Energy from Electrons and Matter from Protons:
A Preliminary Model Based on Observer Physics
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Virtually all the energy we use involves some form of electricity.   All chemical processes and all electronic devices run on electricity.   In a word, life on our planet is electrical.   Electricity requires working with electrons.   Unfortunately, although most of physics, and all of chemistry, involves primarily working with electrons, nobody has any idea what an electron is, or what it looks like, or how it is "built". The "models" that physicists work from are either derived from pure question marks or fairly thorough nonsense.

Here is a list of fundamental questions about the nature of the electron that remain unanswered or only opaquely answered as far as I can tell from browsing around in the literature.

*   Why does the electron have the mass it has?
*   What is mass?
*   Why does an electron spin?
*   How does an electron spin?
*   Why is the electron's spin quantized?
*   Why is an electron charged?
*   What is charge?
*   Why is charge quantized?
*   Why is charge dipolar (when gravity apparently isn't)?
*   Why do electrons have both electric and magnetic aspects?
*   Why are these oriented normal to each other?
*   How can an electron constantly radiate charge without decaying?
*   How do photons interact with electrons?
*   How can an electron be a point particle and still have mass?
*   How can an electron be a point particle and still be a wave packet?
*   How is a wave packet generated?
*   Where does it come from?
*   What, if any, is the structure of an electron?
*   Why does an electron behave most of the time like a fermion?
*   Why doesn't the electron fly apart if it has negative charge and spins rapidly?

(There is no theory of gluons for "pointlike" electrons.)

Most scientists simply accept the existence of mass, spin, charge, and the other phenomena listed above as givens and try to work from there.

If we wish to solve our energy problems, make progress toward a unified field theory, develop new quantum electronics technologies and so on, it seems we should make some effort to develop a coherent model of the electron.   In **Observer Physics** (ch. 11) I propose a simple, perhaps crude, model as a starting point for research -- a target to shoot at or a seed to plant and nurture.   At least it' s a start.

The first stage of the model is quite analogous to the Bohr model of the atom.   Bohr began his theory with a simple description of the hydrogen atom.   That simple model formed the starting point for modern quantum chemistry and physics.   Although the heavier atoms become more complex, the simple hydrogen model with some refinements formed the "prototype".   In the essay that follows I will provide at least a first draft answer to each of the above questions.   The answers will hold together into a coherent picture of what an electron is and how it behaves.   As a bonus we will also get a striking new detailed model of the proton.

For our new model I will ask you to forget the notion of electrons drawn as particles that you see in many books, and also forget the notion of the electron wave packet drawings that you see in lots of other books.   Both these visualizations are way off the mark and tend to mislead.


"Wave Packet"
(Typical Drawing)

I will propose some new visualizations that will help resolve the confusion and contradiction that surrounds the electron.

The first visualization refers back to the model of the atom with a positively charged nucleus surrounded by a set of negatively charged electrons that move in shells or orbits.   We transfer that model to the electron as a "view from a distance".   What we then see is that the electron functions as a negatively charged "nucleus".   It is

surrounded by set of positively charged virtual shells or orbits occupied by positively charged virtual positrons that have quantized levels of probability in the same way that the electrons orbiting a nucleus have quantized levels of excitation energy.   In this visualization we see the electron as a smaller scale reversed image of an atom.

e+ (virtual positron)
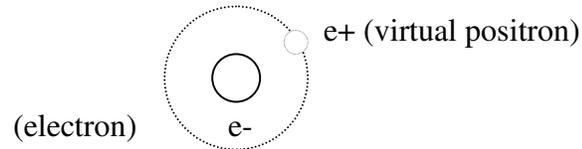
(electron)   e-

The simplest atom is hydrogen.   It has one proton and one electron.   All the electron shells except the one occupied by the single electron are in virtual mode.

Use your imagination to visualize an electron with a phantom virtual positron orbiting around it at a certain quantum probability which is too low to manifest as a real particle because it is smeared out into a cloud around its electron "nucleus". Because the mass of a real positron is the same as an electron, a real positron-electron pair forms positronium, an unstable "element" that quickly decays by the two particles mutually annihilating.   Positronium is similar in structure to a meson, an evanescent particle formed by the conjunction of a quark and an anti-quark.   To behave like a stable atom, the electron must only have a **virtual** positron in orbit around it.   The mass of the virtual positron is very small, at least a hundred thousand times smaller than the mass of the electron, and only sufficient to cause the electron to wobble slightly as it moves along.   This model explains why electrons vibrate as they move rather than simply translating in a straight line.

With this model we are still observing the electron "from a distance", and can' t see any details except that there is a fundamental connection between the electron and its antiparticle, the positron.   We will develop this idea in more detail later.

Now let' s turn to the first question on our list -- the problem of mass.   So far no theory except **Observer Physics** has proposed a logical reason why the fundamental particles have the masses they have.   This problem is not just limited to the electron. (For a more detailed consideration of the whole problem of mass and the fundamental particles see **Observer Physics**.)   It turns out that the electron' s mass is a bit more complicated than the proton' s mass.   The proton is the fundamental building block of matter.   Its mass is very simple, but its internal structure is complex.   Description of the electron' s mass is complex, but its internal structure is simple.   So we will have to describe in detail the structure of a proton, and the electron' s mass is closely related

to that of the proton.   But there is another important factor, and that is the electron' s relation to the photon, which is the other major interaction the electron has.

The electron functions as a "go-between" integrating matter and energy, space and time.   On the matter side it interacts with nucleons.   On the energy side it interacts with photons.   So its mass is determined by its role in these two types of interactions.

At this point I will state two formulas for the mass of an electron and identify the components without going through the elaborate derivations of these relations.

*   Me = (H eo % a^2) / e.
*   Me = (e / c)(Ru a / Ss)(Ao / %)^3.   (This formula is slightly more accurate.)

In the above formulas (Me) represents the rest mass of the electron.   The (H) represents the "h-bar" form of Planck' s constant and has the value of 1.054x10^-34 J-s. The term (eo) is epsilon zero, and represents the permittivity of electric charge in a vacuum.   It has the value of 8.854x10^-12 kg / m^3.   The units here are sometimes written as Coulomb squared per Newton meter squared, but I prefer to express them as the fundamental (or minimum) density of mass in a vacuum space when that vacuum is excited by the transmission of EM radiation.   The term (e) represents the quantum of charge for a single electron. It is usually expressed in coulombs as 1.602x10^-19 C.   I like to express it in kg/s a generation of a pseudo-mass in time.

Ru is 1 meter.   Ao is the area of a circle with radius of Ru.   Ss is the volume of a sphere with radius of Ru.   The term (%) represents what I call the Dimensional Shift Operator.   It has a value of about 3.1622 m.   The exact value is (10 m^2)^1/2. This is a spatial constant.   It happens that the values of the physical constants fit very closely to the metric system of units.   For example, the speed of light is c = 2.99792458...x10^8 m/s.   This is very close to 3x10^8 m/s.   It is so close that most of the time physicists just round it off.   Another example involves the rest mass of the proton.   By an amazing coincidence it has the following relation.

*   Mp c = P e Ru.

Here (Mp) is the rest mass of the proton, and (c) is the speed of light); (P) is pi, (e) is the quantum unit of charge, and (Ru) is very close to 1 meter.   Another way of writing the expression is to use the Einstein energy form for the proton' s rest mass (Ep):

*   Ep = Mp c^2.
*   Ep = P e Ru c.

Rather than arbitrarily setting the value of a meter, it seems to make sense that we calibrate it from a universal constant.   The proton is found throughout the universe. Physicists already do this to some extent when they use so-called "natural units", setting h = c = 1.   However, this choice renders the D-Shift Operator invisible much of the time.   It is like viewing multidimensional physics from the viewpoint of flatland.

The Shift Operator pops up regularly in physics.   The value (% = 3.162 m) serves as an operator for shifting scales and dimensions in the physical world.   Without going into the details of the derivation and its many applications, we can take as an example the commonly occurring relation between the smallest physical measurement scale and the largest physical measurement scale (in terms of constants), the constants that are usually "normalized" into "natural units".

*   (H) (c) = 3.162x10^-26 kg m^3 / s^2. = (%)(10^-26 J).
*   P %^2 = 31.4159 m^2.
*   P Ru^2 = 3.14159 m^2.
*   (P %^2) / (P Ru^2) = 10).
*   (H) (c) = (Ru)(Ru / %)^51 J.

Thus we can define a Joule entirely in terms of (H), (c), and the two distance constants.   Since all matter, which is what we measure in space anyway, is made essentially of protons, why not simply define the meter as a proton rest mass times the speed of light divided by pi times the charge quantum?

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

The term (a^2) in our electron formula represents the square of the fine structure constant (fsc).   (It is usually written with a Greek letter alpha.)   The fsc is the dimensionless constant in QED that governs the interaction between photons and electrons: (a) = (137)^-1 = e^2 / (4 P eo H c).   Thus we can also write our formula for the electron in another equivalent way that looks slightly more complex:

*   Me = (% e^3) / (16 P^2 eo H c^2).

Here (P) represents pi, and (c) represents light speed.   Since (Me) is the rest mass of the electron, we see Einstein' s mass-energy conversion formula here, taking (Ee) as the rest mass energy of the electron:

*   Ee = Me c^2 = (% e^3) / (16 P^2 eo H).

The components of our basic formula (H eo % a^2 / e) make sense.   Planck' s constant gives us the basic energy.   The permittivity tells us how that energy can configure in space.   The charge quantum tells us our particle is charged.   When we multiply the two, the charges cancel out.

*   (Mp) (Me) = (P e Ru / c) (H eo % a^2 / e) = (P H % Ru a^2 / c).   OR
*   (Mp) (Me) = (P a Ru Ao)^2 (As eo H / Ss c %^3).

As is the surface area of a sphere of radius Ru.   The squared fsc tells us that an electron interacts with the proton (or another electron).   The shift operator (%) tells us that the electron is an inter-dimensional mediator between matter and energy. Here we take (H) as a matter indicator and (c) as an energy indicator.   The quantization of (H) is the marker showing where fluid waves of energy start forming into discrete units according to the design of our universe.

