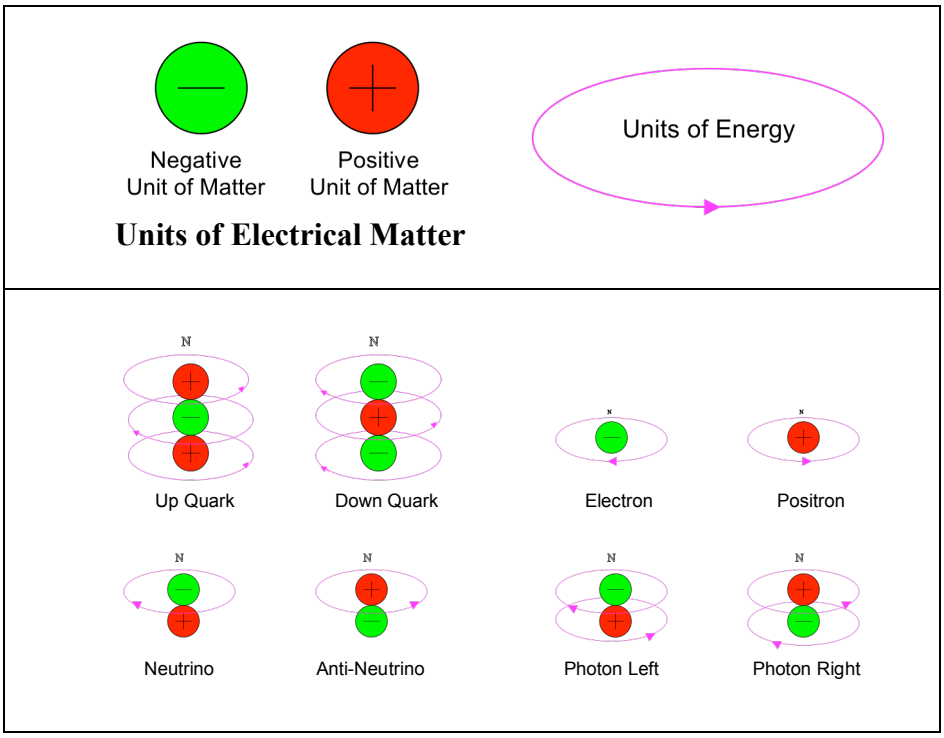
THE UNIT NATURE OF MATTER



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v1.7

THE UNIT NATURE OF MATTER

By James Rees

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Section 1 Summary of the unit electrical matter substructure theory.
Section 2 The steps of deduction of the unit matter substructures.
Section 3 Explanations of several physics quandaries via the unit matter substructures.
Section 4 Particle decays with the unit matter substructures.

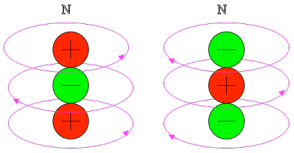
THE UNIT NATURE OF MATTER

Section 1 The Unit Matter Substructures of Standard Model Particles

1.1 Overview

The Standard Model first family of fundamental particles, up and down quarks, electron neutrinos and anti-neutrinos, electrons and positrons, were deduced to have unit electrical matter substructures.

Standard Model Fundamental Particle Unit Matter Substructures

		
Singlet Substructures	**Doublet Substructures**	**Triplet Substructures**
U(1) Symmetry	**SU(2) Symmetry**	**SU(3) Symmetry**
Electromagnetic Force	**Weak Force**	**Strong Force**

The units of electrical matter were deduced from the properties of the Standard Model particles and from the mathematics of high-energy particle physics, not created ad hoc.

The steps of deduction were:

1. Quark triplet unit electrical matter substructure was deduced from quark fractional electrical charge
2. Neutrino doublet unit electrical matter substructure was deduced from the helicity of neutrinos
3. The doublet substructure was deduced to have no rest mass from analysis of pair annihilation

Electrical charged matter will be shown to be composed of fundamental units, units of positive and negative electrically charged units of matter.

The Standard Model particles were deduced to be composed of at least two components:

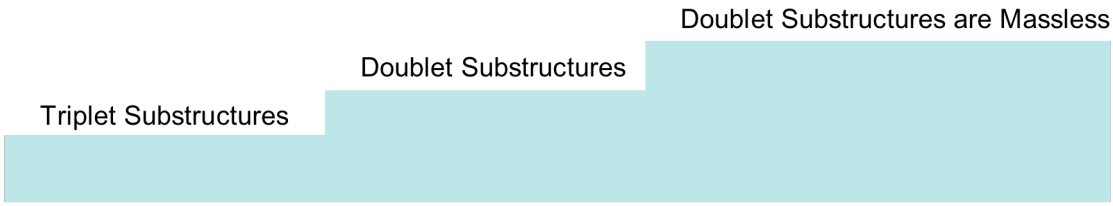
Units of Energy and **Units of Matter**.

- Posses mass-energy
- Do not posses electrical charge

- Possess electrical charge
- Do not posses mass-energy

Units of matter have unit electrical charge, either positive or negative, because the units of matter are the fundamental source of electrical charge. Units of matter are centers of electrical charge, but they do not possess mass-energy. The units of matter host bound energy, but are not made of energy, only electrical charge. Energy conversely, is not the source of electrical charge.

1.2 Summary of the Steps of Deduction of the Unit Matter Substructures



Step 1 Quark Triplet Unit Matter Substructure

Mathematically, fractions indicate ratios of units. Quark fractional electrical charge indicates an electrical substructure within quarks with 3 electrical units. The quark triplet unit electrical matter substructure was deduced from quark fractional electrical charge.

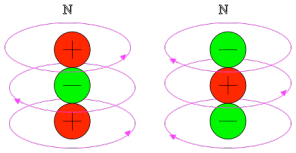
Step 2 Neutrino Doublet Unit Matter Substructures

If quarks had a triplet unit electrical matter substructure, and electrons had a singlet unit electrical matter substructure, then if neutrinos were doublet unit electrical matter substructures, all of the Standard Model fundamental particles except photons could be demonstrated with unit electrical matter substructures. The electron neutrino doublet unit electrical matter substructure was deduced from the helicity of neutrinos.

Step 3 Doublet Unit Matter Substructures are Massless

If the doublet unit electrical matter substructure explained neutrino helicity, then the doublet unit electrical matter substructure must be explained. The doublet unit electrical matter substructure was deduced to have zero rest mass from analysis of electron-positron pair annihilation.

1.3 Verification of the Unit Matter Substructures

		
U(1) Symmetry Electromagnetic Force	**SU(2) Symmetry Weak Force**	**SU(3) Symmetry Strong Force**

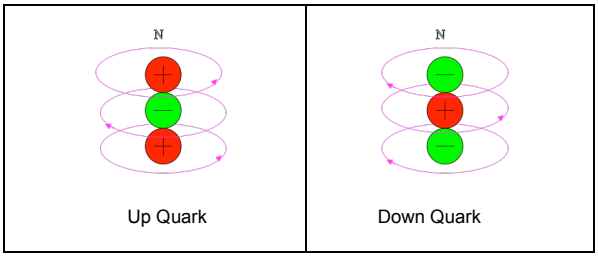
Several quandaries of physics are explainable with the knowledge of the unit matter substructures of Standard Model particles, including **wave particle duality** and the **origin of each symmetry** exhibited by each natural force (Section 3 Physics Quandaries Explained with the Unit Matter Substructures).

The realization that the unit matter substructures explained **wave particle duality** and the **origin of each symmetry** exhibited by each natural force (electromagnetic, weak nuclear, strong nuclear) for the author was manifest verification of the unit matter substructures.

The Origin of Wave Particle Duality
The wave-particle duality of nature can be explained with the unit matter substructure of particles because the particles are composed of two components, units of energy and units of matter. The energy component of the particles causes the wave behavior and the unit matter substructure component causes the particle behavior.

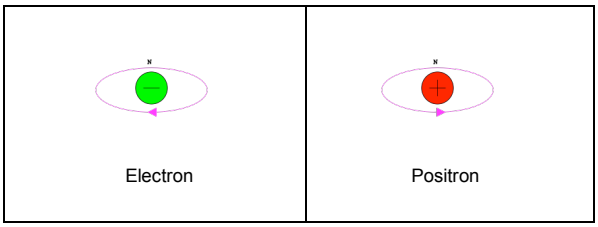
The Origin of SU(3) Symmetry exhibited by the Strong Force
The triplet unit charge substructure of up and down quarks was deduced from quark fractional electrical charge. The triplet unit electrical matter substructure of up and down quarks allows an explanation of the origin of the SU(3) symmetry the strong force exhibits.

The rest mass energy of the quark is in common rotation about 3 centers of charge or poles, which is also a description of the configuration of energy in SU(3) symmetry. SU(3) symmetry is common complex energy rotation about a set of three axes or poles.



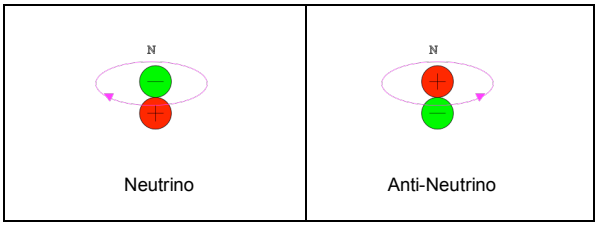
SU(3) Energy Rotation

The quark unit matter substructure also offers an explanation for the tripolar charge of the strong force. The rest mass energy of the quark spread across 3 poles, and energy interacting with that quark rest mass energy is configured with the phase spread across 3 poles.



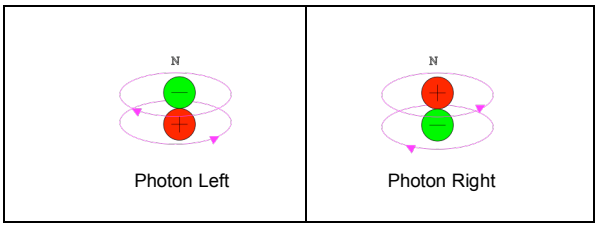
U(1) Energy Rotation

The U(1) energy rotation of the electron is one set of energy in complex rotation about one center of charge with two rotations (720^{o}) required to be back in phase.



SU(2) Energy Rotation

The neutrino has one set of energy in common complex rotation about two centers of electrical charge with two rotations (720^{o}) required to be back in phase.



2 U(1) Energy Rotations

The photon is two sets of energy in complex counter-rotation about two centers of electrical charge.

The distinction between energy quanta and matter quanta as structural components of Standard Model particles allowed for these realizations:

- rest mass is internal structural energy bound to the particle's unit matter substructure
- doublet substructures have no internal structural energy (no rest mass)
- neutrinos are doublet substructures with one set of momentum energy
- photons are doublet substructures with two sets of momentum energy
- there must exist many doublet substructures which have no momentum energy
- bosons have an even number of units of matter in their substructure
- fermions have an odd number of units of matter in their substructure
- strong force SU(3) symmetry is caused by the triplet substructure of quarks
- weak force SU(2) symmetry is caused by the doublet substructure of neutrinos
- wave-particle duality is caused by the two structural components - energy and matter

1.4 About This Document

There are four parts to this presentation on the unit electrical matter substructures of Standard Model fundamental particles.

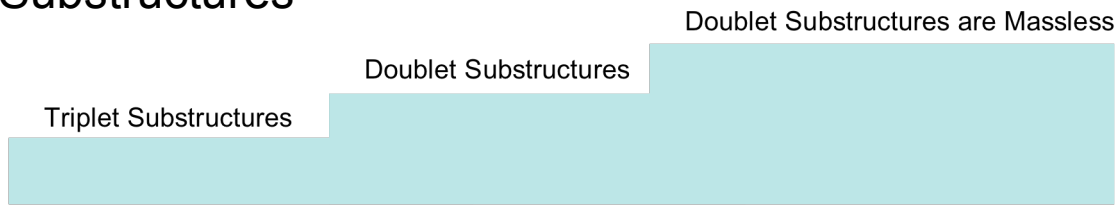
Section 1 Summary of the unit electrical matter substructure theory.
Section 2 The steps of deduction of the unit matter substructures.
Section 3 Explanations of physics quandaries via the unit matter substructures.
Section 4 Particle decays with the unit matter substructures.
Appendix A Particle Catalog - particle's unit matter substructures.

Chronology

Date	**Title - Draft**	**Format**
1991	Triplet Unit Electrical Matter Substructures - Part 1	idea
1992	Doublet Unit Electrical Matter Substructures - Part 2	idea
1993	***Speculation on the Nature of Matter*** - 1st major draft	MS Word
1997	***The Nature of Matter*** - 2nd major draft	MS Word
1999	***The Nature of Matter*** - 3rd major draft	html
2002	***The Unit Nature of Matter*** - separated Part 1 from Part 2	html
2007	***The Unit Nature of Matter*** - (graduate app.) - *this is it!*	MS Word

THE UNIT NATURE OF MATTER

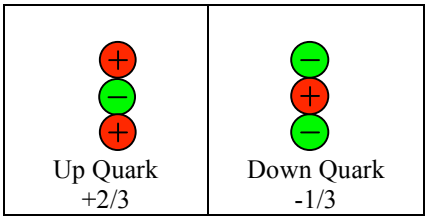
Section 2 The Steps of Deduction of the Unit Matter Substructures



2.1 Step 1 Quark Triplet Unit Matter Substructures

The first step of deduction concerned the fractional electrical charge of up and down quarks. Up and down quarks were deduced to have a triplet of unit electrical charge centers of matter within their structure from this evidence:

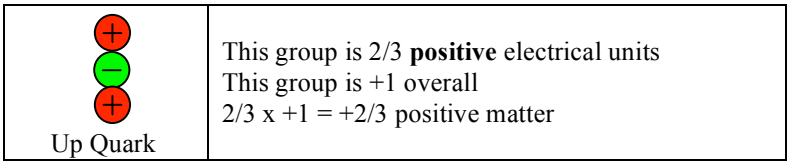
- Quark Fractional Electrical Charge

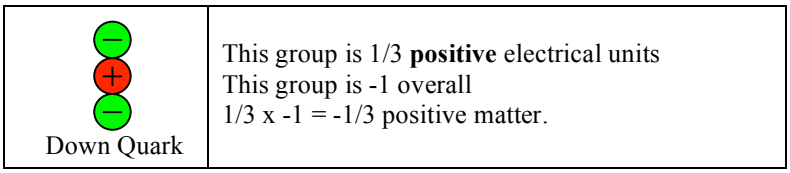


Later, it was realized this evidence already indicated the triplet unit electrical matter substructures of up and down quarks:

- The mathematics of Quantum Chromodynamics
- The tripolar charge of the Strong Force
- The SU(3) symmetry of strong force interactions.

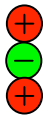
Mathematically, fractions indicate ratios of units. **The mathematics of quark fractional electrical charge cannot logically be ignored.** Mathematical logic dictates that quark fractional electrical charge indicates an electrical substructure within quarks composed of units of electrical charge with 3 total units.

