

## Part V

$$r < r_H$$

### Section 12.1 Continued: Metric Change Effects We Can Astronomically Observe and Observable Effects on the Geological Time Table

#### Introduction

Part V of this book is optional and is a continuation of the fractal  $r < r_H$  solution method of the new pde of section 12.1. It provides the time evolution of the metric in that Dirac equation zitterbewegung motion and some implications of the apparent multiparticle fractalness at cosmological scales. For example inside  $r_H$  the density goes as  $\sinh \theta t$  and so  $R_{22} = \sinh u$ . Solving this equation, including also Kerr metric rotation as a perturbation, gives the time evolution of the cosmological metric. But the nontrivial electron mass implies a nearby cosmological object (called object B in chapter 23 and in general there must be an object C if this is to be a baryon). These objects provide a quantized perturbation to that time evolution. The implications are dazzling, imply an amazing amount of metric change, metric quantization consequences, that have been observed. To understand the metric quantization effects on quantum tunneling we use the Gamow equation with  $1/\theta = \exp(-2\pi Z_1 Z_2 e^2 / \hbar v)$  = transmission coefficient Gamow factor. Also from section 3.3 we have  $\hbar' = \hbar / \sqrt{\kappa_{00}}$ ,  $ke^{2'} = ke^2 / \sqrt{\kappa_{00}}$ .  $1/\sqrt{\kappa_{00}}$  = energy of quantized metric  $\hbar$  then is proportional to  $ke^2$  so in the Gamow factor only speed  $v$  matters when a metric jump occurs. Thus the net effect of the metric jump event is to change the  $v$  in the Gamow factor and so the rate of radioactive decay in the earth (thus effect volcanism) and the rate of thermonuclear fusion in the sun (thus effects climate on the earth). The resulting geological time equation (i.e., earth history equation) then provides a fitting and useful end to this book. Furthermore from chapter 2  $\varepsilon$  was larger in the early universe so  $v$  larger making the effect of the nuclear force smaller so that particles can tunnel out of its Yukawa potential easier. This pushes the maximum binding energy per nucleon back say to silicon and carbon making these binding energy per nucleon the highest and making supernova at those times release those elements, creating a dust but still (after 350by) making a mature “early” universe.

## Chapter 22

### Metric Coefficient Changes with Radius

#### 22.1 Equation 10.2 Empty Space Expansion Corrected For *Non Free Space*

Recall from chapter 2 that case 1,  $\varepsilon$ ,  $\Delta\varepsilon$  now act as independent physical QM operators (e.g.,  $\varepsilon$ =cosmological expansion,  $\Delta\varepsilon$ = cosmological rotation) in this Dirac equation. Note also just below equation 22.5 that this smallest size  $r_{initial} = 20 \times 10^6$  km is approximately  $10^{41}$  times larger than the Planck length  $10^{-32}$  meters. Thus this  $r_{initial}$  distance is the Planck length for the  $M+1$  sized cosmological scale. Thus even the Planck length is fractal and represents the smallest size attained in the Dirac zitterbewegung oscillation. Also note that the universe does not collapse to a point ( $20 \times 10^6$  km) and that the value of the constants  $\varepsilon$  and  $\Delta\varepsilon$  depends on our point in time in the expansion.

Note the relatively large  $\Delta\varepsilon$  rotational term implies small inertial frame dragging and thus a relatively 'nearby' ( $\sim 10^{10}$ LY) implying rotational (thus  $\Delta\varepsilon$  is a Raman spectral rotational energy increment) and vibrational  $\varepsilon$  energy levels. A second, farther away, object (as in a proton) is creating subharmonics to that fundamental 87km/sec.

Note the universe was already old at the linear extrapolation time of 13By ago (red line in so many large galaxies and their associated black holes should already have matured by that time.

## 22.2 Horizon, Flatness and Monopole Problems

There is a lot to say in this theory about the Horizon, Flatness and Monopole problems. It has been said that these are the "big" problems with the big bang theory. Supposedly the "inflationary model" is the only way to solve these problems, but that is just not true.

The Horizon problem is solved in this theory because the expansion rate is proportional to  $t^n$  where  $n > 1$ , which is explicitly true in the  $\cosh t$  and its second order  $t^2$  term (the derivative of the  $\sinh t$  diameter for the inside observer), and this rate of expansion is enough to solve the horizon problem and long time below 300kyear red shift decoupling radius (15.38, Guidry, "Gauge field Theory"). In another context the increased  $c$  due to larger gravity<sup>i</sup> (Einstein 1911) provides a means for thermodynamic equilibrium to be established and so give the CBR its black body and uniform character. Incidentally the flatness implies, along with the sound speed in a radiation dominated plasma of  $c/\sqrt{3}$ , and the 300,000 ly radiation decoupling size, that there will be the  $l=200$  dominated power spectrum implied by boomerang and maxima and WMAP data. Inflation is not the only theory that will give this power spectrum since this theory also gives that flatness.

The flatness problem is explicitly solved here since the universe is oscillating (for the outside observer at least), so the amount of matter in the universe is *automatically* close to critical density implied also by  $\sum_M H_M = 0$  in equation 4.15. Though the inside observer sees the accelerating  $r = r_0 \sinh \omega t$  motion.

The monopole problem is solved because SU(5) GUTS (the source of the monopoles and thought to be "required" for baryogenesis) are not needed here because baryogenesis is not needed since the baryons survived from the previous oscillation (it never collapsed to a smaller size than that 63 million mile radius size implied by equation 22.6, the baryons were always here). Also this theory summarized in figure 5 section 12.4 gives the minimal standard model (with SU(3)XSU(2)XU(1)<sub>L</sub> form) and its fields (see lower right hand side of figure) and so it doesn't say anything about these far more general GUTS with their "X" couplings, causing proton decay (where is it?). The proton is stable because for it  $r = r_H$  so the metric time component  $\kappa_{00}$  is zero in eq.4.1, its clock has stopped.

Note in equation 22.6 and chapter 19 the proton mass is tied to the 1 in the metric and the electron mass (and therefore charge) is tied to the  $a \cos \theta$  angular momentum term. Thus the ratios of charge  $e$  to electron mass and electron mass to proton mass don't change here either according equation 22.6. Radio astronomy observations have confirmed this to at least 20 parts in a million (Christian Henkel, 2008).

### 22.3 Equation 22.6 Calculation of More of the Dipole Structural Details of the Center of the Universe

Recall section 2.1  $\cos\theta$  and eq.22.6  $\ln(r_{final}/r_{initial})+2=[(1/U)-\ln U]$  imply larger  $U$  at larger  $r$  and  $\theta = 0$  and  $180\text{deg}$ . Thus in the direction of the center of the expansion the point  $r=0$  should have small metric contribution (dark) and larger at nearby zero and  $180$  degrees: A dipole with a dark center (in Eridanus) Thus this same dipole should also be visible in the direction of the center of cosmological expansion. Recall objects **B** and **C** in chapter 23 and then note also objects **B** and **C** in figure 7 cause an aberration as well (taking +A):

