A Generally Covariant Generalization of the Dirac equation that does not require gauges(Newpde)

David Maker

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

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

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

References

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

(2)Spherical symmetry: $(\gamma^x \sqrt{\kappa_{xx}}dx+\gamma^y \sqrt{\kappa_{yy}}dy+\gamma^z \sqrt{\kappa_{zz}}dz+\gamma^t \sqrt{\kappa_{tt}}idt)^2=\kappa_{xx}dx^2+\kappa_{yy}dy^2+\kappa_{zz}dz^2-\kappa_{tt}dt^2=ds^2$

$\kappa_{xx}=\kappa_{yy}=\kappa_{zz}=\kappa_{tt}=1$ is flat space, Minkowski, as in his Dirac equation(1).

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

(4) Here $\kappa_{oo}=1-r_H/r=1/\kappa_{rr}$, $r_H=(2e^2)(10^{40N})/(mc^2)$. The **N**=..**-1,0,1**,.. applies to the Nth Fiegenbaum point self-similar fractal scale. Newpde from Occam's razor *optimized* **postulate**1: z=zz is the algebraic definition of **1** and adding (small) constant C is trivial in z+C=zz, δC=0 (1)

A Substitute z=1+δz into equation 1 and get 2D Dirac equations for e,ν (sect.1.1).

B Substitute left side z into right side zz repeatedly in equation 1and get the 2D Mandelbrot set

A,**B** together gives 4D Newpde. So **Postulate**1→**Newpde**

(5) For **N=0** the third order Taylor expansion term of $\sqrt{\kappa_{\nu u}}$ gives the Lamb shift and anomalous gyromagnetic ratio (without the renormalization and infinities(6))

For **N=-1** (i.e.,e^2X10^{-40}) $\kappa_{\mu\nu}$ is then the Schwarzschild metric $g_{\mu\nu}$; so we just derived General Relativity and the gravity coupling *from* Quantum Mechanics(QM) in one line. So κ_{uv} even provides the general covariance of the Newpde. Eq 2a (ref.7) *even* provides us space-time r,t

For **N=1** (so $r<r_C$) Newpde zitterbewegung expansion stage explains the universe expansion.

For **N=1** zitterbewegung harmonic coordinates *and* Minkowski metric submanifold (after long time expansion) gets De Sitter ambient metric we observe astronomically(B1).

For **N=0** $r=r_H$ composite 3e is the baryons and composite e,ν is the Standard electroweak Model Bosons(append.A). We derived Quantum Mechanics (QM,Newpde) for *all* N fractal scales!(B3)

For **N=1** for example the QM large wavelength psi's provide the explanation for the **large stellar speeds** v in the halos (eg.,Witten's 'fuzzy'theory). Just set $\kappa_{oo}=g_{oo}$ in the halo, solve for constant v

For **N=1** there is a ambient fractal self similar (S=½) cosmological Kerr metric *Newpde* rotation so with off diagonal dtdϕ cross term T violation that **then causes** the (given CPT) **CP violation** and (the selfsimilar S=½ spin axis) also puts a weak dipole on the cbr sky (thus the 'axis of evil')

For **N=0** (Eqs.2-5, ref.7) 2D $R_{oo}-(1/2)g_{oo}R=G_{oo}=+H_e+H_\nu$ giving $\sigma*p=H_\nu$ a negative sign and so **left handed chirality** to ν for maximally symmetric space (MS) time since then for 2D $G_{oo}=0$. If not MS, as in a nonzero gravity gradient, H_ν (**neutrino**) thereby **gains** G_{oo}, i.e., **mass.**

References (continued)

6) Need infinities if flat space Dirac equation. For flat space $\partial g_{ik}/\partial x^j=\mathbf{0}$ as a limit. Then must take $g^{km}=1/0=\infty$ to get finite Christoffel symbol $\Gamma^m_{ij}\equiv(g^{km}/2)(\partial g_{ik}/\partial x^j+\partial g_{jk}/\partial x^i-\partial g_{ij}/\partial x^k)$ $=(1/\mathbf{0})(\mathbf{0})$=*un*defined but still implying *non*zero acceleration on the left side of the geodesic equation: $\frac{d^2x^\mu}{ds^2}=-\Gamma^\mu_{\nu\lambda}\frac{dx^\nu}{ds}\frac{dx^\lambda}{ds}$ So we need infinite fields for flat space. Thus QED requires (many such) infinities. But we have in general curved space $g_{ij}=\kappa_{ij}$ in the New pde so do not require that anything be infinite and yet we still obtain for the third order Taylor expansion term of $\sqrt{\kappa_{\mu\nu}}$ the Lamb shift and anomalous gyromagnetic ratio correction (sect.1.2).

7)Derivation of Newpde: **Physics of self similar fractal scales**

We can do this using the Occam's razor *optimized* **postulate** 1. For example z=zz is the algebraic definition of 1 and adding constant C is trivial in

$$z+C=zz,\ \delta C=0 \qquad \textbf{(1)}$$

A Substitute $z=1+\delta z$ into **equation 1**, get $\delta z+\delta z\delta z-C=0$ (or $\delta(\delta z+\delta z\delta z)=0$) (2)

We asume C has a constant density. Solve eq.2 and in-general get $\delta z=\frac{-1\pm\sqrt{1+4C}}{2}$,

C<<-¼, so **BIG-C** so big δz for **(**for random time t) complex solution $\delta z=dr+idt$ (3)

Big δz so δz<<δzδz (and δδz≈0) in eq.2. So $\delta(\delta z+\delta z\delta z)\approx\delta(\delta z\delta z)=(dr^2-dr^2+i(drdt+dtdr))=0$ (4) and take real Minkowski and imaginary component Clifford algebra which for negative and positive dr,dt imply *non*infinite extremum $drdt+dtdr=0=\gamma^i dr\gamma^j dt+\gamma^j dt\gamma^i dr=(\gamma^i\gamma^j+\gamma^j\gamma^i)drdt=0$ (5)

Given that Clifford algebra we get, after factoring $dr^2-dr^2=ds^2$, 2D Dirac equations for e,ν.(δz≡ψ)

B Substitute left side z into right side zz repeatedly in **equation 1** and thereby get the **Mandelbrot set** iteration (with its well known $10^{40\mathbf{N}}$X fractal selfsimilar **N**=.,.-1,0,1,..scale jumps at Fiegenbaum point C_M 2D nonflat extremum δz'). C is not uniform density here.

Notes: **Big -C case** allows random t and so Hamiltonians H (i.e.,***physics***)

Real eigenvalues of H require the (**Mandelbrot set** subset) Cauchy sequence, sect.2.3.

Big **γ** (in (1/γ)δz) boost means small C≈δz>>δzδz (so δ(δz')=0) and so no more quadratic equation but we still keep our complex δz and so dt. Small C is z=zz **postulate** 1.

A,B together (and the γ boost**)** gives: **Newpde** $\gamma^\mu\sqrt{(\kappa_{\mu\mu})}\partial\psi/\partial x_\mu=(\omega/c)\psi$ for e,ν with $\kappa_{oo}=1-r_H/r=1/\kappa_{rr}$, $r_H=(2e^2)(10^{40\mathbf{N}})/(mc^2)$ Summary: **Postulate**1**→Newpde**

8) **ring of truth:** Equation1 bears a striking resemblance to the **Mandelbrot** set iteration formula and *yet* puts out as imaginary & real components the **Dirac** eqs. for e,*ν*. They are connected! (also via Newpde). So we thereafter just do that big γ boost that gets small δz≈C and so zz=z so postulate1 (γ boost also gets the numerical outputs of the Newpde such as that mc^2)

Note this is the first Ockam's razor *optimized* (i.e., postulate1) method of deriving theoretical physics (We figured it out! Appen.A8), not that ~100 postulates, assumptions, >23 free parameters mess (So where do those many postulates come from?). Furthermore, this New pde Nth fractal scale approach is clearly the path to breakthrough physics and generates correct physical constants as we saw in reference 5.

I Summary: Algebra Details of the two substitutions (A,B):

1.1 (Simply **postulate 1**. But z=zz is the algebraic definition of 1 and adding constant C (or K) is trivial in:) zz=z+C, δC=0 **(1)**

A Substitute z=1+δz into **eq.1**, get δz+δzδz=C (2) (or δ(δz+δzδz)=0) with in general (for $\delta z=\frac{-1\pm\sqrt{1+4C}}{2}$, **C<<-¼**, so**Big-C** and so big δz for random time t complex solution δz=dr+idt (2a) Big δz so, δz<<δzδz,. δδz=0 So from eq.2,2a δ((δz+δzδz)≈δ(δzδz)=(dr^2-dr^2+i(drdt+dtdr))=0 (2b) and take real Minkowski and imaginary component Clifford algebra which for negative and positive dr,dt the *non*infinite extremum drdt+dtdr=0= $\gamma^i dr\gamma^j dt+\gamma^j dt\gamma^i dr=(\gamma^i\gamma^j+\gamma^j\gamma^i)drdt$ =0 (3) Factor dr^2-dt^2 =ds^2 eg., δ[(dr+dt)(dr-dt)]=0=[[δ(dr+dt)](dr-dt)]+[(dr+dt)[δ(dr-dt)]] and solve to get: (ds ≡ proper time invariant.)

