

Chapter 10. Spin Like a Dervish, Drop Like a Stone

Let's continue our exploration of the bosons, and while we are at it, we'll take a closer look at the mysterious neutrinos. In our presentation of the photon we will skip most of the details of optics which are covered very adequately in available textbooks. We will just focus on certain aspects that are fundamental to the behavior of photons and their relations to the basic particles and help to introduce our paradigm of the role of the observer in physics.

In our previous discussion we began to explore the way in which photons go through a phase transition from bosonic behavior to fermionic behavior, from predominantly translational behavior to predominantly rotational behavior. The basic concept is that as a photon wave packet carries more energy, its frequency increases and that also corresponds to a decrease in wavelength. As the wavelength gets shorter, the opportunities for the photon to slip into predominantly rotational mode become increasingly greater. Beyond a certain threshold wavelength the distinction between going somewhere as a wave and staying put as a particle becomes indistinct. The wave overwrites itself. At very high energies the photon's probability of mode is almost entirely rotational. Also, under the right conditions, this transition to rotational mode can be precipitated, much like a catalyst can precipitate chemicals.

The first window for photons to transition into rotational mode occurs at the rest mass of the electron neutrino. We discovered that this neutrino "rest" mass is formed by the interaction of the smallest and largest scales of the universe, (H) and (c).

$$* \quad M_{ne} = H / c \% = 1.11 \times 10^{-43} \text{ kg.}$$

There is no unit of electric charge involved, so the particle has a neutral charge. But if the photon is in rotational mode, then it must be rotating around a black hole. That is the only thing that will hold a photon still. So the idea comes up to take a look at the gravitational aspects of a neutrino, using the model we have developed.

The usual rule of thumb for checking for general relativistic gravitational curvature of space-time in the vicinity of a particle is to use the relationship:

$$* \quad (G M_x / L c^2).$$

Here (M_x) represents the mass of a gravity well and (L) is the distance a particle is from it. This pure number is an indication of the space-time curvature. For example, in the case of a black hole, the value is .5. The radius of a black hole is thus:

$$* \quad L = 2 G M_x / c^2.$$

What if we insert the Union boson pair for the mass (M_x) and (%) for (L)? This gives us:

$$* \quad G \text{ Bu}^2 / \% c^2 = 8.1 \times 10^{-46} \text{ kg.}$$

This is very close to the value of the electron neutrino that we derived. Amazingly, it happens to be off by only a factor of the reciprocal of the fine structure constant (α). So we plug that in:

$$* \quad \text{Mne} = G \text{ Bu}^2 / \% c^2 a = 1.11 \times 10^{-43} \text{ kg.}$$

This gives us another way of writing the value of the electron neutrino. It also tells us more about the inner structure of the neutrino. We find that it is made from a pair of Unions interacting with a neutrino-generating sQuark. The sQuark represents the "window" structure that defines the particular entity -- in this case an electron neutrino. It also suggests to us that the gravitational constant (G) is actually an indication of a real "shadow" particle that participates in material structures.

$$* \quad \text{Qne} = G / \% c^2 = 2.34 \times 10^{-28} \text{ kg}^{-1}.$$

This results in a very heavy shadow particle: 4.27×10^{27} kg. Such a BH mass, equivalent to a small star -- a Jovian mass, the crossover point between planets and stars - - can only radiate particles with zero rest mass: photons, neutrinos or gravitons. And, indeed, that seems to be what happens. A (Bu) pair resonating at the neutrino window, manifests itself as a neutrino and may carry along resonant photons as momentum.

We can also now express (Bu^2) in a simplified form:

$$* \quad \text{Bu}^2 = (H c a / G).$$

We recall that ($H c$) is just a fractal echo of ($\%$). Of course, this is also just another way of looking at our original definition of (Bu^2). When we substitute for (a) we get:

$$* \quad \text{Bu}^2 = e^2 A_o / A_s \text{ Peo } G.$$

It is also another form of the Heisenberg Relation:

$$* \quad (\text{Bu}_1)(\text{Bu}_2 G / c a) = H.$$

This means that there is an indeterminacy about the values of (Bu_1) and (Bu_2) that can range all over the place. But the average value will be (Bu_1) = (Bu_2), the requirement that balances the electrostatic and gravitational forces.

The fine structure constant (fsc) = (α) expresses the relation between the Rydberg energy and the relativistic electron. Here ($R\sim$) is the Rydberg energy, assuming infinite mass.

$$* \quad R\sim = (M_e c^2)(\alpha^2 / 2) = 2.184453 \times 10^{-18} \text{ J} = 13.6 \text{ eV.}$$

The (fsc) thus represents the coupling strength between electrons and photons in terms of

(H) and (c). The eight possible coupling processes can be represented graphically by Feynman diagrams, and each has a probability proportional to the (fsc). Each diagram looks like a Y or a three-tined fork with two electron branches and a photon branch, all converging at a vertex. Because the photon is a vehicle for the exchange of energy, the Feynman diagrams must come minimally in pairs that each contain a vertex connected via a shared photon exchange so that the photon has electron terminals at each end of its path. This preserves conservation of energy. Therefore the exchange of a single photon is of order a^2 ; a two-photon exchange is of the order a^4 , and so on. Because the value of (a) is a small probability to begin with, and at each added vertex pair the value of (a) goes to the power of two times the order of the vertex number, the probability for more complex diagrams drops off quickly.

Now let' s use our insights into the neutrino structure to take another look at the electron and proton and see if we can come up with a single elegant quantum pattern by which the resonant windows for union pairs build up.

We have derived a basic model for the structure of these particles:

- * $M_{ne} = B_u^2 Q_{ne}$.
- * $M_e = B_u^2 Q_e$.
- * $M_p = B_u^2 Q_p$.

What are the detailed internal structures of Q_e and Q_p ?

- * $Q_{ne} = G / \% c^2 = 2.34 \times 10^{-28} \text{ kg}^{-1}$.

The model for the sQuark structure is that of a "G" particle with the distance and time units balanced out. (G) contains a (V^2) and an (X), a velocity squared and a distance. The expression ($G / \% c^2$) is as about simple as we can get.

We found that (Q_e) comes to around $2.63 \times 10^{-13} \text{ kg}^{-1}$. We notice that the (c^2) takes care of the (V^2). That leaves a distance. Distance appears to be relative. The distance constants we find are linked to the rest masses of particles (such as the Compton radii we looked at). In addition to pi (P), which is the ratio of half a circumference to its corresponding radius, we have another fundamental distance ratio constant that can be derived strictly from geometry. That is the D-Shift operator, (%).

In OP we find that the D-Shift Operator (%) connects between geometry and physics when we set the value

- * **$R_u = 1 \text{ meter}$.**
- * **$\% = 3.1622776 R_u$.**
- * $P \%^2 / A_o = 10$.
- * $\% = [10 (A_o / P)]^{1/2}$.

This D-Shift ratio, like pi, is important in physics, because of the role it plays in the

fractal structure of the fundamental constants of physics. The simple example we gave shows the relation of (α) to ($h c$), perhaps the most fundamental constant pair in physics. The D-Shift constant is the core ratio of that constant.

So our model of the sQuark structure is that it is built around a nucleus of (G) with elements of (c) and (α) involved. But (Q_e), the next major window, has a value of $2.63 \times 10^{-13} \text{ kg}^{-1}$. So we need to bring some other constants into play. The natural candidates are (e_0) and (e), especially since the electron carries a charge and (e) governs quantum charge units. If we introduce the ratio (e_0 / e) with a single (c) in the denominator, and then multiply by (α), we get the right balance of units and in the right scale neighborhood. When we compare it to our target, what do you know, we find that it is off by the fine structure constant!! So we get:

$$* \quad Q_e = (G e_0 \alpha / c e).$$

Thus we get for the electron:

$$* \quad M_e = (B_u^2) (G e_0 \alpha / c e).$$

This is looking quite elegant. Using this approach we derived the electron much more easily than with the approach we used in the last chapter. And we found a very simple expression. However, the approach we used there was helpful for revealing a lot of relationships that otherwise go unnoticed.

Of course, we can substitute in the value of fsc and rewrite the expression:

$$* \quad M_e = (B_u^2) (G e \alpha_0 / P H c^2 A_s).$$

This is a little more complex, but it shows some more detail of the "fine structure" of the electron. Combining our value for (B_u^2), we get:

$$* \quad M_e = (e^3 \alpha_0^2 / P^2 H c^2 e_0 A_s^2).$$

Turning attention to the proton, we easily derive the structure of (Q_p) from our knowledge of (B_u^2) and (M_p):

$$* \quad M_p = (B_u^2) (G e_0 P^2 A_s / e c \alpha).$$

If we extract the constant ensemble that forms (a), then we get this beautiful summary of the structures of the basic particles:

$$* \quad B_u^2 = (H c a / G).$$

$$* \quad M_n = (H / c \alpha).$$

$$* \quad M_e = (H e_0 \alpha a^2 / e).$$

$$* \quad M_p = (P e R_u / c).$$

the OBSERVER for interpreting the situation. So Mass Conjugation and Four-Particle Mixing are fundamentally equivalent to Phase Conjugation and Four-Wave Mixing. A pure photon wave is just a sinusoidal vibration translating through space/time. The possibilities of group waves and, through the de Broglie relation, particles, arises when we have phase relations. Phase is the aspect of an oscillation that indicates its relation to another oscillation. It never occurs in total isolation. It always requires a reference point. We identify four particles in our ensemble: (Mx), (Qx), (Bu) and (Bu), just like we identify four travelling waves in our Velocity Equation: (Vg), (Vp), (c), and (c). In our particle scheme (as with the Velocity Equation), it is arbitrary which parts of the equation we take as constant. We can set the fundamental particles and their sQarks as constant and vary the values of (Bu1) and (Bu2), or we can set the (Bu)s as a constant and vary the masses of the other particles involved. The expression $(G / c^2 \%)$ is the fundamental of a set of harmonic relations that generates every possible particle.

In passing we note that the other subatomic particles classed as baryons are unstable resonances of the proton. The only stable resonances are quantum multiples of the proton. None of the baryons or mesons falls into that window. The neutral lambda-udb comes fairly close to six proton masses, especially if we figure 3 neutrons and 3 protons. That corresponds to Lithium, but Lithium's atomic weight turns out to be 6.941, shifted for various reasons a good deal beyond 6 protons. If these heavy-"bottomed" lambdas could be produced in quantity, we might be able to finesse them into becoming Lithium atoms. But they require lots of energy to make, so it's much easier to work with hydrogen or deuterium. Thus, electron orbitals come in increments of the angular momentum condition:

$$* \quad L_n = (n h / 2 P) = (n H)$$

So also the proton "nuclear orbital" increments roughly as $(n M_p)$, with various factors involved such as the build-up of nucleonic charge, and so on.

Now let's go back and continue our development of Phase Conjugation and Four-Wave Mixing from the standpoint of waves and compare it in more detail to our mixing of the masses. The following development of concepts and properties of phase conjugate waves is based on **Phase Conjugate Optics** by Jun-Ichi Sakai (New York: McGraw-Hill, 1992), Chapter 2. The classic work on the subject is by Zel'dovich, Piliipetsky and Shkunov, the Russian scientists who discovered the paradigm in 1972. His work is called **Principles of Phase Conjugation**. It was published by Springer-Verlag in 1985.

Most people do not realize this, but the discovery of phase conjugation by Zel'dovich et al. brought Einstein's original vision of the possibility of stimulated emission to the level of a new paradigm for physics with countless practical applications and brilliant theoretical elegance. Although those who know of it often speak in terms of mixing light waves, the Zel'dovich paradigm is totally general and holds not only for Maxwell's equations but for ANY wave phenomenon (including vibrations of sound, water, consciousness, and so on). And, as we are discovering, it also can be extended to include the world of particles. It can be generated using any material with the proper

preparation. And the properties that it manifests are therefore universal properties of ALL wave forms, and that means basically EVERYTHING. Hence it constitutes a paradigm shift on the magnitude of QM and Relativity or bigger.

$$* \quad W_p(\mathbf{R}_-, t) = (1/2) A_p(X, Y) \exp[i(\omega t - K_p Z)] + c.c.$$

Here (W_p) is called the "probe" wave, (+Z) is its direction, (ω) is its frequency, $A_p(X, Y)$ is its amplitude, (K_p) is the wave number in the (Z) direction, (\mathbf{R}_-) is the position vector, and (c.c.) is the complex conjugate of the first part of the expression. Polarization and spatial data can also be included. The subscript p' s indicate the probe wave.

The probe wave has a reflected conjugate wave:

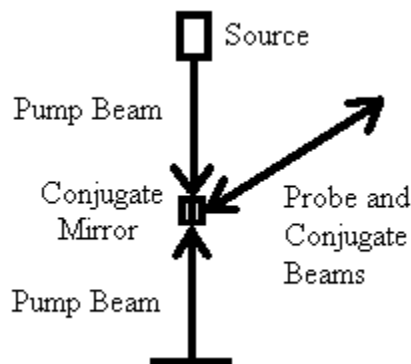
$$* \quad W_c(\mathbf{R}_-, t) = (1/2) A_c(X, Y) \exp[i(\omega t - K_c Z)] + c.c.$$

This wave is the same except that we write subscript (c)' s for the (p)' s to show that this is the conjugate wave. The conjugate wave is also in the (Z) axis. This wave (W_c) is the phase-conjugate wave corresponding to (W_p), so $A_c = A_p^*$, and $K_c = -K_p$,

We then have a pair of conjugate waves: $[W]$ and $[W]^*$. $[W]^*$ is sometimes called the star wave.

$$* \quad W_c(\mathbf{R}_-, t) = W_p(\mathbf{R}_-, -t).$$

The shape of the wave is the same, but it is reversed in time. Thus the reflecting material used to make a phase-conjugate reflection is called a phase-conjugate mirror. As we mentioned before, a conventional mirror reverses a plane wave in space, whereas a conjugate mirror reverses the plane wave in time. Thus it is self-correcting. If part of the plane wave passes through a distorting influence such as a piece of glass, the plane wave is distorted. On the return trip, the glass further distorts the reflected plane wave. A phase-conjugate reflected plane wave reverses the distortion as it passes back through the glass, so that the beam returns to its source self-corrected and undistorted. This looks like magic, but it is just a shift of perspective from reflecting in space to reflecting in time.



A conventional mirror changes a wave's polarization, but the polarization of a wave reflected in a conjugate mirror is unchanged. Conventional mirrors attenuate reflectance, but phase-conjugate mirrors allow you to amplify the reflection. With a conventional mirror the angle of reflection equals the angle of incidence, but with a phase conjugate mirror the phase inverts and the wave front reflects in the same direction as the probe.

Through de Broglie's wave equation for particles with mass and the framework of QM we can write any particle as a wave equation. Thus all the principles of Phase Conjugation apply equally to particles with mass. Hence we coin the term Mass Conjugation and Four-Particle Mixing.

Now that we have developed in a little more detail the general theory of Phase Conjugation, let's develop a bit more the idea of Four-Wave Mixing. You can pump a medium from opposite directions with conjugate beams. Then you add a third beam -- the probe beam -- with the same frequency as the pump beams. This produces a fourth beam in the opposite direction of the probe. Because the frequency is the same, you can use the same source for pumps and probe. You can use whatever you like as the medium for your conjugate mirror.

There are so many ways to generate phase conjugation and apply it that we leave that subject for the interested reader to explore. The technology is already well under exploration and development. Our purpose is to draw attention to the paradigm and point out that it carries over into the world of subatomic particles and even to macroscopic objects as well as simple waveforms such as light and sound and waves of liquid. This is the holographic principle. It is a simple way of shifting scale in various dimensions.

This paradigm can be of great practical use in the development of applied fusion reactions.