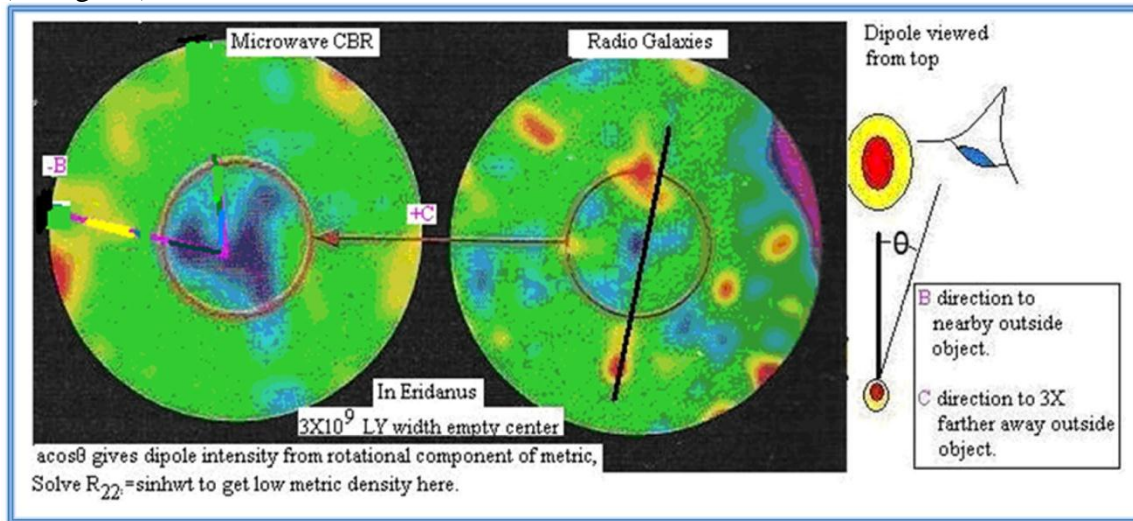
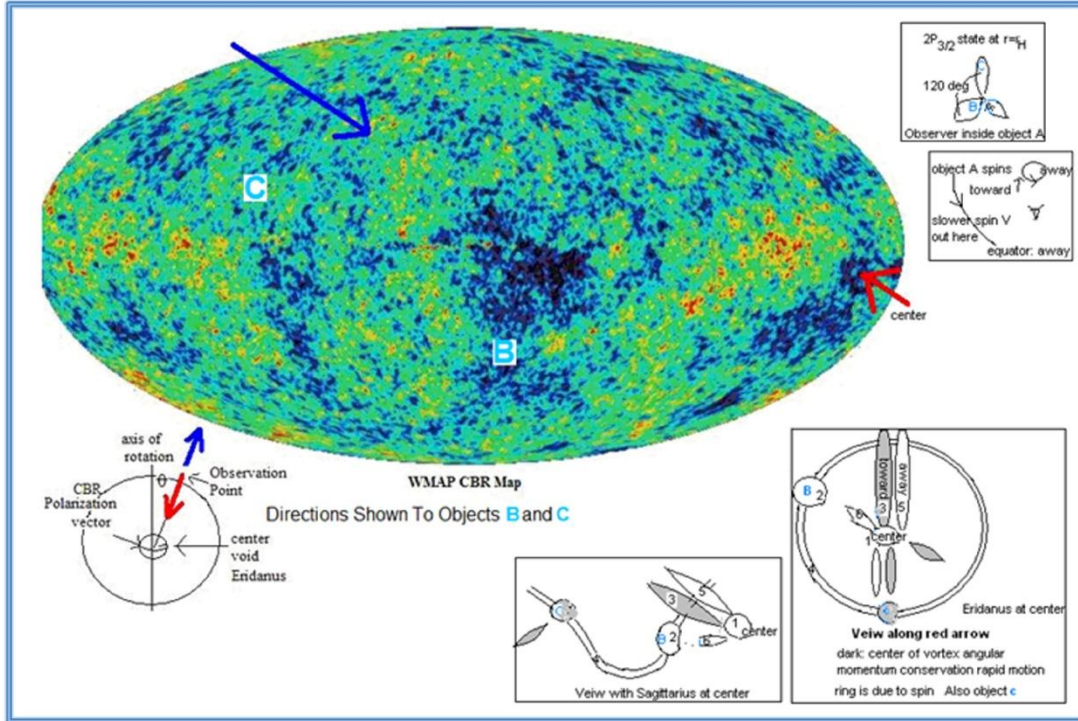


Figure 22-2

Note the observer is looking nearly along the polar axis with the fractal selfsimilarity with the Dirac equation implying net larger charge motion around this center because of the conservation of angular momentum, thus polarization vectors form concentric circles around the central region as occurs whenever charge currents rotate around an axis.



