Chapter 13. Snow White and the Seven Quantum Dwarves

The starting point for this section is to review the theoretical model we are creating for the fundamental building blocks of nature in order to build our theory of quantum gravity.

Our first principle is that all the building blocks of nature arise out of the basic constants of physics and their relation to the constants of Euclidean geometry. We use Euclidean geometry as our basis because the evidence shows that this viewpoint holds in the vacuum state to an extremely high degree of accuracy. The space/time curvature of the vacuum is essentially nil. There may be local quantum fluctuations in the vacuum, but the statistics of the phase space cancel them all out except in the situations when matter arises. Then the space/time takes on curvature properties. This must be the bedrock of our theory.

Physical measurements of various phenomena bring to light invariances. The five fundamental quanstants appear to be the direct interaction of mass-energy with the Euclidean geometry of the vacuum state.

All other physical constants are compounds of the fundamental quanstants.

Let's review our invariant quantities.

The fundamental physical quanstants are (c), (e), (eo), (H), and (G).

First let's give each one a definition, and then we will discuss them in detail and see how they generate the fundamental constituents of the physical universe.

* (c) = 3x10^8 m / s.

This is the quantum invariant relationship between space and time and the speed limit for mass. Found by experiment (Michelson and Morley, 1880).

* (H) = 1.054x10^-34 J-s.

This is the quantum invariant relationship between energy and time. Found by experiment (Max Planck, 1900).

* (G) = 6.672x10^-11 m^3 / s^2 kg.

This is the quantum invariant relationship between mass and space/time. Copernicus (1543) re-established the heliocentric view that had been known to some of the ancients but was lost during the dark ages. Kepler (1601-1619) extracted the principles of orbits from Brahe's observational data, and Newton put Kepler's principles into concise mathematical form some time between 1669 and 1679. The exact value of the gravitational constant was found by experiment over a century later by Cavendish and

Michell, 1798.

* (e) = 1.602x10^19 kg / s.

This is the quantum invariant relationship between mass and time generated by electric charge. It was found by experiment (Millikan, 1909).

* (eo) = 8.854x10^-12 kg / m^3.

This is the quantum invariant relationship between mass and space. It is the quantum of mass density. Coulomb in 1785 found the relationship for electricity that parallels that of Newton for gravity. His constant (Keo) came to 9x10^9 N-m^2 / C^2. For convenience this was later usually written as (1 / 4 P eo) with (eo) at 8.854x10^-12 C^2 / N-m^2. There are alternate ways of defining the constants here, depending on point of view, but this is the standard we follow.

* E = M c^2.

This is the conversion ratio between mass and energy. Discovered by Einstein in (1905).

* (Dp) (Dx) >= H.
* (DE) (Dt) >= H.

This is the Heisenberg uncertainty relation that tells how momentum and energy are related to intervals of space and time in terms of Planck' s quanstant. Werner Heisenberg discovered this relation around 1925 following De Broglie' s discovery in 1924 of the wave relation for particles.

We also have several fundamental constants of Euclidean geometry.

* P = 3.1416...

This is the constant ratio of a semicircle to its radius. It is a pure number ratio without units.

* **Ru = (Mp c) / (P e) = 1 meter.**

This is the unit radius. It is the gauge for the unit system that is adopted. It may be a natural unit or arbitrary. Based on the relations of the physical constants, we set the value of (Ru) at approximately 1 meter. The ratio of the light-speed momentum of a proton (Mp c) to pi times the quantum unit of charge (P e) is extremely close to one meter -- within less than 4 mm, which discrepancy may be due to tiny inaccuracies in the measurements of (Mp), (c), and (e). In my opinion this formula should give us the standard meter. D. A. White discovered this composite constant that links physics and geometry in 2000.

* Oo = 2 P Ru.

This is the circumference of a circle expressed as (2 P) meters.

* Ao = P Ru^2.

This is the area of a circle with unit radius (Ru). It has the value of pi and the dimensions of a flat Euclidean area in square meters.

* As = 4 P Ru^2.

This is the area of the surface of a sphere of unit radius. It has the value of 4 pi and the dimensions of a spherical surface area in square meters.

* Ss = (4/3) P Ru^3.

This is the volume of a sphere of unit radius Ru. It has the value of 1.333... pi and encloses a spherical volume in terms of cubic meters.

* **% = (10 Ao / P) ^1/2.= 3.16227766 Ru.**

This is the D-Shift Operator expressed in meters.
The ratio (P %^2 / Ao) = 10) is the pure number, 10.

The D-Shift Operator Constant, used together with the value of (Ru ~~ 1 meter) and the constants involved with circles and spheres, integrates geometry with physics. The quanstant cluster (H c) forms the value (%)[(P %^2 / Ao) ^-26 J] when the spatial interval (%) is expressed in meters and energy is expressed in Joules. The values of 3 and 1.054, as well as 10, are thus key components of the D-Shift Operator.

If we take the current accepted values for the constants (Mp), (c), (e), and (P) to six decimal places, we get the following "precise" value for (Ru), also to six places.

* Mp = 1.672649x10^-27 kg.
* c = 2.997925 m / s.
* e = 1.602189 C (kg / s).
* P = 3.141593....
* Ru = Mp c / P e = 0.996235 meters.

This is so close to 1 meter that I recommend a thorough study of the standard units used for expressing the constants. With a tiny adjustment the whole system can be unified so that all of physics can be expressed in terms of the constants of geometry.

All particles and physical phenomena are based on these fundamental relationships.

Planck' s quanstant (H), ("h-bar" or "H-cap") represents an "energy-second". Physics unfolds in the theater of space/time. It is a four-dimensional manifold of three spatial dimensions plus a dimension of time. These dimensions represent the resistances of the observer. Resistance is an expression of the will. It manifests through the medium of the attention. The smallest unit of attention is a packet of photon-awareness energy, the "Planckton". In our units it is 1.054x10^-34 J. A Planckton by itself does nothing and is invisible. It is just a potentiality. But once it is pushed by the will through the time dimension, it becomes a Planck-second, a Planck quanstant interacting with time. Thus it finds expression as a quantum of energy in time.

The velocity of light (c) is the rate at which photons move through a vacuum. It is measured by experiment as 2.9979x10^8 m / s. But in our calculations we usually round it off to 3x10^8 m / s, which is close enough most of the time. The photon' s velocity expressed entirely in terms of constants of geometry per unit of time comes to:

* (c) = (As %^2 / Ss)(%^2 P / Ao)^7 s^-1.

Thus we can describe the motion of light as it has been measured in terms of the Light-Second, expressing it in units of (Ru).

* (c s) = (As %^2 / Ss) (%^2 P / Ao)^7.

The second is derived from the relationships of Planck' s constant to space, the speed of light, and the geometry of circles and spheres: Here is a derivation.

* s = (As Ao / Ss P c) [(As Ru^3 / %) (c eo / H)]^1/4.

We can use this as a conversion factor for the standard second. Time always implies the presence of mass-energy. If there is no mass-energy, there is no time. There are a number of equivalent ways to derive it. This is one example.

One of the simplest derivations of a constant time interval is the ratio of the proton rest mass to the quantum unit of charge.

* (Mp / e) = 1.0424x10^-8 s.
* (Mp / e) = (P Ru / c).

The energy of a photon (Ef) is expressed by:

* Ef = H c / Lo.

Here (Lo) is the wavelength of the photon in a vacuum. It is a spatial distance. Alternatively we can express the energy as (H f), where (f) is the frequency of the photon. We are using the form (H) instead of (h = 2 P H). You can stick in the (2 P)' s if you like. This energy is curious, because the photons do not interact with each other. So it is

really a virtual energy. It only becomes real when the photon interacts with a charged fermion, such as an electron. The energy of the photon is really only an expression of geometry with a touch of energy. The compound:

* %x%^-52 P^26 Ao^-26 J = [(H c) = 3.162x10^-26 kg m^3 / s^2]

as we have shown previously is a multiple of (%), the D-Shift Operator, expressed in terms of Joules and meters. It is an "energy-meter". Here an energy quantum is interacting with a quantum of spatial distance. The spatial quantum (%) is derived in physics from the relation between the light-speed momentum of the proton and the quantum unit of charge.

* % = (e P Ao / Mp c).

There is a small discrepancy depending on the number of decimal places we calculate with. The results from the experimental values of each constant rounded to 6 decimal places gives us the value of (%) within about 3 mm, which is pretty amazing considering the scales of (e), (Mp), and (c) range over 35 orders of magnitude.

I used the following values:

* P = 3.141593
* e = 1.602189x10^-19 kg/s.
* Mp = 1.672649x10^-27 kg.
* c = 2.997925x10^8 m/s.
* Ru = Mp c / P e = .996235 m.

In geometry it forms the following constant relation, here idealized:

^ (P %^2 / Ao) = 10.)
^ % = (10 Ao / P)^1/2 = 3.16227766 Ru.

I may seem to have repeated myself in describing these constants a number of times in various ways, but the importance of these two values (Ru) and (%) in our integration of geometry and physics can not be overemphasized. They form a critical bridge of invariance that connects the two aspects of our reality, the physical World and the mathematical Mind.

Photons express themselves in space, but have no sense of time relative to themselves. We use photons as wonderfully precise clocks, but relative to a photon' s viewpoint, the clock stops. Photons also have no sense of perspective. There is no scale for a photon. When you observe an object from the viewpoint of "capturing" a single photon, you can not tell how "far away" the object is or how big or small it is. You need some statistics gathered from two or more viewpoints to get such notions. Photons live in the eternally instantaneous "here and now."

Experiment: Go out on a clear night and look at a far away star with one eye covered. You see the photons from the star here and now, even though you may imagine they came across light-years of distance and perhaps millions of years. Yet each photon is fresh and alive and just as it was when it "left" its source eons ago. It doesn' t get shaggy or crotchety. You can not judge its distance, although with some equipment you could estimate distance from its red shift. In fact, if you relax and pretend you ARE the photon, you realize that the photon just manifested "here and now", and that "here and now" is completely non-local, beyond space and time. How else could it have "come" from such a distant "source" and be so fresh and present in the moment? The real source of the photon is you, the observer. You created the star, and then imagined that you pushed it far away, and then looked at it from a distance, and -- what do you know -- there it is, far away. It even red-shifted for you.

Fermion particles with mass-energy express themselves in the temporal dimension as they appear to move about in space. We say they are time-like. They are made of wave clusters (group waves) that travel subluminally. In general, greater mass means slower speed (with some interesting exceptions). They have real mass. On the other hand, the photon "mass" of

* Mf = [H / c Lo]

is virtual and varies all over the place depending on the value of (Lo). Thus, as long as we do not introduce any fermions into the picture, we can ignore the (kg m*2 / s*2) aspect of the expression,

* Ef = Mf c^2.

This means that, from the PHOTON viewpoint as it flies through a vacuum not interacting with anything,

* (H c) / J = %x%^-52 P^26 Ao^-26 meters.

This is a quantum unit of distance at the Planck scale, expressed in terms of energy quanta.

This "Planck-lightspeed per Joule" is a spatial interval very much like a unit that we commonly use in astronomy for measuring distances, the "light-second".

* (c s) = 3x10^8 meters.

The light second tells us how far a photon goes in one second. Compare this to the light-Planck per Joule.

* (H c / J) = 3.16227766x10^-26 meters.

This is how photons move. We can measure the motions in light-seconds per second (c),

or "light-Planck per Joule-second", which is a velocity.

* (H c / J s).

This is your minimal velocity.

Now we are ready to talk about the electron neutrino.

* Mne = H / c %.

We found that with Heisenberg' s relation at the limit velocity of (c), the position spread of such a particle approaches (%) as a minimum. Thus (%) represents the minimum "spread" of the particle. (H) is the energy packet interacting in time, the energy-second. The time component combines with the minimum spread (%) to form an inverse velocity. Light-speed is also a velocity. Thus we have the minimal packet of energy (defined in terms of seconds and Joules):

* E = (H / s) J.

The interaction of the packet with its photon is (c). This is its spin velocity and that aspect does not go anywhere in space except around in a circle chasing its tail. The interaction of the neutrino packet with 3D space therefore is governed by a minimum quantum "velocity"

* Vmne = % / s.

In order for the packet not to interfere with itself destructively, it must move forward at a minimal velocity that equals or exceeds its minimal quantum positional spread. The neutrino does not have to go very fast in principle, but we recall that the minimal spread is not corrected for relativistic effects. Thus, although the neutrino may think it is dawdling along, from our perspective it is tearing through space at close to the speed of light. We see this effect in particle showers coming down through the atmosphere from cosmic ray collisions with air molecules. These particles have very relativistic speeds. Their decay rates are also very fast, maybe 10^-10 s or less. Yet these particles get all the way to the surface of the earth before they decay. This is due to relativistic time dilation. From the particle' s viewpoint, it has only traveled a meter or so. From an earthling' s viewpoint, it has gone a few hundred kilometers.

To summarize, our model of the neutrino consists of a quantum packet of energy that is formed by a high-energy photon spinning around in a circle -- or we should say, a helix -- since the particle is moving too. The photon vortex is moving along a trajectory in space at a minimum velocity determined by its quantum wavelength. It is no longer travelling at (c) like a regular photon. We determine the photon spin vortex to rotate at (c), and the quantum wavelength of the "packet" is (%). Because of the relativistic dynamics, the neutrino' s mass is "fuzzy". It has no real rest mass because its minimal spread is so large. We can call it a quasi-rest mass. All other particles also stay in

motion, but their minimal quantum wavelength spread is much smaller than the neutrino' s, so the idea of rest mass gets more meaningful.

Our next stop on the tour of the Generation I fundamental particles is the proton, which we have already mentioned in our derivation of the Radial Unit (Ru)..

* Mp = (e P Ru / c) = 1.67x10^-27 kg.
* Mp = (e P Ao / c %) = 1.67x10^-27 kg.

There is a slight difference between these two expressions due to the different values for (pi = 3.1415926535...) and (% = 3.16227766... m). The (e P Ru / c) version gives the current value of (Mp) when we use .996235 m for (Ru). When we use the current standard meter value for (Ru) we get very close to the value of (Mp) -- a bit closer than the second version that uses (%).

The proton has a mass ratio with the electron neutrino as follows:

* Mp / Mne = (e P Ao / H) = 1.5x10^16.

This ratio also tells us the difference between the two particles. Also compare the numerical value to

* c^2 = 9x10^16 m^2 / s^2.

Whereas the neutrino is simply a primordial quasi-packet of energy created by a spiraling photon that moves in a tightly wound helical pattern, the proton has added much more concentrated mass-energy plus another feature -- charge. Additional resistance placed on the photon generates the quantum unit of charge.. The photon' s linear momentum in the direction of its spin, has now become angular momentum as it "orbits". Also the photon has acquired a twist in its orbit so that it looks rather like an infinity sign or a bow tie. It is actually made of two heavy particles with a negative energy "drain" particle in the center. The two particles have intersecting elliptical orbits around a shared inner focus-pair, but because of quantum fluctuations, the two particles can change places and race around a figure eight course. The charge resistance causes the two circulating particles to stay on opposite sides, to keep their distance, but the gravitational pull balances this resistance and keeps pulling them back in.

