d\theta cdt+(2m/r-1)dt^2$$

$$\approx ds^2= dr^2/(1-2m/r+(a/r)^2) +(2m/r-1)dt^2 \qquad (6.1.1)$$

The $(a/r)^2$ is the energy ε angular momentum term which also turns out to be the muon mass. The fractal ground state Δε (is part of the background mass $\xi_o$) is added to this.
That $r_H$ in the old GR metric is $r_H=2GM/c^2$ (the fractal M+1) scale $r_H$. The Mth scale $r_H$ is that $2e^2/m_ec^2=r_H$ and gives those QED results without the renormalization.

$$dr^2/(1-2m/r+(a/r)^2) - c^2dt^2(1-2m/r) \qquad (6.1.2)$$

with $(a/r)^2$ =being in the ambient metric of section 6.4. Thus the ambient metric is caused by the reduced inertial dragging associated with a nearby object B.
On the large factal baseline $dr^2=C_M$. So in the Kerr metric eq.6.1.1
$(a/r)^2\equiv(\xi r dr/ds)/r)^2=(\xi dr/ds)^2=C_M\equiv\xi r_H$ from 4.1a for the small fractal baseline. So
$\xi(dr/ds)=C_M ds/dr \equiv h/\lambda=mv$ (6.1.3)
Note in equation 7 we are again subtracting ε but this time possibly in the form of $\xi r_H\equiv(a/r)^2$ where $\xi\equiv\varepsilon/dr$. This ξ is the mass energy term of equation 3.2, sect.1.1.5. The $(a/r)^2$ in eq.6.1.1 is the energy ε angular momentum term (and also Δε), which turns out to be the muon mass.

**Equipartition of Energy**

So from the above section at the horizon $r\to1/r^2$ so $t\to1/t^2$ in $\kappa_{oo}=1-r_H/r$ and so inside $r_H$ vibrational states are at low frequency and rotational staes at high frequency. Also recall for quantum mechanical equipartition of energy outside $r_H$ rotational rotatational vibration and rotational states are the same energy inside then that makes each each vibrational wave have much more energy than each rotational wave. See equipartition of energy inside deuteron PartII.

## 6.4 This Added Object B $(a/r)^2$ term Is Then The Source Of The Ambient Metric And Mass

Tensor Geometry Consequences of $C^2$

Recall section 4 implies General relativity (recall eq.1.17 and the Schwarzschild metric derivation there). But the context is that of keeping equation 1 $C^2$ and so that local MandelbulbLepton model.eq.1.10 flat space ambient metric manifold. In that regard given a (observable) vector operator A that explicitly operates on the ψ of equation 1.24) we can then construct the Riemann Christofell Tensor of the Second Kind $R^a_{bcd}$ (from section 4. we can assume it is a quantum operator) from the $\kappa_{ab}\equiv g_{ab}$ using the $C^2$ of A given by $(A_{i,jk}-A_{i,kj})|a,t\rangle$ $=(R^m_{ijk}A_m)|a,t\rangle$. We can then contract this $R^m_{ijk}A_m|a,t\rangle$= tensor to get the Ricci tensor $R_{ij}$ (here $R_{ij}\equiv R^m_{ijm}$).
Note here A is the Quantum Operator and the coefficient $R_{\mu\nu}$ is a (geometry) tensor. Define the scalar $R=\kappa^{\mu\nu}R_{\mu\nu}$ We then define conserved quantity $Z_{\mu\nu}$ from

$$R_{\mu\nu}-\tfrac{1}{2}\kappa_{\mu\nu}R\equiv Z_{\mu\nu} \qquad (6.4.3)$$

after substituting in equations 3.2, 4.1 we see for example that $Z_{oo}=4\pi r_H$ (6.4.4)
where from equation 4.4.3 we have $r_H=2e^2/m_ec^2$.
In free space we can see from equation 4.2 that: $R_{\mu\nu}A_\nu|a,t\rangle=0$
From section 1.5 solving the geometry components $R_{22}=0$ and $R_{11}=0$ using 3.2-3.5 for spherical symmetry gives us respectively $1/\kappa_{rr}=1-r_H/r$, and $\kappa_{rr}=1/\kappa_{oo}$ (6.4.5)
showing that equation 6.4.2 is equivalent to equations 3.2 and 3.3 if there is no nontrivial background metric contribution (i.e.,ε=0). The $(a/r)^2$ in eq.6.1.1 is the energy ε contribution of the energy angular momentum term, which turns out to be the muon mass in:
$1/\sqrt{\kappa_{oo}}=(1\pm\varepsilon\pm\Delta\varepsilon/2)\varepsilon/\Delta\varepsilon$
Use metric a ansatz: $ds^2=-e^\lambda(dr)^2-r^2d\theta^2-r^2\sin\theta d\phi^2+e^\mu dt^2$ so that $g_{oo}=e^\mu$, $g_{rr}=e^\lambda$.(6.4.6)
From equation $R_{ij}=0$ for spherical symmetry in free space

$$R_{11}=\tfrac{1}{2}\mu''-\tfrac{1}{4}\lambda'\mu'+\tfrac{1}{4}(\mu')^2-\lambda'/r=0 \qquad (6.4.7)$$

$$R_{22}=e^{-\lambda}[1+\tfrac{1}{2}r(\mu'-\lambda')]-1=0 \qquad (6.4.8)$$

$R_{33}=\sin^2\theta\{e^{-\lambda}[1+½r(\mu'-\lambda')]-1\}=0$ (6.4.9)

$R_{oo}=e^{\mu-\lambda}[-½\mu''+¼\lambda'\mu'-¼(\mu')^2-\mu'/r]=0$ (6.4.10)

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

(eq. 6.4.7 -6.4.10 from pp.303 Sokolnikof): Equation 6.4.8 is a mere repetition of equation 6.4.9. We thus have only three equations on $\lambda$ and $\mu$ to consider. From equations 6.4.7; 6.4.10 we deduce that

$\lambda'=-\mu'$ so that radial $\lambda=-\mu+$constant $=-\mu+C$ for our nonzero free space metric of section 4.4 normalizing to one real dimension as in the postulate. So $e^{-\mu+C}=e^{\lambda}$. Note C can be imaginary or real. Then 6.4.8 can be written as:

$$e^{-C}e^{\mu}(1+r\mu')=1 \qquad (6.4.11)$$

Set $e^{\mu}=\gamma$. So $e^{-\lambda}=\gamma e^{-C}$ and so integrating this first order equation (equation.6.4.11) we get:

$$\gamma=-2m/r+e^{C}\equiv e^{\mu} \text{ and } e^{-\lambda}=(-2m/r+e^{C})e^{-C} \qquad (6.4.12)$$

From equation 6.4.3 we can identify radial $e^{C}\approx 1+2\varepsilon$ with also rotational oblateness perturbation $\Delta\varepsilon$ already a component here (section 6.4).

$\kappa_{oo}=1-(C+C^2/2+..))-2m/r$; $e^{-\lambda}=1/\kappa_{rr}=1/(1-2m'/r)$; (6.4.13)

Our new pde has spin S and so the self similar ambient metric on the N+1th fractal scale is the Kerr metric which contains rotations.

$$ds^2=\rho^2\left(\frac{dr^2}{\Delta}+d\theta^2\right)+\left(r^2+a^2\right)\sin^2\theta d\phi^2-c^2dt^2+\frac{2mr}{\rho^2}\left(a\sin^2\theta d\theta-cdt\right)^2, \qquad (6.4.14)$$

where $\rho^2(r,\theta)\equiv r^2+a^2\cos^2\theta;\quad \Delta(r)\equiv r^2-2mr+a^2,$

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

$\rho^2(r,\theta)\equiv r^2+a^2\cos^2\theta;\quad \Delta(r)\equiv r^2-2mr+a^2$

$$\left(\frac{(r\hat{})^2}{(r')^2-2mr}\right)dr^2+\left(1-\frac{2mr}{(r\hat{})^2}\right)dt^2+..$$

$$\left(\frac{1}{\frac{(r\prime)^2}{(r\hat{})^2}-\frac{2mr}{(r\hat{})^2}}\right)dr^2+\left(1-\frac{2mr}{(r\hat{})^2}\right)dt^2 \qquad (6.4.15)$$

Same same

$$\frac{(r')^2}{(r\hat{})^2}=\frac{r^2+a^2}{r^2+a^2cos^2\theta}=\frac{1+\frac{a^2}{r^2}}{1+\frac{a^2}{r^2}cos^2\theta}=$$

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

$$1+\frac{a^2}{r^2}(1-cos^2\theta)+..=1+\frac{a^2}{r^2}sin^2\theta+..=1+\frac{a^2}{r^2}u^2=1+\varepsilon+\Delta\varepsilon$$

z=1. Over small scales can normalize large targe $\varepsilon$ transistions out.

$$\frac{1}{\left(\frac{1+\varepsilon+\Delta\varepsilon}{1-\varepsilon}\right)}dr^2\left(\frac{1}{1-\varepsilon}\right)=\frac{1}{\left(1+\frac{\Delta\varepsilon}{1-\varepsilon}\right)}dr^2\left(\frac{1}{1-\varepsilon}\right) \qquad (6.4.15)$$

leaving the ground state $\Delta\varepsilon$ and simply resetting the clock dt.

z=0 Given the local Meisner effect can't normalize out the Meisner effect ε (instead of Δε)

$$\frac{1}{\left(1+\frac{\Delta\varepsilon}{1-\varepsilon}\right)}dr^2\left(\frac{1}{1-\varepsilon}\right) \longrightarrow \frac{1}{\left(1+\frac{\varepsilon}{1-\varepsilon}\right)}dr^2\left(\frac{1}{1-\varepsilon}\right) \qquad (6.4.16)$$

**Transitions**

z=0→z=1

$$\frac{1}{\left(1+\frac{\Delta\varepsilon}{1-\varepsilon}\right)}dr^2\left(\frac{1}{1-\varepsilon}\right)$$

z=1→z=0

$$\frac{1}{\left(1+\frac{\Delta\varepsilon}{1-\varepsilon}\right)}dr^2\left(\frac{1}{1-\varepsilon}\right)$$

There is a resulting asymmetry in $1/\kappa_{rr}$ and $\kappa_{oo}$ by implied by 6.4.13. We can reset the clock resetting the proper time (squared) clock $ds^2$ (details in section 6.4.13) by multiplying by the pure radial $e^C \approx 1+2\varepsilon$ coefficient allowing here for both (relative) positive and negative ε in the background metric:

$$ds^2 = (1\pm\varepsilon)\left[(1\pm\varepsilon+\Delta\varepsilon)dt^2 - \frac{1}{(1\pm\varepsilon+\Delta\varepsilon)}dr^2\right]$$

$$ds^2 = (1-\varepsilon)\left[(1-\varepsilon-\Delta\varepsilon)dt^2 - \frac{1}{(1-\varepsilon-\Delta\varepsilon)}dr^2\right] \qquad (6.4.13)$$

Note for the 1+ε choice in equation 6.4.13 we have $g_{oo}=1+2\varepsilon+\Delta\varepsilon$, $g_{22}=1/(1+\Delta\varepsilon)$ (used below in equation 8.3 for real metric coefficient case) or for imaginary C as above

**ε, Δε as operators**

Alternatively write ε, Δε as operators on the eq.1.2.7 ψ. So ε does not operate on Δε( for example $\varepsilon\Delta\varepsilon\psi=0$). allowing us to write the $\kappa_{oo}$ component of 6.4.13 where ansatz $e^C$ generates $e^{\mu}=g_{oo}= e^{i(2\varepsilon+\Delta\varepsilon)} =\kappa_{oo}$ above only if ε, Δε act as operators.

$$g_{oo}= e^{i(2\varepsilon+\Delta\varepsilon)} \qquad (6.4.15)$$

for background metric case. ε=.060406.

Note the $(a/r)^2$ in 6.4.14 is then the ε+Δε in the denominator on the right side of eq.6.4.13, the main reason we went to so much trouble to derive 6.4.13. Thus we have shown how a nearby object B creates mass in object A.

Note(r,t)X(ϕ,θ) is a Cartesian product of two 2D spaces here.

Thus the $(a/r)^2$ term in Eq.6.4.13 thus provides a background metric and this ambient metric then provides the mass of the fundamental leptons. Tauon (1), muon(ε) and electron Δε). Object B and object A area two body object on the next fractal scale (with $w_B=w_A$ at the $r_H$ boundary due to causality) effect of causing a drop in inertial frame dragging and a increase in the mass of the particles through the mass degeneracy provided by quantum mechanical vibrational τ tauon and rotational ε muon and ground state Δε electron metric quantization eigenstates of object A and B together. In $\kappa_{00}=1+\varepsilon+\Delta\varepsilon-r_H/r$. (6.4.1)

**Normalization**

Equation 6.1.2 (Kerr) and equation 6.4.1 and 6.4.13 (ambient metric) thereby shows how to normalize. Recall normalization of $z=(1+\delta z)+\delta z'$ using $1/(1+\delta z)$ was required (sect.1.2) to also have the neighborhood (and not just the point) a subset of the Mandelbrot set.