Map Of The Universe

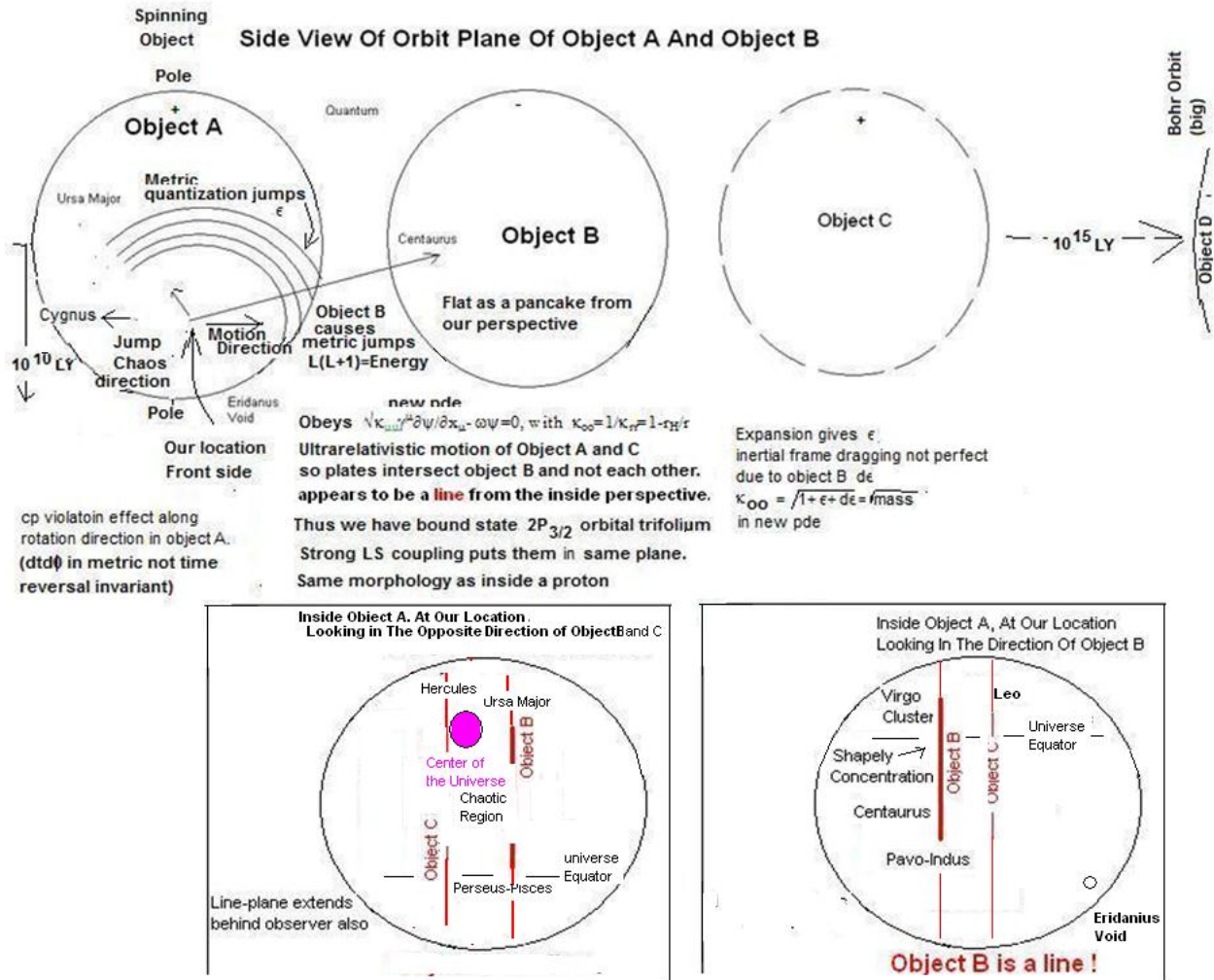


Figure 22-3

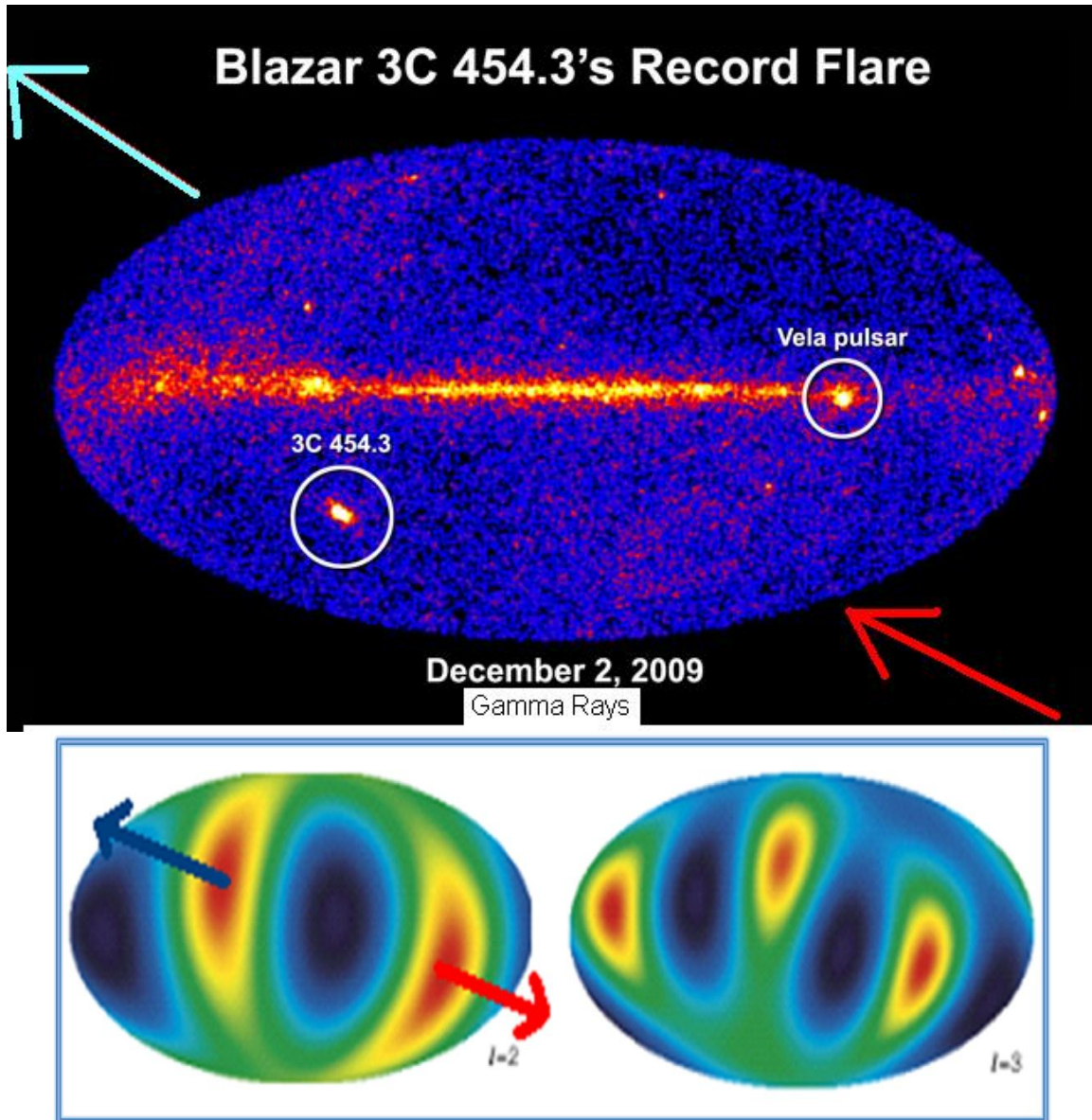
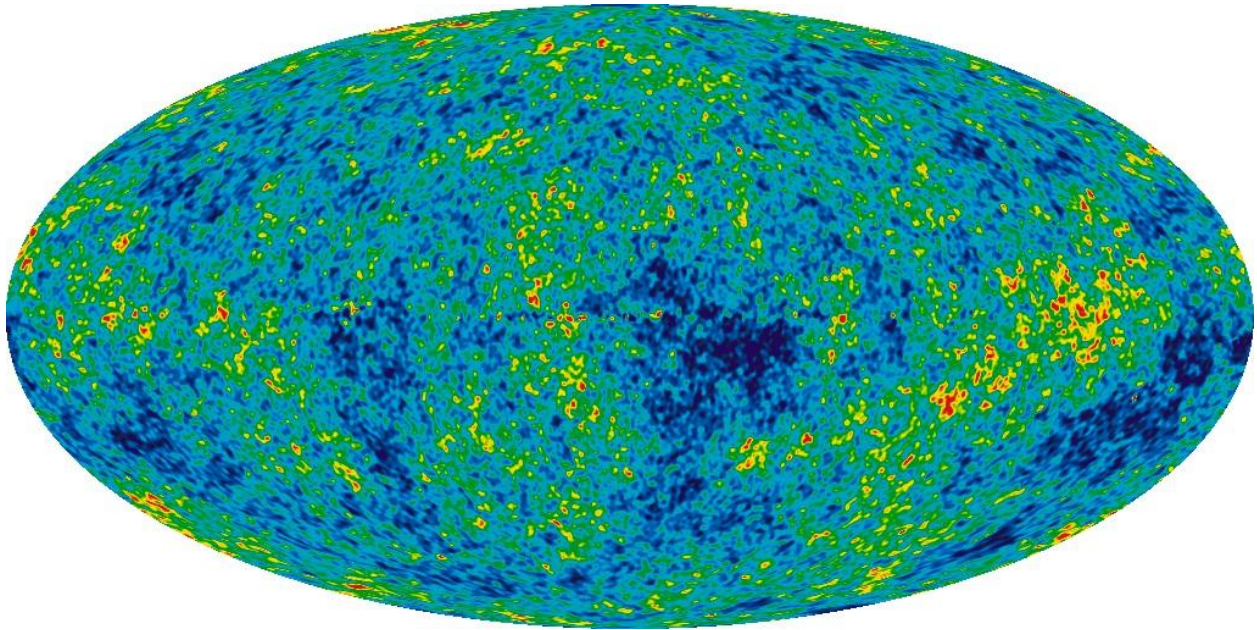


Figure 22-4

L=2 and L=3 cbr moment orientations also imply dipole. Note dipole implies the above orientation as well (blue-red arrows). In Gamma ray image also note the same "axis of evil" spin axis. .New Scientist Sept 2009  
The electron also has a spin (1/2). We are in a Fractal universe. below

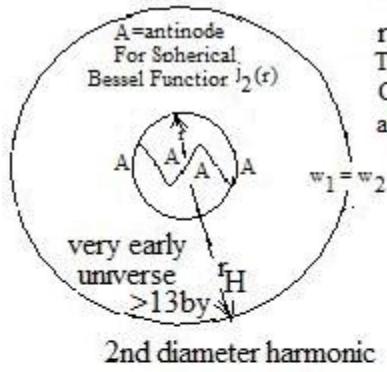


#### 22.4 The $\Delta\varepsilon$ Term Results in Small Left over Polarization of the Ambient Metric

A rotating universe with inertial frame dragging that gave the rotational perturbation  $\Delta\varepsilon/2 \sim .00058/2$  (exact from beginning of section 23.3 quantized metric calculations is  $1/3450 = \Delta v/c \approx \Delta\varepsilon/2$ ) would also give a small dipole ( $l=1$ ) term in the cmb polarization power spectrum since for example the  $N+1$  fractal scale Dirac dipole would give 100% field polarization if not for the inertial frame dragging and would decrease linearly to the present rotational perturbation  $\Delta\varepsilon/2$  value. In that case a power spectrum polarization dipole ( $l=1$ ) of 1 part in 3450 random polarization (equation 1.9) would be expected because of the rotation of the universe Section 21.3). Thus using this linearity we solve (at  $\sim 30\text{GHz}$ , in the K band) the ratio equation  $1/3450 = \Delta_{\text{rotational}} = \Delta T / 2.74$  for  $\Delta T$  giving  $\Delta T^2 = .5\mu\text{K}^2$  fluctuation of the 2.7K cmb background. Therefore we can utilize the Stokes parameters in a monitoring program (symmetrically about the galactic plane) of the cmb polarization in the upper K band for this  $.5\mu\text{K}^2$  polarization temperature. Such a polarization  $\pm .5\mu\text{K}^2$  temperature would be strongly suggestive of a fractal universe because it is essentially a cross check of the rotational  $\Delta\varepsilon/2$  value with the other results in the previous set of applications. There is also a 1% quadropole anomaly to the CBR that would be caused by this inside fractal selfsimilarity with the electron (its spin). From Leonardo Campanelli there are studies of WMAP data.

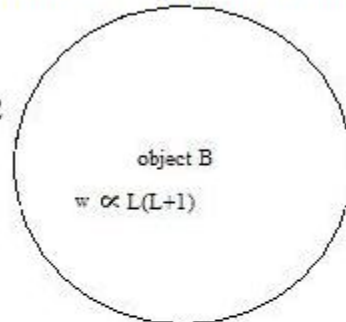
Thus the inside cosmological observer sees the polarization caused by the “spin” of what the outside observer sees as the spin of the electron; The electron and observable universe are one and the same objects but seen from two different perspectives: our underlying principle.