We can also gain insight into the operation of large-scale systems. For example, consider a simple gravitational system that involves our earth-world (M_w) orbiting around the sun (M_s). Disregarding the perturbations caused by other possible planets and moons, we can consider this system using Newton's gravitational equation. We see now that this simple "two particle" system is really a case of Four-Particle Mixing, and the earth-sun system relates by Mass Conjugation. From Newton we have:

$$* \quad F_{ws} = G M_w M_s / R^2.$$

Here (F_{ws}) is the force of gravitation between the world and the sun, and (R) is the distance between the earth-world's center (M_w) and the sun's center (M_s).

$$* \quad (F_{ws})(R^2 / G) = (M_w)(M_s).$$

The force (F_{ws}) represents a "pseudo" mass times an acceleration. The expression (R² / G) represents another "pseudo" mass times an "anti-acceleration". The product

$(Fws)(R^2 / G)$ therefore is mass squared, since the accelerations cancel out. The resultant is equal to $(Mw) (Ms)$. The only difference is that the expression on the left side is put in terms of a constant (G) and an observable distance (R) , and an unseen "force". Since (Mw) , (Ms) , and (G) are fixed, the force (Fws) varies as the inverse square of (R) . If we extract the hidden "mass" in the force -- we can call it (Mx) for now -- this equation has exactly the same basic structure as our formula for the electron neutrino:

- * $(Mne) (\% c^2 a / G) = (Bu1) (Bu2)$.
- * $(Mx) (Ax R^2 / G) = (Mw) (Ms)$.

Here (Ax) represents the acceleration, and (R) is the distance between (Mw) and (Ms) . Everything in the equation is constant except for (Ax) and (R) , which keep oscillating relative to each other. But the relationship stays constant:

- * $(Ax R^2) = Kws$.

And we know that this constant is indeed a mass $(Mkws)$. Thus,

- * $(Mx) (Mkws) = (Mw) (Ms)$.

Thus we effectively have Four Particle Mixing as the reality of any two-body gravitational system. And we can define a value for the fourth particle in our neutrino expression.

- * $(Mne)(Msj) = (Bu)^2$.
- * $Msj = 3.11 \times 10^{25} \text{ kg}$.

From 3.11×10^{25} to 4.27×10^{27} -- the range of (a) -- is the threshold of a stellar mass! Jupiter is in that threshold window, so we call this a "stellar-jovian" mass (Msj) .

The smallest threshold mass of a star times the threshold mass of the smallest possible particle equals the cosmic Union particle squared.

The Union particle squared is the threshold where gravity and electricity meet. We notice that within these limits we can shift the values of the two variable masses around quite a bit, but

- * $(Mne) \leq (Mx) \leq (Bu) \leq (My) \leq (Msj)$.
- * $(Mx) (My) = (Bu^2)$.
- * $Mne = Bu^2 (G / c^2 \% a)$.
- * $Me = Bu^2 (G eo \% a / c e)$.
- * $Mp = Bu^2 (G eo P^2 As / c e \%)$.
- * $Mp2 = 6.563 \times 10^8 \text{ kg}$. (The size of a small moon.)

* $M_{e2} = 3.5256 \times 10^{12}$ kg. (The size of a small planet.)

In the last few years astronomers have identified many jovian planets circling stars. These may belong to a relatively common type of binary star system in which one member of the pair is a small star or just below the threshold of stardom. They do not find planets much larger than several jovian masses because such bodies become stars. Objects smaller than the jovian mass generally become solid planets or moons.

What about larger stars that are many solar masses in size? The above formula using $(Bu)^2$ only deals with individual particles. Just as the larger atoms are made from multiples of the proton mass, the larger stars are made from multiples of the stellar-jovian mass. At some point they become too heavy and will either fragment into smaller stars (with or without some planets) or will undergo gravitational collapse and form neutron stars or black holes. As we have seen, heavier black holes are cool and therefore much more stable than mini black holes. Thus they break out of the (Bu) relationship and form independent systems. However, they can continue to grow. Black holes formed from stellar collapse may range from around 5-10 solar masses. Supermassive black holes in the cores of galaxies may reach a mass accumulated from millions of stars. In between they are now finding mid-size black holes that range in the thousands of solar masses. These tend to be in globular clusters, which are much smaller than full-scale galaxies.

Thus there is a tendency for black holes to have a mass that is on average in a constant ratio to the environment in which they are found. This makes sense considering the relative amount of material they have to feed on in a galaxy versus a globular cluster.

Recent research done on old galaxies shows that they contain conglomerations of black holes that keep eating away at their stars. Black holes have terrible table manners. They have relentless appetites and only talk when their mouths are busy swallowing stars and other galactic material. They are noisy while eating, burping lots of X-rays, but quiet between meals. Eventually the group of black holes in the central area of a galaxy will eat up all the stars in the galaxy and then eat each other. Then they will grow quiet, lacking anything to eat, until they gradually attract other black holes in the vicinity. As the universe ages, there are more and more black holes scattered about as the remains of self-devoured galaxies. There may be many black holes left over from ancient self-devoured galaxies floating around in intergalactic space. We would never notice one unless it happened to cross in front of a known object while it was being observed or got into a gravitational relationship with a visible body. Such quiet black holes may account for much of the unseen matter in the universe. Eventually the black holes will gravitate together and eat each other until they eat up all the mass of the universe into one giant black hole. That black hole will then reach a threshold mass where it becomes unstable, flips automatically into a white hole, and explodes into a new Big Bang.

As you can see from this scenario -- as below, so above -- the universe as a whole recapitulates exactly what happens every fraction of a nanosecond within each proton. The mini black hole ensemble explodes into a proton, and then the remains of the hole eat

the proton, and spit it out again. The cosmic black hole spits out galaxies, and then swallows them, and then spits them out again, over and over on a grand cosmic scale. The whole system is automatic and generates a huge space/time playground for evolution to play in. The main difference in these very different scales is that when the (Bu) ensemble spits a proton, it still maintains its own identity. When the cosmic black hole spits, it spits out everything but the vacuum state, which is "unspitable" and undefined. The cosmic black hole doesn't hold back anything. It plays full tilt and becomes the whole universe. Small identities tend to hold back from totally letting go so as to preserve their individual identities. The cosmic hole trusts that the inherent appetite of gravitation will eventually eat its way back to unity.

To return to our discussion of gravitational satellite systems, if we replace ($\% c^2$) with a variable such as (x^3 / T^2) -- where (x) represents the semimajor axis of an ellipse and (T) is time in seconds --, then we see the macroscopic dynamics of satellites following elliptical orbits that sweep equal areas in equal times as discovered by Kepler. The heavier mass of the system finds its place near one of the foci of the ellipse (Kepler's first law). The center of mass for the whole system is actually on the focus. In a binary system where the two masses are equal or nearly equal, we get two large ellipses that overlap with the center of mass lying in the center of the lenticular overlap area. The smaller satellite case also has two ellipses, but the gravity well's ellipse is so much smaller that it stays oscillating very close to one focus of the large ellipse. The binary star system is a two dimensional model of what the (Bu)² binary system is like in three dimensions. The Unions as binary "stars" are so close that their event horizons intersect. Their joint center of mass lies in the center of the lenticular vesicle where they overlap, analogous in three dimensions to the binary star system that has been flattened into two dimensions.

A binary star system occurs on a cosmic scale where the gravitational force dominates. At our "every day" scale, the electromagnetic forces dominate. We looked at the limit case. The interaction of (Me) and (Mp), the two smallest particles that are stable and interact, defines the limit. The EM force dominates the gravity force by almost 40 orders of magnitude. This sounds like a huge gap. The common misconception is that they are very far apart. This misconception is fed by the observation that at our scale electricity still dominates over gravity at about that 40-1 ratio in orders of magnitude. Yet, when we studied the relationship closely, we found that this gap between the forces closes surprisingly quickly -- if we enlarge the mass of the particle per unit charge. We found that the two forces reach the equilibrium point at particle pairs that average 10^{-9} kg each. Relative to our scale this is still quite small, but is just on the lower border of our unaided perceptual boundaries -- about the size of a tiny dust mote. This is the crossover point between the two forces, the point where they unify. When the mass passes that point, gravity forces already dominate over EM forces. If that is so, then why do the EM forces still dominate at our scale which is around ten orders of magnitude higher. Gravity should wipe out the EM forces on our "every day" scale!!

The reason the EM forces keep up with gravity for a while after they pass the

"equilibrium" point is that ordinary matter is built up mostly by multiple increments of (M_p) rather than large individual particles. We don't see heavy subatomic particles with unit charges floating around in our environment. At least most people don't believe we do. This may be just a problem of attention and viewpoint.

At any rate each increment of proton mass adds a corresponding increment of charge. Thus the two forces of gravity and electricity keep pace with each other for a while. Up a unit of mass, up a unit of charge. But, since the proton's resultant mass is so small compared to the charge, the charge continues to dominate.

Mass mostly consists of protons. A clump of matter is really so many proton masses with so many proton charges. However, the heavier atoms accumulate a lot of neutrons in them. They have more neutrons than protons. Molecules are atoms formed into structures where the electrical charges tend to neutralize each other via interactions of electrons with the protons. This damps the electrical force and allows the gravitational force to catch up.

For every proton there is an electron with much less mass. The electrons get in close to the protons. The opposite electrical charges tend to clump together and cancel each other out, while the mass keeps incrementing. This is true at the nuclear level and at the atomic and the molecular levels. Thus, at our scale almost all of the electrical charge is neutralized most of the time. Otherwise everything would be zapping and crackling with charges jumping about. The gravitational forces gradually keep on building up in contrast to the highly attenuated EM forces as the matter clumps get larger and larger and remain electrically neutral. By the time we get to moons and planets and stars, the particles are adhering primarily by virtue of the gravitational force rather than the electrical force. Thus gravity dominates in the cosmic scale. Large gaseous planets and stars and galaxies are held together almost entirely by gravity.

Our (Bu) relationship tells us that, if a cluster of protons and neutrons formed a dust particle that was electrically neutral except for a single charge, then the gravitational and electrical forces would exactly balance. Later on in Chapter 14 we will explore this possibility in our theory of quantum gravity.

Experiment: Stand by a window with the slanting afternoon sun shining through and observe dust motes floating about in the sunbeams. They are quite visible and quite weightless. The larger particles will eventually settle onto your furniture and give you housecleaning chores. The settling of dust is due to gravity. If you watch carefully and hold your breath and be very quiet, you can see the Brownian motion of dust motes as they are pushed about gently hither and thither by the kinetic energy of molecules of air. The Brownian motion is partly electrical (from molecular bonds, Van der Waals forces, and so on) and partly due to the kinetic energy of air molecules or tiny currents of convecting air. You can also do this experiment with a bright lamp. It's good to have a dark background behind the sunbeam or lamplight for contrast to see the illuminated particles better. With a hot lamp you can also sometimes see very small energetic particles swirling about in the air near the bulb.

When we examine a binary star system that has two stars of equal or nearly equal masses, the two ellipses overlap and their two overlapping foci fit together and form the location of the center of mass. We see that Kepler's first law is actually inaccurate. The sun does not sit exactly at the focus of the ellipse. It also has a small elliptical orbit. The center of mass for the system of two mutually orbiting gravitational objects sits at the point where the foci of the two ellipses overlap. This is nearest to the periastrons of the orbits. Two circular orbits would bring all four foci together. (That may be the case in positronium.) This means that we actually have a general two-body system involving FOUR foci. The center of mass at the overlapping foci corresponds to the interaction of (Bu^2) , producing a sQuark at the center of mass in the lenticular vesicle. What about the two outer foci? Do they correspond to two halves of the resultant particle? They are the opposite poles of "potential energy" that pull the particles apart.

If we lift a ball up high off the ground, we increase its gravitational potential energy. When we let it drop, the potential energy converts to kinetic energy. The ball accelerates toward the earth's center of gravity. The earth also accelerates toward the ball's center of gravity. Because of the vast difference in mass between earth and ball, the earth's motion is too small to measure. The line of "force" runs right through the two singularities and the foci. The ellipse is degenerate. If we imagined a shaft running through the earth, we could drop a ball and it would bounce back and forth through the shaft in a linear trajectory, as if it were on a spring. A pendulum is a good approximation of this situation, though the bob swings back and forth. We just pay attention to the up and down movement. Elliptical and circular orbits are just the bobbing ball with a bit of angle added. The force is directed in all directions, so the ball swings into an elliptical orbit.

Gravity is bipolar. There is the attractive force and the repulsive force. The repulsive force comes from the resistance the objects have to coming together. This is inertial momentum inherited from the past or deliberately added to the object to push it away. The energy used to lift a ball away from the earth corresponds to the potential energy given to the ball in the gravity field. This is positive resistance to letting the ball be at the center of the earth, which is where it would rather be. So the ball and the earth also have a resistance to being apart. The ball wants to be at the center of the earth. Somebody doesn't want the ball to be at the center of the earth. These two desires resist each other. Gravitational orbits are all generated by the interaction of these two opposite resisting forces. Desire is a form of resistance. One resists the current situation and wants to change it. The objects want to come together, but they have kinetic energy that resists allowing them to be together and pushes them apart. But the sum total kinetic energy is only equal to the sum total potential energy. So when they get a certain distance apart, the resistance to being together fades to zero and the resistance to being apart takes over. The attraction draws them together again. The potential energy drops off and the kinetic energy increases. When the ball reaches the center of the earth, it has no more potential, but, alas, it has a lot of kinetic energy, so it zooms back out again.

People feel this in relationships. They are upset with someone so they make distance, but at a distance they don't feel the upset, so a feeling of need in the relationship takes over and brings them back together again. Then the irritation dominates and they separate again. This pattern continues as long as the resistances between them continue.

The objects in a binary gravitational system find a geodesic of equipotential between these two forces and often are able to settle into a stable feedback loop, an automatic system that just keeps going around and around, the two resistances just balancing each other. This allows solar systems to persist for billions of years. The particles have created for themselves a situation in which they have no will power of their own and only obey forces imposed on them. So what can they do? They just oscillate on and on.

In the subatomic particle the kinetic rebound takes the form of Hawking radiation. This radiation squirts out at the edges of the lens, where the density of the sQuark is least, but cycles around and gets sucked back into the flat side of the lens. It forms a double bubble shape that looks like two bubbles kissing. The lens vibrates like a drumhead. The various particle masses are determined by the harmonics of the vibrating lens. Most of the radiation follows a trajectory established by the (Bu) event horizon, though there are very small quantum probabilities for it to spread. This corresponds to the orbit of a binary star, which has a very flattened out geometry, but is also very stable. The outer "poles" of the Hawking radiation loops are a pair of points somewhere outside the lens but inside the event horizons of the (Bu) "particles". They act as foci for the loops to loop around. The sum total of the system generates a resistance to the world outside the (Bu) event horizons that equals the mass of the subatomic particle. This in turn is governed by the sQuark center of mass (CM). The CM acts as a pivot inside the black hole lens complex that reflects on the outside with a resultant resistance of the inertial rest mass of the given particle. In a binary star system the outer poles correspond to the outer foci that are nearest to the apastrons of the orbits. Solar systems with planets are highly distorted variations of this pattern caused by extreme imbalance in their relative masses.

Now we have garnered a deeper understanding of the origins and structure of mass. We see that it comes from a transfer of energy. That transfer of energy originates with resistance. All perception comes through the medium of photon exchange. When we spoke of the advanced and retarded photon waves, it appeared that an electron emitted a retarded photon, which traveled to the observer, who then absorbed the photon, simultaneously emitting an advanced photon that moved backwards in time riding with the retarded photon to the source. Actually the situation is that the advanced and retarded photons arise simultaneously at the source. There are two types of source. One type arises from undefined awareness and has no defined location. It is non-localized. The other arises from the presence of localized "stress" somewhere in a system. This stress is caused by a prior creation. A disturbance arose in awareness due to an act of creation. That creation was subsequently rejected and abandoned without being experienced. This resisted creation then remained floating around in the system waiting to be experienced. Under the proper circumstances the resistance behaves as a secondary source, creating an echo of the original resistance that abandoned

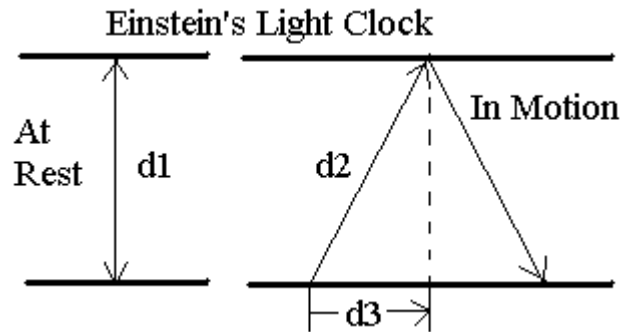
it, as if calling out to be recognized and experienced -- a kind of wake up call.