The two particles that govern this system are the Planck Mass particles that we also call the (Bu) Union ensemble:

The "eon" is the permittivity of the vacuum space to allow photon activity. This is a density ratio of mass-energy to volume. We see the eon appear as part of Coulomb' s law governing the electrostatic force between static point charges. The eon usually is found connected with pi and the value 4. In the (Beo) the role of 4 is played by (As / Ao), the ratio of the area of a sphere to the area of a circle. If we assume the charged body is spherical, then the charge behaves as if originating from the center. The charge

is distributed over the area of the sphere (As), but behaves as if it comes from the center. The distance (Ru) is our "standard" separation between two centers of charge. Thus we get (4 P Ru^2) as the area over which a charge is operating. When we take the ratio of the Coulomb version and the Planck Mass version, the gravitational quanstant cancels and we get:

* [(H c a) (4 P eo)] ^1/2 = (e) = 1.602x10^-19 kg / s.
* (H c a) (4 P eo) = e^2 = 2.5664x10^-38 kg^2 / s^2.

This tells us how the coupling of quantum energy packets at a certain density in a volume of space creates the quantum unit of charge. The constant (a) is the fine structure constant, or coupling constant. The expression (4 P eo) is the critical density for a charge to form. Any energy packet with less density will be unable to form a charge. We saw earlier that an electron neutrino lacks the density to form a charge. So does a muon neutrino. No quarks or neutrinos have charge. But electrons and positrons are capable of carrying charge. However, electrons and positrons are not true particles. They are merely the locations of energy vortices, the foci where energy is sucked in or out of the vacuum state. Therefore they only function as sub-components in energy ensembles such as the proton and neutron. The fundamental particle ensemble is the proton. The proton is a resultant particle from a coalition of Planck Mass Union particles. So we see that the actual threshold for charge generation is at a rate of pseudo-mass generation of 1.602x10^-19 kilograms per second. That means that there is a dynamic process in which the mass-energy packet is sustained at this rate through a secondary process of resistance.

This resistance that we call charge occurs ONLY in the case of the electron and its anti-partner, the positron. These are the vortices that form the foci of dynamic mass-energy wave packet ensembles. Charge only occurs where the vortex of mass-energy swirls tightly around a point. The neutrinos and quarks are the waveforms that flow around the vortices. The muon and tauon are "fat" electrons -- electrons with extra padding of energy whirling directly around the vortex. This extra energy peels off and the fat leptons quickly drop back down into their simplest state as electron (or positron) vortices in a time frame of around 10^-6 s for muons and 10^-13 s for tauons. All charges observed "in" mesons or baryons are due to electron or positron vortices that happen to be localized within the ensemble particle' s average quantum energy radius. Electron and positron vortices follow quantum wave function rules of geometry describing their relative positions with respect to the (Bu) ensembles they anchor as foci.

To understand this more clearly, let' s take a look at the famous experiment to determine the quantum of electric charge. It was performed by Robert Millikan in 1909, and is known as the oil drop experiment. This was a very profound experiment and showed much more than just the quantum unit of charge. Millikan arranged two flat metal plates parallel to each other and set up an adjustable static charge between them. The upper plate had a little hole in it. Millikan then sprayed some oil droplets with an atomizer over the hole and used a telescope to watch the droplets that fell through the hole. The oil droplets were charged by friction as they went through the atomizer.

As the droplets fell through the hole, Millikan then adjusted the electric potential between the plates until he was able to get a charged droplet to hover in midair between the plates. He had generated true levitation!! The gravitational force that pulled the droplet down was exactly balanced by the opposing charges between oil droplet and plate.

* F = q E = Md g.
* E = k Q / r^2.

Here (q) is the charge on the droplet, (E) is the electric field, (Md) is the mass of the droplet, and (g) is the gravitational force generated by the earth' s mass. Millikan calculated the density of the oil and the radius of the droplet, and derived the mass of the droplet. The tricky part was measuring the radius of the droplets. He had to get that by turning off the electric field and watching the drops fall. He then calculated the radius from the terminal velocity of the drop in the viscous air. By many careful measurements he arrived at the discovery that charge was quantized in units of 1.602x10^-19 C. Remarkably he was able to measure charges of a single extra electron on an oil droplet, a single quantum of charge!!

From our exploration of the Planck-Mass (Bu) particles, we realize that Millikan actually demonstrated a macroscopic laboratory model of the (Bu) ensemble and observed it with his telescope. The oil droplet with a single charge had just the right mass of approximately 1.86x10^-9 kg so that it balanced between the gravitational force and the electrostatic force. This is an actual laboratory model of one of the (Bu) particle pair' s key operational principles. The modern MagLev trains work on the same principle -- a balancing of a mass between the electrical and gravitational forces.

A single real microscopic (Bu) particle is unstable and decays. So it needs a partner to work with it and sustain it. In the Millikan experiment the partner is not another droplet, but the charged plate that pushes the droplet upward against the pull of gravity. The oil droplet is obviously not a mini black hole (although the atoms making it up are.) The oil droplet happens to be at just the right mass, about that of a baby flea, that it demonstrates the Union effect where the two forces converge. In the case of a proton, the (Bu) particles are invisible even to the telescope or a microscope, because they have extremely high density, and thus much smaller size. So the mass equal to the oil droplet is compressed down to a radius as small as 2.75x10^-36 m, the Planck length. The radius of the whole (Bu) ensemble, of course, is much larger and comes out to the size of a proton.

Let' s go back to our expression for the charge quantum.

* (H c a) (4 P eo) = e^2 = 2.5664x10^-38 kg^2 / s^2.

A Planck energy-meter (H c) expressed as (J-m) and the coupling constant (a) interacts with the Eon quanstant ensemble k^-1 = (4 P eo) = 1.111x10^-10 kg / m^3. There' s that Planck squared ratio of (10 / 9) again! There is no mass to be measured unless coupling takes place. Coupling requires a pair of charged particles that are exchanging photons.

When the resultant particle formed by the Planck Mass couplet interacts with another particle, the coupling constant is squared. In each component of the Planck Mass couplet we have (a^1/2). The two of these interacting (Bu)s give us (a). This is the original level of "coupling". All other coupling is an echo of the (Bu) pair coupling, so it goes up as (a^2). The two (Bu) particles are constantly exchanging energy and balancing each other. They suck in energy as black holes and radiate it out with Hawking radiation, finding equilibrium at the (Bu) pair configuration. The most stable of these energy configurations is the proton.

* Mp = (P Ao e / c %). (or, P Ru e / c).

Here the value (P Ao e) has replaced the original quasi-mass of the primordial neutrino:

* Mne = (H / c %).

Let' s look again at the ratio of the Planck quantum packet to the proton quantum packet (proton to neutrino mass ratio):

* Mp / Mne = (P Ao e) / H = 1.5x10^16.

The proton packet consists of 1.5x10^16 neutrino quanta. Wow!! It takes that many proto-neutrinos to make a proton. This is the real threshold for stable charge to exist, since the electrons (and positrons) are just vortexes where the energy whirls around points that serve as the foci for the ensemble.

When we look at the distribution of charge in the (Bu) ensemble, we find that it can fluctuate within the ensemble, but finds an overall constant average value of one positive charge quantum. From our quark analysis we saw that:

* Mp+ = (u d+ u).
* d+ = u_ Me++ Mne Mne Me- Mne_.

The charges appear to be localized at the energy vortices that form around the positron and electron foci of the dynamic "binary" system. We get two positive charges crammed into the center of mass area of the lens vesicle. These take the form of a pair of positrons. An electron node forms at one of the negative foci, and a second electron is pulled in close to the other negative focus. Unless the proton is highly energized in a plasma state, it tends to form atomic hydrogen, which then forms molecular hydrogen. We saw that this just means that the hydrogen finds it more comfortable to be in the 2 (Mn) state (two neutrons). This generates a core with four positrons and two internal electrons, one at each negative focus. Because of the extra positive charges, two more electrons are attracted to girdle the lens vesicle. They run opposite each other in an orbit and with oppositely oriented spins so that they balance best. They form a conjugate pair of electrons, imitating a bosonic electron-positron pair the best they can. The (u) quarks are actually the (Bu) particles, and the anti-(u) quark is the sQuark in the lens vesicle. Although the (Bu) and sQuark masses are a bit different, they tend to

average out with quantum fluctuations, since they are moving about so much. The component masses look very different depending on the observer viewpoint we choose -- e.g., discontinuous [multiplicative] or continuous [additive.] The difference depends on whether we see the components as mutually interacting or not. Nevertheless, our net result is the experimentally verified rest mass of the proton.

The expression (4 P eo) was chosen to represent the proportionality constant in the force equation of Coulomb' s law. First a unit is chosen for charge based on current and time. (A) is Ampere, (s) is second, and (C) is Coulomb.

* 1 A s = 1 C.

Based on this the permittivity of a vacuum is measured and then the constant is set so that the total value is (4 P eo). The value of (eo) then becomes 8.854x10^-12 kg / m^3. The reason for breaking it into the three components is convenience for working with Gauss' law for electrostatics. When finding the electric flux through a spherical surface around a point charge, the integral turns out to be the surface of the sphere (4 P Ru*2). This nicely cancels out the 4 P Ru^2 in the denominator, leaving the simple expression, (q / eo).

^ Flux = (1 / 4 P eo) (q / Ru^2) (4 P Ru^2) = (q / eo).

The charge density depends on the volume.

* q = (4/3) P Ru^3 #.

Here (#) represents the charge density and (4/3) P Ru^3 = Ss.

* # = q / Ss.

This is the definition of charge density -- a quantum unit of charge per minimal (spherical) volume unit of space.

The area of a sphere (As) governs the flux term, and the volume (Ss) governs the density. Density is the amount of charge per volume. The pseudo-mass generated by electric charge is, in its simplest configuration, an energy density emanating from a point. The point is the center of the energy vortex, the point charge.

* Flux = q As / As eo = q / eo.
(Flux = Ss # / eo.

The flux is in volume per second, (Ss) is a volume, (#) is a charge per volume, and (eo) is a mass per volume. Now let' s go back to our expression for the "Eon".

* Mpm = Beo = (P eo Ss) (As / Ao)^2 = (4 P eo) (4 Ss).
* Beo = Bu = (e^2 Ao / As P eo G)^1/2 = (H c a / G)^1/2 = 1.86x10^-9 kg.

Our mass-density derivation contains the inverse of the Coulomb constant (1 / 4 P eo)^-1 times the 1 meter radius spherical volume (Ss) times a factor 4.

* Beo = 4 (4 P eo)(Ss) = 1.864x10^-9 kg.

We can now understand fully how the Eon is naturally defined by quantum charges in a vacuum. The factor (4 P eo) is the proportionality constant of Coulomb' s law and tells us the charge per flux.

* eo = q / (Flux).
* Flux = q / eo.

The flux is expressed in terms of volume of space per second (m^3 / s). It represents a flow in space/time, a relationship between space and time. This must be mediated by mass-energy. Without mass-energy, space/time degenerates to a null zone.

Coulomb' s law tells us the force generated when two charges interact.

* Fe = (4 P eo)^-1 (qQ) / Ru^2.

Here (Ru) represents the separation of the charges defined at unit distance. We can choose (q) and (Q) to be each equal to a single quantum of electric charge: (e)(e) = (e*2). The charge per flux is a ratio of mass to volume of space. It is the quantum of mass density.

The factor (Ss) tells us from geometry that the minimal volume of space is spherical. Thus, when mass density interacts with vacuum space, it naturally tends toward forming a sphere.

The factor (4) is a bit mysterious. But our previous exploration of the Union particle ensemble tells us what it means. We find that the "ground state" of true matter is the proton. Everything else does not yet fully qualify as matter. Photons have no rest mass. Neutrinos have mass, but it is only a quasi-mass. The neutrino can not yet hold a charge. It is really just a highly energized photon with a wavelength so short that it moves like a helix or a tube in space/time. But it is unstable and tends to oscillate from one neutrino state to another (e.g. most commonly between electron neutrino and muon neutrino) during free flight. Therefore, in a way, it is not stable as a particle. We have discovered that, although electrons look like independent particles, they are really components of the proton ensemble or group wave function. The factor (4) tells us that the prototype proton contains not one, but FOUR charges. These charges are defined by the structure of the proton. We say the proton has only one unit of charge simply because we do not detect or take into account the other three.

Each proton is made from a binary system of two (Bu) particles mutually orbiting in a manner similar to that of a binary star system. From the laws of celestial mechanics

derived by Kepler and Newton we know that bodies in mutual orbits form trajectories that can be described precisely by the conic sections of geometry. When the orbits are closed, they form ellipses. Each ellipse has two foci. Two ellipses make four foci. Each focus becomes a node around which energy vortices form. These energy vortexes generate the leptonic charges. Usually these take the form of electrons, positrons, muons, and antimuons. Occasionally at very high energies tauons may appear. The only stable charges are the electron and positron charges. All the others represent energy overloads that spontaneously decay. Thus the ground state proton (and its neutron oscillation) consists of the mass-energy of two (Bu) particles interacting and forming a sQuark center of mass. Two positrons in the central lens vesicle, and two electrons in the outer region mark the energy foci. When the proton is relaxed, one of the electrons can shift outward to occupy various quantum energy levels above the internal node. This is a spontaneous symmetry breaking. The electron occupies its symmetry position only at the slightly higher energy level of the neutron or at the restored symmetry level of the hydrogen atom. Here the symmetry of two neutrons is gained at the 2 (Mp) quantum level. The result is that there are two electrons girdling the 2 (Mp) mass proton in the (1 s) orbital. But the quantum increments of the proton remain the same: for every (Mp) mass there are four charges added. In the neutron mode they all cancel out. In the proton mode the nucleon seems positively charged, and there seems to be an external particle called an electron with negative charge. Actually the electron is a non-local component of the proton and represents just the center point of an energy vortex that is somewhat "relaxed" so it can whirligig around "outside" the proton.

We have derived the Union particle in three separate ways.

First, we derived it by using Coulomb' s law for the electrostatic force and Newton' s law for the gravitational force to find the point of equilibrium between these forces. We solved the equilibrium equation to find the two equal masses that would support equilibrium, given that each massive particle carried a single quantum of electrical charge. This gave us the (Bu) Boson Union particle.

Second, we derived a theoretical mass from the permittivity of space to mass energy.