There are metric quantization antinodes for  $1/\varepsilon = 1/.06 = 17$  metric quantization antinodes created by object B (spherical Bessel functions) each of which could be the source of gravitational waves, and spin interaction with the  $\text{dep} = 1/.000058 = 17,000$  antinodes where 25 span the universe, these being the voids.

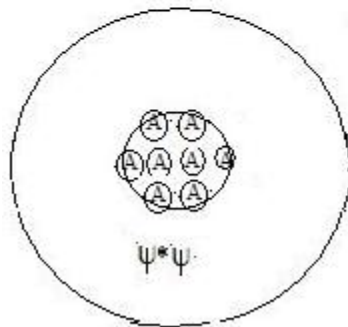


$r = r_0 e^{kt}$  Solutions to the new pde for  $r < r_H$   
 Thus universe with accelerating expansion.  
 Oscillatory universe. Starts out expansion phase at 40million km diameter. like a very slow supernova.

$\psi \propto 2P_{3/2}$



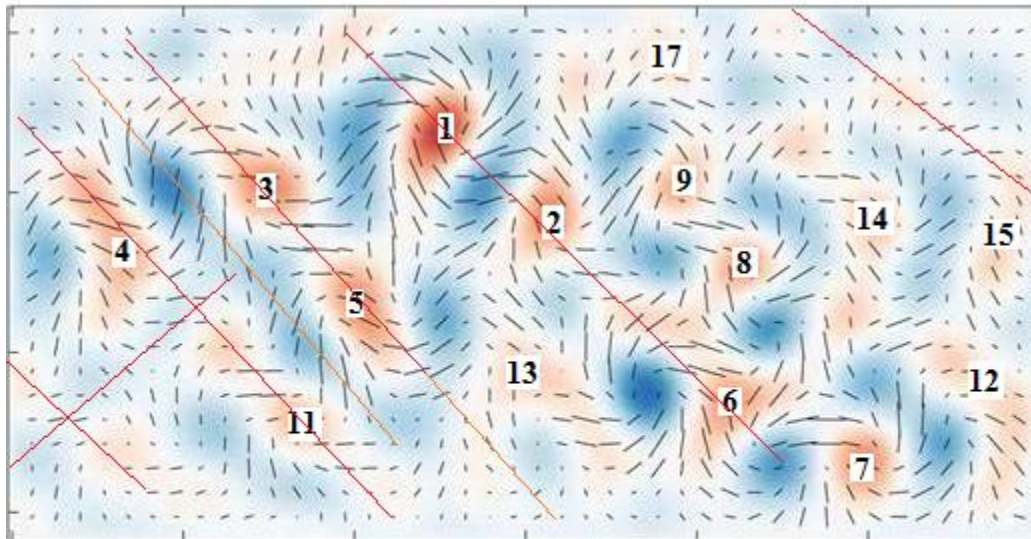
$L=1$  gives  
 $w \propto 2$  second harmonic



Fractal object so spin polarization in cbr.  $h$  is smaller so Gamow factor is smaller so weaker nuclear force. So supernova create silicon and carbon (dust) instead of iron.

350my long expansion.  
 Enough time for thermal equilibrium so horizon problem solved.  
 Metric quantization jumps associated with object B motion cause oscillations with those antinodes.

These antinodes oscillations are gravitational waves.



## 22.5 Metric quantization is responsible for mass constancy (of an electron) from one region of space to another

Recall all those statements in our quantum mechanics text books about how the wave function ( $\psi$ ) behaves. For example taking derivatives of (i.e., operating on) the wave function  $\psi$  gives eigenvalues, the wave function collapses at the time of observation to the value observed,  $\psi^*\psi$  is the probability density etc.,. But what is lost in these statements is that the wave function is also a solution to the Dirac equation (pde), so these properties of the wave function are also a consequence of that equation. In that regard for example the S state solution ( $\psi$ ) applies over all space. Thus with the  $r_H$  horizon boundary the eigenfunctions (e.g., S state) should also apply over all of space including at  $r < r_H$ . Thus the same energy level distribution that exists outside also exists inside  $r_H$ , at  $r < r_H$ . What we observe of the outside energy eigenfunction is in the metric properties and the metric we observe also has energy  $E = 1/\sqrt{\kappa_{00}}$  and thusly must be a result of the (wavefunction) energy quantization (again a property resulting from this new pde). Thus the energy quantization on the outside, at  $r > r_H$ , continues on the inside, at  $r < r_H$ . Note that  $E = \hbar\omega = \hbar/T$  is the energy with T time dilated inside ( $dt^2 = dt^2(1 - r_H/r)$ ) and so observed energy levels are large but yet the energy quantization (e.g., object B rotational energy  $L(L+1)$ ) is the same function of L as on the outside.

Also recall that the single particle time development operator  $e^{iHt}$  operates over the whole particle at once. Thus an observer on the inside doesn't see any metric propagation phenomena, just the changes in energy (jumps) of the metric at his position. He doesn't measure the speed of anything then. Again this property comes out of the pde. The resulting Gibbs phenomena effects then appear later to propagate away from the observer at the speed of light.

By the way there is in fact a MUNDANE but nonetheless important consequence of this metric quantization. The masses of those three particles (tauon, muon and electron) come out of that theory in the metric coefficients as we saw in section 23.5. Recall that they are derived from that fractal selfsimilarity using that Kerr metric ansatz (using the only two numerical inputs into the theory, which are the cosmological radius and angle). Now the resultant ambient metric has approximately the same form here as it does, let's say, on Pluto, so that the masses of these particles are the same here as it is there. Previously though it was in fact a mystery how these completely independent particles have the same masses from place to place. If the vacuum provides NO connection AT ALL between them why should they be the same, coincidence? What physically causes them to be the same? In fact this metric quantization of section 23.3 gives us the mass invariance, of different electrons, from place to place, which of course is a mundane result.

### When Does Classical Gravity Dominate Metric Quantization Gravity?

Recall QM effects are observable when the quantities  $\Delta x \Delta p$  and/or  $\Delta t \Delta E$  are on the order of  $\hbar$ , Planck's constant where  $\Delta x$  could be a wavelength. But  $\hbar$  has units of  $j*s$  and relativity gives changes in these space-time units and mass when gravity and relative speed are changed. By the way in that fractal scale jump  $dr/dt$  is not effected since both  $dr$  and  $dt$  become large so the speed of light remains the same, even in fractal scale  $dx$  jumps by  $10^{40}X$ . But for a constant energy observer (e.g., joules) on the next larger fractal scale  $\hbar$  becomes  $10^{40}X$  larger since  $s=t$  jumps by  $10^{40}X$  in those units of  $h$ . Recall in that fractal theory what the outside observer (outside the  $N+1$  scale  $r_H$ ) observes as an E field the inside observer observes to be gravity. Thus the  $N+1$  large observer's associated E field has this accompanying  $h$ . But we see his E field as our gravitational field and thus for this field see this new much larger  $h$ . Thus we see these (gravity) metric quantization effects.

When do we see classical inverse square gravity versus metric quantization gravity.

Classical gravity dominates where the first derivative on the gravity field is the largest as you expect. The metric quantization is an energy, like a potential energy as you know. If it is nearly a constant the major force that is experienced is the classical gravity force.

Thus space craft moving around the solar system close in don't even experience the metric quantization. Gravitometers don't see it either along with those precision spacecraft measurements of gravitational changes on the surface of the planets.

Recall the derivative of the potential is the field and the field times the source mass is Newton Law of Gravity force.

If the quantized metric "potential" is nearly flat all you see is classical gravity

In Chapter 23 we see that gravity levels, i.e., the local metric perturbation, is a quantized stair step function of distance, but this changes the electron mass very little and is only detectable at very weak gravity.

### Spectra In Galaxy Halos And Metric Quantization

Review: Kerr metric

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

Also recall that setting my  $\kappa_{00} = g_{00}$  where my  $\kappa_{00} = \sqrt{1 - \Delta\epsilon}$  where  $\Delta\epsilon$  is the electron mass and  $g_{00}$  is the  $(1 - 2GM/rc^2)$  Schwarzschild  $g_{00}$  metric coefficient. Using also  $mv^2/r = GMm/r^2$  gives that  $v = 90 \text{ km/sec}$  metric quantization result.

Object B has that rotational  $L(L+1)$  energy quantization so take the square root to get  $v_n$  (in  $(1/2)mv^2$ ) quantization where  $n \sim L$  is an integer.