One can not only create systems and abandon them, one can make them run on automatic so they loop around indefinitely within a certain space in awareness. They will continue to loop until they are disturbed by another creation coming into contact and possibly into conflict with them. Ordinarily an exchange of photons is just an exchange of photons. The energy moves from one place/time in undefined awareness to another place/time in undefined awareness. Undefined awareness has no opinion about where it begins or ends. An event is just an event. Photons do not interact with each other. They can pass right through each other, undeterred and unaffected.

The electron pair acts as a secondary source and terminal, an emitter and an absorber, for the photon pair. The photon partners also act as a pair. The photon's partner is its "antiparticle". But if they travel together, don't they mutually annihilate? Yes, they do. But the products of the annihilation are just another photon-antiphoton pair. That is why the photon vibrates as it travels instead of propagating in a purely straight line. Photons propagate in the conjugate dimensions of the source and observer (absorber), and they oscillate in the dimensions of electrical and magnetic resistance. The source, electric and magnetic dimensions, define space, and the observer's attention defines time. The frequency of the oscillation determines the clock's tick. In this way photon pairs travel along annihilating and recreating each other, carried by their linear momentum at the speed (c) until an electron absorbs them. Then they stay annihilated for a while. Actually their energy is just transformed into a component of the electron's energy. The higher the energy (frequency) the faster the clock ticks. The lower the energy (frequency), the slower the clock ticks for the observer's consciousness. When an emitter and absorber separate from each other at high relativistic speed, the photon clock appears to slow down in comparison in order to maintain energy equilibrium.

This is what Einstein discovered in his theory of Special Relativity. He noted that if the speed of light is constant for all observers, then the wavelength must shift to compensate. He imagined a light clock that bounced a light signal off a mirror. The round trip counted as a clock tick. If the light clock began to move at close to light speed normal to its timing beam, an observer in an inertial frame would see that the beam had to zigzag in his frame as it reflected back and forth from the mirror. To the observer travelling with the clock nothing would seem to change. But to the outside observer, the clock would appear to slow down. This behavior is observed commonly with the frequency shifts of fast-moving astronomical objects and subatomic particles. The spectral lines of starlight are shifted, and the decay rates of fast moving particles appear slowed.

- * $(d1 = c Dt')$,
- * $(d2 = c Dt)$,
- * $(d3 = v Dt)$
- * $d2^2 = d1^2 + d3^2$; $(c Dt)^2 = d1^2 + (v Dt)^2$; $d1^2 = (c Dt)^2 - (v c Dt)^2 / c^2$.
- * $d1^2 = (1 - v^2 / c^2)(c Dt)^2$.
- * **$Dt = (d1 / c) (1 / [1 - v^2 / c^2])^{1/2}$.**



Here we are substituting distance traveled per unit of time to show graphically how the clock's ticking dilates relative to an inertial observer. When the clock moves sideways, (d_1) 's path gets stretched out diagonally into (d_2) relative to an inertial observer. Thus the moving clock appears to tick more slowly for him than the clock at rest.

This time dilation is the same type of phenomenon as the distortion of group waves and phase waves that we saw taking place in a klystron wave guide. The only difference is that the wave guide has a long stationary tube, whereas the light clock has a tube that moves along with the oscillating photons.

We can even dispense with the light clock and just use the photon itself as a light clock. The photon naturally oscillates as a wave in the vacuum through which it travels. Resistance causes this oscillation in the observer's non-local awareness. The whole space between the terminal particles that are exchanging energy vibrates as a non-local standing wave. The energy of the wave is fixed by the quantum mechanical nature of the electron orbits that form the terminals. However, the wave form -- and hence the space/time -- is distorted by the relative kinetic motions of the terminals. If an orbiting electron releases photons at a characteristic wavelength, the motion of the atom or molecule ensemble in which the electron participates adds other properties to the wave. To compensate, the wave appears to modify its wavelength rather than its velocity. Thus light from a receding object is red-shifted, and light from an approaching object is blue-shifted. This is the Doppler effect. In spite of this shift, the observer travelling with the light clock sees the light move at (c) , and the inertial observer also sees the light move at (c) . All observers experience light from a specific source as moving at (c) , regardless of the relative motions of their reference frames.

The compression of waves in the direction of motion corresponds to an increase in energy and therefore an increase in mass. The mass increases without limit as the velocity approaches (c) , rendering it impossible for mass to travel at (c) . To travel at (c) , a particle must convert itself back into radiation mode by unfurling its curled up photon energy into pure linear momentum.

The increase of mass-energy at the front end of a moving particle is balanced by a corresponding loss of mass-energy at its tail end. That is to say there is time dilation and wavelength stretching.

- * $L1 = [(c + v) / (c - v)]^{1/2} (L0)$. (Longitudinal)
- * $L1 = (1 - (v / c)^2)^{-1/2} L0$. (Transverse)

The photon performs the **same number of oscillations** as it moves between emission and absorption for all observers in different frames, but for those who see the objects separating, the wavelengths seem to get longer to compensate for the greater distance.

Einstein simply asserted without explanation the principles of relativity and the constancy of light speed for all observers. This is just how it is. Palmer has pointed out (**ReSurfacing**, p. 111) that whenever you encounter the assertion that "this is just how it is," such a statement usually is a cover for a transparent belief. We can do some brainstorming to uncover the core belief that might underlie such a reality.

Exercise: By yourself or with some friends ask the following question, and see what responses you can come up with. "What might someone believe in order to experience that light moves at (c) for all observers?" It helps to follow the procedure outlined in **ReSurfacing**, Exercise # 23, "Transparent Beliefs". When you have finished the exercise, read on and compare your answer to what I came up with. We may agree, or we may disagree. But in any case we will have thrown some light on possible hidden assumptions behind Einstein' s famous assertion.

I came up with the notion that any observer essentially must be non-local. When an observer observes an event from anywhere in the universe, he observes from the viewpoint of (c). Although local observers differ in terms of space/time reference frames, they all share the non-local view from the viewpoint of (c). This causes signal delays and distortions. Einstein thus had to amend Newton' s laws of mechanics to make them relativistic when the speeds approach that of light. For example, here is what happens to Newton' s second law ($F = M A$).

$$* \quad Ftot = Mo [d (v (1 - (v / c) ^2)^{-1/2}) / dt].$$

Newton made an assertion with regard to gravity. He asserted that any two massive bodies interact gravitationally from a distance with no lag time between them when he stated his law of gravity. For Newton this is just how it is.

$$* \quad F = G (M1 M2) / R^2.$$

This law implies that the force transmits instantaneously between the two masses, regardless of the distance between them. Physicists feel that Newton' s gravitation law must be adjusted to match Einstein' s adjustment of ($F = M A$), since the gravitation law is also a force law. The problem is that no one has actually observed "gravity waves", much less timed their velocity of propagation. We just see the results in the motions of bodies. So far no experiments have revealed gravitational waves or gravitational lag times. This is a continuing topic of research, and recently (Sept. 2002) measurements

were made of a quasar' s conjunction with Jupiter to see if gravity waves could be detected. First reports claim gravity moves at light speed. We' ll see how it develops.

If we look for a transparent belief behind Newton' s law of gravity, we might surmise that Newton subconsciously believed that gravity is a holistic, non-local phenomenon. It arises simultaneously everywhere from the vacuum state reflecting the mass/energy condition of space/time. In Observer Physics we propose a solution to the question that is part way between Newton and Einstein and satisfies both. (We develop a possible solution to this issue later on in this chapter. Our more complete theory of quantum gravity unfolds in Chapter 14.)

The whole system of photon pairs exchanging between electron pairs functions like a hyperbolic satellite system. Instead of forming overlapping ellipses, the fermionic electron pair forms separated hyperbolic wings. The two periastrons of the hyperbolic trajectories form the vertexes of the interaction. The photon pair exchanges between these two periastrons. The center of mass of the system is somewhere at the middle of the photon' s path between the electrons. The electron hyperbola wings are asymptotic, squeezed between the subluminal edges of the light cone. The photon exchange is like a stream of sand passing through the center of an hourglass from future through now into the past, and the observer looks upward from below at the stream of sand, and that is his experience.

The electrons are like the (Bu)' s, and the photon path describes the equivalent of the semimajor axis. It is a fractal echo, again in conic sections, of the structure of a single electron and of the macroscopic solar system. The photon transmits energy (resistance) at maximum speed in a linear fashion. The electron spins and anchors resistance at a slower speed, but with greater inertia. Free electrons have no apastrons (from the viewpoint of this analysis), because their trajectory is an open curve. For electrons in orbit around a nucleus, the periastron is the radius of the ground state after photons are emitted and the apastron is the radius of the excited state when photons are absorbed.

All phenomena are basically built from the "three hairs". These hairs are mass, charge, and spin. All other properties (such as quark flavors, magnetic moment, and so on) are derivations of these three hairs. The three properties are all woven together. They can not be isolated. All particles are created by whirlpools of photonic energy circulating around tiny black holes. These are eddies of energy created by resistance. Resistance comes from concentration of attention. Energy is concentrated attention. Attention is the flow of awareness through a viewpoint. It moves in the form of physical-mental conjugate photon wave functions. Attention "particles" are advanced photons. But we have seen that advanced and retarded photons are relative to viewpoint. If [W] is a retarded photon wave and [W]* is its advanced photon wave, we can just as easily turn the tables and define [W] as the advanced photon and [W]* as the retarded photon. The object you observe is defined by you and projected into mental and physical space from your undefined awareness.

Exercise: Look into somebody' s eyes and allow your attentions to conjugate.

Photons are attention particles. When I look at someone, I send my advanced photons to her and receive her retarded photons. When she looks at me, she sends advanced photons and receives my retarded photons. We like to call our own photons advanced, I suppose, because of the egotistic illusion that we are advanced and others are retarded. (joke) But, as we have seen, the (Vg) and (Vp) aspects of photons are entirely relative to viewpoint and arbitrarily defined by the observer. My advanced photons are retarded to any other person, and vice versa.

The intensity of photons does not control their energy. The energy of photons resides in the wavelength (frequency). Concentration of attention shortens the wavelengths of advanced photons. The greater clarity derives from having more receptor cells in the central region of the retina and fewer cells in the peripheral areas. This same is true for the other senses. This evolution of more receptor cells in the central region of a sense organ derives from greater attention being placed on focussed attention than unfocussed attention. It acts as a magnifying glass on objects on which attention is focussed. If we habitually began to defocus attention, we would rearrange the distribution of receptors in our sense organs.

Experiment: Have a partner gently touch the pads on your finger-tips with a pair of pins. Have your partner start with the pins about three quarters of an inch apart and gradually move them closer together. Keep your eyes closed and feel whether he touches you with one pin or two. How close can they be before you can no longer distinguish whether one or two pins is touching you? Try the same procedure somewhere on your forearm. How far apart are they when you lose the ability to resolve individual points of contact?

Exercise: Select an object and focus attention on it for a few minutes. Do you notice that the object of your attention's focus seems to become not only clearer and more brightly colored, but also larger? (See **Resurfacing**, Exercise #3.)

Really strong concentration reaches black hole energy densities and bends the space/time in the area of focus so that the advanced photons begin to circulate as eddies of space/time. This manifests the photons as subatomic particles of matter. Relative to the photon, the energy is still in the linear momentum and is moving forward in a straight line. Relative to an observer outside the event horizon geodesic in which the photon runs, the energy is now localized as a little blob. Like an eddy in a stream that forms by a rock and then detaches and floats around, the blob can take on a life of its own, moving at (Vg) velocities. It is also observable!! But only indirectly. You can not observe a photon from the "side", and you can not see any particles. You can only see photons "head on" when they exchange energy with your "particles" of resistance. They interact with your current viewpoint and say, "Hey, I am here." Then you can infer their existence.

All perceptions are via photon exchanges. Strange as it may seem, we only infer the existence of other particles indirectly from photon exchanges. The whole thing may be

just in our imagination. To see a photon, you have to absorb it, thereby annihilating it. Experiencing an object destroys it. Another way to indirectly observe a photon is to allow Compton scattering to take place and to note the shift in the trajectory of the scattered electron or other particle that the photon interacts with. You can observe an electron -- but only indirectly via "head on" photons. This is not just because of the small size of the electron and its fast speed, but because it is "transparent". A photon just energizes it and generates a vertex in its trajectory. At least you can observe its track as it moves through a bubble chamber or some such device. But photons (and neutrinos) just zip right through the chamber. You only know of them through the scattering patterns of observable particles interacting with devices that eventually transfer the energy to your attention.

From our fundamental principle of light overwriting itself by curling around to form a black hole whirlpool, we immediately gather some important conclusions about the quantum nature of spin that makes it quite different from classical spin on the macroscopic scale. We know that the particle is made from at least one photon vibrating in a closed circle. This means that its speed of whirling must be (c). All subatomic particles spin at the same speed regardless of their energy and/or mass!!! This also means that the spin, and also the electrical and magnetic effects of subatomic particles and their ensembles, will come in discrete quantum units. From our theory of advanced and retarded photons, we realize that neutrinos, electrons, and protons, are made of attention. A portion of someone's consciousness is locked up in these tiny black holes. Actually, we should say that a CONJUGATE REFLECTION of a particle of consciousness is locked in the black holes of particles.

The spin of subatomic particles has very special quantum mechanical properties that are not found in macroscopic spinning objects. Quantum spin is associated with quantum magnetic moment. The particle behaves like a tiny little magnet with poles. This can be seen in the Stern-Gerlach experiment where electrons can be separated into two types, spin up and spin down. This up and down relative spin orientation helps structure the patterns electrons take as they build orbits around nucleons. They tend to form into up and down pairs balancing the magnetic charge. Although the electron is a fermion, it remembers that ultimately it is a bosonic photon. So it craves bosonic experience. It gets closest to that by forming Cooper pairs. In superconducting materials, the supercooled materials become so orderly that the electrons pair up neatly into Cooper pairs and the substance takes on bosonic behavior, forming a macroscopic quantum mechanical system.

The various classes of particles are found to have quantum spin values. Bosonic particles have integer values, and fermions have half integer values. Fermions lack wholeness, because they represent an unfinished event. The photons form nice pairs. They are more complete. The mesons echo this "wholeness" by forming particle-antiparticle pairs at higher energy resonances than ordinary photons. They are just super-powerful photon eddies. They are unstable and decay rapidly, the longest mean life being on the order of 10^{-8} seconds. An electron must have a partner electron with which to balance its spin magnetic moment and to exchange photons. Otherwise it can

find an antielectron and annihilate back into photons.

Here is a chart of the various theoretical and observed quantum isospin classifications, referred to as (J_p) value.

Spin-0:	Higgses, sleptons, squarks, mesons
Spin-1/2	leptons, quarks, gauginos, Higgsinos
Spin-1	gauge bosons (force fields)
Spin-3/2	gravitino, (omega minus baryon)
Spin-2	graviton

Of these various entities only mesons, leptons, quarks, and gauge bosons have been observed. And quarks are confined inside baryons and mesons. Higgses, sleptons, squarks, gauginos, Higgsinos, gravitinos, and gravitons are all theoretical particles proposed in various unified field theories. The motivation for the graviton is the requirement that there be a force field energy exchange vehicle for gravity. Higgses are proposed to explain how it is that the heavy bosons are found experimentally to have mass when the invariant gauge theories inherently do not generate particles with mass. So Higgses are thought of as a bridge between energy and mass. The field equations have to jump through a lot of hoops to get intermediate vector bosons with mass. Sleptons, squarks, gauginos, Higgsinos, and gravitino are all brought up as heavy particles needed for grand unification and super-gravity theories.

The squarks mentioned here are different from the sQuarks I discussed earlier. Those particles have a spin 1/2 when viewed as matter. A sQuark resembles a big orca swimming just below the zero point surface of the vacuum. The observed particle is his dorsal fin. Wherever matter appears, there is a slight general disturbance in the vacuum state in its vicinity. This covers quite a region of space. We can call it a sQuark. But we will have clearer models of the whole setup as we probe deeper into the internal structure of the proton.