**Details:** Ambient metric $1-\varepsilon$ in the Kerr $(a/r)^2$ is normalized out. The ground state $\Delta\varepsilon$ cannot be normalized out. Because $\kappa_{oo}=\xi_1-r_H/r$, all 3 leptons are in sect.1.2. So the new pde normalization results for z=1 are $\kappa_{oo}=1-(C_M/\xi_1)/r$, $\kappa_{rr}=1/(1-(\Delta\varepsilon/(1-\varepsilon))-(C_M/\xi_1)/r)$. (6.6.15)

For z=0, $2P_{1/2}$ and $2P_{3/2}$ at $r=r_H$ so $\kappa_{oo}=1-\varepsilon-\Delta\varepsilon-(C_M/\xi_o)/r$, $\kappa_{rr}=1/(1-\varepsilon-((C_M/\xi_o)/r))$ (6.6.16) because of the Meisner effect ε (partII) as in eq. 6.4.13. $2P_{1/2}$ at $r=r_H$ $z=0\rightarrow z=1$ transition occurs when the internal virtual decay event occurs so that there is no Meisner effect ε, just the usual object B background ε. See (6.6.17)

In $2P_{1/2}$ at exactly $r=r_H$ (with small but nonzero probability) we have $z=0\rightarrow 1z=$ case since we have a huge $\xi_1$ so we again normalize out $1-\varepsilon$ and so $\kappa_{oo}=1-\Delta\varepsilon/(1\pm\varepsilon)-((C_M/\xi_o)/r)$ for $r=r_H$. (6.6.17) transition case. In summary:

**z=1**,0 so $r_H=\Sigma C_M/(\xi_3+\xi_2+\xi_o)\equiv\Sigma C_M/\xi_1$ in eq.1.2.7; sect.6.3 **infinitesimal rotation**

$\kappa_{rr}=1/[(1-\Delta\varepsilon/(1\pm\varepsilon)-(C_M/\xi_1)/r))]$, and $\boldsymbol{\kappa_{oo}}=1-(\Sigma C_M/\xi_1)/r$ (6.6.15)

z=0 alone sect.1.2 $r_H=C_M/\xi_o$ **180°rotation**

$\boldsymbol{\kappa_{rr}}=1/[(1-\varepsilon/(1\pm\varepsilon)-(C_M/\xi_o)/r))]$, and $\boldsymbol{\kappa_{oo}}=1-(C_M/\xi_o)/r$ (6.6.16)

**Transitions**

$z=0\rightarrow z=1$

$\kappa_{rr}=1/[(1-\Delta\varepsilon/(1\pm\varepsilon)-(\Sigma C_M/\xi_1)/r))]$, and $\boldsymbol{\kappa_{oo}}=1-(\Sigma C_M/\xi_1)/r$

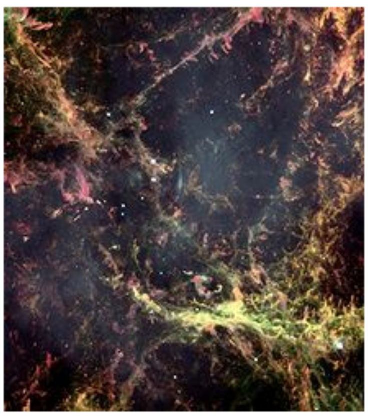
$z=1\rightarrow z=0$ tauon and muon decay into electrons at $r=r_H$ contained by flux quantization.

$\boldsymbol{\kappa_{rr}}=1/[(1-\varepsilon/(1\pm\varepsilon)-(C_M/\xi_o)/r))]$, and $\boldsymbol{\kappa_{oo}}=1-(C_M/\xi_o)/r$

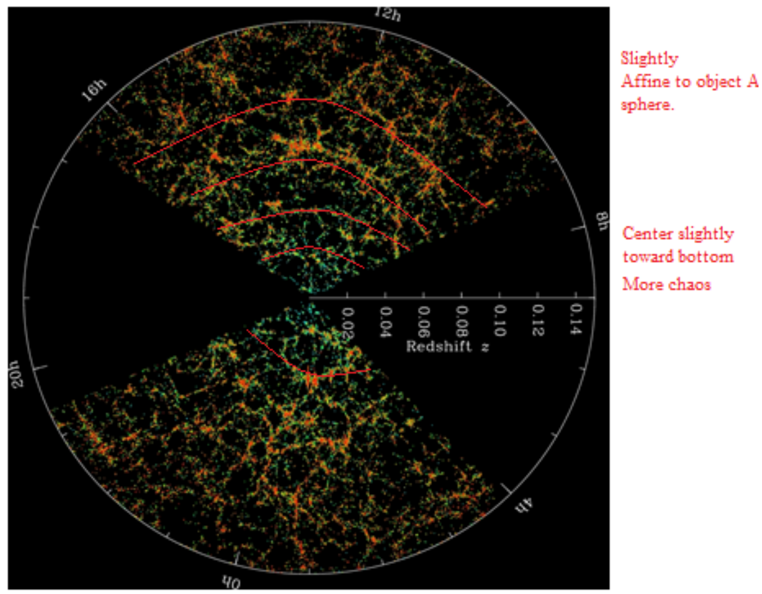
### 6.5 Sum Of All These Effects: Stair Step Metric Expansion

Given the inertial frame dragging reduction effects of nearby object B (sect.6.4.3) the ε (muon) and Δε (electron) have their own zitterbewegung frequencies from the new pde. It is at $r<r_C$ so it exists (sect.1.41). Also from the object A new pde locally $r=r_oe^{kt}$ for expansion. Also the underlying object A space-time is Minkowski, flat space-time as we see in equation 5.1.1 since the time spent in the later parts of the expansion the eq 4 Gauss's law Gaussian Pillbox is nearly empty since most of the material is most of the time next to the horizon $r_H$ So classically the interior of $r_H$ has no gravitational force associated with it and thus is a flat Minkowski metric. These two object A criteria are not perturbations (6.11.1). Recall the outside observer sees a zitterbewegung independent of location inside: it all happens at once. So for the $r=r_oe^{kt}$ expansion to work simultaneously with the Minkowski metric it all must happen simultaneously within $r_H$. The whole thing rises at once from the outside observer's point of view. The two object A and two object B criteria are satisfied everywhere if we have a stair step Minkowski space time, where the space-time is Minkowski at the flat part of the steps with the vertical part being infinitesimal in both time and space. So over the entire interior of object A we have the step function $g_{oo}=\Sigma_n\sin((2n+1)\omega t)/(2n+1)$ with ω being both separately the ε and Δε omegas giving a square wave which is (locally) flat if the sum is to n=∞. The separate sums also exhibit the required perturbation frequencies ε and Δε. Both ε and Δε are smaller than $1/k=r_c$ so they can be actual oscillations (sect.6.11). So the jumps in the larger ε square wave function $\Sigma_n(\sin((2n+1)\omega t)/(2n+1))$ functions must be to the envelope of the exterior observer $r=r_oe^{kt}$ *non*pertutbative function turning the notional space-time rubber sheet into a stair step function. The whole thing still rises at once. But the ε and Δε object B transmissions are local and so get dispersive frequency cut-offs at galaxy scattering cut-offs at 1/100kLY so have 100kLy wide

Gibbs jumps. Thus the space time (and so Gamow factor) briefly jumps up and down every ε (So every 270My, the mass extinctions, the last one being at 248My.) and to a much weaker 1/100 amplitude for Δε every 2.5My. The whole thing rising at once gives rise to some interesting phenomenology. For example a metric quantization event is seen to happen locally at first and then spread out from the observer at speed c. So for example the previous 248My metric jump event can be seen still happening at 248My from us, where in general we then see "rings" of these cyclic events.

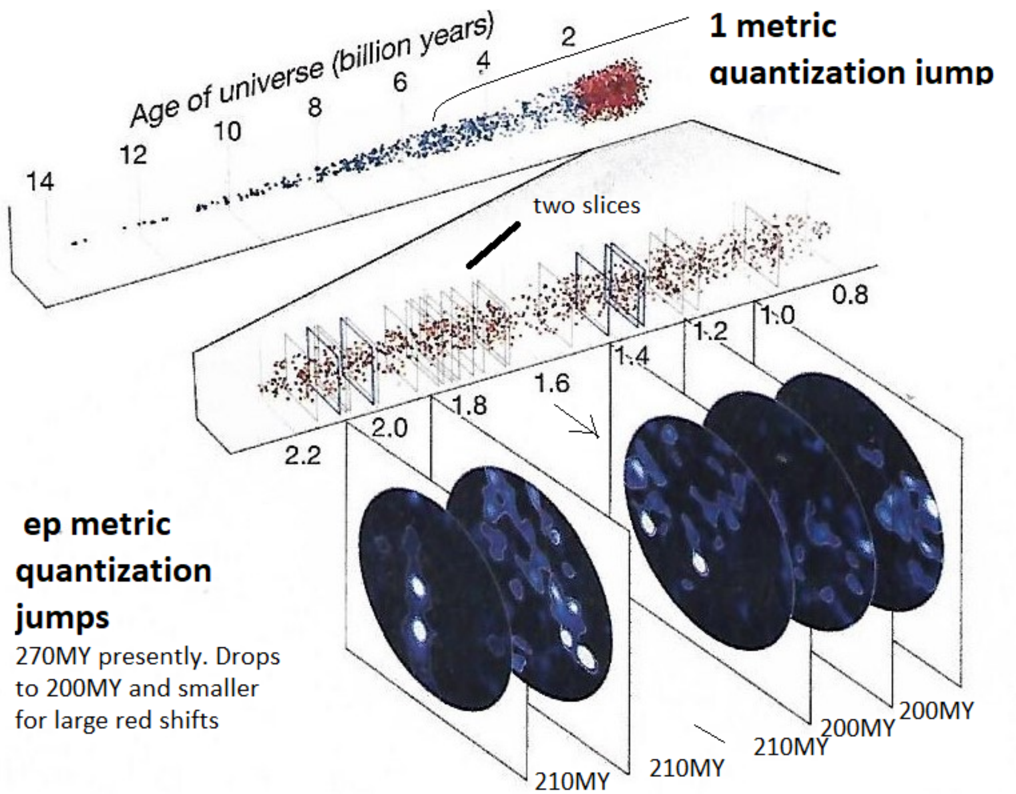


Rayleigh Taylor Instability M1

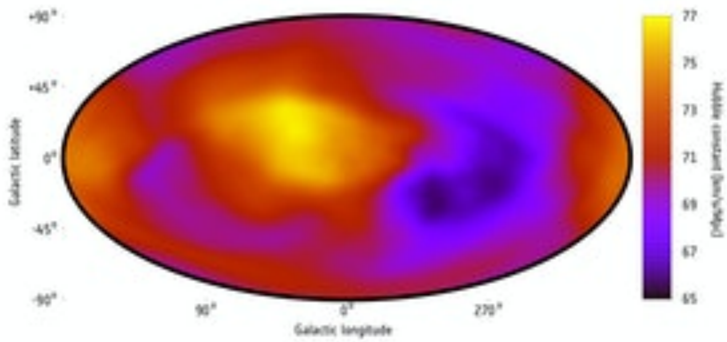


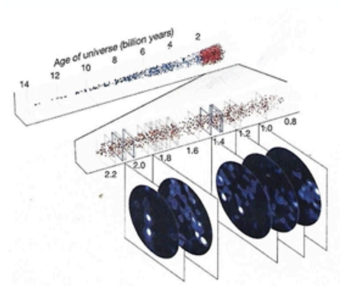

Rayleigh Taylor Instability for universe. Object B zitterbewegung resonances for rotational bands.

270My apart thick radii (red lines) as in this right figure along with remnants of the Rayleigh Taylor instability (4.3.3) RT of the original big bang $\mu=\sqrt{kg}$ in RT=$e^{\mu t}$**.** Note from rings in image nonrelativistically Δz=.02=x/13.7, x≈270My.. The researchers looked at 800 galaxy clusters across the universe, measuring the temperature of each cluster's hot gas. They then compared the data with how bright the clusters appeared in the sky. If the universe was in fact isotropic, then galaxy clusters of similar temperatures, located at similar distances, would have similar levels of luminosity. But that was not the case. Object B and Kerr contribution from 6.4.16 $\kappa_{oo}=1-r_H/r \rightarrow 1-(a/r)^2-r_H/r=1/\kappa_{rr}$ from eq.1.2.4 is $(a/r)^2=\Delta\varepsilon/(1-\varepsilon)$. Note from the Kerr metric contribution eq. 6.4.16 given space-like $r_H$ barrier separations the operators (sect.2.5) are on quantities only within a given fractal scale. If a locally homogenous space-time (where tiny Δε background metric change my still be nonzero.) we can at least normalize out the 1-ε .Given the local $e^{kr}$ metric expansion these QM jumps occur over the whole space-time all at once. So they appear from any given point to propagate radially making each observer think they are the center of explansion. So $e^{kr}$ is then a stair step exponential with Gibbs overshoots at each transition.