In the plane of the galaxy, where we are also given that  $d\theta = 0$ , the Kerr metric becomes approximately the Schwarzschild metric if  $r$  is very large in  $r^2 d\theta^2$  term. Note the important Kerr metric contribution  $(r/r^2)d\theta^2$  is close to zero then.

Thus in the halo region of the plane of the galaxy it is okay to set  $\kappa_{00} = g_{00}$ ! even though the galaxy is a disk, not a sphere, as we did above.

Recall in that 511kV rotator oscillator the metric effects are strongest along the  $z$  axis if  $\omega$ dot,  $r$ dot or  $V$ dot are large enough.

But for a static, but still rotating object (metric) such as the Milky Way galaxy's the movement away from the polar angle  $\theta = 90^\circ$  (with  $d\theta$  not zero) fuzzes out the metric quantization since the (independent variable)  $r$  dependence no longer cancels out to get that simple equality between  $v$  and  $90 \text{ km/sec}$  and we are also left with a dependence on yet another independent variable  $\theta$ . So if we were moving in and out of the plane of the galaxy the metric quantization will fuzz out slightly. If such motion occurs at  $60 \text{ my}$  intervals then we should see some heating and cooling effects or additional Oort cloud instabilities at those intervals. So there should be additional, but smaller, metric quantization effects at  $60 \text{ my}$  time intervals.

The  $270 \text{ my}$   $\epsilon$  and  $2.3 \text{ my}$   $\Delta\epsilon$  metric quantization effects still occur with the  $270 \text{ my}$  jumps being by far the largest of them all.

Note  $e^2/m_e c^2 = r_H$  constant on a given fractal scale and so  $e^2/m_e$  is a constant since  $c$  is.  $h$  is proportional to proper mass  $m_e$  in this theory (eq.1.11) so a larger  $m_e$  (for a metric jump) means a larger  $h$ .

Note the effect in the Rydberg formula for the frequency of spectra is in the  $m_e e^4 / h^3 = (m_e^3 / h^3)(e^4 / m_e^2) = (m_e^3 / h^3) r_H^2$  term and so the frequency of radiation being emitted doesn't change with metric quantization.

Thus you will see the same atomic spectra in galaxy halos as you see in the lab despite the effects of metric quantization in the halos.

## Chapter 23

### Outside $r_H$ Object(s) Give Quantized Metric Inside $r < r_H$

#### 23.1 Most likely Outside M+1 th scale $r_H$ : proton (3 object, sequence pde2b)

$\Delta \epsilon$  is not infinitesimally smaller than the tauon=1 2S state solution, as would be the case for an electron like M+1 th scale object in (a huge) interstellar space or in an orbit outside a nucleus on the M+1 fractal scale. This is because the inertial frame dragging due to objects external to the M+1 th fractal scale horizon is not zero. Thus our M+1 th scale cosmological object apparently is the  $2P_{3/2}$  excited state of the electron inside a hadron. Thus there is a local object we shall call object B.

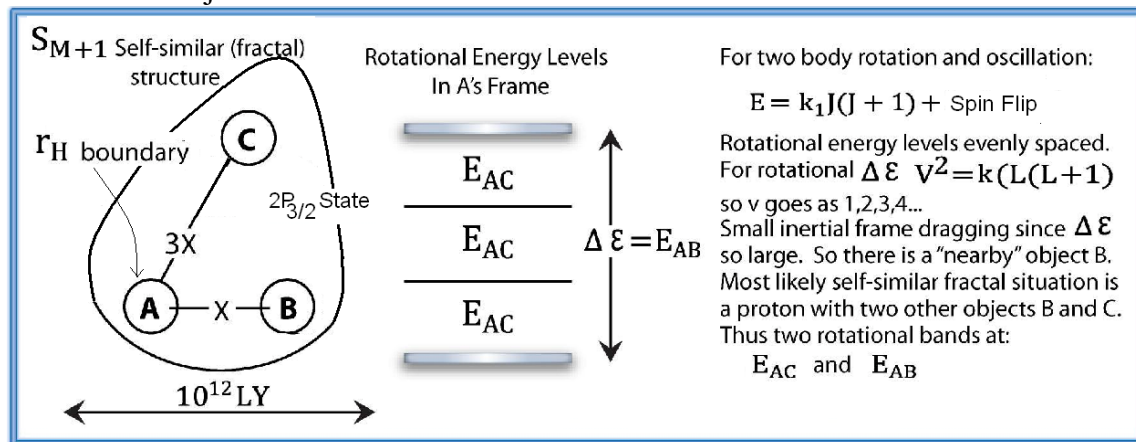


Figure 23-1 Objects Adjacent to the Object We Are Inside of

In that regard, Figure 23-1 (above) is the instantaneous relative position of the ‘electrons’ in the trifolium lobes of the  $10^{12}$  light year diameter selfsimilar cosmological object with the object we are contained in called ‘A’ in the figure 23-1. If this is indeed a  $2P_{3/2}$  baryon there is most likely a farther away object C. As mentioned earlier (bottom of section 20.3) object A and B form a Cooper pair. Object C then effects only the  $\epsilon$  oscillatory coupling, (figure 23.11) not angular momentum as does object B. Thus over a nonzero finite time J and m split as in  $|J,m\rangle \rightarrow |J \pm \Delta J, m \pm \Delta m\rangle \equiv |J,M\rangle_{3N}$ . This makes the energy levels  $E_{AC}$  metastable in free space ( $n\Delta \epsilon$  are then free space asymptotes) but less so inside of the microscopic  $r_H$ . The rotational Raman  $\omega$  is far redshifted for the outside observer but blue shifted back as seen by the inside observer figure 2-1 part 1 so that the frequencies  $\omega$  still scale approximately to the respective fractal scale change from inside to outside (see section 2.3) because of the large time uncertainty and so small energy uncertainty. But, in analogy with the baryons, the transition energies for objects A and B are far larger than the electron mass making the frequencies larger and therefore the smaller times between metric changes than the Hubble time, as indicated in FS scale change value of section 2.3.

Object B and C spin flip (analogous to the 21cm line and mri mode of operation) is the lowest energy transition for the  $\epsilon$  oscillation forcing function. This spin flip energy is the same as rotational energy transitions because here the spin flip is also a rotation. It also allows for transition between these two eigenstates. It is a virtual energy exchange between the ultrarelativistic particles that must occur (since this is the lowest energy transition and a highly perturbed state given the chaotic 3 body motion) still keeping the net spin of the (huge) nucleon constant. So the energy will be for spin up, spin down and so on thus creating a square wave

$E(t) = \sum_n \sin((2n+1)\omega t)/(2n+1)$  contribution. The time for a spin flip is scaled by FS as in section 2.3. Recall that  $2P_{3/2}$  proton had three objects in it, two positrons and one electron. The positrons are in a filled singlet state so the electron cannot annihilate with them. In that regard quantum exclusion forces like the Pauli exclusion principle are stronger inside the proton (than either the nuclear or E&M forces) than for "free" leptons because these are dipole phenomena which are get stronger faster at small separations.. On the cosmological  $N+1$  fractal scale we are inside one of those three objects. We could call our's object A and the other two objects B and C. The other objects decrease the inertial frame dragging in our object A, thereby endowing our  $n$ th scale electrons with mass. Recall an electron can jump through energy levels in a hydrogen atom.

Inside the horizon objects may gain energy and jump from one energy level to the next analogous to an electron jumping from one energy to the next. The sun appears to do that also due to metric change in those EUV jumps: the energy levels are already there it just gains energy as it just jumps in energy as it moves between them. So lets say the metric density is increasing over a large volume due to outside metric changes and so objects are jumping from one energy level to the next over that volume. Nothing really has moved at a high speed. It would be like spreading a huge rubber sheet out at a constant rate(individual components moving a only millimetres a second) and every time the sheet reached a certain tension over an object the object popped. Instantaneously all of the objects would "pop" at once but because the speed of light is finite an individual location would see the effect spread away from their individual point Nothing has moved superluminally at all. In fact components of the metric may be moving at snails pace.

One question naturally arises in this context. Which object are we in, one of the two positrons or the single electron in that huge proton?

It appears as if our object A is that single electron since the inertial frame dragging is small, we are not close to another large object as we would be in that single state. Also the quantum vibrational mode ( $ep$ ) and  $L(L+1)$  dep rotational two body modes are all you need to explain the metric quantization data. This also explains why this core 2 positron, 1 electron state can be treated as a two body problem as in Ch.19 where that new pde really applies to just two bodies in that Frobenius series calculation. The singlet positron doublet and that separate electron act as if they are two bodies instead of three in those computations.