OP has no problem with predictions of heavy particles that have not been seen. Heavy particles certainly exist at high-energy concentrations. They occur naturally as the higher resonances of the proton model. We have already identified several heavy particles. The (Bu)'s are in the range of 10^{-9} kg. The Q-particles (sQuarks) interpreted as ordinary masses are really heavy, the (Qne) reaching the mass of a Jupiter sized planet. But such particles can not exist in the same way as protons in our current universe. The average energy density in our observer space is too low to sustain them above the zero point, so they decay right away back into the vacuum state. But they exist everywhere all the time in the vacuum state as virtual particles and tend to hover under manifest particles. The vacuum state is constantly boiling such particles into virtual existence, and then annihilating them.

Think of an orca (or even just a wave on the ocean). Ordinarily, when you see an orca or dolphin swimming along near the surface, you see a dorsal fin moving along cutting through the water's surface. The orca is very large, but you just see the fin. (You only

see the crest of a wave, not the big part that runs under the surface.) If the orca gets excited, he jumps into the air and you can see the whole animal. In a storm the waves can kick up high. Neutrinos, electrons, and protons are like this. The whole big animal is running just below the surface of the vacuum. A form of symmetry breaking that puts lighter particles on one side of the vacuum and heavier ones on the other holds them there. What you can detect in our ordinary space is just a tiny particle zipping along. It is just the dorsal fin of a much larger animal. By staying under the surface, the heavy particles can be more relaxed and non-focused.

If the photon corresponds to the attention, then the graviton corresponds to the will. The will generates desire and resistance. Will has created particles and set them in motion. The attractive power of gravity comes from matter's remembrance that beneath its fermionic behavior of Pauli exclusion lies the bosonic behavior of liking to be together -- quantum condensation, phase conjugation, and coherence. Matter is made from light. It remembers being light. The best it can do is try to draw as close together as it can. But light also travels fast with momentum. This gives fermions a contradictory tendency toward inertial momentum. The resolution of the contradictions is equilibrium -- balanced in yoga, perform action.

Just as the photon is the retarded wave packet companion for the conjugate advanced wave packet of attention, the graviton particle is the retarded wave packet companion for the conjugate advanced wave packet of the will. Why are we attracted by the gravitational influence of the planet Earth? This is the conjugate mirror reflection of our love of this type of environment. It is the result of our deliberate, willful, decision to be here.

By love I do not necessarily mean mushy romantic love, although that also has its role. I mean simply the attractive force that deliberately placing attention on something generates. The more attention put there, the more concentrated the wavelength, the more solid the environment. As Maharishi says, "What you put your attention on grows in your life." Gravity is the conjugate reflection of that. We love our bodies and the earth so much that it hugs our bodies and attention tightly to it.

However, we can recall that this situation is nothing more than a habit of attention. As we enter a new age, our will can direct our attention in other directions. We may desire to leave our gravitational field and explore zero-G space and other planets. As we do so, the (G) force will shift in intensity. It is possible to assume viewpoints in which you become weightless even within a gravitational field. Try it as an exercise. It is not very difficult. David Copperfield (the illusionist) has an incredible demonstration where he floats and soars about the stage totally independent of gravity with grace and beauty as if flying in a dream. I have no idea how he does it, but it sure is an eye opener. You don't need to put on a show or be acrobatic, but you can do it easily and effortlessly yourself.

Experiment: Discover how to make yourself weightless. Hint: Remember what we have said about the relationship between mass and resistance. Also, do not get stuck in

habitual viewpoints. Caution: Don' t walk off a cliff or tall building unless you are successfully able to lift off and hover from the ground and have full confidence in what you are doing. Start exploring in your room. Once you have truly mastered the art, then you are on your own responsibility. If you feel you need coaching, Maharishi has a course where he teaches you the basics of how to do "yogic flying".

Gravity and will form a conjugate pair. The graviton mediates the gravity interaction. Gravitationally interacting objects have mass, but the graviton itself has no mass. Physicists assume that it moves at (c), the speed of light. But there is no reason why it should be subject to (c) velocity. The collapse of the wave function is virtually instantaneous and non-local. This suggests that the graviton is non-local. It operates from the level of undefined awareness. The will is the feature of undefined awareness that allows for the creation of definitions. The will arises directly from undefined awareness to define creations. It is not located any "where". One of the undefined possibilities in awareness is the possibility of making definitions -- any kind of definitions. We call that feature "will." Gravity is the conjugate wave form of will. If you don' t have any definitions in place, there is no force of gravity. Creations attract creations. The more densely you create, the stronger the attractions. Gravity is very much concerned with a property we call density. But we must reserve exploring that topic more deeply for our discussion of thermodynamics later on.

For now we recognize the existence of gravitons. Gravity is the manifestation of the retarded graviton wave, and will is the manifestation of the advanced graviton wave. The graviton itself is massless and propagates at a velocity that is either infinite (a holistic impulse) or is much faster than (c). I favor the second choice, because the graviton is a defined creation with both mental and physical aspects. It therefore can not be infinite. However, we can' t measure its speed unless we can observe it. And we may not ever observe it except from the non-local level at which speed is not very relevant by definition.

I suspect gravitons have spin 0, but that' s just intuition based on the notion that wholeness doesn' t spin, because it has nothing to spin relative to. Also if the graviton travels at (c) in free space then it will be linked to (c) and will propagate entangled with photons. Graviton particles may be generated only at the level of the entire universe, which can not be spinning relative to itself or any frame. That hypothesis suggests the scale from which the will arises.

The will arises from a different level than the attention. Will is innately non-local, and attention is innately local. Thus attention particles and photons move at conjugate versions of (c), whereas will and graviton particles move at conjugate versions of a much faster superluminal propagation velocity.

We can add some support to that hypothesis by looking at the nature of observer viewpoints. Imagine you are a point in unbounded space. You sense in all directions, but there is nothing elsewhere. There is just a point resonating in an infinite space. This is an observer with nothing to observe but emptiness. If you add a second point to

the space, then the observer point can observe the second point. But he can learn nothing about it regarding size, location, speed, etc. Now add a third point. Now you as observer can relate the two other points. You still can not tell distance or size, but you can observe the two points and the separation between them. The two points define a line, a 1-D creation. Observing just a single point gave you a 0-D creation to observe. Now add a fourth point. You can now discern a 2-D planar relation among the three points, although they can also become collinear. In that sense a line is a degenerate plane. Add a fifth point. You now can define tetrahedral structures and begin to get an illusion of 3-D space. It is not truly a 3-D space until you begin to do linking. This process of adding more points can continue endlessly, but you as observer will not see any change in the nature of the points without defining links that can structure higher dimensions. The linking process is what we earlier referred to as "connecting the dots".

In the above scenario, there is always one more point in the objective space than the order of its dimensionality. Also there is an additional subjective point of the observer. Without the observer no experiment occurs. Also note that the observer always remains a transcendent witness to his creations, no matter how complex they become. Whatever dimension the space has, the observer remains in a transcendental dimension.

However, an observer can step into his creations and participate in a marvelous way by the process of linking. For example, let' s say the observer links himself to one of four points floating in his space. Curiously enough, as soon as he does this, he has TWO EYES and can perceive 3-D depth. Even if the other point is just a dull point without perceptive ability, the link somehow enlivens it. This is how awareness becomes consciousness (a viewpoint) and then creates a body (another point) and then links a conscious viewpoint to that body. The body can be as simple as a point or as complex as you please.

Exercise: Do the above thought experiment as a physical exercise on a flat table with some pebbles (or other tokens). Place four of them anywhere you like on the table. Use one eye as your viewpoint. It is the pebble you have chosen to identify with as you observe your world. You can move your viewpoint around to view the four pebbles from various angles. Use only one eye to sight your pebbles. You' ll be hampered a bit by familiarity with the table and pebbles and the environment of the room. So, once you have the hang of the exercise, abstract your imagination into a space where none of that exists. You' re in a space ship in outer space, and there are stars all around. Without using spectroscopy and other tools, how do you know how far away each star is? Even faintness is no guarantee. Try using mathematical points, which have no definite size. They are fractal dust particles. As you get closer they keep shrinking so they always appear the same size, though their relative separations can change.

Now go back to your table and replace one of the pebbles with a pen. Hold one end of the pen close to your eye, and let the other end stick out where you can see its tip. Now that pen tip is linked to your viewpoint. By shifting around you discover that the frame you have established with your link stays fixed, and you can now judge angles and distances of pebbles using the pen as your gauge. (But only if you **move** relative to the

objects.) You have full 3-D vision with depth perception. That is the value of having two eyes fixed in one place. Even if you go blind in one eye, you can still use a reference point on your body such as the tip of your nose or a finger for comparing distances and angles. Two seeing eyes just make life easier and provide insurance against injury. The motivation for motion comes from the desire to appreciate creations from various angles and viewpoints. Linking is the step that allows you to integrate mind and body and extract a rich physical world from just a bunch of points. The fundamental link is from observer (subjective) viewpoint to an objective "anchor". Secondary links can then be created among other object points. This generates ensembles that relate and move together if they move, just like you and your linked object. You can iterate the points and links as much as you like to generate a complex experience. You can also jump your viewpoint from one location to another. You do not have to stay stuck with the same pebble or link all the time. You can move your pebble or pick a different pebble. After all, you selected and made the points and pebbles.

Now we have enough background that we can start to talk more deeply about what spin is. In order to have spin, you must have at least four points and one observer link, plus something else. The observer point and the linked object point occupy two points. The third and fourth points are also linked to serve as a reference. Without the linked reference you'd never know if you were spinning. Recall Newton's bucket. Your link corresponds to the bucket. It moves as a unit, as a single macro-particle. You have no water particles to scatter. Therefore you need at least a pair of linked reference points to detect rotation.

With all of this you need one more thing. You need a push. In our model so far, we have assumed that you could move your observer point around. It has no mass, so it takes no effort. Previously when we moved a linked observer, we translated the whole apparatus. Now we will have to move the observer in one direction and the linked object in the **opposite** direction. Or we somehow hold one end still while pushing the other end (which is the same thing really, except with regard to the reference link). So, if our linked system is labeled O--A, we can spin it in three different ways. We can spin (A) around (O), (O) around (A), or we can let them both rotate around the center of the link. In the latter case they move in opposite directions. In the absence of inertial forces and an external reference frame, it is impossible to tell which of the three rotational modes we are in other than from knowledge of the initial conditions or by the use of the reference frame. It also helps if the reference link is in or near the plane of rotation and not lined up pointing away from your viewpoint (so it degenerates into a single point).

Note: there are actually two other ways to rotate O---A. It can spin along the length of its axis and it can have a "precession" or wobbly spin, pivoting at its center of mass, although in this latter case the link is not actually going around the center point. There is also a smaller wobble called nutation. Navigators refer to the types of motion of an object with axial length in 3-D space as roll, pitch, and yaw. Pitch and yaw are really the same thing if you have no preferred orientation of up and down.

From our previous discussion, we can see that in the first case (A) is orbiting and (O) is rotating. In the second case (O) is rotating and (A) is orbiting. In the third case both (O) and (A) are orbiting and the center point of the link is rotating. And that adds another focal point to our system, even if it is "unmanifest" as in the outer foci of our binary star system. If the link is a long one it can look like orbiting is just translation. It really looks that way if the links can shift as they do when a rock wanders through the solar system skirting the gravity fields of various planets.

The three cases of rotation can be distinguished by the change in size of B--C, the reference link. In the first case B--C remains unchanged. In the second case B--C's length oscillates. In the third case it also oscillates, but less so than in the second case. Of course, you don't know that unless you try both types of motion.

According to modern physics, a photon (and other gauge bosons too) has spin 1. Neutrinos, electrons, and protons have spin 1/2, and mesons have spin 0. Atoms can also have composite spins. In general, particles with whole number values of spin behave more like bosons, and particles with 1/2-integer multiples behave like fermions. The charged fermions are spin 1/2. What does this mean? It means that the photons running around in circles begin as electrical vibrations. When they wrap around, the vibration becomes a band. The electrical vibrations also have a magnetic vibration that is normal to the electrical vibration. When the electrical vibration degenerates into an orbit, the magnetic vibration is rolled up into a little pole that sticks out normal to the electrical band. This turns the electron into a little magnetic top with north and south poles just like an ordinary magnet, with the difference that it is quantum mechanical. This set of poles gives the electron magnetic moment. The motion of the photon vibration's "forward" whirl propagation is constant at (c), so charge is constant, and Dirac magnetic moment ($m_D = q \mathbf{S} / Me$) for all electrons depends only on spin vector: (\mathbf{S}) is spin vector, (Me) is mass, and (q) is charge. The wavelength of the photon involved determines a particle's mass, so the mass of any "point" particle can have different values, but is non-relativistically constant for each type. The charge is determined by (c). Magnetic moment in protons ($2.79 e[\mathbf{S}]/M_p$) and neutrons ($1.91 e[\mathbf{S}]/M_n$) differs because they are ensembles, not point particles (more on that later). The pictures you see of little top-like electrons in physics books are really pretty close to the right idea, except that the poles are more pipe-shaped. These magnetic tops have precession and nutation just like other tops.

Physicists make the concept of quantum spin magnetic moment in the spin 1/2 particles very obscure and mysterious in every text I have read, including Feynman, who most of the time is a master of clarity. Feynman just begs the reader to trust him on why fermions are quantized with spin 1/2 and bosons are quantized with spin 1. He says, "The explanation is deep down in relativistic quantum mechanics. This probably means that we do not have a complete understanding of the fundamental principle involved. For the moment, you will just have to take it as one of the rules of the world." (Vol. III, Lecture # 4-3.)

I think the model I have built is quite simple and clear. Any high school student can understand it in the light of relativity's fixing of (c) as a constant velocity for photons and the notion that the energy of the photon is in its frequency, and that the electric and magnetic forces are normal to each other. This latter concept is something anyone can observe. The "normal" behavior of rotating systems is echoed at the macroscopic level in the behavior of physical tops and gyroscopes in general. (See Chapter 15.) The "normalness" of electromagnetic phenomena is also observable at macroscopic levels, magnified by collections of quantum particles.

Given that there are two, and only two, possible relative orientations of a particle with spin magnetic moment -- up and down -- this means that fermionic particle ensembles build in increments of $+1/2$ or $-1/2$.

We said that it is the energy of a particle expressed as its potential and kinetic energy that expresses the conjugate wave of gravitation. What motivates that energy? It is an expression of the electrical and magnetic fields. How do we know this? We have two indications. First, the motion of objects is controlled via that force. Second, we see that the Universe particles are created in a perfect equilibrium due to the balance of equal and opposite gravitational and electrical forces at their crossover point. Thus the electrical force serves as the conjugate to the gravitational force. It expresses this relation as potential and kinetic energy and the observable phenomenon of motion.

The $(Bu)^2$ structure of the subatomic particle is an example at the finest level of creation of phase conjugation and four wave mixing. The gravitational and electrical forces form one conjugate system. The black hole radiation and suction form another conjugate system. The two are normal, but wrapped around in a spherical geometry. It is a prototype.

Now we understand why the rest mass of fundamental particles occurs apparently at non-quantum intervals, whereas charge and spin are quantized. But we still must ask some questions that we have been holding back on. What are electricity and magnetism? If the mass resonances are determined by the quanta, what determines the values of the quanta?

Ultimately the three "hairs" are the conjugate reflections of three aspects of the observer. So we must go back to our analysis of the way undefined awareness becomes consciousness and objective creation. We mentioned A, B, and C. Awareness, Boundary, and Cancellation. Awareness inherently is undefined, but it contains as an undefined possibility, the potential for definition. This is the origin of potential energy. The energy of definition arises from Cancellation, which we called the Will aspect of undefined awareness -- Aware Will. This is fundamentally a negation of undefined awareness. It is thus what we call Resistance, even though, from the standpoint of a Self, it appears to be Desire. Any Desire is a Resistance to undefined awareness.