Rolland Bacon MUSE VLT study of Lyman Alpha 121.4nm redshifted emission in 2021




▲ **COSMIC SLICE** Astronomers picked up the signal of Lyman-alpha emission from hydrogen at different times in the first 2 billion years of cosmic history (red, top). They found 22 notably dense regions (gray rectangles, center), five of which contained especially prominent filaments (blue rectangles and bottom row).

A map showing the rate of the expansion of the Universe in different directions across the sky.K. Migkas et al. 2020, CC BY-SA 3.0 IGO

In my theory the universe is fractal (note Mandelbrot set discussion below) with $10^{40}$X fractal scale separation. Postulate 1 implies eq.1a and eq.1b and they in turn imply eq.1.11 and that Clifford algebra. so they imply leptons, eq.1.11 (eq.1,24) is the electron which has spin so is dipole which also thereby is fractal. So we are inside of the next largest "electron" and it is a dipole, as in that image below. Thus **an interior cosmological dipole is the most blatant manifestation of the fractalness**

From the mainstream:

"The researchers looked at 800 galaxy clusters across the universe, measuring the temperature of each cluster's hot gas. They then compared the data with how bright the clusters appeared in the sky.

If the universe was in fact isotropic, then galaxy clusters of similar temperatures, located at similar distances, would have similar levels of luminosity. But that was not the case. "

Note this dipole has the same orientation as the axis of evil (for the CBR).

**6.6 Origin Of Mass**

**Introduction** Nth scale is $10^{-40}$X small baseline

Recall that Eq. 1.3 (with its small C) gave us eq.1.15 at min ds at 45°, for our observables (eigenvalues).

Also eq.1.5 gives $-dr=drdr+C_M$ so for large fractal baseline $C_M\approx|drdr|>>dr$ so that if we define mass $\xi$ from the Mandelbrot set with $\xi\propto\delta z$ then $C_M=<\delta z>+<\delta z\delta z>$ has to equal $\xi dr_N+\xi\xi dr_{N+1}$with resultant $dr_2$ definition from $C_M\equiv\xi dr=\xi(dr_1+dr_2)=\xi dr_1+\xi dr_2$ with $dr_N$ local r.

On the big (cosmological) fractal eq.9 baseline both $dr_{N+1}$ and $dr_2$ are large constants (since zz>>z) so we can also define some new constant $\varepsilon$ from $\varepsilon=\xi\xi dr_2$. So $\varepsilon/\xi=\xi dr_2$ with $\varepsilon=\varepsilon_N+\varepsilon_{N+1}$. $C=\xi dr+\varepsilon/\xi\equiv\varepsilon_1$.

**B2 Introduction To Chapter 6 and PartII**

Also on the big cosmological eq.9 object B&A fractal baseline (as sect.6.6 implies) vibrational $m_\tau$ ($\frac{1}{2}kx^2$) and rotational $m_\mu$ (L(L+1)) modes so $\frac{1}{2}kx^2$ and L(L+1) from section 6.4 (ambient metric formalism: $\kappa_{oo}=1+\varepsilon+\Delta\varepsilon$) add to true angular moment effect of the $m_\mu$ so can replace $(a/r)^2$ in the Kerr metric. For example $\frac{1}{2}kx^2$ $m_\tau$ allows squared $x^2=dr^2$ to occupy the squared $(a/r)^2$. And so $\xi\equiv m_L=m_\tau+m_\mu+m_e$ for $(a/r)^2$ is clamped into the Kerr metric in free space with $\Delta+m_e$ with $m_e$ the ground state.

So from object B vibrational and rotational many bodied states in Kerr metric $(a/r)^2$ in eq.4.1

$\kappa_{00}=1-m_\tau+2m_\mu+m_e-(r_{HN+1}/r_1)-(r_L/r)$. At our cosmological position $r_1=r_{HN+1}$:

$\kappa_{00}=1-m_\tau+2m_\mu+m_e-)-r_L/r-(r_{HN+1}/r_{HN+1})=$

$\kappa_{00}=1-m_\tau+2m_\mu+m_e-1-r_L/r=m_\tau+2m_\mu+m_e-r_L/r=\xi-\varepsilon/r_N$. Normalize and get $\boldsymbol{\kappa_{00}=1-(\varepsilon/\xi)/r}$, (B2)

$r=r_H=2e^2/(m_Lc^2)$. **Use in E&M free space applications**.

Section 3.3 (object B implications sect.4.1.3; 4.1.4) then give us the origin of the mass of 2AI. For example object B is close to object A (so smaller inertial frame dragging and larger $(a/r)^2$) and larger mass term $\xi$ in 4.1.2 and so in 4.1.3. Also 2AI is off the diagonal so $\xi dr>0$ so $C_M=\xi dr=\varepsilon$ so $\varepsilon/\xi=\lambda=$De Broglie and so $\varepsilon_o/r_H=\Delta\varepsilon=4AI$ is larger than if object B was farther away. In that regard recall that object B is outside the big $10^{11}$LY horizon so its state is still oscillatory in the eq.9 Heisenberg QM formulation for p for example $T(t)|p>=p(t)>$ where $T(t)=e^{iHt/\hbar}$. Recall alternatively inside $r_H$ the $i\rightarrow1$ so the time evolution is purely exponential, hence the $r=r_oe^{kt}$ accelerating universe expansion discovered by Perlmutter et al in 1998. We did a radial coordinate transformation (sect.7.8) to the comoving observer frame and got $\ln(r_{M+1}/r_{bb})+2=[1/(e^\mu-1)-\ln[e^\mu-1]]2$ which is locally still $r=r_oe^{kt}$ but jumping by $\varepsilon$ and $\Delta\varepsilon$ and mixed state values (sect.4.2.4). The dyadic radial coordinate transformation of $T_{oo}=\varepsilon^2$ dyadic divided by $m_e$ to that local coordinate system comoving with $r=r_oe^{kt}$ gives "constant" gravity G (see Ch.12). So what the N+1th fractal scale observer sees as the electric field the Nth fractal scale observer sees as gravity. The dyadic angular transformation at our present $r=r_H$ gives coefficient $1/(1\pm\varepsilon)^2$ (from 4.7.3). Mass is also time since $2GM/c^2$=invariant in sect.7.4 with G changing with time. So mass is also our clock time.

**6.7 Fractal Selfsimilarity And Object B Implications**

Given our dr frame of reference between our two fractal baseline scales separated by that $10^{40}$X scale jump we have that drdr<<dr $=C_M$ (subatomic) and dr<<dr'dr'$=C'_M$ (cosmological, sect.4.1) in the context of the Kerr metric.

Given object B decreases the effects of frame dragging and so accentuates the effect of the Kerr metric $(a/r)^2$ term thereby creating a nonzero mass ξ in the $g_{oo}$ of the Kerr metric: the self similarity between the two baseline scales implies that $C'_M \propto C_M$ so that dr'dr'∝dr and so:

Kdr'dr'$= K\left(\frac{a}{r}\right)^2 = \xi dr \equiv \xi r_H$,

$K = \frac{r_{Ho}}{m_0 c^2}$, $a/r \equiv \xi r \frac{dr}{dt}\frac{1}{r}$, dr=λ, v=dr/dt, m=ξ, h=Kc/ds. So $\lambda = \frac{h}{mv}$ (6.6.1)

This result in the context of sect.1.1 (eq.1.1.15, mv/ħ≡k=2π/λ) allows you to interpret dr as a wave length λ. So we defined both mass ξ and derived the De Broglie wavelength λ and found the origin of Planck's constant h and so found the origin of quantum mechanics and mass.

**Section 6.8 N+1 Fractal Scale Object B and C Rotation, Vibrational, Entangled State Transitions For $r<r_H$**

In section 7.4 we do the radial coordinate transformation. In this section we do the transformation to the rotating frame allowed by object B. With object B close by there are two quantum states rotation ε and ground chiral state Δε just as you see in Raman spectra for a diatomic molecule and the entangled states. These are the lepton states 1.11 1.12 of section 1). So $\omega_1 \to \omega_2$. and $\omega_o$ gets through at the cosmological $r_H$ boundary (i.e., rope not broke). So what was outside (object A cosmological object) as ordinary "diatomic" quantum states (τ vibration $E=\hbar\omega_o(N+1/2)$ and rotation ε $E=\hbar\omega'_o\sqrt{(L(L+1))}$, $\omega_o >> \omega'_o$) is the metric quantization inside and also the entangled states. These are classical GR gravitational wves.

**6.9 3 Metric Quantization Levels From Object B**

Recall there are 3 main levels of metric quantization coming out of object B, the Δε,ε,1 levels (i.e., electron, muon, tauon) arising from the QM ground state, rotation and vibration levels of object A with B that get through the $r_H$ boundary and also become GR metrics inside. This means that instead of that single GR single ambient metric rubber sheet there are 3 $g_{ij}$. So $\omega_1 \to \omega_2$. across the $r_H$ boundary so rotation and oscillation ħω eigenstates are passed inside as metric quantization provided by object B as r→0: Metric disturbances cross the metric boundary and curved space unscattered just as light moves through magnetic and electric fields unscattered.

Alternatively, you could also say that object B gives the metric quantized energy levels Δε, ε, τ analogous to carbon monoxide vibrational τ and rotational ε and ground state electron mass Δε energy levels.

**6.10 Multiple Applications Of The eq.B6**

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

Recall equation B6. Equation B6

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: $t \rightarrow t_o/\sqrt{(1-v^2/c^2)}$=KH since energy $H=m_oc^2$ has the same $\gamma$ factor as time does. So in the $e^{iHt}$ of object B the $Ht/\hbar=(H/\sqrt{(1-v^2/c^2)})t_o/Kt_o= KH^2=\phi^2$. Define $\phi=H\sqrt{K}$. Note also ultrarelativistically that p is proportional to energy: for ultrarelativistic motion $E^2=p^2c^2+m_o^2c^4$ with $m_o$ small so E=Kp. Suppressing the inertia component of the $\kappa$ thus made us add a scalar field $\phi$. Thus $\phi'=p(t)=e^{iHt/\hbar}|p_o>=\cos(Ht/\hbar)=\exp(iH^2t_o/Kt_o)= \exp(i\phi^2)=\cos(\phi^2)=\phi'=1-\phi^4/2$. 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 $\phi$=1.1.11 by itself from:
$(D_\mu)^t(D_\mu\phi) - \frac{1}{4}\lambda\left(((\phi^t\phi)^2 - v^2)\right)^2$ Note in the covariant derivative

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

W is from our new pde S matrix. Need the $B_\mu$ of the form it has to make the neutrino charge zero. Need to put in a zero charge Z. The B component is generated from the $r_H/r$ and the structure of the B and A=W+B =$A_\mu = cos\theta_W B_\mu + sin\theta_W W_\mu^1$ is needed to both have a zero charge neutrino and nonzero mass electron. So Define

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

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

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

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.

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

Recall section 4.9 ambient metric requires division by $(1+\varepsilon+\Delta\varepsilon+r_H/r)$ to create the nontrivial ambient metric term $1\pm\varepsilon$.
$\psi(t)=e^{iHt}\psi(t_o)=e^{i(1+\varepsilon+\Delta\varepsilon)^2}\psi(t_o)$. See partIII

**6.11 S States Are Point like Particles And P States Are Not Point Like Particles**
**P States At $r=r_H$**
Recall $\Delta\varepsilon$ is ultrarelativistic so integrating the 1.1.11+1.1.11+1.1.11(PartII) Fitzgerald contraction in the 2P state (L=1), $r=r_H$ gives ($\cos\theta\equiv v/c=\beta$), $\theta=90°$

$$r_H\int\sqrt{(1-\cos^2\theta)}\cos\theta d\theta=r_H\int\sin\theta\cos\theta d\theta=r_H\sin^2\theta/2=r_H/2\equiv r_{HP}$$

*so there is contraction by only a factor of 2* from the vantage point of the plane of rotation (From the axial perspective the radius is Fitzgerald contracted to near zero.). From part II. The $\varepsilon$ P state big radius: $r_{HP}\equiv 2ke^2/\text{electron}\approx 2ke^2/m_ec^2$ =2.817F =$r_H$
**$NS_{1/2}$ States at $r=r_H$**
From equation 1.21 $r_L = r_H/(m_Lc^2)$ Lepton $r_L$ (6.11.2)
Thus the object B: S and P state metric quantization is the source of the tiny S state radius

$$\varepsilon\equiv r_c\equiv ke^2/(\text{tauon+muon})\approx ke^2/(m_Lc^2) \approx 10^{-18}\text{m} \qquad (6.11.3)$$

*This explains why leptons (S states) appear to be point particles and baryons aren't*!