*   (1.054)(3) = (3.1622)
*   (1.054)(3.1622) = (10 / 3).
*   (1.054)(3) = (10 / 3.1622)

We haven' t yet answered fully the question of how mass arises, and we have pushed the question of mass value over onto the question of why the universal constants, (H) and (c), have their values.   But we' ll come back to these issues after we have developed our model in a bit more detail.

The next question we tackle is the question of spin.   Why does an electron spin, and why is the spin quantized?   What IS quantum spin?   This whole question is treated with great mystery by physicists, and the answer is supposed to lie deep in the Dirac equations as a relativistic effect, a sort of time dilation.   Now this is fine, but we will find that it is not all that mysterious once we build our model in a way that we can easily visualize what is going on.   One of the major problems with modern physics is that it has divorced itself from simple visual models and jumped so deeply into

abstract mathematics that it begins to lose touch with the real world that it is supposed to describe.   Our model will simultaneously answer the whole list of mysterious questions that we asked at the beginning of this article, while providing a simple visualization of what is going on.

The drawings of the electron given in physics texts showing it as a wave packet are correct only in the sense that the electron is indeed a wave packet.   But the electron wave packet does not look at all like what artists draw in the books.   The wave packet in the books raises the question: where do all these waves come from?   If they are infinite sine waves, they all go off forever to the ends of the universe.   But the electron is a real impulse, an interference pattern of these various wavelengths, and it travels along a trajectory and interacts electro-magnetically and gravitationally with other particles (although the gravitational component is usually very weak in comparison to the EM component.)   So basically the electron goes along its path interacting (usually) with other electrons or with nucleons via the EM interaction, exchanging photons.   Since the electron habitually emits and absorbs photons, we might reasonably surmise that an electron is simply made of photons.   And this is our surmise.

So we need to take a look at the behavior of electromagnetic exchanges via photons and extrapolate the electron structure from this.   We can start by assuming the usual model that EM radiation travels through space as a transverse wave phenomenon. Observers with different viewpoints may see the waves distorted in various ways, but we can view the standard EM wave propagation in a simple way.   The wave propagates from a point source (e.g. an electron) expanding at the speed (c) in all directions as a bubble similar to the way a wave spreads from a pebble dropped in a pond.   The impulse oscillates electrically normal to the direction of travel. (Under some conditions the angle can appear distorted.)   The electric oscillations induce a secondary magnetic oscillation that is normal to the electric one.   Thus we have three oscillations: the oscillation of the exchange of advanced and retarded photons between charged particles, the electrical oscillation, and the magnetic oscillation. Each has its own separate dimension.   The result is the three-dimensional space that we experience.

Sound waves transmit longitudinally, but EM waves are transverse and have this peculiar three-dimensional quality.   We will hold off for the moment the question of why they do this.   Assuming that they do, our question is then how this affects the electron structure.   The energy of EM radiation resides in the frequency.   The

higher the frequency (smaller the wavelength) the higher the energy content. Theoretically there is no upper limit to the frequency.   However, in practice we find that at some point the energy of a photon, which itself has no rest mass, but only linear momentum, may become equal to the energy of a particle with rest mass (Mo) by the relations (E = Mo c^2 = h u).   It then becomes a very real possibility that the photon can turn into the particle.

This only happens at very high frequencies.   At such high frequencies the primary electrical oscillations become so tight with their small wavelengths that they "overwrite" themselves.   Instead of simply wiggling back and forth as they travel along, the photons begin to look like they go around in tight little circles.   Now the linear momentum becomes localized and generates the illusion of mass.   Because the EM radiation travels at the constant speed of (c), this means that the circular motion is at the constant speed, (c).   Once the radiation speed is transformed into rotational motion, the eddy of energy that is now a particle continues to move, only at a slower speed called the "group" velocity.   This answers the questions of why electrons spin and why the spin is quantized.   All observers will see the EM energy that forms the electron spinning at the same speed.   What was once EM radiation propagating through space at (c) becomes EM radiation circulating in one spot at (c).   This is electron spin.

This model also explains why electrons have charge, and why that charge is quantized. When the electric oscillation moves circularly, it causes the magnetic oscillation that is normal to it to roll up into a central axis like the axis through a top.   When the electric oscillation is waving along through space, the magnetic oscillation waves along with it (in opposite phase).   However, when the electric oscillation goes around in a circle, it does not oscillate any more.   Yet it still moves.   Thus it induces a steady magnetic charge at the poles of the electron.   The electron becomes like a little magnet.   One pole is north, and the other pole is south.   In free space the electron has no particular orientation, so the electrons are randomly distributed.   But when a group of electrons enter a magnetic field, each one, based on its random orientation will take the shortest path to line up with the magnetic field.   So you will get half spin up and half spin down.   The same is true of ordinary tops if you spin them randomly at high speed and then place them in a gravitational field -- say on a floor.   Half will precess one way, and half will precess the other way.   This answers the question of why electrons have quantum charge split into two possibilities.   The two poles of the charge on a particle correspond to the two poles of the magnetic oscillation in free space.   But they have been frozen into position.   The oscillation

damps down to become the electron's precession.

Now we have refined our "Bohr" model of the electron to the point where we see it as a photon that is "circulating".   This gives us the second level of our visualization -- the image of an electron as a little top.   However, this stage of our model is not at all complete.   The electron is considered a "point" particle, and a photon rotating around such a point would seem to move faster than light.   What is going on here?   We need a third level of visualization to fully understand electron structure.

We must now take our model to another level of resolution.   Zooming in for a closer look, we discover that the electron is indeed a kind of "point" particle.   But how can you have mass and rotation with a mathematical point?

The real world is not an abstract mathematical world.   There are no infinitesimal points in real world space.   Space and time, as Einstein showed, are just another way of talking about mass-energy and gravitation.   The so-called force of gravitation is actually a warping of space/time in the vicinity of concentrated mass-energy. Looked at in that way gravity is not a "force".   As we look closely, we find that both the strong force and the gravitational force disappear.   They are only inventions by physicists to describe poorly understood phenomena.   The so-called weak force is an especially dense form of the EM force that arises from the vacuum when particles interact and scatter.   So there is no need to "unify" the forces.   There is really only one kind of "force", and that is generated by the observer, and has nothing to do with particles.   The particles are just an excuse.

Our third major visualization comes when we zoom in closer and discover that what looks from a distance like a top is actually a vortex.   It's like a tiny tornado or energy vortex that looks like a waterspout.   For this visualization we must imagine that a photon seems to emerge spontaneously from a point in space.   It then spirals outward around the focal point of the vortex.   The electron is like a tiny white hole, spitting out energy.   The photon spirals outward until it reaches the de Broglie radius.   This is somewhat like the event horizon of a black hole, but works in reverse.   When something passes inward across a black hole event horizon, it can no longer escape and will spiral inward to the singularity of the black hole.   In the case of our "white hole", once a photon passes beyond the de Broglie radius, it becomes a radiating photon emitted by the electron.

Now there are some serious questions that come up with this model.   Why doesn't

the electron evaporate and disappear? Wouldn' t there be superluminal velocities? A black hole increases in mass as it absorbs material, so a white hole should decrease in mass.   The answer involves extending our model to include the relation of the electron to a nucleon.   There is a circulation of energy that takes place between protons and electrons.   A proton behaves like a black hole and captures energy that is emitted by an electron in its vicinity.   That energy then spirals inward to a point inside the proton where it disappears "down the drain" so to speak.   Inside each proton are anti-vortices that are essentially positrons held in captivity. A positron is an electron moving backward in time.   The positrons swallow the EM energy that they absorb from the emitting electrons.   The energy goes down the drain and runs backward in time to the point at which the positron vortex was co-created with an electron as a matter/antimatter pair.   At that point it reverses in time and flows forward, spiraling outward from the point center of the electron.

As you may have imagined by now there is a relativistic effect going on inside both the electron and the proton.   When the photon is close to the point center of the vortex it experiences extreme time dilation and appears to an observer in our space/time as if it is moving very, very slowly.   As it spirals outward from the center of an electron, it appears to accelerate.   By the time it reaches the de Broglie wavelength radius, it hits light speed (c) and moves out across the vacuum of space as EM radiation.

The "photon" spiraling out of an electron vortex is effectively moving in a wave guide. Photon interchange in free space is governed by the Einstein-de Broglie Velocity Relation.

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

In a wave guide, however, the photon/antiphoton pair that are moving interactively at (c) split apart and move at different velocities.   The actual motion of the photon pair in the guide is always at (c).   However, the effective progress along the guide becomes (Vg), the group velocity.   The interaction of the phase of the wave front with the guide (the energy density) moves at the phase velocity (Vp).   Since we hold (c) to be a constant, this means that the group and phase velocities have an inverse relation.   By convention we label the slow velocity "group" and the fast velocity "phase".   The phase velocity therefore is always greater than (c) in such a wave guide.   Another feature of wave guides is that the frequency stays constant (holding the energy constant), but the wavelength drops to compensate for the group wave' s

drop in speed.

It is clear from our spiral model that the electron indeed is a wave packet composed of many different wavelengths.   However, it is not spread out in a linear fashion.   It is wound like a spring.   This spring can also stretch, just like a regular spring, giving us the Heisenberg uncertainty relation.   The uncertainty arises from the interaction between the photons that are emerging, the momentum of the electron, and the observer's intervening observation.   The spring, of course, can bounce around, and we experience that as the motion of the electron particle.

How does the photon energy of the electron spring uncoil from the center?   Let's explore.   Photons in free space move at the phase velocity $(c) = (u)(Lo)$ where (u) is frequency and (Lo) is wavelength.   This has mass-energy in the following way:

* $E = hc / Lo = p\ c$.
* $p\ c = h\ c / Lo$.
* $Mu\ c^2 = h\ c / Lo$.
* $Mu\ c\ Lo = h$.

