What the Mainstream Says

Abstract The universe is infinitely complicated according to the mainstream (eg.,string theory, dark matter, colors, gauges, infinite mass and charge electrons,....) but I am finding **in contrast** that the universe is more and more simple, in fact it is infinitely simple eg.,1. The notion of reducing everything around us to a single thing is the (infinitely) simplest idea I can conceive of. It is ultimate reductionism (eg., of complex z) to a single real number 1**.** So just **postulate 1.** Algebraically define 1,0 from z=zz. Also for 1 (**zz-z**=0) to be real min(**zz-z**)>0 :the entire theory

Appendix B2 defines min and zz-z in a real analysis context. So:

I wanted to point out that this is just **elementary algebra** (in contrast to that mainstream multitude of disconnected convoluted assumptions)'

Postulate 1

with 1 (and 0) algebraically defined as

$$z=zz \quad (1)$$

so (given the 0 definition) rewrite equation 1 as

$$\mathbf{zz\text{-}z=0} \quad (2)$$

But in order for 1 to be a real number (so having a Cauchy sequence) we must postulate 1 as:

$$\min(\mathbf{zz\text{-}z})>\mathbf{0} \quad (3)$$ which is our entire theory.
The rest is simple algebra.

Relation 3 can be rewritten as

$$z=zz+C \quad (4)$$

$$\delta C=0,\ C<0 \quad (5)$$

real 1

To get that Cauchy sequence and so real 1 plug in the left side z into the zz on the right side of equation 4 and repeat

So iterate z=z1=0 to get $z_{N+1}=z_N z_N+C_M$. Can use δC=0 for some C_M to get the Mandelbrot set.

Familiar form for equations 4,5

We need equations 4 and 5 put into familiar forms to recognize the usual physics outcomes(eg.,operator formalism).

So we define δz from z=1+δz and substitute it into equation 4 and get

$$\delta z+\delta z\delta z=C \quad (6)$$

which is a quadratic equation with complex solutions (if C>1/4)

$$\delta z=dr+idt \quad (7)$$

Plug equation 6 back into equation 5 and get

$$\delta(\delta z+\delta z\delta z)=0 \quad (8)$$

which I call the amazing equation since it (with eq.7) gives:

real part is special relativity (A). sect.1.1.2

imaginary part is Clifford algebra (B)

and these both imply the operator formalism (C)

(A),(B),(C) here imply the Dirac equation for the electron e and neutrino v.

The Clifford algebra drdt area min also implies a extremum smallest area Mandelbulb and so the Fiegenbaum point. The Fiegenbaum point (fractal) local source and the Dirac equation imply that

New pde (9).

Given equation 9 the composite e,v give the Standard electroweak Model and the 3e composite the rest of particle physics (partII). The fractalness implies cosmology and gravity. Getting A,B,C out of eq.8 in one step like this is the reason for calling it the amazing equation.

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1.1.1 Amazing Equation rewrite eq.1.1.1;1.1.2 as the more familiar operator formalism

Sect.1 Postulate 1 as min(z-zz)>0 which can be rewritten as: z-zz=C (1.1.1), δC=0, C<0 (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: δz=[-1±√(1-4C)]/2. For noise C>¼ δz=dr+idt (1.1.5)

(So we derived `space-time.`). Plug 1.1.4 into eq. 1.1.2 δC=δ(*δz-K)+δ(δzδz*)=0 (1.1.6)

which is the amazing equation.

Note because of that δ on the extreme left in eq.1.1.6) we can add constant arbitrary -K to δz in eq.1.1.4 to use δ(δz-K)=0 in eq.1.1.6) to initialize C to a global flat space-time with arbitrary (noise) C since C ≈ δz allowing K to be a constant in K-δz=0.

Also since K is complex we must also add 2 degrees of freedom as in 2⊕2 (Note then 4D keeps ds^2 invariant even if K≠δz).

1.1.2 δz=K →flat

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)

and $ds_3\equiv$ $\delta(drdt+dtdr)=0$ (1.1.8)

If dr,dt positive then $drdt+dtdr=ds_3=0$ is a minimum. Alternatively if dr,dt is negative then drdt+dtdr=0 is maximum instead for dr-dt solutions. In fact all dr,dt sign cases imply a single invariant extremum $ds_3\equiv$: $drdt+dtdr=0$ (our 1st invariant,sect.1.2.5) (1.1.9)

Note in general dr,dt are any two of these 4 independent variables implying eq.1.1.9 defines a Clifford algebra(sect.1.2.3). Next **factor**