**6.12 $\kappa_{\mu\nu}$ Metric:** without the operator formalism so that then $\kappa_{oo}\neq 1/\kappa_{rr}$.

Use metric a ansatz: $ds^2=-e^{\lambda}(dr)^2-r^2d\theta^2-r^2\sin\theta d\phi^2+e^{\mu}dt^2$ so that $g_{oo}=e^{\mu}$, $g_{rr}=e^{\lambda}$. From equation $R_{ij}=0$ for spherical symmetry in free space

$$R_{11}=\tfrac{1}{2}\mu''-\tfrac{1}{4}\lambda'\mu'+\tfrac{1}{4}(\mu')^2-\lambda'/r=0 \qquad (6.4.7)$$

$$R_{22}=e^{-\lambda}[1+\tfrac{1}{2}r(\mu'-\lambda')]-1=0 \qquad (6.4.8)$$

$$R_{33}=\sin^2\theta\{e^{-\lambda}[1+\tfrac{1}{2}r(\mu'-\lambda')]-1\}=0 \qquad (6.4.9)$$

$$R_{oo}=e^{\mu-\lambda}[-\tfrac{1}{2}\mu''+\tfrac{1}{4}\lambda'\mu'-\tfrac{1}{4}(\mu')^2-\mu'/r]=0 \qquad (6.4.10)$$

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

(eq. 6.4.7 -6.4.10 from pp.303 Sokolnikof): Equation 6.4.8 is a mere repetition of equation 6.4.9. We thus have only three equations on $\lambda$ and $\mu$ to consider. From equations 6.4.7; 6.4.10 we deduce that

$\lambda'=-\mu'$ so that radial $\lambda=-\mu+\text{constant}=-\mu+C$ for our nonzero free space metric of section 4.4 normalizing to one real dimension as in the postulate. So $e^{-\mu+C}=e^{\lambda}$. Note C can be imaginary or real. Then 6.4.8 can be written as:

$$e^{-C}e^{\mu}(1+r\mu')=1 \qquad (6.4.11)$$

Set $e^{\mu}=\gamma$. So $e^{-\lambda}=\gamma e^{-C}$ and so integrating this first order equation (equation.6.4.11) we get:

$$\gamma=-2m/r+e^{C}\equiv e^{\mu} \text{ and } e^{-\lambda}=(-2m/r+e^{C})e^{-C} \qquad (6.4.12)$$

From equation 6.4.3 we can identify radial $e^{C}\approx 1+2\varepsilon$ with also rotational oblateness perturbation $\Delta\varepsilon$ already a component here (section 6.4).

$$\kappa_{oo}=1-(C+C^2/2+..))-2m/r;\ e^{-\lambda}=1/\kappa_{rr}=1/(1-2m'/r); \qquad (6.4.13)$$

Our new pde has spin S and so the self similar ambient metric on the N+1th fractal scale is the Kerr metric which contains rotations.

$$ds^2=\rho^2\left(\frac{dr^2}{\Delta}+d\theta^2\right)+\left(r^2+a^2\right)\sin^2\theta d\phi^2-c^2dt^2+\frac{2mr}{\rho^2}\left(a\sin^2\theta d\theta-cdt\right)^2, \qquad (6.4.14)$$

where $\rho^2(r,\theta)\equiv r^2+a^2\cos^2\theta;\quad \Delta(r)\equiv r^2-2mr+a^2,$

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

$$\rho^2(r,\theta)\equiv r^2+a^2\cos^2\theta;\quad \Delta(r)\equiv r^2-2mr+a^2$$

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

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

Same same

$$\frac{(r')^2}{(r^{\wedge})^2}=\frac{r^2+a^2}{r^2+a^2cos^2\theta}=\frac{1+\frac{a^2}{r^2}}{1+\frac{a^2}{r^2}cos^2\theta}=$$

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

$$1+\frac{a^2}{r^2}(1-cos^2\theta)+..=1+\frac{a^2}{r^2}sin^2\theta+..=1+\frac{a^2}{r^2}u^2=1+\varepsilon+\Delta\varepsilon$$

for z=1. To make this result consistent with ambient metric 6.4.12 at large r and make dr have the same 1+ε dependence as $(r\hat{})^2$ we merely divide by 1-ε as in

$$\frac{1}{\left(\frac{1+\varepsilon+\Delta\varepsilon}{1-\varepsilon}\right)}dr^2\left(\frac{1}{1-\varepsilon}\right)=\frac{1}{\left(1+\frac{\Delta\varepsilon}{1-\varepsilon}\right)}dr^2\left(\frac{1}{1-\varepsilon}\right) \qquad (6.4.15)$$

leaving the ground state Δε for z=1.
For z=0 the Meisner effect implies

$$\frac{1}{\left(1+\frac{\Delta\varepsilon}{1-\varepsilon}\right)}dr^2\left(\frac{1}{1-\varepsilon}\right) \longrightarrow \frac{1}{\left(1+\frac{\varepsilon}{1-\varepsilon}\right)}dr^2\left(\frac{1}{1-\varepsilon}\right) \qquad (6.4.16)$$

Recall from sect.1.2 $\kappa_{00}=(1-((C_M/\xi_1)/r))$ (from eq.6.6.16). Recall also $\xi_1=\xi_2+\xi_3+\xi_o \equiv \tau+\mu+m_e \equiv 1+\varepsilon+\Delta\varepsilon$, with $\xi_1$ big and $\xi_o$ both stable and small. Also recall from sect.1.2 that $\xi_2$, $\xi_3$, $\xi_o$ all spin ½ and $\xi_o$ the ground state. $C= C_M/\xi_1$
From eq.1.2.7 and eq,8.2 $E=1/\sqrt{\kappa_{oo}}$ so $E=\xi_1/\sqrt{(1-(C_M/\xi_1)/r)}$. We normalize to the Coulomb interaction potential energy by multiplying by $\xi_1$ =tauon+muon+electron and then get the electron energy contribution by subtracting off the tauon and muon contributions. From eq.1.2.32

$$E_e=\frac{2\frac{(tauon+muon)}{2}}{\sqrt{1-\frac{r_{H\prime}}{r}}}+2m_e/2-2(tauon+muon+PE\tau+PE\mu)/2 \qquad (6.11.4)$$

Note the $PE=e^2/2r$ potential for the electron since it is orbiting the Hydrogen atom proton $mv^2/r=ke^2/r^2$ so $KE=½mv^2=(½)ke^2/r$ =PE in PE+KE=E. So for the electron (but not the tauon or muon who are not in this orbit) $PE=(½)ke^2/r$. Note all we did in 6.11.4 is to write the hydrogen energy and pull out the electron contribution. Also recall the 2,0,0 state hydrogen eigenfunction $\psi_{2,0,0}=(1/(2a_o))^{3/2}(1-r/(2a_o))e^{-r/2ao}$.

**Variation δ(Eψ*ψ)=0 At $r=n^2a_o$**

Next note the $\psi_{2,0,0}$ eigenfunction variation in energy is equal to zero at maximum ψ*ψ probability density where for the hydrogen atom is $r=n^2a_o=4a_o$. Also from 1.2.1 and eq. 4.4.1: $r_{H'}=(1+1+.5)2e^2/(m_\tau+m_\mu+m_e)/2=2.5e^2/(m_pc^2)$. $m_Lc^2=(m_\tau+m_\mu+m_e)=2m_pc^2$ normalizes ½ke²:

$$E_e=\frac{tauon+muon}{\sqrt{1-\frac{r_{H\prime}}{r}}}+m_e-(tauon+muon+PE\tau+PE\iota=$$

$$2(m_\tau c^2+m_\mu c^2)\frac{1}{2}+2\frac{2.5e^2}{2r(m_Lc^2)}m_Lc^2-2\frac{3}{8}\left(\frac{2.5e^2}{rm_Lc^2}\right)^2m_Lc^2+\frac{2m_ec^2}{2}$$

$$-2(m_\tau c^2+m_\mu c^2)/2-2\frac{e^2}{2r}-2\frac{e^2}{2r}$$

$$=\frac{2m_ec^2}{2}+2\frac{e^2}{4r}-2\frac{3}{8}\left(\frac{2.5}{rm_Lc^2}\right)^2m_Lc^2=m_ec^2+\frac{e^2}{2r}-2\frac{3}{8}\left(\frac{2.5e^2}{rm_Lc^2}\right)^2m_Lc^2$$

So: $\Delta E_e=2\frac{3}{8}\left(\frac{2.5}{rm_Lc^2}\right)^2m_Lc^2=$

$$\Delta E=2\frac{3}{8}\left[\frac{2.5(8.89X10^9)(1.602X10^{-19})^2}{(4(.53X10^{-10}))2((1.67X10^{-27})(3X10^8)^2}\right]^2(2(1.67X10^{-27})(3X10^8)^2$$

$=hf=6.626X10^{-34}$ 27,360,000 so that f=27MHz

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

Note from section 1.3.2 that $\kappa_{\mu\nu}$=possibly nonconstant. So it does not have to be flat space, whereas for the standard Dirac equation $g_{\mu\nu}$=constant in eq. 4.2.1. Also eq.9 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 $\Gamma^m_{ij}v^iv^j$ 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 $\int g^{ij} = \int A = \infty$ in the S matrix integral context and $\partial g_{ik}/\partial x^j = \mathbf{0}$ since the mainstream (circa 1928) Dirac equation formalism made the $g_{ij}$ constants in eq.4.2.1. Then $\Gamma^m_{ij} \equiv (g^{km}/2)(\partial g_{ik}/\partial x^j + \partial g_{jk}/\partial x^i - \partial g_{ij}/\partial x^k) = (1/\mathbf{0})(\mathbf{0})$=*un*defined, 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 $A_o=1/r$ (and U(1)) and note the higher orders of the Taylor expansion of the Energy=1/(1-1/r) term (=1-$1/r+(1/r)^2-(1/r)^3$...(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* $\int A=\infty$ 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 1.2.4 is not in general a flat space time (i.e.,.in general $\kappa_{\mu\nu}\neq$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+1th fractal scale to the Nth fractal scale $r_H=2GM/c^2 \rightarrow 2e^2/m_ec^2$ See sect.3.9 and Ch.1.2.4 where we calculate the Lamb shft and anomalous gyromagnetic ratio in closed form from our eq.1.24 energy 1.21: $E=1/\sqrt{\kappa_{oo}}=1/\sqrt{(1-r_H/r+\Delta\varepsilon)}$ (Ch.3.9) and the square root in the separable eq.1.2.4 (Ch.1.2.4 and section 6.12 for Lamb shift calculation without renormalization.).

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

$H_o\psi=E_n\psi_n$

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

$H'+H=H_{total}$ where H ≡ΔG 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 $\psi=\Sigma a_i\psi_{Ii}$=orthonormal eigenfunctions of $H_o$. $|a_i|^2$ 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:

$a_k=(1/(\hbar i)\int H'_{lk}e^{i\omega lkt}dt$

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

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

**Pure States From 1.1.11+1.1.11+1.1.11 Equation 6.13.2 (Also see Part II of This Book)**

Instead of the (hybrid) mixed metric quantization state $1/\sqrt{(\Delta\varepsilon+\varepsilon)}$ of sect.6.13 we find the masses of the pure states $1/\sqrt{\Delta\varepsilon}$ and $1/\sqrt{\varepsilon}$ individually in the bound state 1.11+1.11+1.11 (or 1.11+1.11) at $r=r_H$ of part II so that $1-r_H/r=0$ in 6.13.2 ($r_H$ =Nth fractal scale, our subatomic scale).
Note these are not the free particle pure states $\Delta\varepsilon$ (electron) and $\varepsilon$ (muon) giving also the galactic halo constant stellar velocities.
$e^{i\Delta\varepsilon} \rightarrow 1/[\sqrt{(1-\Delta\varepsilon-r_H/r)}](1/(1\pm\varepsilon))=(1/\sqrt{\Delta\varepsilon})(1/(1\pm\varepsilon)$ =mass of W,Z i.e., ⊥same as Paschen Back: $E_Z=Bu_B(0+1+1+1))$ (fixes the value of the LS coupling coefficient)
$e^{i\varepsilon} \rightarrow 1/[\sqrt{(1-\varepsilon-r_H/r)}](1/(1\pm\varepsilon))=(1/\sqrt{\varepsilon})(1/(1\pm\varepsilon)$= mass of $\pi^{\pm}, \pi^{o}$. || Paschen Back
Fixes the value of the LS coupling coefficient

**6.14 More Implications of The Two Metrics Of Equation 1.18 Of 1.19 and Eq.11.2 Gaussian Pillbox Approach To General Relativity**

From equation 11.2 the $\kappa_{oo}=1-r_H/r$ all the comoving observers are all at $r=r_H$ so that only circumferencial motion is allowed with the new pde zitterbewung 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 Schwarschild metric to $r/r_H$ in the De Sitter metric (see discussion of eq.11.2) at $r=r_H$:

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

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.1.1.10 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 $ds^2=-dx_o^2+\Sigma_{i=1}^n dx_i^2$
Submanifold is $-x_0^2+\Sigma_{i=1}^n x_i^2=\alpha^2$
In static coordinates r,t : (the new pde harmonic coordinates for $r<r_H$)

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

$x_1=\sqrt{(\alpha^2-r^2)}\cosh(t/\alpha)$:
$x_i= rz_i$ $2\leq i\leq n$ $z_i$ 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

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

$\alpha\rightarrow i\alpha$, $r\rightarrow ir$ 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=infinity so all you can see of your immediate vicinity (within 2byly 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! I checked this out. The radial component $r = r_{M+1}$ in 6.14.1 is still a function of that $r_{bb}$ mercuron radius in $\ln(r_{M+1}/r_{bb})+2=[1/(e^{\mu}-1)-\ln[e^{\mu}-1]]2$.
Also the $\kappa_{oo}=1-r^2/r_H^2$ in 6.14.1 (instead of the external observer $\kappa_{oo}=1-r_H/r$) in $E=1/\sqrt{\kappa_{oo}}$ in looking outward (internal observer) at the cosmological oscillation from the inside ($r<r_H$) implies that the longer the wavelength the higher the energy cosmological "photons". So 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).