### 23.2 Outside Sources Cause Metric Quantization

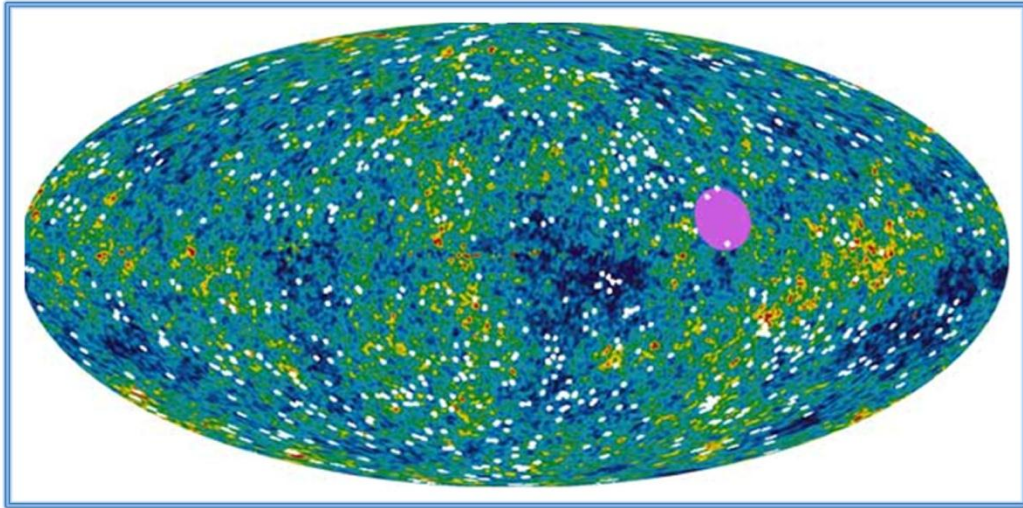


Figure 23-2

800km/s flow of (white) galaxy clusters in direction of outside object(11) at colored oval. Motion of outside object itself causes these  $L(L+1)$  rotational eigenstates inside. This oval is the actual direction of object B. Kashlinsky et al, Oct. 20 issue of the journal *Astrophysical Journal Letters*, identified streaming matter toward such a outside object in the direction of Vela-Centaurus at constant 800km/s. If object B is positively charged, given let's say object A is negative, so the effective ambient field is larger in that direction and so then the metric contribution to  $\Delta\epsilon$  and thereby  $e^2$  in  $\alpha$  (fine structure constant) is minutely larger in that direction.

John Wheeler sponsored a (Bosonic) “wave function of the universe” conference at Tufts U in 1990. The more recent rotational symmetry observations of WMAP (polarization symmetry) and the “axis of evil”(7) imply a particle with spin, most likely a *Dirac equation* particle, not a boson, especially given the  $2P_{3/2}$  state (at  $r=r_H$ ) implications of appendix E. The isolated nature of this cosmological object implies large inertial frame dragging causing spin effects to be almost unobservable, hence the small but observable CMBR dipole and net polarization.

Smaller inertial frame dragging due to object B (to a lesser extent object C) makes  $\Delta\epsilon$  nonzero.

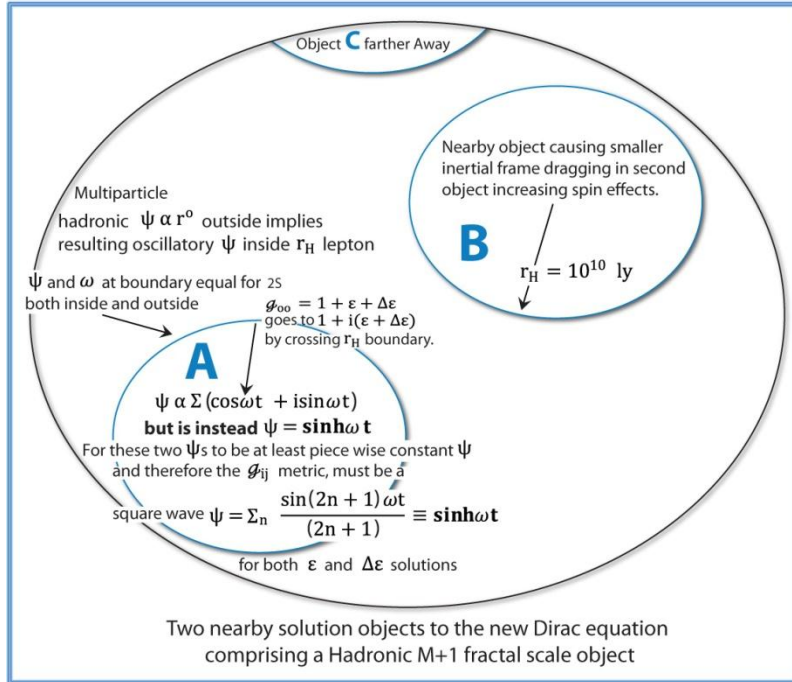


Figure 23-3  
Source of Square Wave Phenomena

Here is another way of understanding the spin flip generation of that square wave. Recall from Ch. 19, in the Frobenius solution,  $r \propto \psi$ , and  $\psi$  is constant inside  $r < k$  for  $j = 1/2$ , for  $N=0$  solutions, the  $j = 1/2$ ,  $\psi \propto r^0$ . Because of the fractalness (selfsimilarity of Dirac electron to the observable ‘universe’) we can calculate for inside the cosmological horizon  $E \propto \int \psi^* H \psi d\tau$ , with Fourier decomposition due to sum of states caused by perturbations beyond the horizon (that also are responsible for the nonzeroness and constancy of the  $\Delta \epsilon$  again as implied by that  $r_0$  proton solution). These give the eigenfunctions the above sine and cosine perturbations  $\psi \propto K + \sum a_j e^{ikt}$  where  $K$  is that contribution of the ambient metric background from the  $\psi \propto r^0$   $N=0$  solution equation. Thus putting this into the above integral (i.e.,  $E \propto \int \psi^* H \psi d\tau$ ), we find that  $E \propto K + \sum b_j e^{ikt}$ . But we showed in the Frobenius solution section that these  $E$  s have constant eigenvalues or at worst piecewise constant, also the  $j = 1/2$ ,  $\psi \propto r^0$   $N=0$  solutions from Frobenius solutions. Thus that  $\sum b_j e^{ikt}$  series must give a piecewise constant, therefore, a square wave. Using the Heisenberg equations of motion for coordinate time dependence recall that  $dr^2$  has the same sine functionality as  $\psi^* \psi$  and so  $e^\epsilon e^{\Delta \epsilon} = e^{\epsilon + \Delta \epsilon} = (e^\epsilon) * (e^{\Delta \epsilon}) = (\psi_\epsilon^* \psi_\epsilon) * (\psi_{\Delta \epsilon}^* \psi_{\Delta \epsilon})$ .

Recall the metric component  $dr'^2 = g_{rr} dr^2 = e^{\epsilon + \Delta \epsilon} dr^2$ . Take negative square root which is consistent with square waves which also keep the metric constant as appears to the outside observer nonflat  $r' = \int dr = \int -\sqrt{e^\epsilon e^{\Delta \epsilon}} c dt$ . Thus the  $i \sinh \omega t$  (out in  $\psi \propto r^0$  region) goes back to  $\sin \omega t$  in those perturbative summed eigenfunction solutions.

$$\int_t \sqrt{\left(\sum \frac{\sin((2n+1)\omega_\epsilon t)}{2n+1}\right)^2 \left(\sum \frac{\sin((2n+1)\omega_{\Delta\epsilon} t)}{2n+1}\right)^2} c dt = \int_t \left|\sum \frac{\sin((2n+1)\omega_\epsilon t)}{2n+1}\right| \left|\sum \frac{\sin((2n+1)\omega_{\Delta\epsilon} t)}{2n+1}\right| c dt . \tag{22.1}$$

$$E_\infty \int \sum_{n=0} \sin((2n+1)\omega t) / (2n+1) dt \text{ for each of } \epsilon \text{ and } \Delta\epsilon \text{ separately.} \tag{22.2}$$

Note square waves exhibit Gibbs overshoot and undershoot phenomena. The epsilon changes in delta epsilon increments and stellar spectra don't change except in each spectral line being shifted from the standpoint of a distant astronomical observer.

