Screw the Zoo! Observer Physics Simplifies Nuclear and Particle Physics!

by

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In this article I present a new set of principles governing fundamental particles, then introduce the new set of primary particles according to the principles and show how they map to the current particle zoo that is based on quark theory. Then I give some examples of particle interactions using modified Feynman diagrams to show how the upgraded notation works. This new way of looking at fundamental particles results in a new model of the nucleus that may assist in the search for a controlled fusion technology, a better understanding of cosmology, and ways of predicting interactions that are currently unknown.

For a while the atomic world used to be made up of protons, neutrons, and electrons that combined in different ways. Alas, these good old days are gone, and now we have to keep track of a formidable zoo of "fundamental" particles that researchers have discovered over the past few decades. Now it's time for some simplification. We can't go back to the old days, but we can move forward to a new day when the zoo once again becomes a manageable little family. We will still use the taxonomy we have grown used to. But we will see that underlying all the complexity things really are neat, and elegant. The appearance of complexity comes from the way in which the information is interpreted. Let's introduce some principles that will help us shift our viewpoint. Suggestion: first read "Energy from Electrons and Mass from Protons: A Preliminary Model Based on Observer Physics" (available at zpenergy.com).

Key Principles

* The fundamental "essence" of the universe is something undefined. From an observer's subjective viewpoint we can call it undefined awareness. From an objective viewpoint we can call it undefined potential.

* Matter and energy as well as consciousness and experience can occur only when an observer establishes a viewpoint with respect to the undefined essence. Otherwise it remains undefined and there is nothing we can say about it. (Because of the critical role played by the observer in defining the universe I refer to the emerging new physics paradigm as "Observer Physics".)

* All particles are unstable and decay in close to one billionth of a second or less

(<=10^-8 s) as Dirac discovered and as we find is the case in most particle interactions. The appearance of stability only occurs in the case of certain dynamic energy feedback loops that allow potential to keep recycling automatically and indefinitely as long as the loop is undisturbed with regard to its critical core structure.

* Of all the particles in the "zoo" only the photon, the proton/neutron quark complex, the electron, and the neutrino complex, are stable. All other known particles are unstable. We will only consider "stable" particles fundamental. And of these only the photon, electron, and neutrino complex are truly "fundamental". And even these can not exist in isolation. For all particles are interdependent.

* Photons are the fundamental constituents of all phenomena. Everything, including the photon, is made of photons configured in different ways.

* The photon is the "objective" reflection of consciousness, a tiny packet of awareness that has no mass, only a linear momentum exemplified by the observer' s "line of sight". The photon' s "subjective" form (or antiphoton) is the attention particle. We will call it a **scion,** or **"seeon"**.

* Photons and scions possess spin 1/2, but always form pairs that create a balanced spin of 1. EM radiation always consists of a photon/scion pair. You can not have a single photon alone without a partner. The scion is what the literature sometimes refers to as an "advanced" photon. The ordinary photon is the "retarded" photon. Both travel at (c), but in opposite directions in space/time. To the observer, however, they seem to form a pair that usually travels together.

* Which is photon and which is scion is relative to the observer' s viewpoint. In other words, one observer' s photon may be another person' s scion, and vice versa. Viewpoint determines what you see.

* All perception and experience can only occur when an observer maps one of his scions to a photon. Beyond that there is only pure, undefined awareness, which is neither objective nor subjective, and simply represents a potential for any and all possibilities that might be defined on it. This is why modern quantum physics measures phenomena in terms of probabilities. How "real" something is depends on its quantum level of definition. The definition process ultimately depends on the observer alone. This is how he creates and participates in his creations.

* Photons are "bosons". They behave primarily as waves and can overlap and cluster and mutually interfere. Constructive interference is the method by which a photon ensemble may become one or more "particles". In other words particles are interference patterns of photon waves of various frequencies interacting constructively. This wave nature of photons, plus the speed of EM radiation, ensures that most "particles" will be unstable on the level of 10^-8 s or less unless there exists a special feedback condition. This suggests also that there is a spatial distance around 1-3 meters in which a "particle" moving along at nearly light speed will decay.

* (3x10^8 m/s)(10^-8 s) ~~ 3 m.

* We will propose that there are two primary spatial windows in which this decay occurs. The first one is at 3.1622 m and corresponds to the decay threshold of electron neutrinos. The neutrino often decays by oscillating into a different type of neutrino (muon neutrino or tauon neutrino). Neutrinos have almost no mass and represent the primary form of photon self-interaction (constructive interference). The second window is almost exactly at 1 meter. This is the window for the baryons, primarily the proton, and may also apply to the decay of light mesons such as charged pions. We represent the first window with the symbol %. We represent the second window with the symbol Ru (radial unit) or @ (rotational unit) because this window involves a spiraling loop and results in orbits.

* Protons and neutrons are oscillations of the same particle. The proton/neutron oscillation represents the fundamental particle **family** unit or ensemble, and is not really a fundamental particle. But all experience depends on the EM exchanges of photons between electrons, and electrons can only survive by virtue of the existence of the proton/neutron ensemble. Thus we also refer to proton/neutrons as fundamental. The electron is a component of the proton/neutron ensemble which is able to project itself at a distance under certain conditions..

* Electrons and their antiparticles, the positrons, are photon vortexes that each carry a fixed quantum of charge. They are the ONLY charged particles. All other "charged" particles get their charge from electron/positron components in their ensemble structure. As vortexes these leptons seem to arise from a focal point or singularity, unlike neutrinos that are smeared out particles lacking in focus. As we shall see, the electrons and positrons are the foci for the mass-energy of proton/neutron ensembles. The proton or neutron is actually formed by a pair of overlapping slightly ellipsoidal energy bubbles. But the vibration of the interaction

is so fast that the whole ensemble effectively looks like a sphere.

* The neutrino complex consists of three quasi-particles (that we will write as ue, um, ut). They have no charge and are formed by photon wave interference. They are "stable" ripples in space/time. But, when they translate in linear fashion through space, they tend to oscillate among the three main harmonics that relate them to the charged leptons. When they are "bound" in a nucleus they function as "sidekicks" to charged leptons. The electron antineutrino goes with the electron, the muon antineutrino goes with the muon, and the tauon antineutrino goes with the tauon. However, tauons occur as ensemble components only in exceedingly high-energy particles. To date they have been identified only indirectly as pair production in high-energy scattering processes. Note that the "sidekick" pairs are always matter/antimatter pairs. (Thus the positron sidekick is the electron neutrino, which should really be called the positron neutrino.)

* Electrons have charge because they are wave packets formed by photon vortexes at singularities. The charge then localizes around a point. Neutrinos have no charge because they are wave packets formed by photon beams that interfere as they move in parallel. A good example is the solar neutrinos that stream through our planet from the sun. These two fundamental types of interference produce the two main types of particle: charged and uncharged. Only the vortex particles are charged.