Note the sine wave has a period of 10trillion years and we are now at 370billion years, near $\theta=-\pi/2$ in $r=r_o\sin\theta$ 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

**Observations Inside Of $r_H$**

The metric quantization pulses ride the metric like sound waves moving in air, including going in straight lines in our toroidal universe. That means that when we look in the direction of object B using nearby metric quantization effects, like galaxies falling into a compression part of the vibration wave, which also organizes galaxy clusters as in the Shapely and Perseus-Pisces concentration, we are looking in straight lines at least for local superclusters (<2BLY) and so are actually looking in the direction of object B. But the CBR E&M radiation that is bent by strong gravity follows that toroidal path and so you really are looking at the (red shifted) light coming from yourself as you formed 370BY ago in this expanding frame of reference.
So the direction to the nearby galaxy clusters, even out to the Shapely concentration, is metric quantization dependent so we have straight line observation, but the CBR follows the curved space and so the galaxy superclusters we see in a given direction have CBR concentration counterparts in exactly the opposite direction. Note distant galaxy clusters are also not seen along straight lines, but lines on that spherical torus. So you only see hints of the actual directions of object B, of the object A electron dipole, etc. for relatively nearby superclusters.

The spherical torus Bg gravimagnetic dipole shape comes from the rotational motion implied by the new pde (from eq.1.11). Recall the new pde applies to dipole Bg field and spin motion; The electron has spin as you know. The new pde spherical torus is applied on top of a Minkowski space-time inside $r_H$ because the Gaussian pillbox does not (usually) contain anything if its radius is smaller than $r_H$. So astronomers really are observing the inside of an electron (i.e.,what comes out of the new pde) in this fractal model!

**6.15 Relevance (Of These Two Metrics Of Section 1.1.5) to Shell Model of The Nuclear Force Just Outside $r_H$**

Note my model is a flat de Sitter $\alpha \to i\alpha$ inside $r_H$ and perturbed Schwarzschild (i.e.,Kerr) just outside, the two metrics of section 1.4 and Part II (on 1.11+1.11+1.11) above. The transition between the two is quite smooth. So at about $r_H$ we have a force that gets stronger as r increases. But this is what the simple harmonic oscillator does in this region. So my model gives the simple harmonic oscillator (transition to Schwarzschild metric) and the flat part inside that the Shell model people have to arbitrarily have to adhoc put in (they call it the flattening of the bottom of the simple harmonic potential energy). Anyway, the above fractal theory explains all of this. Also the object B perturbation metric is a perturbative Kerr rotation.

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

## 7.1 Comoving Coordinate System

Here we multiply eq. 1.16 result $p\psi=-i\partial\psi/\partial x$ by $\psi^*$ and integrate over volume to define the expectation value:

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

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:

$$i\hbar\frac{d}{dt}\langle a,t\,|\,A\,|\,a,t\rangle = i\hbar\frac{d}{dt}\langle\Psi(t),A\Psi(t)\rangle = \left(\Psi(t),Ai\hbar\frac{\partial}{\partial t}\Psi(t)\right)-\left(i\hbar\frac{\partial}{\partial t}\Psi(t),A\Psi(t)\right)$$

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

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: $\quad r=r(o)+c^2p/H+(\hbar c/2iH)[e^{(i2Ht/\hbar)}-1](\alpha(0)-cp/H). \qquad (7.1.2)$

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

Note there is no Klein paradox at r<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 $\sqrt{\kappa_{oo}}=\sqrt{(1-r_H/r)}$ 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. $G_{oo}$ energy density (source).

## 7.2 $r<r_H$ $e^{\omega t}$ -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 3rd next smaller fractal N-1 scale using the generalized Heisenberg equations of motion giving us

$$(\partial x_{oN})/\partial x_{oN+1})\,(\partial x_{oN})/\partial x_{oN+1})T_{ooN}-T_{ooN}=T_{ooN-1} \qquad (7.2.3)$$

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

**7.3 Derivation of The Terms in Equation 7.2.3**

For free falling frame no coordinate transformation is needed of source $T_{oo}$. 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 $T_{oo}$ 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 $\ln(r_{M+1}/r_{bb})+2=[1/(e^{\mu}-1)-\ln[e^{\mu}-1]]2$ in our own coordinate frame).


THE DISCOVERY INSTRUMENT Spectroscope Slit

Slipher's Spectroscope 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., 1.2.31 Frame of Reference**

Given N+1 fractal cosmological scale (Who just sees the $T_{oo}$) frame of reference we then do a radial dyadic oordinate transformation to *our* Nth fractal scale frame of reference so that $T_{oo} \rightarrow T_{oo}' = T_{oo} + dT_{oo}. \equiv T_{oo} + G_{oo}$ (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 $Z_{oo}$ E&M energy-momentum tensor 00 component replacement for the $G_{oo}$ 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 $z_{oo}$. Thus transform the dyadic $Z_{oo}$ to the coordinate system commoving with the radial coordinate expansion and get $Z_{oo} \rightarrow Z_{oo} + z_{oo}$ (section 3.1). The new $z_{oo}$ 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 see in the observer primed nonmoving frame is: $dr = \sqrt{\kappa_{rr}}dr' = \sqrt{(1/(1+2\varepsilon))}dr' = dr'/(1+\varepsilon)$. $1/\sqrt{(1+.06)} = 1.0654$. Also using $S_{½}$ state of equation 1.21. $\varepsilon = .06006 = m_{\mu} + m_e$

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 $r_M = \lambda_M/(2(2\pi)) = h/(2m_e c 2\pi) = 6.626\text{X}10^{-34}/(9.1094\text{X}10^{-31}\text{X}2.9979\text{X}10^{8}\text{X}4\pi) = 1.9308\text{X}10^{-13}$

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: $x_{cm} = (\sum xm)/M = = \iiint r^3 \cos r \sin\theta d\theta d\phi dr / (\iiint r^2 \cos r \sin\theta d\theta d\phi dr) = 1.036$. As a fraction of half a wavelength (so $\pi$phase) $r_m$ we have $1.036/\pi = 1/3.0334$ (7.4.1)

Take $H_t = 13.74\text{X}10^9$ years$=1/2.306\text{X}10^{-18}$/s. Consistent with the old definition of the 0-0 component of the old gravity energy momentum tensor $G_{oo}$ we define our single $S_{½}$ state particle

(E&M) energy momentum tensor 0-0 component From eq.3.1 $Z_{oo}$ we have: $c^2Z_{oo}/8\pi \equiv \varepsilon = 0.06$,. $\varepsilon = \frac{1}{2}\sqrt{\alpha}$=square root of charge.
$Z_{oo}/8\pi \equiv e^2/2(1+\varepsilon)m_pc^2 = 8.9875X10^9(1.6X10^{-19})^2/(2c^2(1+\varepsilon)1.6726X10^{-27}) = 0.065048/c^2$
Also from equation 1.24 the ambient metric expansion component $\Delta r$ is:

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

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 $H_t$= 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:

$$\frac{\partial x^{\alpha}}{\partial x'^{\mu}}\frac{\partial x^{\beta}}{\partial x^{\nu\,\prime}}Z_{\alpha\beta} = Z'_{\mu\nu} \text{with in particular } Z_{oo} \to Z'_{oo} \equiv Z_{oo} + z_{oo} \tag{7.4.3}$$

After doing this $Z'_{oo}$ calculation the resulting (small) $z_{oo}$ is set equal to the Einstein tensor gravity source ansatz $G_{oo} = 8\pi G m_e/c^2$ 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 $r = r_o + \Delta r$ and $ct = ct_o + c\Delta t$ using $D\sqrt{1-v^2/c^2} \approx D(1-\Delta)$ 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 $c^2dt^2 = dr^2$ and so equation 11.4 does double duty as a r=ct time $x_o'$ coordinate. Also note we are trying to find $G_{oo}$ (our ansatz) and we have a large $Z_{oo}$. Also with $Z_{rr} \ll Z_{oo}$ 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 $\delta(r) = \delta(r_o(e^{\omega t}-1)) = (1/(e^{\omega t}-1))\delta(r_o)$. 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:

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

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

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

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

$$2\left(\frac{e^2}{2(1+\varepsilon)m_p}\right)\left(\frac{r_M}{3.03m_e c(1+\varepsilon)}\right)\omega e^{\omega t} =$$

$$\left(2\left(\frac{e^2}{2(1+\varepsilon)m_p}\right)\left(\frac{r_M}{3.03m_e c(1+\varepsilon)}\right)\left([e^{\omega t}-1]/H_t\right)\right)\delta(r) =$$

$$= 2\left(\frac{e^2}{2(1+\varepsilon)m_p}\right)\left(\frac{r_M}{cm_e 3.03(1+\varepsilon)}\right)\left([e^{\omega t}-1]\delta(r_o)/\left(\left[e^{\omega t}-1\right]H_t\right)\right) = G\delta(r_0)$$

Make the cancellations and get:

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

from plugging in all the quantities in equation 7.4.5. This new $z_{oo}$ term is the classical $8\pi G\rho/c^2=G_{oo}$ 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 $Z_{oo}$ term. Note Dirac equation implies +E and -E solutions for –e and +e respectively and so in equation 7.4.5 we have $e^2=ee=q_1Xq_2$ in eq.7.4.5. So when G is put into the Force law $Gm_1m_2/r^2$ there is an *additional* $m_1Xm_2$ thus the resultant force is proportional to $Gm_1m_2=(q_1Xq_2)m_1m_2$ 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, $ke^2/(m_ec^2)=ke^2/(Mc^2)$ is also constant so if G is going up (in 7.4.4) then M' is going down. Note then $r_H=ke^2/(m_ec^2)\rightarrow 10^{40}Xr_H=r_H(N+1)=$
$=GM'm_e/(m_ec^2)=GM'/c^2=$famous Schwarzchild 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 **$d^2r/dt^2$ $=r_o\omega^2e^{\omega t}$= 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 $r_o$ is the radius of the universe then $r_o\omega^2e^{\omega t}\approx 10^{-10}\text{m/sec}^2=a_M$ 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.