(→±**e**) dr+dt=ds, dr-dt=ds ≡ds_1 for +ds→ I, IV quadrants (4)

(→light cone ***v***) dr+dt=ds, dr=-dt, for +ds→ II quadrant (5)

" " dr-dt=ds, dr=dt, " " III quadrant (6)

(→vacuum) dr=dt, dr=-dt so dt=0=dr (7)

We square eq.4 ds_1^2=(dr+dt)(dr+dt) =[dr^2+dt^2] +(drdt+dtdr) ≡ds^2+ds_3=ds_1^2. Since ds_3 (is max or min) and ds^2 (from eq.4) are invariant then so is **Circle** ds^2=dr^2+dt^2 =ds_1^2-ds_3. Note this separate ds is a minimum at 45° and so Circle≡δz=$dse^{i\theta}$=$dse^{i(\Delta\theta+\theta o)}$= $dse^{i((\cos\theta dr+\sin\theta dt)/(ds)+\theta o)}$, θ_o=45°.We define k≡dr/ds, ω≡dt/ds, sinθ≡r, cosθ≡t. $dse^{i45°}$≡ds'. So take the global ordinary dr derivative (since flat space) of 'Circle' $\frac{\partial\left(dse'^{i\left(\frac{rdr}{ds}+\frac{tdt}{ds}\right)}\right)}{\partial r}=i\frac{dr}{ds}\delta z$ so $\frac{\partial\left(dse^{i(rk+wt)}\right)}{\partial r}=ik\delta z,\ k\delta z=-i\frac{\partial\delta z}{\partial r}$ (8 Cancel that $e^{i45°}$ coefficient then multiply both sides of eq.8 by ħ and define δz≡ψ, p≡ħk. Eq.8 then implies (Hermitian) operator ħk **observable***s* formalism(QM). See next paragraph for real k part, (also appendix B3). Eqs 4,5,6,8 and eq.3 Clifford algebra imply 2D Dirac equations for e,*v*.

Needed Big -C to have random t and Hamiltonians (***observability***)

B Substitute left side z into right side zz repeatedly of **eq.1** to get a Mandelbrot set iteration (for small C limit **eq.1** cases z≈1,0). The right side extremum Cauchy seq. iteration defines **real** k (dr/ds eigenvalues) in eq.8**.** It's left side small drdt (eq.3, δ(drdt)=0) extremum is the fractal Fiegenbaum pt.=C_M Mandelbulb δz'. Note certain Cs have a higher density here so *perturbations* **A&B Big γ** (1/γ)δz boost means small C≈δz>>δzδz and so no more quadratic equation but still keeps our complex δz and so dt. So we must Fitzgerald contract (boost=γ) δz to get small C and so z=zz and the **postulate** of 1. So then boost C_M as in δz'=C=C_M/γ=C_M/ξ=r_H so ξ_1 (defining mass) *must be big*. For z=1 in z=1+δz, δz is small and so in C_M=ξδz, **ξ_1 *is* big** and so we got z=zz and the **postulate** of 1**.** But for z=0, δz is big so ξ_o is small and in δC_M=δξδz+ξδδz=0 then since δδz=0 then δξ small so ξ_o is both stable and small (≡electron). On small scales δz >>δzδz so in eq.2 |δz|≈C=constant so can only perturb eq.4 at 45°using (dr-δz')+(dt+δz')≡dr'+dt'=ds (9) since ds=|δz|=C. Define κ_{rr}≡(dr/dr')^2= (dr/(dr-(C_M/ξ_1)))^2=1/(1-r_H/r)^2 =A_1/(1-r_H/r) +A_2/(1-r_H/r)^2 r≡dr. The A_I term can be split off from RN (as in classic GR) and so κ_{rr}≈1/[1-((C_M/ξ_1)r))] . So we have: ds^2= $\kappa_{rr}dr'^2$ +$\kappa_{oo}dt'^2$ +..(10). Note from eq.3 dr'dt'= $\sqrt{\kappa_{rr}}dr\sqrt{\kappa_{oo}}dt$ =drdt so κ_{rr}=1/κ_{oo} so given that 2D perturbation we get curved space 4D. For 4D our eq.3 Cliffordalgebra then implies $(\gamma^x\sqrt{\kappa_{xx}}dx+\gamma^y\sqrt{\kappa_{yy}}dy+\gamma^z\sqrt{\kappa_{zz}}dz+\gamma^t\sqrt{\kappa_{tt}}idt)^2=\kappa_{xx}dx^2+\kappa_{yy}dy^2+\kappa_{zz}dz^2-\kappa_{tt}dt^2=ds^2$. Multiplying the bracketed term by 1/ds &δz then eq 8 implies 4D **Newpde** $\gamma^\mu(\sqrt{\kappa_{\mu\mu}})\partial\psi/\partial x_\mu=(\omega/c)\psi$ for e,*v* (11) (covariant derivative still ordinary since ψ (complex) scalar). Therefore **postulate1→Newpde**

Small C boost gets z=zz (so postulate 1) but also gets the ***numerical* value of Large ξ_1**
For that stable z=0 the only way to get stable large ξ (required by that small C boost) is with the Newpde composite 3e $2P_{3/2}$ at $r=r_H$ state (partII davidmaker.com). So *stability* $(dt'^2=(1-r_H/r)dt^2)$ clocks stop at $r=r_H$ The *two positron motion* and h/2e quantization of flux BA then gives us the exact proton mass m_p as a reduced mass for the associated Hund rule $\tau\equiv 2S_{1/2},1S_{1/2}\equiv\mu$ states (so $\tau+\mu=\xi_1$, $m_p=\xi_1/2$). We rewrite this in the Kerr metric formalism with the 3rd mass also reversing the pair annihilation (Thus virtual pair creation inside the r_H volume given $\sigma=\pi r_H^2\approx(1/20)$barns) and reducing the inertial frame dragging due to the spin½ ξ_1 thereby adding a Kerr metric $-(a/r)^2$ angular momentum operator in $\kappa_{oo}=1-(a/r)^2-r_H/r=\xi_1+\xi_o-C_M/(\xi_o r)=\tau+\mu+m_e-2e^2/(\xi_o r)=$ $\mathbf{1+\varepsilon+\Delta\varepsilon+2e^2/(\xi_o r)=\kappa_{oo}}$ (Fiegenbaum pt. C_M defines charge e^2.). Divide by $\xi_1=1+\varepsilon$ to normalize for only free electron $\Delta\varepsilon$ energy (Needed for the following two electron applications in eqs.15,16) asymptotic local flat space and thereby finally getting back to that initial requirement for that free particle z=1, *large* ξ_1 case: $\kappa_{oo}=1-\xi_o/(1+\varepsilon)-C_M/(\xi_1 r)=1+\Delta\varepsilon/(1+\varepsilon)-2e^2/(2m_p r)$ (12) also giving us the *numerical value* of that **large ξ_1** ($=2m_p$). With τ normalized to $\tau=1$ with the Newpde ground state e mass then $\Delta\varepsilon=m_e=.0005799$ with $\varepsilon=\mu=.06$. (12a)

1.2 A N=0 Application example: Separation Of Variables On New Pde

After separation of variables the "r" component of equation 11 (Newpde) can be written as

$$\left[\left(\frac{dt}{ds}\sqrt{\kappa_{00}}m_p\right)+m_p\right]F-\hbar c\left(\sqrt{\kappa_{rr}}\frac{d}{dr}+\frac{j+3/2}{r}\right)f=0 \qquad (13)$$

$$\left[\left(\frac{dt}{ds}\sqrt{\kappa_{00}}m_p\right)-m_p\right]f+\hbar c\left(\sqrt{\kappa_{rr}}\frac{d}{dr}-\frac{j-1/2}{r}\right)F=0. \qquad (14)$$

Using the above Dirac equation component we find the anomalous gyromagnetic ratio Δgy 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 $1/\sqrt{\kappa_{rr}}$ rescales dr in $\left(\sqrt{\kappa_{rr}}\frac{d}{dr}+\frac{j+3/2}{r}\right)f$ in equation 13. Thus to have the same rescaling of r in the second term we must multiply the second term denominator (i.e.,r) and numerator (i.e., J+3/2) each by $1/\sqrt{\kappa_{rr}}$ and set the numerator ansatz equal to $(j+3/2)/\sqrt{\kappa_{rr}}\equiv 3/2+J(gy)$, where gy is now the gyromagnetic ratio. This makes our equation 13, 14 compatible with the standard Dirac equation allowing us to substitute the gy into the Heisenberg equations of motion for spin S: $dS/dt\propto m\propto gyJ$ to find the correction to dS/dt. Thus again:

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

$[1/\sqrt{\kappa_{rr}}](3/2+½)=3/2+½gy=3/2+½(1+\Delta gy)$ (15)

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

Thus in equation 15 we get the gyromagnetic ratio of the electron with eq.12a $\kappa_{rr}=1/(1+\Delta\varepsilon/(1+\varepsilon))$ and $\varepsilon=0$ for electron. Thus solve equation 15 with eq.12a values for $\sqrt{\kappa_{rr}}=1/\sqrt{(1+\Delta\varepsilon/(1+\varepsilon))}=$ $1/\sqrt{(1+\Delta\varepsilon/(1+0))}=1/\sqrt{(1+.0005799/1)}$. Thus from equations 15,12,12a $[\sqrt{(1+.0005799)}](3/2+½)=3/2+½(1+\Delta gy)$. Solving for Δgy 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 κ_{oo} in eq.11 we get the anomalous gyromagnetic ratio correction of the muon in the same way

Separation of Variables

After separation of variables the "r" component of equation 11 (Newpde) can be written as

$$\left[\left(\frac{dt}{ds}\sqrt{\kappa_{00}}m_p\right)+m_p\right]F-\hbar c\left(\sqrt{\kappa_{rr}}\frac{d}{dr}+\frac{j+3/2}{r}\right)f=0 \qquad (13)$$

$$\left[\left(\frac{dt}{ds}\sqrt{\kappa_{00}}m_p\right)-m_p\right]f+\hbar c\left(\sqrt{\kappa_{rr}}\frac{d}{dr}-\frac{j-1/2}{r}\right)F=0. \qquad (14)$$

Comparing the flat space-time Dirac equation to the left side terms of equations 13 and 14:

$$(dt/ds)\sqrt{\kappa_{oo}}=(1/\kappa_{00})\sqrt{\kappa_{oo}}=(1/\sqrt{\kappa_{oo}})=\text{Energy}=E \qquad (16)$$

Note for electron motion around hydrogen proton $mv^2/r=ke^2/r^2$ so $KE=½mv^2=(½)ke^2/r=PE$ potential energy in PE+KE=E. So for the electron (but not the tauon or muon who are not in this orbit) $PE_e=½e^2/r$. Here write the hydrogen energy and pull out the electron contribution. So from eq.16: $r_{H'}=(1+1+.5)e^2/(m_\tau+m_\mu+m_e)/2=2.5e^2/(2m_pc^2)$. (17)

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

Next note for the variation in $\psi^*\psi$ is equal to zero at maximum $\psi^*\psi$ probability density where for the hydrogen atom is at $r=n^2a_o=4a_o$ for n=2 and the $\psi_{2,0,0}$ eigenfunction. Also $m_Lc^2=(m_\tau+m_\mu+m_e)c^2=2m_pc^2$ normalizes $½ke^2$ (Thus divide $\tau+\mu$ by 2 and then multiply the whole line by 2 to normalize the Taylor expansion result $m_e/2$. $\varepsilon=0$ since no muon ε here.): So substituting eqs.17 and eq.12, and 12a values in eq.16:

$$E_e=\frac{(tauon+muon)(\frac{1}{2})}{\sqrt{1-m_ec^2-\frac{r_{H'}}{r}}}-\left(tauon+muon+PE_\tau+PE_\mu\right)\frac{1}{2}=$$

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

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

So: $\Delta E_e=2\frac{3}{8}\left(\frac{2.5}{rm_Lc^2}\right)^2m_Lc^2$ = (Third order $\sqrt{\kappa_{\mu\mu}}$ Taylor expansion term)=

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

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

The other 1050Mhz comes from the zitterbewegung cloud.

1.3 Conclusion: Postulate1 as z=zz, add constant C as in z=zz+C, δC=0 (1)

uniquely implies the **Newpde** given that later small C boost returning us to z≈zz. We finally found an *optimized* Occam's razor physics theory(1).

So we really did figure it out! For example recall from the introduction that composite 3e $2P_{3/2}$ at $r=r_H$ is the proton: The big proton mass implies high $\gamma=917$ (speed) positrons means Fitzgerald **contracted E field lines is the strong force**. The two positrons have a large ξ, two body motion(partII) so **ortho(s,c,b) and para(t) excited (multiplet) states.**

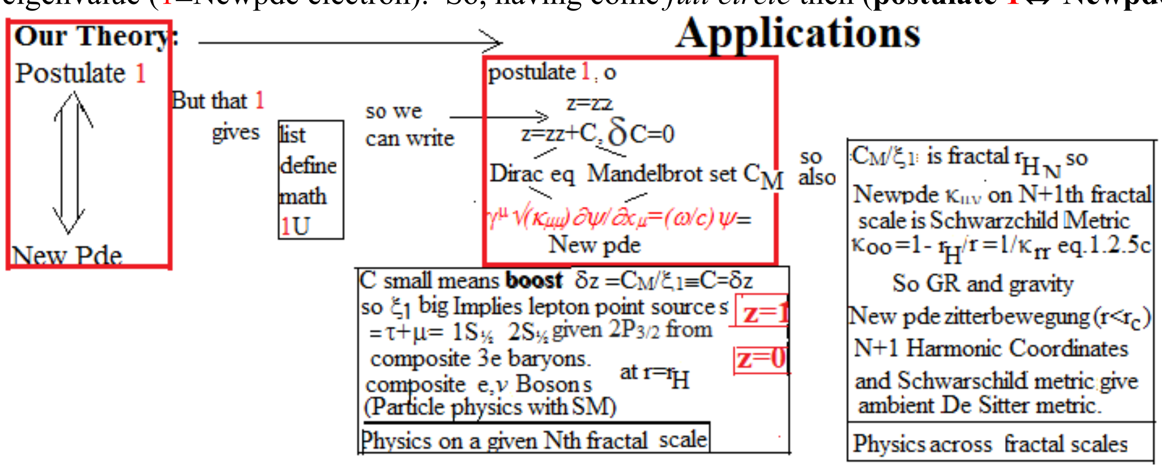
Composite e,ν at $r=r_H$ is **the electroweak SM** (appendixA). **Special relativity** was that initialization. **Eqs.8,11 gave us Quantum Mechanics** (B3) and eq.2a **gave us r,t space-time**.

Other fractal (Nth) scales: That Newpde $\kappa_{\mu\nu}$ metric (In eq.10), on the N=-1 next smaller fractal scale so $r_H=10^{-40}2e^2/m_ec^2\equiv 2Gm_e/c^2$, is the Schwarzschild metric since $\kappa_{oo}=1-r_H/r=1/\kappa_{rr}$: we **just derived General Relativity(gravity)** ***from*** **quantum mechanics in one line**. The Newpde zitterbewegung expansion component ($r<r_C$) on the next larger fractal scale is the universe expansion: **we just derived the expansion of the universe in one line.**

So those **precision** QED values **we derived** above from the separation of variables (and smallC so large ξ_1 argument (also **proving leptons are point like**)) in the Newpde are a trivial result of a much bigger picture! But they did allow us to **abolish the renormalization and infinities.**

Real# Mathematics from Postulate 1

The postulate 1 also gives the *list-define* math(B2) *list* cases 1∪1≡1+1, *define* a=b+c (So no other math axioms but 1.) and Cauchy sequence proof of real number eigenvalues from the Mandelbrot set iteration formula. That means the **mathematics** ***and*** **the physics** come from (**postulate 1→Newpde**): *everything*. Recall from eq.4 that dr+dt=ds. So combining eqs 4&8 (dr/ds+dt/ds)δz =((dr+dt)/ds)δz=(1)δz and so having come *full circle* back to postulate 1 as a real eigenvalue (1≡Newpde electron). So, having come *full circle* then (**postulate 1⇔ Newpde**) (8a)



Intuitive Notion Of (postulate 1⇔Newpde)

The Mandelbrot set introduces that $r_H=C_M/\xi_1$ horizon in $\kappa_{oo}=1-r_H/r$ in the Newpde, where C_M is fractal by 10^{40}Xscale change. So we have found (davidmaker.com) that: Given that fractal selfsimilarity astronomers are observing from the inside of what particle physicists are studying from the outside, that ONE *New pde* e electron r_H, one thing. *Everything* we observe big (cosmological) and small (subatomic) is then that (*New pde*) r_H, even baryons are composite 3e. So we understand, *everything*.

This is THE only *first principles*, one simple assumption(1), derivation of theoretical physics.