* There is a fourth neutrino that is at least 13 times the mass of the tauon neutrino. It is usually called the up quark. It is hard to measure "mass" in the case of the free neutrinos because they move so fast and, lacking charge, do not interact very much, so we only have some approximations. But the electron and muon neutrinos are extremely light. They really only have mass in the form of "linear momentum" the way photons do. We will propose a simple way to identify and study single "free" quarks. (We already see them and study them in detail, but physicists just don' t know that that is what they are looking at.) The up-quark "neutrino" is too heavy to be stable by itself, though further research may show that it does occur with a certain probability in the neutrino oscillation patterns. Thus it occurs only in conjunction with other particles confined as a super "sidekick" that we call "quark".

* The neutrino oscillation should occur at least at the "decay" rate for most particles. But when one neutrino type can occur, its harmonics will also occur, and the interference pattern will tend to cycle around through the harmonics. The heavier the neutrino, the faster it should decay in the cycle. Thus the electron

neutrino should be the most commonly observed form.

* In the formation of ensemble particles quarks often pair with antiquarks, and electrons with positrons. Neutrinos tend to pair up as "sidekicks" to positrons, and antineutrinos form the "sidekicks" of electrons. Thus, in our notation for particle ensembles, whenever we record the presence of an electron or positron, we will assume the presence of its corresponding neutrino sidekick and usually will leave the neutrino notation out. The role of the neutrino is to work with the electrons and manage the uncertainty that builds up as leptons crowd together.

* Up quarks and neutrinos are uncharged, and thus have strong bosonic tendencies. So, among themselves they do not follow the uncertainty rules and Pauli exclusion that apply to fermions.

* All six flavors of quarks (up, down, strange, charmed, bottom, and top) are up quarks with various lepton entourages.

We will symbolize our fundamental particles as follows:

* (g) photon or gamma particle
* (g*) antiphoton or scion
* (e-) electron
* (e+) antielectron or positron
* (p+) proton
* (n) neutron
* (ue) neutrino
* (ue*) antineutrino (Like photons, neutrinos are their "own" antiparticles.)
* (ue = electron neutrino), (um = muon neutrino), (ut = tauon neutrino)
* (u) up quark
* (u*) anti-up quark (Like neutrinos, up quarks are their own antiparticles.)

We mark charge with a (+) or a (-) sign so we can keep track of the charges. The positive charge automatically indicates an "antiparticle". The minus charge indicates a particle. For uncharged particles the (*) indicates an antiparticle (a conjugate particle). Disregarding the conjugate forms of particles and their various oscillations, we now have a simple list of (stable) fundamental particles.

* (g), (ue), (e-), (u).

Everything else is composite. And, of course, even (ue), (e-), and (u) are made from (g). The proton/neutron oscillation pair (p/n) is a composite particle made from combinations of the above three matter particles. In fact, all forms of matter are built from variations of (u), (ue), and (e-). Matter interacts through the exchange of gauge bosons -- the photons (g), and their heavier cousins, (W) and (Z). So on the particle side we have (ue), (e-), and (u), while on the "wave" side we have (g), (W), and (Z). But (W) and (Z) are merely intense clusters of (g) that echo in the vacuum during interactions, as we shall see. Just as we can say that (ue), (e-), and (u) are interference patters of (g), we can say that the (g)' s that we can detect are just (g)' s leaking from the energy loops of (ue), (e-), and (u) ensembles.

* Muons (m) and tauons (t) are highly energized electrons. They quickly decay, muons at around 10^-6 s, and tauons at around 10^-13 s, throwing off the excess energy and returning to electron status.

For more detailed discussion of these principles and fundamental particles, please refer to my collection of articles, **Observer Physics**, and to the article, "Energy from Electrons and Matter from Protons". The latter is posted at zpenergy.com. Those materials discuss in detail the vortex structure of the electron/positron energy loops and the way they acquire quantum charge, as well as a theory of why neutrinos have "spin" but lack charge.

Now that we have established some principles and a family of fundamental particles, we can explore the zoo and see how various other particles occur as combinations of the fundamental particles.

First let' s identify the various quarks from our new interpretation. Then we' ll see how the quarks are made. Then we' ll look at various quark combinations. In the following table neutrinos are assumed as sidekicks: (e- ue*), (e+ ue), etc.

	Name	Symbol	Components
*	up	(u)	u (e- e+) (Electron pairs are virtual.)
*	anti-Up	(u*)	u* (e+ e-) (Electron pairs are virtual.)
*	Um	(U)	U (m- m+) (Muon pairs are virtual.)
*	anti-Um	(U*)	U* (m+ m-) (Muon pairs are virtual.)
*	down	(d-)	u e- (e- e+) (Electron pairs are virtual.)
*	anti-down	(d+)	u* e+ e+ e-
*	strange	(s-)	U m- (m- m+) (Muon pairs are virtual.)

*	anti-strange	(s+)	U* m+ m+ m-
*	charm	(c)	u e- e+
*	anti-charm	(c*)	u* e+ e-
*	Chum	(C)	U m- m+
*	anti-Chum	(C*)	U* m- m+
*	bum	(b-)	c e- (usually called "bottom")
*	anti-bum	(b+)	c* e+
*	top	(T-)	C m-
*	anti-top	(T+)	C* m+

The structure is quite simple. The quarks are all made from an up quark plus a combination of leptons. The up quark is a fat neutrino that buffers the leptons from the antileptons. Any quark left alone automatically decays into photons and neutrinos or electrons, photons and neutrinos.

The light quarks (up and Um) are virtual lepton pairs when considered alone. The c-quarks are more energetic resonances of the u-quarks. They just have extra electron-positron pairs. Although there seems to be an energy difference between the charged quarks and antiquarks, this is balanced out by the sidekick neutrinos. For example, the negative down quark can use a relativistic antineutrino to balance the difference between itself and the positive down quark. So the effective masses of the two particles add up to the same value. The hot-to-trot relativistic antineutrino in the negative d-quark is the one that squirts out when the neutron decays into a proton. The positron' s neutrino has very low kinetic energy and stays inside the ensemble except in the case of the antiproton, where the component roles all reverse. Also note that there is a 7th quark in the list -- the Um quark. This is a heavy up quark that supports a pair of muons instead of electrons. It has an even heavier resonance called the Chum quark, giving us an octet of quarks. We' ll soon see where that leads us.

Let' s look at some mesons. A meson often is made from a quark and an antiquark. Mesons are very unstable and decay quickly. They mostly occur as transition particles or virtual particles buzzing like bees around baryons. They also help to hold the standing wave pattern of the nucleus together (their interactions forming what is sometimes called the "strong" force.) Here are some examples of quark-antiquark pairs.