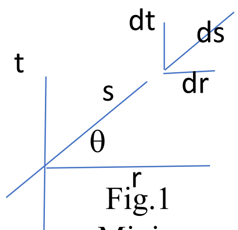
$\delta(dr^2-dt^2)=\delta[(dr+dt)(dr-dt)]=\delta(ds^2)=[[\delta(dr+dt)](dr - dt))] +[(dr +dt)[\delta(dr - dt)]]=0$ (1.1.10)

Solve eq. 1.1.10 and get	(→±e)	dr+dt=√2ds, dr-dt=√2ds, $\equiv ds_1$	(1.1.11)
	(→light cone *v*)	dr+dt=√2ds, dr=-dt,	(1.1.12)
	" "	dr-dt=√2ds, dr=dt,	(1.1.13)
	(→vacuum)	dr=dt, dr=-dt	

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) and eq.1.1.9 gives the Clifford algebra (Sect.1.2.5). Thus K=δz initializes to locally flat space. But the invariants ds_1 and ds_3 imply a third invariant.

Third Invariant

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, sect.1.2). Note in fig.1 min ds is at 45°. So ds is diagonal.



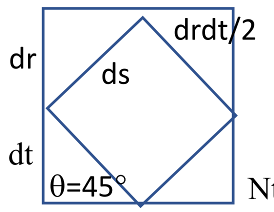


Fig.1 Nth fractal scale

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 $\Delta\theta$ $\delta z=dse^{i\theta}=dse^{i(\Delta\theta+\theta o)}=dse^{i((\cos\theta dr+\sin\theta dt)/(ds)+\theta o)}$, $\theta_o=45°$. (1.1.15) So $\theta=f(t)$. $\delta z=dse^{i(45°+\Delta\theta)}$. In eq.1.15 we define $k\equiv dr/ds$, $\omega\equiv dt/ds$, $\sin\theta\equiv r$, $\cos\theta\equiv t$. $dse^{i45°}=ds'=ds$. 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 $\dfrac{\partial\left(dse^{i\left(\frac{rdr}{ds}+\frac{tdt}{ds}\right)}\right)}{\partial r}=i\dfrac{dr}{ds}\delta z$ so

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

$k\delta z=-i\dfrac{\partial\delta z}{\partial r}$ 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 $\xi_s\equiv m_e$. $\delta z\equiv\psi$,(eq.6.6.1) Note we also derived the DeBroglie wavelength$\lambda=h/mv$

$p_r\psi=-i\hbar\dfrac{\partial\psi}{\partial r}$ 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 qubits) 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 and get z'=z'z'+C since z'≡(zz+C)=z. So you can repeat this step with this new z'=z'z'+C. We get the iteration $z_{N+1}=z_N z_N+C_M$ with $\delta C=\delta(z_{N+1}-z_N z_N)=0$ () 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 ξ_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. For example Eq.1.1.8 says that δ(2drdt)=0=δ(area)=0 which occurs at the Fiegenbaum point C_M, the smallest of the Mandelbulbs which is also real. So by setting z=0 we showed that the electron is at the Fiegenbaum point

Bring back the C≈0 by defining $C_M\equiv\xi\delta z$ since for small δz (in z≡1+δz and eq.1.1.6) in the z=1 case, $C\approx \delta z=C_M/\xi$ since $\xi\equiv\xi_1$ is then a big in $C_M\equiv\xi C$ (So small local noise C_M/ξ making C real since C_M is.). So (z-zz)/ξ≡z'-z'z'≈C and so z'≈z'z' so z'≈**real#1.** Thus:

Postulate1 as **min(zz-z)**>0. (and so also making 1 a real#).

Again for $z_1=z=0$ given z≡1+δz then δz=-1 so |δz| is big. Also δz+δzδz=C then δz<<δzδz≈C for the big fractal scale baseline. So $C_M\approx\xi C=\xi\delta z\delta z$ and so $\xi=\xi_o$ is small since δzδz is big. So the z=0 particle is stable ($\xi_o\equiv m_e$). $\delta C_M=\delta(\xi(\delta z\delta z))=(\delta\xi)(\delta z\delta z)+2\xi(\delta\delta z)\delta z=0$. So both δξ and ξ are small for z=0. This small ($\xi_o<<\xi_1$) and stable ($\delta\xi_o=0$) particle is our equation 1.1.10 (spin½) electron since its $r_H=C_M/\xi_o$ (see partII) is in the $\kappa_{\mu\nu}$ s of eq,1,2,7.