II Details of Algebra Of Substitutions A,B into z=zz+C, $\delta C=0$ (1)

postulate 1. But z=zz is the algebraic definition of 1 and adding constant C (or K) is trivial in

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

2.1 A Substitute $z=1+\delta z$ into **eq.1**, get $(1+\delta z)-(1+\delta z)(1+\delta z)+C=0$

so $\delta z\delta z+\delta z-C=0$ (or $\delta(\delta z+\delta z\delta z)=0$) (2)

with in-general $\delta z=\frac{-1\pm\sqrt{1+4C}}{2}$, **C<<-¼**, so **BIG |-C|** and so big δz for random time t complex general solution $\delta z=dr+idt$ (2a)

Big δz so $\delta z<<\delta z\delta z$. So from eq.2 $\delta((\delta z+\delta z\delta z)\approx\delta(\delta z\delta z)=(dr^2-dr^2+i(drdt+dtdr))=0$. (2b)

and take real Minkowski and imaginary component Clifford algebra which for negative and positive dr,dt the *non*infinite extremum $drdt+dtdr=0=\gamma^i dr\gamma^j dt+\gamma^j dt\gamma^i dr=(\gamma^i\gamma^j+\gamma^j\gamma^i)drdt=0$ (3)

Factor $dr^2-dt^2=ds^2$ eg., $\delta[(dr+dt)(dr-dt)]=0=[[\delta(dr+dt)](dr-dt)]+[(dr+dt)[\delta(dr-dt)]]$ and solve to get: (ds ≡ proper time invariant.)

(→±**e**) dr+dt=ds, dr-dt=ds ≡ds_1 for +ds→ I, IV quadrants (4)

(→light cone ***ν***) dr+dt=ds, dr=-dt, for +ds→ II quadrant (5)

“ “ dr-dt=ds, dr=dt, “ “ III quadrant (6)

(→vacuum) dr=dt, dr=-dt so dt=0=dr (7)

We square eq.4 $ds_1^2=(dr+dt)(dr+dt)=[dr^2+dt^2]+(drdt+dtdr)\equiv ds^2+ds_3=ds_1^2$. Since ds_3 (is max or min) and ds^2 (from eq.4) are invariant then so is **Circle** $ds^2=dr^2+dt^2=ds_1^2-ds_3$. Note this separate ds is a minimum at 45° and so Circle$\equiv\delta z=dse^{i\theta}=dse^{i(\Delta\theta+\theta o)}=dse^{i((\cos\theta dr+\sin\theta dt)/(ds)+\theta o)}$, $\theta_o=45°$.We define $k\equiv dr/ds$, $\omega\equiv dt/ds$, $\sin\theta\equiv r$, $\cos\theta\equiv t$. $dse^{i45°}\equiv ds'$. So take the global ordinary dr derivative (since flat space) of 'Circle' $\frac{\partial\left(dse'^{i\left(\frac{rdr}{ds}+\frac{tdt}{ds}\right)}\right)}{\partial r}=i\frac{dr}{ds}\delta z$ so $\frac{\partial\left(dse^{i(rk+wt)}\right)}{\partial r}=ik\delta z,\ k\delta z=-i\frac{\partial\delta z}{\partial r}$ (8)

Note this space time is flat with derivatives=0

Cancel that $e^{i45°}$coefficient then multiply both sides of eq.8 by ħ and define $\delta z\equiv\psi$, $p\equiv\hbar k$. Eq.8 then implies (Hermitian) operator ħk **observable***s* formalism(QM). See B substitution for real k part (also appendix B3). Given eqs 8 and 4,5,6 and the above eq.3a Clifford algebra we thereby get 2D Dirac equations for e,*ν*. These together imply the (Hermitian) operator *observables* formalism, eq.10 (thus **QM**), and 2D Dirac eq.for e,v.$\delta z\equiv\psi$, ($\langle F\rangle^*=\int(F\psi)^*\psi d\tau=\int\psi^*F\psi d\tau$ $=\langle F\rangle$ Hermitian). $p_r\psi=-i\hbar\frac{\partial\psi}{\partial r}$ the observables p_r condition gotten from eq.8 (9)

operator formalism thereby converting eq.4-6 into Dirac eq. pdes. So we **derived QM here** (also see B3). (The fractal N=1 cosmology implies Minkowski+Dirac zitterbewegung submanifold give De Sitter Appendix B1)

(**Needed Big C to have** random t and Hamiltonians (***observability***)

Origin Of Math from Eigenvalue of δz: Since ds=dr+dt (recall eq.4,8) then

$$(dr/ds+dt/ds)\delta z=((dr+dt)/ds)\delta z=(1)\delta z \qquad (10)$$

and so having come *full circle* back to postulate 1 as a real eigenvalue (1≡Newpde electron). So (**postulate 1⇔ Newpde**) (8a)

2.2 **Iteration Ansatz** (B) for real k eigenvalues

Plug in the left side z (of eq.1) into the right side zz repeatedly and use δC=0 and get the (fractal) Mandelbrot set iteration formula $z_{N+1}=z_N z_N+C_M$, $\delta C_M=0$ (since δ(z'-zz)= $\delta(z_{N+1}-z_N z_N)=\delta(\infty-\infty)\neq 0$). $z_o=0$. Note that without δC=0 equation 1 would not yield the Mandelbrot set. The Clifford algebra δ(drdt)=0 extremum area is drdt at the Fiegenbaum point Mandelbulb whose position of $C=C_M$ =|-1.4011..| is large but we need C small in z=zz+C since z=zz+0 is satisfied by z=1 (and z=o), our postulate1 (bottom right side of fig.1). Recall from eq.2 δz+δzδz=C. But on the next smaller fractal baseline (at 10^{40}X smaller, zoom) δzδz<< δz≈C and so all we need is a Fitzgerald contraction boost making δz smaller: $C=\delta z=\delta z/\gamma=C_M/\gamma=C_M/\xi_1$. (13) with ξ_1 defining mass and C_M charge. So ξ_1 has to be big for C to be small and so we need a new frame of reference, to make δz and therefore C smaller.

z≈1 $C_M=\xi\delta z'$, δz' in z=1+δz' is small so ξ_1 is **big** in boosted **lepton term** $C=r'_H=C_M/\xi_1$ new pde.$\kappa'_{oo}=1-r'_H/r$.

z≈0 $C_M=\xi\delta z'$, δz' in z=1+δz' is big (-1) so ξ_o is small. (So small C occurs only for composite 3e). $\delta C_M=\delta\xi\delta z'+\xi(\delta\delta z')=0$. So δξ=0 since δδz≈0

2.3 Clifford Algebra +Mandelbulbs Implies Big Right end Cusp and Left end Small Fiegenbaum point Extremum Making not flat space (The new 2D C≡δz' perturbation of δz). drdt are areas enclosed by Mandelbulbs of dimensions drXdt (of equations 4-6). Scalar component of eq. 3a δ(**2drdt**)=0 implies smallest area δz' real C extremum Mandelbulb which is the Fiegenbaum point $C=C_M$ subset of the Mandelbrot set containing that selfsimilar fractalness. The big extremum on the right is the cusp of that big single limacon.

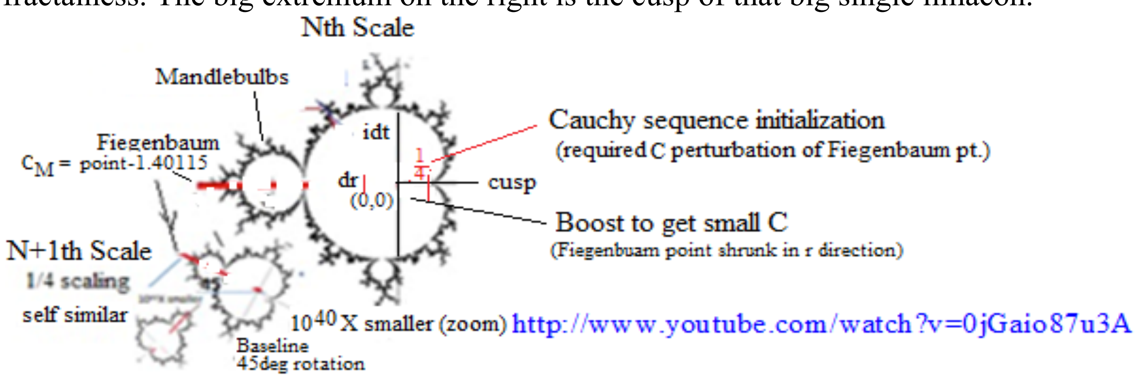


Fig1

Right end extremum cusp of *Big* limacon at z=¼

On the right end of the Mandelbrot set we get the Mandelbrot set iteration formula starting from extremum $z_o=0$, C_M=- ¼ that is *also* uniquely the Cauchy sequence of rational numbers (since the sequence started with a rational number -¼) then 1/16=¼¼, 1/256 = (1/16)(1/16), … with limit 0 that implies that 0 in our (later) small C limit application region is a real number so we have **real eigenvalues** (12)

(for our later small C limit neighborhood.). Also since right side extremum C= -¼ (in $\delta z = \frac{-1\pm\sqrt{1+4C}}{2}$) we get time (dt≠0 in eq.2a) and so the Hamiltonian (operator) and so observability showing why the nonzero C had to be added to z=zz in the first place.