Name	Symbol	Quark Combination
Pos. Pion	P+	u d+

Neg. Pion	P-	d- u*
Neut. Pion	Po	u u*, d- d+ (These occur mixed together.)
Pos. Kaon	K+	u s+
Neg. Kaon	K-	s- u*
Neut. Kaon	Ko	d- s+
Neut. Anti-Kaon	Ko*	s- d+
Pos. Delta	D+	c d+
Neg. Delta	D-	d- c
Neut. Delta	Do	c u*
Neut. Anti-Delta	Do*	u c*
Strange Delta	Ds-	s- c*
Strange Anti-Delta	Ds+	c s+
B meson	B-	b- u
Anti-B meson	B+	u b+
Neut. Strange B	Bso	b- s+
Neut. Str. Anti-B	Bso*	s- b+

We can basically combine any two quarks to get a meson. Each quark has spin 1/2. So when a quark combines with an antiquark, the net spin is 0. So mesons have spin 0 when they are particle antiparticle pairs. However, when a quark combines with another quark or an antiquark with another antiquark, we get spin 1. The above list shows only quark-antiquark pairs. Below we' ll give a spin 1 meson nonet. First let' s see a spin 0 nonet.

LIGHT (0) SPIN MESON NONET

	(498)		(494)	
	Ko		K+	
	(d- s+)		(u s+)	
(140)	(135)	(547)		(140)
P-	Po,	V		P+
(d- u*)	(uu*, uu)	(Uu*)		(u d+)
	(u*u*, d-d+)	(uU*)		
	V' (958)			
	(494)	(UU*)	(498)	
	K-	(UU, U*U*)	Ko_	
	(s- u*)	(s- s+)	(s- d+)	

The charged pi mesons or pions are the lightest mesons. From the structure one might expect them to decay directly into photons, antineutrinos, and electrons (or the conjugates of these.) However, they first decay into muons. Then the muons decay into electrons. The decay of the (u) quarks and (d) quarks adds a lot of extra energy. Each (u) quark is about equal to 3 muons. A lot of the energy also goes off in the muon neutrinos. The V-meson, or eta meson (u U*, U u*), usually decays into a triplet of pi mesons with net zero charge. 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 lightest of all mesons, the neutral pions are (u u*, d- d+), while the V' -meson consists of (U U*, s- s+). The alternate forms of neutral pions and V' -mesons are virtually equivalent and just form via different pathways.

The upper and lower ranks of the meson octet are filled with heavier kaons that have strange quarks in them. The rule for the light mesons is that they always consist of a quark paired with an antiquark. Our notation shows explicitly the spin and charge on each meson, so we do not need to calculate or tabulate those as separate quantum numbers, though we do need to know the energy based on the neutrino momenta.

HEAVY SPIN (1) MESON NONET

	(896) Ko^ (U c)		(892) K^+ (U* s+)
(769) R- (d- u)	(769) Ro (uc, uc*, u*c, u*c*)		(769) R+ (u* d+)
	(782) w (cc, c*c*, cc*)	(1019) f (CC, C*C*, CC*)	
	(892) K^- (s- U)		(896) Ko^* (U* c*)

In this nonet the pairing is quarks with quarks and antiquarks with antiquarks, except for (u, U, c, C) which are their own antiparticles. So generally the energy is much higher than for quark-antiquark pairs. Only the heaviest of the light mesons, the V' -mesons, cross into the realm of the heavier mesons. Note that the Ko^ and Ko^* are made from (Uc, U*c*), not (d- s+, s- d+), which can not go any higher on the energy ladder. There is also a neutral meson set formed from (UC, U*C, UC*, U*C*). Higher energy neutral mesons contain bum and top quarks combining with each other or with down and strange quarks.

If the light mesons can be 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 considers 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. The key question is how the proton manages to remain stable. I discuss this puzzle in detail in **Observer Physics** and the article "Energy from Electrons and Mass from Protons", so I won' t go into it here.

The baryons have three quarks of the following possible types.

* three quarks,
* two quarks and an antiquark,
* one quark and two antiquarks,
* three antiquarks.

Protons and neutrons and most of the more commonly seen particles are made from two quarks and an antiquark. Their antiparticles have two antiquarks and a quark. The triple quark and triple antiquark forms usually occur as high-energy resonances. This range of possible quark/antiquark combinations explains why some particles that apparently contain the same types of quark are found appearing at two different energies and with different spin values. The principle is the same as for the mesons. Here are some examples of baryons in our new notation. Our notation automatically handles the spin and energy differences.

Name	Symbol	(spin 1/2)	(spin 3/2)
Proton	p+	u d+ u	
Anti-Proton	p-	u* d- u*	

Neutron	n	d- u d+	
Lamda	L	u s+ d-; u d+ s-	
Sigma Plus	S+	u s+ u	u s- u e+ e+
Neut. Sigma	So	u s+ d-	u s- d- e+ e+
Neut. Cascade	Eo	u s+ s-	u s- s- e+ e+
Neg. Cascade	E-	d- s+ s-	d- s- s- e+ e+
Omega Minus	O-	s- s+ s-	s- s- s- e+ e+
Lambda Plus	L+	u d+ c	
Cascade Plus	E+	u s+ c	
Charmed Neut. Cascade	Eoc	s- d+ c; d- s+ c	
Charmed Omega	Ooc	s- s+ c	
Bottom Neut. Lamda	Lob	u d+ b-	

Now let' s look at how the particles relate to each other. Here is the basic light baryon octet.

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-)

The neutral Lamda is basically the same quark structure as the neutral Sigma in the Standard Model. But our notation makes clear the fundamental 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. Now lets look at some spin 3/2 particles.

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

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

The (Do) and (D+) look similar to the neutron and the proton from the viewpoint of the Standard Model. 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 positrons and a lot of extra energy puff up each one. The extra energy load speeds up the pump mechanism, and the particle must vent more quickly. So the electron energy input members of the extra positron pair system are pushed way outside the ensemble and the positron vents are all put to work deep inside the ensemble draining out the excess energy. Thus the total apparent charge on each ensemble is boosted by two positive charge quanta. The exiled electrons go off a distance from the ensemble and effectively appear to be free electrons. The decuplets are thus "super-ionized". 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 a proton resonance, as are all quark triplets.

In our system the quarks and other fermionic components inside the ensemble all have net spin +1/2 for quarks and -1/2 for antiquarks. So the notation automatically indicates the spin orientation. A fundamental fermion' s spin is always an odd integer multiple of (1/2) because it is a boson split in half. It takes a pair (or even number) 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 particle ensembles are 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 structures are generally arranged inside the 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 for a quark triplet. 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 bit heavier than the ensembles that have (u) quarks. Interestingly the Cascades in the octet overlap the Deltas in the decuplet energy-wise. 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.

Properly speaking we should tally up the spins for all the component leptons as well as the quarks. But the leptons always form "sidekick" particle-antiparticle pairs that balance out their spins, so we can just use the quarks for our spin accounting.

