Chapter 12. Three Quarks for Muster Mark

The next step in our exploration is to probe deeper into the (Bu) pair to learn more about its structure and interactions so that we can lay the groundwork for a precise mathematical description of the leptons, hadrons, and nucleons as they are manifested by the Union Bosons. This will lead us gradually toward an outline of cosmology, a theory of quantum gravity, and a consideration of the laws of thermodynamics.

Since the discovery of the red shift phenomenon, astrophysicists and cosmologists have increasingly accepted the notion that the universe is expanding and has evolved over time from a primordial state known as the Big Bang (BB). According to this theory the universe began as a small particle that suddenly underwent an adiabatic expansion, the details of which form the history of our universe. Where the cosmic particle came from and why it Big Banged usually is thought to be beyond physics.

One of the first questions that comes up when contemplating the BB is, how big was the original particle that produced the Big Bang? The generally accepted answer is based on the notion of the quantum gravity limit, the point where physics breaks down. To calculate this limit we consider the point where thermal energy of the particle or particles is such that the de Broglie wavelength (Ldb) goes below the Schwarzschild radius (Rs). The Schwarzschild radius is the smallest radius that a black hole may have. We should qualify this by pointing out that this radius refers to a Schwarzschild black hole. Such a type one black hole has only mass (Mbh), with no spin (J) or charge (Q). Type two black holes (Kerr) have the added property of spin (Mbh + J). Type three black holes (Reissner-Nordstrom) have mass and charge (Mbh + Q). And type four black holes (Kerr-Newman) have all three "hairs", mass, spin, and charge (Mbh + J + Q). If the original particle had spin and charge, as it may have had, then this rough calculation may have to be modified a bit. But this is a start, and it is hard to imagine a particle with no external context "spinning".

According to our theory of how charge is generated, we propose that, at least for mini black holes, there must be spin involved in order for charge to manifest. A spinless black hole would have no charge. However, for massive black holes, as for massive atoms, the charges can all cancel out and leave a neutral mass that is still spinning -- e.g. rotating neutron stars. So one may have spin without charge, but not charge without spin. Therefore I doubt any Reissner-Nordstrom black holes will be found in nature. A neutron star, while not yet a fully qualified black hole, functions as a single macroscopic neutron that has no net electrical charge. A black hole definitely functions as a single macroscopic fundamental particle. From this example, we can see how very possible it is that there may be "macroscopic subatomic particles" even though that sounds like a true oxymoron. A massive black hole is a single massive quantum particle, even though it is so massive that its quantum increments appear practically continuous. As we become familiar with quantum processes, we are more and more able to construct macroscopic quantum mechanical systems in laboratory experiments and applied technology. In any case, the above arguments make a pretty good case for the Big Bang beginning from a Schwarzschild type black hole.

Cosmologists think of the original Big Bang particle as a compact black hole that somehow became unstable and blew apart. To find its size limit, they set the de Broglie wavelength and the Schwarzschild radius to be equal, just exactly like we did with the gravitational force and the electrical force to find our (Bu) particle.

* Rs = 2 G Mbh / c^2.
* Ldb = 2 P H / p.

Here (p) represents the light-speed momentum of the particle, which we are here taking to be our black hole (Mbh).

* 2 G Mbh / c^2 = 2 P H / Mbh c.
* Mbh^2 = P H c / G.
* Mbh = Mpl = (P H c / G)^1/2 = 3.8583x10^-8 kg.

Solving for (Mbh) gives us a mass that is known as the Planck mass (Mpl).

From this we can also derive the Planck length.

* Lp = (H G / c^3)^1/2 ~~ 10^-35 m.

And we get the Planck time (which we have already discussed in detail and employed.)

* Pt = (H G / c^5)^1/2 ~~ 10^-43 s.

When we compare (Mpl) to (Bu), we find that they have a mass ratio of just 20.

* Mpl / Bu ~~ 20.

Given the vast scale at which we are working, a mass ratio of just 20 suggests that we are looking at the same particle with these two completely different derivations.

Also we note that the Planck Mass-Union scale is not too far removed from our scale. We are talking about the weight of a skinny flea compared to a small dust mote when we compare the two masses to our ordinary world.

If we take the factor of pi out of (Mpl*2), then we discover that the Planck Mass squared only differs from the (Bu*2) by the coupling constant (a).

* **Bu^2 = e^2 / 4 P eo G = 3.46x10^-18 kg^2.**
* **Mpl^2 = (H c a / G) = 3.46x10^-18 kg^2.**
* (H c a / G) = (e^2 / 4 P eo G).
* H c a (4 P eo) = e^2.
* (H c) = e^2 Ao / As P eo a). (As / Ao) = 4.

This expresses our (Bu) particle in terms of "super-gravity", or Planck Gravity. It is the super-graviton.

* Bu^2 = H c a / G.

We also notice that the Planck D-Shift Operator (H c) appears in the expression as well. This suggests that the D-Shift Operator (%) at the Planck scale is the "ground state" quantum of distance in our world. What does this mean? It means that the Heisenberg uncertainty principle disallows a continuum of distance (or time). For example, if we allow for a variable interval of time (Dt) to shrink and become truly instantaneous, then we get infinitely large amounts of energy. Equations blow up.

* (DE) (Dt) = H.

Therefore, we must "stop the clock" somewhere, and the Planck second:
(Ps = 1.33x10^-42 s) seems like the point beyond which time loses meaning in our universe. This is a **temporal** boundary. This means that the maximum energy involved in any elementary particle transaction is:

* DE = H / Dt = (1.054x10^-34)(.75x10^42) = 7.905x10^7 J = 4.934 TeV.

Therefore, if you bang a proton and an antiproton together, the maximum that you will get out of the collision of a single particle pair is 4.934 TeV. The total conversion of proton rest mass to energy is 2 Mp = 1876 MeV. That means you can get an additional 4.932124 TeV from the momentum buildup of your collider, but that's it. End of story. That's 2.466062 TeV per proton. Beyond that the relativistic requirements of energy input are so high that you can't squeeze any more momentum using physical processes available to us at our density. At higher densities such as prevailed during the time just after the BB initiated, the situation is different, because the high energy density curves space-time very sharply. Such conditions can also hold inside of black holes. Thus each proton can reach a relativistic mass of 2.467 TeV, or roughly in the range of the Fermilab Tevatron collider. If we consider one at rest and the other in flight, then we use Einstein's equation to figure the relative velocity of the moving proton:

* M1 = M0 / (1 - v^2 / c^2)^1/2.

The relative velocity of the protons must be 99.99997% of the speed of light. The Superconducting Supercollider is supposed to get up to 20 TeV. The collider business is pushing against the upper speed limit for this approach. The bang for your buck diminishes rapidly once you are in the TeV range. They are already using super-conducting magnets and electron cooling plus stochastic cooling for the antiprotons. The engineering challenges are formidable. It may be possible to move peak energies up a bit to a net spread of 7 or 8 TeV. That takes us down to 10^-47 s for (Dt). The limit can't be too far from this neighborhood. It takes too much energy to boost the speed up any further using these methods -- but maybe there will be breakthroughs.