The reduced mass motion value is: $\xi_1/2=m_p$ inside nucleons

(In part II we derive the value of m_p, and so ξ_1, from B flux quantization inside the ξ_o, $r=r_H$)

Bring back C≈0 In One Reference Frame At Least

But C is still small for *both* z=1 and z=0 because 1-(1)(1)=0 for z=1 and 0-0*0 =0 for z=0. Since ξ_o is small we must be in the boosted reference frame of ξ_o gotten by adding KE =ξ to ξ_o in $\xi_1\equiv\xi+\xi_o$ implying only one $C=C_M/\xi_1$. So we can then use only postulate 1 $z=z_1=1$ which is then the single result of combining our two ($z_1=0,z_1=1$) Mandelbrot sets. Also since ξ_1 and ξ_o are both spin½ then ξ must be ½-½=0 (since ξ is mass in new pde eq.1.2.7 which is also S=½) so there must be two spin½ particles defining $\xi_1=\xi_2+\xi_3+\xi_o\equiv\tau+\mu+m_e\equiv1+\varepsilon+\Delta\varepsilon$, 3 leptons with their associated Reimann surface neutrinos eq.1.1.11; 1.1.12. $\xi_o=\Delta\varepsilon$ is the stable ground state for all three states.

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/($m_p c^2$). 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 $r_2=10^{40}Xr_1$

K≠δz

1.2.2 K≠δz

Recall small δz, so small K, C≈ δz-K in eq.1.1.4 K≡x+iy in eq.1.1.4 also adds 2 more degrees of freedom since K can be complex. So from the Mandelbrot set $\delta C_M=\delta(\xi C)\approx\delta(\xi(\delta z-K))=\delta\xi(K-\delta z)+\xi\delta(K-\delta z)\approx 0$. So ξ large (in $C_M=\xi(\delta z-K)$). So z-zz=C_M/ξ fractalness with large ξ implies small C and so small δz implies a Δθ 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 θ≈45°: $(dr-\delta z)+(dt+\delta z)=(dr-(C_M/\xi_1))+(dt+(C_M/\xi_1))=\sqrt{2}ds=dr'+dt'$ (1.2.1)
= 2 rotations from ±45° to next extremum (appendix AI below). 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. So the postulate of 1 z-zz=C with C small can once again be written but for a local source $((C_M/\xi)\delta(r-r_H)/\pi r)=C\approx 0$ for large ξ.
Recall z≡1+δz so if z=0 then 0=1+δz so |δz| is big in $C_M=\xi(\delta z-K)$ so ξ is small
So for z=0 rotations ξ is small so big C_M/ξ_o (also δξ=0 so stable, electron,sect1.2.4) from A1 $\theta=C_M/ds\xi_o=45°+45°=90°$. In contrast for z=1 ξ_1 big so θ=45°-45°≈0 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 $\kappa_{rr}\approx 1/[1-((C_M/\xi_1)r))]$ (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.
Generalizing $ds^2=\kappa_{rr}dr'^2+\kappa_{oo}dt'^2$ (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* z (eq. 1.1.10) which shows why we said **K≠δz** implies curved space.

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 $\xi_1/2=m_p$. 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 $\kappa_{oo}\approx[1-(C_M/(\xi_ir))]$ by 1-ε to then get $[1-\varepsilon-\Delta\varepsilon-C_M/(\xi_or)]$ 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/ξ_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 $r_H \to r_H 10^{40}$, κ_{oo}= $1-C_M/\xi_o)/r \to 1-(a/r)^2-r_H/r= 1-\xi_1-(C_M/\xi_o)/r$, N+1th fractal scale, and $1/m \to m$ (since $r_H=2e^2/m_ec^2 \to 2GM/c^2$) defining G.

1.2.3 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 γ^μ 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.1.9 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$\to$