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

The lack of an antiquark means that these ensembles are extremely 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 in the form of liquid hydrogen. The 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++). Go from left to right to watch it decay. Here (p+) means a proton and (d*) means anti-down quark. The Standard Theory assigns a -1/3 charge to each (d) quark and +2/3 charge to each (u) quark, something that is very bizarre, illogical and entirely ad hoc, though it gives the right answers. This is done because quarks were discovered after electron charge quanta and physicists had to find a way to justify the baryon charges without being stuck with a 3/1 charge ratio between the proton and electron, something that is just not true.

```
              |---> u ---------------------> u |
              |                                |--> P+
              |                    |<--- d*    |
              |                    |
D++  -->      |                    |---> d   |
              |---> u --------------------> u |--> p+
              |---> u --------------------> u |
```

This diagram shows that the D++ is formed by a positive pion momentarily fusing with a proton. This quark analysis is OK, but it really does not tell us what is going on inside the proton when it interacts with the pion so intimately. Here' s how the D++ production process works in our revised system.

```
      |--> u --------------------------> u --->|
P+ <--|                                        |----|
      |<-- d+ <---  e+  ( e+  e- ) <-- e+ <--|    |
              u* <------|                         |
                        |<--  Po*                 |--> D++
              u* <------|                         |
p+    |<-- d+ <---  e+  ( e+  e- )  <-- e+ <-|    |
      |  --> u  ------------------------>  u -->|----|
      | ---> u ------------------------>  u -->|
```

Positive Pion Interaction with Proton to Generate D++ Resonance

This drawing looks a little bit more complex, but you get the same final result written in our notation and can see the internal transformations more clearly. The main distinction is that we do not write our Delta++ with only a (u) triplet (u u u), but with (u u u) (e+ e+). This clearly includes a double positive charge in the form of two internal positrons and explains where the double charge comes from. The Standard Model really makes no sense unless we think of the D++ as having 5 quarks. You must assume that two down quarks form a neutral pion that quickly disappears unnoticed (see the d and d* quarks in the Standard diagram.) The production process results in a heavy neutral anti-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. The Standard Model calculates the charges as 3(2/3) + 1/3 - 1/3 = +6/3 = +2.

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. A proton also has two positrons draining energy, but since the excitation is much lower, an electron moves back inside the "event horizon" and cancels one of the positron charges, thereby reducing the energy loop. And, sure enough, both our diagram and the Standard diagram show that the D++ is just a proton jazzed up with extra positive pion (P+) energy.

What is the original ground state triple up quark particle that contains an anti (u) quark?

* u u* u = ?

There is no such thing in the Standard Model. We know such a beastie has no net charge, and its energy is much lower than a Delta++ and even lower than a proton, though it will not be stable. Let' s go back to our list of quarks and write down a single up quark.

* u = u (e- e+).

What is it? It' s a type of positronium! The simplest form of positronium has only one electron and one positron orbiting.

* (g) (g*) --> (e- e+) --> (g) (g*).

This is the case of virtual pair production and annihilation. There is no quark energy to buffer the two apart and give them a life span in the "real" world. So the ground state of positronium as a quasi-atom is simply a single up quark. Now you know what a single quark looks like, and it is already quite familiar to us. It is just a virtual particle pair with enough energy to form a transitory particle. The up quark provides the extra boost to keep the virtual pair manifest for a moment above the vacuum. Another thing that is extremely interesting about positronium is that you can actually "see" a naked positron core. This is a living example of the fabled "naked singularity" that physicists talk about when discussing black holes. The positron usually lies hidden in the core of a proton, neutron or other baryon or as a meson component and therefore physicists do not notice its presence even though it provides the positive charge of so many particles.

The electron and positron in positronium behave like a tiny binary star system. Positronium has the same energy levels as hydrogen, but the levels are spaced more closely. The quarks determine the energy quanta. The lepton pair in single-quark positronium has conjugate particles instead of the two electrons we see in hydrogen molecules or helium atoms. The conjugate pair mimics the Cooper pairing that occurs in ordinary atoms, but the spins can be matched or opposite during the brief lifetime. If the spins are the same, you get spin 1 (orthopositronium); and if the spins are opposite, you get spin 0 (parapositronium). Parapositronium is the true ground state. The decay rate for para is slightly over (2 H / Me c^2 a^5) = 1.24x10^-10 s), and the decay for ortho is a bit over 10^-7 s. The combined average from experiment is slightly under 10^-3 s.

The (u u) pair gives positronium excited into its second (2S) orbit. One lepton pair fills the first orbit (1S), and the second pair is in the second orbit (2S). The triplet (u u u) gives us the equivalent of a carbon atom with a nucleus lighter than hydrogen. Wow! What if we could find a way to stabilize these positronium quasi-carbon atoms into crystal form? This would give us a kind of super-light Buckyballs that would be much lighter than hydrogen. A ship made from such positronium diamonds would float us right out to the edge of space with no need for any fuel!! How' s that for a far-out new solution to the space program' s main bottleneck? Unfortunately, we currently do not know how to stabilize positronium so that it will not decay very rapidly. Until we do, this is just a sci-fi pipe dream. But, remember. The proton is just (u d+ u). There are positrons in there, and they do not decay. So once we fully understand the dynamics of how this occurs, we should be able to design stable (u u* u) atoms and build structures with them. The main problem is that the proton' s positrons are passive and anchor the singularity. Positronium' s positrons whirl around like electrons in orbit. But with (u u* u) we have enough quarks available that we can set up some effective buffering patterns. I suspect that the secret lies in the harmonics of the phonon standing waves. Perhaps with the right kind of music we can make it fly.

The energy of a single (u) quark ensemble is too low to have a central drain in its core. The positrons whirl around in orbits opposite the electrons. The triple (u u* u) has an antiparticle (u* u u*), a conjugate kind of positronium. The tripleness of the electron-positron pairs allows the configuration to last longer than the ground state, but the pairs still quickly annihilate. The trick is to get the charged particle pairs to balance in their orbits without annihilating. The third orbit of positronium is strange, also, because carbon has 1 Px up electron and 1 Py up electron rather than an up-down pair in the Px orbit. Thus the third orbit must be ortho, unless....?

With our new quark model and notation we can construct all the "weird" atoms. For example, we can make various forms of muonium in the same way as positronium by using the Um quark instead of the up quark.

* (m- m+) = virtual muonium.
* U (m- m+) = muonium ground state.

We know this is a fact, because muonium has been identified and studied in the laboratory. We can get many combinations of leptons forming temporary wave patterns, but at too low an energy level to develop a nucleon with a central drainage system. In doing our accounting we can basically just tally the quarks as electron-positron pairs or muon-antimuon pairs and then add in the odd charges if the particle is charged. The up quark carries some energy, but it acts primarily as a buffer. The charged leptons are the real core of the action.