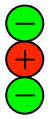




A symmetry is immediately obvious. Quark fractional electrical charge is immediately obvious as a form of group ratio mathematics.

There are only two configurations of a group of three unit electrical charge particles possible. Since the units of positive and negative matter can only form two groups of three units, the anti-up and anti-down quarks must be accounted for with just the two 3 unit configurations.

 Anti-Down	This group is 1/3 **negative** electrical units This group is +1 overall 1/3 x +1 = +1/3 negative matter

 Anti-Up	This group is 2/3 **negative** electrical units This group is -1 overall 2/3 x -1 = -2/3 negative matter.

Quark fractional electrical charge is group mathematics where we track the type of unit charge the target proton is in the numerator. The group is the denominator. For normal matter, we track positive units in the numerator. For anti-matter, we track negative matter in the numerator.

Normal Matter		**Anti-Matter**	
Positive Matter Ratios	Negative Matter Ratios	Negative Matter Ratios	Positive Matter Ratios
up = +2/3	up = +1/3	anti-up = -2/3	anti-up = -1/3
down = -1/3	down = -2/3	anti-down = +1/3	anti-down = +2/3

Table 1 **Table 2**

The left hand columns of Table 1 and Table 2 are the group ratios used in physics. The right hand columns (gray columns) of Table 1 and Table 2 are group ratios that are not used in physics as they add to zero. For normal matter, the negative matter ratios are not presently used, and for anti-matter, the positive matter ratios are not presently used.

> For instance, in normal matter quarks, it is positive units that are tracked in the numerator over the group total in the denominator. The up triplet has two positive units out of a total group of three. The group has a group charge of +1. Multiplying group charge by the ratio of the chosen unit gives +1 * 2/3 = +2/3. The down triplet has one positive unit over a group of three with a group charge of -1, therefore -1 * 1/3 = -1/3.

SU(3) Symmetry and the Tripolar Charge of the Strong Force

The quark triplet unit matter substructure not only offers a physical mechanism to explain the quandary of fractional charge existing on a supposed fundamental particle, it also offers a physical mechanism to explain the tripolar color charge of the strong force and the associated SU(3) symmetry of the strong force observed in energetic interactions between quarks.

Quantum Chromodynamics already indicated the triplet unit electrically charged matter substructures of quarks because QCD is tracking the energy of the tripolar charge of the strong force as the structural energy of the quark is configured around three poles.

The SU(3) symmetry of strong force interactions is another manifestation of the structural energy of the quark being configured about three poles in the quark triplet unit matter substructure.

The reason energy exchanged between quarks manifests a tripolor charge and exhibits SU(3) symmetry is because the structural energy of a quark is divided among three axes on three units of matter.

SU(3) is special unitary symmetry with three axes of rotation, which equates physically to a constant amount of energy in rotation about three axes of rotation, i.e., on three units of matter in the quark triplet substructure. (See Section 3.1)

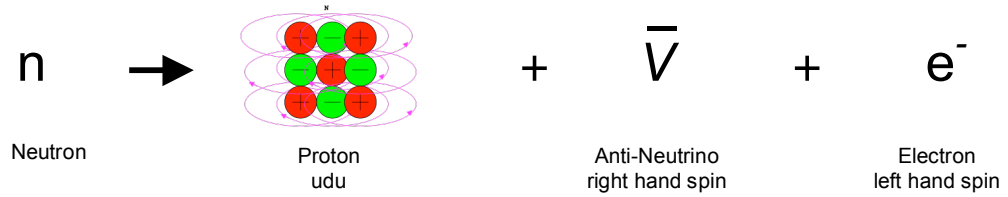
2.2 Step 2 Neutrino Doublet Unit Matter Substructures

The neutrino doublet unit electrical matter substructure is manifested by these phenomena:

- Neutrino Unidirectional Spin
- There are only two neutrinos in each family.
- Neutron Magnetic Dipole Moment
- Weak Force Parity Violation
- SU(2) Symmetry of the Weak Force

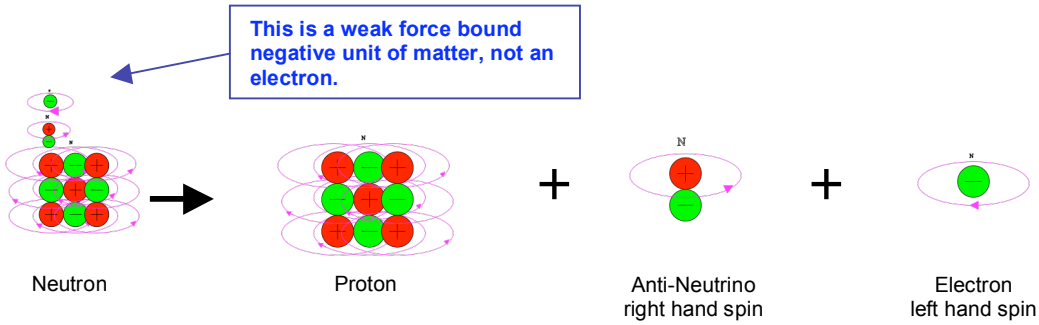
After deducing the triplet unit electrical matter substructure of quarks, the distinction between energy and matter as components of quarks is clear. Then, one could speculate that electrons and positrons were composed of a singlet of unit of electrical matter and energy. Then, the question would be, could neutrinos also have a unit matter substructure and could the unit matter substructure explain neutrino helicity?

Analysis: Neutron Decay



The driving idea was, could the unit matter substructures explain the exclusive right hand spin of the anti-neutrino in neutron decay?

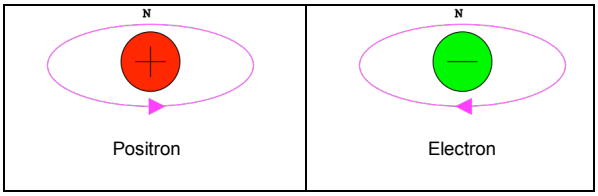
Neutron Decay with Unit Matter Substructures



If the neutrino had a doublet substructure, could it explain neutrino helicity? Why does the neutral neutron would have a magnetic dipole? Could the unit matter substructure concept provide a mechanism to explain why the neutron has a magnetic dipole?

Neutrino Unidirectional Spin

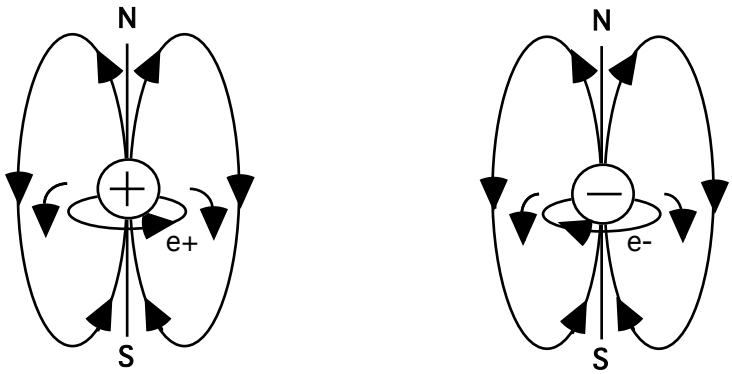
Using the unidirectional spin of neutrinos as a clue, one might think there is a connection between the unidirectional magnetic dipole moments of positrons and electrons and the unidirectional spin of neutrinos.



U(1) Energy Rotation

ANALYSIS: POSITRON AND ELECTRON MAGNETIC FIELDS

The magnetic fields of the positron and the electron can be modeled as viewing the



Magnetic lines of force – indicated by the larger elliptical loops
Electrical current (energy rotation about charge) – indicated by small elliptical loop around the center of electrical charge
Right or Left Hand Rule - indicated by the little curved arrows on each side of the current around the center of charge

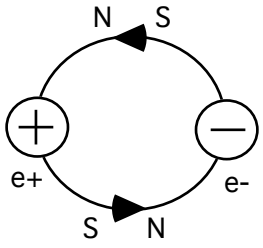
energy rotation or spin of the charged unit of matter as causing a current around the unit of matter (center of charge) with the direction of the current the same as the direction of the spin (quantum angular momentum) of the unit of matter. In the model, the current (energy rotation) around the unit of matter generates a magnetic field, the direction of which follows either the right hand rule or the left hand rule, depending on the charge of the current.

The positive current of the positron generates a magnetic field that follows the right hand rule, as indicated by the little curved arrows on each side of the current or energy rotation around the positron. The negative current of the electron generates a magnetic field that follows the left hand rule as indicated by the little curved arrows on each side of the current around the electron. The larger elliptical loops indicate magnetic lines of force.

As can be seen from the illustration above of the positron and electron magnetic fields and their cause, a positron exhibits right hand spin with respect to energy rotation and an electron exhibits left hand spin with respect to energy rotation.

ANALYSIS: POSITRON AND ELECTRON ANNIHILATION

Consider how a positron and an electron interact in annihilation. In the process of mutual annihilation, the electron - positron pair form an atom of positronium**.**

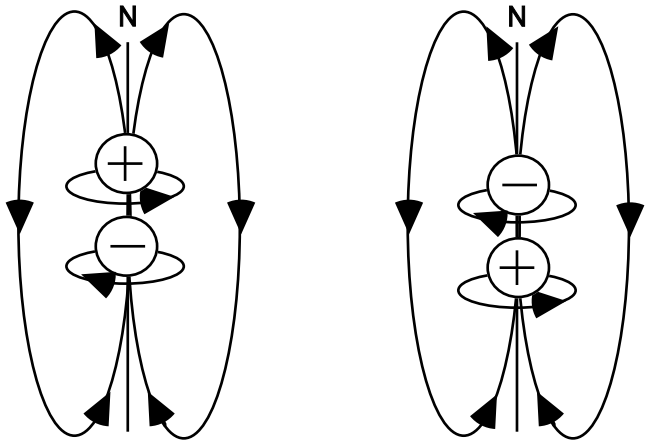


Positronium

The positronium cannot collapse unless the positron and electron magnetic fields are aligned. When the magnetic dipoles are aligned, the energy of the two particles are in counter rotation. Once the unit of matters are magnetically aligned and the energy rotation of the two leptons is in counter in rotation, the stage is set for the annihilation to proceed.

The positron and electron can align to each other in only two possible configurations because the magnetic dipoles of each composing unit must align north to south.

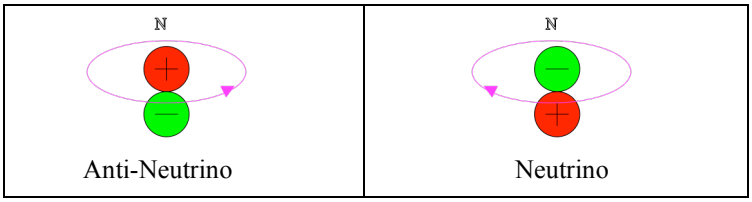
The magnetic dipoles of annihilating pair must be aligned for the annihilation to proceed. There are only two configurations the positronium could take in the final stage of the annihilation, one configuration with the positron at the northern most position on their common magnetic dipole (**positive north positronium** diagram below), and one configuration with the electron at the northern most position on the common magnetic dipole, (**negative north positronium** diagram below).



positive north positronium **negative north positronium**

Looking at the **positive north positronium** diagram above, or the **negative north positronium** diagram above, one could conclude that a doublet unit matter substructure composed of two opposite charge units of matter with quantum angular momentum energy bound to only one of the two units of matter would give the structure required to explain neutrinos, a doublet with spin ½. This doublet substructure has promise in explaining neutrinos.

An interesting feature and a substantiating feature as well is that one set of energy in rotation about two poles of charge would be SU(2) energy rotation.



SU(2) Energy Rotation

Reviewers have questioned whether neutrinos as composed of two units of matter could have spin ½, because two particles could not have spin ½. That is why I have drawn the particles with each of the two components, matter and energy, individually illustrated. The energy is indicated by the loop. Matter is indicated by the two charges.

½ + ½ can not equal ½ is the main reason physicists do not think a neutrino could be composed of two unit charge particles, because naturally it is assumed that both unit matter components must have their own angular momentum energy.

The answer is, the units of matter do not possess mass-energy, only electrical charge. The units of matter are not mass-energy, and therefore do not possess momentum. The units of matter require mass-energy to be bound to have momentum.

Why would we suppose the momentum energy added to the resulting doublet unit matter particle binds to the resultant neutral particle with one set of energy rotation which follows the rule that energy binds to positive units of matter in right hand rotation and binds to negative units of matter in left hand rotation?

The answer is to explain the unidirectional spin of anti-neutrinos in neutron decay.

Why there are only two neutrinos in each family

The reason there are only two neutrinos in each family is caused by two things, the weak force bond and by the doublet substructure of the neutrino. Energy binds to matter in a specific direction depending on the charge of the unit of matter, right hand binding for positive units and left hand binding for negative units of matter. The weak force deposits momentum energy onto the doublet substructure creating the neutrino with the energy binding in the appropriate direction.

SU(2) Symmetry of the Weak Force

SU(2) is special unitary symmetry with two axes of rotation, which equates physically to a constant amount of energy bound to two interacting axes of rotation on the two units of matter within the doublet substructure.

Neutron Substructure and the Weak Force

The doublet substructure of the neutrino offers a direct mechanism to explain the weak force parity violation of neutron decay, which in turn explains the unidirectional spin of the neutrino.

The weak force parity violation of neutron decay was deduced to be caused by the unit matter substructure of the neutron and the need for the unit particles of matter within the neutron substructure to be magnetically aligned.

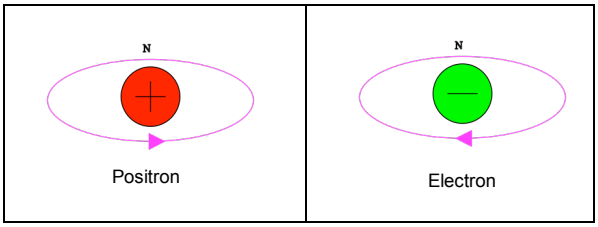
The unidirectional helicity of neutrino spin is ultimately caused by energy only being able to bind to a unit of matter in one direction depending on the charge of the unit of matter, while the doublet substructure of the neutrino is manifested because energy can bind in right rotation only and because of the SU(2) symmetry of the weak force.

Unidirectional Magnetic Dipole Moments

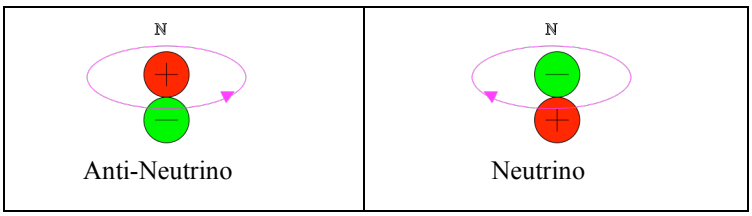
If energy binds to positive units of matter in right hand rotation and binds to negative units of matter in left hand rotation, could that provide a mechanism to explain why there are only two neutrinos in the first family?