So on the right end of the Mandelbrot set we are merely defining observability of k here (i.e., using the above real eigenvalues hk=p in the eq.8 operator formalism $p_\mu\psi=-i\partial\psi/\partial x_\mu$).

Proper time ds invariance needed for observability also since two comoving sensors measure the same thing (e.g.,no Doppler differences). But what's the use of this operator formalism given it's for flat space, with no forces so *still* not observable by a 2nd object? We need curved space (forces) 'observability' as in $\gamma^\mu\sqrt{\kappa_{\mu\mu}}p_\mu\psi=-i\gamma^\mu\sqrt{\kappa_{\mu\mu}}\partial\psi/\partial x_\mu$ in the context of the observability of "1" in equation 10. But even then 2D flat space is still unobservable so the entire 4D Newpde itself becomes the *ultimate operator formalism* criteria for observability! Observability is then the reason we chose that z=1+δz ansatz' (so at least get operator formalism eq.11 and Newpde), and iteration ansatz (so Cauchy seq. and real eigenvalues) and z=zz (and not z=zzzzz let's say). If it is not observable then why bother?

Left end small extremum Fiegenbaum point Fractalness

So Clifford algebra δ(drdt)=0 extremum (eq.3a) on the left end of the Mandelbrot set is the Fiegenbaum point C_M (11a)

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 (eq.18 below). So for each larger electron there are **10^{82} constituent electrons**. Also the scale difference between Mandelbrot sets as seen in the zoom is about **10^{40}, the scale change** between the classical electron radius and 10^{11}ly giving us our fractal universe.

Recall again we got from eq.1 δz+δzδz=C with quadratic equation result:

$\delta z=\frac{-1\pm\sqrt{1-4C}}{2}$. 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 $r_2=10^{40}Xr_1$

2.4 Big γ boost *so* Small C (so z=zz and **postulate 1** in our own reference frame)

Big **γ** (in (1/γ)δz) boost means small C≈δz>>δzδz (so δ(δz')=0 and z=zz) and so no more quadratic equation but we still keep our complex δz and so dt. Also the 2D high concentration C=δz' thereby breaks the flat 2D dr,dt degeneracy so curved space 2⊗2=4D. Recall $(dt+dr)^2=dr^2+dt^2+drdt+dtdr=ds^2=dr^2+dt^2+0$. But we must still must imbed 2D δz' perturbation in a 2D manifold.

4degrees of freedom in 2 spatial dimensions in **rectangular** coordinates. we have 2 additional degrees of freedom δz' added to δz 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 $(dx'+dy'+dz'+dt')^2=(\gamma^x dx+\gamma^y dy+\gamma^z dz+\gamma^t dt)^2=dr^2+dt^2=ds^2$ (13)

(new pde) to keep ds^2=C constant implying the Clifford algebra $\gamma^\mu\gamma^\nu+\gamma^\nu\gamma^\mu=0$, $\gamma^\mu\gamma^\mu=1$.

4degrees of freedom in 2 spatial dimensions in **polar** coordinates. for eq.2 **small C(**$\approx\delta z>>\delta z\delta z$, in eq.2 so $|\delta z|\approx C$=constant (from eq.1). Thus $C=C_M/\gamma\equiv r_H$.. Certain Cs have higher density in the Mandelbrot set and small $\delta z=C$ so these δz's are 2D perturbations of the otherwise flat space dr,dt. where we assumed a constant density of Cs.

A,B together So since $ds=|\delta z|=C$ we can only perturb eq.4 at 45° using curved space Fiegenbaum point $\delta z'$ as that Circle rotation to keep that ds (**proper time**) radius invariant. Note that Fiegenbaum point $\delta z'$ is an independent 2D perturbation of eq.4. So we just add those 2 new parameters in a **2D** rotation at 45° since ds invariant $(dr-\delta z')+(dt+\delta z')\equiv ds$ (eg.,$\Delta\theta,\Delta r$) (13)

Eq.13 gives metric tensor force of eq.17 and *equivalent* Boson exchange force Appendix A

So small δz implies a $\Delta\theta$ in C_1 Eq.9 $\delta z=dse^{i(45°+\Delta\theta)}$ rotation occurs here implying that the eq.8 associated infinitesimal uncertainty $\pm C_M/\xi_1=\delta z'$ cancel to rotate at $\theta\approx45°$:). On very small scales $\delta z>>\delta z\delta z$ so in eq.2 $|\delta z|\approx C$=constant (from eq.1) so since $ds=|\delta z|=C$ high concentration (Mandelbrot set components) $C=\delta z'$ perturbs dr,dt in eq.4. But we can only perturb eq.4 at 45° using: $(dr-\delta z')+(dt+\delta z')=(dr-(C_M/\xi_1))+(dt+(C_M/\xi_1))=ds\equiv dr'+dt'$. (14)

= 2 rotations from ±45° to next extremum (appendix AI below). (15)

This also keeps ds_1 invariant so keeping the eq.4 ds invariance. Note that by keeping dt not zero we have *already* put in background white noise (since then C>¼ in eq.2) into eqs.4-6

Recall $z\equiv1+\delta z$ so if z=0 then $0=1+\delta z$ so $|\delta z|$ is big in $C_M=\xi(\delta z)$ so ξ is small.

So for z=0 rotations ξ is small so big C_M/ξ_o (also $\delta\xi=0$ so stable, electron, sect.2.1) so big $\theta=C_M/ds\xi_o=45°+45°=90°$. In contrast for z=1 ξ_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 $\kappa_{rr}\approx1/[1-((C_M/\xi_1)r))]$ (16)

From partial fractions where N=0 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.4 becomes 2D⊗2D:

$$ds^2=\kappa_{rr}dr'^2+\kappa_{oo}dt'^2+.. \quad (17)$$

and so a new frame of reference dr',dt'. Note from 3 $dr'dt'=\sqrt{\kappa_{rr}}dr\sqrt{\kappa_{oo}}dt=drdt$ so $\kappa_{rr}=1/\kappa_{oo}$

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. The $\kappa_{\mu\nu}$ of the Newpde on the N-1th fractal scale ($10^{-40}Xe^2$) is the Schwarschild metric where $\kappa_{oo}=1-r_H/r=1/\kappa_{rr}$ where N=-1, $r_H=2Gm_e/c^2\equiv10^{-40}X2e^2/m_ec^2$. So we have derived General Relativity (and gravity) *from* quantum mechanics in one step!

Note on the N=1th fractal cosmological scale $\kappa_{\mu\nu}$ is the ambient metric.

So we derived General Relativity (eqs.14,15,16,17) by the C_M **rotation** *of special relativity* (eq. 4) which shows why we said $K\neq\delta z+\delta z'$ implies C perturbation is 4D curved space. Use eq.13.

Defining relation for Clifford algebra γ^μs (spherical symmetry): Recall we derived a Clifford algebra eq.3 implying $(\gamma^x\sqrt{\kappa_{xx}}dx+\gamma^y\sqrt{\kappa_{yy}}dy+\gamma^z\sqrt{\kappa_{zz}}dz+\gamma^t\sqrt{\kappa_{tt}}idt)^2=\kappa_{xx}dx^2+\kappa_{yy}dy^2+=ds^2$.(spherical symmetry).Multiply the term between the brackets by dz/ds and use eq.8 to get the 4D

New pde $\gamma^\mu\sqrt{(\sqrt{\kappa_{mm}})}\partial\psi/\partial x_\mu=(\omega/c)\psi$ for e,ν: (18)

Covariant derivative here is a ordinary derivative since ψ is scalar.

ξ mass and $C_M=\varepsilon=e^2$ charge

So ξ is defined to be mass and C_M is defined to be charge. One result is that from eq.17 we have nonzero ε in $(dr-\varepsilon)\equiv dr'$. So from 17 $ds^2=dr'^2+dt'^2=dr^2+dt^2+dr\varepsilon/2-dt\varepsilon/2-\varepsilon_1^2/4$ (19)

From eq.5 the neutrino is defined as the particle for which $-dr'=dt$ (so can now be in 2nd quadrant dr', dt' so $dr\varepsilon/2-dt\varepsilon/2$ has to be zero and so ε has to be zero therefore $\varepsilon^2/4$ is 0 and so is pinned as in eq.5 (*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. Eq.4: 2D Recall eq.4 electron is defined as the particle for which dr≈dt so drε/2-dtε/2 cancels so ε_1 (=C_M) in eq.19 can be small but nonzero so that the δ(dr+dt)=0. Thus dr,dt in eq. 4 are automatically both positive and so can be in the *first quadrant*. Eq. 4 is *not* pinned to the diagonal so $\varepsilon^2/4$ (and so C_M) in eq.A1 is not necessarily 0. So *the electron is charged* since C_M is not 0.