The solution, of course, is to start working with neutron stars and black holes, or something like that. There you can get much richer densities to work with.

When particles come into "contact" during scattering experiments, they enter a zone of interaction that also pushes the **spatial** limits of Heisenberg uncertainty.

* (Dp) (Dx) = H.

The spatial limit tells us that two colliding particles with a certain momentum can not get indefinitely close as might be assumed in a continuous space. Space is not continuous. It is defined by mass-energy. If there is no mass-energy, then there is no space. A very small density of mass-energy results in a nearly Euclidean space. The density of mass-energy relates the amount of mass-energy to the volume of space. At a certain maximum density of mass-energy, the space occupied by that density collapses into a black hole. The same applies to momentum. The momentum of a black hole internalizes and no longer relates through intervals of space to the rest of the universe. The maximum linear momentum for a particle with mass is (Mx c). The minimal massive particle is an electron neutrino Mne = (H / c %). This is the quantum threshold for the emergence of mass. Below that threshold we only have linear momentum of photons with no rest mass. The spread over this threshold thus gives us the "rest" mass of the electron neutrino. What is the minimal position spread for this minimal neutrino?

* (H / %) (Dx) = H.
* (Dx)min = % = 3.16227766 meters. (For the lightest possible particle.)

This corresponds to a photon in the VHF microwave range at around 94 MHz. It is the point where photons can begin to show a more particle-like behavior.

Therefore we select (%) as the quantum lower limit of particle "smear" for the lightest particle. There is growing evidence that the neutrino has mass. If we accept our definition of the electron neutrino ground state "rest" mass, then a neutrino approaching light-speed momentum has a minimal spread of 3.16227766 meters. It is all smeared out over the length of a small room. If the neutrino is moving slowly at 1 m/s, then it is smeared out over 9.486x10^8 meters. Then you really don' t know where it is! If you could completely stop a neutrino, it would be spread over an infinite interval, which is ridiculous. At that point it becomes completely undefined. An undefined particle is only a virtual particle, a possibility in undefined awareness. This is true for the wave function of any particle. Thus we know that the neutrino always has some relative motion, such as random thermal jiggling, no matter what the relativistic frame is. Free neutrinos usually wail along at super high speeds.

In any case we do know that the D-Shift Operator forms the minimal limit for neutrino "smear". You can not get an electron neutrino into a smaller interval of trajectory without raising its rest mass. If its rest mass turns out to be some factor above our minimal value for its mass (say 10^5), then we simply adjust (Dx) min by that factor and multiply (%) by that factor. If we apply Einstein' s relativistic conversion to the neutrino, we find that when a neutrino moves at very close to the speed of light, it has a significantly increased mass. Therefore, the neutrino can never get its smear all the way down to (%), but can approach this as a non-relativistic theoretical limit.

Suppose we substitute an electron (Me = H eo % a^2 / e) into our uncertainty equation.

* (H eo % a^2 / e) (c) (Dx) = H.
* (Dx) = (e / eo % a^2 c) = 3.579669x10^-13 m.

Notice how much smaller this spread is. This is about the electron "radius". Electrons seem tightly defined compared to their neutrino sidekicks, even when the latter are moving at close to light speed.

But don' t worry. They aren' t really tightly defined. The electron' s wave packet is described by a "group" wave, and each component can have a different velocity. As a result the packet spreads over time as the electron moves. In less than a millionth of a second it can spread 100 meters. The moral here is that particle wave packets don' t like to be particles. They are forced into that role by observer beliefs. As soon as the observer isn' t looking at it through the filter of his fixed identity of beliefs, any particle spreads out and becomes non-local, which is where it likes to hang out. Whenever that silly localized observer looks again, the particles pop back into a local disguise located in accord with the current probabilities of the wave function like a bunch of Indians dressed up for tourists.

An electron dawdling along at 1 m/s is defined (instantaneously) at an interval of .11 mm. A proton has a light-speed interval limit in the range of 10^-15 m. At 1 m/s this only moves up to 6x10^-8 m. The proton wave packet also spreads more slowly than an electron' s. At our scale of 70 or 80 kilograms, our wave packet spreads much more slowly than a proton' s. We experience what is known as middle age spread. But it is the same idea. Eventually our attention' s self-centered focus wanes, and then the body non-localizes quite rapidly.

We have a speed limit on velocity, and we also have a limit on the mass of the particle. As particles become more massive, they have more energy and take up more space. If the mass is not dense, it has to be spread around, and therefore takes up more space. If we compactify the energy beyond a certain limit, we end up with a black hole. This wraps the nearby space around the hole. Thus our minimum (Dx) here is the minimal black hole radius. If we calculate the Schwarzschild radius using the minimal mass at the maximum speed allowed, we get a mass of 1.54x10^-8 kg with a radius of 2.282x10^-35 m.

* (Mx c) (2 G Mx / c^2) = H.
* Mx^2 = H c / 2 G.
* Mx = 1.54x10^-8 kg.
* Rs = 2 G Mx / c^2 = 2.282x10^-35 m.
* Rs^2 = 2 G (H c) / c^4 = (%)(5/3)(10^-70) m^2 = (% / 3)(10 / 2)(10^-70) m^2.

* Rs^2 = (Ss P % / As Ao) (P %^2 / As)(Ao^70 / P^70 %^140).
* Rs^2 = (Ss Ao^69 / P^68 %^137 As^2).

This of course is the Planck length, which I have expressed here completely in terms of mathematical constants of geometry. The mass (Mx) is within an order of magnitude of the Planck Mass from these rough calculations. The "ratio" 1.647 is very close to (5/3), the ratio of the proton.

Our conclusion is that the Heisenberg principle requires us to have limits in space and time as well as energy quanta. We are "boxed in" on all sides by a quantized, discontinuous universe. The good news here is that it keeps our equations from exploding with infinities. We know that when we do calculus, the values of (Dx) may not be less than 2.282x10^-35 meters [Dx^2 >= %x1.647x10^-70 m^2], and the values of (Dt) may not get smaller than the Planck Second. Furthermore, when dealing with the lightest particle, we can not define its position spread within an interval less than (%), which is an everyday distance at our scale. Thus the results from calculus using the theory of limits gives us only good estimates. For most purposes these work fine. But under some circumstances where you approach singularities, the system breaks down and equations explode.

The core quanstant relation for the Planck Mass is what I call a Generation II quanstant cluster. That means that it is made from a combination of two mass-bearing quanstants, and we must take a square root to get its average value as a single particle.

* Bu = (H c a / G) ^1/2.

There are five other combinations of the quanstants in Generation II. Generation I, we recall is just a quanstant by itself, expressed as a mass. There are only four (H, G, e, eo) plus photons.

