A Preon Model for Particles and Forces, based on Modified Electric Charge

Ronald Agius

Abstract. A simple model is proposed in which quarks and leptons are composed of preons that carry only electric charge. But electric charge is modified so that it comes in three varieties. All short-range forces are transmitted through exchange of massive bosons that are themselves composed of preons. The massless bosons that mediate the long-range forces are not composed of preons.

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1. Overview

I propose a simple model in which:
(a) All quarks and leptons are built from preons.
(b) There is only one type of charge - the electric charge (ie. no colour or weak charges).
(c) Electric charge comes in three different varieties called <u>species</u> (E1, E2, and E3). A charge can be positive or negative, and is assigned an arbitrary value of 1/2. There are thus six different elementary charges, ie. E1+1/2, E1-1/2, E2+1/2, E2-1/2, E3+1/2, E3-1/2.
(d) Each preon carries two elementary charges, which must be of different species.
(e) All short-range forces are transmitted through exchange of massive bosons that are themselves composed of preons.
(f) Electric charge must be conserved separately for each one of the three electric species.
(g) The internal symmetry of preon isospin can explain the observed particles and short-range forces.

2. Preons

An <u>electric preon</u> carries two elementary charges of unlike species and of like sign. A <u>dipolar preon</u> carries two elementary charges of unlike species and of unlike sign. There are thus twelve different preons, forming six preon-antipreon pairs. Preons fall into three groups according to which two electric species they carry.

All preons must have a sign. So three dipolar preons are considered to be of positive sign, and their antipreons are considered to be of negative sign.

Group A preons carry charges of species E1 and E2.
PE1 preon = [E1+1/2][E2+1/2] ; NE1 preon = [E1-1/2][E2-1/2]
PD1 preon = [E1+1/2][E2-1/2] ; ND1 preon = [E1-1/2][E2+1/2]

Group B preons carry charges of species E2 and E3.
PE2 preon = [E2+1/2][E3+1/2] ; NE2 preon = [E2-1/2][E3-1/2]
PD2 preon = [E2+1/2][E3-1/2] ; ND2 preon = [E2-1/2][E3+1/2]

Group C preons carry charges of species E3 and E1.
PE3 preon = [E3+1/2][E1+1/2] ; NE3 preon = [E3-1/2][E1-1/2]
PD3 preon = [E3+1/2][E1-1/2] ; ND3 preon = [E3-1/2][E1+1/2]

Note: PE=positive electric; NE=negative electric; PD=positive dipolar; ND=negative dipolar.

Preons are absolutely stable. The elementary charges of a preon cannot ever be altered.

3. Quarks and Leptons

Preons aggregate together spontaneously to form quarks and leptons. A half-integer charge of a particular electric species on one preon will attract another half-integer charge of the same electric species on another nearby preon. This attraction occurs equally whether the two charges are of like sign or of unlike sign. The net charge of the two associated charges will thus be of integer value (+1, -1, or 0). This is a stable state, and the two associated charges will not attract further charges of the same species. Two charges summing to zero are much more stable than two charges summing to 1.

To build a stable particle, all three electric species (E1, E2, and E3) must be present, and each species must sum to a net integer value. This can be achieved by aggregating together three preons, one from each preon group. The resulting particle is said to be in the integer state. There are 64 different such combinations, each corresponding to a quark or lepton. In 48 of these, the preons will be of mixed sign. In 16 of these states, the preons will be all of the same sign.

We now introduce an arbitrary rule: Elementary fermions must be built ONLY using preons of same sign. This rule simplifies the model, and renders it self-consistent and symmetrical.

In 4 of the 16 allowed integer states, all three electric species will have the *same* net integer value (including sign if applicable).
E1,E2,E3 = 0,0,0 or +1,+1,+1 or -1,-1,-1.
Such an integer state is referred to as a singlet state. This is an extremely stable configuration.

Figure 1 (scroll down to image section at end of article) shows the preon composition of the sixteen first generation particles that can be constructed.

Leptons are in the singlet state. They are composed of preons of one type only. Charged leptons have a net electric charge of 1e; each electric species has a net value of 1 (in arbitrary units). Neutral leptons have a net electric charge of zero; each electric species has a net value of 0.

Quarks are not in the singlet state. They are composed of both electric and dipolar preons. Quarks have net partial electric charges of 1/3e or 2/3e. Each quark comes in three different isomeric forms, corresponding to three different preon compositions. The isomeric form of a quark is labelled A, B, or C depending on the preon group to which the preon of minority type belongs.

The list below shows the preon composition of some particles, together with the net value of their E1, E2, E3 charges (in that order from left to right):

Electron = (NE1,NE2,NE3) = -1,-1,-1
Neutrino = (PD1,PD2,PD3) = 0,0,0
Positive U-Quark(A) = (PD1,PE2,PE3) = +1,0,+1
Positive U-Quark(B) = (PE1,PD2,PE3) = +1,+1,0
Positive U-Quark(C) = (PE1,PE2,PD3) = 0,+1,+1
Negative D-Quark(A) = (NE1,ND2,ND3) = 0,-1,0
Negative D-Quark(B) = (ND1,NE2,ND3) = 0,0,-1
Negative D-Quark(C) = (ND1,ND2,NE3) = -1,0,0

Any two preons of same sign belonging to different preon groups are compatible with each other, and can be found together in at least one quark or lepton. The two different preons of same sign that belong to the same preon group cannot be found together inside any elementary fermion, and are known as an incompatible preon pair.