Third, we derived the Planck Mass from combining the Schwarzschild radius of a black hole with the de Broglie wave equation for massive particles to find the critical mass that would form a black hole from the intensity of its own matter waves. We then found that the Planck Mass, when combined with the electromagnetic coupling constant (a), gave us the mass of the Union particle.

* $(H c a / G)^{1/2} = 1.86 \times 10^{-9}$ kg.

This version introduced the gravity constant to our fundamental (Bu) particle. Planck' s constant represents energy interacting with time. The factor (c a) represents the involvement of the electromagnetic interaction -- (c) is the space/time relation, and (a) is the coupling constant.

* (a) = (e^2 Ao / As P eo H c) = 137^-1.

The coupling constant is a compound constant made from the relations of the various other constants, as discussed earlier. When you substitute the constant cluster for (a), you get the derivation of the (Bu) ensemble from the ratio of Coulomb' s law to Newton' s law, thus showing the ultimate identity of the two derivations. The coupling constant describes the way in which photons transfer energy to and from exposed charged vortexes such as free or outer orbital electrons. The photon trajectory in a vacuum is an Euclidean straight line that oscillates transversely as it connects space/time points (energy vortexes). When we match up (c) with (H), the energy quantum in (H) interacts with the trajectory of (c) to bend it into the shape of a conic section. As a closed conic section it forms an ellipse:

* (H c) = 3.1622x10^-26 kg (m^3 / s^2).

The relationship (m^3 / s^2) in the constant compound (H c) is the space/time signature of an ellipse. This same signature occurs in the gravitational constant (G).

* G = 6.672 m^3 / s^2 kg.

When we divide (H c) by G, the two ellipse trajectories cancel out, and we are left with two interacting masses. These are the proto-masses of the (Bu) Boson Planck Mass particles.

From the above discussion it becomes clear that we can dispose of a couple of major myths that have bugged physics for a long time.

The first is the notion that gravity is monopolar. Obviously gravity is not monopolar. It takes two to tango. If you only have one particle, you can not detect any mass. Any force used to move it implies a second packet of mass-energy somewhere outside the first particle. Therefore, if there is only one particle, there is no gravity. We can say that the particle will tend to be spherical and the gravity "field" will degenerate to a single point and thus become undetectable. Whenever there are two particles, then we have a system that behaves according to the rules of conic sections. An ellipse always has two foci. In a gravitational system the symmetry of the system is broken by a bias that charges the two foci. One becomes positively charged (both with gravitational mass and with electric charge), and the other becomes negatively charged with gravitational mass and electric charge.

All electrical systems are bipolar. The same is true of their children, the magnetic systems. They are also bipolar. This is the second myth. There are no magnetic monopoles by definition and by the very structure of the beast. Scientists can look if they like, but they will not find them, just like they will not find a naked quark. The only "naked quarks" are the neutrinos. The same is true of gravity. When any of these "resistances" becomes monopolar, it degenerates and you can not detect either pole. In

equilibrium you can not feel contrasts.

A solenoid is an example of a macroscopic magnetic black hole. Here the hole is inside out, because the magnetic flux is inside the solenoid and the boundary of the solenoid blocks it from interacting with the outside. A gravitational black hole is a macrosopic example of a gravity singularity. Light can not get out from inside, but gravity is not affected on the outside. The hole contains lots of mass, but no gravity on the inside. You can detect gravity from the outside of a black hole only if you have mass or linear momentum (like photons). From inside the black hole, however massive it may be, oddly enough, you can not detect any force of gravity. It is like standing at the center of the earth or floating in inertial orbit. The same is true of a static electric charge on a sphere. There is no charge inside the sphere. A statically charged hollow sphere is a macroscopic electrostatic singularity.

The only exception to these rules is that, because there is a real dynamic system there and not just the quiescent vacuum state, there will be quantum fluctuations due to Heisenberg uncertainty. An example of this is the Aharonov-Bohm effect with regard to the magnetic field trapped in a solenoid. With black holes we have the quantum fluctuation of Hawking radiation. Generally these fluctuations are minute fringe effects. But under special conditions they can have far reaching consequences.

The two poles of the gravitational system are located at the two foci of the ellipse that defines the particle trajectory. The inner, positive pole has positive mass and is the reservoir for the potential energy of the system. How much mass-energy there is in the earth' s physical structure determines how much potential energy is available in its environment. If you lift an apple up into the air, you raise its potential energy. You are doing this by drawing on the potential energy of the earth. If the earth were not present, moving the apple from position A to position B in open space would not increase its potential energy one bit. However, it does increase the apple' s kinetic energy. Once you stop accelerating the apple, it will maintain the kinetic energy you gave it until acted on by some other force.

On the other hand, the "kinetic energy" of the apple is still relative to some observer' s frame of reference. If there is no reference frame, then the apple has no motion. Without motion it has no kinetic energy. Once again we see that kinetic energy is bipolar and dualistic, just like gravity. We propose that kinetic energy is the other side of the coin, the other pole of mass. This is why the negative poles of the proton can cut loose and appear to move around.

Not all conic sections are closed. They can also be open forms such as the parabola and the hyperbola. However, such open forms imply the existence of other open forms so that the total symmetry of the system is maintained. In other words, protons can exchange electrons with other protons. So, for example, in a molecule of water, a hydrogen atom can share its electron with an oxygen atom. The electron can oscillate back and forth between the two atoms doing double duty. If a hydrogen atom is ionized into a plasma mode, its electron can fly off and zip around for a while and then land on

another atom. When the hydrogen ion settles down again, it will pull in any electron that happens to be nearby. All electrons at the same energy level look alike, and the nucleon is not particular. Thus a proton is really a non-local particle when we include its second electron, and the proton' s wave function extends indefinitely in space/time. But it is not infinite. Protons were created as quantum eddy fluctuations during the Big Bang inflation. All individual (Bu) quanta spontaneously decay. Only those that happened to have their event horizons touching or overlapping in the dense quantum soup of creation managed to survive. They found an equilibrium that has survived until now.

Are protons immortal? The answer is yes and no. Protons can have immense life spans equal to the life span of the universe. They ARE the universe. On the other hand, protons annihilate when they encounter antiprotons as anyone who works at a high-energy collider can tell you. But there are not a lot of antiprotons around. They all annihilated with protons as the universe cooled and expanded. All that is left are some protons that survived in random pockets of space. Like the left-handed neutrinos, and the right-handed sugars, the leftover proton ensembles had to be all of the same type, so there was a breaking of symmetry at the cosmic level when the protons were created -- just like the case of the neutrinos. However, when you take a proton ensemble apart, all the lepton components that make it up exactly balance out. The apparent imbalance of twice as many (u) quarks as (u_) quarks disappears when the quarks are separated, for then they immediately dissipate into pure energy via Hawking radiation. The whole ensemble is an elaborate and wonderful mirage.

When the universe collapses during the Gnab Gib, or big Crunch, at the point when matter returns to the density of quark soup, the protons will all melt down and decay back into the pure energy that they really are anyway. In the next universe cycle, they will reappear as usual with their particular statistical frequency in the freeze out from the quark soup.

Our theory of quantum gravity is now beginning to take shape. But we still have to consider another set of fundamental particles, the massive vector bosons (W and Z).

The (W) and (Z) bosons mediate the so-called weak interaction in electro-weak theory. One of the difficulties faced by physicists has been how to account for the massiveness of the (W/Z) bosons. Quantum field theory is based on the assumption of zero mass for particles that exchange energy in a field. This works fine for the photon in QED, but leads to problems with the weak interaction, because the bosons that mediate the weak interaction turn out to have masses almost 100 times heavier than the proton.

Our approach is not through traditional field theory. QED is fine as a field theory for describing the electromagnetic interaction. But we can get the same results in other ways that do not limit us to massless particles or require great contortions in order to get a semblance of mass from a zero-mass field. Also, the field theories have no means to predict masses for any particles without using contrived tricks. So we do not use the standard field theory approach. With our approach we get a nice quantum field with all the particles and masses just as we experience them experimentally.

From the viewpoint of the photon, there is no time or space. Penrose has developed this idea to some extent in his twistor theory. The "null lines" of photons in twistor space become points. Twistor space is developed from the viewpoint of projective geometry -- which we introduced briefly in an earlier section and highly recommended --, and forms a complex number field reflection of a space of lines into its dual, a space of points. This is a fine mental concept, but does not go anywhere in physics. It is just a transformation of one viewpoint to another. The value of Penrose' s ideas is in recognizing the existence of this viewpoint and its validity as a mathematical idea. However, as with field theory, twistor theory has trouble with the incursion of mass, which is what physics is all about.

We have no such trouble in our approach because we start with definitions of the invariant relations between mass-energy and space/time that are based on actual experimental data. We also show that these values are inherent reflections of constant relations in geometry. Thus we have invariance built into our theory right from the start and do not have to start with generating a theoretical field with invariances. This principle is a key to assembling our theory of quantum gravity. We must establish a systematic method for defining the physical constants completely in terms of the constants of geometry. That unifies the mental field of geometry with the physical field of experimental phenomena.

We have a simple four-step program for achieving this marriage of geometry and physics.

Step I. Use factors from the constants of geometry to shift each physical constant to an exact power of 10 while maintaining the units of the physical constant unchanged.

Step II. Identify all the fundamental physical constants that contain mass units, and organize them into all the combinations such that all the units cancel out. Disregard the ratios and scales.

Step III. Substitute the power-of-ten versions for each of the physical constants as derived in Step I into the combinations derived in Step II.

Step IV. Total up the powers of ten and set that equal to (P %^2 / Ao) to the power of your total.

We now have an equation for each possible combination of physical constants that is expressed solely in terms of constants of geometry. Since we have a power-of-ten version for each physical constant, we can obviously write each combination as a power of ten. The D-Shift Operator can match that at any power. The D-Shift Operator is a constant of geometry and a constant of physics. It forms the link between the two and the link between various scales.

Now let' s do it.

Step I. Shift each constant to a power of ten.

* (e) ---> (**e** P Oo / %) = 10^-18 kg / s.
* (G) ---> (**G** Oo %^2 / Ss) = 10^-9 m^3 / s^2 kg.
* (eo) --> (**eo** As^3 / Ss^2) = 10^-9 kg / m^3.
* (H) ---> (**H** As % / Ss) = 10^-33 kg m^2 / s.
* (c) ---> (**c** Ss / Ru As) = 10^8 m / s.

Step II. Express each constant involving mass as a pure number ratio.

* (G H / c^3 %^2).
* (G eo %^2 / c^2).
* (G e / c^3).
* (H / e %^2).
* (H / eo c %^4).
* (e / eo c %^2).

Step III. Express each constant in Step II in terms of powers of ten.

* (G H / c^3 %^2) --> (**G** Oo %^2 / Ss) (**H** As % / Ss) / (**c** Ss / Ru As) ^3 (%^2)
* (G eo %^2 / c^2) --> (**G** Oo %^2 / Ss) (**eo** As^3 / Ss^2) (%^2) / (**c** Ss / Ru As)^2
* (G e / c^3) --> (**G** Oo %^2 / Ss) (**e** P Oo / %) / (**c** Ss / Ru As)^3
* (H / e %^2) --> (**H** As % / Ss) / (**e** P Oo / %) (%^2)
* (H / eo c %^4) --> (**H** As % / Ss) / (**eo** As^3 / Ss^2) (**c** Ss / Ru As) (%^4)
* (e / eo c %^2) --> (**e** P Oo / %) / (**eo** As^3 / Ss^2) (**c** Ss / Ru As) (%^2)

Step IV. Write the total powers of ten with the D-Shift Operator.

* (G H / c^3 %^2) --> (G Oo %^2 / Ss) (H As % / Ss) / (c Ss / Ru As)^3 (%^2) = (P %^2 / Ao) ^-67.
  10^-9 10^-33 10^-24 10^-1 10^-67

* (G eo %^2 / c^2) --> (G Oo %^2 / Ss)(eo As^3 / Ss^2) (%^2) / (c Ss / Ru As)^2 = (P %^2 / Ao)^-33.
  10^-9 10^-9 10^1 10^-16 10^-33

* (G e / c^3) --> (G Oo %^2 / Ss) (e P Oo / %) / (c Ss / Ru As)^3 = (P %^2 / Ao)^-51.
  10^-9 10^-18 10^-24 10^-51

* (H / e %^2) --> (H As % / Ss) / (e P Oo / %) (%^2) = (P %^2 / Ao)^-16.
  10^-33 10^18 10^-1 10^-16

* (H / eo c %^4) --> (H As % / Ss) / (eo As^3 / Ss^2) (c Ss / Ru As) (%^4) = (P %^2 / Ao)^-34.
  10^-33 10^9 10^-8 10^-2 10^-34

* (e / eo c %^2) --> (e P Oo / %) / (eo As^3 / Ss^2) (c Ss / Ru As) (%^2) = (P %^2 / Ao)^-18.
  10^-18 10^9 10^-8 10^-1 10^-18

Clearly we can take any combination of physical constants and express them in terms of constants of geometry. If you wish not to use (Ru), you can simply square both sides, substitute (Ru^2 = %^2 / 10), and adjust the right hand side by a factor of 10.

As you look at the above equations, you discover that we have accomplished the goal of the field theorists. We have a set of equations that express all the forces and from which we can derive all the particles of physics that have mass and other dimensions and properties. But they are all massless and propertyless in this field of powers-of-ten. We have created a mathematical "grid" that has "depth" of scale and in which we can embed physical processes. When it is quiescent it is just an n-Dimensional field of 0' s with an undefined quantum value of 1 floating about as a possibility to land somewhere, anywhere.

* (P %^2 / Ao)^n.

When it is in the quiescent vacuum state, it is flat. In mental space this is reflected as an n-dimensional field of 0' s, or an indefinitely long line of 0' s when viewed in 1 dimension. Each zero represents a quantum possibility to hold a value and a scale in a particular (as yet undefined) dimensional unit. But interestingly --

* (P %^2 / Ao)^0 = 1.

The zero dimension of our field is a unity. The only way we get the field to be really all zeroes is to make its dimension really "small" but NOT zero. At zero the whole thing makes a quantum leap and jumps to the value 1 right in the middle of the zeroes.

* 00000000000000000000000001.00000000000000000000000000000

* (P %^2 / Ao)^n, where n ---> minus infinity, approaches --

* 00000000000000000000000000.00000000000000000000000000000...

But the reality is that we do not play in infinity. We play in the relative world. Therefore we define an arbitrary range as our playground. The numerical values we give to the range do not matter. All that matters is the relationships. Once these are set, they hold for all viewpoints. The physical constants become the observed invariances of our physical world. Transformation operators purely derived from constants of geometry bring the quiescent particles to life and automatically endow them with their proper masses.

Here is what a 1-D numerical version of the quiescent vacuum state field with the Planck-scale value of n = -35 (10^-35) looks like. To make it easier to read this "field" notation, we can use the convention of splitting the digits apart into triplets.