* (H / c Lo) = photons,
(H / c %) = neutrinos
(e Ru / c aw) (Ss P % / As Ao)^4/2 = W bosons
(e Ru / c aw) (Ss P % / As Ao)^9/2 = Z bosons
(P e Ru / c) = protons,
(P eo Ss (As / Ao)^2) = "Higgs" / (Bu) bosons / gravitons / Planck Mass

We saw how the positrons and electrons are encoded naturally inside the protons in combination with the (u) quark neutrinos to make protons and neutrons and other hadrons. That gives us all the fundamental ingredients for building a universe right from the fundamental quanstants interacting with space and time through gravitational and electromagnetic exchanges: photons, neutrinos, electrons, W/Z bosons, protons, and Higgs-Bu bosons.

The precise Generation I version of the (Bu) boson is

* Beo = Bu = (P eo Ss) (As / Ao)^2 = (eo Ss) (%^5 P^2 / Oo Ao^2) = 1.86x10^-9 kg = 1.047x10^27 eV / c^2.

Written in eV format, this looks suspiciously like another echo of 1.054:

* Beo = 1.047x10^18 GeV.

The W/Z boson duo includes the factor

* (Ss P % / As Ao) = 1.054.

This is the Planck factor. For the W Boson we square the Planck factor, and for the Z Boson we take the same factor to the (9/2) power. The former gives us 1.424x10^-25 kg, or 80 GeV / c^2, right on target for the experimental value of the W boson. The latter gives us 1.624x10^-25 kg, or 91.12 GeV / c^2, for the Z boson, which is within the range + / - .01 of 91.11 GeV / c^2.

From our newly acquired details about the inner structure of the proton, we can now answer another question. Why does the electron seem to behave like a point particle? The positron at the center of the proton is formed by the vortex of the energy swirling "down the drain" out of the (Bu) quark region. There is nothing else going on "inside" it. Everything is going on "outside" it. The same is true for the electron. What we see as the electron is like a mirror' s reflected image. When you stand in front of a mirror, another version of you seems to be standing in a space "behind" the mirror, "inside" the Looking-Glass World. If you are a positron whirling at the center of a proton, you look out at the event horizon and see yourself reflected as in a mirror. That reflection seems to be "outside" the proton. It seems to whirl around the proton. It is a conjugate reflection. The "guts" of the positron are "outside" it.

From the electron' s viewpoint, its "guts" are also outside it. Narcissistic bugger that it is, it is always drawn to look at itself in the proton mirror. The reflection it sees is itself "inside" the proton phase conjugate mirror. That reflection is the positron at the proton' s core. The "guts" of the positron and the "guts" of the electron are the same thing -- the three (u)-quarks plus some neutrino energy adjusters. Actually what we have is two (Bu) particles with the sQuark mass. These three play the roles of three (u) quarks, and the foci of their orbits form the positron-electron pair.

This is our "five point" binary system that we spoke of before. The sQuark forms the center of mass located where the two inner foci overlap, and the two (Bu) particles form the binary black hole system. What remain are the two outer foci. These are the positron and the electron. However, in the case of the proton there is an important difference from the binary star system. In the latter case the two stars orbit, each moving around its corresponding outer focus. However, in the proton' s case, we are dealing with binary mini black hole dynamics. The space/time becomes extremely warped and twisted so that one of the foci is inside the orbits and the other one is outside. (This may start to remind vaguely of Roger Penrose' s twistors.) Since energy circulates at velocity (c) around the three foci, each carries a quantum unit of charge once the charge threshold has been crossed, and each also generates a magnetic moment.

Here are the six possible clusters of Generation II:

* (H c a / G)^1/2 = 1.86x10^-9 kg. (This is the Bu boson/Planck Mass).
  (H Pv / G) ^1/2 is close to the electron.
* (H e / c)^1/2 (As^2 / Ss P %).= 9.1x10^-31 kg. (This is the electron.)
* (H eo As^2 Ao^3 / c Ss^2 P^3 %^2)^1/2 = 1.67x10^-27 kg. (proton.)
* (e c %^2 / G)^1/2 = 2.683 kg.
* (e eo %^4 / c)^1/2 = 6.876x10^-19 kg.
* (eo c^2 %^4 / G)^1/2 = 1.093x10^9 kg. (This is the threshold range for gravity to begin superceding EM in macrospace.)

We can substitute (Ao / P) for any (%^2), but that only changes the value of a cluster by a factor of 3.183. Generation II is like an "average" between two quanstants. But it still just gives us the (Bu) boson, electron, proton, and perhaps the threshold for gravity to overtake the EM force at the large scale.

There are 24 Generation III quanstant clusters. We find in the list a version of the electron (H eo % a / e). You can play around with them and find various windows with relatively stable masses. However, the most important ones are the four fundamental Generation I classes plus the photon. The others are echoes and overtones or other ways of saying the same thing.

We recall that our original (Bu) derivation came from an apparent Generation IV quanstant cluster: (e^2 / 4 P eo G)^1/2. But now we see that we can also derive it abstractly in Generation I, from the Planck Mass in Generation II, and from the Planck relation to the electrical charge unit and gravity in Generation III.

The beauty of this system is that it "automatically" generates the masses of the various elementary particles from constant physical relations and constants of geometry. Thus we have unified physics and geometry. All the physical quanstants that represent mass also relate it to space and time. Space and time are dimensions derived from geometry when it interacts with energy. This system also holds us within a quantum limit in all dimensions, so that our equations do not explode when we bring particles too close. We are limited by the Planck Length, and the Planck Length is a link between physics and geometry.

* (H G / c^3) = (As Ao / Ss P %)(10^-70).

An interesting property of black holes that Hawking discovered is that they have a minimal area and an irreducible mass. In other words, a black hole can grow fatter, but not thinner. This guarantees the law of entropy. However, since black holes also radiate via the Hawking quantum evaporation process, that means that during radiation, first rotational energy is lost in the case of a large black hole. Then it shrinks to its irreducible mass (keeping its fixed surface area but losing density). Beyond that it can only explode. The irreducible mass recalls our ratchet and saw discussion. When we get to subatomic black holes, this shows up as the fixed rest masses of fundamental particles.

However, subatomic particle black holes can not slow down their rotation, since they are "rotating" at (c). The rotation is quantized. So is the mass-energy. Thus they stay fixed at an energy quantum level or go through a phase transition and release their energy in one blast (particle pair annihilation). Hawking radiation involves release of a particle and absorption of an antiparticle. This is what happens when, say a proton annihilates with an antiproton. The two quanta perfectly match and annihilate each other. This is the limit of Hawking radiation. The conjugate process of the limit of Hawking radiation (pair production) is pair annihilation. Ordinarily, however, the (Bu) pair in the proton state stays in equilibrium with positron vortices inside and electron vortices outside. If it did not, our physical universe would explode.