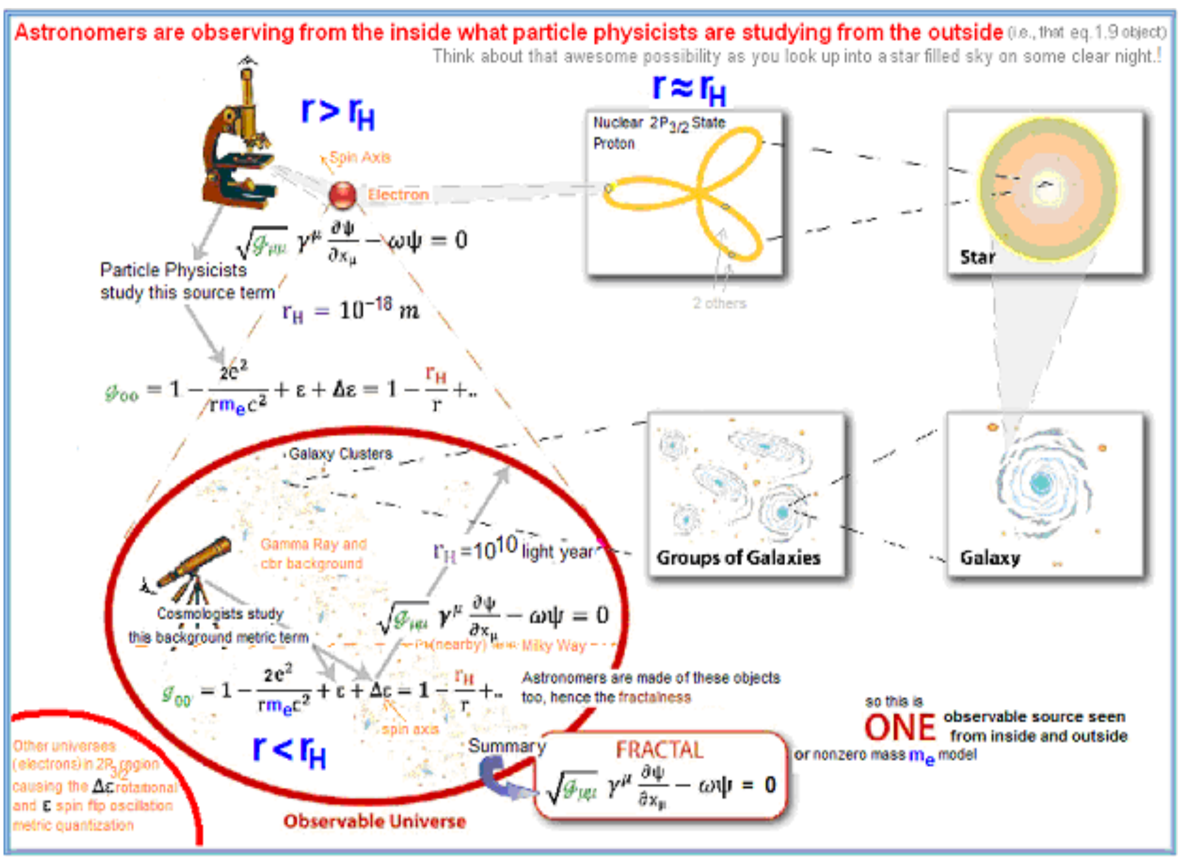
$ds=(\gamma^1\sqrt{\kappa_{11}}dx_1+\gamma^2\sqrt{\kappa_{22}}dx_2+\gamma^3\sqrt{\kappa_{33}}dx_3+\gamma^4\sqrt{\kappa_{44}}dx_4)\delta z\to$

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

$\omega\equiv m_Lc^2/h$. 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,v at $r=r_H$ and in partII we show that the $2P_{3/2}$ particle physics at $r=r_H$ from.

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.