The expression of Will to define something results in a Boundary. This defines a creation. The creation is a resisted resistance. It is a second order Resistance. If we

call Resistance (R), then a Boundary is $(R)^2$. The movement of the Will to define is always the same wherever it goes. We can define its velocity of Cancellation via pure non-local will as (W), an as yet underived superluminal velocity, and via attention as (c). The value of a Boundary is then $(c)^2$, and the value of a non-local background in which $(c)^2$ exists is $(W)^2$. This defines an area of consciousness within a field of awareness. By the initiation of Will, undefined awareness becomes transcendental witness Awareness observing a creation. This is now not undefined awareness, it is consciousness!!

Each of these three values -- (A), (B), and (C) -- exists in its separate dimension. Each dimension is orthogonal to each other dimension in mental space. We give a name to the "differenceness" of something as a dimensionality. By creating dimensionality, things can be separated, and thereby **abandoned** by attention. Something exists in its own particular dimension, and can even coexist with other things in other dimensions without interference. Or there can be rules for crossover effects, or interference, or exchanges between dimensions. It depends on the viewpoint one takes.

The three fundamental dimensions of undefined awareness, (A), (B), and (C), form the three hairs, and the three dimensions of the physical space that we experience. The fourth dimension is the transcendental dimension of the Witnessing Observer. When the Witness exercises Will and takes a viewpoint and begins observing his world, time begins.

Cancellation itself is the subjective Will. The objective conjugate of the will is gravitation. When the witness desires, gravity appears. But the witness desires and then abandons his desire, shifting orthogonally back to his inherently transcendental status and avoiding the responsibility of experiencing the gravitational reflection of his desire. Thus the abandoned gravity has "lost" its partner, and makes one up out of the contradictory resistance of the Will. This manifestation in the physical world of the resistance of the will is the electrical charge. The motion of awareness flowing through a boundary as it cancels is attention. The directedness of attention is in a space-time-mental geodesic. The conjugate of an attention particle wave is a photon particle wave, as we discussed. The alignment of attention and will becomes orthogonal when the observer shifts viewpoint to Witnessing after having willed. So the direction of the photon wave propagation is now normal to the expression of will which has become gravity and electrical charge.

This is rather abstract discussion. Take a break and go for a walk and get back into experience.

Exercise: Take a walk. Notice your attention. You will notice that most of the time habitually you live your life with attention normal to the gravitational force "vectors" of our planet. When you sleep or die, you relax and shift dimensions. You lie down and your attention loses focus, and then shifts dimension and realigns with the gravitational force vectors and its physical conjugate, the abandoned charges. The dreams you have in sleep are mostly electrical discharges of stress from abandoned creations.

The Boundary of a creation is in yet another dimension. This is the abandonment of abandonment. This is a real illusion. We now view the world as separate from us, and in addition we view a creation as separate from the rest of creation. This is a second order resistance. Most of physics is concerned with describing how objects interact. So physics is the world of second order resistance. Thus Einstein found that the relation between energy and mass is:

$$* \quad \text{Energy} = Mx c^2.$$

The (Mx) is the defined localized inertial resistance that we call mass. It is the reflection of one' Self that one chooses to focus attention on. The (c²) is the second order resistance that forms the area occupied by the inertial resistance per second per second. The time factor is determined by the Witness viewpoint. The resultant of this interaction is what we call energy.

The Boundary is also orthogonal to the photon' s propagation direction and electrical wave. This third orthogonal component is called the magnetic component. Just as attention is a transverse wave that has three orthogonal components (Awareness flowing through a Boundary by means of Cancellation), so the photon wave is "transverse" and has three orthogonal components: propagational direction, electrical vibration, and magnetic vibration. These are the physical reflections of attention and resistance in three dimensions of space plus time to account for the appearance of change.

The energy density of the E-field, say between the plates of a capacitor, is like this:

$$\wedge \quad uE = (eo / 2) E^2.$$

The energy density of the B-field, say in a current-carrying toroid, is like this:

$$\wedge \quad uB = (1 / 2 mo) B^2.$$

The two fields are related in a general way:

$$\wedge \quad E = c B.$$

The velocity (c) is related to (eo) and (mo) as follows:

$$\wedge \quad c^2 eo mo = 1.$$

Thus:

$$\wedge \quad uE = uB.$$

This means that the electric and magnetic fields play equal roles in electromagnetic energy as it moves through space.

Thus,

- * $u = uE + uB.$
- * $u = \epsilon_0 E^2.$
- * $u = (1 / m_0) B^2.$

If we assume, given isotropic media, that the energy flows in the direction of the wave' s propagation, we get the Poynting vector:

- * $(S \rightarrow) = (1 / m_0) (E \rightarrow) \times (B \rightarrow).$
- * $(S \rightarrow) = c^2 \epsilon_0 (E \rightarrow) \times (B \rightarrow).$

The conjugate Poynting vector $(S \leftarrow)^*$ is therefore the flow of attention energy in consciousness. The electric and magnetic fields represent the force of abandoned attention that manifests in two other directions orthogonal to the flow of attention and its conjugate, the wave propagation.

Where do the values of the quanstants come from? They arise naturally from the geometry of 3-Space. We have already derived the D-Shift operator $(\%)$ from geometry. This operator allows us to shift scales. Once we decide on a scale in which to operate and select our units of measurement, $(\%)$ assumes a relative value. So do all the other universal constants. The numerical values of the units are arbitrary, but the relations of the quanstants are universal and invariant. We will have to explore this concept of invariance and why it is important. But assuming that this is the case, then what remain are the various ratios of the quanstants. Their units just indicate their dimensionality at the scale we have selected for our viewpoint of the creations we are playing with.

We have shown how $(H c)$ is a dimensional unit (Joule) and scale shift $(P^{26} \%^{52} / A_0^{26})^{-1}$ away from $(\%)$.

- * $(H c) = (\%) (P^{26} \%^{52} / A_0^{26})^{-1} J.$

(J) stands for one Joule, the unit of energy: $1 \text{ kg m}^2 / \text{s}^2$. The whole expression is in Joule-meters, just as (H) by itself is in Joule-seconds. We are using (c) as our pivot between space and time as we look at energy. The meter (Ru) is our chosen unit of distance. From our expression of $(H c)$ in terms of $(\%)$, we see that $(\%)$ is in meters. So that means we can define a Joule in terms of (H) , (c) , and $(\%)$. The Joule is just an arbitrary choice of numbers we plug into the expression. Behind it is a constant relation that expresses energy.

- * $1 J = (H c) (P^{26} \%^{52} / A_0^{26}) / \% = (H c) (P^{26} \%^{51} / A_0^{26}).$

Instead of using $(H = 1)$ and $(c = 1)$ for "natural units", we could use $(H c) = (\%)$.

We now have a general framework for defining energy units at any scale in terms of our universal constants, (H), (c), (%), and (P).

We know also that (c) is derived from the "energy" geometry of a sphere:

$$\begin{aligned} * \quad (c \ t) &= (A_s \ A_o / P \ S_s) (\%^{16} P^8 / A_o^8) = 3 \times 10^8 \text{ m.} \\ * \quad (c \ t) &= (A_s \ P^7 \ \%^{16} / S_s \ A_o^7) = 3 \times 10^8 \text{ m} = 1 \text{ light-second.} \end{aligned}$$

We simply plug in the dimensionality and scale. We know that (c) comes from the attention. Attention can observe (perceive) objects only by absorption of "head on" photons that move at velocity (c). The attention functions like a "ray" or radius from a center point occupied by the observer. It can sweep a full 360 degrees in 3-Space, thus moving freely within a sphere. A sweeping ray forms a disc-like area. We also refer to the D-Shift Operator (%) as a "sweep" constant, because of the relation $(P \%^2 / A_o = 10)$, which happens to be one complete order of magnitude scale shift in a base ten system. (A_o) is the area of a circular disc of unit radius. The ray can be defocused to cover sectors of the sphere or the whole sphere at once. The object of observation is at the terminus of the ray, on the surface of the sphere. Thus we have an elegant relation involving a radial disc, a spherical volume, and a spherical area.

$$* \quad (ct)^2 = (A_s \ A_o / S_s \ P)^2 (P \ \%^2 / A_o)^{16}.$$

Meters and seconds are two arbitrary units. We want a general frame from which we can choose our units of space and time based on the selection of our viewpoint as observer.

For this we may turn to Planck Time. During his research on black body radiation, Max Planck discovered a fundamental relation of the constants to time at the Planck scale Big Bang instant. This relation gives us a universal ruler from which to derive all clocks. Compton clocks and Cooper clocks are all still based on elementary particles, which must ultimately be derived from the constants. Weak interaction half-life clocks are also based on particle interactions rather than pure constant interactions. But, again, it is up to us to choose where we wish to start from.

Planck noticed that if we start from the relationship $(h \ G)$ instead of $(H \ c)$, the masses cancel out and we just have a lot of velocity whipping around to the beats of interacting clocks.

$$* \quad (h \ G) / s^2 = 44.2 \times 10^{-45} \text{ m}^5 / s^5.$$

So he stuck in c^5 , a constant 5-D Velocity, to see what would happen. He ended up with Planck time.

$$* \quad (h \ G) / c^5 = 1.8225 \times 10^{-86} \text{ s}^2.$$

Taking the square root, he got the Planck second (T_p) . Since this is the square root of a

quadratic expression, we can get a second or an anti-second, (a +s) or (a -s). So we can count Planck Time forwards or backwards.

$$* \quad T_p = 1.35 \times 10^{-43} \text{ s.} \quad (\text{These are rounded figures}).$$

Looking at this expression we notice a few things. Planck used ($h = 2 P H$). The ($2 P$) suggests a circular loop, as in ($O_o = 2 P R_u$). So maybe the ($2 P$) really goes with (c^{-1}). We propose that these are loop "anti" velocities:

$$* \quad 2 P c^{-1} = [2 P (.333 \times 10^{-8}) \text{ s / m}]$$

We thus seem to have 5 loop "anti" velocities interacting. This reminds us of our model of a binary star system with two stars and three foci oscillating about in loops. When an observer observes something, he forms a binary system with the observable, occupying one of the foci/singularities. Using five such loops just slightly adjusts our value for Planck Time with a few extra π 's and 2's, but now it makes more sense as a physical expression. We'll call our adjusted Planck Time (P_s) for Planck second.

$$* \quad (H G) (2 P / c)^5 = P_s^2.$$

$$* \quad 4 P_s = 4 (1.33 \times 10^{-42}) \text{ s.}$$

We include a factor to take out the 4 = (A_s / A_o) to get a ratio of 4/3, which is the same ratio as a sphere. The ratio (A_s / A_o) is the relation between the area of a sphere and the area of a circular sweep. This is the relation we have seen between a spherical field and an equipotential orbital sweep. The object follows a conic section trajectory.

$$* \quad P_s = (H G) (2 P / c)^5 (A_o / A_s).$$

$$* \quad 1 \text{ s} = (3/4) \times 10^{42} P_s.$$

The ratio of the volume of a sphere to the area of an equatorial cross-section is

$$* \quad S_p = S_s / A_o = (4/3) \text{ m.}$$

I call this a Spaceant. This is another universal distance ratio that we can define in any units. Because we use meters for ($\%$) and (R_u), we use meters here for consistency. The (S_p) ratio is constant regardless of the value for (R_u) and thus functions like the ratio π , but we have seen that ($\%$) is a constant interval in space. The ratio of a Spaceant to a Planck Second is what I call the Planck Velocity.

$$* \quad P_v = S_p / P_s = 10^{42} \text{ m / s} = (P^{42} \%^{84} / A_o^{42}) \text{ m / s.}$$

$$* \quad P_v = (c) (S_s / A_s R_u) (\%^{68} P^{34} / A_o^{34}).$$

I write (P_v), not (V_p). The latter is always superluminal. But (P_v) is **extremely** superluminal and a constant as well!! It may be the fastest possible speed, traversing the entire universe in the blink of an eye. It is the speed of the cosmic clock of the whole universe, because 10^{-42} s is the Planck scale of the Big Bang. Just like a light second

is (3×10^8) meters, (1.054×10^{-34}) Joule-seconds is one (H), and 1 Joule-second = $(.9487666 \times 10^{34})$ H = $(3 \text{ m} / \%) \times 10^{34}$ H. A Pv-second is 10^{42} meters. The visible universe stretches out around 10^{26} meters. So a Pv-second may indeed traverse the entire universe in a second or less. Later on we will explore some of the consequences of such a superluminal velocity and whether or not it can be tested.

- * $1 \text{ c-s} = 3 \times 10^8 \text{ m.}$
- * $10^{-8} \text{ c-s} = 3 \text{ m.}$
- * $1 \text{ J-s} = (10^{-8} \text{ c-s} / \%) \times 10^{34} \text{ H.}$

The seconds cancel out.

- * $1 \text{ J} = (10^{-8} \text{ c} / \%) \times 10^{34} \text{ H.}$
- * $1 \text{ J} = 10^{26} \text{ H c} / \%.$

This is a more compact expression of the relations among (H), (c), and (%). Contemplate it. This is the fundamental quantum unit of energy!! Of course we can arbitrarily shift the scale we work from by $(\text{P} \%^2 / \text{Ao})^n$. Maybe we should use the "Natural Joule" for calculating energy: $(\text{J} = \text{H c} / \%)$. That is a fine jewel.

Incidentally, with our D-shift operator in hand, we can define several other cosmic clocks: Here are their frequencies relative to standard seconds.

- * The Photon/D-Shift = $(\text{c} / \%) = 9.4876 \times 10^7 \text{ Hz} = 94.876 \text{ MHz.}$
(The inverse of 1.054, the ratio of Planck' s constant.)
- * The Charge-to-Space frequency = $(\text{e} / \text{eo} \%^3) = 5.71 \times 10^{-10} \text{ Hz.}$ (ELF)
- * The Gravity-Space Second = $(\text{G eo})^{-1/2} = 2.43 \times 10^{-11} \text{ Hz.}$
(ELF; the frequency of a graviton?)

High precision work in physics generally uses a photon clock or its relative, the atomic clock (an oscillating atomic structure.) The other two clocks (gravity and charge) have frequencies so far into ELF range that they are not very practical for us. We haven' t even been able to detect gravity waves for sure yet. The Gravity clock is very suggestive, because it shows the interaction of the gravity quantant with the permittivity of photons in the vacuum. This reminds us of the interaction of (H) and (G) that Planck explored. This clock seems to operate by the beats of an interference pattern generated between gravity and electromagnetic exchanges.

Of course, using the ratios of these clocks to the Planck second and the relation between (eo) and (c), we can derive (c), (e), and G. We leave that as an exercise.

We can also express (c) directly in terms of (Pv), which is how we got it anyway. (Pv) is not dependent on units. The 10^{42} m is a universal. It is the scale of the universe demanded by geometry and our observations of the quanstants.

$$* \quad c = 3 \times 10^{-34} \text{ Pv.}$$

This is the Planck scale for velocity -- (c) compared to (Pv) is at the Planck scale!!
Velocity is fractal!!

Is there a slowest speed limit? A lower speed limit seems as absurd as an upper speed limit. But the quantization of energy by Planck's constant ensures that you can't have a "something" that moves at zero velocity. That "something" must have some energy or it's nothing, and that implies some tiny jiggling must be present for something to exist. The jiggling comes from the creation and annihilation processes with the vacuum state. So this is another limiting condition on the range of Heisenberg's uncertainty relation. Heisenberg gives us uncertainty, but that does not mean that you can plug in any absurd value and get it to work. The mass component is limited by the mass of the universe. The velocity component is limited by (Pv) and (c) and a minimal quantum jiggle. The position element is limited by the ranges of all the other limits and (H) which seems fixed, like an anchor. That is the space of uncertainty we can play in as long as we play by the rules of inertial mass and subluminal velocities in the world of "energy".