Here (u) is frequency, (E) is energy, (h) is Planck's constant, (Lo) is the wavelength of the photon in space, (p) is its linear momentum, and (Mu) is its virtual "mass".   As (Lo) decreases below $(\%)$, the photon energy concentration increases to the point where it may begin to shift into quasi-particle mode (electron neutrinos).   In a wave guide the velocity (c) becomes split into two components, the group velocity (Vg) and the phase velocity (Vp), related by the Einstein/de Broglie Velocity Equation as we mentioned.   We'll let (Mg) be virtual mass, and (Lg) be the shifted wavelength in the wave guide.

* $Vp = p\ c\ Lg / h$.
* $Vp = Mu\ c^2\ Lg / h = c^2 / Vg$.
* $Vg = h / Mu\ Lg$.
* $(Vp)\ (Vg) = c^2$.
* $c^2 / Vg = Mu\ c^2\ Lg / h$.
* $(Mg\ Vg)\ Lg = h$.

An electron or an anti-electron (positron) is an energy vortex that functions like a curved wave guide that bends the path of photons in a manner similar to glass or water.   The energy density strongly refracts the photon's trajectory.   Thus the

frequency remains constant, but, to a hypothetical "outside" observer, photons nearer the dense singularity of the vortex seem to move slower than at the de Broglie radius. They have **shorter, contracted,** wavelengths unlike the longer wavelengths that photons moving through glass have.   The electron is a mini white hole, and the anti-electron is a mini black hole.   Energy flows into the positron, is swallowed into its singularity like water flowing down a drain, and then tunnels through hyper-space (below the zero point) backward in time to emerge from the singularity of an electron. It spirals out from the electron singularity and is sucked through ordinary space as ordinary EM radiation toward a positron.   All electrons look alike, and all positrons look alike, so the loop does not have to be restricted to the original pair partner. Photon flow can share around.   It is bosonic in nature.   Now we let (Me) become the electron mass, and (Le) is the wavelength loop "cycle" of the vortex energy as it swirls around the singularity.   The expression (Le / 2 P) gives the radius, whereas (Le) is the approximate wavelength of one loop around.

* Me Ve Le = h.
* (Le / 2 P) = (H / Me c).
* Redb = 3.86x10^-13 m.   (Effective de Broglie radius of electron.)
* Ledb = 2.426x10^-12 m.   (Wavelength loop at de Broglie radius.)

The point-like "white hole" vortex eye of an electron (Reh = 2 G Me / c^2) is way below the Planck length.   From our perspective it may as well be a point, though it is not.   The electron inherently "leaks" energy in the form of EM charge.   The Planck length (Lpl = (h G / c^3)^1/2 ~~ 4x10^-35 m.) defines the circumference of the tube around the singularity through which energy leaves an anti-electron and flows timelike through a time reverse tunnel to an electron. Photon energy flows into the core of an electron through this tube. There is no spatial distance between the electron and anti-electron when the energy crosses over.   Outside the de Broglie radius an electron' s photon energy is very diffuse and tends to stream lightlike through space as EM radiation and "free" photons moving at (c) toward an anti-electron attractor, generating the phenomenon of electric charge.   The tube through the center of an electron forms a magnetic pole.   The whole thing looks rather like the pictures we see of black holes swallowing material at their equators and spewing out energy at the poles, except that the process runs in reverse, since the electron is a white hole. Photons come in at the polar axis and go out at the equator.   Positrons operate like black holes.   Since the positron is trapped inside the proton, it can not annihilate with an electron.   Instead it just leaks energy by Hawking radiation in a loop with the electron.   The loop is driven by the inertial momentum of the Big Bang, and will

continue until all the protons decay and allow the positrons to annihilate with their electron partners.   Expansion and isolation simply prolongs the process indefinitely.

Physicists do not imagine the electron spinning at (c) because then, as the particle "spins", they suppose the outer parts would have to move at superluminal speeds. This is not the case.   Inside the de Broglie radius speeds undergo the wave guide effect and are split into group and phase components.   There is also a refraction effect that slows the velocity of the photon and shifts its wavelength in the dense core. The photons never deviate from their characteristic speed of (c).

*   (c) = (u) (Lo).
*   (Ve) = (u) (Le).
*   n = (Lo / Le).
*   n (Ve) = c.   (The refraction formula)

Here (u) is the constant frequency of the electron, and (Lo) represents the wavelength of EM radiation from electrons as its emitted photons move through space.   (Le) represents wavelength inside the de Broglie radius.   As (Ve), the group velocity of a photon inside the electron, drops below (c), (Le) also decreases, and (n) increases. The frequency stays the same.   This tells us that photons at the super dense core of the electron vortex appear to move extremely slowly.   The frequency being constant, (Ve) at the Planck scale is about 10^{-15} m / s, and the Planck loop is about 10^{-35} m.   At the theoretical electron black hole center the velocity would be in the range of 10^{-78} m / s.   Thus for the photon to progress from there to a distance of 10^{-12} m at an average speed of 10^{-35} m/s would take over 3 quadrillion years, roughly 300,000 times the estimated lifetime of the universe.   But from the Planck scale it might take as little as 10^{-4} s, which is still quite pokey for a photon.

*   Ve = (u) (Le) = $(1.24 \times 10^{20}$ Hz$)(10 x^{-35}$ m$)$ = 1.24×10^{-15} m/s.
*   n = 2.42×10^{23}.

The value of (n) is very high at this point.   It will drop to n = 1 at the de Broglie radius.   Because the initial loop is so small, the photon still makes a lot of loops per second.   As a photon moves outward on a spiral path, the energy density drops off, and the photon speed and wavelength both increase until the wavelength reaches 2.426×10^{-12} m.   At this point the photon (with its characteristic electron frequency of around 1.24×10^{20} Hz) is moving at (c) and finds itself in free space.   Other group wave effects arising from the motions and energy states of the electron as a

whole -- for example, an electron in an orbital -- may contribute modifications to the fundamental frequency-wavelength relationship, but that is a separate, well-studied, question that we will not discuss here.   A perfect tangent to the energy loop would have no energy at all.   But the photon oscillates and keeps a linear momentum as it streams toward its "anti" partner.   Vibrations present in the electron when the photon shakes loose determine the photon oscillation.   These oscillations, as we have seen, are caused by the unseen influence of the virtual positrons.   The de Broglie radius is the distance from the singularity at which the photon reaches light speed as it emerges from its self-imposed density.

We could represent the electron's vortex with a simple Archimedean spiral. In polar coordinates with the angle (A) in radians and a constant radial progression of (a), we might write the photon's radial distance from the electron's singularity (Re) as:

*   Re = a (A).   (Or we can use the parametric equations:)
*   x = a(A) cos (A); y = a(A) sin (A).

However, I suspect that the spiral is more likely a phi-pi type of spiral.   Such a spiral allows the photon to constantly maintain the Einstein/de Broglie Velocity Relation [(Vg) (Vp) = c^2] as it moves out from the singularity toward the de Broglie radius. Thus we modify the Archimedean equation as follows, taking phi as a base starting value, (A) as a number representing some multiple of pi as the spiral unwinds, and (P) as pi.

*   c^2 = (Vg) (Vp).
*   [phi^(AP+P)] [phi^(AP+P)] = [phi^AP] [phi^(AP+2P)]
*   Re = phi^(AP/P) (Rpl)   (Rpl ~~ 10^-35, the Planck radius)

As the photon spirals outward, (A) increases, and the wavelength (1 loop around) grows longer, and the photon appears to accelerate, because each loop is larger and thus has a longer path, and the photon must travel around each loop in the same amount of time.   If the photon at (phi^A) (Rpl) represents the group distance, then the photon after another full loop represents the phase distance.   Half way around from (phi^A) (Rpl) to phi^(A+2) (Rpl) we find phi^(A+1) (Rpl) representing a relativistically contracted "light speed".   We can either say that time has dilated or that the wavelength has shortened.   But it goes through a much smaller loop in the same time that it takes to go through the larger loop at the de Broglie radius at its normal velocity of (c).   When (phi^A) (Rpl) = 2.426x10^-12 m, then the speed

becomes (c).   The photon will then take leave of the electron and move at "standard" (c) through space.   This description may need refinement, but you get the idea.