* 00000000000000000000000.000 000 000 000 000 000 000 000 000 000 000 000 010....

This gives the "scale" for our universe. Next we set the ratio of mass to space -- (eo) -- for our universe. Armed with this we can create particles. Consider the mass of a hypothetical proton. It exists "frozen" in the vacuum until activated as a physical possibility. The vacuum splits.

* (10^-35) (10^17) = (10^-18) = (P %^2 / Ao)^-18 =

* (P e Oo / %) (Ru As / c Ss) (Ss^2 / eo As^3) (1 / %^2).
  (10^-18) (10^-8) (10^9) (10^-1) = (10^-18).

* 0000000000000000.000 000 000 000 000 001 000 000

Now we have a potential mass window involving a charge at a certain scale in the vacuum mass gauge. But it still has no mass. It is just a blip of possibility of mass at that pure number scale window around 10^-18. Next we rearrange the components to reveal the hidden proton mass.

* (P e Ru / c) (1 / eo) (Oo Ss / %^3 As^2) = (P %^2 / Ao)^-18.
* Mp = (eo) (%^3 As^2 / Oo Ss) (P %^2 / Ao)^-18.
* 00000000000000000.000 000 000 000 000 000 000 000 00**1 67 kg**.

We extract the Planck scale we want for our universe from an indefinitely long string of zeros by choosing an arbitrary pure number value of 10^-35. We split that into two other pure numbers based on the ratio of charge to the Planck scale. Then we operate on one of them with the ratio of mass to space that we defined for our vacuum. Whenever the (eo) constant encounters the simple relationship in geometry, (%^3 As^2 / Oo Ss) (P %^2 / Ao)^-18, a proton magically appears!!! The proton likes this (eo) window because of the simple relation between the physical ratio (e / c) and the pi gauge (P Ru).

* Mp = (e / c) (P Ru).

Now our hypothetical particle has a specific value, and that value we measure in kilograms from the viewpoint we have selected. Oddly enough, the geometry relation that the vacuum ratio encountered had nothing to do with mass. The cluster of relations from geometry is not only massless, it is purely an abstract mental property of the geometry of circles and spheres with an arbitrary unit radius that somehow reflects into the physical world. Once the vacuum permits mass at the (eo) density, certain particles can appear. The collection of circles and spheres is probably what John Wheeler was imagining when he broached the concept of "quantum foam." It is simply the geometry of pure Euclidean space boiling into bubbles.

What happens here reminds me of the fairy tale of Snow White and the Seven Dwarves. Snow White is the sea of quantum foam at the Planck scale. The Seven Dwarves are the seven constants of pure Euclidean geometry that provide a "house" for Snow White to live in. The Seven Dwarves build the first three dimensions of space at the Planck scale. They are:

* 0D --> P.
* 1D --> Ru, %.
* 2D --> Oo, Ao.
* 3D --> As, Ss.
* 4D --> T

We can even hazard an identification of the Dwarves. Pi at 0D sounds like Sleepy. He' s OD' d and gone to sleep. He' s really out of touch with the world, but the point is that the whole world is his dream of pie in the sky. Doc is the gauge metric at (Ru). He sets the ruler for measuring the world. Dopey gets lost and confused wandering all over the scales with D-Shifts (%). Bashful seems like (Oo). He' s somewhat autistic and seems one-dimensional. But actually he extends himself into a second dimension by his autistic circularity. Happy is (Ao), with a smiley face, but a bit flat. Grumpy is (As), because he' s all bluff on the surface with nothing inside. He' s a real Ass. But he LOOKS three-dimensional. And Sneezy is (Ss), spraying bubbles all over the place into three dimensions. At least he' s for real, but he must have some allergies.

Sneezy gives us the Big Bang. Yep. That' s how it happened. God sneezed. That tossed us into the 4 dimensional world of physics and introduced another dimension, Time. Time gave rise to the story.

In the story there is a beautiful, narcissistic Queen who wants to be and remain the most beautiful and powerful of all. She is the Black Hole Queen. Ironically, inside her impregnable castle lives Snow White, her stepdaughter. Snow White happens to be growing into a woman who will be more beautiful than the Queen. She is the lively quantum foam. She is a potential White Hole. Inside the castle of the primordial cosmic Black Hole lives a quantum foam White Hole, hidden and unknown. The invisible Transcendental Observer is the King. His original Queen, Pure Awareness, died when she gave birth to Snow White, the Quantum Foam. But Snow White reflects the transcendental beauty of Pure Awareness. The Black Hole Queen is the King' s second Queen, and the potential White Hole is really the King' s daughter, but Snow White doesn' t know this.

The jealous Queen stepmother tries to get rid of Snow White. Snow White survives and takes refuge with the Seven Dwarves, miners who dig gems of perception from deep in the depths of the Poincare Peak of Possibilities. The Magical Phase Conjugation Mirror on the wall of the Queen' s Castle bedroom never lies. One day it tells the Queen that Snow White still lives and has become the most beautiful woman in the Universe. The Queen decides to kill Snow White with a poisoned Apple of Gravity. Her disguise for delivering the Apple is to transform herself into the hideous old crone, Time, and reflect her Beauty as it appears when ravaged by her warped imagination. The Apple is Newton' s Apple, and the Apple of the Garden of Eden. It is Gravity, the Black Hole' s specialty. When Snow White eats the Apple, Gravity pulls her into a prone position, flat on the Ground State, stuck to the Event Horizon. She remains that way, in a sleeping trance, protected by the Seven Dwarves. She is the quiescent quantum foam.

One day Prince Charming arrives. He is the Perfect Conjugate Mate, wearing a magical dwarf jewel. When he kisses Snow White, she wakes up, and they live happily ever after. The physical world emerges, and the celebration of creation as a Universe of All Possibilities begins.

There is a principle of duality at work here. For example, each particle with mass has an abstract relationship in geometry that calls forth its specific mass. The Snow White quantum foam is made up of nothing but combinations of the Seven Dwarves. It is pure space in zero, one, two, and three dimensions. But the space has been compactified and wrapped into little balls all jumbled together. The quantum gauge for doing this is the Planck Length. So Doc applies his Planck ruler and sets the gauge. He uses a set of jewels to do this. The Dwarves mine mental jewels from the mountain-of-all-possibilities and arrange them into beautiful sets that can magically generate universes. For our universe Doc chooses the Chakra set -- Seven Gems of Perception: (H = Sneezy' s Sinus), (G = Sleepy' s Butt), (c = Happy' s Heart), (e = Bashful' s Pubis), (eo = Grumpy' s Throat) and (Ru = Doc' s Navel gauge), with (% = Dopey' s Crown) for their settings.

The Planck-scale gauge:

* (H G / c^3) = (Ru) (P % / Oo) ^2 (Ss P % / As Ao) (P %^2 / Ao)^[-7(P %^2 / Ao)]

connects the pure Euclidean space to our particular universe. Some quantum theorists, such as Everett, propose a many-universe interpretation of quantum theory. Our approach also allows for multiple universes, but in a different way. Each universe is defined by the set of physical quanstants -- set of Dwarf-jewels -- that applies to that particular universe. A set of fundamental quanstants needs to be finite, few in number, and mutually consistent. The quanstants are folded into the quantum foam according to the steps we outlined above.

The quantum foam itself consists of the Seven Dwarves of compacted spatial dimensions tumbling about in all possible combinations. There are only Seven of them, so the number of ways the Seven can fit together into combinations is limited. Of course, there are higher power combinations, but they are much less probable. The quanstant gems are coated with foam like dirt particles in an emulsion. So they slip and slide about in the foam and do not interact. They also have no mass. They are transparent beliefs that are present, but can not be seen. However, whenever one or more of them happens to kiss the right combination of foam bubbles, magically its foam coating drops off and the quanstant, or particle, or force, or velocity, manifests in space/time. The property of Gravity, as we shall see, is global and nonlocal. Thus, when one particle appears, it breaks the symmetry of the quantum foam for all possible universes, and the whole foam selects that particular universe option that kissed it rather like the way some baby animals bond to the first individual they interact with. Others are then incompatible. In that context they interfere self-destructively and their probability drops effectively to zero for that universe.

For example, from QED we know that if photons emanate from a source (A) with an observer positioned at (B), the photon wave function actually goes every which direction. But only the photons following the straight path from (A) to (B) interfere constructively and are detected by an observer at (B). All others cancel out. However, if we choose to stand as observer at point (C), then the photon wave function emanating from (A) as before, will now only collapse with constructive interference at point (C). Quantum foam interference works exactly the same way. Which "universe" we condense out of the quantum foam of all possibilities depends only on our position as an observer at the moment of creation.

Since we are used to living at a scale far removed from the Planck scale, we generally choose an arbitrary metric such as a meter as our radial unit. Thus all the constants are shifted to different numerical values and scales. But that does not disturb the fundamental relationships of our particular universe' s jewel set.

Let' s do another example. This time let' s call forth a force from the vacuum and see what happens.

Suppose we want to look at the electrostatic force between a proton and an electron. We want to call forth Coulomb' s Law. To simplify things, we will place the charges 1.77x10^-10 meters apart.

* Fe = e^2 / 4 P eo 10^-20 Ao.
* (10^-35) (10^-1) = (10^-36) =
* (P / P) (**e** P Oo / %)^2 (Ss^2 / **eo** As^3)^2 (Ru As / c Ss)^2 (1 / %^4) = (P %^2 / Ao)^-36.
(10^0) (10^-38) (10^18) (10^-16) (10^-2)

* (e^2 / 4 P eo 10^-20 Ao) (P^3 Oo^2 Ss^2 Ru^2 / eo %^6 As^3 c^2) = (P %^2 / Ao)^-16.

We define the abstract notion of a "force" operator (Prince Charming), who "kiss"-multiplies our "Snow White" quantum foam bubble cluster:

* Fe = (eo c^2 / Ru) (As^3 %^6 / P^3 Ru Oo^2 Ss^2) (P %^2 / Ao)^-16.
(Prince Charming) (-------Snow White----------) (Snow White' s Bed)
* Fe = 7.34x10^-9 kg m / s^2.
* 000000000000000000000000000.000 000 00**7 34**0 00000000000 **kg m / s^2.**

Charming Prince Eo of the Kingdom of "Newton" is an archetype of force from the "gems". His brother Planck (H c / Ao) is also Charming. We activate the "force" dimension of our vacuum state by means of the pure geometry of space (Snow White) that has nothing to do with forces. A kiss from Prince Eo awakens geometry to play in the world of the forces.

We start simply by operating on a power of ten: (P %^2 / Ao)^-36.

In this expression there are only some distances and curves, no mass or time or force. We do a couple of simple transformations and end up with a precise physical force

expressed by a law of physics -- **all within the vacuum**. Furthermore, this procedure is totally general. We can plug in any value and Coulomb' s Law works. The dual mate of Coulomb' s Law is this curious assembly of circles and spheres, a purely abstract set of mental relations -- a team of Bubble-Dwarves. But whenever this geometry occurs, Coulomb' s Law goes to work in the specific way we want. This is not just true for Coulomb' s Law, but for any law of physics.

Let' s do one more example. This time, let' s make a "basic" neutrino.

* Mne = (H / c %) = (H / c) (%)^-1.

* (10^-35)(10^1) = (10^-34).
* (P %^2 / Ao)^-34 = (H As % / Ss) (Ss^2 / eo As^3) (Ru As / c Ss) (1 / %^4)
* (10^-34) = (10^-33) (10^9) (10^-8) (10^-2).
* (H / c %) (Ru / As %^2) (1 / eo) = (P %^2 / Ao)^-34.
* Mne = (eo) (As %^2 / Ru) (P %^2 / Ao)^-34.
* Mne = 1.111x10^-43 kg = (10 / 9)x10^-43 kg.

* 0000000000000000.000 000 000 000 000 000 000 000 000 000 000 000 000 000 111 111 111 111 ....

Prince Charming is Eo of the Kingdom of Eon, Purveyor of Particles.
Snow White is dressed by her Dwarves as (As %^2 / Ru).
The scale, (P %^2 / Ao)^-34, forms Snow White' s bed.

By the way, the pure ratio of (10/9) that shows up in the neutrino generates a pure dimensional value. Any number divided by 9 projects that number across the whole linear dimension to the right from the scale at which it begins, and (10 / 9)^2 does another 90 degree shift.

The vacuum undergoes a series of symmetry breaks. The whole quantum foam manifestation process works very much like the biochemical processes that occur in the plasma soup inside the cells of our body. A neutralized particle can float around in the alphabet soup and nothing happens. When it is activated, it gets a certain charge or shape, and starts to link up at "receptor sites" with various molecules and form structures. The unique property of the quantum foam field is that it starts from a flat empty vacuum and passes automatically into quantum foam and then into a solid physical reality -- all from the choice of viewpoint made by an observer. This is observer physics.

From the observed invariances of our physical world translated into our quiet field, we can derive all the observed masses of the objects in our physical space as well as their dynamic interactions. The numerical values assigned to the physical constants are dependent upon the particular units chosen to work with, but the relations of the constants to each other remain invariant. Thus the masses that we derive are also invariant and independent of the units chosen. Our concept of space is also derived from the experimental observation that a quiescent vacuum is indistinguishable from Euclidean space and a quiet mind. The fundamental (Beo) particle, source of all other particles, is simply the marriage of energy and geometry.

* Beo = Bu = (eo) (P Ss As^2 / Ao^2) = (4 P eo) (4 Ss).

Prince Eo, the ratio of mass to pure space, finds his true Princess (4 P) (4 Ss). The (4 P eo) is a bubble of mass-energy as four particles intermixing (4 Ss). The quanstants (G) and (H c) tell us how space/time distorts under the influence of mass-energy. The Einstein relation tells how mass is related to energy, and the Heisenberg relation tells how momentum and energy are related to intervals of space-time through Planck' s constant. The basic principles of Newton' s laws, Einstein' s relativity, and modern quantum mechanics hold -- with the few special modifications that I have pointed out.

		Prince Physics Constants	Snow White Geometry Constants
*	Beo =	(eo)	(P Ss) (As / Ao)^2.
*	Mne =	(H / c)	(%^-1).
*	Mp =	(e / c)	(P Ru).
*	Me =	(e^3 / H c^2 eo)	(Ao / P As)^2 (%).

Now let' s continue exploring quantum gravity to find the graviton. When we want to identify the basic quantum unit of gravity in the form of mass, we simply work with the quantum relationship (G). That' s its job. It can tell us what a graviton is. Hence, (G) ^-1 becomes our first factor. We use the inverse to see the mass, because (G) is describing the dynamic negative pole of orbital motion that swings out around the outer focus of the ellipse, so it has an inverse mass. But this factor tells us the relation between mass and the geometry of ellipses. We must balance out the elliptical geometry in order to see just the gravitational mass itself. There are two ways to do this. The first way is by multiplying by the factor (H c) (and the coupling constant) as we did to find the Planck Mass. This cancels out the elliptical geometry and leaves us with a pair of interacting masses. Einstein' s relation tells us that mass and energy are the same thing transformed by the proportionality constant (c^2).