> Energy binds to positive units of matter in right hand rotation.
> Energy binds to negative units of matter in left hand rotation.

Using the unidirectional spin of neutrinos as a clue, one might think there is a connection between the unidirectional magnetic dipole moments of positrons and electrons and the unidirectional spin of neutrinos.

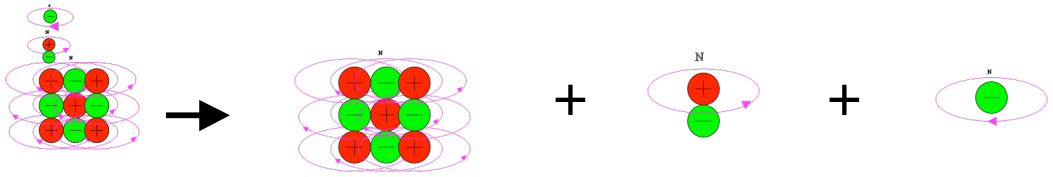


U(1) Energy Rotation



SU(2) Energy Rotation

Neutron Decay with Unit Matter Substructures



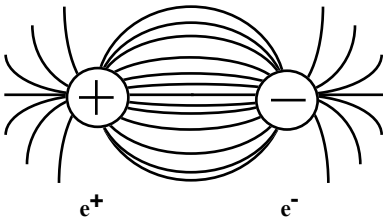
2.3 Step 3 Doublet Unit Matter Substructures are Massless

Consider the structure of the electrical fields of the electron and the positron during the process of mutual annihilation. In the ground state, the lines of force of the electrical fields of the electron and of the positron extend radially outward.

e^+
positron

e^-
electron

Now imagine a free positron and free electron in pair annihilation. As the electron and the positron approach each other in annihilation, the lines of force of the electrical fields are deformed from their ground state and are bent toward the oppositely charged particle by the force of electrical attraction.

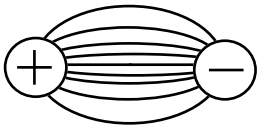


e^+ e^-

Because we have identified two components of quarks in Step 1, unit electrical particles of matter and units of mass-energy, it is reasonable to look for the two components in neutrinos. Therefore, let us consider what happens to the electrical fields of the pair after the energy of the electron and the positron are ejected by the collapse of each particle's electrical field.

Suppose that at some point all of the electrical lines of force have been neutralized.

The Massless Doublet Particle



positive unit matter **negative unit matter**

- combination has zero energy
- combination has zero net charge
- combination has zero net angular momentum

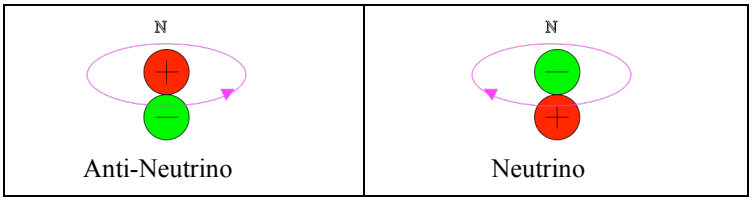
Suppose that once all of the electrical lines of force are neutralized by a line of force of the opposite charge that the electrical attraction is neutralized, and that the annihilating pair reach a point of equilibrium in their attraction.

After the pair of leptons annihilate, the only remnants of the positron and electron are the gamma ray photons that carried away the energy of the two leptons - the input energy of the leptons completely converted to the output energy of the gamma ray photons.

A combined resultant doublet unit matter neutral particle resulting from the positron-electron annihilation would have zero momentum as all of the mass-energy was carried away with the resultant photons. The rest-mass energy and the momentum energy of the annihilating leptons is expelled in the form of photons by the collapse of their electrical fields under the force of electrical attraction.

In this first analysis of pair annihilation, the idea is the resultant photons carried away all of the energy of the annihilating pair, however the resultant photons left behind the units of electrical matter that anchored the electron and positron with their electrical fields folded into one another. (Later, we must consider where the source of electrical charge in the resultant photons came from because the puzzler here is, in Step 1 it was deduced that quarks have two components with electrical units of matter supplying the electrical charge. Later we will look at the source of electrical charge in photons.)

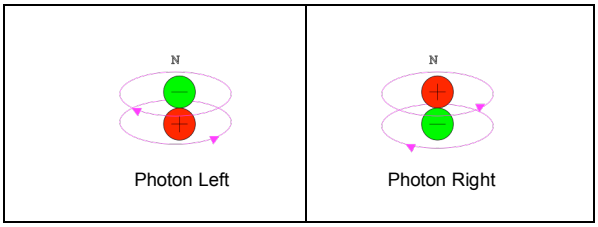
Now suppose we add momentum energy to the combined resultant neutral doublet of unit matter particle resulting from the positron-electron annihilation. Suppose the momentum energy added to the two unit resulting particle binds to the resultant neutral particle due to the weak force with only one set of energy rotation *following the rule that energy binds to positive units of matter in right hand rotation and binds to negative units of matter in left hand rotation.*



SU(2) Energy Rotation

The doublet unit electrical matter substructure was deduced to have no internal structural energy in the particle substructure, which equates to no rest mass. Neutrinos are now deduced to be composed of massless doublet substructures with momentum energy bound in one direction of rotation.

Photons manifest a massless doublet unit particle of matter substructure.



2 U(1) Energy Rotations

Photons have two sets of hosted energy rotation, one set hosted by the positive unit particle of matter, which creates the positive electric field, and one set of energy hosted by the negative unit particle of matter, which creates the negative electric field.

The correlation of the magnetic and electrical fields of electromagnetic propagation within photons with how the magnetic and electrical fields would propagate if two oppositely charged counter-rotating sets of energy were hosted by the two unit particles of matter in a doublet substructure revealed an exact match. The electromagnetic propagation of photons is explainable with two sets of counter-rotating momentum energy (spin 1) in rotation about each of two unit particles in a doublet substructure.

The energy rotation loops are only symbolic of bound energy rotation. Energy rotation is described by the wave function. One should interpret the mathematics literally. If the mathematics says double cover, then the energy rotation somehow involves two flows or phases.

The Permanent Nature of Matter

Photons are observed to convert into electron-positron pairs. Electrons and positrons are the smallest units of matter observed to materialize from the massless energy of the photon, which indicates that electrons and positrons are among the most fundamental units of matter.

Measurements of pair creation events indicate that the input energy of the photon, a "particle" with no rest mass, is converted into the output energy of the particle/anti-particle pair. The driving force in understanding what was observed is the understanding of the famous equation $E=mc^2$ and the laws of conservation of energy and conservation of momentum.

Just as energy quanta were realized to be neither created nor destroyed, but permanent in nature, the newly deduced units of matter were realized to be permanent in nature.

The present understanding is that electrical charge is created from energy and can be destroyed, that electrical charge is not permanent in nature. The deduction of the doublet unit matter substructure indicated that the units of charged matter are permanent in nature.

The existence of the doublet substructure proves that the units of charged matter are permanent in nature because the negative and positive units of charge reach equilibrium and do not destroy each other.

This document limits the discussion of the consequences of the existence of a doublet unit matter substructure. Particle creation events are simply said to pull the required units of matter needed to build the created particles from the quantum background, just as presently thought.

One can think of the massless energyless doublet as disappearing into a background of quantum foam (since an energyless particle is un-measurable), a background quantum foam from which the energyless doublet can be pulled to construct newly created particles in particle creation events.

This document purposely limits the discussion of these background energyless doublet particles of matter. Further discussion is in the document ***The Nature of Matter*** by this author**.** The first part of the document, **Part I The Background of Matter,** explains the consequences of the units of matter being permanent in nature.

THE UNIT NATURE OF MATTER

Section 3 Physics Quandaries Explained with Unit Matter Substructures

3.1 The Origin of the Symmetry of Each Natural Force

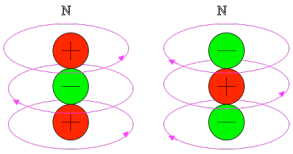
THE MOST POWERFUL ARGUMENT IN FAVOR OF THE THEORY SECTION 3A

The most powerful argument in favor of the Unit Matter Substructure Theory is that the theory provides a highly plausible mechanism to explain why and how each of the three particle forces are associated with each particular symmetry, and what the source of the symmetry is.

The source of the each symmetry of force is proposed to be the energy of the particle being configured by the unit matter substructure of the particle.

The unit matter substructure within each particle and the associated set amount of energy bound within the substructure of the particle (rest mass) are proposed to be the root cause of the symmetry exhibited by interactions that occur with that particle substructure.

Standard Model Fundamental Particle Unit Matter Substructures

 Electron Positron	 Neutrino Anti-Neutrino	 Up Quark Down Quark
Singlet Substructures	**Doublet Substructures**	**Triplet Substructures**
U(1) Symmetry	**SU(2) Symmetry**	**SU(3) Symmetry**
Electromagnetic Force	**Weak Force**	**Strong Force**

This explanation shows that the symmetry and associated mathematics have a physical root cause which is deeper and more profound than the presently thought cause, which is that the force carriers cause the manifestation of the symmetry. This explanation is deeper and more profound because the symmetry of the energy transfers are caused by the root physical structure of the particles. The energy of interaction is configured by the particle's unit matter substructure, as opposed to the presently held idea that the force carriers alone are the cause of the symmetry.

The ability to explain why each of the three fundamental forces are associated with a particular symmetry, and a particular conservation law, is an extremely powerful argument in favor of the unit matter substructure theory.

THE SOURCE OF THE SYMMETRY IN EACH NATURAL FORCE SECTION 3B

Noether's Theorem states that there is a one to one relationship between each a conservation law of nature and a symmetry of nature.

Conservation Law	Symmetry
Energy	**Time** displacements
Linear Momentum	**Spatial** displacements
Angular Momentum	**Spatial** rotations
Electric Charge	**1 axis complex rotation** U(1) Symmetry (phase rotations in a complex field)
Color Charge	**3 axes complex rotation** SU(3) Symmetry (rotations in 8 dimensional color space)

Table 3.1.1

It is proposed that the source of both the electric charge symmetry and the color charge symmetry is the unit matter substructure composing the particles that exhibit the charge, be it electric charge or color charge because it is energy in either case.

Energy bound in the unit matter structure of a particle is configured by the unit matter substructure of that particle. The unit matter substructure of a particle is proposed to be the root cause of the specific symmetry exhibited by interactions with that particle and its bound rest mass energy.

The source of the symmetries of nature observed by the natural forces is proposed to be the unit particle of matter substructure of the particle exhibiting the force.

- Net singlet substructures are proposed to cause energy to exhibit U(1) symmetry.
- Doublet substructures are proposed to cause energy to exhibit SU(2) symmetry.
- Triplet substructures are proposed to cause energy to exhibit SU(3) symmetry.

It is proposed that the reason each force of nature exhibits a particular symmetry of nature is because each manifestation of a force is a transfer of energy, and the transferred energy exhibits the symmetry of the energy in the structure the particle from which the energy is transferred.

- Energy interacting with a net singlet unit matter substructure exhibits U(1) symmetry.
- Energy interacting with a doublet matter substructure exhibits SU(2) symmetry.
- Energy interacting with a triplet unit matter substructure exhibits SU(3) symmetry.

U(1) symmetry exhibited by the electromagnetic force is proposed to be caused by a set amount of energy being bound by a singlet unit particle of matter. Electrons and positrons are proposed to have singlet unit particle of matter substructures.

Neutrinos and their proposed doublet substructure are proposed to be the source of SU(2) symmetry exhibited by weak nuclear force interactions.

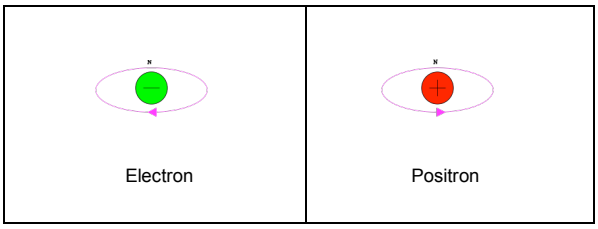
The energy bound in the proposed quark triplet unit particle of matter substructure is proposed to be the source of the SU(3) symmetry exhibited in the strong force interactions.

A symmetry in particle interactions is caused by the set amount of rest energy bound in a particle substructure configuring the transferred energy between the interacting particles.

The configuration of energy bound in a particle is a set amount and that is why the total energy rotations among the quarks must sum to a set amount of energy.

THE SOURCE OF U(1) SYMMETRY
SECTION 3.1

The manifestations of U(1) symmetry in energetic interactions between particles is caused by the interacting particle having energy hosted by a host net singlet unit charge particle of matter.

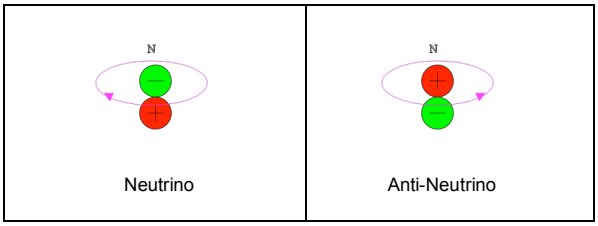


U(1) Energy Rotation

The electron is described in quantum mechanics as one set of energy in complex rotation about the center of charge with a 720^{o} rotation required to complete one rotation.

THE SOURCE OF SU(2) SYMMETRY
SECTION 3.2.

The source of SU(2) symmetry in weak force interactions is proposed to be the doublet substructure of the neutrino, which is involved in the weak force interaction. The doublet substructure is composed of two units of matter bound together. The SU(2) symmetry exhibited by weak force interactions is proposed to impart energy onto the doublet substructure of the neutrino in a way such that the energy is interacting with both units of matter in the neutrino doublet substructure.



SU(2) Energy Rotation

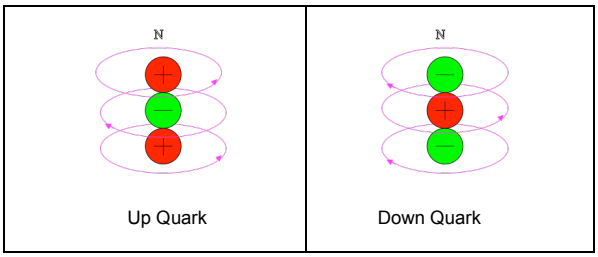
The neutrino has one set of energy in complex rotation about two centers of charge with two rotations required to complete one cycle of the wave or a 720^{o} rotation required to complete one rotation.

A doublet substructure is massless, meaning there is no internal structural energy in the structure of the doublet. The energy of a doublet unit of matter substructure is proposed to be 100% momentum energy as the neutrino has no rest mass.