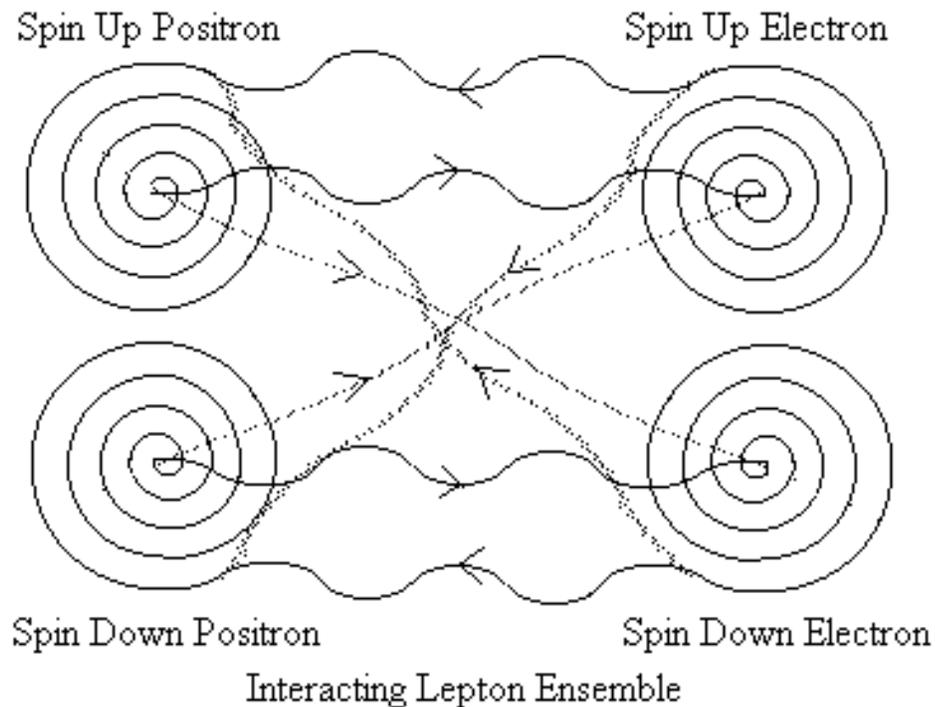**Rough Sketch of Photon's Spiral Path in the Electron Wave Guide**
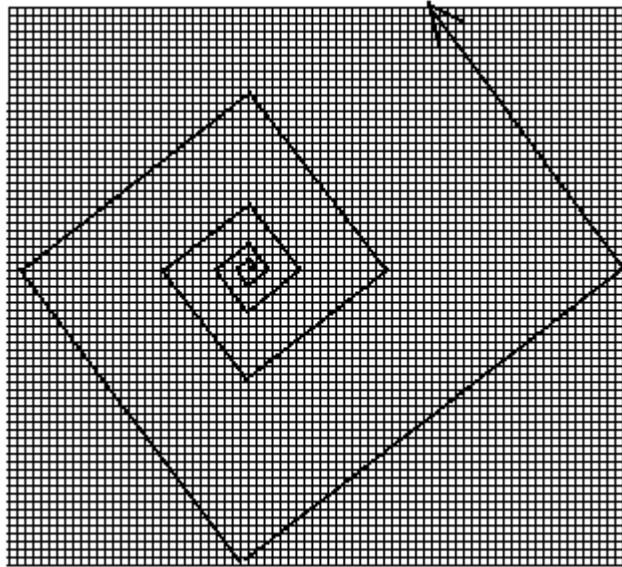
The path shown here has been squared off to show the phi relationship.   The actual spiral path of the photon is a curved logarithmic spiral.   The spiral tracks of charged particles in magnetic fields that are recorded in scattering events are large-scale versions of the same path.   One unit on the grid above represents the Planck radius (Rpl ~~ 10^-35 m.)   To see the Einstein/de Broglie relation, look, for example at the point where (AP / P) = 2.

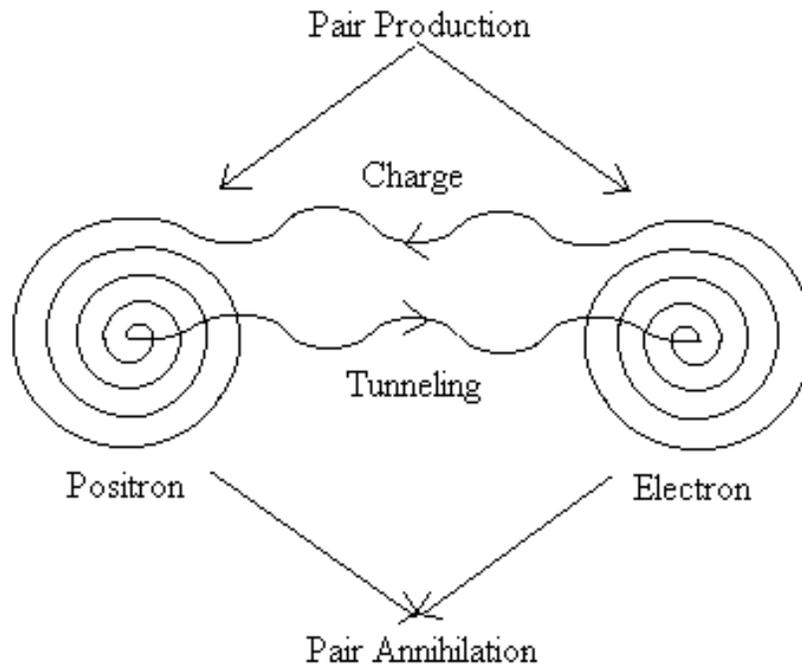*   Rfe = (phi^2) (Rpl) = (2.618)(10^-35) m.

Since the frequency is constant, we can just look at distance ratios.   At that moment the outward progress (Vg) of the photon is 2.618 times its initial velocity which we' ll call unity.   Its actual instantaneous motion is 3.325 times the initial velocity, and the phase velocity (Vp) is 4.236 times the initial velocity. As the photon approaches the de Broglie radius around 2.426x10^-12 m., its instantaneous outward progress will be 2.36x10^8 m / s, it will move forward at around (c) = 3x10^8 m / s, and its instantaneous phase velocity will be 3.818x10^8 m / s.   Once the photon reaches the speed of light in a vacuum, it leaves the electron and travels in free space.   The group and phase velocities coalesce and both become (c).   On the other hand, at the moment when the photon pops out of the tunnel at the vortex singularity, it moves at around 1x10^-15 m / s, its centrifugal velocity.   (Below that level we can not see,

because it penetrates back both energetically and temporally to the Big Bang.)   At the Planck scale in the vortex the photon moves forward at around 1.27x10^-15 m / s, and its phase velocity is 1.618x10^-15 m / s.   As we see, the only superluminal aspects are phase velocities near the de Broglie radius.   Phase velocities commonly exceed (c).

The whole operation is a tiny version of the Hawking radiation system.   The electron-positron pair splits apart at the "event horizon" of a black hole, in this case the mini hole that forms the vortex center of the electron-positron pair.   The "anti" energy falls into the positron vortex, and then the energy spins out of the electron vortex.   Pair creation causes the two halves to seem separated, but they remain together, connected through the vacuum in hyper-space.   Multiple pairs share energy and the streaming photons distribute quantum mechanically among the members of the system according to the relevant probabilities.

Spin Up Positron   Spin Up Electron

Spin Down Positron   Spin Down Electron

Interacting Lepton Ensemble

Pair Production

Charge

Tunneling

Positron

Electron

Pair Annihilation

To Summarize:

* L_{edb} = h / M_e c = 2.426x10^-12 m.   (electron's de Broglie wavelength)
*   u = M_e c^2 / h = c / L_{edb} = 1.237x10^20 Hz.
    (electron's fundamental frequency)
*   (u) (L_{edb}) = c = 3x10^8 m / s.   (Photon velocity at the de Broglie wavelength)
* L_{pl} ~~ 4x10^-35 m.   (Planck scale wavelength)
* V_{epl} = (f) (L_{pl}) ~~ 4.95x10^-15 m / s.   (Photon velocity at Planck wavelength)

(The spirals in the charts above are drawn as Archimedeans to show more vortex detail.)

*   (V_g) (V_p) = (c) (c).
*   (phi^0)(phi^1) = (phi^1/2)(phi^1/2).
*   [phi^AP] [phi^(AP+2P)] = [phi^(AP+P)] [phi^(AP+P)].
* R_e = phi^(AP/P) (Rpl).   (One possible formula for the spiral)

The above example could be a pair of electrons in a hydrogen atom interacting with the positrons that lurk at the core of the proton.

The electrons function as the "white hole" portion of the system, receiving anti photons at the singularity and spitting photons out from the periphery to feed the positrons.   The positrons function as the "black hole" portion of the system, sucking photons in at the periphery, and feeding them to the electron singularity as anti-photons via the quantum tunnel under the vacuum zero point.

There seems to be a general misunderstanding among physicists about the non-classical nature of an electron' s quantized spin.   First, they marvel at its two values. All spinning tops have two equally probable values -- up and down -- if they are symmetrical.   But they can have various angular momenta.   The restriction to only two values of spin derives from the fact that the electron' s spin is an expression of the photons emerging from its singularity.   The photons all travel at light-speed in a vacuum, and the photons moving around the outermost rim of the electron move at that constant speed.   The electron itself does not spin.   It is just a tiny piece of highly warped space/time generated by the density of the tightly curled photon trajectory.   The photon, on the other hand begins its journey from the singularity at an extremely slow pace.   Compared to its usual pace it is nearly frozen in space/time. Therefore the analysis using Heisenberg uncertainty is faulty.   (For example, see Kroemer, p. 561.)

* $v = H / Me\ r$.

Here (r) is the radius of the electron and (v) is the rotation speed at the equator.   This leads to a confrontation with the requirement that v < c. Hence,

* $r > H / Me\ c$.

This analysis shows that the electron, although a point particle, does have an outer radius in the range of 10^{-12} m.   But the "electron" is not really spinning.   The photons are spiraling out from a singularity through a mass-energy refraction wave guide.   This gives the illusion of spin.   So we must analyze by way of the de Broglie wavelength (which varies), the de Broglie frequency (which remains constant), and the radius, which varies as the photon spirals.   We thus are dealing with a spiral EM wave guide, not a spinning particle.   The electron is a point particle, because the spiraling photon arises from its center.

Why doesn' t the electron fly apart?   In fact it does -- all the time -- as it gives off photons.   However, the electron remains stable because a stream of new photons comes in all the time to replenish the ones that radiate away.   The electron is not a particle, it is simply a self-referring vortex wave guide for channeling photons.

Another interesting realization occurs when we confront the notion of electrons and positrons inside the nucleons.   This viewpoint radically departs from standard theory.

Here is what Feynman says on the subject (Lectures, 2:1-1).

"If we try to confine our electrons in a region that is very close to the protons, then according to the uncertainty principle they must have some mean square momentum which is larger the more we try to confine them.   It is this motion, required by the laws of quantum mechanics, that keeps the electrical attraction from bringing the charges any closer together."

The generally brilliant Feynman has gone off base here, although what he says sounds reasonable at face value.   First, we have evidence that neutrinos and electrons lurk inside neutrons, because a decaying neutron gives off an electron and an antineutrino. This tells us that an electron CAN get inside a nucleon.   Every neutron has not just one, but TWO electrons forming a Cooper pair in an internal orbit.   The emergence of an antineutrino also informs us that there is antimatter in the neutron.   The proton' s positive charge also suggests the presence of at least one positron. Dirac' s first version of his theory of antimatter was entitled "A Theory of Electrons and Protons." This theory was closer to the truth than his contemporaries realized.   The discovery of the positron as a free particle threw physics off the track for many decades.   The same positrons that occur briefly in scattering experiments are trapped "forever" inside protons.   Dirac' s "Sea" is not in the vacuum, it is in the proton.