Our discussion thus far brings us to a model brought up in a thought experiment about quantum gravity developed by Roger Penrose in his thought-provoking work, **The Emperor's New Mind**. In this work Penrose proposes that a theory of quantum gravity must be based on a time-asymmetric theory. Aside from being inelegant (why should time be asymmetric other than to provide another viewpoint?), I believe his premise regarding the time-asymmetry in quantum mechanical state reduction is incorrect. At least the example he gives as evidence is not convincing. However that may be, his thought experiment is extremely interesting and relevant for what we are discussing, which is why I bring it up.

But first, let' s dispose of the state-reduction-time-asymmetry problem so it doesn' t nag at the back of your mind. We' ll save a full discussion of the time-symmetry problem for our consideration of thermodynamics, because that is where the greatest apparent time asymmetry problem lies. What Penrose calls the "unitary evolution" phase of quantum mechanics is time symmetrical. There is no problem with that. The issue Penrose has is with "state reduction", also known as "collapse of the wave function." He claims that if you run a quantum process of state reduction backwards, you do not get the same results that you do when you run it forwards. His example is a photon source (S) that produces a recorded beam that is then split in half by a 45 degree angled half-silvered mirror. Each half-beam is sent to a photon detector (Da or Db). The two detectors are at right angles. (He only uses one, but using two is clearer.) Running forwards in time we ask:

* <Da | Do> "If a photon leaves the origin (Do), what is the probability it will reach detector (Da)?"

The probability amplitude is (2^-1/2). The absolute square of this amplitude is (1/2), which is the correct answer. Penrose then tries to turn the process around and say that the reverse process gives a different answer. He calculates an amplitude of 2^-1/2 for a photon from (Da) to reach (Do), and a similar amplitude for it to reach (Dc), which is opposite (Db). He also considers the probability that a time reversed photon from (Dc) reaches (Da).

His time-reversed statement of the original proposition is as follows:

* <Do | Da> "If a photon leaves detector (Da), what is the probability it will reach detector (Do)?"

The answer is "one". One is not one half. But the trick is that Penrose has shifted viewpoints. We are now only locally aware of the photons that arrive at (Da), and we know that they all originated at (Do), so the answer has to be "one".

This is not the whole picture. What Penrose really has here is four-wave mixing. If you have a mirror at each position, (Do), (Da), (Db), and (Dc), and release a photon into the system, that photon will echo back and forth throughout the system. It will spread its wave function to include the whole space and will be 1/4th present at each mirror. If you collapse the state vector at any one of the mirrors, it will be found at one of the four mirrors. Thus the probability amplitude is (1/2) for each mirror, and the absolute square comes to (1/4). You really want to put the photon source in the middle. Then you see that if you send photons out randomly in all 4 directions and have counters at Do, Da, Db, and Dc, you will get 1/4 of all of the photons at each detector. (We assume that the 4 detectors detect all the photons sent out.)

We must think holistically. Let' s call the central photon source (S).

We ask our first question:

* "If a photon leaves S, what is the probability it will reach a particular detector?" (Answer: 1/4.)

We should also ask a second question:

* "If a photon leaves S, what is the probability it will reach one of the detectors?" (Answer: 1.)

The true time reversed first question is:

* "If a photon leaves one of the detectors, what portion of the photons reaching S will it form?" (Answer: 1/4.)

The true time-reversed second question is:

* "If a photon leaves a particular detector, what is the probability it will reach S?" (Answer: 1).

In this way we see that the system as a whole maintains time symmetry. But if you take the first time-forward question and match it with the second time-reversed question (which is worded in the reversed manner and thus SEEMS to be the correct time-reversed partner of question one), you get the wrong answer. If you interleave the questions according to the proper viewpoints, then they match up nicely and you get the same answer going each direction in time within the same viewpoint framework.

Now that we have used the principles of phase conjugation to salvage quantum time symmetry from the attack of Mr. Penrose, let' s get on to his wonderful thought experiment, which is actually based on an idea by Hawking, called Hawking' s box. (We paraphrase Penrose' s argument that starts on p. 360.)

Thought Experiment: We imagine a huge box (size is relative to our viewpoint.) In the box is some undefined material, and the box is sealed off from everything else. The experiment involves doing nothing to the contents of the box. You are to leave it alone forever. The question is this: What happens to the stuff in the box?

We presume according to the second law of thermodynamics that entropy grows until equilibrium is reached, and then nothing much happens other than fluctuations. This situation recalls our discussion of Poincare Peaks. Penrose considers the situation in terms of phase space. He divides the phase space into two areas, one (A) that has no black holes, and another (B) that contains one or more black holes. (Are you starting to see some resemblance to our model of the proton?)

The largest portions of each area, (A) and (B), will be in thermal equilibrium. Next we visualize a vector field on the phase space. This tells us the time evolution of the physical system. The arrows will mull around, and some will flow from (A) to (B) marking the formation of a black hole in area (B). Some vectors will flow back from (B) to (A), marking the Hawking evaporation processes of the black hole(s).

At some point an equilibrium is established between the black holes sucking material in and radiating material out, so that regions (A) and (B) are balanced. This equilibrium sounds exactly like what we discussed as the dynamic equilibrium for the proton. If you do the bathroom sink experiment to study the model, you can actually see in the water' s flow lines that resemble the vector arrows of the system. It all looks very much like the drawing Fig. 8.5 in his book that Penrose labels "The Hamiltonian flow of the contents of Hawking' s box."

Penrose goes on to invoke Liouville' s theorem to show that the phase-space fluid is incompressible, so material can not accumulate in either of the two regions. Hawking arrives at the conclusion that the Hawking radiation process can be considered a "white hole" and thus the white and black hole aspects form a conjugate pair. White holes are the time-reversed versions of black holes. Black holes swallow, and white holes regurgitate.

Penrose objects to this because he believes that white holes do not exist, and he also wants to throw in some time asymmetry because that is HIS pet theory. He brings up the problem of the destruction of information as it enters the black hole. This merges flow lines. You seem to imagine this happening when you look at the water flowing down the drain in the sink. Penrose believes this violates Liouville' s theorem. The problem with this argument is that it involves an unannounced shift of viewpoint. Penrose stands outside the black hole talking to us, and then tells us that information has been lost by something falling into the black hole. How does he know this? He only knows this by going into the black hole. He can' t see in, just like you can' t see down the drain. If he retains his original position as an outside observer, what he sees is all the information slowing down and standing still just outside the black hole at the event horizon. If you look at the flow lines (and have adjusted the flow of water so there is not too much turbulence), you will see that they form a standing wave pattern that sits on the water above and outside the vortex. This is just the way the "information" structure of an object appears to float just above the event horizon of a black hole when we "know" that the object obviously falls right in just like the water obviously falls right down the drain.

So there are two viewpoints on the black hole side -- one outside and detached, the other jumping in and going down the drain. What about the other side? Penrose suggests that the merging of vectors on the (B) side may be balanced on the (A) side by vector bifurcations due to state reduction (wave function collapse). But once again he is making an observer viewpoint shift. He starts out detached as a transcendent observer uninvolved watching the time evolution (leaving the box alone forever). Suddenly he jumps in and makes measurements. Only by making observational measurements do you pop the qwiff and collapse the state vector. Penrose has contradicted himself.