We can use the Velocity Equation to calculate the slowest speed limit. If (Pv) is called "Big Pv" (Pvb), then we can find "small Pv" (Pvs).

$$* \quad (Pvs)(Pvb) = c^2.$$

$$* \quad (Pvs) = 9 \times 10^{-26} \text{ m / s.}$$

That is pretty slow!! It would take around 9×10^{26} seconds or around 2.85×10^{19} years to move one meter. Pvs is the inverse of the size of the visible universe! The age of the universe probably hasn't yet gotten to 10^{18} seconds. So this cosmic turtle has barely started to crawl across his meter stick. All creations must stay between the two speed limits, (Pvb) and (Pvs), with (c) in the middle. We live most of the time at a comfortable pace of around (1 m / s), which means nothing but that we chose units convenient for the space/time scale we are used to. Space and time are undefined except in their relation to the constants, geometry, and the observer's viewpoint. Because velocity is the ratio of distance to elapsed time, the geodesic trajectories of particles warp as velocities increase, or as masses increase -- the two being equivalent in relativity and quantum mechanics. Time is a measure of energy, which is another way of measuring mass. So we also can express Heisenberg's relation in terms of (Energy)(Time) $\geq H$, as we mentioned above.

The observer can move about in the space/time world as he pleases or stay aloof and transcendental, which is where he or she is in reality anyway. All we have to work with is a set of relationships. In order to quantify the relationships with numerical values, we must make one selection as observer. We must choose one arbitrary unit as the basis for our relationships. It can be distance, time, energy, or perhaps something else. These are all reflections in different dimensions of the same thing. The constants give the crossover ratios for converting from one dimension to another. Our range of velocity

goes almost 77 orders of magnitude (using a base ten system of counting with the D-Shift Operator) when we look at it in terms of Planck time and the two speed limits.

The number 9 relating to the number 10 forms the dimensional crossover between orders of magnitude and physical dimensions. We have noticed the behavior of calculations done with multiples of 9.

We have already discussed how (eo) and (mo) arise in the theory of electromagnetism as constant factors related in the manner of the Velocity Equation to (c^2). How does this relate to the phenomenon of electrical charge?

The elementary unit of charge (e) is one of the major puzzles of physics. The value of the Coulomb quantum unit in which we measure charge can be derived from our other units. Charge is a ratio of mass to time and is measured in Coulombs. Current is a flow of charge per second, measured as Amperes, or Coulombs / second.

The elementary charge unit was first measured experimentally in the oil-drop experiment of Robert Millikan and found to be:

$$* \quad e = 1.602 \times 10^{-19} \text{ C.}$$

Comparing the Charge-to-Space frequency to the Planck second, we get:

$$* \quad (e \text{ Ps} / e_0 \%^3) = 7.6 \times 10^{-52}.$$

This is a universal numerical constant independent of units, similar to the ratio of the electric force (Fe) to the gravitational force (Fg). It does not matter what units we use for the quantities, meters or feet or cubits so long as (%) is equivalent to 3.1622 m..

The experimental value of the unit charge comes very close to: (e) = 16×10^{-20} C, which suggests that charge is related to geometry via the squared ratio of the area of a sphere to the area of a circle with another small factor involved and a scale factor:

$$* \quad (A_s / A_o)^2 = 4^2 = 16.$$

The scale just tells us that the charge quantum operates at the scale level of subatomic particles. The appearance of 4 squared is no surprise, since electrostatic charge distributes evenly over the surface of an object, and a sphere is the smallest area-per-volume we can get. To get the charge to flow -- that is, discharge -- which is how we know there WAS a certain charge on an object, we have to bring in a second object that lacks charge or has an opposite charge. This generates a flow, which we can measure. We have two spherical areas interacting. This gives us 4^2 as a key factor.

From our analysis of mass, we see that the "pseudo-mass" generated by electrostatic force is also unmanifest unless it interacts. You can not tell the mass of a planet without it interacting with some other body. The mutually non-interacting quality of photons also

indicates their inherent "masslessness". The mass and the "pseudomass" exist only as potentials. The potential is determined by the resistance of the observer (directly) or the system (indirectly). It is the same as the coefficient of friction for a wood block resting on a horizontal table. If the block sits still, the coefficient may exist in theory, but there is no friction. It is just fictional friction.

This is one value of meditation. You can temporarily transcend life's frictions by sitting quietly in a quiet place. Friction in the case of a motionless object resting on a surface is a potential in the same manner that a ball held in the air has a gravitational potential relative to the earth. Both are imaginary potentials that can only be verified by dropping the ball or by moving the block. Friction on a block acts like antigravity. For the ball we have the drag of the air literally acting as antigravity. If the drag is greater than the gravitational pull, the ball floats in equilibrium or may even rise upward like a helium balloon.

We may believe very strongly in friction and other forms of resistance. But ironically the cause of the friction or other resistance is the very strength of our belief in it.

Natural laws are beliefs that are held so firmly that they govern the world.

Harry Palmer once posed a wonderful question for people to contemplate: "Can God create a stone so heavy that he can't lift it, so real that he can't make it disappear?" What do you think? What is your experience?

Charge is only verified by an interaction that causes an interactive current of exchange. In gravitational and electrical force relations the interaction takes place in a conjugate vector pair that runs between two singularities. But that 1-D conjugate interaction magically generates a 3-D sphere of influence with spherical (non-Euclidean, general relativistic) 2-D area equipotentials that radiate out from a theoretical or real "center" point of common singularity between the two objects. Do you begin to see the relation here to the binary star systems we spoke of earlier?

When we look closely at our model of how quantum charge originates in a particle, we run into trouble with the mysterious neutrinos. Everybody has trouble here, and this is partly because neutrinos are so small and fast and non-interactive with the rest of the world. They are hard to study in detail. (The difficulty may be due to going about it in the wrong way. It usually is.) The problem with neutrinos is that they interact as fermions, which suggests that they have a tiny amount of mass or at least a lot of linear momentum. They have half-integer spin, but no charge, and are considered close to massless elementaries, "point" particles.

There are some contradictions in this catalog of properties. Any particle with half-integer spin should have charge, even if it seems to behave as a neutral particle. The neutron is electrically neutral, but it does have an intrinsic magnetic moment of $1.91 (e / Mn)(S \rightarrow)$, so we know it is a composite particle in which the charges balance. And, sure enough, it decays into a proton (+ charge), an electron (- charge), and an

antineutrino (0 charge). The same is true of the heavier particles. But electron neutrinos don't seem to decay. Maybe they DO DECAY, but we do not detect their decay. If they do decay into charged particles, we should be able to detect their charged components with the usual tools of magnetic fields and bubble chambers, etc. So we must ask why we don't see such things? Either something is wrong with our theory of charge, or something is wrong with our concept of the neutrino. We must dig deeper.

This brings us to one of the major fundamental assumptions of physics. It is referred to as the principle of invariance, also known as conservation, or symmetry. The notion is that the universe fits together in an orderly way by various symmetries. What we often see is apparent "spontaneously" broken symmetry due to selecting a "weird" viewpoint of observation. Invariance means that under transformations of different kinds, the structure (and its mathematical description) remains constant. It means that regardless of your viewpoint as observer, the laws of physics work the same for everyone everywhere. Conservation and symmetry are two ways that we can recognize this principle at work. The physical constants are signs of invariance in nature. In Observer Physics we postulate the fundamental principles of invariance from which all other invariances, symmetries, and conservancies derive..

*** CONSERVATION OF UNDEFINED AWARENESS: BY DEFINITION UNDEFINED AWARENESS REMAINS IDENTICAL UNDER ANY POSSIBLE TRANSFORMATIONS. (The identity transformation.)**

*** CONSERVATION OF VIEWPOINT: A VIEWPOINT IS MAINTAINED UNTIL IT SHIFTS OR IS SHIFTED. WHEN A VIEWPOINT SHIFTS, THE ENTIRE VIEWPOINT OR SUBVIEWPOINTS OF THE VIEWPOINT MAY BE ABANDONED (NOT EXPERIENCED.) ALL ABANDONED VIEWPOINTS AND SUBVIEWPOINTS CONTINUE TO EXIST IN THEIR PREVIOUS VIEWPOINT FRAME(S) UNTIL SUCH TIME THAT THEY ARE FULLY EXPERIENCED IN THEIR ORIGINAL VIEWPOINT FRAMES AND THEREBY DISCREATED BACK INTO UNDEFINED AWARENESS.**

Viewpoints may be created and/or dissolved. They are created by belief, and dissolved by experience. We can shift them deliberately or non-deliberately (by default). A deliberate viewpoint shift is the creation of a new viewpoint. A non-deliberate viewpoint shift is caused by default interactions with abandoned unexperienced viewpoints. Creation of a viewpoint localizes energy in a defined space. Dissolution of a viewpoint delocalizes the energy, releasing it back into undefined awareness or making it available for further creation. Unlimited energy is available in principle, but because we operate through localized defined Selves, the available energy becomes limited by the imposed boundary conditions.

The conservancies of physics derive from these conservancies of awareness. Here are some of the major conservation laws.

* The symmetry of translation in space leads through quantum mechanics to

conservation of momentum.

- * Rotational invariance is reflected as conservation of angular momentum.
- * The sums of all the energies involved in a process remain constant. The conservation of energy corresponds in quantum mechanics to the symmetry that laws can be translated in time. (T)
- * Mirror image structures and processes form conjugate pairs, seen in particle-antiparticle pairs. (P)
- * Charge conjugation (C) in electromagnetic theory is known as "gauge invariance."

These symmetries express very general viewpoints.

Gauge invariance means that if we shift the quantum mechanical phase of a wave function (Φ_0) by some arbitrary constant (e^{iD}), where (D) is the arbitrary constant, and (e) is the natural log base, and (i) is the imaginary number $(-1)^{1/2}$, the laws are unchanged. In quantum mechanics the wave function represents a pattern of amplitudes of some process. To find the probability of an event occurring in this process we take the absolute square of the amplitude.

- * $\Phi_1 = \Phi_0 (e^{iD})$
- * $|\Phi_1|^2 = |\Phi_0|^2$.

The constant (e^{iD}), when varied, oscillates like a sine wave. Absolute squaring of the constant corresponds to unity, which magically leaves us with the original wave function squared!

- * $e^{iD} = \cos D + i \sin D$.
- * $|e^{iD}|^2 = \cos^2 D + \sin^2 D = 1$.

Thus, if a wave function's phase is shifted by an arbitrary constant, its absolute square equals the absolute square of the original wave function. This corresponds to the conservation of charge quantum numbers in a system. Although the phase of the wave function varies in time and space, the electromagnetic potential changes with it in a corresponding way so that there is no net observable change in the total charge.

Although some violations of C and P invariance show up in the weak interactions, they indicate a deeper combined invariance called CP invariance. The odd case of Kaon CP-violation is handled by assertion of a deeper level of CPT invariance. The Kaon decays have time delays that just balance out the CP violation.

But the neutrinos remain a puzzle in current physics. They seem to have neutral charge, spin 1/2, but only move with their spin oriented opposite (left-handed) to the momentum of the particle they decay from. Antineutrinos only show preference for "right-handedness". Also, the neutrino flux from the sun seems way below what it should be from our model of the sun. Finally we don't know what their "rest" masses are.

If a neutrally charged neutron is made from a positive proton, and negative electron and

an antineutrino, then, according to the law of conservation of charge, the neutrino must lack charge, or the neutron would end up with a charge.

As we mentioned, the constant velocity (c) ensures that we get quantum units of charge and magnetic moment (spin) in fundamental fermion particles. If the neutrino has half-integer spin, it would seem to require a mass AND a charge, although the mass could be very, very small -- so small that it could almost be treated as massless, just a very strong linear momentum. Why is there no charge?

There are two reasonable explanations. One is that there is a **threshold** for charge. The other is that the neutrino is also a composite like the neutron, but the component particles are too small for the magnetic moment to be measured. Our answer will incorporate aspects of both views and go beyond into new territory.

Let's consider whether there is a threshold for quantum charge to manifest. The "rest" energy of the neutrino is so low that its charge "winks out". How might that work? We observe that the electron seems to be the smallest unit of mass that will support a charge. This suggests a threshold for onset of charge somewhere just below the mass of the electron. We may also consider the possibility of a range of very light neutrinos that are chargeless and have very small masses. We already know of three types of neutrino, the electron-, muon-, and tauon-neutrinos. Presumably the threshold would be above the mass for the tauon neutrino and below that of the electron. Otherwise we need a mechanism to explain how a tauon neutrino can get to be fatter than an electron and still have a neutral charge, since that seems to be the case. Here is a rough picture of the lepton masses. Our information about the neutrinos is pretty sketchy because they are so small and they do not interact very much. Mostly they are used as an accounting procedure so that conservation of mass-energy can be maintained. Without them that theory gets into serious difficulties.

- * $M_{ne} < 15 \text{ eV} / c^2.$
- * $M_{nm} < 0.17 \text{ MeV} / c^2.$
- * $M_{nt} < 24 \text{ MeV} / c^2.$

- * $M_e = 0.511 \text{ MeV} / c^2.$
- * $M_m = 105.6 \text{ MeV} / c^2.$
- * $M_t = 1777 \text{ MeV} / c^2.$

We suppose that, if the electron is the mass threshold for a particle to carry charge, then we can begin probing for such a threshold with the Bohr magneton (mB).

- * $mB = e h / 2 M_e = 9.274 \times 10^{-24} \text{ J} / \text{T}.$

This value expresses the quantum threshold (in Joules per Tesla) of the magnetic moment for electrons in orbits. The magnetic moment derives from the angular momentum of the electron's motion. In the same way that Planck and company looked at $(h c)$ and $(h G)$ let's consider the interaction of the unit of charge with Planck's constant -- $(h e)$. If

we take out the velocities by dividing by (c^2), this expression looks very much like the interaction of two of our proposed quant particles: the proton and the neutrino.

$$* \quad (e / c) (H / c) = e H / c^2 = 1.876 \times 10^{-70} \text{ kg}^2.$$

The square root of that comes out to $1.369 \times 10^{-35} \text{ kg}$.

If we use the electron instead of the proton, we get:

$$* \quad m_e (H / c) = 10.12345679 \times 10^{-74} \text{ kg}^2.$$

We take the square root and get: $3.18 \times 10^{-37} \text{ kg}$.

This naturally falls right in the middle between the neutrino mass and the electron mass. The electron has charge and the photon does not, nor does the neutrino. Here we have replaced a photon with a neutrino in an interaction. We divide by the fine structure constant squared, which is the probability of the photon-electron vertex interaction, and add another electron mass for the other vertex. That brings the "average" mass pretty close to the electron threshold:

$$* \quad (m_e^2 m_\nu)^{1/3} / \alpha^2 = 8.446 \times 10^{-31} \text{ kg}.$$

This gives us a threshold for vertex interactions of electron pairs and neutrinos considering both charge and electrical influences. We get an "average" mass that is right about at the electron. We have imagined an electron emitting or absorbing a neutrino instead of a photon, an event that does **NOT** occur. Why not? Why don't electrons decay into neutrinos? This never happens, thereby locking in conservation of quantum charge. There can be lepton mixing, but not so as to violate conservation of charge. This is an important observation.

$$* \quad m_e \rightarrow m_\nu + g_{\sim} \quad (g_{\sim} = \text{Photon}).$$

Electrons are very stable and do **not** decay into neutrinos. What we wrote above was not an interaction but a limit to an interaction.

$$* \quad m_{e^-} + m_{e^+} \rightarrow g_{\sim} + g_{\sim-}.$$

Electrons DO annihilate with positrons. This approaches as a limit

$$* \quad m_{e^-} + m_{e^+} \rightarrow m_{\nu} + m_{\nu-}.$$

In our notation we mark antiparticles with ($-$) if they have neutral charge. If they have positive charge, we assume they are antiparticles. If extra energy is added, the outcome can be boosted to muon neutrinos, or even a pair of muons or taus. But the electron and positron charges balance, so we do not see any charge reflected in the neutrinos, and that is no problem.

The standard QED Feynman diagram has two electron trajectories converging at a photon trajectory to form a Y-vertex. The electron is a one-way trap. A single electron can move up to become a muon or tauon, but it will not decay back down into a neutrino. Electrons decay only by particle annihilation directly back into photons. This is very useful for locking in the stable electromagnetic theater of the electron and proton. The proton is another stable window that goes up, but not back down -- except by antiparticle annihilation. These two resonating harmonics, electron and proton, are very stable self-reinforcing loops of energy.