For our second approach we can take (c^2) as our second factor. That gives us (G^-1) (c^2). This gives us a mass per distance [(Mx) / (x)], a mass distributed along a trajectory, a sort of 1-dimensional density. So we need to put a constant of distance into the mix in order to find a constant mass. The only constant of distance we have other than our unit radius, is the D-Shift Operator (%). So we plug that in.

* (% c^2 / G) = 4.2669x10^27 kg.

This is an awfully big particle. But it is an important one. It is the "macrograviton". It defines the quantum mass level at which a cloud of gas in space begins to contract into a ball and function as a star. Anything smaller tends to become just a large planet or remains a gas cloud, depending on certain initial conditions. Of course there are noticeable statistical variations at this large a scale. But on average this is about where

it happens. Our planet Jupiter at 1.9x10^27 kg is just about on the edge of becoming a star. It may have been at the edge in the past and became destabilized somehow and lost some of its mass to make the other planets in our system.

Now that we have technology to detect Jovian planets in orbits around stars, we can collect a large sample of these entities and determine statistically the correct Jovian multiple at which the onset of stardom occurs.

Consider the intermediate boson. From a viewpoint as an "outside" observer, a photon has been moving along merrily at (c), and -- wham! -- its energy is suddenly shifted up tremendously by a surge from the vacuum state, and it turns into a big fat (W) Boson. This pulls globs of mass-energy out of a nucleon or other particle, causing it to undergo what is called the weak interaction decay. The (W) Boson then disappears, leaving the pieces to scatter at various angles. Depending on our orientation with regard to time and the Boson, an intermediate Boson can also cause pair production from the vacuum state.

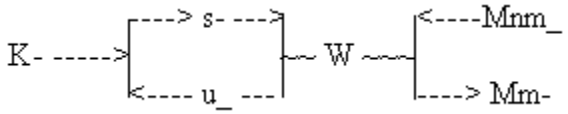
Pair production and annihilation is the main role of the (Z) Boson. It has a mass that is heavier than the (W) Boson by slightly more than (10/9) -- a factor of around (1.14).

* (10 / 9) = (1.054)^2 = (Ss P % / As Ao)^2.
* (%^4 / P^2 Ao^2) = (Ss P % / As Ao)^1/2 = (1.054)^1/2 = 1.026.

We see here another incursion of four D-Shift Operators. This time they are squeezed into a factor of only (1.14). This is very close to (1.67)^1/4. These numbers are very interesting.

One important principle about the (W) bosons is that they have no charge. They only differ slightly in their function from the (Z)' s. This lack of charge actually is good news, since all good bosons should be neutral with respect to charge. They only transmit what is already there like a catalyst. Whatever charge they transmit, that is the charge they seem to have. But they are only messengers and just transmit what is already there.

For example, here is a (K-) interaction.



The negative Kaon meson is made of an (s-) quark and an anti (u) quark. The quarks are looping in time in almost parallel trajectories, so they look like one particle. The muon antineutrino loops around, bounces off a (W) Boson, time-reverses, and juices up into a muon. The negative charge is transferred by the (W) from the (s-) quark to the muon.

Recall that the strange quark "decay pattern" is:

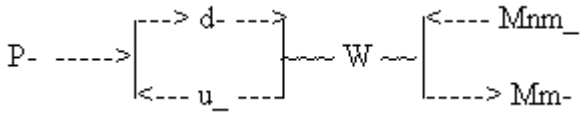
* s- --> u, Mm-, Mnm_.

If we swap the (u) quark over to the (s-) quark side, it flips into its antiquark identity:

* s-, u_ --> Mm-, Mnm_.

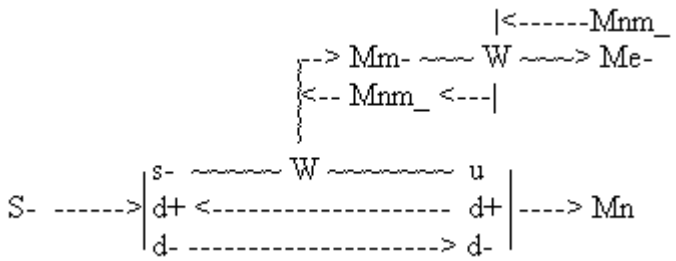
The (W) Boson catalyzes this process, as the diagram above shows.

Here is negative pion decay by the same mechanism running at a lower energy:



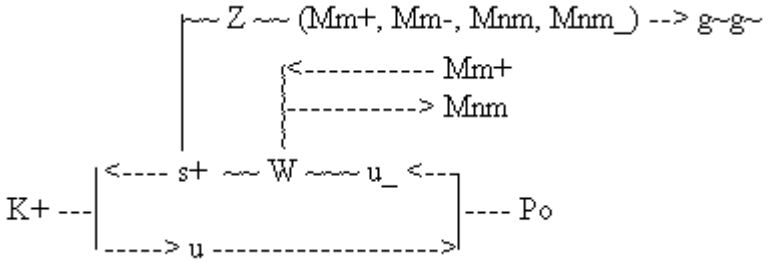
The quarks loop in time forming the negative pi meson. The (W) loops a muon antineutrino around, in the process amping it into a muon. It also passes the (d-) quark' s negative charge over to the muon. Note the gravitational slingshot effect the heavy (W) particle often has. This slingshot effect is a typical (W) boson function. The (Z) boson does it also, but without the stepping function.

Here is a Sigma minus decay pattern, resulting in a neutron and a negative lepton:



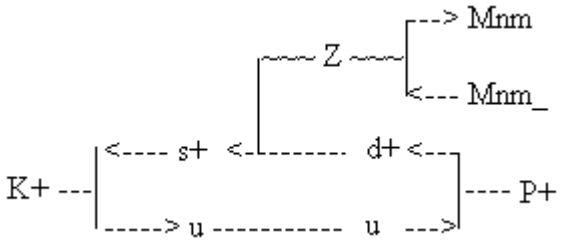
Here the (s-) quark decays dropping the Sigma into a neutron (Mn). The (W) boson pulls off the muon and an antimutrino, transmitting the (s-) quark' s negative charge to the muon. Later the muon decays into an electron. The antineutrinos mix with the lepton energy exchange as the muon decays. This shows the other way a (W) boson operates -- downstepping quarks by pulling off lepton whorls, and then stepping them down to electrons or positrons and neutrinos. The neutron later beta decays.

Here is a positive kaon interaction:



Here we see a (Z) boson peeling off a muon pair and mutrino pair from an (s+) antiquark. Then the (W) boson drops the positive Kaon' s (s+) antiquark to a (u_) antiquark, pulling off an antimuon and mutrino. The antimuon in the (W) boson interaction carries away the positive charge. The extra muon pair and mutrino pair annihilate into chargeless photons (g~ g~) via the (Z) boson interaction, releasing the extra energy of the Kaon as it drops down to a lighter neutral pion. The pion then decays and all that remains is the antimuon, that goes down to a positron, dropping neutrinos along the way. Finally the positron annihilates with an electron.

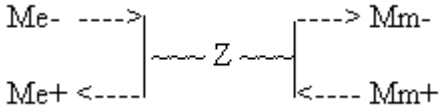
Here is an example of a positive Kaon decay pattern that is apparently NOT allowed:



The problem here is that there is no way to go from an (s+) quark to a (d+) quark. The difference between (s) and (d) quarks is that the (s) is loaded with muon energy, and the (d) is loaded with electron energy. The muons must first leave the quark ensemble as muons, and then they can decay into electrons. So the positive Kaon prefers to drop its charge onto a muon packet that leaves via the (W) mechanism rather than using the (Z) mechanism and leaving the charge with a pion.

The (Z) mechanism works by pair creation/annihilation and, like the (W), is also a step-up/step-down transformer particle. The (W) passes on charges like a catalyst. The (Z) differs from the (W) in that it does NOT transmit charge. Compare the two examples above. Notice that the proper (Z) interaction only carried off energy, and not charge. In pair creation and annihilation, the charges are always balanced.

The (Z) boson is closer to the photon-coupling interaction, and there is always a certain amount of background (Z) interaction in any photon-dominated interaction. At high energies (Z) dominates, and photon coupling accompanies. Here is a sample of a (Z) interaction. This can go either way, depending on the energy. To the right is formation, to the left is decay. The (Z) can take a particle pair right down to a photon pair, because the charges balance.



Further research is needed to fully understand the role of the D-Shift Operator in these functions, although it seems reasonable that the bigger boson would take on the responsibility for pair production and annihilation. Both the (W) and (Z) intermediate bosons are doing energy step-up/step-down transformations, which is just what the D-Shift Operator does in mathematical space. This may be the connection.

We see that gravity in the form of the (G) quanstant plays a key role in the structure and operation of the (Bu), (Z), and (W) bosons. The photons do not play this game of operatiing on mass, because they are massless. The gravity-operation bosons are all bosons that carry "mass". The photons have no rest mass.

When we say that the (Bu), (Z), and (W) have "mass", this is actually a bit misleading. We often associate mass with stability. Perhaps this is a misconception. You will never see one of these particles hanging around. They are highly transitory. It turns out that EVERYTHING is highly transitory, even the apparently stable proton. Therefore it is better to think of these particles as big bubbles of energy that well up from the vacuum state to echo the energy transitions that occur among the particles. This is simply an expression of Newton' s third law of action and reaction. If you drop a rock into the water, there is a kerplunk, and then a big glob of water rises into the air for a moment. Then the water settles back down. In other respects these heavy bosons are no different from photons. The only remarkable thing is that the heavy (Bu) bosons can form a pair that finds a stable range of equilibrium. This allows matter to build into complex structures.

Now let' s step back and go abstract again for a moment and get our principles laid down for the role of quantum gravity in connecting the mental and physical worlds.

Our theory of quantum gravity at this point is based on the principle that pure awareness has the option to exercise decision-making through the **will**. This process occurs through the cancellation operator and the resulting boundary-forming operation. This operation of forming mental boundaries is called **definition**. The process of definition generates **bias** in pure awareness. The awareness is no longer undefined. The loss of equilibrium causes flow of awareness. The flow of awareness through a boundary is called attention. Attention manifests as desire and resistance. Desire and resistance are the two conjugate aspects of the same bias operation. Desire is an attraction toward a particular creation. Resistance is pushing away from a creation. Desire and resistance are conjugate forms. This is what we mean by bias. Another word for bias is **identity**. Attention with bias unknowingly and automatically generates a creation of identity on the attention itself. This identity is the **observer**, the participant in creation who either just watches or watches and then gets actively involved. Attention, attracted

to a creation, flows in that direction. This is the beginning of **gravity**. A subjective synonym for gravity is **seriousness**. Seriousness means that attention has become **fixated** on a particular creation and thus biased from its natural state of dynamic equilibrium.

The more attention flows into the boundaries of a creation, the more solid and "real" that creation becomes. The natural state of awareness is to be undefined. This is its state of equilibrium. Therefore, as attention flows strongly into a creation, the creation responds with an equal and opposite reaction. The creation develops a bias for the identity that attention has unknowingly created for itself. The echo of biased attention that comes back to the observer from his creation manifests as gravity.

We only experience that all physical bodies attract gravitationally and there seems to be no "antigravity" force. The true antigravity force is the force of desire that generates the solid matter in the first place. When the observer tires of what he originally desired, he wishes it would go away. Unfortunately wishing something away does not work. It is just another desire that creates another creation. But this creation is resistive and pushes against the prior creations. This generates kinetic energy. This is a secondary form of antigravity, the physical form of gravity' s conjugate form.

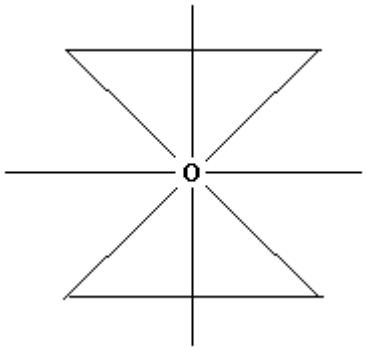
The only way to get rid of solid creations is to experience them. Pushing them away or wishing them away just complicates things by getting them all moving around and piling on top of each other. But this is a problem of psychology rather than physics. Techniques such as the Avatar Creation Handling Procedure can handle such problems easily. Our goal in this stage of our discourse is to understand theoretically how gravity works in the physical world. We discuss the mental aspects only so that we understand intellectually the source from which the "mysterious" force of gravity originates.

We have shown that mental space can be interpreted either vaguely with general concepts, or through mathematical precision. Mathematical models include number space, algebraic space, or geometric space, and so on. All of these mathematical mental spaces are equivalent and map to each other. We have shown the relation between mental space and physical space. The two are also transformations of the same system. The transformation operator lens of consciousness turns orderly, discrete mental objects into random collections of statistics, and mental continua composed of random and unpredictable sips and gulps (irrational values) into predictable wave functions.

We also saw that discrete physical events or objects are described by quantum statistics that multiply to form probabilities within an ensemble of possibilities. Continuous physical creations are composed of unquantized components that add up to unity. We can now include the property of mental bias that shows up in the physical world as gravity. Electromagnetic biases are secondary tendencies generated by resistance. Resistance is the second level of desire. Electromagnetic resistance generates the mechanical forces of physics that show up in dynamic and static systems at all but the largest and smallest scales (where gravity dominates.)

The way gravity manifests in the mental world is through bias. Bias is a distortion of equilibrium that drags everything toward a particular focus of attention. This bias can be represented mathematically in number theory, algebra, or geometry. Geometry is a simple way to visualize, so we will use geometry to develop our theory. We could use field theory, but that is not necessary. Bias in geometry manifests as a distortion of shapes. Topology is a field of geometry in which one learns to identify common structures underlying distorted shapes.

One of the simplest systems of geometry that demonstrates the way distortion works is the conic section. To make a cone with a pair of conjugate nappes, mark a point O on a straight line, and then generate a second line normal to it through point O. We then bisect the right angles and generate two more lines passing through the bisections. The first two orthogonal lines form our "transcendental" reference frame. The second two orthogonal lines represent our relative frame. We then rotate the relative pair of lines within the transcendental frame pair. The result is a double napped cone that looks like a very straight hourglass.