In conclusion, we see that the Penrose puzzle with the Hawking box is just like the Penrose puzzle with quantum time reversal. He again has "four wave mixing" with two pairs of conjugate situations. Taken all together, the two pairs of viewpoints and the two styles of function all balance out. If we stick to a transcendental observer viewpoint, then we just see smooth time evolution taking place. Phase state vectors do not merge or split. If we jump into an area (B) black hole, we cause vectors to merge. If we jump into area (A) anywhere outside the black hole and make a "measurement", we collapse the state vector and cause splitting.

What this all suggests is that the observer viewpoint is intimately involved in the whole experiment. The observer determines how many vectors there are moving about in phase space by the viewpoint he chooses. We may even propose the idea that the attention of an individual consciousness functions as a white hole. It can create any number of new creations by simply defining them to be so. It can shift mental creations into physical creations by simply intensifying the level of attention and belief that it bestows on them. It can also toss creations out into "empty space" and abandon them. This is consciousness functioning as a white hole. However, when consciousness turns around and attracts its creations to itself, swallows them, and fully digests them, they "disappear" leaving only the energy of undefined awareness, with its potential for cancellation and boundaries. These are the three original properties from which all creations are built, whether mental or physical. This experiential mode of consciousness is its "black hole" phase. The two phases, "white hole" and "black hole", creative and experiential, are two sides of the same coin, two cycles of the same engine.

At the end of his discussion of the Hawking box Penrose suggests a model for identifying and measuring a graviton. In an effort to "externalize" and "objectify" the role of the observer' s attention, Penrose believes that when a quantum particle reaches a certain critical threshold, it automatically collapses the wave function. He describes a particle passing through a cloud chamber. He proposes that the particle has a quantum wave function that describes its possible paths. Many of these paths pass through the cloud chamber producing a linear superposition of many strings of condensing droplets. Penrose believes that the point at which the wave function condenses into an actual string of droplets that can be observed is the quantum threshold of one graviton. This is another very intriguing idea and is worth further investigation. The fact remains, however, that without an observer there to see the trail of droplets, the wave function essentially remains uncollapsed in the same manner that the cat in Schroedinger' s box remains in an indeterminate "quantum wave function" state of existence. Therefore, I believe that we must go back to the Hawking box thought experiment and clearly understand that the appearance of the condition of the system entirely depends on the viewpoint decisions of the observer.

The observer always has two fundamental viewpoint choices. He can choose to create, or he can choose to experience. Another way of saying this is that he can exercise will and shape his world, or he can relax and just be, taking it as it comes. These are two conjugate phases of the same observer. You can not have one without the other. Otherwise you violate Liouville' s theorem and get a logjam.

Here is what physicist John Hagelin has said about the observer' s choice of viewpoint and its importance for determining a physical system (Hagelin, 1992, p. 41.). He starts from the transcendental viewpoint of the vacuum state.

"If the field were to remain in a state which was a superposition of all classical shape states, the field would not possess any definite amplitude and the measurement could not yield a definite result. Hence the effect of a measurement is to collapse the initial quantum-mechanical superposition of all classical field shapes to some definite, well-defined classical shape. However, this localized classical state of the field is highly unnatural from the standpoint of quantum mechanics, since it represents a state of infinite energy density. From the Heisenberg uncertainty principle, the fact that the uncertainty in the field (df) is zero in a definite classical shape state implies an infinite uncertainty in its canonically conjugate momentum. Such a field shape will therefore immediately explode from its classically definite value to assume, once again, a quantum-mechanical superposition of all possible shapes. However, the resulting superposition of classical field shapes will no longer possess the precise and definite balance of shapes which characterizes the vacuum state. (The vacuum state is the unique superposition of field shapes which is stable in time, unbounded in space -- i.e. Lorentz invariant.) The initially perfect balance of the vacuum state, once disturbed by the quantum measurement process, becomes unstable: the field continues to reverberate forever in a highly nontrivial time evolution."

Because the "collapse" of the vacuum wave function would take it to a highly excited state, this also would take much energy, which would have to be accounted for. Also, and more importantly, there seems to be no evidence of state reduction when there is no observer. Thus Hagelin goes on to suggest that (p. 43)

"It seems much more plausible, from the standpoints of both modern science and Vedic Science, that the ' collapse of infinity' does not constitute an actual collapse of the vacuum wave function, but merely represents a shift in attention -- from the quantum-mechanical superposition of all possible field shapes, which represents the true structure of the quantum vacuum, to one of the infinite number of field shapes which comprise this state . . . . The overall structure of the vacuum remains completely unchanged and retains its perfectly balanced and symmetrical structure."

In other words, the collapse of the wave function represents a simple shift of attention by the observer, a change of viewpoint. It may seem trivial, but the whole universe looks different from a different viewpoint. This is a fundamental principle of Observer Physics.

A simple way of summarizing the human condition on planet Earth in our age (from one point of view) is that there is a large fluctuation of group consciousness taking place in which people prefer to create and not to experience. They also prefer to create with great gusto of attention and belief, play with the creations for a while and then abandon them without fully experiencing them. The result is that the environment gets cluttered up with a lot of unexperienced or partially experienced abandoned creations that just float around and eventually begin to come up as "problems". But it's all OK. Eventually the fluctuation subsides and, one way or another, the system returns to equilibrium. At the same time that all the mess is being made, consciousness is waking up and getting very lively, discovering many things about itself, and rediscovering and recovering many lost creations of great subtlety and beauty.

Before we move on into a more detailed consideration of quantum gravity and thermodynamics, let's give a summary of the major hadrons in the light of our proton model, integrating this with current quark theory.

Each quark has an anti-quark partner. If the quark has charge, its anti-quark partner has the opposite charge. The neutral (u) quark is its own antiparticle, and so also is the neutral (c) quark its own antiparticle. They go to whichever state is appropriate in a particle. As a convention I'll write the positive quarks as "anti-quarks". All positively charged particles are understood to be fundamentally what we call antimatter, and all negatively charged particles are what we call matter. Neutral particles can be their own antiparticles. So in this text we will mark a neutral particle that is functioning in antiparticle mode with an underline (_) after it.

We have seen how an antiparticle can survive inside a dynamically configured particle ensemble. Also we must remember that the quarks are not really particles since they can not exist alone. They represent resonant transients -- except for the proton and its (Mp) quanta increments -- standing wave patterns inside an energized proton (Bu pair). Thus all baryons and mesons except the proton are unstable. With our notation everything seems to work out, and we do not have to make up ad hoc fractional charges. Our quark notation automatically includes charge and isospin as well as flavor quantum values.

Quark	Symbol	Charge	
up	u, u_	0	
down	d-	-	
down	d+	+	
strange	s-	-	
strange	s+	+	
charmed	c, c_0		
bottom	b-	-	
(bottom)	b+?	+?	
top	t-?, t+?	?	(Only seen as t, t_ annihilation events?)