It is proposed that the weak force decay that produces the neutrino imparts the momentum energy onto the neutrino that reflects the two unit matter doublet substructure of the neutrino.

THE SOURCE OF SU(3) SYMMETRY
SECTION 3.3

The SU(3) symmetry exhibited by the strong force in interactions involving quarks is proposed to be caused by a set amount of bound energy within the quark triplet substructure being in a closed loop rotation about the quark substructure. The three units of matter within the triplet substructure of quarks is proposed to be the source of the tripolar color charge exhibited by quarks.



SU(3) Energy Rotation

SU(3) symmetry is three sets of complex rotation about a common origin or set of axes. If you just accept what the math is telling you directly, the solution - energy in complex rotation about three poles.

The SU(3) symmetry is caused by the energy rotation about the three unit charge particles of matter in the quark substructure being a constant discreet amount of energy, and having three U(1) sets of axes.

The energy within the quark must be in a harmonic state in its confinement in the quark triplet substructure such that at every complete rotation the energy is starting its rotation at a harmonic interval.

Color charge symmetry of quarks is proposed to be the result of a triplet compound of three unit charge particles of matter sharing energy in a strong force bond with the three poles of color charge caused by the three unit charge particles of matter in the quark triplet substructure to which the quark energy is bound.

The 'SU' in SU(3) stands for 'Special Unitary'. Special Unitary means the three units of matter in the quark substructure share a common set amount of energy bound between them, and that the energy is in a closed loop rotation about the 3 poles in the quark substructure.

SU(3) symmetry is caused by a three unit particles of matter within the quark triplet structure having a particular amount of shared energy in the closed loop rotation about the triplet quark substructure (special). Interactions with the quark structural energy reflect the quark substructure and the energy bound to it.

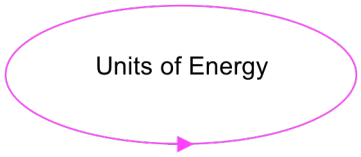
THE UNIT NATURE OF MATTER
SECTION 3 PHYSICS QUANDARIES EXPLAINED

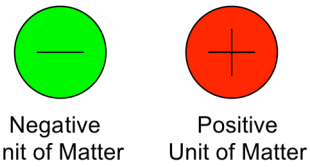
3.2 The Origin of the Wave-Particle Duality of Nature

The Unit Matter Substructure Theory allows an explanation for the wave-particle duality of nature because the Unit Matter Substructure Theory deduced that the Standard Model fundamental particles were composed of just two types of structural components, unit matter components and unit energy components.

The Standard Model particles were deduced to be composed of at least two components:

Units of Energy and **Units of Matter**.





- Posses mass-energy
- Do not posses electrical charge

- Possess electrical charge
- Do not posses mass-energy

Units of matter have unit electrical charge, either positive or negative, because the unit particles of matter are the fundamental source of electrical charge. Units of matter are centers of electrical charge, but do not possess mass-energy. The units of matter host bound energy, but are not made of energy, only electrical charge. Energy conversely, is not the source of electrical charge.

The Standard Model particles being composed of two components, matter and energy, allows an explanation of the wave-particle duality of nature.

Wave-Particle Duality Explanation
Energy bound to a unit matter substructure of a particle causes the wave-like behavior of that particle because the bound energy quanta carve the wave function.
The unit matter substructure of the particle is responsible for the particle-like behavior of the particle because the energy is bound to the unit matter substructure.

The energy component of particle causes the wave like behavior of the particle and actually carves the wave function exactly as the mathematics describes.

The unit matter substructure component of the particle causes the particle like behavior of the particle because the energy carving the wave function (rest mass plus momentum) is ultimately bound (or localized) to the unit matter structure of the particle, and therefore goes where the matter substructure goes.

The particle like behavior of a particle is caused by the structural energy of a particle (rest mass) being bound and localized to the unit matter substructure of the particle.

The wave like behavior of a particle is caused by the energy component of a particle being bound in closed loop rotation about its host unit matter substructure. The energy dynamics are described by the quantum mechanical wave function.

The Unit Matter Substructure Theory deduces that the particle like behavior of a particle is caused by the rest mass energy being bound to the unit matter substructure of the particle. The Unit Matter Substructure Theory deduces the wave like behavior of a particle is caused by the bound structural energy quanta (rest mass), which trace the wave function of the particle.

THE TWO SLIT EXPERIMENT

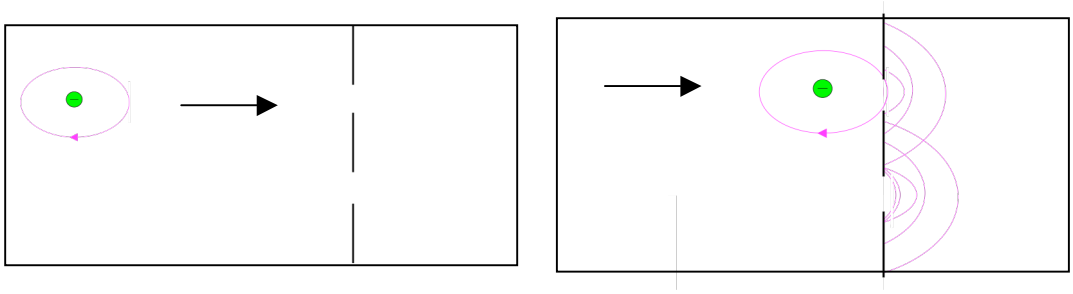
Photons
The Two Slit Experiment is the classic example of the wave-particle duality of light. In a classic Two Slit Experiment, a monochromatic source of light is sent through two parallel slits in a barrier causing an interference pattern to form on a target wall behind the two slit barrier due to the waves of light from the two slits interfering.

The wave nature of the light is demonstrated in the Two Slit Experiment by the interference pattern forming on the target wall, as described by a the wave mechanics of energy traveling through two slits. Light energy waves coming through each of the two slits, interferes, causing an interference pattern to emerge on the target wall described by classic wave mechanics.

The particle nature of light is demonstrated by the fact that if one detects the passage of a photon through one of the slits, every photon is measured to have 100% of the energy expected of a photon for that wavelength.

Electrons
Let's examine the Two Slit Experiment with electrons. The Unit Matter Substructure Theory provides an explanation for the dual wave-particle behavior of electrons observed in the Two Slit Experiments.

The short explanation is, while the physical unit matter doublet substructure of the electron and the bound energy of the electron must physically travel through one slit or the other, the energy wave component, as described by the wave function, travels through both slits and interferes with itself, even when just one electron (and 100% of it's energy) at a time passes through one of the two slits.



Electron Unit Matter Substructure and Energy Wave Traveling Through Two Slits
(The unit circles represent unit particles of matter and the closed loops represent closed loop energy rotations)

The Unit Matter Substructure Theory explains why in the Two Slit Experiment that single electrons sent though the slits, one single electron at a time, cause an interference pattern. An interference pattern emerges because the energy component of the electrons travels like the wave function describes, through both slits.

The energy component of the electron traces the wave function of the electron. It is the energy component that interferes with itself while traversing the two slits. It is the energy component that causes the interference pattern to emerge. Energy is responsible for the wave nature of the electrons.

The particle nature of the electron is caused by the rest mass energy of the particle being bound to the point like unit matter substructure, which causes the energy to be anchored locally. Even though the rest mass energy is anchored on the particle substructure, the energy still carves an energy wave.

How a Single Photon in the Two Slit Experiment Causes an Interference Pattern

How can a single particle of light interfere with itself when the photon always has 100% of the energy when detected at one of the slits?

The short answer the unit particles of matter forming the particle substructure are responsible for the particle behavior and the energy quanta are responsible for the wave behavior.

A single photon generates an interference pattern because the photons energy wave is interfering with itself. It requires both slits to be open for a particle's energy wave to interfere with itself. However, the photon unit matter substructure to which the energy is ultimately bound can only pass through one slit.

A single photon sent through one of the two slits causes an interference pattern like a wave because the because the energy component goes through both slits, and interferes with itself, like a wave, because it is a wave, a wave of energy quanta.

If you determine which slit the photon passes through, you collapse the energy wave by capturing the energy and the interference pattern disappears. If you close one slit, the energy portion cannot interfere with itself. In Complimentary Principle language, the wave properties have ceased to be observed because the wave function collapses when the particle is observed (detected).

In the words of Complimentary Principle, as long as the energy wave can go through both slits, the wave will interfere with itself and cause an interference pattern, but as soon as a observation is made to determine which slit the photon particle went through, the wave is collapsed and the interference pattern stopped.

The detection of through which slit the photon passes collapses the wave function of the photon because the detection of the photon captures the photon's energy. However, if the energy component is not captured, it carves the energy wave through both slits and the energy interferes with itself.

THE UNIT NATURE OF MATTER
SECTION 3 PHYSICS QUANDARIES EXPLAINED

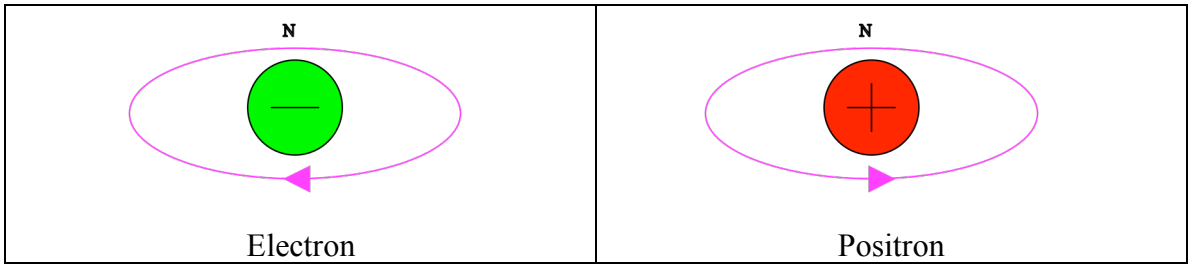
3.3 The Nature of Rest Mass

The Unit Electrical Matter Substructure Theory makes the distinction between units of matter and units of energy as components of Standard Model particles, which allows the deduction that rest mass as internal structural energy.

Rest mass energy is internal structural energy of the particle.

The unit matter substructure of a particle determines the rest mass of that particle.

Energy rotation about a host unit matter substructure is a complex action and is described by the wave function of the particle. The mathematics should be taken literally.



An electron and a positron shown as composed of one energy rotation and one unit matter.

For instance, electrons have a singlet unit particle of matter substructure with a single energy rotation hosted by that single unit particle of matter substructure.

Double Cover

The mathematics explains it, but double cover could be energy that is in two phases, or spheres, within rest mass, where if each sphere rotates simultaneously, one rotation of the electron with of two energy spheres gives 720º of rotation. It would require one rotation of two energy spheres (720º) for the electron to be back in phase. This is how the author views rest mass energy rotation.

The circumference of the .51 MeV energy loop could have a fundamental harmonic such that exactly two rotations of the energy are required for the energy to be in the same phase. The energy requires two rotations for one complete wave. This is how the author has read it described.

The energy dynamics are described by the quantum mechanical wave function.

THE UNIT NATURE OF MATTER

SECTION 3 PHYSICS QUANDARIES EXPLAINED

3.4 The Nature of Quark Fractional Electrical Charge

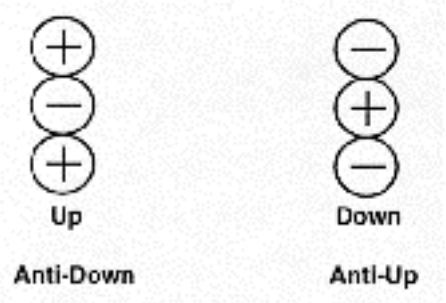
SECTION 3.4.1 THE TRIPLET SUBSTRUCTURE OF QUARKS

The Unit Matter Substructure Theory and the subsequent distinction between matter and energy as components of Standard Model particles were both first realized by following the mathematics of quark fractional electrical charge and making the connection to the tripolar nature of the strong force.

The hypothesis that quarks could have a group of 3 unit electrical charge particles forming an internal structure followed directly from the fractional electrical charge mathematics of quarks because fractions are ratios of units.

It is logical that fractional charge on a particle indicates a substructure of units of electrical charge.

By definition, a fundamental charged particle must represent the unit charge. Since quarks were determined to have fractional charge properties, it followed that quarks must not be fundamental as charged particles and that quarks must have at the minimum 3 unit charge particles within their structure.



The fractional electrical charge mathematics of quarks signaled that quarks had a composite structure with the quarks made from more fundamental unit charge particle components, which when taken as a group accounted for the fractional charge mathematics.

SECTION 3.4.2 QUARK GROUP RATIO MATHEMATICS

Normal Matter		Anti-Matter	
Positive Matter Ratios	Negative Matter Ratios	Negative Matter Ratios	Positive Matter Ratios
up = +2/3	up = +1/3	anti-up = -2/3	anti-up = -1/3
down = -1/3	down = -2/3	anti-down = +1/3	anti-down = +2/3

Table 1 **Table 2**

Quark Group Ratio Mathematics consists of two ratios, positive matter ratios and negative matter ratios.

Positive Matter Ratios are used for Normal Matter. Positive Matter Ratios are employed in physics to calculate the electrical charge of quarks if the quark is a normal matter quark. If the quark is an anti-matter quark, then Negative Matter Ratios are employed to calculate the charge of the anti-quark.

The other half of each method, which is not presently exploited in physics because they add to zero, is in the gray right side columns both in **Table 1** and in **Table 2**.

The same ratios are seen in both tables. It is just different ratios are emphasized in each table.

Positive matter ratios track positive matter units in the numerator. Negative matter ratios track negative matter units in the numerator. Each ratio independently accounts for the charge of the opposites implicitly through the group sign.

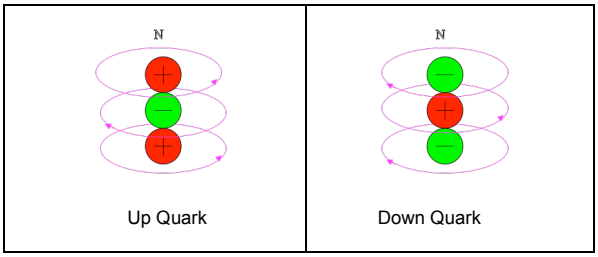
The group sign is the overall charge of the group. The group sign is allowed through the group bound. The benefit of invoking a group bound in the accounting of charge is that it allows that only the relevant half of the charged matter need be tracked explicitly in the numerator.

Since the positive matter ratios for Normal Matter counts positive units in the numerator, the -1/3 charge of the down quark is, one third because of the one positive unit in the substructure. There are three total unit charge particles in the group with a net negative charge giving the overall group a charge of one unit negative.