Six incompatible preon pairs:
PE1 and PD1; PE2 and PD2; PE3 and PD3.
NE1 and ND1; NE2 and ND2; NE3 and ND3.

Leptons are in the most stable configuration possible (the singlet state), so their masses are low. In the neutral lepton, stability is maximal because the paired elementary charges of same species sum to zero, so the particle mass is vanishingly small. The mass of the charged lepton, on the other hand, is appreciable, because the paired elementary charges of same species sum to 1 (a less stable configuration), and constituent electric preons of same sign repel each other electromagnetically.

Quarks are not in the singlet state, so they have much more energy than leptons. A quark's mass is thus much higher than that of the electron.

4. Preon-binding force

The three preons of same sign that make up any quark or lepton are bound together by the preon-binding force. This is transmitted by the gluon, which is very massive and has an extremely limited range. The force is so powerful that the constituent preons are kept permanently confined within the particle.

In a preon interaction, a constituent preon emits a virtual gluon and another constituent preon absorbs it. As a result, the two preons exchange identity, and the preon-binding force acts between them. The two preons thus attract each other. Incessant interactions, two preons at a time involving all three constituent preons, keep the preons tightly bound together to form a discrete particle.

The proposed model provides a simple physical mechanism that can explain how the specific gluon that is required for any preon interaction can be generated. This is the vacuum shuttle.

Gluon emission occurs when an appropriate preon-antipreon pair arises from the vacuum on borrowed energy, and collides with a constituent preon located at X. The energy of the collision causes a 'change of partner'. The constituent preon pairs up with one of the two preons making up the vacuum pair, specifically with the one of unlike sign from its own. This new combination now constitutes a gluon, which moves away until it encounters the second constituent preon. The remaining member of the vacuum pair is left behind at the collision site, and will become the new constituent preon at location X if the interaction is completed.

The gluon emitted at location X travels a short distance and collides with the constituent preon at location Y. Again, a 'change of partner' occurs. The constituent preon pairs up with its antipreon, forming the same preon-antipreon pair that was initially borrowed from the vacuum. This pair returns to the vacuum, paying back the borrowed energy. The other preon forming part of the gluon is left free as the new constituent preon at location Y. The interaction is now complete.

Figure 2 shows an interaction between NE1 and NE2 preons (eg. inside an electron).

The above interaction can be summarised as:
(NE1) at X + borrow[PE2][NE2] => (NE2) at X + gluon[PE2][NE1]
(NE2) at Y + gluon[PE2][NE1] => (NE1) at Y + return[PE2][NE2]

All preon interactions follow the above general pattern. At the end of an interaction, the two preons seem to have moved to each other's location. What really happens is that one interacting preon moves from X to Y, while the other leaves Y to disappear into the vacuum. The books are balanced because a preon coming from the vacuum, identical to the one that 'disappeared' at Y, becomes the constituent preon at X.

Thus constituent preons are constantly moving into the vacuum, and are replaced by preons coming from the vacuum. What we can observe, and call a matter particle, is a stable state of congealed energy which has definite properties (rest mass, intrinsic spin, electric charge). This pattern is maintained despite the continuous preon replacements. The pattern defines the particle.

A gluon is composed of two preons of unlike sign that belong to different preon groups. There are 24 different gluons. Some have a net electric charge (1/3e) and some are neutral. In each gluon, one of the electric species comes as two paired half-integer elementary charges, which sum to a net value of 0 or 1. The charges of the other two species are unpaired, and are thus of half-integer value.

All possible interactions between different electric preons of same sign are mediated by six different neutral gluons. Each is composed of two electric preons of unlike sign.

All possible interactions between different dipolar preons of same sign are mediated by a second set of six different neutral gluons. Each is composed of two dipolar preons of unlike sign.

All possible interactions between an electric preon and a dipolar preon of same sign are mediated by twelve different charged gluons. Each is composed of an electric preon and a dipolar preon of unlike sign, and has a net electric charge of 1/3e (six are positive and six are negative).

All gluons are unobservable, because they are not in the singlet state.

Any preon-antipreon pair from the vacuum can collide with any constituent preon. So, any possibile combination of two preons (a dipreon) can be emitted. As we saw, some dipreons are gluons that transmit the preon-binding force. Within an elementary fermion, any dipreon (gluon or not) that is not or can not be absorbed by another constituent preon inside that same fermion, must be reabsorbed, ie. absorbed by the preon left behind at the emission site. No net change thus occurs. Note that when a constituent preon is replaced with an identical preon from the vacuum, the borrowed preon-antipreon pair is re-created, and is immediately returned to the vacuum.