The **u**p quark and the **c**harmed quark both seem to be neutral. The charmed quark is probably another "neutrino" window above the up quark. The down quarks have positive and negative sub-flavors, as do the strange quarks. They are up quarks with lepton ensembles. There seems to be a negatively flavored bottom quark. If there is a negative one, there also should be a positive one. The top flavor is an unknown, since it is so unstable at our energy levels. I would presume it is charged in parallel with the strange quark. The up, down and strange quarks match with the charmed, bottom, and top quarks. The three quark families match to the three lepton families.

QUARK DETAILS (Me- = electron; Me+ = positron; Mm- = muon; Mm+ = antimuon; Mne = electron neutrino or eutrino; Mne_ = electron antineutrino or antieutrino; Mnm = muon neutrino or mutrino; Mnm_ = muon antineutrino or antimutrino. The tauons and their neutrinos are not used apparently, because the quarks come in sets of three -- bare, with electron, with muon -- or because we have not explored high enough energy regions.)

(In the following chart we leave out the neutrinos and understand that wherever there is a lepton, its antineutrino sidekick joins it, and antileptons have neutrino sidekicks. -- e.g., Me-, Mne_.)

* Mu = P e Ss / c As.

This is the (u) quark mass expressed as approximately one third of a proton mass. Although quarks are confined, their average masses can be estimated from interactions in which there occur quark mixing and decay processes. The parentheses indicate an option.

*	u	=	u (Me+ Me-).
*	u	=	u (Mm+ Mm-).
*	u_	=	u_ (Me+ Me-).
*	u_	=	u_ (Mm+ Mm-).
*	d-	=	u Me-.
*	d+	=	u_ Me++ Me-.
*	s-	=	u Mm-.
*	s+	=	u_ Mm++ Mm-.

*	c	=	u d+ s- (Each version of u is possible.)
*	c_	=	u_ s+ d- (Each version of u_ is possible.)
*	b-	=	c Me-
*	b+	=	c_ Me+
*	t-	=	c Mm-.
*	t+	=	c_ Mm+.

Note that a (d+) quark consists of an antiup quark plus TWO positrons and TWO neutrinos. The same is true for an (s+) and so on. This holds when the antiquark is the "odd" man in the center. It' s the other way around for antiparticles. Then the (d-) quark consists of an (u) quark plus TWO electrons and TWO antineutrinos when it is the "odd" man in the middle between two antiquarks. This happens because of the overlapping foci. The charged leptons are tiny vortexes located at energy foci.

SOME BARYONS

		(spin 1/2)	(spin 3/2)
p+	=	u d+ u	
n	=	d- d+ u	
L	=	u s+ d-, u d+ s-	
S+	=	u s+ u	u s- u Me++
So	=	u s+ d-, u d+ s-	u s- d- Me++
Eo	=	u s+ s-	u s- s- Me++
E-	=	d- s+ s-	d- s- s- Me++
O-	=	s- s+ s-	s- s- s- Me ++
L+	=	u d+ c	
E+	=	u s+ c	
Eoc	=	s- d+ c, d- s+ c	
O0	=	s- s+ c	
Lob	=	u d+ b-	

SOME MESONS

P+	=	u d+
P-	=	d- u_
Po	=	u u_, d- d+ / (2)*1/2
K+	=	u s+
K-	=	s- u_
Ko	=	d- s+
Ko_	=	s- d+
D+	=	c d+
D-	=	d- c_
Do	=	c u_
Do_	=	u c_
Ds+	=	c s+
Ds-	=	s- c_
B+	=	u b+
B-	=	b- u
Bso	=	s- b+
Bso	=	b- s+

BASIC BARYON OCTET (Jp = 1/2+)

N (940) P (938)
(d- d+ u) (u d+ u)

Lo (1116)
(u d+ s-)
S- (1197) S+ (1189)
(d- d+ s-) (u s+ u)
So (1193)
(u s+ d-)

E- (1321) Eo (1315)
(d- s+ s-) (u s+ s-)

You can see from this chart that the neutral Lamda is basically the same as the neutral Sigma in the Standard Model. But our notation makes clear the difference between them. The Sigma transitions with a mean life of 10^-20 s into the Lamda, which transitions with a mean life of 10^-10 s. This is because the Sigma has a larger amount of antiquark mass than the Lamda, and is thus less stable. All members of this octet are just excited states of the proton-neutron ground state baryon into which they decay by emitting pions.

RESONANT BARYON DECUPLET (Jp = 3/2+) (MeV Range)

D- (d- d- d-)	Do (u d- d-)	D+ (u d- u)	D++ (u u u)	(1232)
S*- (d- s- d-)	S*o (u s- d-)	S*+ (u s- u)		(1384)
E-* (d- s- s-)	Eo* (u s- s-)			(1532)
O- (s- s- s-)				(1672)

The (Do) and (D+) look similar to the neutron and the proton. In fact they are quite different. Each of the decuplet baryons is a triplet of quarks with NO antiquark component. This gives each one a total isospin of (+ 3 / 2). In each of these particle ensembles the quark charge is shifted in the positive direction by two positive charge units. This is due to the extra energy it takes to make decuplet resonant particles. Two extra positron-electron pairs and a lot of energy puff up each one. The extra energy load speeds up the pump mechanism, so the particle must vent more quickly. So the electron input vent members of the extra pairs are pushed way outside the ensemble and the positron outlet vents are all put to work inside the ensemble draining out the excess energy. Thus the total charge on each ensemble is boosted by two positive charge quanta. The exiled electrons go off a distance from the ensemble and effectively become free electrons. The decuplets are "superionized". The Deltas are around 1232 MeV, and the "fat" Sigmas are around 1384 MeV as opposed to the "skinny" Sigmas that are around 1193 MeV. The Cascades (Xi' s or E' s) are 1532 as opposed to 1315. The Omega minus is the heaviest at 1672. All decuplet members are considered resonances except the O-. But it too is really a proton resonance, as are all quark triplets.

In our system the quarks and other fermionic components inside the (Bu) ensemble all have spin +1/2 for quarks and -1/2 for antiquarks. So the notation automatically indicates the spin orientation. As we discussed earlier, a fermion' s spin is always a multiple of (1/2) because it is a boson split in half. It takes a pair of fermions to make a bosonic partnership. The bosonic ensembles are in pairs, but stay together and are not split apart. So we get spins of 0 or 1 for them. For each baryonic quark cluster there generally will be two quarks and an antiquark, or two antiquarks and a quark. That is how the (Bu) ensemble is put together. In our notation we follow a convention of placing the antiquark in the middle surrounded by the quarks (or vice versa) because that is the way the quark wave forms are generally arranged inside the (Bu) system. The antiquark charge is reversed and so is its spin orientation. Thus the lighter baryons have the configuration (+1/2 -1/2 +1/2 = +1/2). The antiquark-dominated ensembles are just the opposite. The spin sign is arbitrary and only needs to be consistent. The baryon decuplet members are more energized than the octet members, so we end up with three quarks or three antiquarks. Each quark has spin +1/2, so we get a total spin of + 3/2.