Gravity Cone

If we then allow a plane to intersect this "hourglass" at various orientations, the intersections form a set of shapes that include a point, a line, a circle, an ellipse, a parabola, and a hyperbola. The various curves can have a range of eccentricity and scale. All of these represent the various manifestations of gravity. A point is a singularity, a black hole that lies in the center between the two nappes. A line is a photon trajectory that runs tangent to the cone. A circle and an ellipse describe various possible orbits of one object around another. Circular orbits are always very balanced kinetically, but the masses of the two objects may be very unbalanced. For example, some planets and moons have nearly circular orbits around stars. A parabola represents an object that is moving "parallel" to the "opposite" cone edge photon line of a singularity (when viewed from the intersecting plane but outside the cone) and thus never enters an orbit but just swings by a gravity focus. A hyperbola represents an object that is moving "parallel" to the frame of a singularity. It also never enters orbit but pushes away. The hyperbola is an expression of observer resistance. The parabola is an expression of

physical resistance in the form of inherent kinetic energy that exceeds the gravitational attraction. The greater the kinetic energy difference, the farther away from the singularity the parabolic trajectory will swing in its parallel path.

Each type of gravitational interaction involves a conjugate mate. The "degenerate" singularity in the center point is its own conjugate. Each of the others has a mirror reflection of the upper nappe in the lower nappe.

We could define our cone in other ways. For example, if our vertical frame is in the time dimension, then the upper nappe goes into the future, and the lower nappe goes into the past. This is a special cone called the light cone. There are several ways of setting it up. We can let the speed of light (c) be the tangent to the cone. All group waves move inside the cone. Slowly moving objects stay close to the vertical time axis. Infinitely fast phase waves would follow the "horizontal" space axes. The light cone separates motions into timelike and spacelike. Timelike motions stay in the cone, and spacelike motions stay outside the cone. Light stays on the cone' s surface.

However, in our model we are taking our cone to be the gravity cone not the light cone. All objects must move on the surface of the cone. This includes everything from photons to black holes, to stars and planets, to subatomic particles. The particular gravity relationship of any pair of objects determines their trajectories as they move on the cone. Notice that I said "pair" of objects. A single object always sits at the center of the cone. Its gravity field is degenerate. As a lone individual without a partner, it has no gravity experience. It just sits there. Actually it is not alone but has merged with its partner and may be quite happy!! The central point corresponds to an observer sitting in equilibrium inside a black hole. He has fully experienced everything, and has no external world. Gravity is null for him.

Balanced orbits come the closest to recapitulating the singularity equilibrium while still having a pair of objects interact dynamically. The circular orbit passes at an interval always equidistant from the singularity. The two foci of the circularly orbiting objects overlap in the center where the black hole should be. The orbiting objects float like a halo above (and reflected below) the singularity of the cone, and their orbits are parallel to the horizontal axes.

What makes the objects orbit is kinetic energy. Without that the two would move to the singularity and behave as if they were a single particle with null gravity. The kinetic energy acts as antigravity and pushes the objects apart from each other and up the vertical axis. This tells us that the vertical axis of our frame can be thought of as a dimension of kinetic energy. If the kinetic energy is somehow lost, the objects will gradually spiral down the cone' s surface like a couple of marbles spinning in a cone-shaped bowl. Finally they will settle into the center.

Elliptical orbits occur when there is eccentricity. Objects in elliptical orbits move up and down relative to the horizontal axes as they go around the vertical axis. This means that there is an energy oscillation in the system between kinetic and potential energy.

The reservoir of potential energy is set by the amount of mass energy stored at the center of gravity. As an object moves up the vertical axis, it transforms its potential energy into kinetic energy.

An object that has escape velocity follows a parabolic trajectory.

* E = (Mx (V^2) / 2) - (G Mx My) / R. = 0. (We set energy = E = 0.)
* Vesc = (2 G My / R)^1/2.

The conjugate trajectory of an object with escape velocity is an object that lacks orbital velocity and falls. It also follows what looks like a parabolic trajectory, but is actually a piece of an elliptical orbit in which

* Ve < Vc < Vesc.
* Vc = (G My / R)^1/2. (Circular Orbit)

The circular orbit and the parabolic trajectory are both idealizations that are held only momentarily by real world fluctuating objects. Elliptical orbits are in the range from 0 < Vea < Vc < Veb < Vesc. The difference between the two elliptical orbits (Vea) and (Veb) is simply a relative switch of the foci. Trajectories in which Vh > Vesc are hyperbolic.

By convention in our discussions we will always locate the massive gravity well at (F1), This appears to govern the motions of the other orbiting bodies. However, when the orbiting bodies have the same mass as the gravity well, we realize that the mass is not the ultimate governing factor, but simply tends to act as a focus for attention.

A parabolic trajectory runs parallel to the edge of the cone. Light has maximum escape velocity and tends to run at or near the tangent parallel to the edge. Unless the center of mass is very great, it easily escapes and moves into outer space.

The hyperbolic trajectory runs parallel to the vertical axis or at an angle that keeps the intersecting plane from intersecting all around either nappe. So there is a conjugate reflection in the lower nappe. Since the vertical axis represents the amount of kinetic energy, the hyperbolic trajectory comes from the observer' s desire and resistance, his bias that pushes objects away and abandons them. The asymptotic nature of the hyperbola expresses the unwillingness of the core center to accept the object. It can only get so close, and then it is pushed away.

The parabola and hyperbola seem like open trajectories. In a sense this is true. However, there is a funny twist to the cone structure that relates to principles of projective geometry. The upper nappe of our hourglass represents physical objects, and the lower nappe (with negative kinetic energy) represents the subjective world of thoughts and feelings, the inner world of the observer. It is a mirror that exactly reflects in its conjugate geometry what the observer experiences. Your world is exactly what you experience. The singularity at the center is the point of now, the present moment

of experience where the mental world meets the physical world.

The circles and ellipses in the lower nappe represent situations that the observer experiences repeatedly, over and over. For example eating and sleeping and breathing, and so forth. This also includes day and night, and the coming and going of the sun, moon, planets, and stars. The parabolic trajectories are experiences that only seem to happen once and then pass on. People and situations come into one' s life, and then, after a while, they are gone and do not seem to repeat themselves. You don' t do anything particular and they pass on. Hyperbolic trajectories are similar to parabolic trajectories, but they seem to come right at you. They look like they are headed for a collision, so you tense up and push or flinch or react in some way. Then they swing by and move away. The energy of resistance sends the object swinging back out toward its asymptote. However, at the same time, you have sent a conjugate impulse of energy deep into your own mental awareness closing on an asymptote somewhere deep in the depths of your mind.

Now here' s the twist. The cone is a projective cone. An hourglass nappe extended to infinity wraps around and comes back through the opposite nappe. If this sounds puzzling, go back to the discussion of the principles of projective geometry and redo the exercises regarding projections through infinity. Since the two conjugate wings of the parabola and hyperbola are spreading farther and farther apart, one toward infinity and the other toward an asymptote, we have a four-wave mixing phase conjugation system! "Infinity" is not infinitely far away. It is as if there is a mirror set up above and below the cone. The mirror expresses the principle "As above, so below." The mirror reflects the wings back down (up) toward the center. The result is that the parabolic trajectory is just a super big elliptical orbit. In the quantum world, any random free electron can drop in and replace an electron that has left the system when the energy settles down.

There is not an infinite amount of energy available, even for the whole universe. If so, the whole thing would collapse into the center. When the parabolic moving object reaches the point where the potential energy of its reservoir runs out, then it falls back again. But, because it is running parallel to the opposite edge of the cone (the tangent plane parallel to the parabolic trajectory plane), it will not hit the center unless it has been modified by some other interaction and shifts to running parallel to its own edge. Such a modification might involve a scattering event or a warping of the trajectory. The only "parabolic" trajectories that can hit the center are pure light rays. These are the only things we can perceive. Everything else is imaginary. We can only perceive as the center the bundles (lines passing through a point) of light rays that converge on our point of being.

A hyperbolic trajectory can come as close as it pleases. Closeness is relative. But again, it only actually contacts the center if it is degenerated into a pair of light rays that run along the cone' s edge and intersect at the center. So a hyperbola degenerates into a pair of degenerate parabolas. Then we experience it. Otherwise it comes in close and then is pushed away. It is like doing pushups. You have to pump the energy. When you resist the hyperbola and keep it floating and rocking in its asymptotic cradle, you

expand your own sense of self from a point into an area defined as lying between the two vertices of the closest hyperbola trajectory. This kind of life tends to become based on fear. It is defined not by the self deliberately, but by the near misses of heavy flying objects. It is a life defined by dodging bullets.

The subjective side of the story is also interesting. Parabolic "orbits" slice through our lives now and then like comets. But then there are the monsters from the deep that come welling up to shake our definition of self from below, even as we are dodging falling rocks from above.

In a collider experiment the area between the hyperbolic trajectories is called the scattering cross-section. When high-energy particles moving at nearly light speed (almost following the plane tangent to the cone' s surface) are put on a collision course they scatter off the interaction zone. If they penetrate too far, they get into the Planck region. At that scale, Heisenberg' s uncertainty takes over and the identities and locations of particles become unclear. The only thing that is clear is that conservation prevails in the end. If the colliding particles are bosons such as light-speed photons, they go right through each other. But fermions appear to scatter. Or do they? Maybe they DO go right through each other and are distorted by the heavy gravitational field. Thus they emerge at different angles and masses and velocities.

Astronomers have found galaxies that act as gravitational lenses bending the light from stars behind them. This is a milder form of the same phenomenon. Einstein' s great prediction of the gravitational bending of starlight by the sun' s mass is another example.

The (W) and (Z) bosons form the massive anchor in the vacuum state that magnifies the total lensing effect of the colliding particles' masses. Inside the proton the (Bu) Bosons and the sQuark center form the anchor for the fundamental fermion.

In our model of the gravitational interactions of mental-physical space the horizontal axis represents the equilibrium point of the vacuum state. The vertical axis represents the level of kinetic energy. Distance on the horizontal axis represents displacement in space due to kinetic energy. The more kinetic energy available, the more expanded the system becomes in space. The origin of the kinetic energy is the bias of the observer. That is why no one can ever find its origin in the physical universe. The origin is at the "origin" of the model, right at the center of mass. The vacuum state vibrates according to the bias of the observer and his "abandoned" creations that are bouncing around in energy space. Ultimately the observer is the source of all gravity. By relaxing into his center of mass, he can turn off all the gravity and float in the vacuum state.

Another way of interpreting the "scatter" of the colliding particles is that they suddenly raise the mass density in the Planck region above the level that is tolerated by the equilibrium of mass density in the current universe. So the excess energy rebounds back out. The proton and its stable atomic increments are the only possible outcomes. Electrons, neutrinos and photons pick up anything left over.

We know now that electrons are point vortexes of energy, and neutrinos are quasi-particle packets of mass-energy. So what is the gravity particle, the particle that tells the various objects moving about on the surface of the cone where they should be? It must be a boson. Let' s find it in our diagram. To do that, first we should give a rigorous definition of the various trajectories.

PARABOLA -- This is a curve defined by a set of points on a plane (the plane that intercepts the cone) that are equidistant from a fixed point called the focus and a fixed line called the directrix which is outside the parabola curve. A conjugate parabola occurs as a mirror image in the lower nappe of the cone. The parabola has a second focus at infinity (the mirror limit of kinetic energy in our system.) Parabolas have a reflectivity property such that any ray parallel to its axis reflects off the curve to the focus. Thus parabolic mirrors can be used to focus energy, motion or other phenomena from a parallel flux to a point. Because the distance from a point on the curve to the focus and via the shortest path to the directrix is equidistant, the eccentricity of a parabola is always exactly 1.

ELLIPSE -- This is a curve defined by a set of points such that the absolute distance between any point on the curve and the focus point (which is outside the curve and not on the directrix) equals the eccentricity times the length of the perpendicular (shortest distance) from the same point on the curve to the directrix. The eccentricity of an ellipse is restricted to a value between 0 and 1. When the eccentricity is 0, then the ellipse becomes a circle. As the eccentricity approaches 1, the ellipse gets more and more stretched out. Orbits with eccentricity approaching one are very eccentric. At the limit 1 the ellipse degenerates into a line (or a parabola). The ellipse has a second focus and a second directrix mirrored on the opposite side of the ellipse. It also has a conjugate in the opposite nappe. A ray from any focus reflects from the curve back to the other focus and the length of the two rays is constantly equal to twice the semimajor axis. This reflecting structure gives it a special "whispering" property. Energy echoes back and forth between the foci from all directions.

HYPERBOLA -- This is a curve defined by a set of points such that the absolute distance between any point on the curve and the focus point (which is not in the curve or on the directrix) equals to the eccentricity times the length of the perpendicular (shortest distance) from the same point on the curve to the directrix. The hyperbolic eccentricity is greater than 1. In our model we orient the hyperbola so that the energy axis is the transverse axis and the "space" axis is the conjugate axis. So there is a conjugate reflection of the upper nappe curve in the lower nappe, and it also has a focus and directrix. The two directrices are parallel. The edges of the cone form the asymptotes of the hyperbola. The hyperbola also has a reflection property such that if you connect any point on the curve to the two foci, the tangent to the curve through that point on the curve bisects the angle between the two lines to the foci.

Each conjugate intersecting plane of a parabola, circle, or ellipse stays only in its respective nappe. The parabola' s intersecting plane has the additional restriction that it is parallel to a plane tangent to the cone. Thus each of these has a separate conjugate in

the opposite nappe. The hyperbolic intersecting plane has an angle that cuts both nappes.

Now that we have precise definitions of our conic sections, we can ask where would we find the graviton? Let' s explore. The positive and negative energies of a moving body tend to gather at the foci of its elliptical orbit. The gravity cone only represents the motions of a single body. Each body has its own cone. A massive gravity well cone tends to be very near the focus of its satellite' s cone focus. Each particle with mass moves on a curved trajectory on the surface of its gravity cone. A photon moves on the edge of its cone in a straight trajectory. It is massless. The more massive a particle is, the more it hugs in close to the center of mass between the nappes to get close to a focus. The center of mass is just that, the point in the center. The size of the physical world is an exact reflection of the size of the mental world. The two nappes are conjugate pairs, and their conjugate directrices are parallel.

We have covered the cone' s center, its surface, and the foci.

The eccentricity is a distortion factor that refers to imbalance in the energy that causes oscillations in the motions. An eccentricity of 1 means the energy passes through the system in a balanced way without oscillating. An eccentricity of 0 indicates that the energy has a smooth kinetic oscillation at a fixed potential level. Circles have eccentricity 0, and the black hole singularity also has the eccentricity of 0. It is a degenerate circle. Eccentricities between 0 and 1 mean that the potential energy fluctuates up and down, but is stable. In an elliptical orbit variation in the horizontal component dominates over the vertical component. Eccentricity greater than 1 indicates that variation in the vertical component of the oscillation dominates over the horizontal component.

The only other component we have not mentioned is the directrix. This is not a point, but a straight line that lies outside the trajectory. The directrix is transcendental to the perceived action. It does not get directly involved. Yet it controls the whole operation. It is the lady who directs the show.