### Origin Of This Square Wave

Recall from chapter 1 that we postulate

$z^*z=z$  defining the "unit" real number 1 point norm (so  $z = Z^tZ = \|Z\|^2$ ) requiring a D in  $Z^tZ' = f(z+D') = z + (z-D')dZ'^2 + \dots + (z-D')^2 ddZ'^2 / 2 + \dots$

with  $dz^2 = \int (\partial z^2 / \partial C') dC' = \int dC' = 0$  if  $z^*z' = z + dC'$  where  $z', z \approx Z_p, dC' \approx D', D_q, D_s, D_r, \dots$  and  $z', z$  is not infinity. We can then do a convergent iteration  $z_{n+1} - z_n = C$  to populate the set  $z, z' = Z_p$  over interval  $dz$ .

We can then rewrite the above integral as

$dz^2 = \int (\partial z^2 / \partial C') dC' = \int (\partial z^2 / \partial C') dC' = \Sigma C_n = D_1 - D_1 = \Sigma (z_{n+1}^2 - z_n^2) = 0$  (or finite) here implying also  $z < \infty$ .

Note in this integral even though  $z_{n+1}^*z_{n+1}$  is a function of  $C_n$  that  $z_n$  is *not* so you can take that partial derivative of  $z_{n+1}^*z_{n+1}$

as the partial derivative of  $z_n + C_n$  with respect to  $C_n$  resulting in 1 **making the integral simply**  $\Sigma C_n!$  It's doable!!

Iteratively populating the set  $Z_p$  that the path integral is done over also makes  $z_1$  a Julia set and we have an alternative to the real numbers: one that is a sum of these  $z^2 - z = dZ$  s.

But these  $dZ$ s can be written as the sum of  $dZ = d(s_0 + ds_1 + ds_2) e^{i(\theta_0 + d\theta_1 + d\theta_2)} + C = \psi$  eigenfunction.

Note for a locally flat space the Fourier sum of these  $dZ$ s have to be "square" waves! By the way along a  $Z$  plane diagonal  $dZ = e$  is zero and the time and space derivatives of  $dZ$  are orthogonal to  $dZ$  so their expectation value integrals are zero (the vacuum has zero net energy and momentum).

In a cosmological context what if there is metric  $L(L+1)$  quantization so the heights of these square wave humps jump as the local region changes energy density as in cosmological expansion? Also what if these square wave higher frequencies (in their Fourier expansion) are attenuated by galaxies for example (100kly years in diameter)? They would then be 100kly wide Gibbs overshoot and undershoot jumps!! Those ep extinction level events (every 270my apart) would be 100ky long!

**Gamow Factor Change**

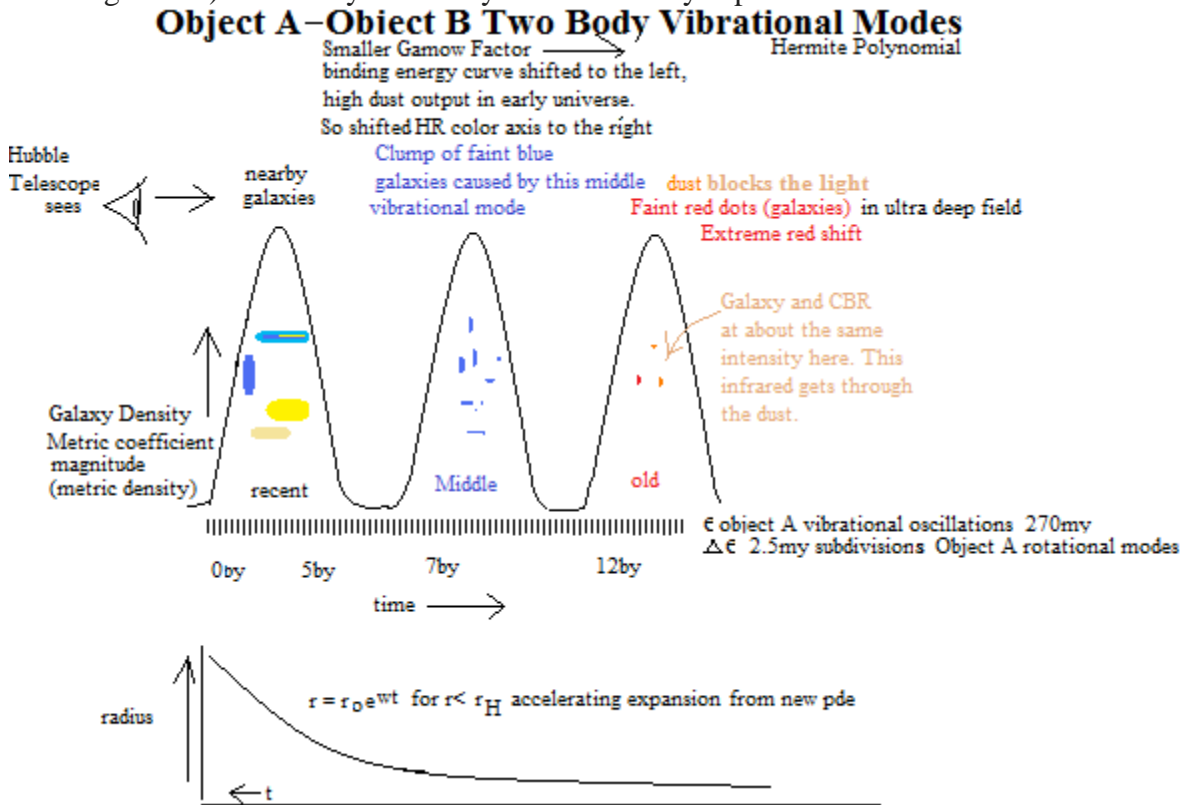
Note the  $\Delta\epsilon$  was a lot smaller so the Gamow factor was smaller in the early universe (above introduction to Ch.22) for heavy nuclei. Thus the binding energy per nucleon was a lot smaller than for the larger nuclei. This higher binding energy per nucleon for smaller nuclei meant that for a given mass large O,B,A stars burned hotter and thus burned hottest in the EUV instead of just the extreme blue part of the spectrum. So the HR diagram color (horizontal) axis was shifted to the right so there were far more short lived EUV stars than blue stars at this early epoch. These stars were subsequently red shifted into the blue creating a huge amount of distant faint blue galaxies in the Hubble ultra deep field (which images back to the beginning of the universe). Recall blue stars are short lived so these blue stars are short lived with many many more red stars in these galaxies too faint to be seen here. See **huge faint blue** galaxy population below. You need a blow up of this image to see these faint blue galaxies which are at least three times more numerous in these images than all the other types of galaxies combined.



Also because of this shift in the binding energy per nucleon peak to the light elements supernovas did not produce iron at that time, produced mostly silicon and carbon dust. In that regard a 13 billion old star was recently discovered that had these properties.

“ However, the new observations have shown that SMSS J031300.362670839.3's composition harbors no iron pollution. Instead, the star is mostly polluted by lighter elements like carbon, ANU officials said.”

There are two body vibrational  $1/\beta=kT$  modes of object A-B that have much larger jumps in the metric quantization than  $\epsilon$  and so more time separation. Because of the ultrarelativistic motion the field lines are contracted between objects A and B making for such a high energy oscillation. In the Hubble ultra deep field you can see hints of this vibrational mode in the faint blue galaxies that almost all have about the same luminosity (middle clump), deep field red dots (ultra red shifted galaxies) are mostly hidden by dust created by supernova. etc.



**Gamow Factor Change and 350by Old Universe**

The expansion radius function I derive from that Heisenberg equations of motion (given my new pde) for  $r < r_H$  is  $r = r_0 e^{kt}$ , If you take the derivative of this function with respect to time t that derivative is the present rate of expansion and is a slope. The line with this slope intersects the  $r=0$  axis at  $t=13.7$  billion years. So the rate of expansion at this time matches the rate given by the Hubble constant and so there is no contradiction with data.

Note the second derivative of  $r = r_0 e^{kt}$  is  $a = r_0 (k^2) e^{kt}$  so that the universe is accelerating. So I derive that acceleration; the mainstream merely mythologizes it with silliness like quintessence!???. So **even in the new standard cosmological model**, the one with the acceleration, **the universe has to be a lot older than 13.7by.**

Note this large age also explains the horizon problem since there is plenty of time for the universe to come to thermodynamic equilibrium, so the cbr then looks black body as it does.. You don't need that adhoc inflationary model to explain the horizon problem anymore, this fractal theory will do.