The opposite is true for the antiquark decuplet. The (d) quarks are slightly heavier than the (u) quarks, so the decuplet ensembles with (d) quarks are a tad heavier than those that have (u) quarks. Interestingly the Cascades in the octet overlap the Deltas in the decuplet energywise. This is due to the extra heaviness of the Cascade strange quarks. A lot of the extra decuplet energy can be carried by the extra neutrinos that come along with the positrons.

The series of Delta resonances forms an interesting pattern. Each Delta has the same core structure. The only difference is in the number of internal leptons. Each succeeding Delta subtracts one electron (and its partner antineutrino) as we move across from negative charge to positive charge. In the chart below I leave out the neutrinos for simplicity.

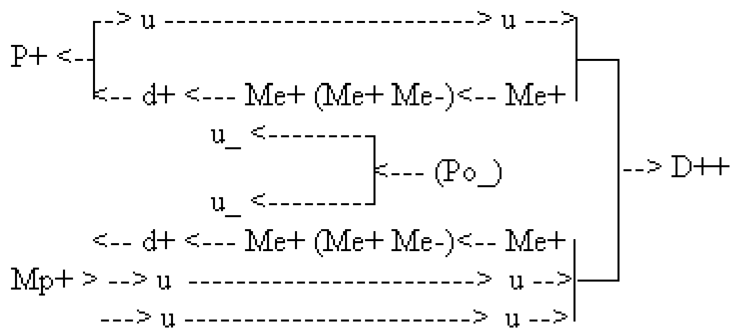
* D- = (d- d- d-). = (u u u), (Me++, 3 Me-).
* Do = (u d- d-) = (u u u), (Me++, 2 Me-).
* D+ = (u d- u) = (u u u), (Me++, 1 Me-).
* D++ = (u u u) = (u u u), (Me++, 0 Me-).

The lack of an antiquark helps the three quarks buffer the extra positrons, but these ensembles are quite unstable and disappear as soon as their resonant energy window is passed in either direction. The (D++) is a puzzle from the viewpoint of the Standard Model. It turns up when highly energized positive pions are shot at proton targets (liquid hydrogen). The various Deltas are various possible outcomes of this interaction. The Standard Model maps the quark interaction (here showing the decay process) as follows. Go from right to left to make a (D++).

```
          |---> u ---------------------> u  |
          |                                 |--> P+
          |                      |<--- d_   |
          |                      |
D++  -->  |                      |---> d    |
          |---> u --------------------> u   |--> Mp+
          |---> u --------------------> u   |
```

The quark analysis does not tell us what is going on inside.

Here' s how the D++ production process works in our system.



Positive Pion Interaction with Proton to Generate D++ Resonance

It looks a little bit more complex, but you get the same final result written in our notation. The main distinction is that we do not write our Delta++ with only a (u) triplet (u u u), but with (u u u) (Me++), which clearly includes a double positive charge in the form of two internal positrons. This explains where the double charge comes from. The production process results in a heavy neutral pion that goes undetected because it lacks charge. The (u) quark easily oscillates with its antiquark mode in the same way a photon does. So when two (u) quarks or two (u_) quarks meet, one flips over, and then they annihilate. A pair of quarks is always unstable and forms a transitory meson. In the standard model it is not clear how three up quarks can generate a double positive charge. They have the right quark flavors, but the distribution of charges and the reasons for such a distribution is unclear.

What our diagram tells us is that the Delta++ is a true triple up quark ensemble that has been jazzed up with extra energy so it forms a positron doublet drain hole to let out all the extra juice.

What is the original ground state triple up quark particle that contains an anti (u) quark? We know it has no net charge, and its energy is much lower than a Delta++.

* u
u_ = u_ Me+ Me-.
u

Bingo!! It's positronium! The energy of an ordinary triple (u) quark ensemble is too low to have a central drain in its core. It only supports a positron and an electron in orbit around each other. The triple (u) antiparticle (u_ u u_) is the other kind of positronium. So this gives us ortho- and para- positronium as two possibilities.

With our new quark model and notation we can construct all the weird "atoms". For example, we can also make muonium in the same way as positronium by just adding more energy to our triple (u). We can get all kinds of combinations of leptons forming temporary wave patterns, but at too low an energy level to develop a nucleon with a central drainage system. In the following expressions (3u) means (u u_ u) or (u_ u u_), according to context.

* (u u_ d-) = (u u_ u), (Me+, 2 Me-)
* (d- u_ d-) = (3u), (Me+, 3 Me-).
* (u u_ s-) = (3u), (Me+, Me-, Mm-).
* (d- u_ s-) = (3u), (Me+, 2 Me-, Mm-).
* (s- u_ s-) = (3u), (Me+, 2 Me-, 2 Mm-).
* (u c_ u) = (u_ d- s+) = (3u), (Me-, Mm+).

And so on.

Hey, wait a minute! What are we doing here? We are describing leptonic ensembles in terms of quark ensembles! If we recall our proposal that the (u) quark is actually the "fourth" neutrino, the "missing link" between the leptons and the hadrons, then the above expressions contain nothing but leptons. The (u) quark, just like the other neutrinos, functions as our quantum energy accountant. We realize that by making a slight adjustment to the Standard quark notation to fit our (Bu) ensemble theory, we have also in one stroke achieved an elegant lepton-quark unification. In fact, if you look back over all the quark expressions given above, you will see that with our system all hadrons are made from (u) quark "neutrinos" and leptons as their basic building blocks. Aside from the (u) quark "neutrinos" all other quark labels are just macros.

Before taking leave of the Delta series, we should mention that there are two Sigma series, one of which is in the light baryon octet, and one which is in the Resonance Decuplet just below the Delta series. These two Sigma series work the same way as the Delta series. The only difference is that the Sigmas have one muon replacing an electron. Here is the octet Sigma triplet.

* S- = (d- d+ s-) = (3u), (Me++, Mm-) 2 Me-.
* So = (u d+ s-) = (3u), (Me++, Mm-) 1 Me-.
* S+ = (u u_ s-), Me++ = (3u), (Me++, Mm-, 0 Me-.

The Decuplet Sigmas just have the anti-up quark flipped into an up quark:

* S- = (d- s- d-) = (3u), (Me++, Mm-, 2 Me-) (2 Me- expelled)
* So = (u s- d-), (3u), (Me++, Mm-, 1 Me-) (2 Me- expelled)
* S+ = (u s- u), (3u), (Me++, Mm-, 0 Me-) (2 Me- expelled)

The octet ensembles are less energized versions of the decuplet particles. Both are written in the Standard Model with the same quark signatures, which does not distinguish the fine structural differences. In our notation the neutral Lamda, the Octet Sigma and the Decuplet Sigma are each written differently in ways that signify the differences in their masses and decay times.