Modified Dirac Sea Model
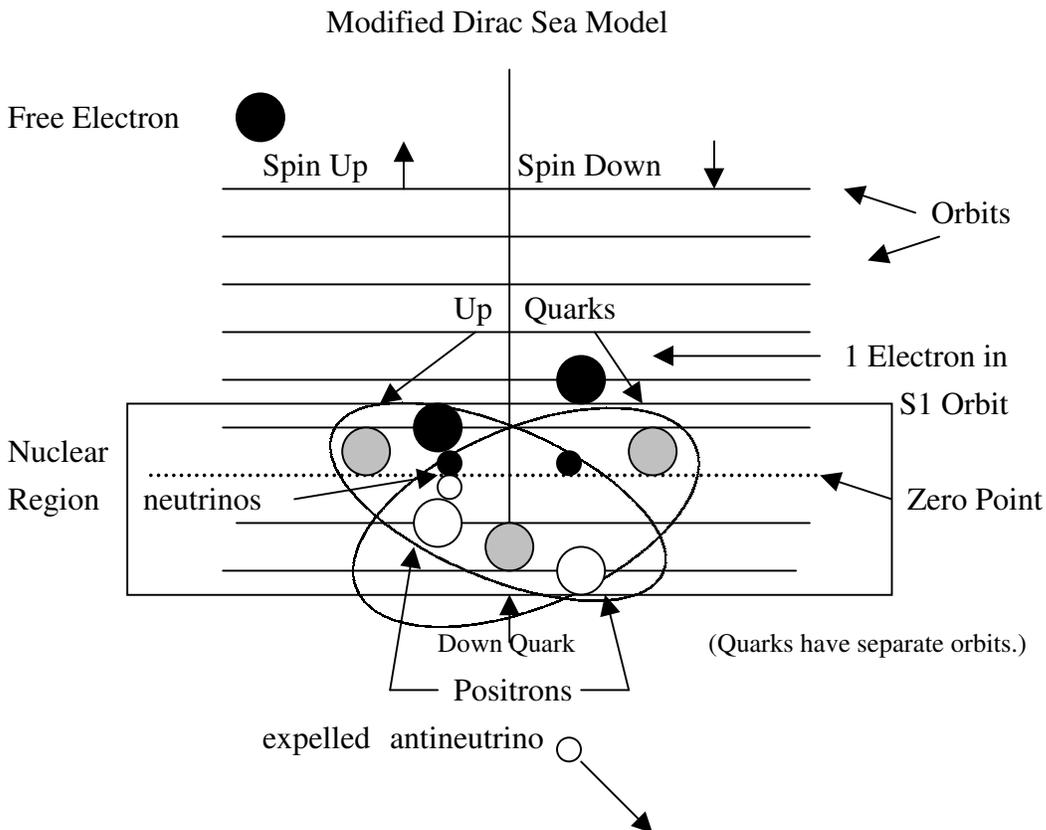
The above is a schematic model of a hydrogen atom with a free electron in its vicinity. It shows us that the inside of a proton is a droplet of quark soup left over from the ancient ocean of quarks.   The neutrinos and antineutrinos are close to the zero point. An antineutrino has exited when the nucleon decayed from neutron to proton. The neutron differs from a proton only in that the S1 Orbit electron is in the nuclear region and there are two antineutrinos.   The two up quarks have spin 1/2, but no charge, so they try to eat each other.   The down quark is the overlap region of negative energy. It also has spin 1/2, but no charge.   I place it in the middle because it is not clear whether it is spin up or down.   It is torn between the two up quarks and wobbles back and forth.   The two positrons in the overlap region function as photon drains so the system does not overload.   Positronium has only one drain.   Hydrogen has two, and heavier baryons and nucleons have more.   The overall spin of the proton is 1/2, since there is an odd number of components, each with spin 1/2.   The charge is positive, because there are two positrons and only one electron.   The up quark is actually a neutrino with a mass in between the muon and the tauon.   An up quark has a mass slightly less than 3 muons, and a proton is slightly over 3 up quarks.   The tauon is close to double the size of a proton.   The muon is over 200 times the size of an electron.   An up quark is about 13 times the mass of a tauon neutrino.

Free neutrinos are not well defined and sometimes tend to oscillate from one type to another.   Recent studies of neutrino flux from the sun show that neutrinos oscillate in this manner.   Interestingly the up quark "neutrino" is found only in the bound state within nucleons.   Neutrinos have wave packets that look a little bit like this:
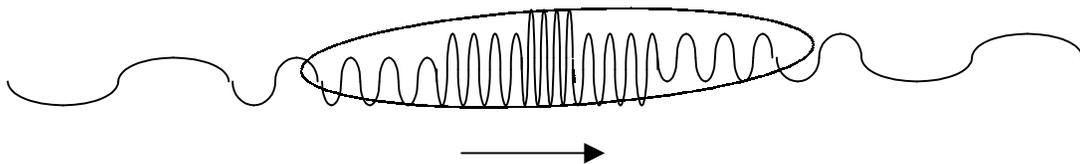
The wave packet has an area of high frequency waves that cancel out elsewhere along its path.   Essentially a neutrino is just an interference pattern of a group of photon wave packets that are travelling along together.   The small neutrinos travel almost at the speed of light.   The heavier neutrinos are just overtones of the smaller ones. Since the waves do not wrap around, there is no charge, and in that respect the neutrino behaves like a boson.   (This is different from the ensemble particles such as neutrons in which opposite charges all balance out.)   But for neutrinos the photon pairs split apart into group and phase wave aspects, so a neutrino has a spin (polarization) of one half for the group wave component and one half for the phase

wave component, and the neutrino also shows fermion behavior.   Thus it is usually classed as a fermion, and called a "lepton" even though the tauon is heavier than the proton.   The phase wave component is slightly superluminal and much more spread out than the neutrino, so we do not detect that aspect.   Neutrinos are hybrids straddling the "gap" between particles and waves.   (See **Observer Physics**, ch. 9-12 for more details on neutrinos.)

Heisenberg' s uncertainty relation applies inside a nucleon, but has special rules because the entire inner ensemble of the nucleon functions as a standing wave echoing inside a hot mini black hole' s event horizon.   All components are locked into position by virtue of "phonon" wave harmonics just like the internal components of a superconductor, but on a much smaller scale.   The two positrons and two electrons respectively form miniaturized Cooper pairs, the distances being harmonically scaled down.   The nucleon' s small scale subjects the components to extreme black hole dynamics.   The hole is hot and explosively radiates a proton or neutron.   Then the extremely dense space/time sucks the escaping energy back into the hole again.   The zero-point black hole ends up pulsating in a remarkably stable manner, perfectly balanced between condensation and evaporation, and manifesting as a proton or neutron.

All protons look the same and all electrons look the same.   They do not have preferences about their choice as a mating partner.   Energy continually circulates in the loop between protons and electrons because the positrons inside the protons are trapped and insulated by the quarks and can not get close enough to the electrons to annihilate with them.   This homeostasis occurred at the time of the Quark Confinement.   Certain clusters of mass energy got caught in quark pairs that were swirling around each other like tiny binary star systems.   They formed hot mini black holes that behaved somewhat like bosons and could cluster together, overlapping and sharing energy.

* $Bu = 1.86 \times 10^{-9}$ kg   (a single component)
* $Bu^2 = (H c a / G)$.   (a pair interacting)

We can call this energy swirl the Unity Boson (Bu).   There are a number of ways to derive it.   One simple way is to start with the ratio of the electrical force to the gravitational force between a proton and an electron.

* Fe = e^2 / 4 P eo r^2.   (Coulomb' s Law of Electrostatic Force)
* Fg = G (Mp)(Me) / r^2.   (Newton' s Law of Gravitational Force)
* Fe / Fg = e^2 / [(4 P eo) (G Mp Me)] = 2.3x10^39.

We toss out the proton and the electron and plug in two interacting particles that we will consider equal in mass (Bu)(Bu).   Then we set the ratio to unity, the point where the electrical force exactly balances the gravitational force.   We want to find out what kind of particle pair could produce that situation.

* Fe / Fg = e^2 / 4 P eo G Bu^2 = 1.
* Bu = 1.86x10^-9 kg.

This particle turns out to be the mass of the tiny oil droplet with a single electric charge quantum that Millikan observed in his famous experiment.

This "particle" also naturally occurs when we look at a minimal Schwarzschild radius of a black hole and then combine it with the de Broglie wave equation (Compton wavelength) for particles with mass.   This gives us the critical mass that would form a black hole from the intensity of its own matter waves.   We use Newton' s formula for gravity to determine the approximate radius of a black hole event horizon (which is what our proton forms.)

(Mx) is the mass of the satellite photon.   (A) is its acceleration.   (V) is the velocity. (My) is the core mass.   (G) is the gravitational constant.   (R) is the radius.

* Fg = Mx A = G Mx My / R^2.
* A = G My / R^2.
* R/s^2 = G My / R^2.
* R^2 / s^2 = V^2 = G My / R..
* R = G My / c^2.   (We set V = c.)
* My = R c^2 / G.
* My = H / c Ly.   (This is the Compton wavelength radius.)
* H / c Ly = R c^2 / G.   (We set these as equal.)
* R = Ly.
* Ly^2 = H G / c^3.
* Ly = 1.61x10^-35 m.   (This is the vortex hole, the Planck radius.)

We can now calculate (My), the deflecting mass by substituting (Ly) back into the

Compton expression.

*   G My / c^2 = H / My c.
*   My^2 = H c / G.
*   My = 2.177x10^-8 kg.

This is quite close to the mass of (Bu) = 1.86x10^-9 kg.   (My) turns out to be off from (Bu) by a factor of 11.7 = (a^-1/2), the inverse square root of the fsc.   Thus:

*   Bu^2 = H c a / G.

We know this is correct, because we can substitute Bohr' s derived value for the fsc in terms of constants and convert this Planck black hole into our first derivation.

*   Bu^2 = e^2 / 4 P eo G.