A quark or lepton is made out of three preons that are bound together by the preon-binding force; excited states of this bound system result in a higher-generation version of the same particle. For example, the electron, the negative muon, and the negative tauon all have the same preon composition of (NE1/NE2/NE3). In the ground state, the three constituent preons are maximally bound together. They are held quite close to each other, and so particle mass is low. This is the electron. When the three preons are energised, they move some distance apart. An excited state of higher mass thus results. This is the negative muon. Further excitation leads to a particle with still higher mass as the preons move further apart. This is the negative tauon.

5. Particles and forces

In this model, electric charge must be conserved separately for each one of the three electric species.

Only particles in the singlet state can be observed in isolation. Preons are not in the singlet state, so isolated preons can never be observed. They aggregate together spontaneously to form quarks and leptons. Leptons are in the singlet state. Consequently, (a) they can be observed as discrete particles; and (b) they do not aggregate together. Quarks are not in the singlet state. Consequently, (a) isolated quarks can never be observed; and (b) quarks must aggregate together spontaneously to form more complex particles (baryons) that are in the singlet state.

A quark or lepton of higher generation can change into lower-generation particles only if all three constituent preons lose energy at the same time. This can be achieved only through a weak decay, involving emission of either a W-boson or a Z-boson.

The vacuum is an unobservable continuum full of energy, from which we can temporarily borrow preon-antipreon pairs. All short-range forces are transmitted by massive virtual bosons that are composed of preons. Some of these forces arise at the preon level, and some at the quark level.

6. Proton decay

Proton decay could theoretically occur if the two members of an incompatible preon pair (ie. same preon group, same sign, different type) located in two different quarks within a proton could exchange a boson between themselves and exchange identity. Figure 3 shows one way in which this process could occur. The PE1 preon in one U-quark would exchange an X-boson with the PD1 preon in the other U-quark. The two preons would thus swap their location. So, the two interacting U-quarks would change flavour - one would become a positron, and the other would become a positive D-quark. The proton would thus decay to a positron and a neutral meson.

The interaction can be summarised as:
(PD1) in quark PosU(A) + borrow[PE1][NE1] => (PE1) in positron + X-boson[PD1][NE1]
(PE1) in quark PosU(B) + X-boson[PD1][NE1] => (PD1) in quark PosD(C) + return[PE1][NE1]

Exchange of an X-boson would transmit the superweak force between the two elementary fermions, causing both of them to change flavour.

The X-boson is composed of an electric preon and a dipolar preon of unlike sign belonging to the same preon group. It has a net electric charge of 1/3e (positive or negative). It carries only two electric species, both of which have a net integer value. An X-boson is thus not in the singlet state.

It is likely that Nature does not allow a non-singlet boson to be emitted away from an elementary fermion. Thus proton decay would not be possible. (Non-singlet bosons bind preons within an elementary fermion; non-singlet mesons bind quarks within a baryon; but nucleons are bound together by charged pions in the singlet state).

7. Weak charged force

This force acts between two elementary fermions, and is transmitted by the W-boson, which is composed of the six different preons of same sign. It has a net charge of 1e (positive or negative), and is in the singlet state. It arises at the preon level, when all three constituent preons of an elementary fermion change sign and type while remaining in the same preon group. Each preon borrows a preon-antipreon pair from the vacuum, and emits a Y-boson. The three Y-bosons associate together to form a W-boson.

Example: Positron emits a W-plus to become an antineutrino.
(PE1) + borrow[PD1][ND1] => (ND1) + Y-boson[PE1][PD1]
(PE2) + borrow[PD2][ND2] => (ND2) + Y-boson[PE2][PD2]
(PE3) + borrow[PD3][ND3] => (ND3) + Y-boson[PE3][PD3]
Then [PE1][PD1] + [PE2][PD2] + [PE3][PD3] => W-plus

A Y-boson consists of the two members of an incompatible preon pair, and has a net charge of 1/3e. The two carried electric species each have a net integer value. A Y-boson is not in the singlet state, and is unobservable. But the W-boson is in the singlet state.

Figure 4 shows how the sixteen first-generation particles pair up to form eight weak pairs. When a fermion emits or absorbs a W-boson of appropriate sign, the fermion changes sign and flavour, and changes into its weak pair partner. Note that the two quarks forming a weak pair are of same isomeric form. In a weak interaction, two elementary fermions of unlike sign and of like handedness exchange a W-boson between themselves. If the two fermions are the two members of a particular weak pair, they will change into each other. If not, each fermion changes into its weak pair partner. For example, if an electron emits a W-minus and turns into a neutrino, theoretically (ignoring mass considerations) the W-minus can be absorbed by a positive U-quark(A) which changes into a negative D-quark(A).

Since the neutral leptons have a fixed handedness, it follows that interactions involving them will be asymmetric. For example, the neutrino (which is left-handed) can interact with a left-handed electron, but not with a right-handed one. Similarly, the antineutrino (which is right-handed) can interact with a right-handed positron but not with a left-handed one. The preon composition explains why two particles of same sign (eg. electron and antineutrino) cannot interact.