Although the Octet series and Decuplet resonance series look the same in Standard quark notation, they have very different energy levels. The Standard Model does nothing to explain this. With our notation we can clearly indicate which series we are talking about and we know exactly why that series has the energy level that it displays.

Now let' s take a quick look at the mesons.

LIGHT (0-) MESON OCTET (NONET)

	Ko (d- s+)		K+ (u s+)	
P- (d- u_)		Po, V (u u_, d- d+ / (2)*1/2)		P+ (u d+)
	K- (s- u_)		Ko_ (s- d+)	

The (V) is an eta meson which usually decays into a triplet of pi mesons with net zero charge. There is a heavier octet/nonet that has rho mesons in the middle row as well as omega and phi mesons. The high energy neutral mesons are formed by (u u u_ u_), (u u d+ d-), (u_ u_ d+ d-), . . . ensembles. We can mix and match all the pair combinations of up and down quarks that give neutral values. The (u) quark alternates with itself, so in a situation where two (u) quarks are joined, one oscillates to its antiquark mode, and then the two annihilate. The upper and lower ranks of the meson octet are filled with heavier kaons that have strange quarks in them. The rule for mesons is that they always consist of a quark paired with an antiquark. We also follow that rule, although our notation shows explicitly the spin and charge on each meson, so we do not need all those other quantum numbers. A key observation we might make at this point though, is this. If the mesons are all made from combinations of quarks with antiquarks, and they have mean lives about the same as most of the baryons, why is it that no one has considered the possibility that the baryons with their triple quark ensembles might also combine quarks and antiquarks? I believe our theory provides justification for this approach, and it makes just as much sense as building mesons from quarks and antiquarks combined. We have shown with a simple physical model that a dynamic energy system can be formed of very opposite components that find a joint condition of homeostasis, thus allowing for the stable existence of the proton.

Appended to this chapter is a set of rough sketches of what some of the baryon/nucleon structures may look like. The components of these drawings are not to scale, and they may not be completely accurate, but they give a flavor of what we are talking about. Sheet 1 includes the Proton, Neutron, and Neutral Lamda. Sheet 2 shows the Sigma Plus and its decuplet resonance. Sheet 3 has Sigma Minus, Cascade Neutral, and Cascade Minus. Sheet 4 has Omega Minus and a Charmed Lamda Plus. Sheet 5 has a Charmed Cascade Plus, Charmed Omega Neutral, and a Bottom Lamda Neutral. Sheet 6 contains a Deuteron and a Hydrogen Molecule. Sheet 7 contains a preliminary rough sketch of the Helium Atom. (See end of Chapter 12.) The diagrams all resemble two hearts or apples or eggs having sex. The basic structure is a four-particle mixing phase conjugation system with a twist. Instead of using mirrors, we use the black hole force of gravity and the white hole force of Hawking radiation to direct the energy flows. This generates spin, polarity, charge, and so on. It also causes the space-time in and around the particle to be thoroughly warped.

The drawings are all variations on a single structure. As the structure grows in complexity, its inner core undergoes a series of bifurcations in its wave structure. I suspect the whole thing is a fractal, and that the core grows with a binary cascade system bound within the lens vesicle.

A binary star system is configured as two overlapping ellipses. Each ellipse has two foci, a positive and a negative one. The positive focus has a positive mass and a positive charge. The negative focus has a negative mass and a negative charge. These are relative values. When the two massive objects of the binary system have equal masses, the positive foci overlap in the center of mass position. Thus they look like a single particle with a double charge. The quark formulas produce such "doublets". To save space sometimes I write (Me++) for the positron double vortex in the center of the proton and (Mm++) for an antimuon doublet. The positive charge centers there. The two negative foci swing about outside like yellow jackets attracted to autumn apples. Because of quantum uncertainty, the paths may not be flat like stellar orbits, but three dimensional with rapid precessions.

In the proton case one negative focus is internal and cancels the charge of one positive focus. The other negative focus is spinning around at a distance and appears to be an electron attracted into an orbit around the proton to balance the charge of the second positive focus. In the neutron case both negative foci are internal, so the particle as a whole seems to have a neutral charge. The charges always gather around the foci, just as with magnets the magnetic flux gathers at the north and south poles. The foci themselves have no "internal" structure. They are just vortex points where energy gathers or disperses. This is why we see internal structure for protons, but not for electrons. The electron' s "internal" structure is "externalized" and found in the proton. The structure of electrons and neutrinos is dependent on and integrated with the ensemble structure of the proton.

Once the two outer foci are filled, it seems that other electrons must be drawn as close to the positrons as they can get. With that in mind I have allowed them to go into a path around the waist of the dumbbell shape in a pattern that resembles the (dz^2) electron orbital. This means that just below the (1 s) orbital is a girdle-shaped orbit with space for two charged leptons. Although the "girdle" orbit is external, it can get in pretty close. It' s a bit ambiguous whether it is external or internal. The Hydrogen molecule therefore is a 2 (Mp) configuration with a pair of electrons moving in a (1 s) orbital. The two protons together form a lower electron energy orbital than the usual (1 s) size, so the electrons are pulled in closer. Together with the other two internal electrons, they make a sphere that is closer than the (1 s) that obtains in the case of Helium. I put them into the girdle orbit, but they may not go in quite that close. Deuterium and Tritium add one and two (Mn) quanta. With Deuterium there is one electron in the girdle, and one in the proper (1 s). With Tritium the girdle has two electrons, and the (1 s) proper has one electron. Then Helium again fills the (1 s) orbital -- the proper (1 s) orbital -- with the girdle also containing two electrons with balanced spin. Thus atomic Helium is like molecular Hydrogen with two neutron quanta added.

Once the (1 s) orbital is full as in molecular Hydrogen or atomic Helium, the charges and spins are pretty well distributed in the ensemble. Atomic Helium is stable and chemically inert. The (1 s) orbital is pretty much spherical and more distant than the girdle orbital. From the (1 s) orbital onward the (2 s), (p), (d), and (f) orbitals fill according to the usual description.

You can extrapolate from these rough sketches past Helium on up the periodic table with the usual electron orbitals and corresponding nucleons. As the nucleons grow heavier -- even from Lithium on -- they look more and more like clusters of (Mp) and (Mn) balls with their components all shifting about and exchanging. A mathematically generated computer model that allows you to select the particle or nucleon you want and then automatically generates the proper graphic would be really useful and not too hard to put together. I' m not sure if I have drawn the relative scales properly in these rough drawings, but they do show the basic structural organization of the subatomic particles and nucleons. Everything proceeds in an orderly pattern, incrementing upward a step at a time using the basic quantum building blocks of the (u) quark and the lepton family. As we look at heavier and heavier nucleons, we have to enlarge the lens so we can see the details of the geometry of the standing waves inside. A 3-D model with rotation and zoom capability will be very helpful for visualizing the structure and carrying on further research.