Applications Of section 1

1.2.4 Metrics 1.2.2 for z=1 and z=0 solutions to z=zz

$\kappa_{\mu\nu}$ Metric: From eq.1.2.2 $\kappa_{00}=(1-((C_M/\xi_1)/r))$.
Recall $z=1+\delta z$, $\delta(C_M)\equiv\delta(\xi C)$ and $\delta z+\delta z\delta z=C$ (1.1.6). For
z≈1 then δz is small with $\delta z\delta z<<\delta z$ for the small fractal scale baseline. So $\delta z\approx C$. Thus $\delta C_M\equiv\delta(\xi\delta z)$ and so since δz is small then $\xi\equiv\xi_1$ is big in $C\equiv C_M/\xi_1$ the C is thereby still small so z-zz≈0. Also $\delta(C_M)\equiv\delta(\xi\delta z)=\delta\xi\delta z+\xi\delta\delta z=0$. Big ξ_1 means $\delta\delta z\approx 0$.
z=0 Given $z\equiv 1+\delta z$ then $\delta z=-1$ so δz is big. Also $\delta z+\delta z\delta z=C$ then $\delta z<<\delta z\delta z\approx C$ for the big fractal scale baseline. So $C_M\approx\xi C=\xi\delta z\delta z$ and so $\xi=\xi_o$ is small since $\delta z\delta z$ is big. So the z=0 particle is stable ($\xi_o\equiv m_e$). $\delta C_M=\delta(\xi(\delta z\delta z))=(\delta\xi)(\delta z\delta z)+2\xi(\delta\delta z)\delta z=0$. So both $\delta\xi$ and ξ are small for z=0.
But C is still small for both z=1 and z=0 because -1+(-1)(-1)=0 for z=0 and 0-(0*0)=0 for z=1. Note the noise C is different for the z=1 and z=0 solutions. Again, given $z-zz=C_M/\xi$, for both z=1 and z=0 ξ has to be large since z-zz has to be small for *both* cases. Also in general, given $C_M=\xi\delta z$ the noise δz on z=1 (ξ_1) is clearly different than the noise on z=0 (ξ_o). So if z=1→z=0 then ξ may change by that *small* amount ξ_o to still keep z-zz close to zero. Thus this small change in ξ defines our small ξ_o. Thus constant ξ_1 in C_M/ξ_1 always contains stable ξ_o and so $\xi_1\equiv\xi+\xi_o=m_L\equiv$ KMQ. Also since both ξ_1 and ξ_o are both spin½ then ξ must be ½-½=0 (since ξ is mass in new pde eq.1.2.7 which is S=½) so must be two spin½ particles defining $\xi_1=\xi_2+\xi_3+\xi_o\equiv\tau+\mu+m_e\equiv 1+\varepsilon+\Delta\varepsilon$, 3 leptons. In $C_M=\xi C$ then C is different for different ξ so in equation 1.1.4 solution the complex plane is different for each of the three different masses so there are three pairs of leptons (charged and uncharged leptons hence `we derived the three` (eq.1.11-1.13) `lepton families` Riemann planes: electron, electron neutrino; muon, muon neutrino; tauon and tauon neutrino.). Eq.7.4.1 (i.e., the γ=917) and m_e sets the size of KMQ=ξ_1. $\xi_o=m_e$ in C_M/ξ is set by the distance r to object B in the Kerr metric term $(a/r)^2$.(section 6.3. Also see type A metric quantization partIII).
So $C_M=(\xi_2+\xi_3+\xi_o)C$ and thus $C=\frac{C_M}{\xi_1}=\frac{C_M}{\xi_3+\xi_2+\xi_o}$ =is a source to the new pde for $r<r_H$. given this constraint $\xi_3+\xi_2=\xi_1$.
z=1 $\kappa_{\mu\nu}$ Metric: From 1.2.2 $\kappa_{00}=(1-((C_M/\xi_1)/r))$ ξ_1=big$\equiv m_L=\tau+\mu+e$
So in the (sect.6.3) Kerr $\kappa_{00}=1-m_L-(C_M/m_L)/r$. We get all of leptonic particle physics there (sect.6.12). From sect. 8.2 $E\propto 1/\sqrt{\kappa_{00}}$. Next multiply by ξ_1 to normalize the first order Taylor expansion term $(C_M/2\xi_1)/r$ to the Coulomb potential:

$$E=\xi_1/\sqrt{\kappa_{00}}\equiv\xi_1/\sqrt{(1-(C_M/\xi_1)/r)}=m_L/\sqrt{(1-((ke^2/m_L)/r))} \quad (1.2.4)$$

Note $\xi_1=m_L$ (≈4000m_e) is mass energy and really is big in eq.1.2.7 also giving point source like leptons since large r denominator in E. So those eq.1.1.11 single free space **leptons** (or

equivalently TeV COM mass collision 3e (PartII) $2P_{3/2}$ objects) **really are point like particles**.
Note also ξ_1 and ξ_o are independent operators since they are associated with different z s in eq.1.1.16.
Note in equation 1.1.15a if $dz=dr=dse^{i(\omega t+kr)}=dse^{i(t/\sqrt{\kappa oo}+kr)}$ so $(a/r)^2=(\xi e^{i(t/\sqrt{\kappa oo}+kr)})^2$ (1.2.5)
with Taylor series $\Delta\varepsilon\varepsilon$ cross terms in B3. Note ξ (mass) and dt share the same eq.1.1.10 Lorentz transformation γ, sect.1). But dt=0 and $\delta dt=0$ (and so $\delta\xi=0$, the electron, z=0) is seen even in the zoomed (sect.A5) Mandelbrot sets at their respective rotated Fiegenbaum Points(FP) implying FP is still the global $\delta C=0$ |C| max even in the zoomed sets. Thus we have a (10^{40}Xsmaller) fractal universe with tinier and tinier electrons (eg.,with their respective eq,1.2.7 zitterbewegung *expansion* (and contraction) oscillations for $r<r_C$) separated casually by these r_H horizons thereby deriving cosmology.