It is likely that interactions not involving neutral leptons can occur symmetrically. For example, if a positive U-quark(A) interacts with a negative D-quark(A), the two will change into each other. This happens if both quarks are right-handed, and also if both quarks are left-handed.

When a W-boson is absorbed, each constituent preon of the absorbing fermion pairs up with its antipreon present in the W-boson. Three preon-antipreon pairs are thus formed, and are returned to the vacuum. Note that the returned preon-antipreon pairs need not be identical to the borrowed ones.

The weak charged force is too weak to bind two elementary fermions together. W-boson exchange occurs too infrequently for this to occur.

The W-boson decays by dividing its six preons into two packets of three preons each. Two elementary fermions of same sign are thus formed, most often of same generation. In a leptonic decay, the W-boson decays to a charged lepton plus a neutral lepton; in a hadronic decay, the products are two quarks of same isomeric form but of different flavour. The two quarks may remain associated to form a charged meson, or they may combine with a quark-antiquark pair from the vacuum to form two mesons (one charged and one neutral).

Note that when a W-boson decays in the leptonic mode, two leptons of opposite handedness are always produced.
W-minus => electron(L) + antineutrino(R)
W-plus => positron(R) + neutrino(L)

8. Weak neutral force

This inter-fermion force is transmitted by the Z-boson, which is composed of six different preons - three positive and three negative - that together are formally equivalent to three different preon-antipreon pairs. It has a net charge of zero, and is in the singlet state. It arises at the preon level, when the three constituent preons of an elementary fermion change into each other. Each preon borrows a preon-antipreon pair from the vacuum, and emits a gluon. The three gluons associate together to form a Z-boson. When a fermion emits a Z-boson, its preon composition remains unchanged.

Example: Positron emits a Z-boson.
(PE1) => (PE2) + gluon[PE1][NE2]
(PE2) => (PE3) + gluon[PE2][NE3]
(PE3) => (PE1) + gluon[PE3][NE1]
Then [PE1][NE2] + [PE2][NE3] + [PE3][NE1] => Z-boson

On absorbing a Z-boson, an elementary fermion retains its preon composition. The three preon-antipreon pairs present in the boson are returned to the vacuum. Only momentum is transferred. A weak neutral interaction can occur between two elementary fermions of like or of unlike sign. The handedness of the fermion does not make any difference. The Z-boson couples equally to left-handed and right-handed fermions.

The Z-boson decays by dividing its six preons into two packets of three preons each, keeping together preons of like sign. A fermion-antifermion pair is thus formed. In a leptonic decay, the Z-boson decays to a lepton and its antilepton; any lepton-antilepton pair can be produced (eg. positron and electron). In a hadronic decay, the direct products are a quark and its antiquark (except top-antitop which are too heavy); these then combine with quark-antiquark pairs from the vacuum to form the observed particle jets.

9. Baryons

Quarks (not in singlet state) aggregate together spontaneously to form observable baryons, which are in the singlet state. A baryon is obtained by combining one quark of isomeric form A, one of isomeric form B, and one of isomeric form C. Two baryon families can be constructed: one (which includes the nucleons) using positive U-quarks and negative D-quarks; the other using negative U-quarks and positive D-quarks. Two quarks that can be found together in at least one baryon are compatible with each other. The quark composition and net E1/E2/E3 charges of the baryons belonging to the nucleon family are listed below:

Delta-plus-plus = [PosU(A)][PosU(B)][PosU(C)] = +2,+2,+2
Proton(A) = [NegD(A)][PosU(B)][PosU(C)] = +1,+1,+1

Proton(B) = [PosU(A)][NegD(B)][PosU(C)] = +1,+1,+1
Proton(C) = [PosU(A)][PosU(B)][NegD(C)] = +1,+1,+1
Neutron(A) = [PosU(A)][NegD(B)][NegD(C)] = 0,0,0
Neutron(B) = [NegD(A)][PosU(B)][NegD(C)] = 0,0,0
Neutron(C) = [NegD(A)][NegD(B)][PosU(C)] = 0,0,0
Delta-minus = [NegD(A)][NegD(B)][NegD(C)] = -1,-1,-1

10. Quark-binding force

The three quarks making up a baryon are bound together by the very powerful quark-binding force, keeping them confined within the particle. The force is transmitted by several neutral or charged non-singlet mesons. The force is generated through the vacuum shuttle. A quark-antiquark pair from the vacuum collides with a constituent quark. A meson is thus generated, which is absorbed by a second constituent quark. So, the two interacting quarks exchange identity, and attract each other.