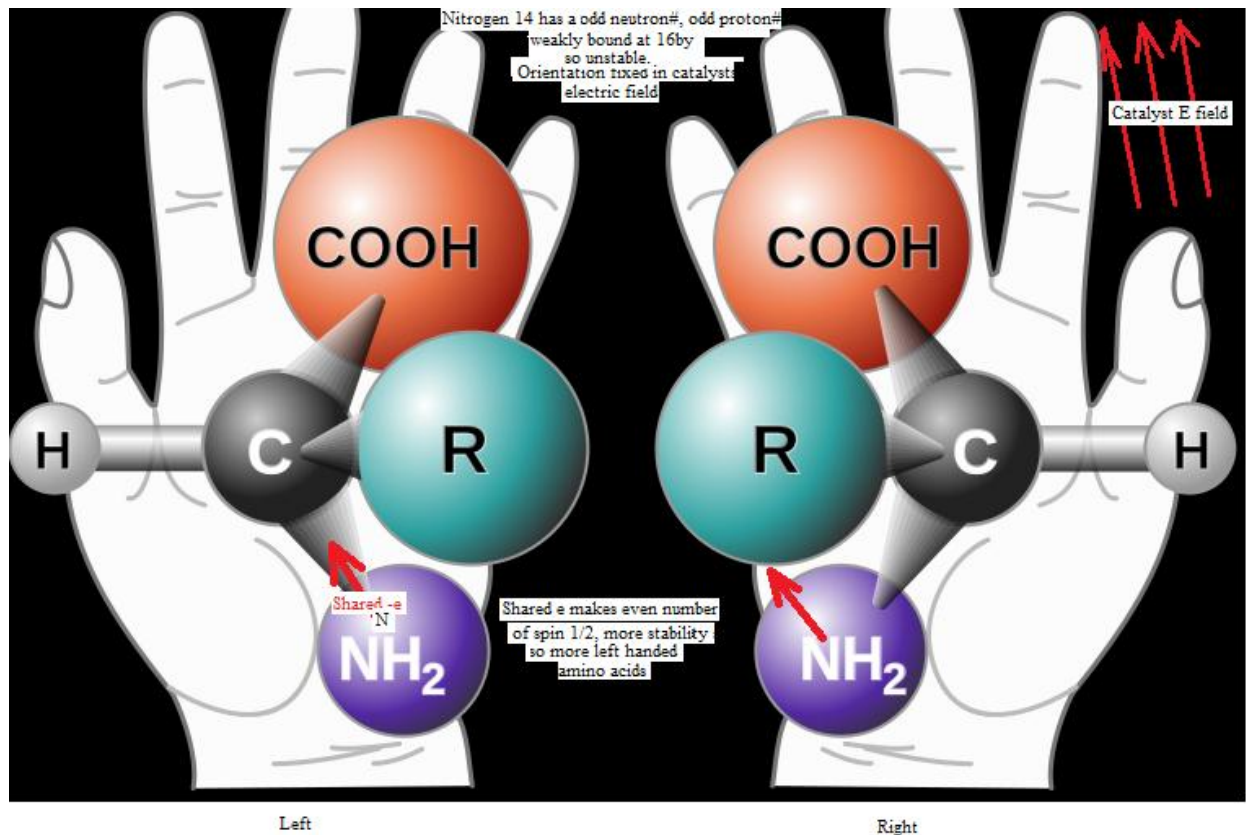
Recent studies of very distant galaxies, the dimmest ones in those Hubble deep field images and the ones the ones magnified by the gravitational lens of cluster Abell 2218 and the ones that are less than a billion years old appear to be mature galaxies and already very dusty. But the big bang only creates hydrogen and helium and no C and Si dust. So where did the dust come from? In my model there was plenty of time for this dust to form from those Si,C supernovas. The Gamow factor (see above introduction to Chapter 22) becomes smaller and so the nuclear binding energy per nucleon becomes smaller. Thus at some point in time supernovas are going to put out Si,C dust and not iron. Also elements like nitrogen with its odd number of protons and odd number of neutron will become preferentially more unstable.

### **Origin Of Life**

Another such consequence of that 350by universe is the origin of life!

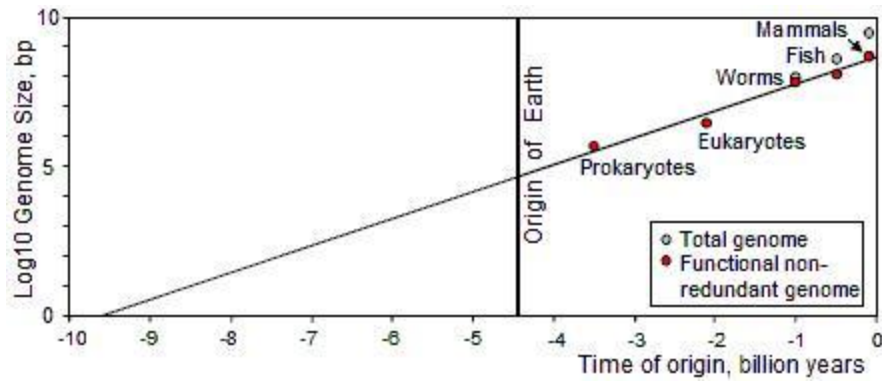
Recall that in chapter 2 we derived a 350 billion year old universe.

- 1) The left handedness of the weak interaction (see eq.1.12) *would be much more pronounced* for such a smaller universe. So why are amino acids in living organisms all left handed? Nitrogen14 is odd (#neutrons and #protons) and so possibly unstable in this epoch since the nuclear force is weaker. Let's say in the presence of a catalyst the bond direction electron makes it even and so stable. In the right handed version in the catalyst's electric field the nitrogen is still unstable since the bond is in a different direction. So with the catalyst at the time of the transition of nitrogen going from stable to unstable and with a later catalyst creating the RNA in life as well (see below example) then the RNA contains just the left handed amino acids (and nonchiral ones as well). Can't think of any other reason than that they (ie.,left handed amino acids) formed in this old universe. Note in that regard that the oldest meteorites (~4.5by) contain a higher ratio of left handed to right handed amino acids.



2) The cbr would be bright at these early ages, even planets out in interstellar space would be bathed in this heat and light, so practically every planet anywhere could contain life.

3) thus turning that 16by universe into an “incubator”, a petri dish, for life: recall an incubator requires heat also. Also the formation of the key ingredients for life, RNA strands and cell –lipid membranes, is relatively easy. For example James Ferris has found that Montmorillonite clay (as catalyst) speeds up the rate of formation of lipid (cell wall) vesicles and also will catalyze the formation of RNA in water, so **one common mineral does it all** (i.e., nucleotides and cell membranes). Since relatively short RNA molecules (~50 basis’) that are capable of replication have been artificially created in labs, we just need to allow time for  $\sim 50! = 10^{64}$  of the RNA amino acids basis’ permutations, and all it takes is just one such moment to start life off. But in a universe with this many warm planets and this slowly expanding so that panspermia is important (**the whole universe is then a single incubator!**) you actually have an upper limit of  $10^{82}$  number of possibilities (after counting the number of  $\sim 4\text{nm} \times 4\text{nm}$  basis units in a 1m surface depth on  $10^{20}$  earth like planets extending over  $10^{16}$  seconds), more than enough permutation possibilities to allow for the formation of primitive bacterial life somewhere out there. The subsequent evolution then leads to a kind of Moors law for life. Apparently for every 350my the (genome) complexity of life doubles. Note even bacteria are incredibly complex with their organelles, fine tuned Krebs cycle, cell wall pumps, mitosis morphology, etc. so it is highly unlikely the starting point was 3.5by as is also implied by the below “Moors law” extrapolation to before to 3.5by:



Given the inefficiencies of the panspermic process this line most likely extends much farther back, perhaps to 15by. So when those earliest supernovas started forming phosphorus ( $Z=15$ ) life first formed ( $\sim 15$ by), panspermia did the rest which there is plenty of time for in that old of a universe expanding at that slow of a rate.

After the supernovas started forming copper  $\sim 13$ by you got photosynthetic organisms (copper ligands eg.,chlorophyll), 10 billion years old (iron ligands, e.g.,hemoglobin), etc..

After that the universe was expanding too fast and panspermia becomes less and less efficient, life became isolated inside the horizons.

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