* d- = u e- ue* This is an energetic electron.
* d+ = u* (e+ e+ e-) (ue ue* ue) This is an energetic positron.

Think of these as positronium with a conducting electron. Here is an energetic muon.

* s- = U (m+ m- m-).(um um* um*)

Hey, wait a minute! What are we doing here? We are describing lepton ensembles with quarks! 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 up quark, just like the other neutrinos, functions as our quantum energy accountant. We realize that by making an adjustment to the Standard quark notation to fit our ensemble theory, we have also in one stroke achieved a lepton-quark unification. In fact, if you look back over the various quark expressions given above, you will see that with our system ALL hadrons are made from up or Um quark "neutrinos" using leptons as their basic building blocks. Aside from the up/Um quark "neutrinos" all other quark labels are just macros of the u/U quarks plus various leptons. Virtual positronium and muonium can exist without quarks being involved. But for actual pair production we need the energy to produce them -- (2 Me c^2) or (2 Mm c^2) -- plus some extra energy to keep them apart. So study of high energy positronium and muonium may give us insights into quark structure and even the possibility of observing an elusive quark on its own.

Here is a way to represent a proton and a neutron with our system.

* p+ = (e- u ue e+ ue* u* e+ ue u) e-^ ue*-->

* n = (e- u ue e+ ue* u* ue* e+ ue u e-)

The parens mark the proton' s "event horizon". The e-^ is an orbiting electron. The ^ indicates it is moving relative to the proton. The ue*--> is an escaping antineutrino. By moving away from the proton' s core ensemble, the electron and antineutrino take away the inherent uncertainty of so many particles so close together by adding whatever momentum or distance is needed to maintain equilibrium. Notice also how the electron and the antineutrino move normal to each other. The electron moves in orbit around the positron singularity, and the antineutrino moves directly away from it.

Before taking leave of the Delta series, we should mention that there are two series of Sigmas, one of which is in the light baryon octet, and one which is in the Resonance Decuplet just below the Delta series. These two series of Sigmas 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), (e+ e+, m-) (2 e-).

* So = (u d+ s-) = (3u), (e+ e+, m-) (1 e-).

* S+ = (u u* s-), e+ e+ = (3u), (e+ e+, m-), (0 e-).

The Decuplet Sigmas just have the antiquarks flipped into quarks by some additional energy:

* S- = (d- s- d-) = (3u), (e+ e+, m-, 2 e-)

* So = (u s- d-) = (3u), (e+ e+, m-, 1 e-)

* S+ = (u s- u) = (3u), (e+ e+, m-, 0 e-)

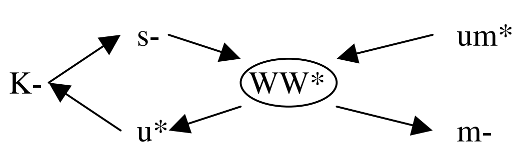
The octet ensembles are less energized versions of the decuplet particles. Both octet and decuplet Sigmas are written in the Standard Model with the same quark signatures, a procedure that does not distinguish the fine structural differences. In our notation the neutral Lamda, the Octet Sigma and the Decuplet Sigma are each written differently in ways that indicate the differences in their masses and decay times. It is important to remember that many particle ensembles have components that are outside the baryon core. Protons are the archetypal case.

Although the Octet series and Decuplet resonance series quark notations look the same in the Standard Model, they have very different energy levels. The Standard Model does not explain how the same quark structure can have two forms. With our notation we can clearly indicate which series we are talking about and we know why that series has the energy level that it displays.

With this brief introduction to our new quark theory, let's look at some interactions.

Let's begin with the decay of a negative kaon (K-). The kaon is (s- u*). Via the intercession of a W boson the kaon drops into a muon and a muon antineutrino (m- um*). Here is a "Feynman" diagram of this interaction.

*



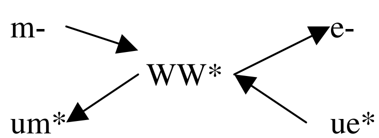
The negative kaon consists of a strange quark and an anti-up quark. The quarks loop in time in a little bubble, so they look like a particle. The muon antineutrino loops back in time, bounces off a W boson, time reverses, and juices up into a muon. The strange quark also bounces off the W boson and turns into the anti-up quark, giving some of its energy to boost the neutrino into a muon. It also passes its charge through the boson to the muon. The muon subsequently decays. We could also say that the strange quark decays into a muon while the antineutrino amps up into an anti-up quark.

The W and Z bosons have NO charge, contrary to the Standard Model. No bosons have charge. That is part of why they are bosons. They pair and naturally cancel all charges. They act as catalysts and pass charges of quarks and leptons through the reaction. So the W boson is actually a (W W*) conjugate pair, just like (g) is really (g g*). And, of course, (Z) is (Z Z*). All interactions are cases of 4-wave or 4-particle mixing, the interaction of two conjugate pairs. This is even true at the macroscopic level when we consider the gravitational interaction of stars and planets, but the mechanics of those interactions is another topic for another article.

Here is how the muon decays.

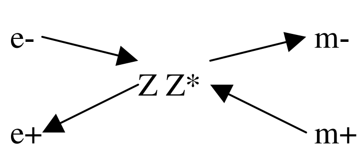
* (m-) → (e-) + (ue*) + (um).

We really should represent it this way with a Feynman diagram.

* 

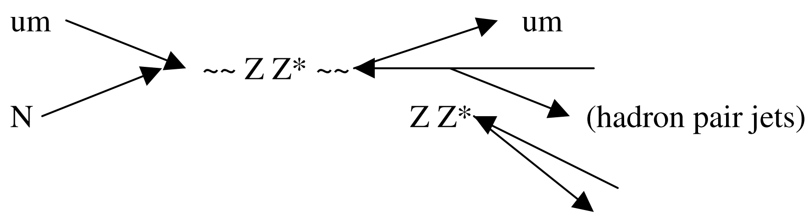
The muon drops into an electron, while the electron antineutrino amps up into a muon antineutrino. Again the W boson pair is just a catalyst. Physicists often write the muon neutrino as a normal particle and place it on the output side. This is OK. The rule is that if you twist a member of a 4-particle mix interaction backwards in time from its proper direction, then you must reverse it into its antiparticle.

The Z bosons function as catalysts for pair production and annihilation.

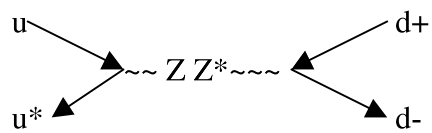
* 

The process (e+) + (e-) ---> (ue) + (ue*) can go via either the Z or the W mediation since it involves conjugate pair interaction and also involves down-stepping of energy.