3 Small C Boost Applications so that z≈zz and the *postulate of 1* holds

Composite 3e baryons**. But there is one *stable* multiparticle case of stable z=0: composite 3e at $r=r_H$** (see partII for details) composed of stable z=0 (electrons)

Below we find the value of the leptonic Newpde stable ξ_1 needed for this small C boost.

By the way **the z= 0** case can still have this same C boost to small C (as the z=1 case) for the 3 lepton case (composite 3e). Again, for small C (boost) for z=zz **need large ξ_1**

For that stable z=0 the only way to get large ξ (required by that small C boost) is with the Newpde composite 3e $2P_{3/2}$ at $r=r_H$ state (partII). So stability ($dt'^2=(1-r_H/r)dt^2$)clocks stop at $r=r_H$

The two positron motion and h/e quantization of flux BA then gives us the exact proton mass m_p as a reduced mass for the associated Hund's rule $\tau\equiv 2S_{1/2}, 1S_{1/2}\equiv\mu$ states (so $\tau+\mu=\xi_1$, $m_p=\xi_1/2$). We rewrite this in the Kerr metric formalism with the 3rd mass also reversing the pair annihilation (with virtual pair creation inside the r_H volume given $\sigma=\pi r_H^2\approx(1/20)$barns) and reducing the inertial frame dragging due to the spin½ ξ_1 thereby adding a Kerr metric $-(a/r)^2$ angular momentum operator in in $\kappa_{oo}=1-(a/r)^2-r_H/r=\xi_1+\xi_o-C_M/(\xi_o r)=\tau+\mu+m_e-2e^2/(\xi_o r)=$ $\mathbf{1+\varepsilon+\Delta\varepsilon+2e^2/(\xi_o r)=\kappa_{oo}}$ (Fiegenbaum pt. C_M defines charge e^2.). Divide by $\xi_1=1+\varepsilon$ to normalize for only free electron Δε energy (Needed for the previous separation of variables two applications) asymptotic local flat space and thereby finally getting back to that initial requirement for that free particle z=1, *large* ξ_1 case:

$$\kappa_{oo}=1-\xi_o/(1+\varepsilon)-C_M/(\xi_1 r)=1+\Delta\varepsilon/(1+\varepsilon)-2e^2/(2m_p r) \qquad (12)$$

also giving us the numerical value of that **large ξ_1** (=$2m_p$). With τ+μ normalized to τ=1 with the ground state e mass then $\Delta\varepsilon=m_e=.0005799$ and ε=μ=.06. (12a)

So that small real C boost derives the baryons and Bosons and makes the leptons point like particles since $r_H=C_M/\xi_1$ is small.

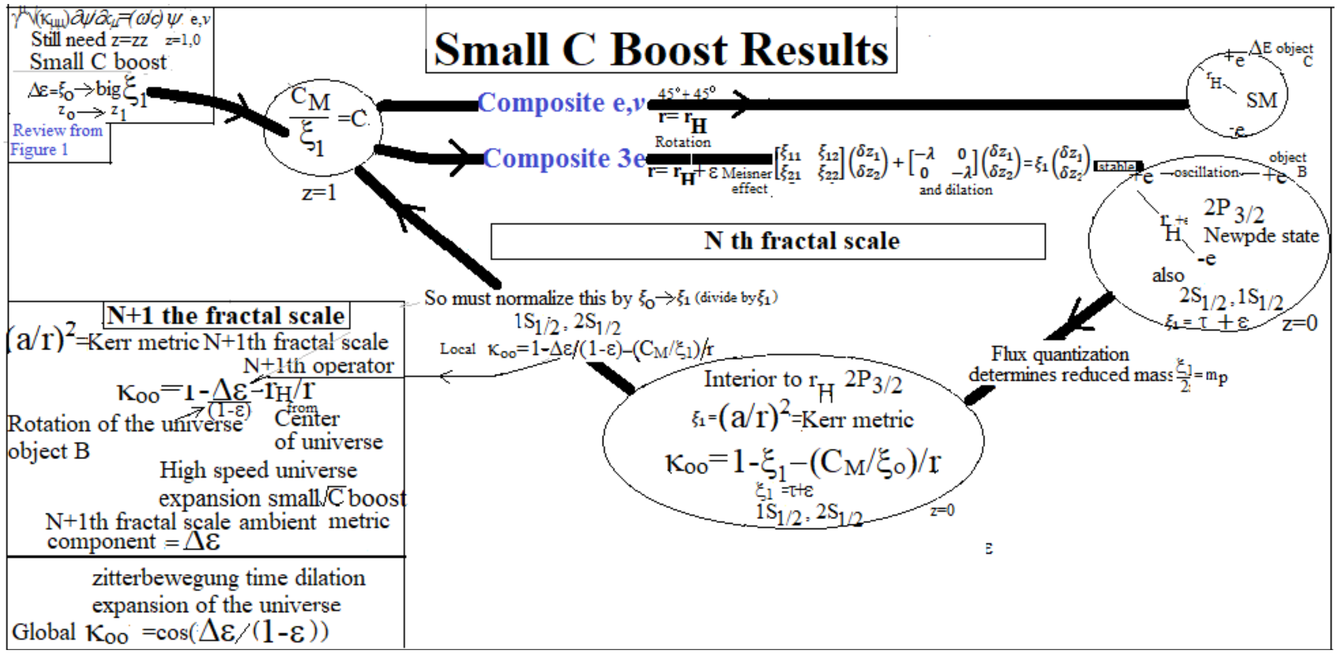


Fig.2

Appendix A **Composite e,ν** Top line of Fig.2 triangle composite e,ν application

A1 z=0 and equation 13 imply two 45° rotations And Give SM Bosons

For z=0 δz' is big in z=1+δz and so we have again ±45° min ds and so two possible 45° rotations so through a total of two quadrants for ±δz' in eq.13.Note in fig.3 dr,dt is also a rotation. Thus from equation 8 for (θ) angle rotations $\theta\delta z \equiv (dr/ds)\delta z = -i\partial(\delta z)/\partial r$ for the first 45°rotation. So we got through one Newpde derivative for each 45° rotation. For the next 45° rotation it is then a second derivative $\theta\theta\delta z' = e^{i\theta p}e^{i\theta'}\delta z = e^{i(\theta p+\theta)}\delta z = (dr/ds)((dr/ds)dr') = -i\partial(-i\partial(dr'))/\partial r)\partial r = -\partial^2(dr')/\partial r^2$ large angle rotation in figure 3. For z=1, δz' small so 45°-45° small angle rotation in figure 3. Do the same with the time t and get for z=0 rotation of 45°+45° then $\theta\theta\delta z' = (d^2/dr^2)z' + (d^2/dt^2)z'$ (A1)

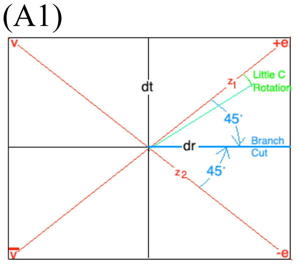


fig.3°

So ΔS=½+½ =1 or ½-½=0. So ΔS=½+½=1 making 2 body (at $r=r_H$) S=1 Bosons. Note we also get these Laplacians characteristic of the Boson field equations by those 45°+45° rotations so eq.13 implies Bosons accompany our leptons (given the δz'), **so these leptons exhibit "force".**

A3 2D Eq.18 2P½ at r=rH, for z=0 Composites of e,ν (from boost) Using Equation 13

So z=0 allows a large C z rotation application from the 4 different axis' max extremum (of eq.11) branch cuts gives the 4 results: Z,+-W, photon bosons of the Standard Model. So we have derived the Standard Model of particle physics in this very elegant way (from the four axis'). You are physically at $r=r_H$ if you rotate through the electron quadrants (I, IV).. So we have large C_M dichotomic 90° rotation to the next Reimann surface of eq.13, eq.A1 $(dr^2+dt^2)z''$ from some initial extremum angle(s) θ. Eq.13 solutions imply complex 2D plane Stern Gerlach dichotomic rotations using eq.A1 thereby using Pauli matrices σ_i algebra, which maps one-to-one to the quaternionA algebra. Using eq.13 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.13 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.11 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.11 can then be replaced by eq.A1 $(dr^2+dt^2+..)z''=(dr^2+dt^2+..)e^{quaternionA}$Bosons because of eq.A1. Then use eq. 13 to R rotate: z'':