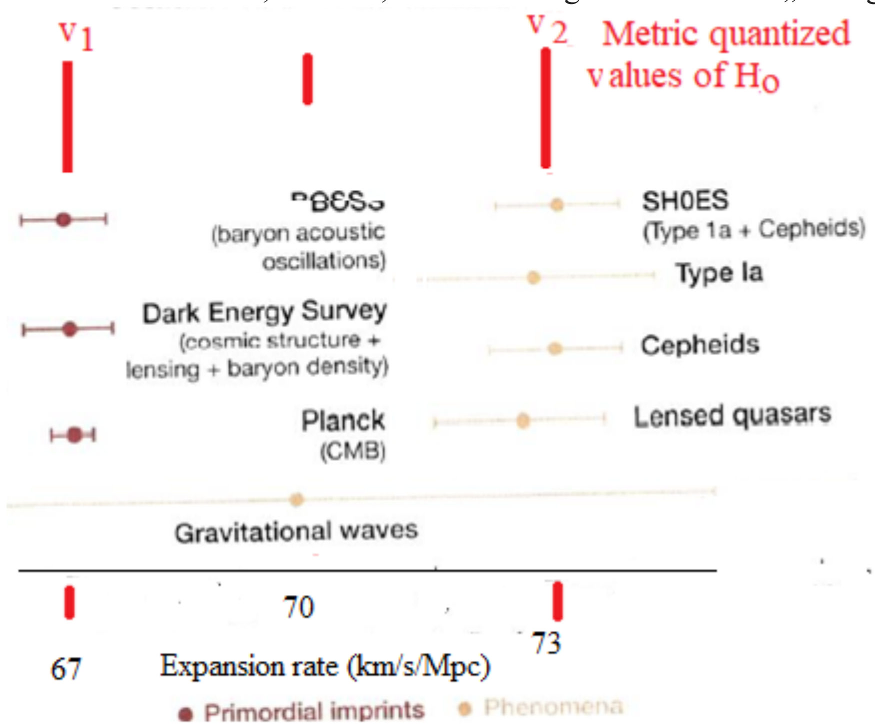
Note below equation 7.4.5 above that $t=13.8\text{X}10^9$years and use the standard method to translate this time into a Hubble constant. Thus in the standard method this time translates into light years which are $13.8\text{X}10^9/3.26=4.264\text{X}10^9$ parsecs= $4.264\text{X}10^3$ megaparsecs assuming speed c the whole time. So $3\text{X}10^5$km/sec/$4.264\text{X}10^3$ megaparsecs = 70.3km/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 3.26Megalightyear=(2.5/.821)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 refernence 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 $r>>r_H$ (far away from one of these particles) and so is nearly flat space since ε and Δε 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:

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

Λ=cosmological constant, p=pressure, ρ=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 ρ gives it a contribution to the cosmological constant of $4.7X10^{-36}/s^2$.
Since from equation 7.6.1 $a=a_o(e^{\omega t}-1)$ 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 $\omega=1.99X10^{-18}$ with 1 year=$3.15576X10^7$ seconds, also $c=3X10^8$ m/s. So:
$\Lambda= 3(\omega^2/c^2)=1.32X10^{-52}\ /m^2$, 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: $1.19X10^{-35}/s^2$. Add to that the above matter (i.e.,ρ) contributions to get $\Lambda=1.658X10^{-35}/s^2$ contribution.

## 7.7

Note that we have thereby derived the Newtonian gravitational constant G by using a radial coordinate transformation of the $T_{oo} =e^2\delta(0)$ charge density component to the coordinate system commoving with the expansion of the N+1 th fractal scale (cosmological).
Note that our new force we derived was charge and mass independent but the old force was charge dependent. Also note that the new force metric has universal geodesics that even curve space for photons. The old one had a q in the $k_{ij}$ (chap.17). If q=0 as with the photon there would be no effect on the trajectory of the photon whereas the same photon moving near a gravitational source would be deflected. Recall again this is all caused by the taking of the derivative in the above coordinate transformation.
So as a result of this coordinate transformation photons are deflected by the N+1 fractal scale metric and area not deflected by the Nth scale metric.
Also the GM does not change in the commoving coordinates for the same reason as the speed of light does not change as you enter a black hole, your watch slows down because of GR to compensate.

**References**

Merzbacher, *Quantum Mechanics,* 2nd Ed, Wiley, pp.597

**7.8 Comoving Interior Frame**

Recall from solution 2 (section 1.2) that the new pde zitterbewegung $E=1/\sqrt{\kappa_{oo}}$ energy smudged out $r=\langle r_o e^{i\omega t}\rangle$ with $\omega\rightarrow i\omega$ inside $r_H$. so m $r=\sinh\omega t$. Do a coordinate transformation (Laplace Beltrami) to the coordinate system of the r>rH commoving observer (us) and that equation pops right out.

**The Origin of that Mercuron**.

My new pde uses a source term $\kappa_{oo}$ in the external inertial reference frame. In contrast for the comoving term the field itself can be the origin of the field, especially near the time of the big bang so I must transform to the comoving coordinate system to derive the fields the comoving observer measures.
In that context in the commoving De Sitter metric reference frame inside $r_H$ we are not in free space anymore with instead the source term as the multiple of the Laplacian of the metric tensor in harmonic local coordinates (recall the Dirac eq.) whose components satisfy Ricci tensor = $R_{ij} =-(1/2)\Delta(g_{ij})$ where Δ is the Laplace-Beltrami second derivative operator is not zero. Geometrically, the Ricci curvature is the mathematical object that controls the growth rate of the volume of metric balls in a manifold. Note also the second derivative (Laplacian) of sinωt is –

$\omega^2$sin$\omega$t. Also recall that inside $r_H$ so that r<$r_H$, then sin$\omega$t–>sinh$\omega$t, which is rewritten as sinh$\mu$ to match with $R_{22}=e^{-\nu}[1+½ r(\mu'-\nu')]$ with $\mu=\nu$ (spherical symmetry). So the de Sitter metric submanifold is itself the source of this $R_{22}$ which is a nontrivial effect in the very early, extremely high density, universe.
I solved this $R_{22}$ equation and got $\ln(r_{M+1}/r_{bb})+2=[1/(e^{\mu}-1)-\ln[e^{\mu}-1]]2$
That Mandelbrot set Lepton analysis (appendix C) implies that u is the muon contribution (as a fraction of the tauon mass). Set $r_{M+1}=10^{11}$LY and get $r_{bb}$ (radius of Big Bang) of about 30million miles, approximately the size of Mercury's orbit (hence the "Mercuron"), a large enough volume to just pack together those $10^{82}$ electrons (With 3 each a proton) at r=$r_H$ separation.
Given these protons we *do not require protogenesis* and we also have an *equal number of particles and antiparticle*s(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

Recall we start out in the new pde external frame of reference that observes the Schwarzchild metric with perturbative rotation. Furthermore at r=rH we the Schwarzchild metric appears to the comoving observer as a De Sitter universe. But in the commoving De Sitter metric reference frame inside $r_H$ we are not in free space anymore so the multiple of the Laplacian of the metric tensor in harmonic local coordinates whose components satisfy $R_{ij}=-(1/2)\Delta(g_{ij})$ where $\Delta$ is the Laplace-Beltrami second derivative operator is not zero. Geometrically, the Ricci curvature is the mathematical object that controls the growth rate of the volume of metric balls in a manifold Note the second derivative (Laplacian) of sin$\omega$t is $-\omega^2$sin$\omega$t. Also recall that inside $r_H$ so that r<$r_H$, then sin$\omega$t→sinh$\omega$t, which is rewritten as sinh$\mu$ to match with $R_{22}=e^{-\lambda}[1+½ r(\mu'-\nu')]$ with $\mu=\nu$ (spherical symmetry) and $\mu'=-\nu'$. So the de Sitter metric submanifold is itself the source of this $R_{22}$ which is a nontrivial effect in the very early, extremely high density, universe. (Note that the contemporary G calculation in Ch.12 just uses the de Sitter sinh$\mu$ (just as in Ch.12 coordinate transformation because this feedback effect no longer is dominant in this era). So the usual spherically symmetric:
$R_{22}=e^{-\lambda}[1+½ r(\mu'-\nu')]-1=0$ → de Sitter metric cosh$\mu$=1, itself is the source, comoving coordinate
$R_{22}=e^{-\lambda}[1+½ r(\mu'-\nu')]-1=-\sinh\mu$ (A)
Use metric a ansatz: $ds^2=-e^{\nu}(dr)^2-r^2d\theta^2-r^2\sin\theta d\phi^2+e^{\mu}dt^2$ so that $g_{oo}=e^{\mu}$, $g_{rr}=e^{\nu}$. From $R_{ij}=0$ for spherical symmetry in free space

$$R_{11}=½\mu''-¼\nu'\mu'+¼(\mu')^2-\nu'/r=0 \qquad (6.4.7)$$
$$R_{22}=e^{-\nu}[1+½ r(\mu'-\nu')]-1=0 \qquad (6.4.8)$$
$$R_{33}=\sin^2\theta\{e^{-\nu}[1+½r(\mu'-\nu')]-1\}=0 \qquad (6.4.9)$$
$$R_{oo}=e^{\mu-\lambda}[-½\mu''+¼\nu'\mu'-¼(\mu')^2-\mu'/r]=0 \qquad (6.4.10)$$
$$R_{ij}=0 \text{ if } i\neq j$$

(eq. 6.4.7 -6.4.10 from pp.303 Sokolnikof): Equation 6.4.9 is a mere repetition of equation 6.4.8. We thus have only three equations on $\nu$ and $\mu$ to consider. From equations 6.4.7; 6.4.10 we deduce that $\nu'=-\mu'$. Here we consider the possibility of a large ambient metric C $\mu=\nu+C$ and **fractal selfsimilar comoving frame with Laplace-Beltrami -sinhu rotation (Kerr perturbation) $R_{22}$ source** as observed internally to $r_H$.

$R_{22}$=e $^{-\nu}$[1+½ r(μ'-ν')]-1=-sinhν=(-(e$^{\nu}$- e$^{-\nu}$)/2),   ν'=-μ' so
e $^{-\mu}$[-r(μ')]=-sinhμ-e$^{-\mu}$+1=(-(-e$^{-\mu}$+ e$^{\mu}$)/2)-e$^{-\mu}$+1=(-(e$^{-\mu}$+e$^{\mu}$)/2)+1=-coshμ+1. So given ν'=-μ'
e $^{-\nu}$[-r(μ')]= 1-coshμ. Thus
e $^{-\mu}$r(dμ/dr)]=1-coshμ
This can be rewritten as: e$^{\mu}$dμ/(1-coshμ)=dr/r (B)
The integration is from $\xi_1$= μ=ε=1 to the present day mass of the muon= .06 (X tauon mass).
Integrating equation B from ε=1 to the present ε value we then get:
ln($r_{M+1}/r_{bb}$)+2=[1/(e$^{\mu}$-1)-ln[e$^{\mu}$-1]]2 (7.8.1)
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 $r_H$.

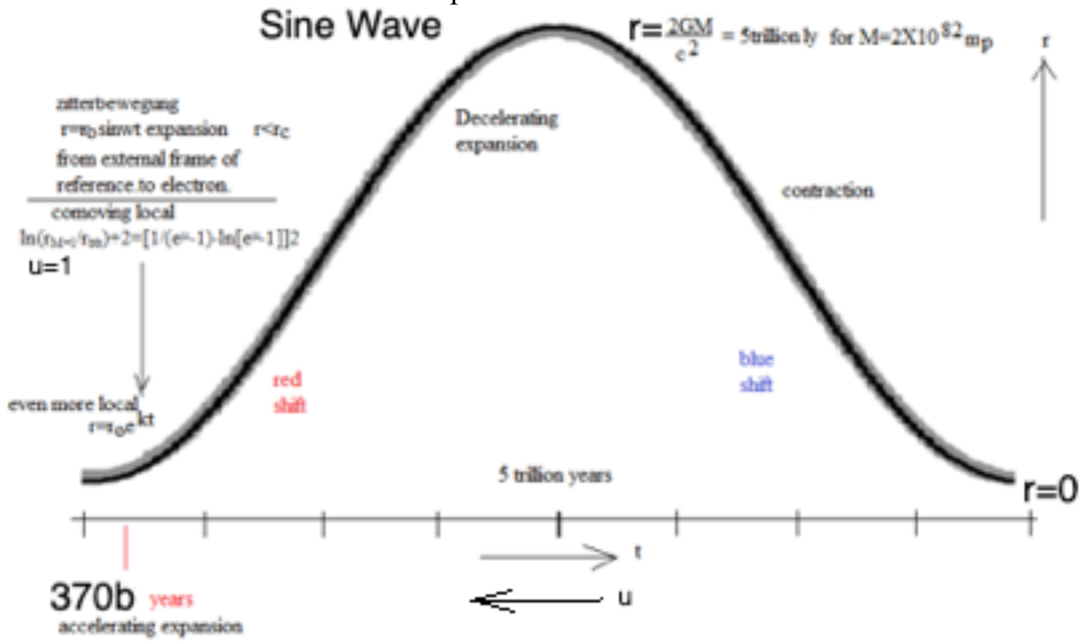
**Also Spherical Bessel Function Oscillation Nodes Inside Mercuron**
Given μ is the muon mass 7.4.4 in equation 7.8.1 the smallest radius of this oscillation period is about the radius of that Mercuron). Because of object B rotational energy 51 radial oscillation (270My into 14BY) nodes also exist in the Mercuron creating (4π/3)(51)$^3$=5.5X10$^5$ (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.7.8.1

```
      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
      endd=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
```

Sin(1-u)=r  gives the same functionality as the above program does for μ≈1 the sin(1-μ)

And the sine: sin(1-μ)≈sinh(1-μ). For larger 1-μ we must use 1-μ→i(1-μ) given sect 5.2 harmonic coordinates from the new pde in the sine wave bottom.