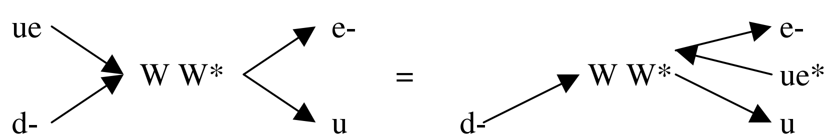
Depending on circumstances this interaction can go either direction. The lepton pairs can also annihilate into conjugate photon pairs. There is also a probability for it to run by the W boson. Another role of the Z boson is to mediate what are called neutral current reactions.

*


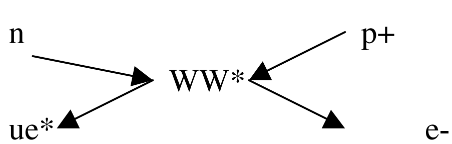
In this diagram N represents some nucleon, and the output is a cluster of particle-pair jets. The term "neutral current" should really refer to the fact that the Z boson does not pass charges. Only the W boson passes charges through a reaction. This is the fundamental distinction between the W and Z boson reactions. We can show this difference with some quark interactions. Here is a Z boson quark interaction.

*


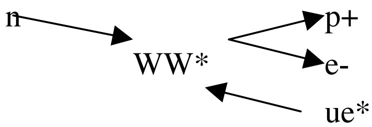
Here is a W boson quark interaction showing the W boson decay of a down quark into an up quark..

*


This is the inner workings of the well-known semileptonic decay of the neutron into a proton, which we can write in our notation as follows.

*


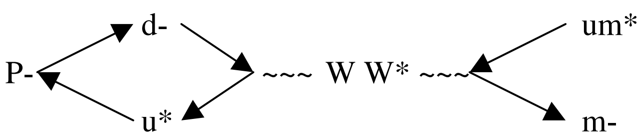
This diagram looks strange, because most people insist on assuming that the proton is not an antiparticle even though that results in an inability to account for the missing antimatter to balance out the existence of matter and the fact that the positron has a positive charge. So, to make things look more familiar, we can redraw the diagram as follows.



This is closer to the way physicists draw the event. We have twisted the proton' s direction in space/time without changing its sign, so to compensate, we also move the antineutrino over while keeping it an antiparticle. This is OK. The (d+) quark does not get involved in this decay path. Only the (d-) quark is involved, and it is not an antiparticle, nor is its (u) quark outcome as we showed in the quark analysis.

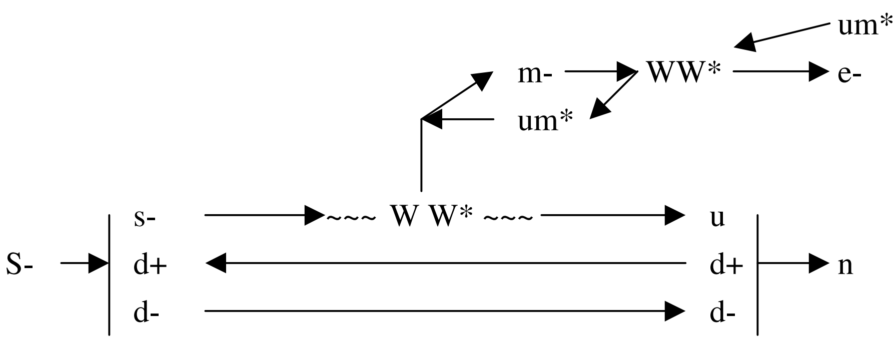
Here is negative pion decay running at a lower energy than the K- decay, but in the same manner.

*



Here' s a more complex decay pattern for a Sigma minus baryon becoming a neutron:

*

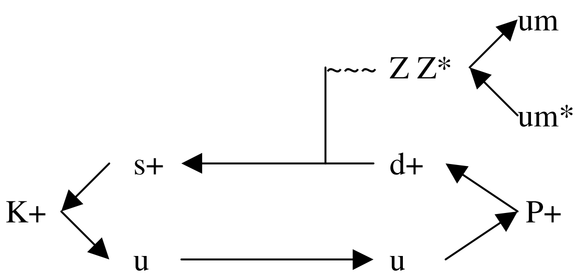


The (u) quark has flipped directions in time and changed from an anti-u to a (u) quark.

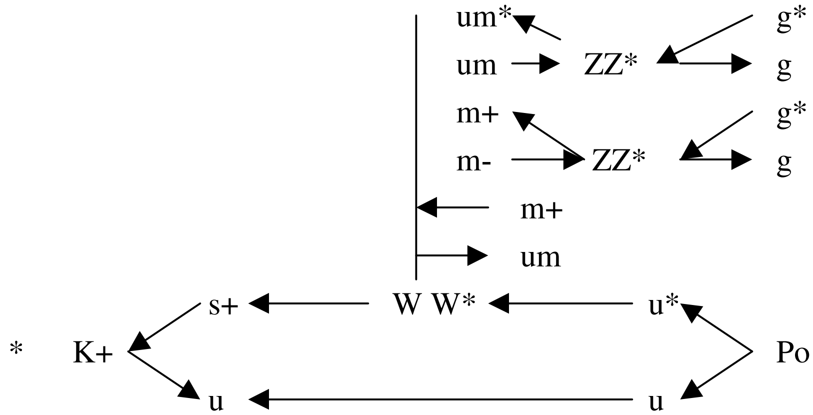
* (s-) + (u*)~~~ WW* ~~~(m-) + (um*).
* (s-) ~~~WW* ~~~(u) + (m-) + (um*).

Here is a K+ decay route that is NOT allowed. Why?

*



The problem here is that there is no way to go from an (s+) quark to a (d+) quark using a Z boson in this manner. We need conjugate pairs to use a Z boson. So it goes like this instead.



* (s+) + (u) ~~~WW*~~~(um) + (m+).
* (s+)~~~WW*~~~(u*) + (um) + (m+).

The (u) quark switches sides and directions in time resulting in a neutral pion that quickly decays. The W boson reaction pulls the extra positive antimuon out of the (s+) quark leaving an up quark. The leftover virtual muon and neutrino pairs then decay into photons by the Z boson mechanism. We are left with an antimuon and a muon neutrino. The antimuon subsequently also decays.

The W and Z bosons arise from the vacuum state to act as catalysts when particles scatter or decay. Z bosons are clearly higher energy resonances of the EM interaction. In **Observer Physics** I derive the mass of each and the relation of each to its specific coupling constant. Niels Bohr derived the fine structure constant (a) for the electron' s electromagnetic interaction and this is pretty well understood. The electroweak unification condition is:

* $e / [2 (2eo)^{1/2}] = gw \sin Ow = gz \cos Ow$.

Here (gw) is the coupling constant for the (W) boson and (gz) is the coupling constant for the (Z) boson, and (Ow, or theta sub omega) is the weak mixing angle.