A third derivation arises from considering the minimal permitted stable mass-energy density sphere in a vacuum [eo = 8.854x10^-12 kg/m^3] simply in terms of geometry.

*   Bu = P eo Ss (As / Ao)^2 = 16 P eo Ss = (64/3)(P^2 eo Ru^3).

Here (Ss) represents the volume of a sphere with a radius (Ru = 1 m), (As) is the surface area of that sphere, and (Ao) is the area of the disc of rotation that generates the sphere.   (Ru) = (Mp c / P e) is the spatial distance that defines the proton rest mass.   This gives us Bu in terms of the proton.   (Ru) is the radius of a (2 pi Ru) circle with a proton core. When you are 1 meter from a person' s heart, your two energy fields overlap forming a radius (Ru) vesica pisces vibrating at 4.775x10^7 Hz.

All other energy swirls in the primordial quark soup except neutrinos were unstable and quickly decayed, but these creatures happened to decay into protons, retaining enough virtual mass-energy below the zero-point that they kept recycling.

What appears at first glance to be an overlapping binary black hole system actually becomes a triple system.   By itself a single (Bu) black hole evaporates quickly and explosively.   At the time of Quark Confinement that is what happened to almost all of them.   But two of them that happen to overlap forming a stable feedback loop. A very small portion of the Bu-size black holes bubbling around in the quark soup happened to be in that condition just as the temperature dropped under 10^14 K (just

over 1 GeV).   And they became the protons of our universe.   The two hot black holes are eating each other, attempting to merge.   At the same time they are hot, and keep evaporating.   Most of the evaporation just flows into the partner hole, only to be sucked back again.   The lenticular area where they overlap forms the center of gravity.   In this region there are TWO singularities.   These effectively are a pair of positrons.   Between them is a dense mass of swirling energy that generates a third "particle".   Thus, the two (Bu) outer particles and the third particle in the core together form the three quarks that have been detected inside the proton.   The two (Bu) particles correspond to up quarks, and the central particle corresponds to a "down" quark.   Just as the proton is an ensemble particle, so also the down quark represents a mini ensemble.   Among all the members of the particle zoo there are only two quarks -- the up and the anti-up.   All others (down, strange, charm, bottom, top) are just up or anti-up quarks with various collections of lepton entourages.   Also, as we discussed regarding neutrinos, the quarks are just waves of energy without charge.   Up quarks are fat neutrinos surging wave harmonics.   The charges are generated by the vortexes where the tightly wound photon spirals occur.   These are the electrons and positrons exclusively.   The down quark inside the proton is actually an anti-up quark with an "anti-mass" of about 4.827×10^{-9} kg^{-1}.   It is heavier than an up quark because it has associated with it two positrons and one electron, plus two neutrinos and an anti-neutrino.   Thus it has a net positive charge.   Just think of this zoo as a set of standing waves in a rapidly pulsating spherical bubble.   A negative down quark (d-) is the (d+)'s partner.   It consists of an up quark (u), an electron, and an antineutrino.   It is clear then that a neutron contains an up quark (u), a positive down quark (d+), and a negative down quark (d-).   When the neutron decays, the negative down quark releases its electron and anti-neutrino, leaving only an ordinary up quark behind.   The whole ensemble thus turns from a neutron with no net charge into a positively charged proton.

We can not treat the quarks as independent particles because they are confined in a constant dynamic interaction with each other.   Therefore, we indicate this interaction by multiplying the three particles together.

*   (u) (u) (d+) = (Bu) (Bu) (Bd+)
     $= (1.86 \times 10^{-9}$ kg) $(1.86 \times 10^{-9}$ kg) $(4.827 \times 10^{-9}$ kg$^{-1})$
     $= 1.67 \times 10^{-26}$ kg = Mp.

These are just probable values.   The masses constantly shift in value in the dynamic evaporation and condensation processes.   Sometimes they will have even values:

*   (2.56x10^-9 kg) (2.56x10^-9 kg) (2.56x10^-9 kg^-1).

But the Bu value for up quarks is the most probable condition.   A single Bu particle has the "rest" mass that reflects the memory of the Big Bang.   If the quarks were free particles, they would probably seem to have a mass of around 1/3 of the proton.   But they are confined, so this is sheer speculation.   The Bu and Bd+ are virtual disturbances in the zero-point of the vacuum.   The total mass-energy involved is much larger than what the proton can provide.   What we detect with our instruments is only the resultant that they spit out in the evaporation phase -- the proton.   The proton is just the tip of the iceberg.   The underlying quark soup carries in it memory of the era just after the end of Super-Symmetry.   The proton is an ideal laboratory for studying the dynamics of this early period in the history of the cosmos between 10^-12 and 10^-6 seconds after the Big Bang.

Antimatter is not some exotic type of matter off hidden somewhere or produced only in high-energy scattering.   Antimatter is the essence of the inner core of the proton. All the mesons tell us this when they turn out to be made of quark-antiquark pairs. Every baryon contains two quarks and an anti quark.   Every antibaryon contains two antiquarks and a quark.   Once quark theory is properly updated to reflect the equal distribution of matter and antimatter, plus the operation of the charges, many strange anomalies and puzzling questions will disappear, such as the strange notion of quarks with 1/3 charge quanta, or wondering where the missing antimatter is.   The notation can also become much simpler, since it automatically calculates many quanta that are currently assigned separate notational values.

So our complete census for the internal population of a neutron is:

*   2 up quarks, 1 anti-up quark, two positrons, two electrons, two neutrinos, two antineutrinos.

This is a total of 11 components for the neutron.   A proton has 9 components after the neutron releases an electron and an antineutrino during decay.   Of course, the components are jumbling around at a fantastic speed.   Heisenberg uncertainty exists, but has been mostly localized into the tiny compass of the proton' s event horizon. The exceptions to this are the electron and antineutrino that emerge during neutron decay.   The antineutrino moves at or near light speed and carries off the excess "uncertainty". It puts a lot of distance into play in order to cool out the momentum

overheating inside the event horizon. The electron carries a lot of momentum uncertainty out of the nucleon.   This is why neutrons are unstable and decay whenever they are not held down by nearby protons.   Both electrons of the internal Cooper pair can not be held inside the neutron without help from outside.   But, amazingly, the neutron does not completely disintegrate.   It drops down to a proton and then stabilizes.   This is the amazing balancing act that makes our physical universe possible.

The way a proton maintains its stability is through a perfect balance of black hole condensation and Hawking evaporation.   Hawking developed a formula for calculating the temperature of a black hole (Tbh).

* $Tbh = (1.2 \times 10^{26} \text{ K}) / [(Mx) (10^3 \text{ kg})]$.

With this formula we find that a solar mass black hole of 10^{30} kg has a temperature of 10^{-7} K.   That' s quite cold!   But a hole with 10^{14} kg has a Tbh of 10^9 K and emits photons and neutrinos.   When we get down to 10^{11} kg, we' re getting pions and kaons and Tbh is around 10^{12} K.   When we get down to 10^8 kg, the Tbh goes up to around 10^{15} K and starts emitting protons and neutrons.   This is the kind of virtual density we get inside the proton' s lenticular vesicle.   How do we get in the neighborhood of 10^8 kg?   It' s very simple.   The anti-mass inside the vesicle is equivalent to a regular mass that is the inverse of the anti-mass.

* $(4.827 \times 10^{-9} \text{ kg}^{-1})^{-1} = (2.07 \times 10^8 \text{ kg})$

On the Fermilab chart of the temperature evolution of the universe, we find this is just past the window of the Quark-Hadron transition but before Electro-Weak Unification. We' re in the quark soup.   At this point the core lenticular vesicle of our black hole spits out protons and neutrons.   So we have a dynamic vortex in the vacuum state that sucks energy (including protons) into its core, and then spits out protons.   The proton stability is thus something like a movie with a series of frames that flash into existence and then disappear, over and over, endlessly.   Most of the energy is dedicated to the proton.   A tiny portion is sucked in from the external electron and then time-tunnels from the positron drain back into the electron.   The fleeing antineutrino and the loose electron manage the proton' s internal uncertainty turmoil caused by the close proximity of electrons and positrons coexisting without annihilation.   Actually, what we have is controlled and recycled annihilation. Something has to give, and the antineutrino handles that with help from an electron.

Why does an electron behave like a fermion?   Like charges repel, so electrons push away from each other.   An electron and a positron placed together do NOT behave like a fermion.   They convert back into bosonic photons.   Only the quark buffers keep the electrons from annihilating with the proton's positron core.   So like charge is the reason for fermionic avoidance.   Otherwise particles tend to return to their bosonic nature.   To illuminate this further we need to take a deep look at the nature of mass and charge.   Why do like charges repel?   Of the three major components of matter spin is the easiest to visualize because we can "observe" it and experience it for ourselves as a rotating motion.   However, this can lead to deceptive assumptions as we saw in our analysis of the electron structure.   Let's start with mass.

Despite appearances and the insistence of generations of physicists, matter has NO inherent mass.   Mass does not reside in matter.   It arises as an artifact of the observer's relation to matter.   Newton attempted to describe mass with his force law. However, this just confused things, because it seemed to describe phenomena so accurately.   There's no problem with accurate description so long as we are clear about what is really going on. But the clarity has been lacking.   Let's take a look at the problem with Newton's second law.

* $F = M A.$

Force, mass, and acceleration are all declared by Newton to be co-dependent by this simple mathematical relationship.   However, there is a serious problem with this formula.   Newton assumed that the observer observes the interaction from an absolutely detached reference frame.   From such an inertial reference frame the observer can detect acceleration by comparing the motion of an object with some reference object, presumably some object that has little or no motion relative to the observer's detached frame.   However, being totally detached from the experiment, the observer has no way to detect the force.   Therefore he has no way to determine the mass.   He may say that he uses laboratory instruments to make measurements, but that is an imaginary game. It is make believe.   Any intervention with instruments disrupts the experiment.