Recall object B is close by so we must include the small Kerr metric oblation term acosθ=.9602 in $r_{bb}^2 = r^2+a^2\cos^2\theta$ that gives an added Δε when it is inserted.
So substituting into $\ln(r_{M+1}/r_{bb})+2=[1/(e^{\mu}-1)-\ln[e^{\mu}-1]]2$ using the $r_{bb}$ value=~30M miles to the present $r_{M+1}$= 13.7X10$^9$LY value for the case with and without the oblation term gives $\ln(r_{M+1}/r_{bb})=36.06$ and current value ε=.06, and Δε=.00058 from the oblation term. Thus the present day mass of the muon gives us the size of the universe at the time of the big bang, it was not a point! Note that (from appendix A) all the $10^{81}$ baryons at $r_H$ (~$10^{-15}$m) separation were packed into this $(4\pi/3)r_{bb}^3$ volume and so not violating baryon number conservation since from this fractal theory these objects originated from a previous collapse. Thus we do not need to be concerned with baryogenesis because the baryons survived the big bang. Equation B implies that the commoving time turns out to be 370by. So the universe is not 13.7by old but 370by. This long of time explains the thermalization of the CBR and the mature looking galaxies and black holes at 13by ago. The contemporaneous tangent line intersection with the r axis for $r=r_oe^{kt}$ gives the 13by.
Thus we have derived the values of the free lepton masses in our new pde and have a curved space, non perturbative curved space generalization of the Heisenberg equations of motion. The comoving field is almost inertial on the straight sides so the sine wave is observed as a perfect sine wave by the external Dirac equation observer and near perfect by the comoving observer (that self field term on the bottom blunts the sine wave there.)
This would be the Schwarzschild metric (a=0) without object B. Given the incomplete inertial fram dragging angular momentum then provides an oblation term.
Recall that the new pde for $r<r_H$ gives iω→ω in its Heisenberg equations of motion.(Ch.10)
Thus $r=r_oe^{wt}$ or $\ln(r/r_o)=\omega t=\omega t_o\sqrt{(1+\varepsilon)}$ where the sum of the free lepton masses in the new pde is under the square root sign. Recall this equation gives our expanding universe and the second derivative gives the acceleration in this expansion. Note the (section 1.2.1) $10^{81}$ particles give above $r=r_H$ if edges touching can be contained in volume of radius 1.746X10$^{12}$ m Also the

present radius of the universe is approximately $13.7X10^9$LY=$1.27X10^{27}$m. Given the oblation term $a^2\cos^2\theta \equiv \Delta^2$ from the above rotation metric we have then $\ln(r_{M+1}/\sqrt{(r_M^2+\Delta^2)})=\ln(1.27X10^{27}/1.746X10^{12})=34.22$ if $\Delta=0$. Given the muon mass =.06 ((1/16.8) tauon mass) we find that $\Delta=1.641X10^{12}$m so that acos($1.64X10^{12}/1.746X10^{12}$)=20°, our polar angle from the rotation axis.
Recall from the above nonperturbative derivation we got $\varepsilon$=.060 without oblateness and with oblateness $r_L$ get the added rotation contribution $\Delta\varepsilon$=.00058. Note here (i.e.,eq.5.1.2) that there is no big bang from a point. Instead it is from 434million km radius object, so with just enough volume to hold all the baryons ($10^{81}$each of radius~.434Fermi) and so this type of "big bang" event can be easily computer modeled as a core collapse supernova like rebound (but too hot even for iron production). Note that the mass of the electron is determined by the drop in inertial dragging (giving that oblation term) due to nearby object B. 1, $\varepsilon$, $\Delta\varepsilon/2$ is the ratio of the tauon to muon to electron mass and so our new Dirac pde 9 gives us the three fundamental S state lepton masses with $\Delta\varepsilon$ the single ground state lepton with nonzero rest mass. Note also $\Delta\varepsilon=m_e \propto \hbar$ from eq.9 and $m_e \propto e^2 \propto \alpha h$ since $r_H$ is an integration constant. . The main result though of this chapter is that the *present numerical value of the lepton masses imply this huge fig.2a $10^{40}$X scale jump* (from S state classical electron radius=$10^{-18}$m to the $r_{final}$ cosmological radius) of equation 5.1.2 from the electron equation 9 object to the cosmological scale equation 9 object implied by equation 5.1.2. 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.).
That formula for the electron mass and also the fine structure constant alpha has the ambient metric epsilon (muon) in it.
Looked up the variation of alpha from: arXiv:1608.04593
$\Delta\alpha/\alpha = -2.18 \pm 7.27 \times 10^{-5}$. At 13by.
So to get it at 1by divide by 10 then: $\Delta\alpha/\alpha$= $2X10^{-6}$ at 1by.
The fine structure constant is proportional to the square of 1.25-([(1/64)/(1-ep/2)]+1/16+1/4).
Looked at the change in ep in the Grand Canyon Tonto to Unkar jump vs 270 My.
ep/2=.03 changes 1by by 10% which is: .003. 0.003 of 1/64 is $4.7X10^{-5}$. After squaring it is 1/32 **get $1.46X10^{-6}$. Actual is $2X10^{-6}$**.
My electron mass formula appears to also work for a completely different application: that of calculating the rate of change of the fine structure constant alpha.

**Sine Wave**

The 10 trillion years represents the period of object A we are inside. The 6billion year oscillation represents the gamma =917 of electron object B that we are on the edge of. It has a frequency 917X object A's from our frame of reference.

## 7.9 Summary

In the external reference frame the $\kappa_{oo}=1-r_H/r$ and the equation 9 (4AI) zitterbewegung gives a smudged out blob $r=\langle r_o e^{ikt}\rangle$ first solution ($r>r_H$, new pde, eq.9, 4AI) and $R_{ij}=0$ from the second solution. But in the commoving frame of reference inside $r<r_H$ in the new pde is not free space anymore and so $R_{ij}$ does not equal 0 anymore and so equals the above De Sitter dual choices sinh or cosh so the second solution requires $R_{ij}$=sinhu ($R_{22}$ eq.A left side does not match with cosh).

A second derivative of sinh is once again a sinh so this is a source in the Laplace-Beltrami second derivative operator-(De Sitter source). This result also comes out of the second solution but for the commoving internal observer frame of reference. Recall that the multiple of the Laplacian of the metric tensor in harmonic local coordinates whose components satisfy $R_{ij}=-(1/2)\Delta(g_{ij})$ where $\Delta$ is the Laplace-Beltrami second derivative operator. In that regard geometrically, the Ricci curvature is the mathematical object that controls the growth rate of the volume of metric balls in a manifold.
So $R_{22}$=sinhu comes out of the new pde with the second solution! This is equal to $e^{ud}u/(1\text{-cosh}u)=dr/r$ whose solution is $\ln(r_{M+1}/r_{bb})+2=[1/(e^u-1)-\ln[e^u-1]]2$.
This equation and the metric quantization sect. 6.8 stair step give the equation of motion stair v steps of our universe for the inside $r_H$ and so give that quantized Hubble constant.

Note here also the muon (and so the pion) were 100X times heavier at the big bang making the nuclear force equal to the E&M force then.

**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 (1.11, eq.1.24), pde for the neutrino (eq.1.12) 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 1.11+1.11+1.11 at $r=r_H$ strong force model (ie., 1.11+1.11+1.11 $r=r_H$, Ch.9,10)
So from the postulate of 1 we can now construct the standard model Largrangian, or at least predict the associated phenomenology, from all these results for the Nth fractal scale. Here it is:

1

$$-\tfrac{1}{2}\partial_\nu g^a_\mu\partial_\nu g^a_\mu - g_s f^{abc}\partial_\mu g^a_\nu g^b_\mu g^c_\nu - \tfrac{1}{4}g_s^2 f^{abc}f^{ade}g^b_\mu g^c_\nu g^d_\mu g^e_\nu + \tfrac{1}{2}ig_s^2(\bar{q}^\sigma_i\gamma^\mu q^\sigma_j)g^a_\mu + \bar{G}^a\partial^2 G^a + g_s f^{abc}\partial_\mu\bar{G}^a G^b g^c_\mu$$

2

$$- \partial_\nu W^+_\mu\partial_\nu W^-_\mu - M^2 W^+_\mu W^-_\mu - \tfrac{1}{2}\partial_\nu Z^0_\mu\partial_\nu Z^0_\mu - \tfrac{1}{2c_w^2}M^2 Z^0_\mu Z^0_\mu - \tfrac{1}{2}\partial_\mu A_\nu\partial_\mu A_\nu - \tfrac{1}{2}\partial_\mu H\partial_\mu H -$$
$$\tfrac{1}{2}m_h^2 H^2 - \partial_\mu\phi^+\partial_\mu\phi^- - M^2\phi^+\phi^- - \tfrac{1}{2}\partial_\mu\phi^0\partial_\mu\phi^0 - \tfrac{1}{2c_w^2}M\phi^0\phi^0 - \beta_h[\tfrac{2M^2}{g^2} + \tfrac{2M}{g}H + \tfrac{1}{2}(H^2+\phi^0\phi^0+2\phi^+\phi^-)] + \tfrac{2M^4}{g^2}\alpha_h - igc_w[\partial_\nu Z^0_\mu(W^+_\mu W^-_\nu -$$
$$W^+_\nu W^-_\mu) - Z^0_\nu(W^+_\mu\partial_\nu W^-_\mu - W^-_\mu\partial_\nu W^+_\mu) + Z^0_\mu(W^+_\nu\partial_\nu W^-_\mu - W^-_\nu\partial_\nu W^+_\mu)] - igs_w[\partial_\nu A_\mu(W^+_\mu W^-_\nu - W^+_\nu W^-_\mu) - A_\nu(W^+_\mu\partial_\nu W^-_\mu -$$
$$W^-_\mu\partial_\nu W^+_\mu) + A_\mu(W^+_\nu\partial_\nu W^-_\mu - W^-_\nu\partial_\nu W^+_\mu)] - \tfrac{1}{2}g^2 W^+_\mu W^-_\mu W^+_\nu W^-_\nu + \tfrac{1}{2}g^2 W^+_\mu W^-_\nu W^+_\mu W^-_\nu + g^2c_w^2(Z^0_\mu W^+_\mu Z^0_\nu W^-_\nu - Z^0_\mu Z^0_\mu W^+_\nu W^-_\nu) +$$
$$g^2 s_w^2(A_\mu W^+_\mu A_\nu W^-_\nu - A_\mu A_\mu W^+_\nu W^-_\nu) + g^2 s_w c_w[A_\mu Z^0_\nu(W^+_\mu W^-_\nu - W^+_\nu W^-_\mu) - 2A_\mu Z^0_\mu W^+_\nu W^-_\nu] - g\alpha[H^3 + H\phi^0\phi^0 + 2H\phi^+\phi^-] -$$
$$\tfrac{1}{8}g^2\alpha_h[H^4+(\phi^0)^4+4(\phi^+\phi^-)^2+4(\phi^0)^2\phi^+\phi^-+4H^2\phi^+\phi^-+2(\phi^0)^2H^2] - gMW^+_\mu W^-_\mu H - \tfrac{1}{2}g\tfrac{M}{c_w^2}Z^0_\mu Z^0_\mu H - \tfrac{1}{2}ig[W^+_\mu(\phi^0\partial_\mu\phi^- - \phi^-\partial_\mu\phi^0) -$$
$$W^-_\mu(\phi^0\partial_\mu\phi^+ - \phi^+\partial_\mu\phi^0)] + \tfrac{1}{2}g[W^+_\mu(H\partial_\mu\phi^- - \phi^-\partial_\mu H) - W^-_\mu(H\partial_\mu\phi^+ - \phi^+\partial_\mu H)] + \tfrac{1}{2}g\tfrac{1}{c_w}(Z^0_\mu(H\partial_\mu\phi^0 - \phi^0\partial_\mu H) - ig\tfrac{s_w^2}{c_w}MZ^0_\mu(W^+_\mu\phi^- - W^-_\mu\phi^+) +$$
$$igs_w MA_\mu(W^+_\mu\phi^- - W^-_\mu\phi^+) - ig\tfrac{1-2c_w^2}{2c_w}Z^0_\mu(\phi^+\partial_\mu\phi^- - \phi^-\partial_\mu\phi^+) + igs_w A_\mu(\phi^+\partial_\mu\phi^- - \phi^-\partial_\mu\phi^+) - \tfrac{1}{4}g^2 W^+_\mu W^-_\mu[H^2+(\phi^0)^2+2\phi^+\phi^-] -$$
$$\tfrac{1}{4}g^2\tfrac{1}{c_w^2}Z^0_\mu Z^0_\mu[H^2+(\phi^0)^2+2(2s_w^2-1)^2\phi^+\phi^-] - \tfrac{1}{2}g^2\tfrac{s_w^2}{c_w}Z^0_\mu\phi^0(W^+_\mu\phi^- + W^-_\mu\phi^+) - \tfrac{1}{2}ig^2\tfrac{s_w^2}{c_w}Z^0_\mu H(W^+_\mu\phi^- - W^-_\mu\phi^+) + \tfrac{1}{2}g^2 s_w A_\mu\phi^0(W^+_\mu\phi^- +$$
$$W^-_\mu\phi^+) + \tfrac{1}{2}ig^2 s_w A_\mu H(W^+_\mu\phi^- - W^-_\mu\phi^+) - g^2\tfrac{s_w}{c_w}(2c_w^2-1)Z^0_\mu A_\mu\phi^+\phi^- - g^1 s_w^2 A_\mu A_\mu\phi^+\phi^-$$