* $\cos (Ow) = Mw / Mz$ $(0 < Ow < pi/2)$

The weak mixing angle is analogous to the Cabbibo angle for quark mixing. As the relation shows, the weak mixing angle is based on the (W/Z) mass ratio. The unification condition neatly connects the various coupling constants.

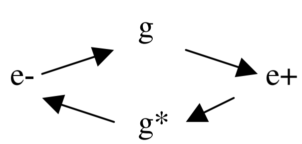
However, the charges must also be taken into account. For that physicists postulate the "anomaly condition." This states that the sum of the lepton charges plus three times the sum of the quark charges equals zero. The six leptons and six quarks of the Standard model satisfy this condition. The factor of three comes from summing over the three different color states of the quarks. I think the "anomaly condition" is so called because the charges on the quarks are anomalous and make no sense. So someone just arbitrarily made up a rule. With our new interpretation we see that the sums of all the charges for leptons and antileptons, quarks and antiquarks always equals zero no matter how many colors or flavors we divide them into. Only electrons and positrons have charge, and they always have one quantum unit each. The charges in any complete ensemble of leptons or quarks and leptons always balance out to zero. The "anomaly condition" is not necessary in our interpretation.

However, the zero sum for the charges of all particles is important in electroweak unification theory, because, without it, the infinities that crop up in the field equations will not all cancel out in all processes. Our proposed system has no problem here because the charges always cancel out, and because we derive and incorporate finite distance constants that prevent the occurrence of infinities in field equations. But that is another discussion. In **Observer Physics** we present a simple theory of quantum electro-gravity that generates the proper masses and forces of natural phenomena from the vacuum without any danger of infinities cropping up.

Why do we have a whole hierarchy of unstable particle ensembles that collapse almost instantly, while we also have a whole hierarchy of stable nucleons that build up our periodic table and the numerous molecular structures that populate our world? The key lies in the stability of the proton and its partnership with the neutron. This derives from the relation between bosons and fermions. All fermion particles are fundamentally bosons at heart and wish to collapse into pure photon energy. However the electro-gravitational equilibrium that the proton ensemble generates enables this boson nature to shift into fermion mode. The Pauli exclusion principle is a mysterious and apparently arbitrary rule (despite its description in arcane mathematical language) until you understand the simple dynamic internal structure of the proton. Then you realize that only the true nucleons and electrons are fermions, and you also understand why. For that discussion I refer you to **Observer Physics** (dpedtech.com) or my article, "Energy from Electrons and Matter from Protons: A Preliminary Model Based on Observer Physics." (available online at zpenergy.com).

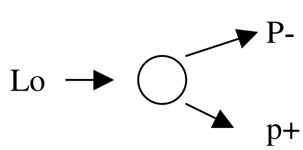
Before we take leave of this brief introduction to the new method of quark analysis, I would like to give an example of a very important guiding principle that I mentioned earlier, but can not emphasize enough. The new quark theory must come into line with the great paradigm shift of phase conjugation. This is a completely general principle that operates throughout creation at all levels. It manifests in the wave mode as 4-wave mixing. But it also holds true for particles as 4-particle mixing.

In terms of particle physics this means that interactions take the canonical form of interacting and transforming in sets of four according to the principles of phase conjugation. Many texts on particle physics spend a lot of time talking about creation and destruction. There is no such thing in the physical world. In physics there is only transformation. The total number of particles remains constant throughout any interaction. The ground state of the universe is a single photon that loops about in space/time. Its simplest figure is:

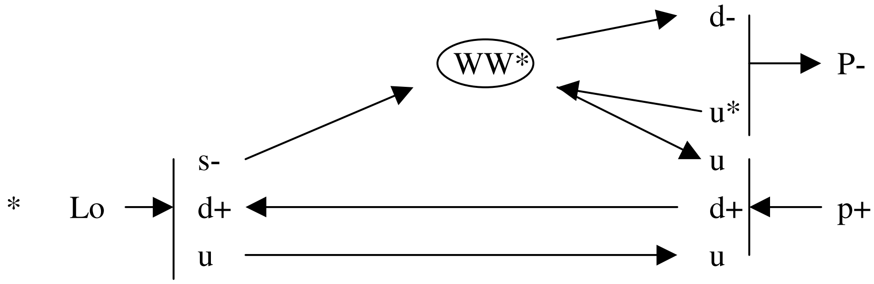
* 

Physical transformation proceeds by alternation of conjugate fermions and conjugate bosons -- fermion, boson, fermion, boson, fermion, boson, and so on. By echoing rapidly back and forth in space/time the transformations can produce the illusion of the entire universe in all its multiplicity. However, every interaction proceeds by the principle of phase conjugation through what Vivaldi accurately called the "Four Seasons".

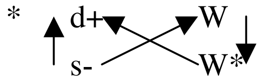
Therefore, the many Feynman diagrams in physics texts that show particles branching like trees are all drawn wrong and misleading. Here is an example that I took from Frauenfelder, p. 7. It shows a neutral lamda decaying into a negative pion and a proton. Not only is the branching wrong, the arrows are drawn wrong.

* 

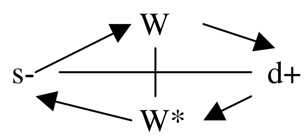
To see what is going on, we must first break the interaction down into its constituent quarks. When we do so, we find something interesting.



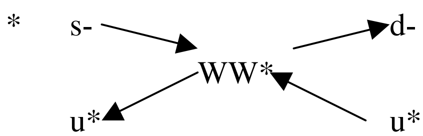
First we count 8 quarks. That gives us two sets of 4. We notice that the (u) and (d+) quarks pass right through into the proton forming one simple loop in space/time. So the real interaction is the decay of the (s-) into a (d-). This process is facilitated by a WW* boson pair. So the primary interaction from the lamda side is as follows:



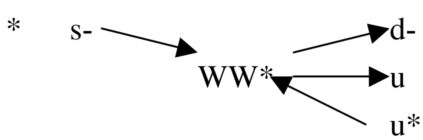
or we can write:



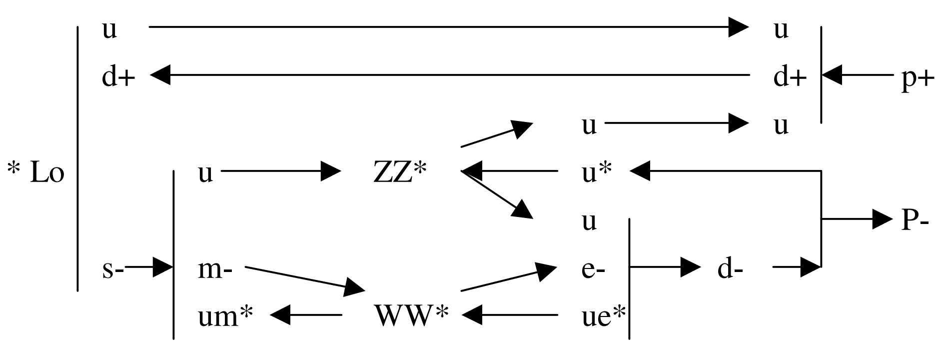
Expanding this into a pair of interactions we get:



The fermion pairs tend to separate at angles, whereas the bosons tend to travel tightly parallel, bundled together. The fermions are just bosons that have been split apart by wave guide effects. We can move the (s-) antiup quark over to the (d-) side, reversing its temporal direction and flipping it into a particle:



However, this is not the whole story. There are two subprocesses.