Calculation Of ξ_1. Reduced Mass $\xi_1/2$ Positron Stable Model $2P_{3/2}$ at $r=r_H$ (partII)

We use the equation 1.2.7 energy normalization ($m_e\equiv1$) for two reduced mass $2P_{3/2}$ ultrarelativistic positrons (sect.7.6) at $r=r_H$ with ansatz $\xi_3\to x^2$, and $\xi_o\to1$ in $\xi_1=\xi_3+\xi_2+\xi_o$.
$\equiv x^2+(2+\Delta)x+(1+\Delta)$. So $E=\frac{1}{2}\frac{C_M\xi_1^2}{\xi_1\sqrt{2}}=\frac{1}{2}\frac{\xi_1^2}{\xi_1}=\frac{1}{2}\frac{1}{(x^2+(2+\Delta)x+(1+\Delta))}=(partial\ fractions)=$
$\frac{1}{2}\left(\frac{\left(-\frac{1}{\Delta}\right)}{x+1}+\frac{\left(\frac{1}{\Delta}\right)}{x+1+\Delta}\right)$=positron1+positron2. So for $x\to0$ then $\Delta=1/3684$ from the boosted magnetic flux calculation $2\gamma=3684$ in section 7.3.

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

One result is that from eq.1.18 we have nonzero ε in $(dr-\varepsilon)\equiv dr'$
So from 1.2.3: $ds^2=dr'^2+dt'^2=dr^2+dt^2+dr\varepsilon/2-dt\varepsilon/2-\varepsilon_1^2/4$ (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 ε has to be zero therefore $\varepsilon^2/4$ is 0 and so is pinned as in eq.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.1.11 electron is defined as the particle for which $dr\approx dt$ so $dr\varepsilon/2-dt\varepsilon/2$ cancels so ε_1 ($=C_M$) in eq.1.16 can be small but nonzero so that the $\delta(dr+dt)=0$. Thus dr,dt in eq. 1.11 are automatically both positive and so can be in the *first quadrant*. 1.11 is *not* pinned to the diagonal so $\varepsilon^2/4$ (and so C_M) in eq.1.2.2 is not necessarily 0. So *the electron is charged* since C_M is not 0. This then explains the positioning of the +e,-e, v vectors in figure 2.

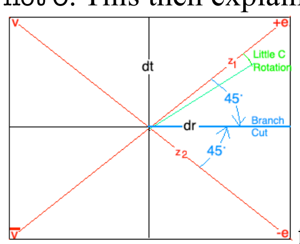


fig.2

Note for finite C in 1.2.7 we also **break** the **two** 2D **degeneracies (**in eq.1.1.11) giving us our **4D.**

1.2.4 Implication for Real plane: Recall all observable z satisfy eq.1.15 so that $z\propto e^{i\theta}$. Eq.1.1.4 $\delta\delta z=0$ implies 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.0.1. 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. So just for $z_{1,r}$: $z_{1,r}=-idz/dr$ (partial derivatives). Then do the $-C_M$ rotation:
$-45°$, $(dr/ds)z_{1,r}=z_{2,r}$. So $-idz_{1,r}/dr=z_{2,r}=-i[(d/dr)(-id/dr)z=(d^2/dr^2)z$. Do both and get for

$$45°+45° \text{ rotation } dr^2z+dt^2z\rightarrow \quad (d^2/dr^2)z+(d^2/dt^2)z \qquad (1.2.8)$$

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.1.4 and eq.1 we then have eigenfunctions z. This time however *all* variations $\delta C=0$ (even the 45° rotation to branch cut extremum) are realized and so have real (stable electron) particles instead of virtual(transitory).

1.2.5 z=0 Complex Plane Z,W Composites of e,v

So the *large* **C** z rotation application from the 4 different axis' max extremum (of 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. So we have large C_M dichotomic 90° rotation to the next Reimann surface of 1.1.15, eq.1.2.3 $(dr^2+dt^2)z''$ from some initial extremum angle(s) θ. Eq.1.5a solutions imply complex 2D plane Stern Gerlach dichotomic rotations using noise $z''\propto C$ (1.2.1) using Pauli matrices σ_i algebra, which maps one-to-one to the quaternionA algebra. From sect.1.2, 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.1.2.2 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.1.1.11 can then be replaced by eq.1.1.14, eq.1.2.3 $(dr^2+dt^2+..)z''=(dr^2+dt^2+..)e^{quaternionA}$Bosons because of eq.1.15. Then use eq. 1.2.2 to R rotate: z'':