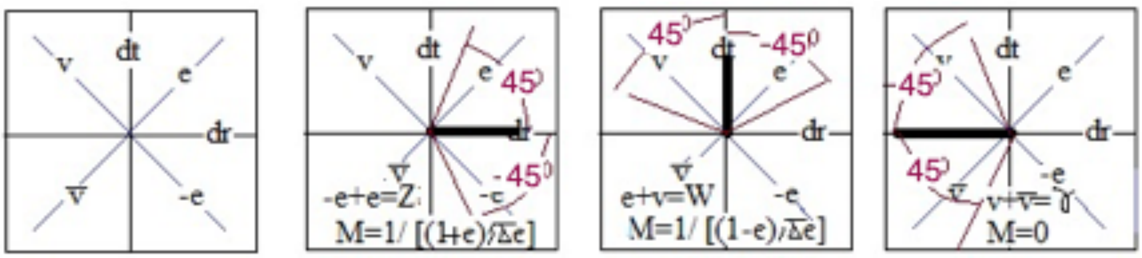


Figure 4. See eq.13. The Appendix A4 derivation applies to the far right side figure.
Recall from eq.13 $2C_M=45°+45°=90°$, gets Bosons. 45°-45°= leptons.
v in quadrants II(eq.) and III (eq.11). e in quadrants I (eq.4) and IV (eq.6).
Locally normalize out 1+ε . For the **composite e,*v*** on those required large z=0 eq.13 rotations for $C\rightarrow 0$, and for stability $r=r_H$ (eg.,for $2P_{1/2}$, I→II, III→IV,IV→I) unless $r_H=0$ (II→III)

A4 Quadrants II→III rotation eq.A2 $(dr^2+dt^2+..)e^{quaternion\ A}$ =rotated through C_M in eq.11.

example C_M in eq.A1 is a 90° CCW rotation from 45° through *v* and anti*v*
A is the 4 potential. From eq.3 we find after taking logs of both sides that $A_o=1/A_r$ (A2)
Pretending we have a only two i,j quaternions but still use the quaternion rules we first do the r derivative: From eq. A1 $dr^2\delta z=(\partial^2/\partial r^2)(\exp(iA_r+jA_o))=(\partial/\partial r[(i\partial A_r\partial r+\partial A_o/\partial r)(\exp(iA_r+jA_o)]$
$=\partial/\partial r[(\partial/\partial r)iA_r+(\partial/\partial r)jA_o)(\exp(iA_r+jA_o)+[i\partial A_r/\partial r+j\partial A_o/\partial r]\partial/\partial r(iA_r+jA_o)(\exp(iA_r+jA_o)+$
$(i\partial^2Ar/\partial r^2+j\partial^2A_o/\partial r^2)(\exp(iA_r+jA_o)+[i\partial A_r/\partial r+j\partial A_o/\partial r][i\partial A_r/\partial r+j\partial/\partial r(A_o)]\exp(iA_r+jA_o)$ (A3)
Then do the time derivative second derivative $\partial^2/\partial t^2(\exp(iA_r+jA_o)=(\partial/\partial t[(i\partial A_r\partial t+\partial A_o/\partial t)$
$(\exp(iA_r+jA_o)]=\partial/\partial t[(\partial/\partial t)iA_r+(\partial/\partial t)jA_o)(\exp(iA_r+jA_o)+$
$[i\partial A_r/\partial r+j\partial A_o/\partial t]\partial/\partial r(iA_r+jA_o)(\exp(iA_r+jA_o)+(i\partial^2A_r/\partial t^2+j\partial^2A_o/\partial t^2)(\exp(iA_r+jA_o)$
$+[i\partial A_r/\partial t+j\partial A_o/\partial t][i\partial A_r/\partial t+j\partial/\partial t(A_o)]\exp(iA_r+jA_o)$ (A4)
Adding eq. A2 to eq. A4 to obtain the total D'Alambertian A3+A4=
$[i\partial^2A_r/\partial r^2+i\partial^2A_r/\partial t^2]+[j\partial^2A_o/\partial r^2+j\partial^2A_o/\partial t^2]+ii(\partial Ar/\partial r)^2+ij(\partial A_r/\partial r)(\partial A_o/\partial r)$
$+ji(\partial A_o/\partial r)(\partial A_r/\partial r)+jj(\partial A_o/\partial r)^2++ii(\partial Ar/\partial t)^2+ij(\partial A_r/\partial t)(\partial A_o/\partial t)+ji(\partial A_o/\partial t)(\partial A_r/\partial t)+jj(\partial A_o/\partial t)^2$.
Since ii=-1, jj=-1, ij=-ji the middle terms cancel leaving $[i\partial^2Ar/\partial r^2+i\partial^2Ar/\partial t^2]+$
$[j\partial^2A_o/\partial r^2+j\partial^2A_o/\partial t^2]+ii(\partial Ar/\partial r)^2+jj(\partial A_o/\partial r)^2+ii(\partial Ar/\partial t)^2+jj(\partial A_o/\partial t)^2$

Plugging in A2 and A4 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: $\partial A_r/\partial r + \partial A_o/\partial t=0$ (A5)
$i[\partial^2 A_r/\partial r^2+i\partial^2 A_r/\partial t^2]=0$, $j[\partial^2 A_o/\partial r^2+i\partial^2 A_o/\partial t^2]=0$ or $\partial^2 A_\mu/\partial r^2+\partial^2 A_\mu/\partial t^2+..=1$ (A6)
A4 and A5 are **Maxwell's equations** (Lorentz gauge formulation) in free space, if $\mu=1,2,3,4$.

$$\Box^2 A_\mu=1,\ \Box\bullet A_\mu=0 \qquad \text{(A7)}$$

A5 Other 45°+45° Rotations (Besides above quadrants II→III)

For the **composite e,*v*** on those required large z=0 eq.13 rotations for $C\approx 0$, and for stability $r=r_H$ for $2P_{1/2}$ (I→II, III→IV,IV→I) unless $r_H=0$ (II→III) are:

Ist→IInd quadrant rotation is the W+ at **$r=r_H$**. Do similar math to A2-A7 math and get instead a Proca equation
$E=1/\sqrt{(\kappa_{oo})} -1=[1/\sqrt{(1-\Delta\varepsilon/(1-\varepsilon)-r_H/r)}]-1=[1/\sqrt{(\Delta\varepsilon/(1-\varepsilon))}]-1$. $E_t=E+E=2/\sqrt{(\Delta\varepsilon/(1-\varepsilon))}$=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 again.
$E=1/\sqrt{(\kappa_{oo})} -1=[1/\sqrt{(1-\Delta\varepsilon/(1-\varepsilon)-r_H/r)}]-1=[1/\sqrt{(\Delta\varepsilon/(1-\varepsilon))}]-1$. $E_t=E+E=2/\sqrt{(\Delta\varepsilon/(1-\varepsilon))}$=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.
$Et=E+E=2E=2\Delta\varepsilon$ is the pairing interaction of SC. The $E_t=E-E=0$ is the 0 rest mass photon Boson. Do the math (eq.A2-A7) and get Maxwell's equations. Note there was no charge C_M on the two *v* s.
Note we get the Standard electroweak Model particles out of composite e,*v* using required eq.13 rotations for z=0.
For z=0 composite 3e (For new pde $2P_{3/2}$, rapidly moving two positrons, 1 slow electron.) is ortho s,c,b and para t particle physics. See partII.davidmaker.com
For z=1 the new pde applies to QED with **large r**. See separation of variables section.

Object B Effect On Inertial Frame Dragging

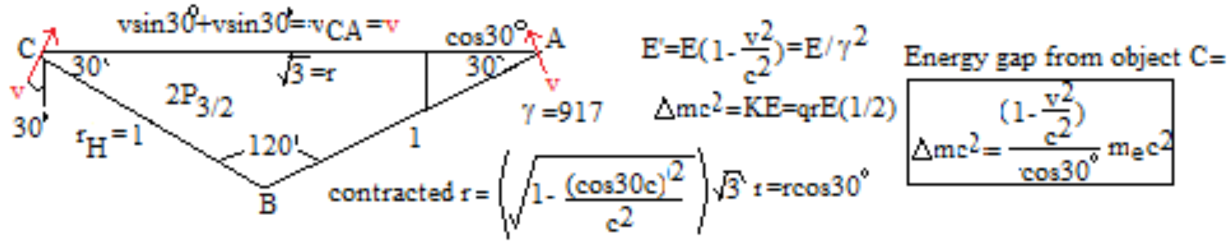
The fractal implications are that we are inside a cosmological positron inside a proton $2P_{3/2}$ at $r=r_H$ state. The cosmological object (electron) we are inside of is a positron and call it object A which orbits electron object B with a given distant 3rd object C. Object B is responsible for the mass of the electron since it's frame dragging creates that Kerr metric $(a/r)^2=m_ec^2$ result used in eq.12. So Newpde ground state m_ec^2 is still the fundamental Hamiltonian eigenvalue here as in the defining relation for the Fermi 4 point $E=\int\psi^t H\psi dV=\int\psi^t\psi H dV=\int\psi^t\psi G$. All the interaction occurs inside r_H $(4\pi/3)\lambda^3=V_{rH}$. $\frac{1}{V^{1/2}}=\psi_e=\psi_3\ \frac{1}{V^{1/2}}=\psi_v=\psi_4$ so 4pt $\iiint_0^{r_{rH}}\psi_1\psi_2\psi_3\psi_4 dV =$
$2G\iiint_0^{r_H}\psi_1\psi_2\frac{1}{V^{1/2}}\frac{1}{V^{1/2}}V$
$\equiv\iiint_0^{r_H}\psi_1\psi_2 G\equiv\iiint_0^{r_H}\psi_1\psi_2(2m_ec^2)dV_{rH}=\iiint_0^{V_{rH}}\psi_1(2m_ec^2)\psi_2 dV_{r_H}$ (A8)