Figure 5 shows an interaction between two PosU-quarks (eg. in a proton).
PosU(A) at X + borrow[PosU(B)][NegU(B)] => PosU(B) at X + meson[PosU(A)][NegU(B)]
PosU(B) at Y + meson[PosU(A)][NegU(B)] => PosU(A) at Y + return[PosU(B)][NegU(B)]

11. The strong force

Baryons, being in the singlet state, are expected to be found as isolated particles. So, why are protons and neutrons found bound together inside atomic nuclei? Theoretically, two quarks can interact, and exchange identity, even if they are located in separate baryons. The interacting quarks must be the two members of a strong pair, ie. a u-quark and a d-quark of unlike sign but of same isomeric form. When two such quarks exchange a virtual charged pion in singlet form between themselves, a force called the strong force is generated between them. Baryons are observed to be affected by this force, but in fact it is their constituent quarks that generate the force and respond to it. However, the force of attraction is insufficient to bind two baryons together because interactions occur at a low rate. Thus, baryons do not aggregate together spontaneously as quarks do. But inside the cores of stars, under conditions of very high pressure and temperature, protons and neutrons can bind together to form deuterium and more complex nuclei. Once bound together, many of these nuclei remain stable even in low-energy environments like Earth (while others are radioactive).

12. Nucleon binding

Note: A specific isomeric form of a nucleon is indicated by a three letter sequence showing its quark composition, written from left to right in order of quark isomeric form A/B/C. eg. Proton(C) = uud.

We now examine a strong interaction between a proton and a neutron of differing isomeric form.
Proton(A) = [NegD(A)][PosU(B)][PosU(C)] = duu.
Neutron(C) = [NegD(A)][NegD(B)][PosU(C)] = ddu.

Two of the quarks are identical in both nucleons. There is only one strong pair, of isomeric form B. So a strong interaction can occur only between these quarks. Upon exchanging a charged pion in singlet form, the two quarks exchange identity. As a result, the two nucleons exchange identity, both retaining their isomeric form.
duu + ddu => (quarks of isomeric form B interact) => ddu + duu.

Note that the two nucleons still share the same strong pair of isomeric form B. Continuous interactions will bind the two nucleons together, resulting in a deuterium nucleus. Each nucleon alternates successively between being a proton and being a neutron. A nucleon is thus a 'hybrid' of the two.

We now examine a strong interaction between a proton and a neutron of same isomeric form. In this case, there are always three strong pairs. But one pair cannot interact, as it would result in two delta baryons which are heavier than the two nucleons.

Example:
Proton(C) = [PosU(A)][PosU(B)][NegD(C)] = uud
Neutron(C) = [NegD(A)][NegD(B)][PosU(C)] = ddu.

In this example, the quarks of isomeric form C cannot interact. But the interaction can occur between the quarks of isomeric form A, or of isomeric form B. If the two A quarks exchange a charged meson in singlet form, and exchange identity, the two nucleons do not exchange identity. The proton, as before, changes into a neutron, and the neutron changes into a proton, but both nucleons change to isomeric form B.

uud + ddu => (quarks of isomeric form A interact) => dud + udu.

ie. Proton(C) + Neutron(C) => Neutron(B) + Proton(B)

In fact, a proton and a nucleon of same initial isomeric form cycle continuously through all three isomeric forms (A, B, C) depending on which strong pair interacts in successive interactions.

Two protons of differing isomeric form share two strong pairs. For two protons to exchange identity, the quarks of both strong pairs must interact at the same time. The probability for this to occur is low. The same applies to two neutrons of differing isomeric form. Thus, proton-proton and neutron-neutron bonds are either very weak or non-existent.

It is thus concluded that the proton-neutron bond is by far the most important binding element inside atomic nuclei.

13. Long-range forces

The two long-range forces are transmitted by massless bosons (photon and graviton) that are not composed of preons.

Only electric preons take part in electromagnetic interactions; dipolar preons do not take part in such interactions. The photon is emitted and absorbed by electric preons. Electric preons of same sign repel each other, while electric preons of unlike sign attract each other. This applies independently of preon group. The photon does not affect the preon composition of the emitting or absorbing preon. Only momentum and energy are transferred.

Only dipolar preons take part in gravitational interactions; electric preons do not take part in such interactions. The graviton is emitted and absorbed by dipolar preons. Two interacting dipolar preons - irrespective of sign or preon group - attract each other. The graviton does not affect the preon composition of the emitting or absorbing preon. Only momentum and energy are transferred.

Since dipolar preons are found mainly in the quarks inside the nucleons of atomic nuclei, we wrongly conclude that the source of gravity is 'mass'.

The two massless bosons are generated when constituent preons are accelerated by the preon-binding force. The photon is emitted through the joint action of the two elementary charges of differing species but of like sign carried by electric preons. The graviton is emitted by the joint action of the two charges of differing species and of unlike sign carried by dipolar preons.

14. Gauge theory

As we saw, three preons of same sign belonging to the three different preon groups are bound together by the preon-binding force to form an elementary fermion. The force arises when a preon-antipreon pair from the vacuum collides with a constituent preon, and the constituent preon is replaced with one of the vacuum preons (identical to one of the other two constituent preons). In this replacement, at least one electric species suffers a change in value. But we saw that the vacuum shuttle mechanism will also generate the appropriate boson, so that overall conservation of charge is respected separately for each one of the three electric species. Preons are just shifted around, so the conservation principle will always apply.

A gauge theory can model a physical 'preon replacement' using a mathematical 'preon transformation'. Such a theory must therefore be applied to preons. It must be based on the internal symmetry of preon isospin, ie. any preon can be transformed into any other preon. The associated conserved quantity must be species charge.