THE UNIT NATURE OF MATTER
SECTION 3 PHYSICS QUANDARIES EXPLAINED

3.5 The Nature of the Strong Force

THE ORIGIN OF SU(3) SYMMETRY IN STRONG FORCE INTERACTIONS Section 3.5.1



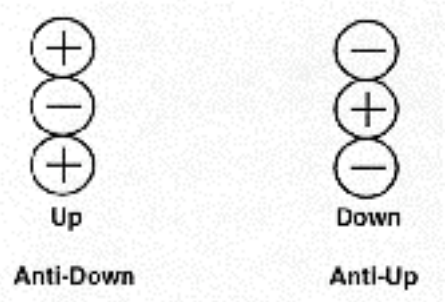
SU(3) Energy Rotation

The SU(3) symmetry associated with the strong nuclear force is proposed to be caused by the energy of the quark being in common rotation about the triplet unit electrical matter substructure of the quark.

Quark internal energy is configured by the quark unit matter substructure and manifests the tripolar nature of the quark. Energetic interactions with the quark tripolar internal energy, which is in rotation about three centers of charge, exhibit or reflect the SU(3) symmetry of the quark structural energy.

THE ORGIN OF TRIPOLOAR CHARGE IN THE STRONG NUCLEAR FORCE Section 3.5.2

The deduction of the unit matter substructures of Standard Model particles and the subsequent distinction between matter and energy as components of Standard Model particles elucidated the nature of the tripolar charge manifested by strong force interactions among quarks.

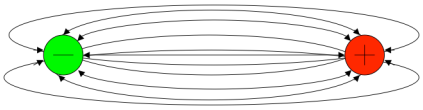


The tripolar charge of the strong nuclear force of quarks is caused by the rest mass energy composing the quark being bound in closed loop rotation about the quark triplet unit electrical matter substructure. The tripolar color charge of quarks is a manifestation of the triplet unit matter substructure of quarks because the hosted rest mass energy of the quark is in common rotation about the three unit charge particles of matter in the quark substructure.

The gluons are the strong force carriers and exhibit the strong force color charge. In energetic interactions between quarks, the energy exchanged is configured or reflects the host particle's energy configuration. The quark triplet substructure gives rise to the tripolar nature of the gluons in the strong force.

ASYMPTOTIC FREEDOM AND UNIT MATTER ELECTRICAL FIELD STRUCTURES
Section 3.5.3

Doublet Electrical Field Structure

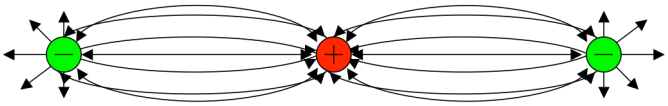


Doublet Substructure

Asymptotic freedom is manifested by the unit particles of matter within the unit matter substructures that compose quarks, and neutrinos, and photons because they reach a state of equilibrium in their mutual attraction to one another when within the particle substructure.

Asymptotic freedom is the manifestation of unit particles of matter reaching a state of equilibrium in their attraction to one another mediated by, well who knows what really, could be the dynamics of electrical field deformation, or could be electrical field neutralization by opposing electrical field lines, or just plain physical contact, or something else. The point is, the unit particles of matter reach a state of equilibrium in their mutual attraction when forming a doublet.

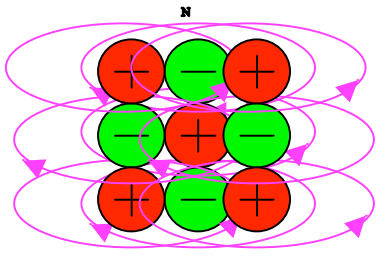
Quark Triplet Electrical Field Structure



Triplet Substructure

Quark units of matter also reach a state of equilibrium in their attraction to one another within the triplet substructure, another manifestation of asymptotic freedom. Of course the triplet substructure is entirely unstable unless bound within a larger structure, like a proton. Each triplet has one net unit charge and one net energy rotation.

Proton Electrical Field Structure



Proton Substructure

The author proposes that the strong force is fundamentally an electromagnetic force and that the strong force simply appears different than the familiar manifestations of electromagnetic force because of the

tripolar charge, the vastly different distances between the centers of charge within the quark triplet substructure, and the much higher amounts of energy versus energy involving electrons and atomic nuclei interactions with single poles of charge and much lower amounts of energy.

This view fits with Robert Mills view of quark color confinement in which gluon field lines are strings of energy which require energy to be stretched.

The below illustration is of the gluon field between two quarks as imagined by Dr. Robert Mills of the famous Yang-Mills Theory. The illustration is taken from Part III of "Space Time and Quanta - An Introduction to Contemporary Physics" by Robert Mills published by W. H. Freemen 1994. Part III is more technical and was thankfully published by Dr. Mills.

Fig. 1. The gluon field of a pair of color charges (imagined)

Space Time and Quanta - An Introduction to Contemporary Physics"
by Robert Mills published by W. H. Freemen 1994 (page 72)

Quoting Dr. Mills on page 72 of Part III:

> "It is generally believed, in fact, that when two color charges are far apart there may be a strong gluon field at all points along a sort of string joining them, as illustrated in Figure 1 for the case of the R quark and the R-bar quark - the anti-particle of an R quark. The lines joining the R quark and the R-bar quark are the gluon field lines and no matter how far apart the quarks are the field strength along the string is undiminished.

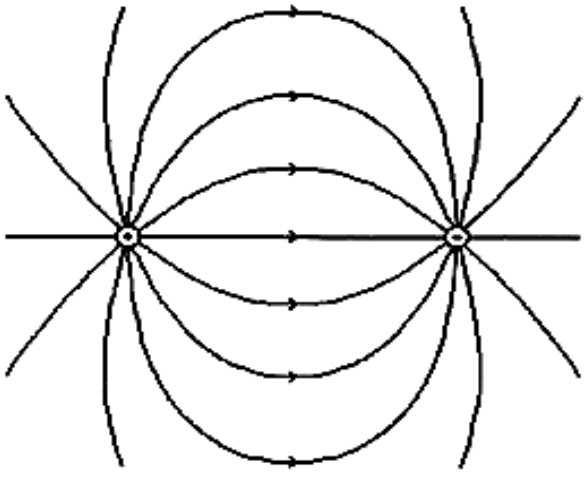


Fig. 2. The electric field for a pair of charges.

This is in contrast to the case of electric charges where the field distribution is more like that shown in Fig. 2 and the field strength is much weaker in the space between the charges than it is near the charges. In the case of color the energy in the gluon field is more or less constant along the string, so the total energy is

proportional to the length of the string. The farther apart you pull the strings the more energy you have to supply, which is the same as saying that the force between them doesn't diminish with distance. "

Open electrical lines of force are electrical lines of force that are not terminated in an opposite charge.
Closed electrical lines of force are electrical lines of force that are terminated in an opposite charge.

The author views the difference between electrical fields (particles interacting with mainly open electrical lines of force thereby giving the ¼ distance relationship) and gluon fields (particles interacting with mainly closed lines of force such as within a doublet unit matter substructure) as the same difference between gluon fields and electrical fields enumerated by Dr. Mills. Within a particle substructure, closed electrical lines of force stretch before they break.

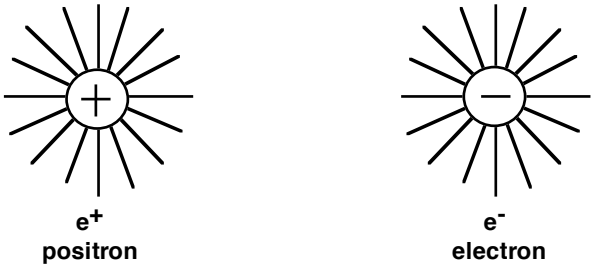


Figure 3 Two Electrical Charges Interacting

Figure 3 illustrates the ground state of the annihilating pair. In Figure 4, the two electrical charges are weakly interacting through the electromagnetic interaction.

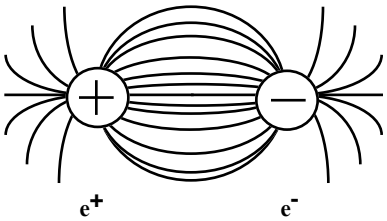
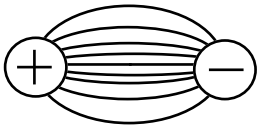


Figure 4 Two Electrical Charges Interacting

In Figure 5, the two units of matter are strongly interacting, but in the doublet it is not the strong force because the interaction is not tripolar.

The Massless Doublet Substructure



positive unit of matter **negative unit of matter**

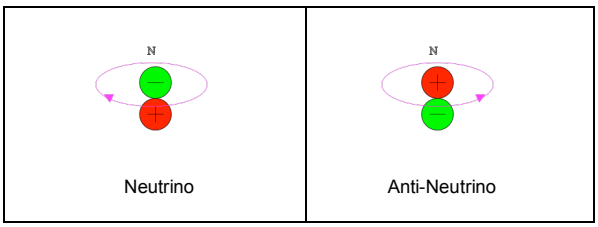
Figure 5 Two Units of Matter Forming a Doublet

THE UNIT NATURE OF MATTER
SECTION 3 PHYSICS QUANDARIES EXPLAINED

3.6 The Nature of the Weak Force

3.6.1 THE ORIGIN OF SU(2) SYMMETRY IN WEAK FORCE INTERACTIONS

The Unit Matter Substructure Theory of Standard Model particles allows an explanation of the source of the SU(2) symmetry exhibited in weak nuclear force interactions.



SU(2) Energy Rotation

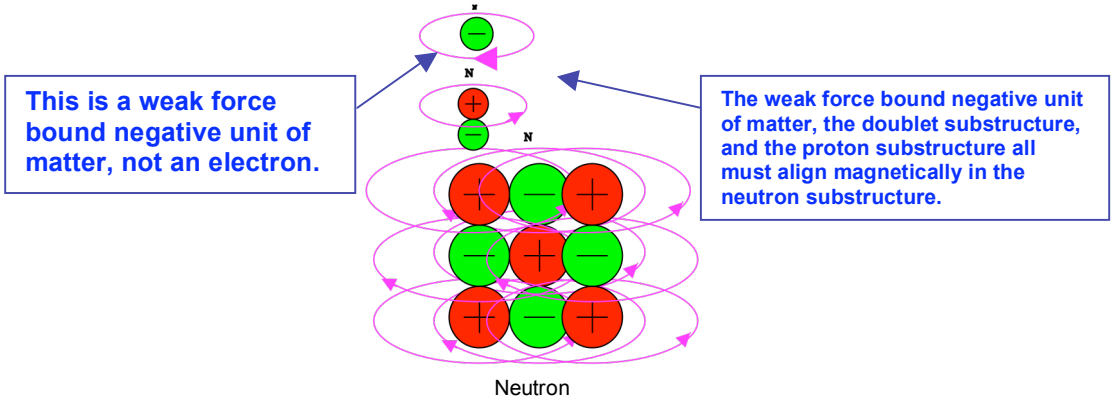
The SU(2) symmetry of weak nuclear force interactions is a manifestation of the sharing of one set of energy rotation between two units of matter in the neutrino doublet substructure. The doublet substructure component of the neutron is the source of the SU(2) symmetry component in weak force interactions.

The doublet substructure component decays into the neutrino component in weak force decays.

3.6.2 THE SOURCE OF THE MAGNETIC DIPOLE OF THE NEUTRON

WHY DOES THE NEUTRAL NEUTRON HAVE A NEGATIVE MAGNETIC DIPOLE MOMENT?

The answer is because the neutral neutron is composed of charged units of matter and has a unit matter substructure.



Neutron

The best example of the weak nuclear force bond structure is the neutron. A neutron has the host proton, a single unit matter component bound via a doublet unit matter component to the proton core.

One does not see an electron wave function within a neutron because the negative unit of matter is not an electron.

The magnetic dipole moment of a proton is +2.79 units. The magnetic dipole moment of a neutron is -1.91 units.

The magnetic dipole moment of the neutron indicates a negatively charged shroud covering the neutron. The weak force structure exhibits partial folding of the electrical field of the weak force bound negative unit of matter via a doublet component over the core proton.

The neutron has a negatively charged shroud covering the proton core. The proposed view of the neutron as a proton with a weak force bound negative unit of matter is that the electrical field of the negative unit of matter is folded over the proton giving the proton a partial negative covering, which accounts for the magnetic dipole moment of -1.91 units.

THE SOURCE OF WEAK FORCE PARITY VIOLATION
3.6.3

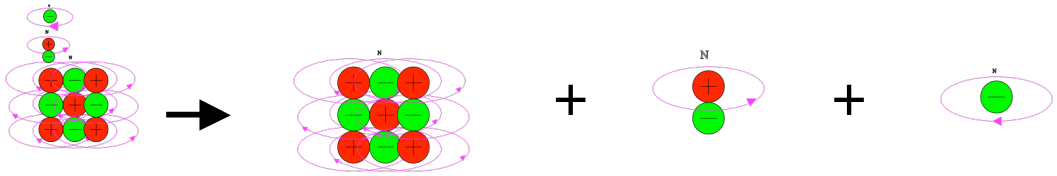
The Unit Matter Substructure Theory of Standard Model particles explains the physical cause of parity violation in weak force decays.

The alignment of the magnetic dipoles of the composing units of matter in the substructure of the neutron offer a cause and effect mechanism to explain why the anti-neutrinos emitted in the neutron decay are right handed and why the electrons emitted by the neutron decay are left handed.

Energy Chirality Theory
Energy binds to a positive unit matter with right hand rotation when the thumb is north on the unit matter magnetic dipole.
Energy binds to a negative unit matter with left hand rotation when the thumb is north on the unit matter magnetic dipole.

The spin of the decay products are determined by the alignment of the magnetic dipoles of the component units of matter within the neutron substructure.

The anti-neutrino and electron emerge from the neutron weak force decay traveling north on their magnetic dipoles (or something like that!).



Neutron Decay

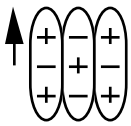
THE UNIT NATURE OF MATTER

Section 4 Particle Decays

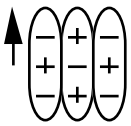
4.1 Hadrons

PROTONS **1.1**

A **proton** is a compound structure composed of two up quarks and one down quark bound together by the strong force**.**



Proton
udu



Anti-proton
dud

Protons are one net unit of positive charge because there is one net positive unit of matter in total in the proton particle. With the two up quarks each contributing two positive units of matter and the down quark contributing one, the positive unit of matter total is five. With the two up quarks each contributing one negative unit of matter and the down quark contributing two, the negative unit of matter charge total is four.

The proton is a half integer spin particle. The quarks each as a unit have a spin of 1/2. The resulting total is +1/2.

The odd number of units of matter composing the proton is at the heart of its command of a great mass. The nine unit of matter geometry of the proton is the first stable odd numbered strongly bound configuration past the single unit of matter of an electron substructure.

Immediately evident is the direct correlation between the proton's interior electrical field structure and its mass. The strong force bonds between the quarks and within the quarks must be responsible for holding the mass of the proton.