This is a rough first draft at solving the mystery of the neutrino' s lack of charge, like a Newtonian calculation for a black hole, but it gives the general approach, which we can then refine. The charge threshold operates like an all-or-nothing response. For an analogy, consider your nerves. The electrical signals that travel along them are delivered by chemical changes that are all-or-nothing. The signal either goes or does not go. It is a discontinuous quantum system. But the stimuli to the nerve may have any value. Therefore, the stimuli must build to a certain threshold, and then the nerve fires off its signal. In the same way there must be a certain amount of mass-energy for a neutrino to behave like an electron and combine with fat protons rather than running with its skinny neutrino brethren. This is a key crossover point in the fermionic bootstrap ladder.

There remains our other approach to the problem. Perhaps the neutrinos are actually composites like neutrons. Then we have to explain why they behave like point particles and do not have measurable magnetic moment. But these may not be insurmountable issues. It does suit the observation that tauon neutrinos seem to be more massive than electrons, a situation that goes against the threshold theory.

Now let' s explore a tentative theory of leptons assuming a theory of charged protoneutrinos, keeping also our threshold concept. I call it tentative, because we could use a lot more solid information about neutrinos. Our theory will look a little bit like quark theory, and it will run right on from the leptons into the baryons without stopping for tea. We call it the fermionic bootstrap ladder. The energy resonances and exchanges have to be worked out in detail and experimental data (such as neutrino masses) are missing or imprecise, but here is the basic scheme.

Suppose that there are two tiny first generation neutrinos that actually **have** charge. We' ll call them Adam+ and Eve-. The photon is spinning at (c), so the primordial neutrino must have a quantum unit of charge. One has a positive charge, and the other is negative. The charge is the usual quantum unit value, which we have seen is fixed by the photon speed. Because the mass is so small, the electric charge overwhelmingly dominates and holds them very tightly together most of the time. Thus protoneutrinos mate up tightly in pairs of equal size as their primary choice, and the universe is filled with neutral neutrino Adam-&-Eve pairs zipping around. They have hardly any mass, and neutral charge -- like mini "stable" positronium atoms.

These are what we call ordinary electron neutrinos. However, we recall that our model

for all fermions is a pair of (Bu) bosons resonating together. This Adam-&-Eve neutrino complex occupies the lowest mass-energy window. Adam and Eve may turn out to be the (Bu) bosons, which we originally gave identical charges. With the appearance of the third particle in the lens (the neutrino sQuark), the charge distribution becomes ambiguous. It's now a 3-body system. But at this lowest resultant mass-energy level, the resultant particle is too weak to hold a unit of charge like the heavier particles may do. Remember that the third charge is caused by the energy trapped in the lens looping out as radiation and then being sucked back in again. The radiation loop for the basic neutrino is equal to a neutrino mass -- too small to generate a charge. It is below our threshold. This means that its energy is low, which means its wavelength is long, which means this looping photon energy doesn't realize that it is looping in a circle and thinks that it is still out cruising in space. In fact it probably IS out cruising in space. A neutrino is quite spread out and fuzzy due to Heisenberg uncertainty.

The mass relationship between the electron neutrino, the electron, and the proton is as follows:

$$* \quad M_e M_p / M_{ne} = (e_0 a^2 \% P A_0) = 1.4 \times 10^{-14} \text{ kg.}$$

The electron to electron neutrino mass ratio is

$$* \quad M_e / M_{ne} = (e_0 a^2 \% P A_0 / M_p) = 8.2 \times 10^{12}.$$

Electron neutrinos and photons are barely distinguishable. We can think of the neutrinos as "clumpy" photons. They are fuzzy and spread out. They can oscillate in their mass-energy value and interfere with each other. The mass-energy boundary is not so well defined. There is a large energy gap between a low energy electron neutrino and an electron. But the neutrino can move at nearly light speed and thus carry a lot of relativistic linear momentum. It is a slippery customer and can get highly souped up, a condition that makes it much more massive.

When it gets souped up, it rapidly increments by multiples of quantum neutrino masses. At some point of incrementing neutrino masses, the resultant mass becomes a muon neutrino. This is a stable window, and much more clearly defined as a particle. A growing neutrino can rest there. As we get a better experimental value for muon neutrino mass, we'll know better why that is a good window. We can think of a muon neutrino as a leptonic quark. When the muon neutrino reaches a triple muon neutrino level, it passes the charge threshold, and begins to reflect the extra charge generated in its lens, and turns into an electron. At the electron window it is stable again, but has a net negative charge (unless it is a positron and has a net positive charge.) The electron made of "three protomuon neutrinos" (a Bu pair plus an electron sQuark) is an analogy for a proton with three quarks and is very stable and carries a net negative charge. Viewed as separate particles, the protomuon neutrinos are additive and have masses that are averaged.

$$* \quad 3 (0.17 \text{ MeV} / c^2) = 5.1 \text{ MeV} / c^2.$$

$$* \quad \text{MnmA}^- + \text{MnmE}^+ + \text{MnmA}^- \rightarrow 1 \text{ Me}^-.$$

Each protomuon neutrino has a rest mass of about 3×10^{-31} kg.

$$* \quad \text{Mnm} = (\text{Bu}^2) (\text{G eo } \% a / c e) (\text{Ss} / \text{As Ru}) = (\text{Me} / 3).$$

Generally a mutrino (muon neutrino) is made from an increment of eutrinos (electron neutrinos) with equal positive and negative charges. Unlike quarks, mutrinos are not always bound. They are much lighter than quarks. But, at the triple mutrino mass threshold, the odd third mutrino breaks the balance of charge. A single mutrino is balanced as a charged protomutrino pair, and a double mutrino is balanced as a protomutrino quartet. But, when there are three mutrinos, they behave as three separate charged particles. Thus the charge becomes unbalanced. Why do they do this? I believe it has to do with the vortex dynamics of an electron. The electron behaves as a "point" particle because it forms a whirling vortex that is tightly contracted. This is quite a contrast from the eutrino that is spread out over a fuzzy region that can be at least several meters long. At the level of electron mass, the energy begins to really focus like a small top spinning around a point. This is the beginning of true "particles". The eutrinos are not yet full-fledged particles.

An electron has a choice. It can grab a "positive" neutrino and neutralize itself as a neutrino cluster, or it can behave like an electron and start interacting with protons and other heavier charged particles, or it can annihilate with an anti-electron (positron). An electron glomming with a positive anti-Eve mutrino becomes a mutrino, which is also stable and has a neutral charge and a slightly smaller mass than an electron. However, charged mutrinos do not exist as free particles just as quarks do not exist as free particles. They only occur under certain conditions of lepton mixing. Even then the charge conjugation makes "charged mutrinos" virtually undetectable. So the electron usually runs about in space or gets grabbed by protons, which are also positive and have heavier mass.

We have the funny situation that inside the protons are quarks that are permanently confined because of the low average environmental energy levels, and inside the neutrinos there may be charges that are permanently confined because of the low average mass density of the neutrinos. This leads us to five tentative ideas:

- 1) The leptons are free "quarks".
- 2) The charged leptons are massive enough that their component momenta can overcome the binding effects of charge, thereby allowing them to move "independently".
- 3) The charges of the neutrinos are "externalized".
- 4) The tauon neutrino is like a very light neutron. It is relatively stable, but can decay into electron-positron pairs and lighter neutrinos. (No one has actually seen a tauon neutrino. It is only an inference based on conservation of energy and angular momentum.
- 5) The tauon is really a hadron in disguise, the only restriction being conservation of lepton number during decay.

We will explore and refine these ideas more in succeeding chapters.

The electron may get hopped up with enough energy to become a negative muon. A muon glomming with a positive neutrino might form a 4-teutrino (tauon neutrino) cluster. But usually teutrinos grow from the higher resonances of neutrinos. The teutrino is over the charge threshold and yet has no charge. It is actually a very light prequark. It is a fairly stable window just over the charge threshold. But it is like a liquid taken above its transition point. If disturbed, it will transition. The tauon is actually an electron pumped up to an unstable resonance just below the deuteron mass. Both the muon and tauon are unstable, probably because of imbalance between the charge and the mass. The tauon is a hadron in disguise.

A tauon has lots of choices. It can either decay into a proton and other detritus, or boost into a proton-neutron pair, also releasing a bit of energy as it settles into that energy "orbit", or it can fall into pieces as electrons, muons, neutrinos. The proton-neutron deuteron pair is only marginally stable and so occurs in small ratios versus hydrogen and helium, because of the spin of the electron, as we mentioned earlier. The proton is fine spinwise with a neutron, but helium is a more comfortable condition for the active orbit electrons. Otherwise the neutron drops out and decays into a proton, and the two protons go separate ways. We have already discussed the motivation for this neutron decay. It leaves the proton with a positive charge and a stable mass-energy. The macro ensemble of proton, neutron, and electron are nicely suited to build more complex atomic and molecular structures, while the proton-neutron structure can keep incrementing its nucleonic structure to make heavier and heavier atoms. The neutrinos seem relatively uninvolved, but actually the fact that they spit out from scattered particles indicates that they indeed play a fundamental role in the construction of matter.

Our sketchy neutrino "model" allows for the 1/2 spin of the neutrino and its neutral charge whenever it is observed directly or indirectly. It also provides a mechanism for integrating not only the leptonic family, but also integrates that family with the hadronic family, showing that they all arise from harmonic vibrations of our single (Bu) pair interacting at the crossover point between electromagnetism and gravity. A test of this theory might be to somehow split an electron neutrino. Ha ha! That would be like separating the (Bu) pair. The components would instantly evaporate back into the vacuum with a release of energy. Maybe there are other tests that can be done.

In any case, our model for the generation of the leptons and lepto-quark unification suggests that just as charge and spin and energy behave quantum mechanically, mass also is completely quantum mechanical. This should not be a surprise. If energy is quantum mechanical, governed by (H), then via Einstein's mass energy relation, we expect mass to be quantum mechanical.

$$* \quad 1 \text{ J} = (10^{26}) (H \text{ c} / \%) = (P \%^2 / A_0)^{26} (H \text{ c} / \%) = 1 \text{ kg m}^2 / \text{s}^2.$$

$$* \quad E_q = (K_s) (H \text{ c} / \%).$$

(Ks) is a dimensionless constant that functions like (G) in gravitational systems to fit the experimental value of the electron neutrino scale and ratio to our arbitrarily chosen units of energy. (Eq) is the fundamental quantum of mass-energy.

- * $E = M_{ne} c^2$. (The Einstein Mass-Energy relation for proto neutrinos.)
- * $M_{ne} = (Ks) (H / c \%)$.

(Ks) is just like $(h / 2 P)$ used as a unit of spin. Forget the specific value and just add up the spins. The same is true of mass. Thus quantized, every mass is some multiple of the fundamental neutrino mass quantum unit: $(Ks H / c \%)$.

- * **$Eq = (Ks) (H / c \%) (c^2) = (Ks) (H c / \%)$.**

This is an important missing link in quantum mechanics: the mass quantum unit that corresponds to the energy quantum unit.

The (%) represents the fundamental wavelength of the electron proton neutrino, or eutrino.

- * $E = H c / L = H c / \%$.

We set (L) at a wavelength of $\% = 3.16227766$ meters and we get an energy of 10^{-26} J. It is hardly a very solid particle. It has a frequency of 94 MHz, which is in the microwave VHF range. This suggests that we can make eutrinos easily using microwaves and ordinary light. X-rays can make very excited electron neutrinos. As the neutrino becomes more and more energetic, its wavelength shrinks. By the time we get to a muon neutrino, the energy is 2.733×10^{-14} J, and the wavelength becomes 1.15×10^{-12} m. The frequency is right at the boundary between gamma rays and cosmic rays. Muons are like low-end cosmic rays. Electrons are in the same region, just slightly more energetic. By the time we get to protons, we are in the middle range of cosmic ray frequencies.

These energy ranges are within the capability of modern technology to use energy resources to suck particle pairs out of the vacuum. Even proton pairs can be generated in this way. The electron's wavelength comes to 3.8×10^{-13} meters. This is (8.2×10^{12}) times smaller than the electron neutrino wavelength. This gives an idea how much more focused the electron has become compared to neutrinos. Divide 3.16227766 meters into 8.2×10^{12} tiny steps. One of those steps is the electron's footprint compared to the neutrino. (Of course the electron's footprint can spread by Heisenberg uncertainty, but we are just making a scale comparison.)

With regard to the puzzlingly low flux of solar neutrinos reaching earth compared to the predicted amount, we propose that there is a tendency for neutrinos to "decay" from high energy fast moving particles to slower moving ones which are not detected by the earth-bound neutrino detection experiments. This slowing of neutrinos suggests that their kinetic energy has been converted to mass. According to our model we would expect this to occur, for example, in an analogous way to stellar nucleosynthesis. If the high

temperature and density of a star can "cook" up higher increments of the proton in the form of heavier nucleons, the periodic table of elements, then we would expect it to do the same much more easily for neutrinos. Many of the neutrinos produced by stellar processes are "cooked" in the sun's core until they become stabilized as muon neutrinos or tau neutrinos, or even electrons and protons. These move at a much slower pace than electron neutrinos. Others have thought of this possibility (at least the heavy neutrino part), and experiments are under way to test this hypothesis more thoroughly. In the next chapter we will discuss emerging evidence for another process called neutrino oscillation. There may be a natural tendency for neutrinos to oscillate between the muon neutrino and the tau neutrino modes as they move through space. This would be caused by energy "beats", analogous to the way two sounds can interact to generate oscillating wah-wah beats.

We have dealt in a preliminary fashion with all the major puzzles of the neutrino except for the question of its weird "left-handedness". Nobody has come up with a reason for this. Current theories deal with it ad hoc without really explaining why it should happen. My suggestion is that it is caused by the Ur-observer's original choice of a viewpoint in the same way that the organisms that colonized our planet made the choice to generate an ecosystem based on right-handed organic molecules. You have to make a choice in order to launch the system, otherwise you do not know which food is edible without doing complicated molecular tests. Once it's done, the theoretical molecular symmetry breaks and you've got to stay with your choice unless you want to go back and start all over with a new ecosystem, which of course is always a theoretical option, but doesn't solve any problems.

When the first transcendental observer looked at a photon in such a way that she split it into two opposite eddies, she created left-handed neutrinos and right-handed consciousness. So that's the way it is in our current universe. Most of the particles in the universe are neutrinos. Theoretically in the Unified Field they are of both kinds. But the neutrinos that form our universe are all left-handed. Furthermore, they are the basic building blocks of all physical matter. Once the system was set, it copied itself into all the bricks that built the building, the same way that every living organism on the planet has a common chemical template of RNA-DNA marked by molecular "handedness" from which it builds its physical structure.

There is a story that when Penzias and Wilson were working on an antenna to monitor celestial radio signals, they thought bird droppings were causing static interference in their signals. They tried cleaning the antennas and adjusting them this way and that, but nothing got rid of the annoying and puzzling noise. Finally they realized that they were listening to the echo of the Big Bang when electrons suddenly dropped out of the cosmic soup into orbits around protons and released a vast cosmic flash of photons.

The same may be true for the puzzling over the neutrino helicity. When Goldhaber and others began finding that neutrinos always seemed to be left-handed, they thought it was an anomaly. How could a type of matter have a preferred direction? Such an idea violates our "instinctive" notions about balance and symmetry. Further work has shown

this pattern to be universal. The only exception is a relativistic effect with heavy neutrinos, where they can look right-handed due to relative motion.

This "handedness" may be the appearance of "protocharge". The neutrino is too small to carry a charge, but it does have a preferential twist that corresponds to a charge. Antineutrinos have the opposite twist, just like heavier antiparticles have an opposite charge to their particle twins.

When particles are created from photon energy in the vacuum state, there is conservation of parity and angular momentum. Photons do not care which direction they go, although they may be correlated due to initial conditions. The photons have linear momentum and no charge and a spin of $(1/2) + (1/2) = 1$. When a photon curls into a particle, its partner photon splits off. Half the team becomes a particle with inertial mass (a fermion), and half becomes a particle of consciousness with mental mass (a "memnon"). The one makes physical matter, and the other makes mental matter -- seeds of thoughts and ideas. This is how attention creates solid matter. This is also why the fermions -- the source of solid physical objects -- only have half-integer spins. The other half is spinning in consciousness. The appearance of a physical world is a kind of schizophrenia. We are looking through a vacuum state lens in which we imagine we are seeing things that are not really there. They are virtual phenomena. What we are seeing is just a reflection of our own resistance to our attention that has created a viewpoint that we decided to abandon. So we set it adrift upon the field of all possibilities. And in so doing we set ourselves adrift on the same ocean of consciousness. This is relativity again.