Application of Eq.A8 To Ortho states

The ortho state (partII) changes spin (eg., as in 2nd derivative eq.A1) so 2nd derivative $\Sigma((\gamma^{\mu}\sqrt{\kappa_{\mu\mu}}dx_{\mu})-i\kappa)(\gamma^{\nu}\sqrt{\kappa_{\nu\nu}}dx_{\nu}+i\kappa)\chi=\Sigma((\gamma^{\mu}\sqrt{\kappa_{\mu\mu}}dx_{\mu})-i\kappa)\psi$ so $\frac{1}{2}(1\pm\gamma^5)\psi=\chi$. In that regard the expectation value of γ^5 is speed and varies with $e^{i3\phi/2}$ in the trifolium. The spin½ decay proton $S_{1/2}$ $\propto e^{i\phi/2}\equiv\psi_1$, the original ortho $2P_{1/2}$ particle is chiral $\chi=\psi_2\equiv\frac{1}{2}(1-\gamma^5)\psi=\frac{1}{2}(1-\gamma^5 e^{i3\phi/2})\psi$. Initial $2P_{1/2}$ electron ψ is constant. Start with initial ortho state χ. These γ^5 terms then modify equation A8 to read $=\iiint_0^{V_{rH}}\psi_1\psi_2(2m_ec^2)dV_{rH}=\iint\psi_{S1/2}{}^*(2m_ec^2V_{rH}))\chi dV_\phi=K\int\langle e^{i\frac{i\phi}{2}}\left[\Delta\varepsilon V_{r_H}\right]\left(1-\gamma^5e^{i\phi\frac{3}{2}}\right)\psi\rangle\, d\phi=KG_F\int\langle e^{i\phi/2}-\gamma^5 ie^{i(4/2)\phi}\rangle d\phi=$
$KG_F\left(\frac{2e^{i\phi}}{i}\Big|_0^{2\pi+C}-\frac{2\gamma^5e^{i4\phi}}{i4}\Big|_0^{2\pi+C}\right)$ = k1(1/4+iγ^5)= k(.225+i$\gamma^5$0.974) =k(cos13°+iγ^5sin13°)= =deriving the 13° Cabbibo angle. With previously mentioned CP result get CKM matrix.

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

Review of $2P_{3/2}$ Next higher fractal scale (X10^{40}), cosmological scale proton.Observor inobjectA



Recall m_ec^2 is the energy gap for object B. Recall for the positron motion $\gamma=\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$=917 and E=(1/917²)E' in the forward or backward direction of the CA line. 1/cosθ away from forward direction line(the weakest E field direction), toward the line in the object B direction. But object C is 30° from object B direction and ½Eqr =KE for circular motion with v 30° from object B direction. Also recall law of cosines $r^2=1^2+1^2+2(1)(1)\cos120°=3$, So r=$\sqrt{1-\frac{cos30°c^2}{c^2}}\sqrt{3}$= .866=cos30°. So Eqr =ΔE= $(m_ec^2/((\cos30°)917^2)=m_ec^2/728000$. So energy gap is $\Delta E=(m_ec^2/((\cos30°)917^2)=m_ec^2/728000$. The weak interaction occurs inside of r_H with those electrons m_e. The G can be written for E&M decay as $(2mc^2)XVr_H=2mc^2[(4/3)\pi r_H^3]$.
So for weak decay from **equation A8** it is $G_F=(2m_ec^2/728,000)Vr_H=G_F$ the strength of the Fermi weak interaction constant which is the coupling constant for the Fermi 4 point weak interaction. Note $2m_ec^2/729,000=1.19X10^{-19}$J.So $\Delta E=1.19X10^{-19}/1.6X10^{-19}$=.7eV which is our ΔE for the weak interaction inside G_F.

A8 Derivation of the Standard Model from Newpde But With No Free Parameters

Since we have now derived M_W, M_Z, and their associated Proca equations, and m_μ,m_τ,m_e, etc., Dirac equation, G, 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 θ_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!

Appendix B

B1 N=1 fractal scale ambient (cosmological) fractal scale metric

The superposition of the harmonic coordinate conditions of the Newpde (&Dirac equation) zitterbewegung ($r<r_C$) harmonic coordinates and Schwarzschild metric (local limit is Minkowski) eq.17 give the De Sitter metric we observe. After a large expansion we have

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** x_i for $r<r_H$)

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

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

$x_i= rz_i$ $2\le i\le n$ z_i is the standard imbedding n-2 sphere. R^{n-1}. which also imply the **De Sitter** metric: $ds^2=-(1-r^2/\alpha^2)dt^2+(1-r^2/\alpha^2)^{-1}dr^2+ d\Omega^2_{n-2}$ our ambient metric.

B2 List-Define Mathematics from postulate 1

More fundamental than the zz=z {1,0 }solutions is the set theory: {set,∅}

The null set ∅ is the subset of every set. In the more fundamental set theory formulation $\{\emptyset\}\subset\{\text{all sets}\}\Leftrightarrow\{0\}\subset\{1\}$ since $\emptyset=\emptyset\cup\emptyset\Leftrightarrow 0+0=0$, $\{\{1\}\cup\emptyset\}=\{1\}\Leftrightarrow 1+0=1$.

So l**ist** $1\cup 1\equiv 1+1\equiv 2$, $2\cup 1\equiv 1+2\equiv 3$,..all the way up to 10^{82} (see Fiegenbaum point) and **define** all this list as a+b=c, etc., to create our algebra and numbers which we use to write equation 1 z=zz+C, δC=0 for example. Combining eqs 4 (dr+dt=ds) and 8 (dr/ds+dt/ds)δz =((dr+dt)/ds)δz =(1)δz and so having come *full circle* back to postulate 1 but as a real eigenvalue (1 Newpde observable electron). So **Postulate 1⇔ Newpde.**

B3 Quantum Mechanics Is The Newpde

In z=1-δz 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*δz is the probability we have just an electron. 1 then is the probability we have the entire $\xi_1=\tau+\mu$ complex (sect.2.1), that includes the electron e (Observed EM&QM). 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.4 (eq.18) has *two* parts (dr+dt &dr-dt, same kind of $\delta(p_A-p_B)$ conservation relation as between Alice and Bob, Bell's stuff) that solve eq.2b together we could label *observer* and *object* with associated eq.4 wavefunctions $\delta z\equiv\psi_1$, $\delta z\equiv\psi_2$. So if there is no observer eq.4 (So no ψ_1) then eq.4 doesn't hold at all and so there is no object ψ_2 wavefunction. Thus the wave function "collapses" to the wavefunction 'observed' (or eq.2b does not even hold). Hence we derived the Copenhagen interpretation of Quantum Mechanics(QM).

δδz=0 holds for both A and B substitution cases (not just at 45°) so dr^2+dt^2 is an operator wave equation(A2), that holds all the way around the circle, gives waves. In eq.9, error C is a δz' angle measure on the dr,idt plane. One extremum ds is at 45° so the largest C is on the diagonals (45°) where we have eq.4 extremum holding: particles. So a wide slit has high uncertainty, large C (rotation angle) so we are at 45°(eg., particles, eq.11 photoelectric effect). For a *small slit* we have less uncertainty so smaller C not large enough for 45° so only the *wave equation* A1 holds (small slit diffraction). Thus we proved wave particle duality. Equation 10 (sect.2.1) also counts units N of (dt/ds)=ħω=ħck on the diagonal so that $E=p_t=\hbar\omega$ for all energy components, universally. Thus eq.10 (sect.2.1) counting N detours around the usual quantization of the E&M field with SHM. Equation 11 Newpde is still the core idea since it creates the eigenfunction $\delta z \equiv \psi$ in the first place, directly. So with eq.11 (and so eq.10, eq. 8) *we really have derived Quantum Mechanics.*