A fermion is defined as a particle with a root substructure that has one net set of energy rotation and one net unit of matter electrical charge.

A **neutron** is composed of a proton bound through the influence of a doublet unit of matter substructure to a negative unit of matter by a weak force bond. An **anti-neutron** is composed of an anti-proton bound to a positive unit of matter-doublet unit of matter substructure combination by a weak force bond.

Neutron
udu- or **udd̄**

Anti-Neutron
dud- or **duū**

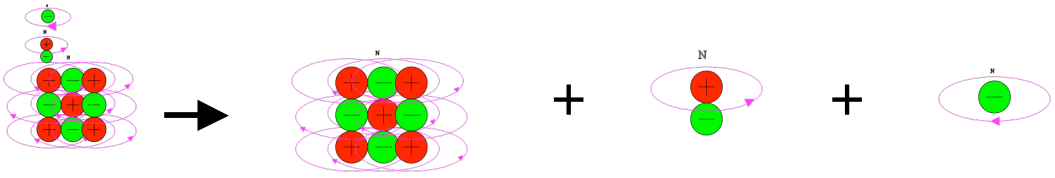
WEAK FORCE BOND HYPOTHESIS

The weak force bond binds a unit of matter to a host particle through the influence of a doublet unit of matter substructure.

A **weak force bond** is a bond that binds a charged unit of matter and a doublet unit of matter substructure to a host particle.

It is known that an electron cannot be inside a neutron because an electron has a much larger wave function than a neutron. The negative unit of matter within the neutron is not an electron. The wave function of the negative unit of matter is substantially altered by the weak force bond holding it within the neutron which accounts for the negative shroud around the neutron.

Neutrons are half integer spin particles, therefore the sum of the parts must equal ½.



Neutron | Proton | Anti-Neutrino right hand spin | Electron left hand spin

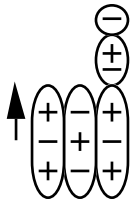
Neutron Decay

The alignment of the composing units of matter explains why electrons emitted in weak interactions tend to have left hand spin and why positrons tend to have right hand spin.

The magnetic dipole moment of a proton is +2.8 where the magnetic dipole moment of an electron is -1.9. The magnetic dipole moment of the neutron indicates that the neutron has a negatively charged shroud covering the proton. The proposed view of the weak force bound negative unit of matter in the neutron is that the electrical field of the negative unit of matter is folded over the proton.

The weak force bond represents partial folding of the electrical field of a unit of matter. A doublet unit of matter substructure is involved in the weak force bond.

Consider that the weak force bound negative unit of matter-doublet unit of matter substructure combination is bound directly to an individual positive unit of matter in one of the up quarks of the proton. As will be seen, the attachment of the negative unit of matter-doublet unit of matter substructure combination to a particular unit of matter of the host particle is valuable in describing the decay of a charged pion.



Neutron

udu- or **ud**$\mathbb{d}$

A conflict exists in the currently held definition of the down quark if the idea of permanence is ascribed to unit of matters. The down quark in a proton when defined as **uud** clashes with the down quark in the neutron when the neutron is defined as **udd**. When defining the neutron as one up and two down quarks, one down quark is a down quark and the other down quark must be an up quark with a weak force bond to an negative unit of matter. The up quark with a weak force bound negative unit of matter could be designated as **u-** or as $\mathbb{d}$. Then, a neutron could be represented as either **udu-** or as **ud**$\mathbb{d}$.

THE UNIT NATURE OF MATTER

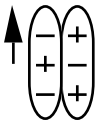
SECTION 4 PARTICLE DECAYS

4.2 Bosons - Pions and Kaons

PIONS **2.1**

First Order Neutral Pions

A neutral pion is composed of one up quark and one down quark. The first order neutral pion is shown below.

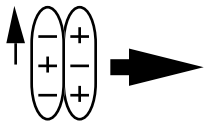


ud

First Order Neutral Pion

The intrinsic angular momentum of the pion is zero. The sum of the spin of the two composing quarks is zero. Physically, zero spin makes means the composing quarks have equal counter rotating sets of rest mass energy.

The neutral pion decays into gamma ray photons 98.8% of the time. It is proposed that this decay mode of the neutral pion is structure collapses into photons and one or more collapsed field particles. Collapsed field particles are massless doublet background particles.



First Order Neutral Pion

gamma rays +
collapsed field
particle(s)

(98.8%)

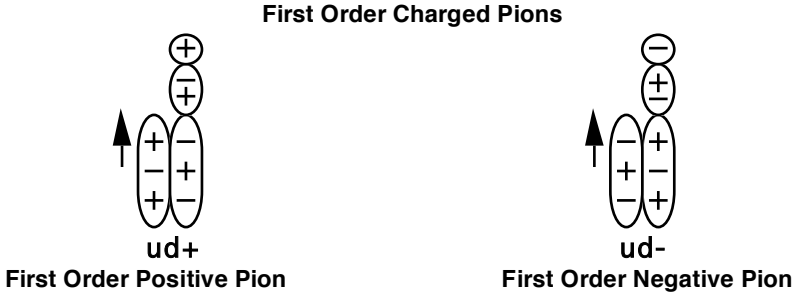
The neutral pion decays 1.2% of the time into an electron-positron pair. The pair production could occur by an electron and positron being ejected before that pair collapsed.

The first order neutral pion is subject to collapse because it is an even numbered unit of matter substructure.

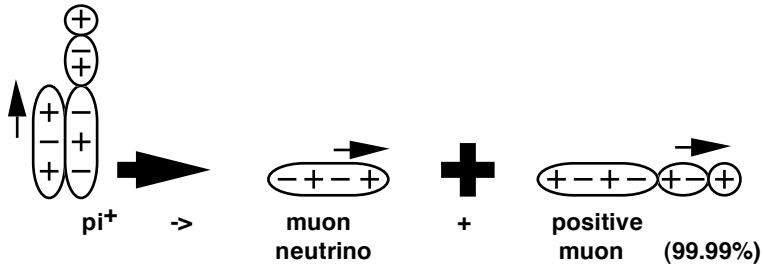
A boson is defined as a particle with a root substructure that has zero net sets of energy rotation and zero net electrical charge (or an even number of units of matter in the root substructure).

First Order Charged Pions

The positive pion is composed of one up quark, one down quark, and a weak force bonded positive unit of matter. The negative pion is composed of one up quark, one down quark, and a weak force bonded negative unit of matter.



The positive pion decays into a positive muon and a muon neutrino 99.99% of the time. The charged pion decay presents the most difficult problem with the concepts presented in this paper. There are not enough units of matter in the above configuration of the charged pions to account for all of the units of matter in what is speculated to be a muon and a muon neutrino. The positive pion decay is illustrated below.



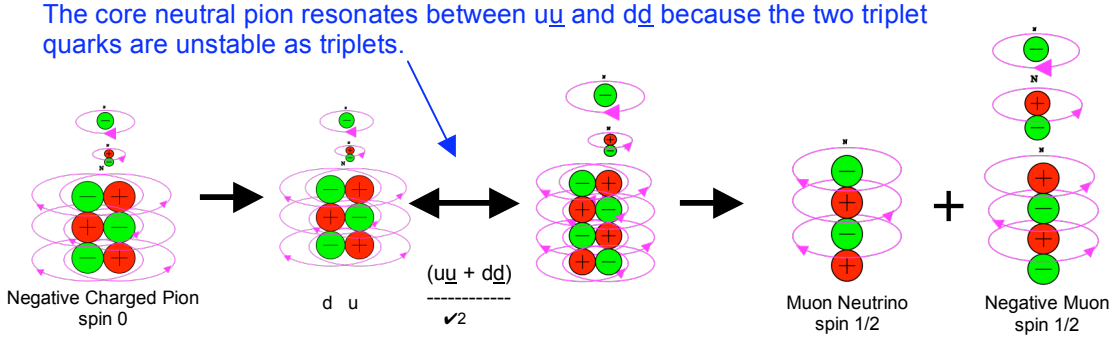
There are two more units of matter in the decay products than there are in the positive pion. Assuming that the configurations of the charged pions are correct, then the proposition is forced that this is a **production decay** mechanism. A production decay mechanism results in units of matter being assimilated from the background of collapsed field particles into the decay products.

The bond structures of the charged pions indicate a mechanism for how the charged pions decay into a charged muon and a muon neutrino the vast majority of the time. It is suspected that the parallel magnetic dipoles of the composing quarks sheer the pion apart in a sliding manner.

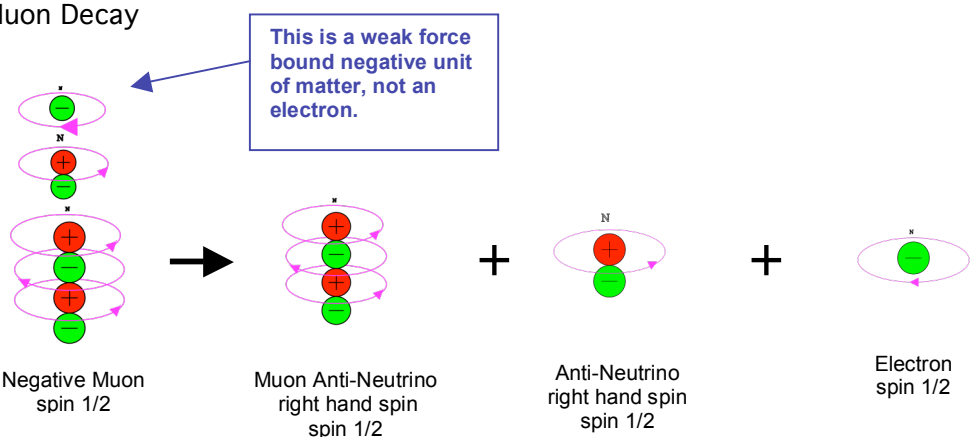
The charged pion decay was the hardest decay to figure out because it required that the two triplets of unit charge matter composing the up and down quarks within the core neutral pion phase from the three unit quarks into a substructure with an even number of units, so that the substructure of the decay product the muon neutrino would have zero rest mass. The answer was in the mathematics describing the neutral pion. The neutral pion core once created, resonates at (u$\underline{u}$ + d$\underline{d}$) / (square of 2).

Charged Pion Decay

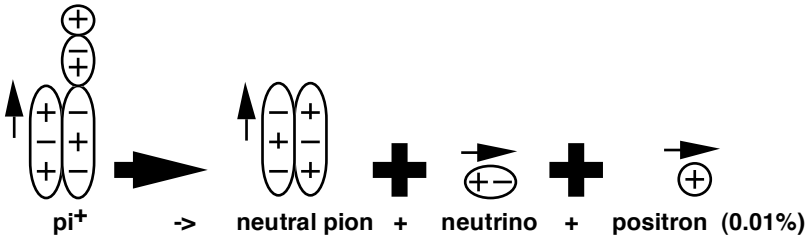
The core neutral pion resonates between uu and dd because the two triplet quarks are unstable as triplets.



The Muon Decay



Alternatively, pi^+ can decay into a positron, a neutral pion, and a neutrino. In this decay, the neutral pion core ejects the positron and electron neutrino decay products.



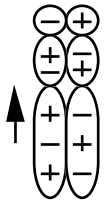
Second Order Neutral Pions

To make the decay products work correctly for the kaons, the concept of multiple weak force bonds had to be explored.

MULTIPLE WEAK FORCE BOND HYPOTHESIS

Pions may have more than one weak force bound unit of matter.

The multiple weak force bond hypothesis allows for more than one type of neutral pion to be hypothesized. The second order type of neutral pion is like the first order neutral pion in that it has an **ud** quark combination as its core. However, this second type of neutral pion has two weak force bonded units of matter, one negative unit of matter and one positive unit of matter.



-ud+ or $u\bar{d}$
Second Order Neutral Pion

The first order and second order neutral pions could conceivably be distributed in the configuration resulting in a statistical definition of the neutral pion of

$$(\mathbf{u}\underline{u} + \mathbf{d}\underline{d})/\sqrt{2}$$

where $\underline{u}$ = anti-up; $\underline{d}$ = anti-down

It is proposed that kaons are complex particle compounds formed from two pions bound together by a weak force particle bond.

COMPLEX PARTICLES HYPOTHESIS

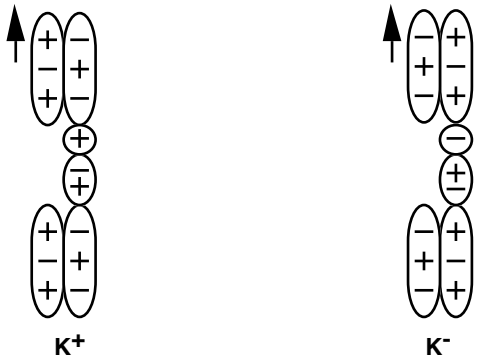
Complex particle compounds are formed from pion or proton core structural units which are bound together through a weak force particle bond.

A **particle bond** binds two particle sub-units together into a complex particle compound. The sub-units of a particle bond can be either protons or pions. The particle bond is given a distinct name because it may be different in nature from the weak force bond, which is required to construct it.

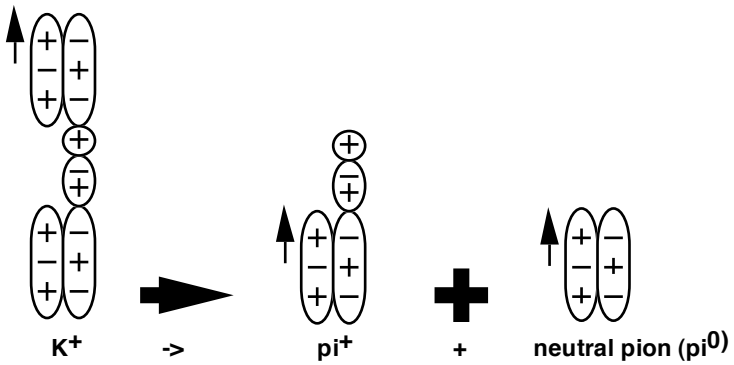
First Order Charged Kaons

The charged kaon decays 25% of the time into one charged pion and one neutral pion. Therefore with the concept of permanence in mind, the charged kaon must be composed of at least the number of units of matter required to construct one charged pion and one neutral pion.

First Order Charged Kaons

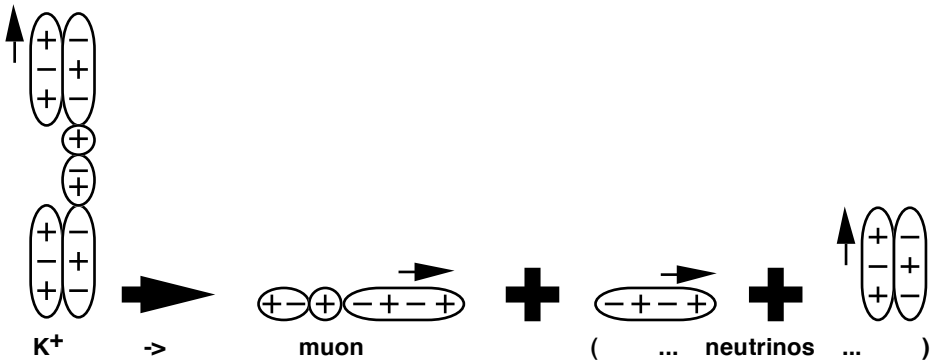


A positively charged kaon and its decay into a positive pion and a neutral pion is shown below.