On the other hand, if the observer jumps into the experiment and observes from a non-inertial frame (such as riding in a car), then he experiences forces, but has no way to ascertain for sure what the actual acceleration is.   The "real" forces described by Newton's "law" may be mixed with the so-called "fictitious" forces generated from

the observer' s own momentum.   The observer can not get both the force and the acceleration -- which he needs to identify "mass" -- without shifting viewpoints in the middle of the experiment and rendering the whole procedure unreliable.   Thus mass becomes a big question mark.   Using some form of F = MA is the only way we can get at it.   Furthermore, when a system is in perfect equilibrium, it is impossible to detect any mass.   Only by disturbing the equilibrium can we detect something like "mass".   But then we only detect our own disturbance of the system.

Imagine Newton looking up and seeing an apple falling toward him.   He sees the apple get larger.   He can either assume that the apple is expanding or that the apple is approaching.   If he assumes the latter, he can calculate the value of (g), the acceleration due to gravity.   However, this tells him nothing about the mass of the apple, especially since all objects regardless of their "mass" fall with the same acceleration in earth' s gravity.   When the apple hits him in the head, he will be able to figure its mass -- assuming that he is still conscious and that he is in a rest frame and not on a rising elevator.   On the other hand, that measurement destroys the acceleration and probably also scatters the mass of the apple.   Thus even in classical physics, the intervention of a measurement by an observer on an event intrudes on and irrevocably alters the event.   And, since Mr. Newton is not a detached observer in the experiment, he can' t use F = MA reliably.

In view of all this, it seems that Newtonian physics is at best a form of religion.   One simply must believe that the forces exist.   Otherwise we are led to the conclusion that matter has no inherent mass.   A classical physicist does his science by watching television and really believing in the shows he watches because he only watches one show on one channel.   Relativity just makes the show a little more complicated, but it is still the same show.   It is amazing what detailed and accurate observations of that one show on that one channel have been made over the years.   But that is really all that is going on.   Physicists watched one show with great delight, attention, and detail for a few centuries and learned a lot of tinseltown trivia about it, all of which is true, but applies only to that particular TV show, which is an imaginary entertainment piece.

There is nothing wrong with being a fan of a particular show and knowing a lot of details about it.   The only problem is that the physicists imagined that the show they were watching was the "real" world.   They called it "Reality" TV.   Not only that, they actually believed for a long time that it was the only world, rather like a fundamentalist religious believer.   Anyone who was not a fervent believer in the

value of the show must be crazy.   They did not realize that the forces and masses that they imagined were real were all created in a studio by computer.   They identified their own mental issues with the images that flashed by on the screen and thought that these images must also be experiencing the same forces.   Unfortunately, the only real proof they had that this was really so was their own belief that this was so.

Quantum mechanics has now come face to face with the realization that the observer plays a critical role in any physical event.   For nearly a century now scientists have been arguing about the collapse of the wave function and how to interpret the "strangeness" of quantum mechanics.   There is nothing strange about quantum mechanics.   The strangeness is in the way people insist on looking at things.   We can be detached or get involved.   Or perhaps we can do both.   But if we are not clear what we are doing we will get lost in pretense.   When we take the role of a detached Newtonian observer and describe "forces", we might better rename them as "farces".   We can imagine things into existence with attention and resistance.   It is time to take responsibility not only as the observer who watches a creation but also as the creator who actively creates it.

Since mass can only be detected by an observer who participates in an experiment and pushes it out of equilibrium in some way, mass must be a reflection of a resistance on the part of the observer.   The observer detects his own resistance as a force that apparently comes from the object.   But this is an illusion.   What he really experiences is what a psychologist would call a projection.

Try this simple experiment to see what I mean.   Make a fist and hit a brick wall with it as hard as you dare.   Does it hurt?   Did the wall resist you and hurt your fist?   Now push as hard as you can against the wall.   Does the wall push against your hand?   Now push with less effort.   Does the wall push with less effort?   Put your hands on the wall and lean against it.   Does the wall just lean against your hands?   Just touch the wall.   Does the wall just touch your hands?   Now let your fingers hover lightly just next to the wall.   Does the wall hover lightly just next to your fingers?   Does the wall have any mass or force, or does it just stand there facing you, quietly being its self?   Just observe the wall.   Does the wall just observe you?   Can you feel any mass or any forces in the wall?

In a nutshell this is physics.   Where do all the forces and masses come from?   They come from the observer participating by resisting things.   As long as you remain fully detached from phenomena, they exist but have no mass or forces.   They can

accelerate relative to your viewpoint at any pace, even at superluminal speed, because they lack mass.   Essentially you are watching TV.   You are witnessing your world.

How much do you weigh?   Can you cancel gravity and float in the air?   Of course you can.   It is simply a matter of shifting viewpoint.   Sit quietly in a comfortable position.   Bring your body into equilibrium.   There you are.   You are floating. Once you stop resisting your environment, the density of your body relative to its surroundings will determine the level at which you float.   But there you are floating. If you seem held to the ground by gravity, that is a different point of view in which you imagine yourself resisting the pull of earth' s gravity.   If you relax, the resistance disappears and you find yourself floating.   The only reason we remain "stuck" to the surface of this planet is our own resistance to being here.   But ironically the attraction we feel from the planet holding us to the earth is simply a reflection of our own original desire to come here.   If you are attracted toward something, it will be attracted toward you.   You will feel that as a force called gravity.   So gravity is a physical reflection of a mental attitude.   Once the attitude of humans toward gravity shifts (and it already has shifted a great deal in the past century), we will be free to come and go from the planet at will.   Gravity is simply a reflection of the observer' s will.   Like EM charge it is bipolar.   The singularity at the center of a mass is one pole of gravity.   The other pole is a point in space determined by the diffusion of density due to kinetic energy.   You can see this mathematically as the two poles of an ellipse.   In a physical system the singularity of the dominant gravity well hovers close to one pole of the ellipse.   The other pole -- the kinetic pole -- is a mirror reflection of the gravity pole and is located out in space away from the center of mass. We can identify it by tracing the orbit of a satellite.   Kepler was the first to notice that satellites follow elliptical orbits around gravity wells.   The implications of this are worth exploring, and I discuss them in some detail as a new theory of gravity and its associated geometry in **Observer Physics.**   (See especially chapters 10, 13, and 14.   The theory generalizes General Relativity.)

Our focus in this article is to understand how the electrical and magnetic "forces" occur in charged particles.   The argument is developed in a much more detailed manner in **Observer Physics** (chapters 10-12; ch. 12 deals particularly with quark theory.)

Let us suppose that an observer decides to experience something.   He mentally defines what it is he wants to experience.   By putting a lot of attention on that well defined idea, it seems to become more and more "real".   At some point it actually

seems to become an experience.   This whole process can just be a flash.   The energy is simply the observer' s attention shifting from non-focus to focus, and then back to non-focus (or to focus on something else).   We do this all the time.   Just pay attention to the behavior of your attention.   (Harry Palmer' s little workbook, **ReSurfacing** has an excellent collection of attention exercises to explore with.)

Now suppose our observer makes a particle and then decides he would like it to stick around so he can play with it for a while.   He wants to be able to even take his focus of attention away from it and then bring it back, and the particle will "still" be there. This, of course, generates time and history as side effects.   To get something to behave like this he must detach himself from it (objectify it) and pretend that it is not connected to him.   He must actually exert some force to push it away.   The process of doing this in the vacuum state is quite clever.

Imagine a field of pure light.   Photons are bosons and they like to be together.   At a minimum they form pairs.   To make a particle, we simply split a photon pair.   One photon goes into "mind" space as an attention particle advanced photon, and the other one goes into "world" space as a gauge boson retarded photon.   The spin which was balanced in the photon pair as an integer value of 1 is now split into two half values. The retarded photon is left spinning like a vortex top or interfering with other photons to form travelling packets.   As a vortex top it can have a relative orientation of up or down.   The particle can now move about in "space" and a mental copy is preserved as an attention particle stored away in mind space.   As long as the particle moves about in space its mirror copy moves about somewhere deep in the mind.   Because its energy loops around automatically in a cycle, the focus of attention need not stay on it.   This is how persistent conditions occur, from personal habits, to galaxies, to fundamental particles. If the two conjugate packets are brought together again, the particle can be released from attention and return to its nature as pure light.   It then becomes just a possibility and not an "actuality".

In the case of the electron the retarded photon loop moves through space/time in the manner we described above.   The loop splits into two phases, the particle phase and the antiparticle phase.   Photons spiral out of an electron vortex, travel through space as photon pairs to a positron (hidden in a proton core), spiral into the center of the positron, tunnel back through time to the pair creation event, and then spiral back out of the electron.   This is the basic current loop that continues indefinitely and constructs our physical universe made of protons, neutrons, and electrons.

There is also an advanced photon loop that runs with the retarded photon.   It is the mental attention that is tied up in that particular item of creation.   However, the observer does not detect it as long as his focus of attention is placed elsewhere.   The advanced photon runs through hyperspace backwards in time and is not visible in real space.   Thus the fermion particle appears to have a spin of 1/2, but the photon seems to have a spin of 1. Put the electron and positron together and you get spin 1 photons.

An individual electron or positron behaves like a fermion, but a pair will emulate a boson, and an electron and a positron will mutually annihilate and return to their photon state if they get too close to each other. The proton' s quarks insulate the internal positrons.   Another way of saying this is that they form an energy basin full of swirling water in which positrons function as drain holes.   The electron is a spigot recycling water back in as the drain removes it from the basin.   (There are a number of interesting variations that can occur with the loop, but this is the basic flow diagram.)

The loop runs both ways.   The procedure described above is the retarded loop.   An advanced loop runs in the opposite direction in both space and time from singularity to singularity so that the photons always travel in matched pairs.   Left undisturbed, the same photon attention particle will keep on recycling over and over endlessly. An important variation on this loop is the exchange of photons between electrons in the outer shells of atoms.   We can pump a bound electron that is quietly in equilibrium with its electron-positron photon loop into an excited state by adding advanced photons to it.   When we relax the pressure of our attention, the electron will relax back to its natural ground state, releasing the excess attention particles as retarded photons.   For example, we turn on a switch and run electricity through a light bulb, pumping the electrons with advanced attention photons from a secondary source.   The electrons then relax, releasing photons as retarded light.   Then we direct advanced photons from our eyes as attention particles at the bulb and draw retarded photons directly from the bulb, or we allow them to echo off other electrons. In this way we create a great hall of mirrors, reflecting our own attention in many directions with wonderful complexity and artistic skill.