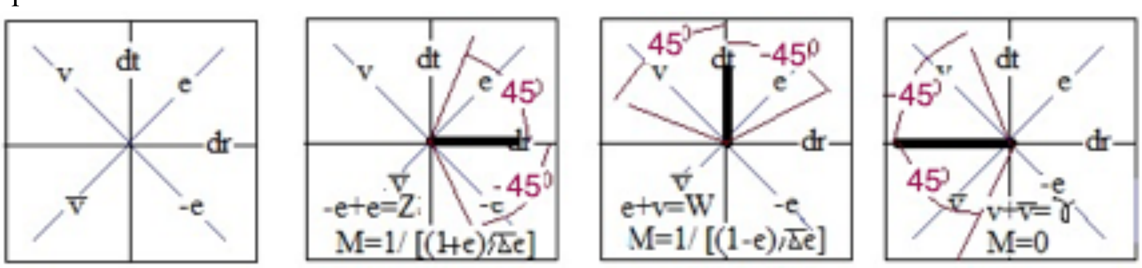


Figure 3. See eq.B4. The Appendix A derivation applies to the far right side figure.
Recall from section 0.1 $2C_M=45+45=90°$, gets Bosons. 45-45= leptons.
2AB: 1.12 Dichotomic variables→Pauli matrix rotations→$z'=e^{quaternion\ A}$→Maxwell γ =Noise C blob. See Appendix A for the derivation of the eq.1.1.15 2ndderivatives of $e^{quaternion\ A}$.
2AC: 1.11+1.11 Dichotomic variables→Pauli matrix rotations→$z''=e^{quaternion\ A}$→KG Mesons.
2AD: 1.11+1.11+1.11at $r=r_H\equiv C_M$ (also stable baryons, partII and also appendix B2.
2AE: 1.11+1.11+1.12 Dichotomic variables→Pauli matrix rotations→$z''=e^{quaternionA}$, Proca Z,W

Appendix A **2AB** eq.0.2 $(dr^2+dt^2+..)e^{quaternion\ A}$ =rotated through C_M in eq.1.1.15. example C_M in eq.1.2.1 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. 1.2.3 $dr^2\delta z=(\partial^2/\partial r^2)(\exp(iA_r+jA_o))=(\partial/\partial r[(i\partial A_r\partial r+\partial A_o/\partial r)(\exp(iA_r+jA_o)]$
$=\partial/\partial r[(\partial/\partial r)iA_r+(\partial/\partial r)jA_o)(\exp(iA_r+jA_o)+[i\partial A_r/\partial r+j\partial A_o/\partial r]\partial/\partial r(iA_r+jA_o)(\exp(iA_r+jA_o)+$
$(i\partial^2 Ar/\partial r^2+j\partial^2A_o/\partial r^2)(\exp(iA_r+jA_o)+[i\partial A_r/\partial r+j\partial A_o/\partial r][i\partial A_r/\partial r+j\partial/\partial r(A_o)]\exp(iA_r+jA_o)$ (A2)
Then do the time derivative second derivative $\partial^2/\partial t^2(\exp(iA_r+jA_o)=(\partial/\partial t[(i\partial A_r\partial t+\partial A_o/\partial t)$
$(\exp(iA_r+jA_o)]=\partial/\partial t[(\partial/\partial t)iA_r+(\partial/\partial t)jA_o)(\exp(iA_r+jA_o)+$
$[i\partial A_r/\partial r+j\partial A_o/\partial t]\partial/\partial r(iA_r+jA_o)(\exp(iA_r+jA_o)+(i\partial^2A_r/\partial t^2+j\partial^2A_o/\partial t^2)(\exp(iA_r+jA_o)$
$+[i\partial A_r/\partial t+j\partial A_o/\partial t][i\partial A_r/\partial t+j\partial/\partial t(A_o)]\exp(iA_r+jA_o)$ (A3)
Adding eq. A2 to eq. A3 to obtain the total D'Alambertian A2+A3=
$[i\partial^2A_r/\partial r^2+i\partial^2A_r/\partial t^2]+[j\partial^2A_o/\partial r^2+j\partial^2A_o/\partial t^2]+ii(\partial Ar/\partial r)^2+ij(\partial A_r/\partial r)(\partial A_o/\partial r)$
$+ji(\partial A_o/\partial r)(\partial A_r/\partial r)+jj(\partial A_o/\partial r)^2++ii(\partial Ar/\partial t)^2+ij(\partial A_r/\partial t)(\partial A_o/\partial t)+ji(\partial A_o/\partial t)(\partial A_r/\partial t)+jj(\partial A_o/\partial t)^2$.
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 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)
$i[\partial^2A_r/\partial r^2+i\partial^2A_r/\partial t^2]=0$, $j[\partial^2A_o/\partial r^2+i\partial^2A_o/\partial t^2]=0$ or $\partial^2A_\mu/\partial r^2+\partial^2A_\mu/\partial t^2+..=1$ (A5)
A4 and A5 are Maxwell's equations (Lorentz gauge formulation) in free space, if μ=1,2,3,4.