Charged kaons are composed of a charged pion bound to a neutral pion by a particle bond. Alternatively, the first order charged kaon can be viewed as being composed of two first order neutral pions connected by the particle bond units of matter.

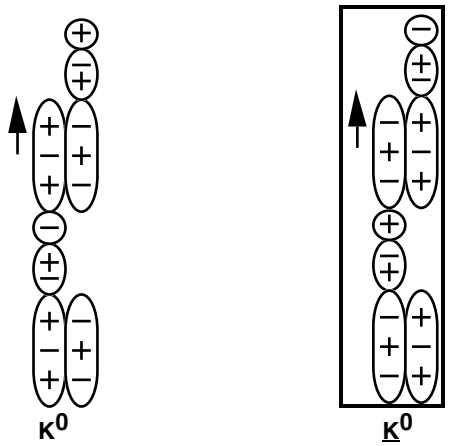
The majority of the time the charged kaon decays into a muon and neutrinos. The neutrinos come from the collapse of the neutral pion and from the decay of the charged pion.



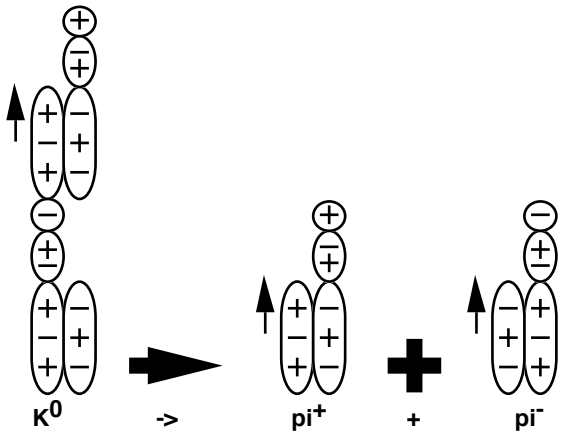
First Order Neutral Kaons

The attachment of a weakly bound unit of matter to a charged kaon would result in the charged kaon becoming neutral. The first order neutral kaons are shown below.[1]

First Order Neutral Kaons

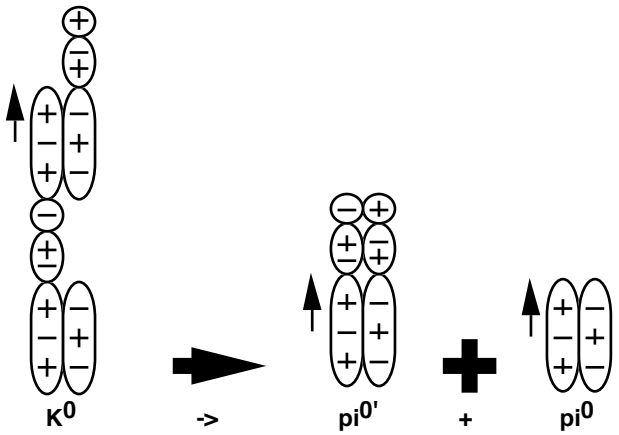


The first order neutral kaon decays into two oppositely charged pions 88% of the time.



The first order neutral kaon decays into two neutral pions 12% of the time. In this decay, the weakly bound positive unit of matter and the particle bond negative unit of matter are attached to the same pion sub-unit after the decay.

[1] The anti-particle of the K^0 is usually denoted with the bar over the K, but this word processor does not provide that capability.



Possibly for this decay, the K^0 was basically composed of a second order neutral pion ($pi^{0'}$) and a first order neutral pion (pi^0) anyway.

K^0 has a weakly bound positive unit of matter available for transfer to another particle during collisions. $\underline{K}^0$ has a weakly bound negative unit of matter available for transfer. Weak force bond unit of matter transfer explains why the reaction

$$\underline{K}^0 + p \rightarrow K^+ + n$$

occurs for $\underline{K}^0$ and not for K^0. The weakly bound negative unit of matter of $\underline{K}^0$ is transferred to the proton, transforming the proton to a neutron.

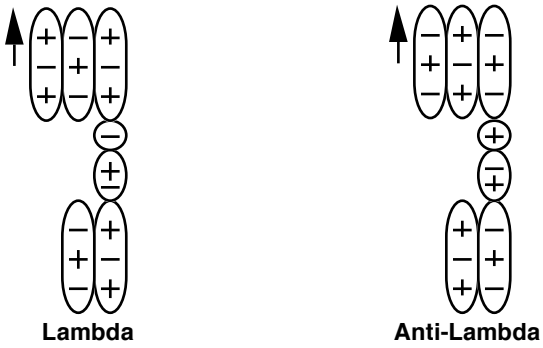
THE UNIT NATURE OF MATTER

PART 4 PARTICLE DECAYS

4.3 Hyperons

LAMBDA **3.1**

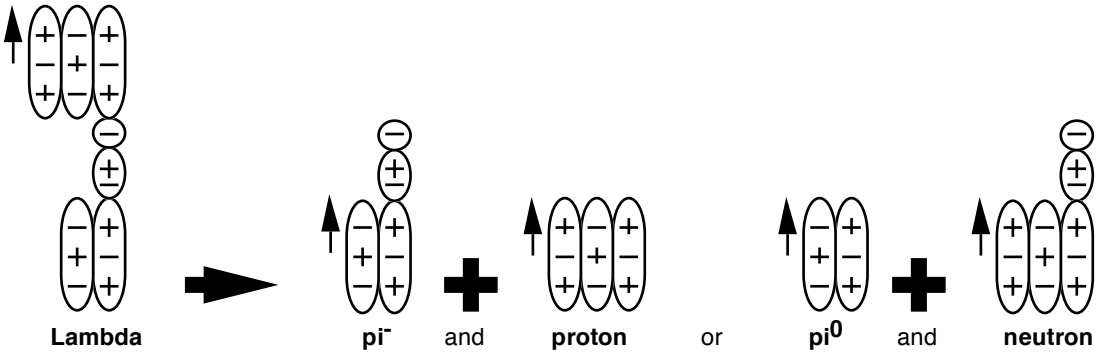
Lambda is a complex compound composed of a first order charged pion bound to proton through a particle bond.



Lambda **Anti-Lambda**

The host of the weak bond is not clear. Since the host particle of the weak bond is not clear, it is not clear whether the decay products are dependent on which sub-unit is the host of the weak bond. The convention here will be to consider the proton as the non-weakly bound sub-unit when possible.

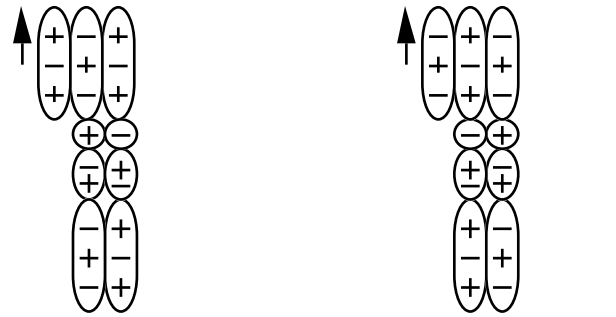
The particles of the weak force electrical bond make the particle bond possible. The assumption is made that the weak force bond constituents, the negative unit of matter and the doublet unit of matter substructure, can bond to either the pion or the proton during the decay process. Therefore, the decay products are either a pi^- and a proton, or, a pi^0 and a neutron.



Lambda Decay

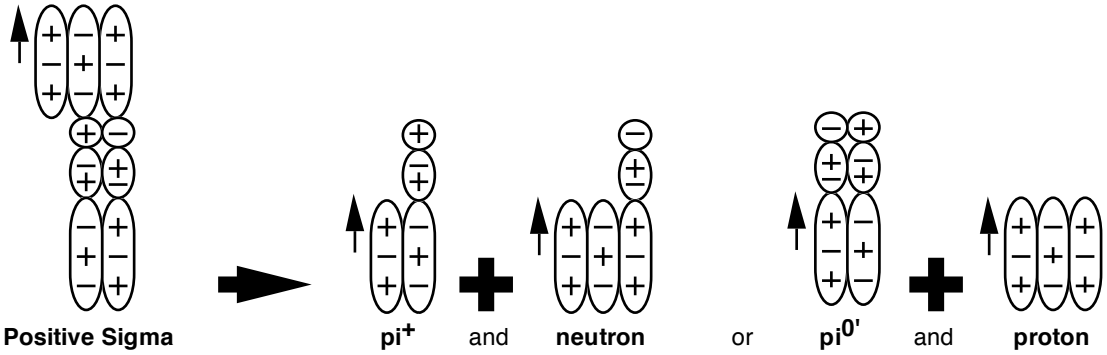
Positive Sigma

Positive Sigma is a complex compound composed of a second order neutral pion bound to a proton by at least one particle bond.



Positive Sigma **Anti-Positive Sigma**

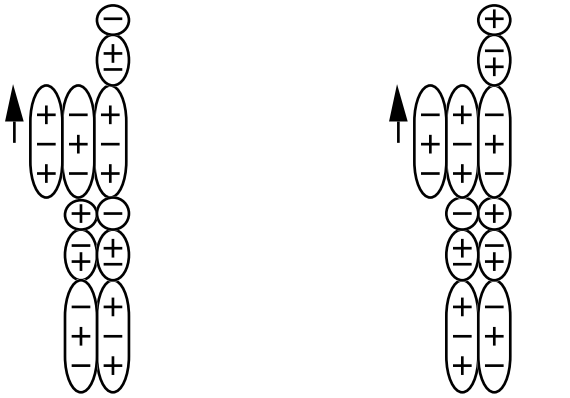
In positive sigma, the weak force bound negative unit of matter can attach to either the pi^+ or the proton during decay. Therefore, the resultant decay products are either a pi^+ and a neutron, or a second order neutral pion and a proton.



Positive Sigma Decay

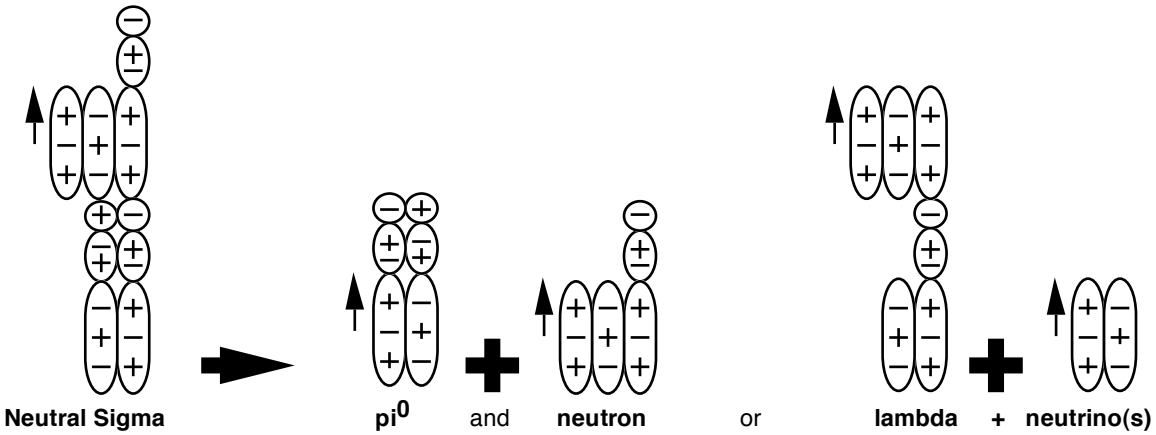
Neutral Sigma

Neutral Sigma is a compound of a second order neutral pion bound to a neutron by at least one particle bond.



Neutral Sigma Anti-Neutral Sigma

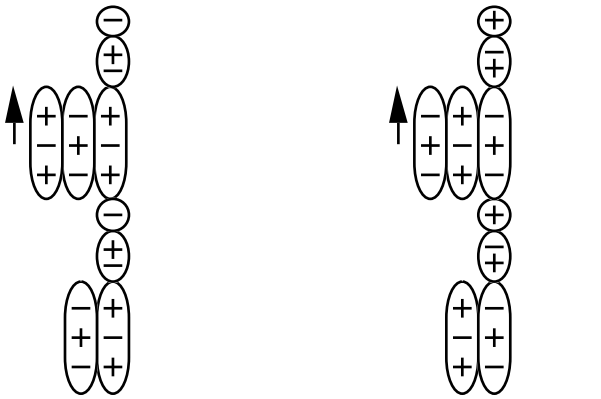
One decay mode of neutral sigma is when the neutron and the second order neutral pion split. Alternatively, a pair of weak force bonded units of matter could collapse producing a lambda particle and neutrinos.



Neutral Sigma Decay

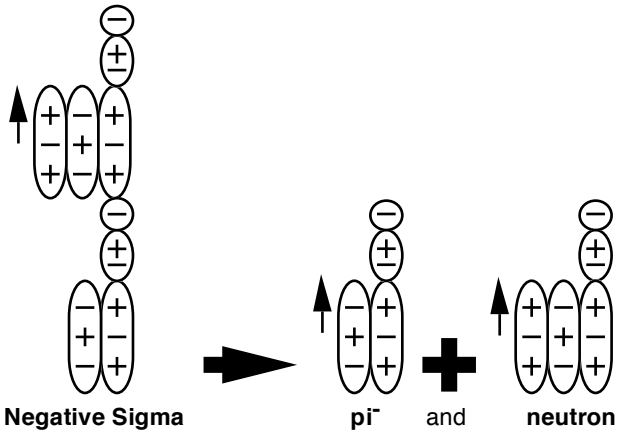
Negative Sigma

Negative Sigma is a complex compound composed of a negatively charged pion bound to a neutron by a particle bond.



Negative Sigma **Anti-Negative Sigma**

For negative sigma, both of the weakly bound negative unit of matters may not bind to the same sub-unit during decay. Therefore, the major decay products are a pi^- and a neutron.