There are two steps to the process of generating an electron.   Each involves a ninety-degree rotation into a different dimension.   The process of generating a persistent particle from a photon creates "charge".   Since a photon has no mass, there is only linear momentum to begin with.   This moves in the line of sight, the direction of attention.   But it doesn' t do anything if it meets no resistance.   So to set up a

persistent system we must rotate 90 degrees from our "head-on" position.   Having done this, unfortunately we now can' t see anything (which is our goal if we want to turn something "off" without "seeing" it.)   We can only "see" a photon by interacting with it, by absorbing it head on.   From the side it is just a potential.   But that potential now has "charge".   It has electrical potential.   This first step involves just stepping aside, a standard procedure in kung-fu.   It is the primary resistance to a creation that is otherwise just a "flash in the pan".   The observer shifts from being a creator to being an observer.   But this is not enough, and he doesn' t see anything.   It is a big flop.   So the observer has to reject the creation by doing another 90-degree shift.   This is a secondary resistance.   The second process of rejection generates the secondary charge called magnetism.   We now have the observer and his creation existing in three dimensions of space.   Its evolution adds a dimension of time.

The looping appears in the photon as an oscillation.   Think of it as a spring.   We blue-shift it to condense the spring' s coils, and we red-shift it to relax the spring' s coils. It' s always the same spring.   We can think of the shifting as motion or as energy. Motion toward blue-shifts.   Motion away red-shifts.   We pump it to play it.

In a three-D space only two rotations are possible, and they must be orthogonal. Recall the top.   When it rotates in its primary rotation, it generates an axis that is orthogonal to the direction of rotation.   When it is placed under the influence of a secondary force, it will "fall" into a precessing rotation.   The essential motion of the secondary rotation will also generate an axis orthogonal to both the primary rotation and the primary axis.   By studying these motions of an ordinary top we can understand how the mass, spin, and charge of fundamental particles arise.

We generate the "forces" attributed to mass and charge by our own "resistances" to objects.   The act of attribution is a rejection of responsibility.   The specific values of the various fundamental particle masses arise from the settings given to a small collection of fundamental constants.   As described in **Observer Physics** chapter 13, the values of these constants are completely arbitrary.   However, they must cohere as a whole or they will destructively interfere with each other.   Thus only certain universes will be stable although infinite universes potentially exist.

Our universe seems to be constructed from seven basic units of space/time geometry and five basic physical constants.

The units of geometry are as follows: (pi), (Ru = 1 m), (% = 3.1622 m), (Oo =

circumference of a Ru radius circle), (Ao = area of a Ru radius circle), (As = area of a Ru radius sphere), (Ss = volume of a Ru radius sphere), (T = time in seconds, derived from Planck time).

The constants of physics are: (H), (c), (e), (eo), (G).   The others are derivative.

The Dimensional Shift Operators (%) and (Ru) form a bridge between geometry and physics, because the constants of both sets are defined in terms of them as we have seen in examples above.

Once the observer sets the constants and units of geometry for his universe, they combine in specific ways to give rise to the various particles and forces that the particular universe displays.

The above discussions outline a theory of the electron and its companion the proton. The discussions are preliminary notes, but the theory is reasonable and provides coherent answers to the major unanswered questions we have about those particles. Much work remains to be done, but our model builds on the successes of the previous centuries and leads us to a deeper and more general framework for the study of quantum mechanics, particle physics, and cosmology.   At least it is a target to shoot at.   If it falls down, then perhaps a better model will arise in its place and these notes will have served their function.

PS: You may be wondering where the "negative" orbits are below the zero point in our modified Dirac diagram (on p. 19).   The "positive" orbits ("above" the zero point) are occupied by electrons that accumulate in orbits around a nucleus as the nucleus becomes heavier.   In the standard model heavier nuclei are made by adding protons and neutrons.   The problem with this approach is that it requires the invention of the strong force and a host of gluons to hold the nucleus together.   In our model the orbital structure of the electrons is reflected by a corresponding internal orbital structure for the positrons.   Just as the electrons in higher orbits are more energetic kinetically in space, the positrons in deeper orbits are also more efficient drains into the hyperspace time tunnel.   They also follow the Pauli exclusion principle, forming Cooper pairs and keeping properly quantized distances.   When an atom is electrically neutral, the number of electrons in various orbits is exactly balanced by a corresponding number of positrons in the nucleus.   We can imagine the nucleus as made of protons and neutrons, or we can think of it as a single bubble of pulsating energy harmonically overlaid with standing phonon waves.   The latter viewpoint

eliminates the necessity for developing a theory of gluons, strong forces and so on. When an atom splits, it breaks into quantum packets according to the rules that have been observed.   (**Observer Physics**, chs. 12 and 13 give a general overview of the various quarks and their octet and decuplet relationships as well as the roles of the W and Z gauge bosons with numerous examples of scattering and decay patterns and diagrams of some of the simpler structures.)

There is a general rule in physics that when a magnetic field bends the path of any charged particle, such as an electron, the particle will give off "braking radiation" or bremsstrahlung.   This phenomenon is necessary because, in order to change direction, the particle must slow down in its current direction of motion and then accelerate in a new direction.   The electron' s slowdown extracts energy from it. The energy must radiate away as photons.   The acceleration means absorption of photons from the magnetic field.   Electrons shifting orbits in atoms do the same thing.   An electron in a stable orbit is also constantly shifting direction, and therefore should also emit bremsstrahlung.   However, since physicists don' t detect any such radiation, they arbitrarily make a rule that electrons in stable orbits do not emit bremsstrahlung.   This is not science.   If a rule holds in one case, it should hold in any other case unless there is some other condition that interferes with it.   Physicists can not provide us with a condition that interferes with bremsstrahlung.   Therefore a reasonable scientist must conclude that electrons in stable orbits emit bremsstrahlung all the time.   The orbiting electrons are moving under the magnetic influence of the positive charge in the nucleus.   Why don' t we see the bremsstrahlung if it occurs? The bremsstrahlung of electrons in stable orbits radiates directly into the nucleus, whereas the bremsstrahlung of electrons dropping inward from excited states radiates outward away from the nucleus.   The bremsstrahlung radiation is simply a reflection. The photons emitted by the relaxation of excited electrons come to the electron from outside the atom, so they reflect back outside the atom.   The photons emitted by electrons in stable orbits come from the nucleus, so they simply reflect back to the nucleus.   An electron moving in an allowed orbit is constantly exchanging photons in the looping process with its companion positron inside the nuclear proton as we have described in this article.   Thus we can safely abandon the rule of quantum mechanics that arbitrarily claims: "Despite the fact that it is constantly accelerating, an electron moving in such an allowed orbit does not radiate electromagnetic energy. Thus, its total energy E remains constant."   (Eisberg and Resnick, p. 99.)   The observed fact that the total energy of a stable atom remains constant is quite true. But the system is in a dynamic equilibrium in which the components constantly exchange energy in a balanced way, not some mystical state that suspends the

ordinary laws of physics observed throughout the universe for no apparent reason other than the failure to detect the expected exchange.   You can not detect a photon unless you have an instrument that can absorb it.   The only way to do that in this case is to take the viewpoint of the nuclear proton that absorbs the orbiting electron' s bremsstrahlung.   The linear momenta of the photons exchanged between electron and proton cause the two particles to jiggle and vibrate. This is indirect evidence of the ongoing bremsstrahlung process within an atom.   The electron jiggles a lot more than the proton, because its "rest mass" is so much smaller than the proton.   The wiggle of an orbiting electron is related to photon exchange with actual nuclear positrons.   The basic wiggle of a free electron is related to photon exchange with its attendant virtual positrons plus wiggle distortions caused by influence from any actual charged particles nearby.

You may also be wondering why all the neutrinos happen to be "left-handed".   This goes back to the era of Quantum Gravity and is due to the observer.   The first step in the generation of a universe is for the observer to separate from the observed.   Since "originally" there was nothing but a single undefined uniton, the observer had to split the uniton arbitrarily into a pair of gauge bosons and then clone the bosons by superluminally pumping them in an echo chamber of awareness with his attention (the superluminal "inflation" stage.)   One mate of the original Adam-Eve boson pair became Mind space/time and the other mate became World space/time.   All the subsequent clones simply repeated the original arbitrary choice in the same way that all sugars in life forms on our planet (until recently) were "right-handed" (dextrose). We can make left-handed sugars, but they currently do not participate in the biological processes and just pass through the system leaving only a flavor. Thus the left-handedness of neutrinos is a recording of an "ancient" memory.   It will be interesting to see if we can find a way to isolate an up quark so as to observe its "handedness".

The superluminal "cosmic inflation" attributed to that "ancient" era occurs when the observer focuses his awareness from an unbounded, undefined state down into a small area in order to play with details.   The illusion that the universe is expanding is caused primarily by the determination of observers to keep defining their identities into smaller and smaller spaces.   Each moment an observer does that, he finds himself in a tightly bounded space/time location and looks back "out" at his universe to see the remnants of this focusing act as an illusion of the galaxies all receding from him.   Then he says, "Oh, there must have been a Big Bang and now all the universe is expanding."   If the observers decided instead to expand their attention focus back out to its unbounded value, then the universe would shrink back to the size of a flea

speck or smaller.

Dirac' s original theory turned out to predict that the universe would decay in about a billionth of a second.   This prediction was quite accurate.   Our model shows how Dirac' s prediction can be true and yet not lead to the destruction of our universe.   We simply set the system up so that it re-boots itself automatically in the next billionth of a second the same way your TV screen refreshes itself by running another scan.

Physics is mostly a matter of viewpoint.   What would you like to play with?