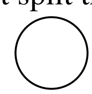


The quarks are just buffers for the internal leptons. The leptons actually are where the action is. But each step in the transformation process is a 4-particle mix governed by the laws of phase conjugation. The hadrons that we find at either end of the process are just the "surface" level.

The physical world is DUMB. Nothing is ever created or destroyed in the physical world. Particles just bump around through transformations doing exactly what they are told like automatons. Every interaction shows the same number of particles that simply appear to change their momentum, mass, direction in space/time, and so on.

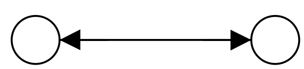
Only the observer can create and destroy. He does this by his choice of viewpoint. He can choose to have no viewpoint. Then nothing is defined, and all is potential. Or he can define a certain viewpoint. Then his experience will reflect the definitions he has imposed on potential.

To define a viewpoint he must first split the UR-PHOTON of creative potential.



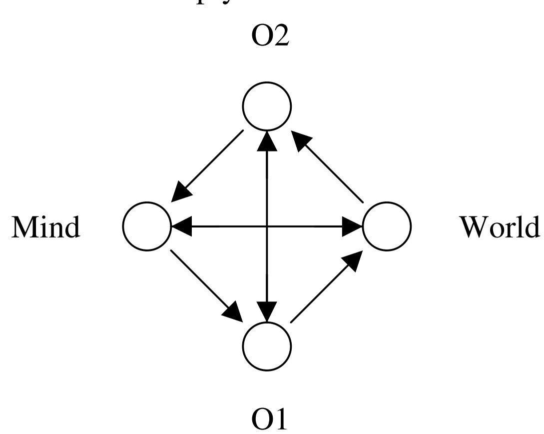
UR-PHOTON

Half becomes Mind, and half becomes World.



Mind World

However, both Mind and World are empty. So he must do a 90-degree rotation.



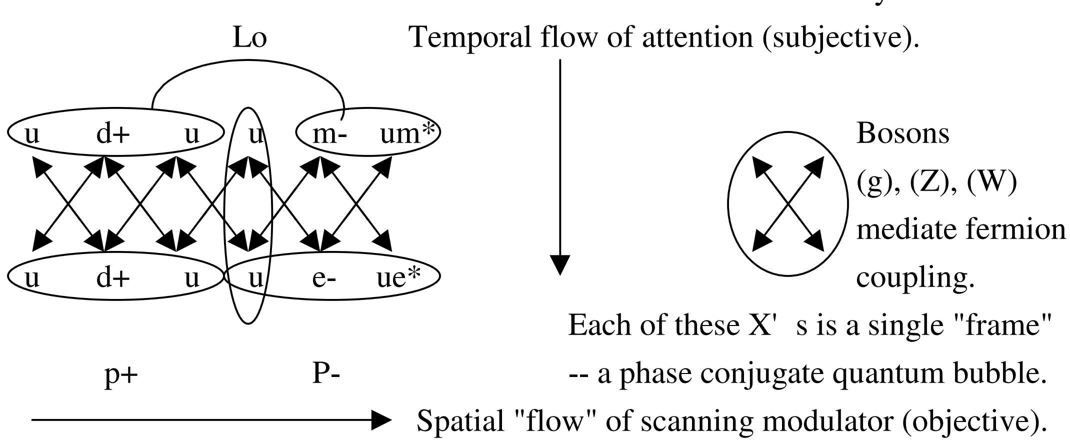
Now he has generated observer viewpoint one (O1) and observer viewpoint two (O2), the conjugate viewpoint that reflects. This is a "creation", but to really "see" it, he must rotate again. As you look at the diagram from your viewpoint outside the page, you experience that secondary rotation. The neutrino world is very primitive and only partakes of the first split of the UR-PHOTON. That is why neutrinos interact so weakly with matter and have no charge. They are only interference patterns in the ur-split that separates mind and world. Electrons, however, carry the momentum of the rotations and appear as vortexes as long as the observer continues to perform his mental gyrations (by his "secret" mental resistances, also known as "games".)

As you look at the 4-particle mix from various angles (even turning the paper over), the diagram distorts in various ways. The diagram includes both what you see as the world and what you imagine consciously or unconsciously in your mind. This diagram echoes about through rapid transformations of viewpoint at an average speed of around 10^8 Hz. This generates a field of experience consisting of around 4x10^8 points of light per second, not the 1000 points of light some politicians have mentioned. At around 60 Hz we get the impression of a smooth flow of experience. Thus we have a Reality TV screen with an approximate resolution of 6.67x10^6 pixels if it runs at an average refresh rate of 60 Hz. We can run it faster at slower resolution or slower at higher resolution. We can fiddle with the controls a bit, but that' s the way it works. Sorry if the show doesn' t meet your expectations.

A word of caution is in order. If you try to contact the program director or the sponsor to complain, you will get no answer. If you persist in going after these guys, you' ll eventually discover that they are none other than yourself (ourself). So if we want a better script, we will have to change channels or create a new script.

You channel flippers have probably already started to figure out that all the channels are just broadcasting more or less the same stuff packaged slightly differently. So we can either turn off the TV by switching off our viewpoints, or we can use our creative intelligence to invent a new show.

Go back to the lamda decay diagram we drew. Can you see how the whole thing is an illusion done with funhouse mirror distortions? Welcome to Reality TV.



* (u d+ u m- um*) = (u d+ s-) = Lo. (Neutral Lamda)
* (u d+ u) = p+. (Proton)
* (u* u e- ue*) = (u* d-) = P-. (Negative Pion)

In sum, it seems that the zoo is still a useful way of keeping track of the denizens of the subatomic world. However, with this new approach to the analysis of quark structures, I think the study of nuclear and particle physics becomes a good deal simpler and a number of puzzling features are resolved.

Some Reading Materials

Here are a few resources on standard particle physics, plus some examples of recent articles on the neutrino oscillation question. Sakai is a good resource on phase conjugation. Also listed are an article and a collection of articles I wrote presenting some new ideas in physics. **Observer Physics** covers a wide range of topics introducing new principles, ideas, and methods for exploring physics. The article presents a model of the detailed dynamic structure of the electron and the proton. The model derives the rest mass of each particle, its charge, and how each particle can remain stable as the raw material for our physical world.

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