The transformation that gives rise to the preon-binding force is transformation to compatible preon (ie. same sign, different preon group). The gauge theory of this force must require that a stable particle be formed only when (a) all three electric species (E1, E2, and E3) attain an integer value, and (b) the integer state be built from preons of the same sign.

Another force - the superweak force - that could theoretically also arise at the preon level probably does not exist. The transformation that would give rise to this force is transformation to incompatible preon pair partner (same preon group, same sign, different type).

In a variation of the above scheme, all three constituent preons can be replaced individually from vacuum simultaneously.
Weak neutral force - transformation to compatible preon x 3 (constituent preons change into each other; three gluons are emitted, which combine to give a Z-boson).
Weak charged force - transformation to preon of unlike sign (same preon group, different type) x 3 (three Y-bosons are emitted, which combine to give a W-boson).

In another variation, a quark in a baryon can be replaced with a quark coming from the vacuum (by collision with a quark-antiquark pair). Since a quark is a packet of three preons, preon isospin is still the underlying symmetry. When a quark is transformed into a different quark, the preon composition of the quark changes, and at least two electric species suffer a change in value. This is balanced by the meson that is produced.
Quark-binding force - transformation to compatible quark. The gauge theory must require formation of a singlet state.
Strong force - transformation to strong pair quark partner.

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My email: ronagi1954@outlook.com

As I am a layman, I invite professional physicists to examine the ideas I have presented. Perhaps they might be useful in formulating a mathematical theory of preons as fundamental particles.

Figure 1 - Sixteen fermions (1st. generation)