The directrix and her parallel conjugate directrix act like a pair of mirrors establishing a resonant cavity in which a standing gravity wave forms. This wave defines the "wavelength" of the graviton for a particular system. In our space a photon takes the shortest path to its destination. In quantum mechanics we discover that the photon actually takes all possible paths, but most of them cancel out and only the ones that build the straight-line path have constructive interference. The same is true of the graviton. The graviton interaction goes in all directions, but all directions interfere destructively and cancel except for the direct line shortest path between the directrix and the orbiting object (e.g. a planet). The relationship between that line and the physically measurable line between the orbiting object and its focus, which is where the center of mass gravity well is located (e.g. a star) is determined by a constant value for that system -- the eccentricity.

When the graviton propagating from the directrix "hits" the mass-energy medium of a massive object, it "refracts" just like light does when it passes from a medium of air into a medium of glass or water. A refracted ray of light has an index of refraction. A refracted graviton ray is bent by the index of eccentricity for the particular orbit system. It travels the shortest path that is allowed by the eccentricity. Thus a graviton propagates as a wave function from a directrix, through a particle in a trajectory, to a mass-energy focus point.

The directrix is parallel to the "spatial" kinetic gradient in our model. It is a line that fixes a certain quantum potential energy level continuously for the system, although it can be any distance from the origin. Similarly a photon always moves at (c) although it can have a continuous gradient of frequencies or wavelengths. A directrix has a fixed potential energy value. And it has a conjugate directrix on the opposite side of the boundary. In a circular orbit the two energy values are the same and the eccentricity is 0. In an elliptical orbit the energies oscillate between two values.

Each directrix functions like a mirror. There are two mirrors in a system. In a parabolic or elliptic system the mirrors embrace the moving particles between them. In a hyperbolic system the mirrors define the boundary of the interaction "cross section", the no-no zone into which the particle may not enter.

We mentioned that we can interpret a cone in many different ways. We can also assign different dimensional units to it. For simplicity we want our results to be all in the same units. For example, we can consider all the dimensions in terms of distance. Then the lines on the cone represent the momentary positions of objects in their spatial trajectories. The dimensions can be anything so long as they are consistent. They can represent forces, distances, energies, amounts of money, -- anything, so long as they are consistent. These various labels we put on the model are just transformations of the same dynamic relationship. So we can visualize the whole thing spatially, and then transform it into an energy model.

(C) is the distance from the satellite to its focus, and (A) is one normal component of (C), and (B) is the other normal component of (C), and (D) is the shortest distance from the satellite to the directrix mirror, and (Ke) is the eccentricity. By the Pythagorean relation we get:

* C^2 = A^2 + B^2.
* Ke^2 D^2 = (A^2 + B^2) = C^2.

(Ke) is a dimensionless factor, (A) and (D) are parallel. (B) is normal to (A) and (D). For example, if Ke = 1/2, A = 3, and B = 4, then D^2 = 100, and D = 10, and C = 5.

^ (Ke D) = C.
^ (Ke D)^2 = C^2.

This equation provides the invariance that we are looking for. Each dimension of the

conic system represents a measurement in space. But the dimension is arbitrary. We can do a global transformation of our units to any other set of units, including time, velocity, energy, and so forth. (C^2) is the square of the distance between the center of mass body and the satellite body. This reminds us of Newton' s gravitational equation.

* Fg = G M1 M2 / R^2.

In this equation the R^2 is the same as the C^2 in a conic section. Thus,

* R^2 = C^2 = G M1 M2 / Fg.

Suppose we substitute (G M1 M2 / Fg) for the (C^2) component of our diagram -- A^2, B^2, C^2, D^2.

The next question is: What are the values of M1, M2, and Fg?

We are looking for the quantum unit of gravity. We already have our principle of "gravitational" invariance for gravitons dictated by the directrix.

* Ke^2 = C^2 / D^2.

Expressed in terms of (C^2) we get:

* C^2 = D^2 Ke^2.

We substitute in Newton' s law of gravity:

* (G M1 M2 / Fg) = D^2 Ke^2.

(Ke^2) will be a constant. We are looking for the graviton particle. So we want to solve for (M1 M2).

* (M1 M2) = (Fg D^2 Ke^2 / G).

We know that the force (Fg) is energy per meter. Because we have substituted Newton' s law for (C^2), we are still operating in distance values for A, B, C, and D. Therefore (D^2) is still in meters squared. This means that the expression (Fg D^2) represents an "energy-meter".

In quantum mechanics we find by experiment that energy occurs in quantum units. These units are usually written as "energy-seconds" (H) or as "energy-meters" (H c). If we are looking for the quantum unit of gravity, then we must substitute into our equation the **minimum quantum value** for energy-meters -- (H c).

* (M1 M2) = (H c) (Ke^2) / (G).

What we have now looks just like the Planck Mass that we derived earlier in this section. There is a constant (Ke) involved. Now we can make a leap of assumption similar to Newton' s leap of assumption when he assumed that the gravitational force between two bodies was mutual and set his gravitational constant at a universal value (G). We assume that this indeed is the Planck Mass in the form of the (Bu) Union pair.

Our justification for this is that it makes no sense to assume that the gravitational boson is smaller than a photon, which seems to be what most people do. The photon has no rest mass and has energies that fade away as the wavelength gets longer and longer. The limit for the photon energy is just empty space with perfectly straight oscillation wavelengths. Such 0-energy photons are constantly exchanging between any two particles, and we call that empty space. It is a virtual transaction in which nothing happens.

Gravity affects objects with mass. We would expect it to come from a source of mass. All masses in our universe are built from protons. Protons are built from (Bu) Boson pairs. Thus we choose the Planck Mass (Bu) Union Boson pair as our graviton.

We determine the value of (Ke^2) as follows.

* Bu^2 = (H c a) / G = (H c Ke^2 / G).
* Ke^2 = a = (137)^-1
* Ke = (a)^1/2 = (137)^-1/2 = 11.7047^-1 = .0854.

The eccentricity constant for the graviton quantum-unit conic section equals the **square root** of the electromagnetic coupling constant! This tells us the internal structure of the warping of space-time, because we know the structure of (a).

* a = e^2 / 4 P eo H c.

Along with this finding we come to the revelation that the Union ensemble has a quantum uncertainty that is somewhat akin to Heisenberg' s uncertainty. The ensemble only makes sense as a couplet, a pair of masses. One mass alone exhibits no gravitational influence on anything, as there is nothing to influence. It takes two to tango. The graviton, like the photon, always appears as a conjugate pair. However, just like our Heisenberg relation and the Velocity Equation that we discussed in detail before, the mass components of the ensemble have an inverse relationship that is governed only by the (Bu) boson' s quantum limit.

* (M1)(M2) = Bu^2.

Compare this to the Velocity Equation.

* (Vg)(Vp) = c^2.

We can do the same thing in algebra that we can do in geometry. These two equations

are essentially the same equation cast in different dimensional units. (M1) can be equal to (M2), and, on average, this will be so. But quantum fluctuations allow the values of (M1) and (M2) to vary widely within the limits of mass-energy. We only know that the ultimate quantum value is like Heisenberg' s (H) uncertainty and the Velocity uncertainty of (c^2) components -- it involves a pair in an inverse relation. For example, neither mass component can be smaller than the smallest quantum unit of mass -- the neutrino. If we take (M1) as the smaller of the two masses in case of inequality, then we get the following relationship.

* M1 >= (H / c %) >= (10 / 9)x10^-43 kg.
* M2 <= (c^2 % a / G) <= (P^3)x10^25 kg <= 3.11x10^25 kg.

This value is pretty close to our threshold for the gravitational generation of stars. It differs only by the **fine structure constant**. This may be a quantum uncertainty spread, a window in which the celestial body decides whether to be a star or not.

We now have a theoretical derivation of the quantum unit of the graviton, with a formula for computing its wavelength in any given gravitational system. The pair of directrices set up the graviton' s standing wave, resonating in the system as between a pair of mirrors. The mirrors can be embracing the system like a pair of brackets [ ] in the cases of circular, elliptical, and parabolic systems, or they can be in the central region reflecting outward] [as in the case of a hyperbolic system.

We have now established a simple and elegant theory of quantum gravity that displays the property of invariance demanded by a quantum system, and avoids all the complications of superstrings, twistors, and other such devices. As in the case of Einstein' s Special Relativity Theory, we use only high-school level algebra, geometry, and the Pythagorean theorem. All of Newton' s classical mechanics and Einstein' s relativity, including both special and general relativity with its tensor calculus, can stand as is. So can most of modern quantum mechanics, with the few revisions we have suggested, such as the modified quark theory. We even have a model for a field that generates particles with mass from massless "seed" particles and properties and has an underlying property of quantum foam. By a simple automatic transformation this quiescent field comes alive and vibrates with all the particles, forces and interactions at just the right masses. The problems of quantum field theory are thus resolved.

We get our invariance directly from the geometry of conic sections. The geometry of conic sections holds regardless of the units that we use for the various components of the system, as long as the units are consistent throughout. Therefore, the same system that works for pure distances or velocities that contain no masses will also work equally well for a system that involves interacting masses.

The fundamental graviton quantum falls naturally out of this invariance principle when the energy and light-speed and gravitational constants are applied to the geometry relations of the conic section geometry. Along the way we derive a new graviton coupling constant, and discover that it is related to the photon' s coupling constant, but at a

subtler level. It underlies the quantum fine structure constant.

* Ke = (a)^1/2 = (137)^-1/2 = 11.7047^-1.

This constant represents the eccentricity of a graviton-oriented gravitational system. The variable eccentricity factor occurs in all systems based on conic sections, and remains constant within a particular system' s total operation. In other words the eccentricity constant represents the gravitational distortion of space-time that a pair of gravitationally interacting masses generates. There is a specific (non-universal) value of eccentricity that holds for any specific gravitational system just like the gravitational constant (Kgs) is defined with any specified unchanging core -- say a star, (s) -- and all the worlds (w) that orbit that star adhere to that constant.

* Fps = Kgs Mw / r^2.

Here (Mw) means the mass of any planet world in the particular solar system.

* Kgs = 4 P C^3 / T^2.

Here (C) is the semimajor axis or distance from the focus to the midpoint of the orbit, and (T) is the period of the orbit.

Newton saw that there is a universal constant (G) that holds for all systems, regardless of the relative masses. This was Newton' s great realization -- when he saw that the system was mutually interactive.

* Kgs = G Ms.

Newton brought the star' s mass into the picture and proposed a universal constant (G). The trade-off to his approach is that the masses can now have ANY value that is possible within the range available. But that is OK. We have a universal invariable constant (G), which tells us an invariant factor for all gravitational systems and thereby unifies them.

That' s how it works in quantum mechanics.

* **If you want invariance, you get uncertainty.**
* **If you want certainty, you lose invariance.**

It sounds wacky, but the point is that the observer must take responsibility and deliberately choose how he wants to look at the system. This then determines what he will see. So you end up only seeing what you are looking for in the first place!! So who' s in charge? You are!!

Our new universal constant holds only when we are looking at things in terms of the bigger picture of gravitons, just like Newton' s constant (G) only is needed when we want

to look at a more general picture outside of a single solar system. In one system, one local value of (Kgs) is sufficient. In all gravitational systems (G) is sufficient for describing the orbits of objects, but tells us nothing about the universal interaction of a gravitational system with a graviton. For that we need a new constant, (Ke), the constant of eccentricity. This constant unifies gravity with all the other forces and constants. Gravitational "attraction" is determined by the mass-energy potential. "Anti-gravitational" Inertial "pull" is determined by the kinetic energy of electrical systems. The two are equivalent, but opposite. They are a conjugate pair. Magnetic forces are secondary echo effects that show up normal to the other pair, relating according to Maxwell' s equations. They are due to further resistance. Each force -- gravitational, electrical, and magnetic -- is a residual effect of resistance, resistance of resistance, and so on. The so-called weak force mediated by the intermediate bosons is really a gravity-energy phenomenon as opposed to a gravity-mass phenomenon. A planet keeps recursively manifesting itself and its gravitational attraction. A (W) or (Z) boson is just an energy bubble that boils up from the vacuum state and then pops. So its gravitational effect is very transitory. Otherwise it is the same as ordinary gravity. It just operates in a short time frame and at a short distance interval. Gluons are theoretical particles used to explain theoretical exchanges of energy inside the nucleon. The force involved with the gluons is not a separate force. It is simply the harmonics of the interacting waveforms of electromagnetic force and gravitational force inside nucleons. With our model of the nucleon we can now construct a precise theory of Lens Harmonics that shows how each combination of quarks and nucleons occurs as a wave pattern of the lens vesicle and its surrounding structure.

In our model the actual graviton particle is the cone itself. This, of course, the observer sets up. The upper nappe is the physical gravity system, and the lower nappe is the mental world or consciousness of the observer. Properly the observer sits in the singularity at the center when he experiences. When he witnesses as a detached observer, he may take the viewpoint of the directrix. He may also take the viewpoint of a focus or the viewpoint of the intercepting plane, or of an object moving on a trajectory, or as someone outside the whole system watching it . . . .

The (Bu) ensemble appears moving on the surface of the cone. The cone is a non-local structure of geometry. It contains the whole "history" of the (Bu) ensemble' s time evolution, or any other gravitational system we wish to model.

Professor Penrose should like this idea of the gravity cone. He has a lot of fine intuitive ideas of how things should be. One of them is his intuition of the importance of the cone structure. Another one is the idea that the collapse of the wave function has something to do with the graviton. Unfortunately he got a bit carried away with his interest in asymmetry, complex fields and twistors, all of which are extremely fascinating but not germane to the quantum gravity issue. On the other hand, his discovery of quasi-crystalline structures and tilings is very much relevant, because the recently discovered occurrence of such things in nature is evidence of macroscopic non-local operations. Even Buckyballs fall into this category of non-locally generated objects.

To follow the graviton trajectory, refer to the appended drawing as you read the description below. A graviton trajectory is in hyper space.

In an elliptical orbit the resultant graviton wave (the graviton trajectory) passes from the directrix (D1) to the object (P) in the trajectory, curves with its own version of Compton scattering, and goes straight to the focus (F1). Then it "tunnels" straight to the other focus (F2), heads straight back to the object (P), makes a sharp turn and then via the shortest route, goes to the conjugate directrix (D2), from which it reflects. The wave reflects back and forth in this fashion between the directrices as the particle moves in its trajectory. The two directrices are like mirrors, and the tangent to the ellipse at the particle' s location acts also like a mirror. The bending of space/time occurs in the vicinity of the particle and at the foci. There the graviton trajectory bends as it slingshots around the energy node. The path from the two foci to the particle is a constant distance of twice the semimajor axis. A physical elliptical orbit is mirrored in the mind as a mental elliptical orbit with a mental particle.

* D1 --> P --> F1 --> F2 --> P --> D2 --> P ..... (See drawing, p. 13-60.)