3

$$- \bar{e}^\lambda(\gamma\partial + m_e^\lambda)e^\lambda - \bar{\nu}^\lambda\gamma\partial\nu^\lambda - \bar{u}^\lambda_j(\gamma\partial + m_u^\lambda)u^\lambda_j - \bar{d}^\lambda_j(\gamma\partial + m_d^\lambda)d^\lambda_j + igs_w A_\mu[-(\bar{e}^\lambda\gamma^\mu e^\lambda) + \tfrac{2}{3}(\bar{u}^\lambda_j\gamma^\mu u^\lambda_j) - \tfrac{1}{3}(\bar{d}^\lambda_j\gamma^\mu d^\lambda_j)] +$$
$$\tfrac{ig}{4c_w}Z^0_\mu[(\bar{\nu}^\lambda\gamma^\mu(1+\gamma^5)\nu^\lambda) + (\bar{e}^\lambda\gamma^\mu(4s_w^2 - 1 - \gamma^5)e^\lambda) + (\bar{u}^\lambda_j\gamma^\mu(\tfrac{4}{3}s_w^2 - 1 - \gamma^5)u^\lambda_j) + (\bar{d}^\lambda_j\gamma^\mu(1 - \tfrac{8}{3}s_w^2 - \gamma^5)d^\lambda_j)] + \tfrac{ig}{2\sqrt{2}}W^+_\mu[(\bar{\nu}^\lambda\gamma^\mu(1+\gamma^5)e^\lambda) +$$
$$(\bar{u}^\lambda_j\gamma^\mu(1+\gamma^5)C_{\lambda\kappa}d^\kappa_j)] + \tfrac{ig}{2\sqrt{2}}W^-_\mu[(\bar{e}^\lambda\gamma^\mu(1+\gamma^5)\nu^\lambda) + (\bar{d}^\kappa_j C^\dagger_{\lambda\kappa}\gamma^\mu(1+\gamma^5)u^\lambda_j)] +$$

4

$$\tfrac{ig}{2\sqrt{2}}\tfrac{m_e^\lambda}{M}[-\phi^+(\bar{\nu}^\lambda(1-\gamma^5)e^\lambda) + \phi^-(\bar{e}^\lambda(1+\gamma^5)\nu^\lambda)] - \tfrac{g}{2}\tfrac{m_e^\lambda}{M}[H(\bar{e}^\lambda e^\lambda) + i\phi^0(\bar{e}^\lambda\gamma^5 e^\lambda)] + \tfrac{ig}{2M\sqrt{2}}\phi^+[-m_d^\kappa(\bar{u}^\lambda_j C_{\lambda\kappa}(1-\gamma^5)d^\kappa_j) +$$
$$m_u^\lambda(\bar{u}^\lambda_j C_{\lambda\kappa}(1+\gamma^5)d^\kappa_j] + \tfrac{ig}{2M\sqrt{2}}\phi^-[m_d^\lambda(\bar{d}^\lambda_j C^\dagger_{\lambda\kappa}(1+\gamma^5)u^\kappa_j) - m_u^\kappa(\bar{d}^\lambda_j C^\dagger_{\lambda\kappa}(1-\gamma^5)u^\kappa_j] - \tfrac{g}{2}\tfrac{m_u^\lambda}{M}H(\bar{u}^\lambda_j u^\lambda_j) - \tfrac{g}{2}\tfrac{m_d^\lambda}{M}H(\bar{d}^\lambda_j d^\lambda_j) + \tfrac{ig}{2}\tfrac{m_u^\lambda}{M}\phi^0(\bar{u}^\lambda_j\gamma^5 u^\lambda_j) -$$
$$\tfrac{ig}{2}\tfrac{m_d^\lambda}{M}\phi^0(\bar{d}^\lambda_j\gamma^5 d^\lambda_j) +$$

5

$$\bar{X}^+(\partial^2 - M^2)X^+ + \bar{X}^-(\partial^2 - M^2)X^- + \bar{X}^0(\partial^2 - \tfrac{M^2}{c_w^2})X^0 + \bar{Y}\partial^2 Y + igc_w W^+_\mu(\partial_\mu\bar{X}^0 X^- - \partial_\mu\bar{X}^+ X^0) + igs_w W^+_\mu(\partial_\mu\bar{Y}X^- -$$
$$\partial_\mu\bar{X}^+ Y) + igc_w W^-_\mu(\partial_\mu\bar{X}^- X^0 - \partial_\mu\bar{X}^0 X^+) + igs_w W^-_\mu(\partial_\mu\bar{X}^- Y - \partial_\mu\bar{Y}X^+) + igc_w Z^0_\mu(\partial_\mu\bar{X}^+ X^+ - \partial_\mu\bar{X}^- X^-) + igs_w A_\mu(\partial_\mu\bar{X}^+ X^+ -$$
$$\partial_\mu\bar{X}^- X^-) - \tfrac{1}{2}gM[\bar{X}^+X^+H + \bar{X}^-X^-H + \tfrac{1}{c_w^2}\bar{X}^0X^0H] + \tfrac{1-2c_w^2}{2c_w}igM[\bar{X}^+X^0\phi^+ - \bar{X}^-X^0\phi^-] + \tfrac{1}{2c_w}igM[\bar{X}^0X^-\phi^+ - \bar{X}^0X^+\phi^-] +$$
$$igMs_w[\bar{X}^0X^-\phi^+ - \bar{X}^0X^+\phi^-] + \tfrac{1}{2}igM[\bar{X}^+X^+\phi^0 - \bar{X}^-X^-\phi^0]$$

Fig. 10

The next fractal scale N+1 coming out of our eq.1 gives the cosmology and GR gravity, which is not included in the standard model. In fact the whole model repeats on the N+1 fractal scale. Object B provides ambient metric quantization states that have been observed implying new physics. So there is the promise of breakthrough physics from our new (postulate 1) model.

Review
Note from our **ONE** assumption min(zz-z)>0 (**postulate** of **1**) we derived the **new pde** with its fractal $r_H$ (sect.1.1-1.2)
Note in contrast the SM has 23 (and counting) free parameters and oodles and oodles of assumptions , perhaps **hundreds** (see above figure).

Our **Free Parameters**: Actually there are ***no*** free parameters here.
The ratio of electron mass m to proton (or tauon mass) is determined by the distance to object B,
is the closest thing to a free parameter here (but it really isn't since in principle we could find that distance.).
Also the muon mass changes with time here, can be calculated from the present gravitational constant G. (Ch.7)
For example:
The charge ke^2 is determined from the Fiegenbaum point $C_M$. ($C_M/m=r_H$)
The Lamb shift and anomalous gyromagnetic ratio found from the third term of the Taylor expansions of the square roots in the new pde.
The 10^82 particles in the universe are found from the Mandelbrot set (counting trifurcations at the Fiegenbaum pt)
The 10^40X fractal scale jump comes out of the Mandelbrot set.
The average temperature T of the universe found from the Mandelbrot set (C>1/4 for time).
We derive the gravitational constant G from our fractal new pde separation of variables and present Hubble "constant"(Ch.7).
h is a unit multiplier that first defines energy (E=hf=2mc^2) from frequency f in that circle operator formalism exponent. (sect.1.1)
c is from the units we choose for time dt and dr distance (in c=dr/dt) and also determines $u_o$ and $e_o$ (in c=1/sqrt($u_oe_o$))
uB (Bohr magneton) is found from the Dirac equation (recall gyromagnetic ratio derivation).
W and Z masses derived for e sitting at $2P_{1/2}$ at r=rH and those required polar coordinate rotations.
The strength of the strong force is from the relativistic dilation of those E field lines due to the ultra relativistic motion in $2P_{3/2}$ at r=rH.
The rH'=rH/2000 of the leptons is derived from the Fitzgerald contraction (not rotation) of the S state.
Fermi constant GF from Compton wavelength volume for W.
Cabibbo angle 'A' comes out of that gamma 5 iteration of the new pde **1/4**=sinA for the 2P1/2 ->2P3/2 +e decay.
CP conservation 'constant' proportional to Energy from the (rotating) Kerr metric cross term kdtdphi caused by us being inside a rotating object,
strong additional evidence we are in a (rotating new pde) fractal universe.
(so we get the entire CKM matrix)
etc,.

**Derivation of the Standard Model But With No Free Parameters**

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

Hey, being able to derive the Standard electroweak Model (SM) in such a clean way is the *mother of all reality checks*.
Cool Heh?

**7.11 Summary**

This is a first principles derivation of mathematics and theoretical physics. "Astronomers are observing from the inside of what particle physicists are studying from the outside, ONE object, the new pde (2AI) electron". Recall the electron was the only object in the first quadrant (so positive integer), every other object is an excited state, caused by increasing noise C. So we started with postulate of 1 and ended with ONE after all this derivation (solving two equations for two unknowns) derivation, we derived ONE thing, which must be the same thing! So we really did just "postulate ONE" and nothing else, as we claimed at the beginning. That makes this theory remarkably comprehensive (all of theoretical physics and rel# math) and the origin of this theory remarkably simple: "one".
So we have only ONE simple postulate here.

**7.12 The Above Mainstream Model (fig.10) Has Many Free Parameters, This Fractal Model has None**

For example the Mandelbrot set $\{C_M\}=r_H$ in $dr-C_M$ so we can always set $C_M=2ke^2/m_ec^2$. $c^2m_edr=c^2m_eC_M=2ke^2$ to define our length units. In section 1.2.7 we show that with a *single* $m_e$ (nonzero proper mass) we can start with arbitrary $ke^2/r$ energy units and have no free parameters among these values. Note this 1.11 electron has the only nonzero proper mass $m_e$ (i.e.,so only $C_M$) in free space making it the only fractal solution. In the time domain the h in $E=h(1/t)$ just defines energy units (equation 4.6) in terms of event time intervals t. The gyromagnetic ratio of $m_e$ is derived from the rotated 1.11, eq.1.24 new pde. The muon mass comes from the distance to object B (Ch.5). The proton mass comes from the flux quantization h/2e (Sect.8.1). The other highest energy boson masses come from the Paschen Back effect given this proton mass (Ch.8). The strength of the strong force arrises from the ultrarelativistic field line compression in the 2AI+2AI+2AI model (Ch.8). The mass energies and quantum numbers of the many particles below about 1.5GeV come out of the Frobenius solution (Ch.9) which is merely a solution to eq.1.24 (i.e., 1.11). Recall the CP violation is due to the fractalness (selfsimilarity with a spinning electron): we are inside a rotating object Kerr metric implying a cross term $d\phi dt$ in it. So you can derive the CP violation magnitude that they use in the CKM matrix. Multiply through the Fermi interaction integral (from the Standard model output and this output from the theory) and integrate to get the Cabibbo angle eq.10.8.7). The pairing interaction force of superconductivity is even derived by substituting the $\kappa_{\mu\mu}$ in the geodesic equations (sect.4.5). You can derive the neutrino masses for a nonhomogenous non isotropic space time (Ch.3). We derived the exact value of the pion mass (Ch.9).

Note since quarks don't exist in this model (they are merely those $2P_{3/2}$ trifolium lobes at $r=r_H$) those 6 quark mass free parameters vanish. The Mandelbrot set $10^{40}$X scale change automatically sets the universe size and the gravitational constant size (sect.7.4) in comparison to classical electron mass and E&M force strength respectively.

If you do a tally **that free parameter list has just shrunk from ~30 down to 0**: so they are all derivable parameters, not free.. In contrast setting these parameters as free parameters is really postulating them because the parameter values are postulated. The equations they are used in constitute many more postulates (fig.10), so the number of potulates you get doing it that way goes out the roof, 100 or so?

But you have to ask yourself: where did all these assumptions come from? You actually do not understand the fundamental physics at all if you require a lot of postulates, free parameters, etc., you are merely curve fitting. In contrast here we have only one simple postulate and get the whole shebang out all at once: that being the standard model particles and cosmology and gravity. We finally 'understand' in the deepest sense of that word!

Note this model (Ch.1) also has none of the mainstream paradoxes either (Klein paradox, Dirac sea, $10^{96}$grams/cm$^3$ vacuum, infinite mass and charge,.. in Ch.4) and not a single gauge but it still keeps the QED precision (eg., see Lamb shft calculation in 6.12).

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[i] Weinberg, Steve, *General Relativity and Cosmology*, P.257