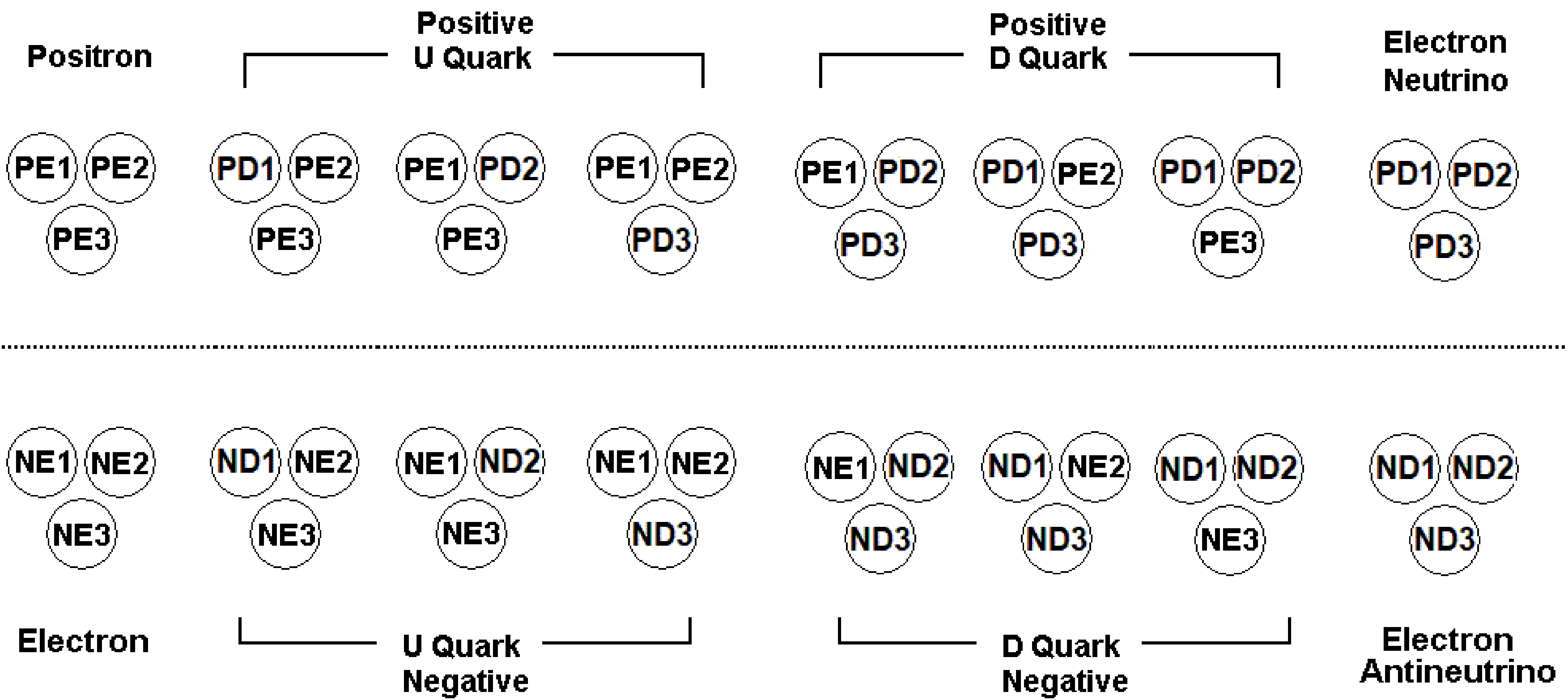

Figure 2 - Preon interaction

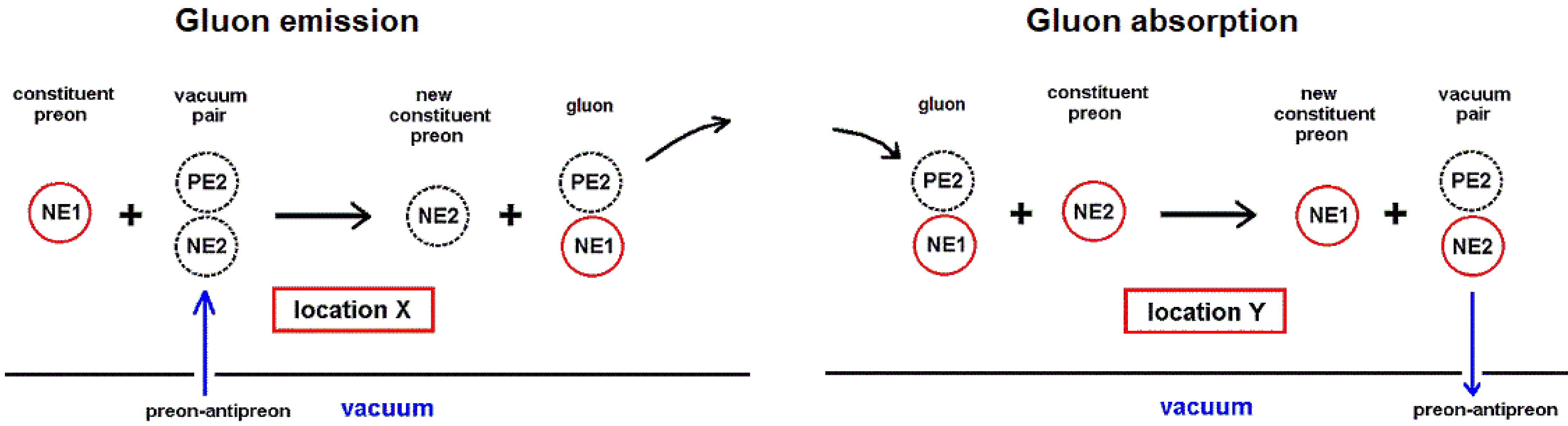

Figure 3 - Proton decay