A parabolic system does the same, except that the parabola acts like a beam splitter. The graviton goes from the directrix (D1) to the physical particle in its trajectory (P1). The wave splits and part goes to the focus (F1) and then passes along the axis of the parabola toward "infinity", shows up coming in the axis of the conjugate parabola, and goes to its focus (F2). From there it goes to the mental image of the particle (P2) and splits, part going to the conjugate directrix (D2) and part reflecting back to the physical object (P1). The other part goes straight ahead from the physical particle (P1), also to infinity and shows up partly reflecting off the conjugate parabola' s mental image (P2) into its focus (F2), and partly going straight to the directrix (D2). It echoes in this manner between the mental and physical states.

In the case of a hyperbolic trajectory the graviton wave-particle trajectory goes from the physical directrix (D1) to the physical particle (P), to its focus (F1). From there it tunnels along the axis through "infinity" to well up from deep inside the mind, arriving at the mental focus (F2), from which it refracts to the mental image of the particle (P2), bending again to reach the mental directrix (D2). It then reflects to (P2) and winds its way back. There is a bridge between (D1) and (D2). The axis tunnel goes both ways, through infinity and through the central region and the directrices. In this way the graviton reflects, passing between the subjective and objective worlds just like photons do with their conjugate pairs. The system works the same way hyperbolic mirrors do, using the principle of conjugate photons to explain the conjugate reflections. When the graviton leaves the directrix, it takes the perpendicular shortest path to the particle. Then it refracts, bending its path to head to the focus. The conjugate ray to the path from particle to focus is a ray coming into the convex "surface" of the trajectory. This conjugate graviton reflects off the particle and goes directly to the other focus. It appears that the back-propagating reflection off the convex side goes off into space, thus attenuating the system. That ray also loops around at "infinity" and eventually feeds back into the system coming in as the conjugate reflection into space from the mental

nappe. If that sounds weird, think of the directrix as having the property of a conjugate mirror. When the convectly reflected rays go off, they hit the directrix, which reflects them back to the respective (P1) or (P2) particle. Ordinarily the rays come in normal to the directrix, but not always. Study the diagrams.

* D1 --> P1 --> F1 --> F2 --> P2 --> D2 --> P2 .....

In tracing the paths we must remember that, like photons, the graviton rides on a conjugate quiff. It is running both directions at once. Also, like a photon trajectory, the graviton trajectory is the resultant interference pattern of a phase conjugated quantum bubble.

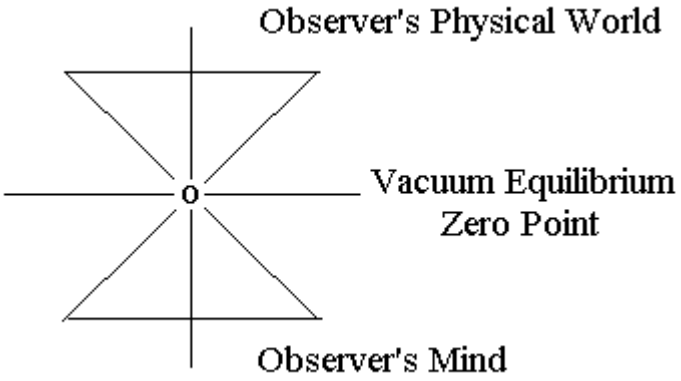
We have a final question about our graviton quanstant -- how fast does the particle exchange energy? Does it operate at light-speed as most physicists assume? To find out we can run a transformation on the graviton mass equation and recast it into the form of a velocity equation.

* (V1)(V2) = c^2.

This seems to tell us that both of the conjugate graviton waves can travel together at the speed of light, or they can "diffract" in such a way that one moves more slowly and the other moves superluminally, exactly like photons. The principle would also be the same. It implies the interaction of two or more waves. Looked at as a group wave, the ensemble moves at less than light speed. Looked at as a set of phase waves, each is moving faster than light. This is a function of the observer' s viewpoint.

But this is not the whole picture. Let' s go back to our concept of the cone.

The Gravity Cone



The cone is the non-local superstructure of the Graviton. When the Observer takes a particular viewpoint of the Graviton, this viewpoint smeared out through space/time becomes a plane. This plane intersects the graviton cone at some angle in the upper

nappe. Each plane has a conjugate plane that intersects the lower nappe. Hyperbolic conjugate planes overlap each other. The particular orientation of the plane' s intersection determines what the observer sees when he looks at something. The directices are sub-viewpoints set up in the intersecting planes. They act like mirrors reflecting the graviton energy back and forth in the observer' s field of vision -- that is, the intersecting plane. All the action that the observer sees, such as particles moving about, is on the surface of the cone where it intersects with the observer' s viewpoint plane.

With this model in mind, we can now analyze the full dynamics of graviton wave motion. Graviton wave components that move along the tangent edge of the cone -- if the observer' s plane touches the edge of the cone -- move at the velocity (c). Graviton wave components that describe curves on the surface of the cone are (Vg) group wave components. These are subluminal. The components in the upper nappe that are mirrored in the lower nappe are connected non-locally. They move in tandem like an image in a mirror, but that motion is independent of the distance between the objects. This is because the Observer' s viewing planes, which are also like a mirror set, unify them. One reveals a mental event, and the other reveals a physical event. The two coincide in the Observer' s consciousness. The wave forms that connect the upper and lower nappe are always superluminal phase wave components (Vp).

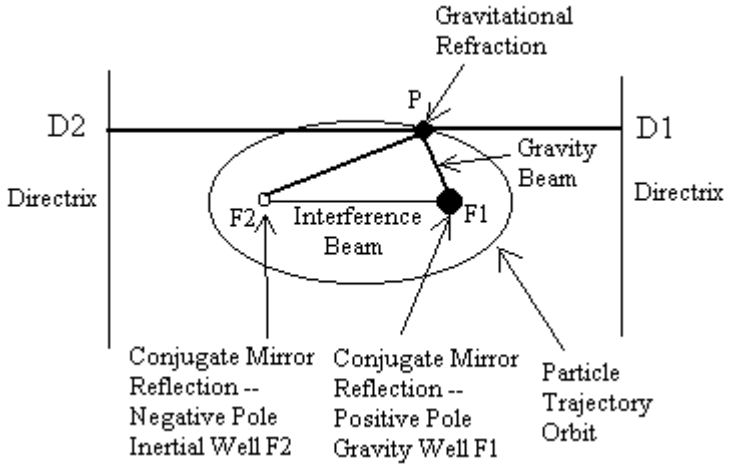
Of course, we are talking about and visualizing the whole model. This suggests that the Observer can take a viewpoint that is 3-D spatial or even 4-D time-spatial and holds the whole cone (mental and physical portions) in his awareness. In that case specific objects move at subluminal velocities, but the information of the whole comes to him in a simultaneous moment. This viewpoint is at the center of the cone or the center' s conjugate location, which is outside and embracing the cone.

Penrose has suggested that the physical evidence of a single graviton is the collapse of the quantum wave function. This appears to happen when a particle with a mass around that of the (Bu) particle becomes involved in an interaction. How can we test our hypothesis? The energy level of the (Bu) particle is 10.45x10^26 eV (1.045x10^18 GeV) on the average. This is way out of our league for the collider business. It is the energy level of the cosmic particle, the energy of super-gravity.

In our next section we will explore the strange phenomenon of the collapse of the wave function and its relation to quantum gravity. This will lead us to look at the physics of detectors and how we measure quantum events with macroscopic devices. This will also lead us to consider some of the fundamental principles of thermodynamics. Along the way we may consider some ways to finesse our way into a closer look at the (Bu) ensemble.

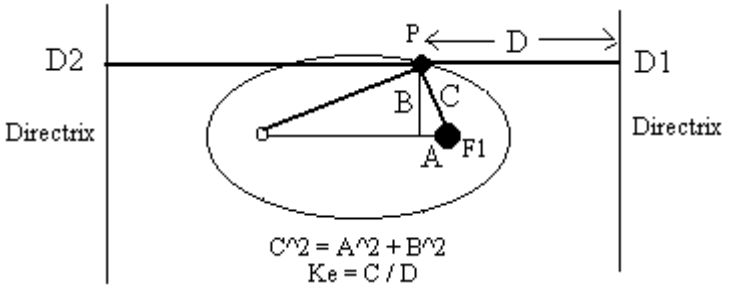
In the meantime we now have a model for the super-string and twistor and other mathematical and quantum mechanical and relativity experts to explore in terms of a theory of "Lens Harmonics". We can now describe in detail and with computer graphics the way in which the prototype proton system increments into its various atomic states. Another project is to generate computer simulations of how the quantum foam operates.

Another is to generate computer simulations of how the graviton field operates. Until we can get such simulations up, we have appended some crude sketches to give the reader an idea of what we are talking about.



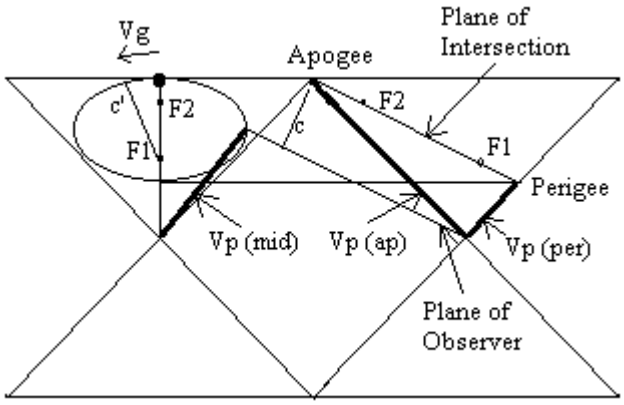
Path of the Reflecting Gravity Wave Form

D1 <--> P <--> F1 <--> F2 <--> P <--> D2 <--> P .....

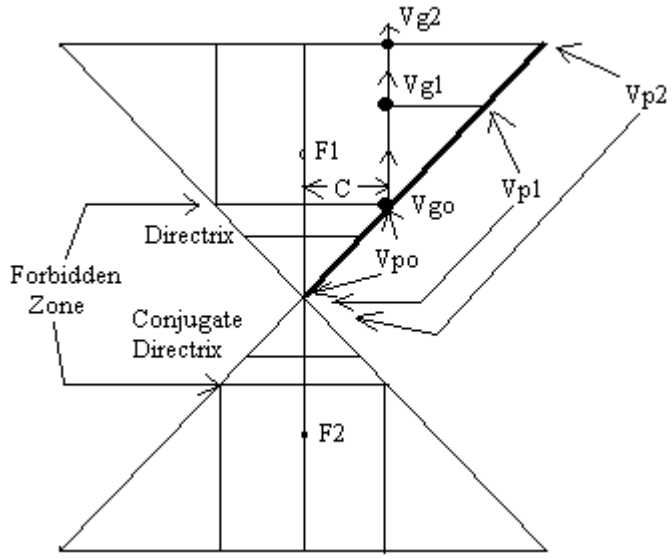


The Eccentricity (Ke) of an Orbit

The Geometry of Gravity Cones

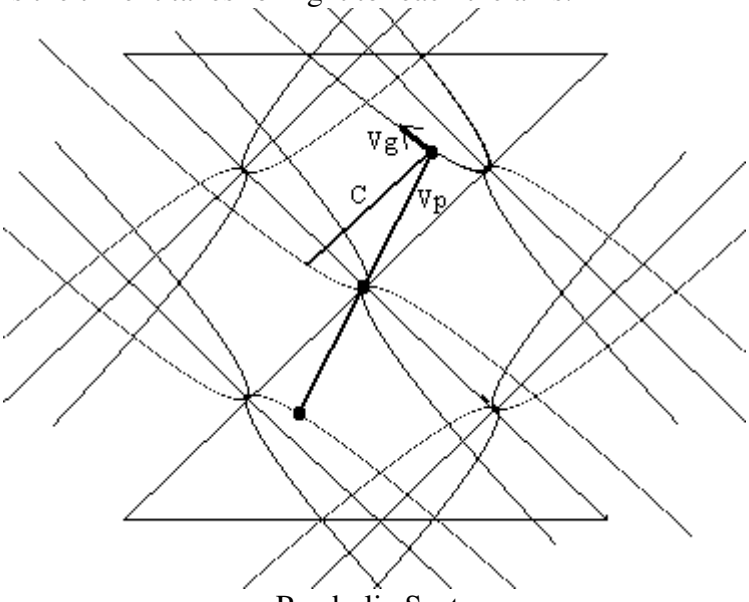


The slanted Plane of Intersection generates an elliptical orbital trajectory along the edge of the cone, shown here from two views rotated by 90 degrees. (Vg) is maximal at perigee and minimal at apogee. (Vp) is maximal at apogee and minimal at perigee. (Vg) is always less than (c); and (c) manifests as the distance between the Plane of Intersection and the Plane of the Observer. The latter is parallel to the Plane of Intersection and passes through the center point between the nappes of the cone.



Hyperbolic Trajectory
Parallel to Cone Axis, "Side On" View

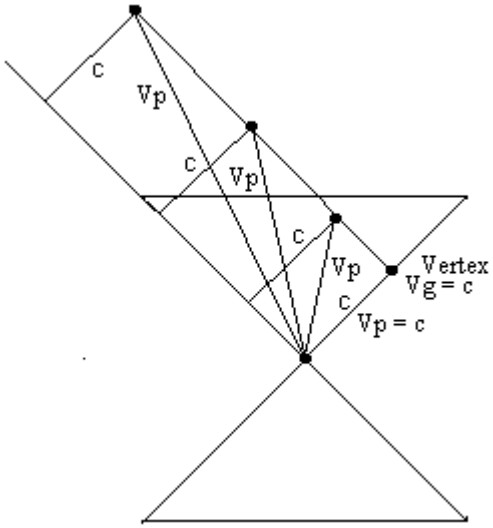
(Vg) is maximal at the vertex (Vgo). (Vp) is minimal at the vertex (Vpo). (Vg) is always less than (c); (c t) is the distance between the intersecting plane and the central axis, where (t) is the time it takes for light to reach the axis.



Parabolic System

The particle moves at the group velocity on the trajectory along the cone' s surface parallel

to the tangent plane opposite it. Light speed is the distance between the particle and the tangent plane. There are mirrored reflections on the upper intersection plane from the lower conjugate plane. (Vg) is maximal at the vertex and equals (c) at the vertex. (Vg) decreases as it moves away from the vertex. Conjugate particles are connected between upper and lower nappes through the center point. The relation between the particle and the center point is always superluminal except at the vertex, where it is (c). Parabolic orbits are ideal. No massive particle follows this orbit. (Cone not tilted in drawing for clarity.)



Maximal speed at the vertex hurls the particle out to "infinity". Photons travel at light speed along the tangent to the cone' s edge from the vertex to the Observer' s center between the two nappes -- direct perception.