The position of the observer in the operation that generates the primordial Ur-particle is "non-local". There's no other choice since no "place" exists at that level. This generates a relative momentum between the observer and the vacuum state. Since the vacuum state is undefined and unobservable, we can not see the "right-handedness" of unbounded awareness quietly spinning in the vacuum. That is what we ARE as source. It's hard to see yourself. But you can see your reflection in the mirror. The only trace we have of this event is recorded in the neutrinos moving with left-handed helicity. They are mirror reflections of the "right-handed" attention particles spinning in consciousness!!

We mentioned earlier in our discussion that we could think of the neutrino field as a kind of Akashic record -- or Ritam tablet -- on which are recorded certain key events in the unfolding of the universe. The left-handed helicity of neutrinos is such a record that far predates the Big Flash recorded in the background radiation. This valuable piece of information about the history of our cosmos goes back to the moment of symmetry breaking that separated gravity from the electromagnetic field. It is a simple recording found everywhere for all time in the record of this universe cycle. It will be erased only when the universe dissolves back into the pure vacuum state of the Unified Field. The apparent loss of "handedness" in particles occurs as particles increase in mass and complexity in exactly the same way that time reversibility is lost as particle systems become statistically huge. The result for statistical systems is a washout of T invariance

and the onset of "entropy".

The mass-energy system works just the opposite. Greater mass-energy brings particle systems closer to an image of the unification from which they sprang and restores the lost symmetry. The tauon neutrino, or teutrino, shows helicity preference fading even though its charge is neutral. The electron with its charge has lost it quite thoroughly and so have the other more massive particles. Electromagnetic and gravitational tidal forces that are much larger wash out the neutrino helicity preference. Only the neutrinos are quiet enough, small enough, and uninvolved enough to retain a memory of it.

I propose that the left-handedness of neutrinos is a peek into the very beginnings of things -- the first observation, when God (whoever He or She is) sitting in the void of the vacuum state said, "Let there be Light," and then there was Light, and then He (She) looked at it and saw that it was good. But it wasn't good. Because He couldn't see anything. Everything was still blank. So He tried "turning around" in transcendental space to see what He had done that didn't work. He rotated his viewpoint so that He got a light field (c^2). He found that He could only "see" the light if He rotated 180 degrees. What He saw was Himself in the mirror, the first conjugate pair. Unfortunately, He didn't see anything because He had no body, no terminal to absorb the light with.

This was not real "seeing" yet, because He had no electrons to absorb the photons. There were still just virtual photons fluctuating in the vacuum state. So He had to shift viewpoint again and look at a photon in such a way that it seemed to curl up and chase its own tail. So He shifted 90 degrees and into transcendental space again. From transcendental space straight lines look like little circles and planes look like little bubbles, just like from a point in space transcendental space looks like a big bubble sphere. This is another conjugate pair. It is a fundamental principle of projective geometry.

But when He did this, He had to "peel off" the advanced photon of His attention from the photon pair. This meant one photon shifted into transcendental awareness, turning it into consciousness with little bits of attention spinning in it. The other photon seemed to continue whirling around endlessly in a circle like a tiny automaton. It was a tossup situation, but, yes Einstein, God flipped a virtual coin to break the symmetry into a "right-handed" consciousness with no boundaries and a "left-handed" creation spinning in boundaries. He did this trick again on another level when He created DNA-based organisms.

By this time He was getting really frustrated. He still didn't see anything. He tried to throw his arms up into the air, but this was hard to do because He had no arms and there was no air. But the virtual idea existed in the vacuum state as a possibility. And putting attention on the idea began to shift it from a mere possibility toward becoming a reality.

He did notice that now the vacuum was spitting out virtual neutrinos as well as virtual photons. The neutrinos were stable and could continue, while the photons were still just

virtual photons. The two did not interact, so not much was going on. And there was another funny thing. Just like his photons that came in pairs, the neutrinos came in pairs. The real pairs were virtual (Bu) particles. He actually let the vacuum spew out all possible pairs, but only the (Bu)'s had the right size so they could balance His desire (gravity) and his resistance (electricity). He did not notice it, but He also now had a preferred helicity in his consciousness. He did notice that the neutrino helicity tended to be oriented in the opposite direction of the particle's momentum. This was an echo of his advanced photons. Now He was observing something "externally" that had previously just been His own attention. As He got more and more interested in this virtual bubble, His attention focussed more and more until He pumped so much energy into it that the whole idea burst out of the vacuum as a reality that corresponded to the intensity of his attention energy. Most of it quickly dissolved back into the vacuum, except for a bunch of these (Bu) pairs with photons whipping around at just the right frequency so that everything balanced when they conjoined into a binary system. The resultant energy found its ground state as the neutrino (Bu) pair, the original Adam and Eve of matter. Only those that married survived. So some neutrinos survived the first great extinction. But those that survived were neutral and did not interact in any interesting way. They were identical also.

Now He also had two "eyes" combined into one consciousness and two bosons combined into one fermion. Why was it a fermion? Because there was also a heavy core particle in the middle that gave an extra spin and a resultant mass. Aha! The core particle could have almost any mass value, just like we have seen for the Heisenberg relation. By playing the whole range of quantum increments on his heavy electric guitar, he found that certain values were inherently more interesting because of their stability and mutual interactions. Two of these happened to be the electron and the proton. They were fat echoes of the original Adam and Eve (Bu) neutrino components. But they had very unequal masses differing by a ratio of about 1836/1. This allowed him to use the play and display of desire and resistance to create more and more complex electromagnetic configurations of resistance and build a whole universe. With the electron and proton he finally saw himself in his true Mutt and Jeff identity. It turned out he had a protofamily all linked together in pure space:

$$* \quad \mathbf{M_p M_e / M_{ne} = (e_0) (a^2 P \% A_0)}.$$

The neutrino and electron did not make sense by themselves. First there was big Mommy (Mp). Then there was little Daddy (Me) and then along came tiny baby (Mne). They lived and played together in a spherical quantum bubble called the Garden of Eon.

With His proto-family all working together, he finally had hydrogen, the clay of the physical world from which to build an image of himself with stars in his eyes.

So the Union **Ensemble** (Bu²) seems to form the whole First Family all at once, not as separate unrelated events. The Garden of Eon is a density. The Vacuum has a built-in

constant resistance to mass-energy. When the particle ensemble (M_p M_e / M_{ne}) appears in empty space, the space permits only a certain density ratio of mass-energy per volume of space. This ensures a fundamental relation between physical matter (the World) and geometry (the Mind). Any ensemble must obey this relationship. By the principle of mass conjugation, wherever the ensemble appears, the space it exists in also constitutes a diffuse particle we will call the (M_{eo}).

* $M_{eo} = (e_0) (a^2 P \% A_0) = 1.47 \times 10^{-14} \text{ kg.}$

* $M_p M_e = M_{ne} M_{eo}.$

What is this curious property of the vacuum, that it itself is a particle playing with the family of particles it has created?

A Note on the D-Shift Operator, $\%$.

The value of the D-Shift Operator as the square root of 10 meters may seem to be an arbitrary choice made with regard to the use of a base ten number system, but it is not. The square root of ten is the product of the square root of two and the square root of five.

* $(2)^{1/2} (5)^{1/2} = (10)^{1/2} = 3.1622\dots$

The square root of two is the length of the diagonal of a unit square. The square root of five (approx. 2.236...) is the length of the diagonal of a doubled unit square. It is also the fundamental component of phi, the Golden Ratio, the ultimate relationship by which Nature builds structures fractally. The product of the nth member of the Fibonacci series multiplied by the square root of five approaches as a limit the nth power of phi as (n) increases in value.

* $(21) (5)^{1/2} = 46.957\dots \text{ approx.} = (1.618)^8 = 46.97\dots$

This, of course, means that any member of the series divided by the previous member in the series also approximates the value of phi with increasing precision as one selects larger numbers in the series.

* $21/13 = 1.61538; 34 / 21 = 1.619\dots\dots$

If you use the Lucas series (2, 1, 3, 4, 7, 11, 18,) together with the Fibonacci series and the square root of five, you get the **exact** value of phi for each ratio of two adjacent numbers in the series.

Magical Numbers

Step	FibonacciSeries	Lucas Series	Power of phi
1	$(5^{.5}) = 2.236$	1	
2	$(00)*(5^{.5}) = 0$	2	$\phi^0 = 1$
3	$(01)*(5^{.5}) = 2.236$	1	$\phi^1 = 1.618$
4	$(01)*(5^{.5}) = 2.236$	3	$\phi^2 = 2.618$
5	$(02)*(5^{.5}) = 4.472$	4	$\phi^3 = 4.235$
6	$(03)*(5^{.5}) = 6.708$	7	$\phi^4 = 6.8537$
7	$(05)*(5^{.5}) = 11.18$	11	$\phi^5 = 11.089$
8	$(08)*(5^{.5}) = 17.888$	18	$\phi^6 = 17.942$
9	$(13)*(5^{.5}) = 29.069$	29	$\phi^7 = 29.03$
10	$(21)*(5^{.5}) = 46.957$	47	$\phi^8 = 46.97$
11	$(34)*(5^{.5}) = 76.026$	76	$\phi^9 = 75.99$
12	$(55)*(5^{.5}) = 122.98$	123	$\phi^{10} = 122.95$

$\phi^{(n+1)} / \phi^n = \phi$

$F_{(n+1)} / F_{(n)} \rightarrow \phi$. (F = some member of Fibonacci series.) As (n) gets larger, the ratio approaches phi. $L_{(n+1)} + F_{(n+1)} / L_{(n)} + F_{(n)} = \phi$. This ratio is always phi for all natural values of (n).

The following chart shows how to figure a Lucas number: Starting denominator = 2; Starting numerator = $(1 + (5^{.5}))$. (L) = Lucas number, (F) = Fibonacci number

	(L)	(F)	
2	2	= 2	= (2 + 0 (2.236))
3	$(1 + (5^{.5})) = 3.236..$	=	(1 + 1 (2.236)) (3.236 / 2) = 1.618
4	$2 + (1 + (5^{.5})) = 5.236$	=	(3 + 1 (2.236)) (5.236 / 3.236) = 1.618
5	$3.236 + 5.236 = 8.472$	=	(4 + 2 (2.236)) (8.472 / 5.236) = 1.618
6	$5.236 + 8.472 = 13.708$	=	(7 + 3 (2.236)) (13.708 / 8.472) = 1.618
7	$8.472 + 13.708 = 22.18$	=	(11 + 5 (2.236)) (22.18 / 13.708) = 1.618
8	$13.708 + 22.18 = 35.89$	=	(18 + 8 (2.236)) (35.89 / 22.18) = 1.618
9	$22.18 + 35.89 = 58.07$	=	(29 + 13 (2.236)) (58.07 / 35.89) = 1.618
10	$35.89 + 58.07 = 93.96$	=	(47 + 21 (2.236)) (93.96 / 58.07) = 1.618
11	$58.07 + 93.96 = 152.03$	=	(76 + 34 (2.236)) (152.03 / 93.96) = 1.618
12	$93.96 + 152.03 = 245.99$	=	(123 + 55 (2.236)) (245.99 / 152.03) = 1.618

In the above tables we can substitute for the constant diagonal of the doubled 1-meter Unit Square (square root of five meters) the ratio of the D-Shift Operator ($\% = 3.1622$ meters) to the diagonal of a 1-meter Unit Square. We derived the "Root Unit" or "Unit Radius", Ru = 1 meter Unit Value directly from the fundamental quantum relationship of the proton to its charge and light speed.

* $Ru = Mp c / P e$.

In other words the ratio of the light-speed momentum of the proton to pi times the quantum unit of charge is one meter.

The Dervish Viewpoint

It is too bad that Einstein apparently never experienced the dance of the Sufi dervishes. Such an event might have had a significant effect on the evolution of the Theory of Relativity. The dervish orders among the Sufis practice a form of trance dance in which they whirl around and around. This exercise rapidly produces a remarkable shift in viewpoint.

Usually when a person moves about in the world, he experiences that he is a miniscule organism making negligible progress travelling in a huge motionless universe. The nearby scenery passes by at a speed equal and opposite to the speed at which such a traveler moves. The traveler has the illusion of going some small distance within a huge motionless world. Scenery at ever greater distance from the mover appears to shift ever more slowly. Very distant points appear not to shift at all. The traveler has almost no control over his world.

When a Sufi dervish whirls, the result is quite different. His viewpoint remains motionless at a central pivot point, and the entire universe appears to whirl about him. This effect is due to the relativity of motion. Scenery very close to him moves slowly, and scenery more distant from his viewpoint appears to move more rapidly. But this may just be an illusion fostered by the assumptions of the "traveler" about space and time. The dervish has almost total "control" of his world within the boundaries of his exercise.

Einstein declared that motion is relative. If two objects are moving without acceleration relative to each other, there is no way to tell which one is "actually" moving without reference to some other frame. Imagining the dervish for the moment detached from his body and in an ideal world, then he has only two reference points -- the nonmoving central axis of his viewpoint as a dervish, and some point in the whirling scenery. He is motionless, and everything else moves. If nothing else in the environment moves, the whole environment can be taken as a single unit, somewhat like Newton's bucket. Any point outside his center point is equivalent.

Einstein also declared that the speed of light is fixed at (c) and no material object can exceed that speed. This means that as material objects move at relativistic speeds, the space/time around them begins to distort. The closer the speed approaches (c) , the more "distorted" the space/time appears to become. This distortion is along the path of the trajectory.

The dervish encounters an odd situation with regard to Einstein's theory. Initially he may assume that the universe is very large. However, as he spins, he notices that, if this is true, objects farther away must seem to spin faster to keep up their position relative to other objects. The instantaneous trajectory of every apparently moving object in the universe is always normal to his polar axis, so there is no distortion of space/time. Also, the objects seem to experience an angular acceleration as they move about him in circular orbits. Yet he can control this acceleration from his central viewpoint almost without effort. (The only exception to this is objects directly above and below his polar axis of

rotation. They do not move and remain fixed relative to him.) If the universe indeed has the vast size people imagine it to have, then, according to relativity, objects very far away from the dervish's center of viewing must be moving at speeds much faster than light. For example, if he is whirling at a rate of one cycle per second, then objects at a distance of about 4.77×10^7 meters from him (less than the distance to the moon) when directly sighted outward normal to his axis are moving at light speed. Anything farther away (including the moon, the sun, and every planet except earth -- not to speak of all the stars and galaxies) is apparently moving faster than light.

Since there is no relativistic distortion going on, something else in the system has to give. If we do not wish to give up the Theory of Relativity, then we must maintain that all the massive material of the universe that our dervish is easily whirling about under his will power has shifted from "hard matter" into massless phase waves. Since the universe has become massless (or more likely is **inherently massless**), it is an easy matter for a dervish to rotate it and otherwise manipulate it with just a tiny effort of the will. The effort that a traveler experiences when pushing against rocks and other "objects" along his trajectory must derive from a viewpoint in which he strongly resists the objects as he interacts with them.

Practice of the dervish whirling enables a dancer to shift his habit of awareness from viewing the universe in a group wave perspective to viewing it in a phase wave perspective. Amazingly a dervish takes the very same celestial and earthly objects that people assume to have great mass (without much evidence for this other than their own beliefs) and effortlessly transforms them into phase wave patterns that have no mass. He then practices manipulating them in a simple way at speeds far faster than light. It is just a few simple steps farther to imagine how one might gain the ability to shift oneself or objects in space and time in much more complex ways. We leave as an exercise experiments with dervish dancing and other methods for transforming "solid" objects into phase waves and manipulating them. (The dervish dance is a very basic introduction to a sophisticated field, and mainly just demonstrates in a simple way the inherent feasibility of telekinesis. Its main practical value is that it facilitates rapid shifting of viewpoint to see the potential of such technologies as something more than "mere" imagination.)