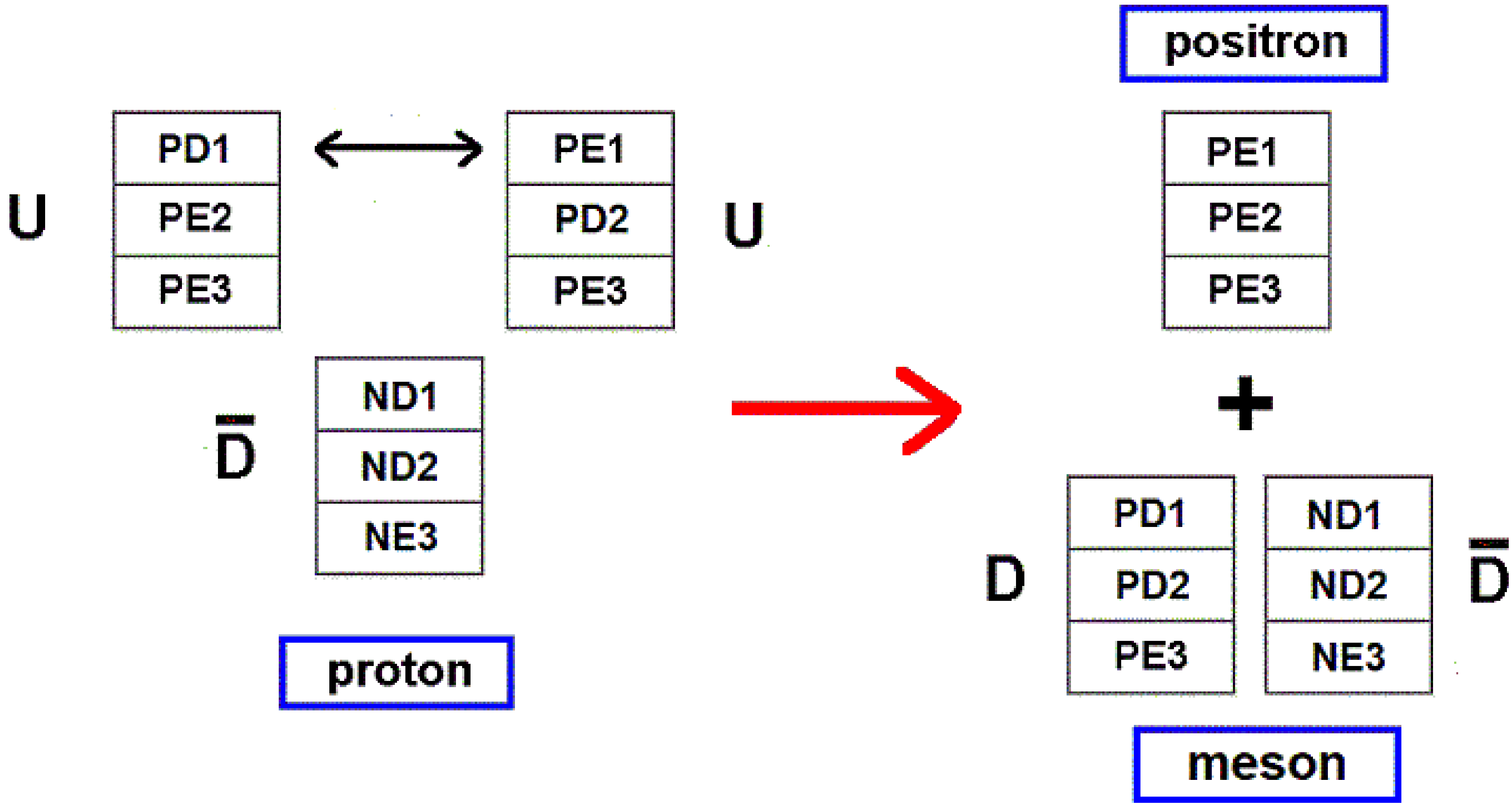

Figure 4 - Weak pairs

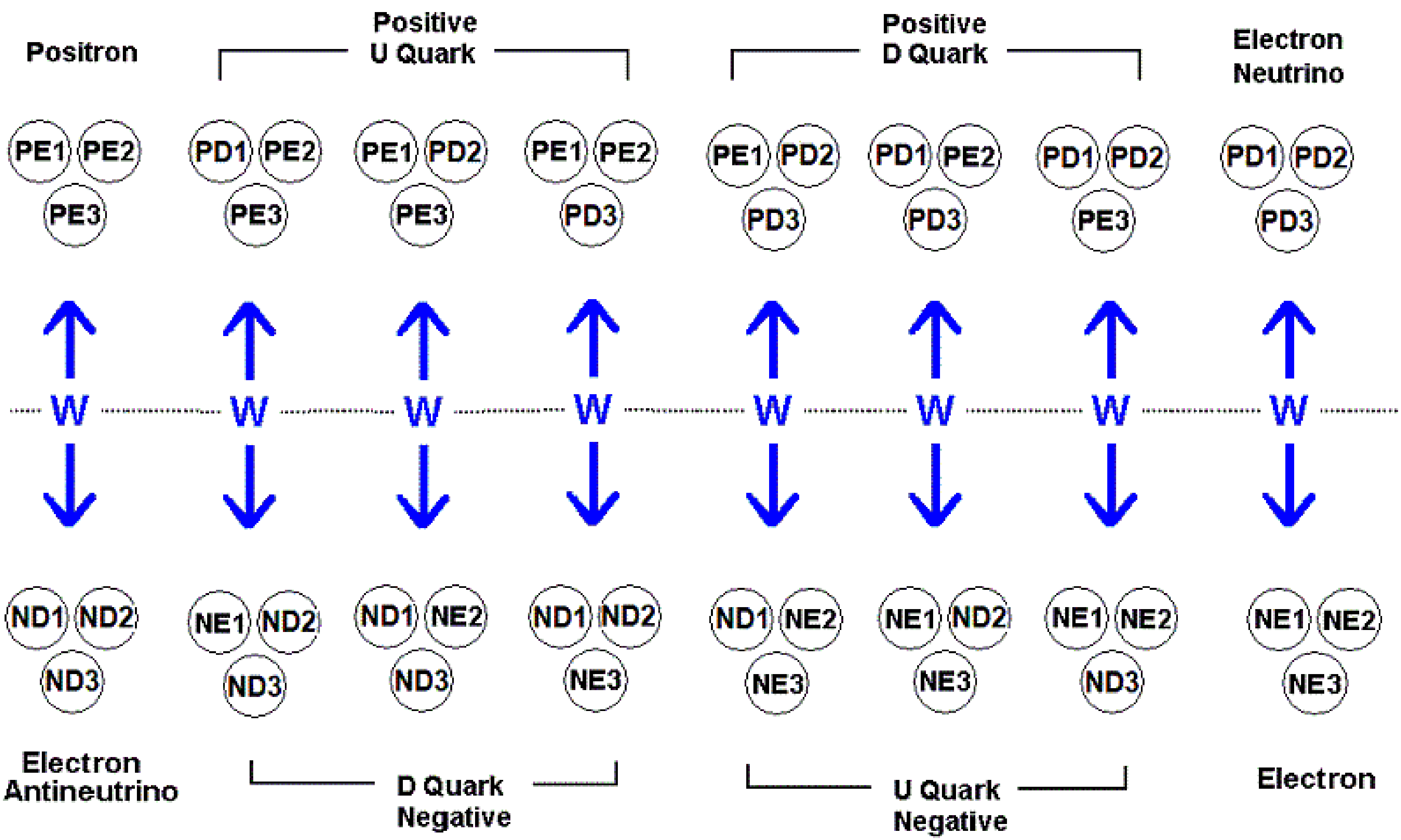

Figure 5 - Quark interaction