$$\Box^2A_\mu=1,\ \Box\bullet A_\mu=0 \quad \text{(A6)}$$

Still ONE Postulated Object: By the way we note A_μ (composed of two ν identified as 1 γ 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 ν&γ in it. We derived the SM here because other derivations similar given their respective fig.4 sources.

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_μ,m_τ,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 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!

A3 z=0

z=0 Metric $\kappa_{\mu\nu}$: For only a single **electron Δε at $r=r_H$ in eq.1.1.14 $2P_{½}$ state** (N neutron) we must then normalize out the 1+ε so $\kappa_{00}=1+\Delta\varepsilon/(1+2\varepsilon)-r_H/r$. But more distant object C (Our large 3 object cosmological object is a proton) for a weakly bound state (eg., $2P_{½}$ at $r\approx r_H$) implies another smaller $r=C_M/\xi_2=r_H$, so $\kappa_{00}=\Delta\varepsilon/(1+2\varepsilon)\approx\Delta\varepsilon(1-2\varepsilon)$ or in general:
$E=1/\sqrt{\kappa_{00}}=1/\sqrt{(\Delta\varepsilon(1\pm2\varepsilon))}=1/[(1\pm\varepsilon))\sqrt{(\Delta\varepsilon)}]=\xi_2$ (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 Δε+ν 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= $2G\iiint_0^{r_W}\psi_1\psi_2\psi_3\psi_4\,dV=2G\iiint_0^{r_W}\psi_1\psi_2\frac{1}{V^{1/2}}\frac{1}{V^{1/2}}V=$
$2\iiint_0^{r_W}\psi_1\psi_2G\equiv\iiint_0^{V_W}\psi_1\psi_2(2m_ec^2)dV_w=\iiint_0^{V_W}\psi_1(2m_ec^2)\psi_2dV_w$. (A8)
What is Fermi G? $2m_ec^2(V_W)=.9\times10^{-4}$Mev-$F^3=G_F$ **the strength of the weak interaction**.

A4 Eq.1.21b derivation of DeSitter, SM ϕ^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 ϕ^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 ε the cosine expansion gives $\kappa_{oo}=\mathrm{Rel}e^{i\Delta\varepsilon/(1-\varepsilon)}\approx 1-(\Delta\varepsilon/(1-\varepsilon)))^2/2+..$ (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 1.2.2 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.

Appendix B

Introduction To Chapter 6 and **PartII: pure states ξ_1= KMQ(sect.1.2)= KE+3m$_e$**

We find in partII that for the three 1.2.7 objects, have rest masses 2e+,1e- at $C_M/\xi_o=r_H$ in $\Phi=BA=B\pi r_H^2$=first B flux quantization level $\Phi=h/2e$. 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 effect 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 im

B2 Why min(z-zz)? **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**) and so as the two most profound axioms in real# mathematics: "completeness" (∃**min**sup) and "choice" (choice function 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.

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/ξ is big and so those big rotations in sect 1.2.

In the more fundamental set theory formulation $\{\varnothing\}\subset\{\text{all sets}\}\Leftrightarrow\{0\}\subset\{1\}=\xi C=z_1$. So ξ_o acts as 0 in eq.1.1.1 since $\varnothing=\varnothing\cup\varnothing\Leftrightarrow 0+0=0$, $\{\{1\}\cup\varnothing\}=\{1\}\Leftrightarrow 1+0=1$. 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).

C 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 r_H in eq.2. So for each larger electron there are **10^{82} constituent electrons**. At the bifurcation point, which is also the Fiegenbaum point, the curve is a straight line and so $\delta C_M=0$. 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.

So that $\delta z = \frac{-1\pm\sqrt{1-4C}}{2}$. is real for noise C<¼ (B1)

creating our noise on the N+1 th fractal scale. So $¼=(3/2)kT/(m_p c^2)$. 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) =$\log 10^{80}/\log 10^{40}$ =$\log((10^{40})^2)/\log(10^{40})$= 2 .

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 ξ_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.*
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.

(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 iteration sequence z_n is Cauchy sequence of rational numbers z_n so 1 is a real number.