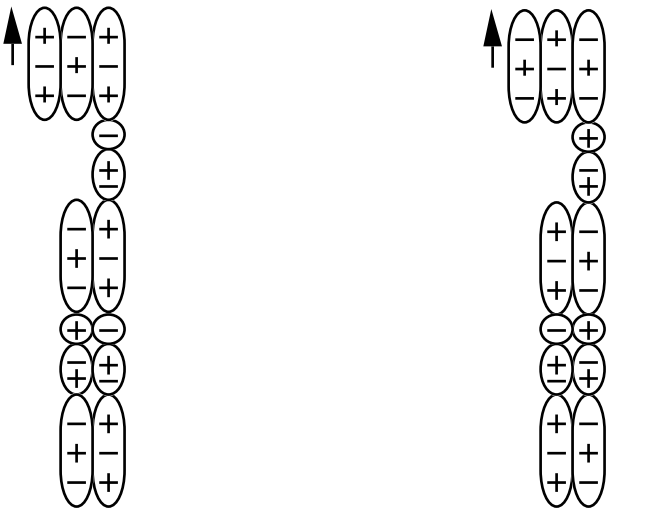
Negative Sigma **pi^-** and **neutron**

Negative Sigma Decay

The order of the increasing mass of positive sigma, then neutral sigma, then negative sigma is explained by positive sigma having no unpaired weakly bound units of matter, neutral sigma having one unpaired weakly bound unit of matter, and negative sigma having two unpaired weakly bound units of matter of the same charge.

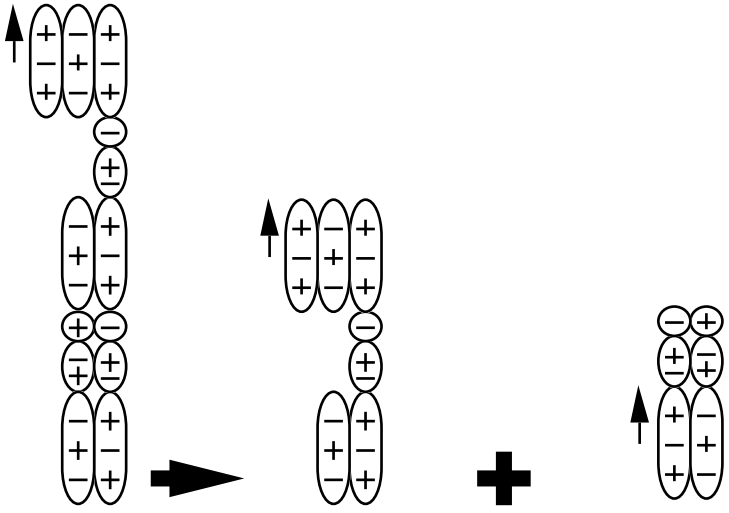
Neutral Xi

Neutral Xi is a compound composed of one first order negative pion and one second order neutral pion bound to a proton by two particle bonds.



Neutral Xi Anti-Neutral Xi

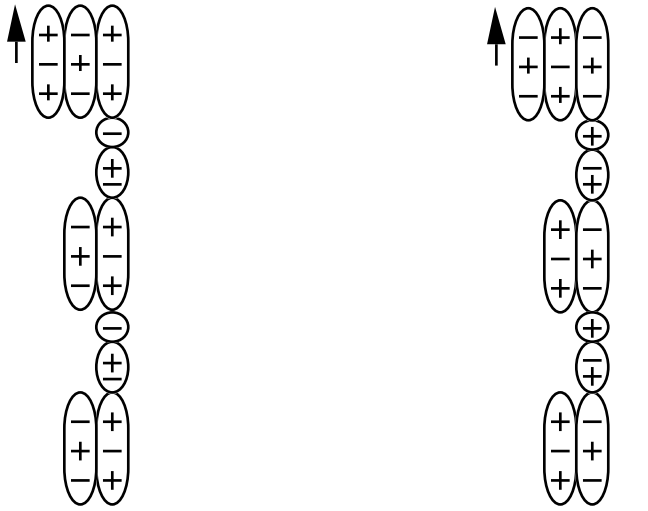
The principal decay mode of the neutral Xi particle is to decay into a lambda and a second order neutral pion.



Neutral Xi Decay

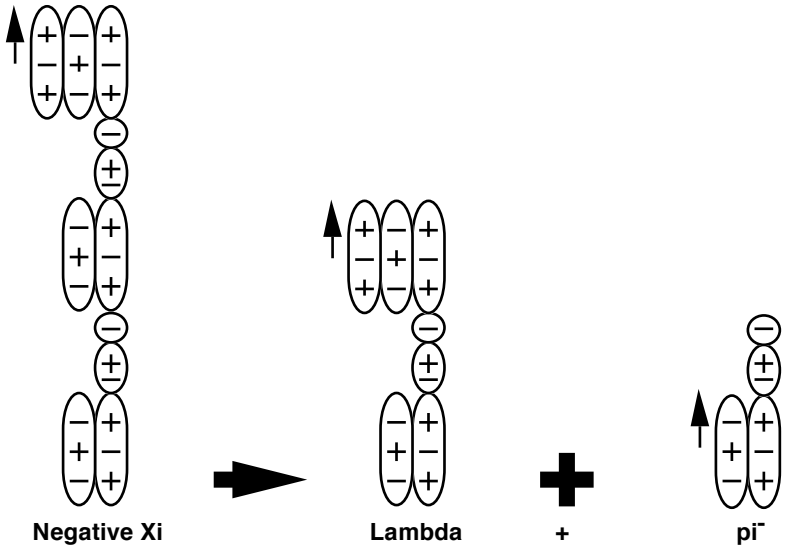
Negative Xi

Negative Xi is a complex compound composed of two first order negative pions bound to a proton by particle bonds. Anti-Negative Xi is centered around the negative anti-proton which has two positive pions bound to it.



Negative Xi **Anti-Negative Xi**

The principal decay mode of Xi^- is to divide into a lambda and a negative pion.

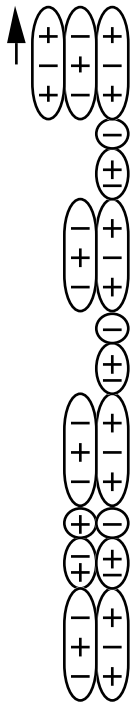


Negative Xi **Lambda** **+** **pi^-**

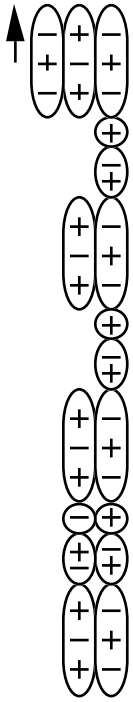
Negative Xi Decay

The greater mass of negative Xi over the mass of neutral Xi, even though neutral Xi contains more units of matter, is explained by neutral Xi having only one unpaired weakly bound unit of matter and negative Xi having two unpaired weakly bound units of matter, which have the same charge.

Omega Minus is a compound composed of two first order negative pions, a second order neutral pion, and a proton, all bound together by particle bonds.



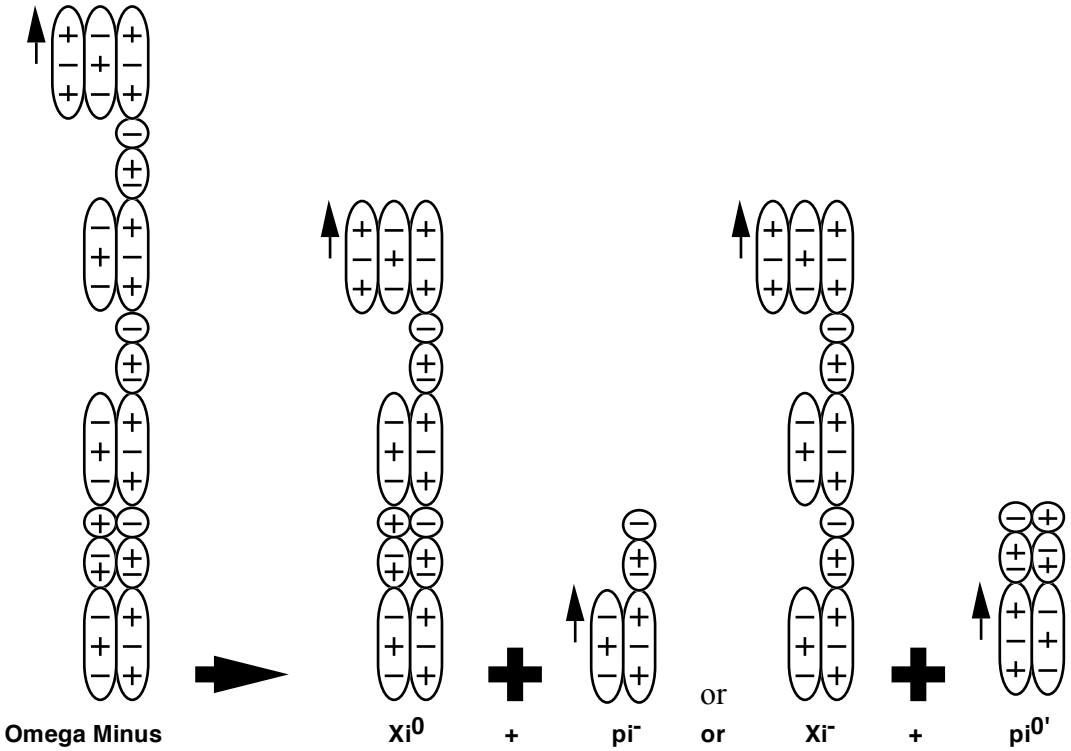
Omega Minus



Anti-Omega Minus

Omega$^-$ is basically a neutral Xi with an additional negative pion bound to it. What is not clear is whether the negative pion is attached to the proton or to the neutral pion.

Omega$^-$ has two principal decay modes. Not surprisingly, one principal decay mode is when omega$^-$ splits into a neutral Xi and a negative pion. The other principal decay mode is when omega$^-$ splits into a Xi$^-$ and neutral pion.



Omega Minus Decay

THE UNIT NATURE OF MATTER

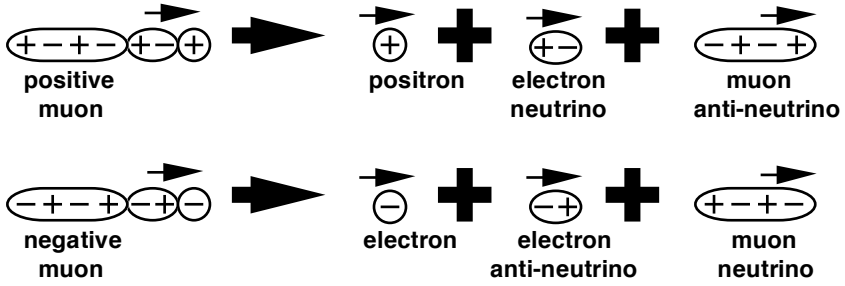
SECTION 4 PARTICLE DECAYS

4.4 Muons

MUONS **4.1**

A **muon** is composed of a muon neutrino, an electron neutrino and a unit of matter all bound by the weak force**.** A muon is the next stable charge-energy ring of the next order past the electron, whatever that structure is.

The muons are illustrated as being composed of exactly their decay products, however the internal structure of the muon prior to decay may be different than its decay products. The positive muon is illustrated as being composed of a positron, an electron neutrino, and a muon anti-neutrino. The negative muon is illustrated as being composed of an electron, an electron anti-neutrino, and a muon neutrino. The decay of each of the two muons is illustrated below. The smaller arrows in the illustrations indicate the north end of the magnetic dipole.



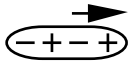
A more aesthetically appealing configuration of the muons requires that the muon neutrino component be converted during decay into its anti-matter or matter counterpart. The muon neutrino conversion would require its units of matter to reverse their spin.

The above configuration of a muon allows it to be seen why the single unit of matter emitted in decay tends to emerge toward the natural direction of the spin axis. The tendency of the single unit of matter to emerge toward the natural direction of the spin axis is parity violation. The above configuration is also easier to account for when a muon is created in a charged pion decay.

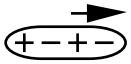
The alignment of the spin axes of the composing particle elements of the muon can explain why the positron emitted in the weak force decay of a positive muon tends to be right handed and why the electron emitted in a negative muon weak force decay tends to be left handed. Since the units of matter emerge from the decay traveling in the natural direction on their spin axis, the units of matter exhibit their natural (inherent) spin direction.

MUON NEUTRINOS 4.2

A **muon neutrino** is composed of at least four strong force bound unit charge matter particles bound together linearly in a quadruplet**.**



muon anti-neutrino
right spin



muon neutrino
left spin

The two types of muon neutrinos parallel the two types of electron neutrinos. The alignment of the composing units of matter on their collective magnetic dipole axes determines whether the muon neutrino will exhibit right or left hand spin.

If the north end of the magnetic dipole is pointed toward the end that terminates in a positive nit charge of matter, then that muon neutrino will always exhibit right hand spin. The muon neutrino that has the north end of the magnetic dipole pointed toward the end that terminates in a negative unit charge of matter will always exhibit left hand spin.

The muon neutrino is speculated to be composed of four units of matter simply because that configuration is the next available even numbered linear configuration past the electron neutrino. The muon neutrino must be composed of an even number of units of matter and four is the first even number past two.

It actuality the muon may be a singlet with just a stable higher energy loop.

THE UNIT NATURE OF MATTER

SECTION 4 PARTICLE DECAYS

4.5 Intermediate Vector Bosons

The charged intermediate vectored bosons are speculated to be composed of an doublet unit of matter substructure and a unit of matter. Why the mass of these particles is so great is not clear. However, the state of the bond between the composing units of matter must be responsible for the great mass of the particles.

W^+ Intermediate Vector Boson

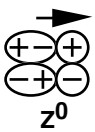
A positive intermediate vector boson is speculated to be composed of an doublet unit of matter substructure bound to a positive unit of matter. W^+ intermediate vector bosons are one unit of positive charge because there are two positive unit of matters and one negative unit of matter.

W^- Intermediate Vector Boson

A negative intermediate vector boson is speculated to be composed of an doublet unit of matter substructure bound to a negative unit of matter.

Z^0 Intermediate Vector Boson

A Z^0 intermediate vector boson is speculated to be composed of two doublet unit of matter substructures, one bound to a positive unit of matter and one to a negative unit of matter. A Z^0 boson might be a W^+ and a W^- bound together.



THE UNIT NATURE OF MATTER

Appendix A Particle Catalog

A.1 Fundamental

LEPTONS


positron


electron

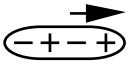
NEUTRINOS

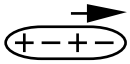
Electron neutrinos


anti-neutrino

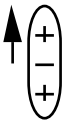

neutrino

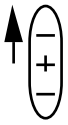
Muon neutrinos


muon anti-neutrino

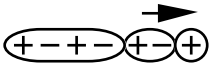

muon neutrino

QUARKS


up


down

MUONS

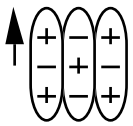

Positive Muon


Negative Muon

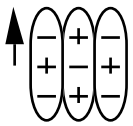
A.2 Nucleons

NUCLEONS

PROTONS

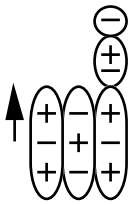


udu
Proton

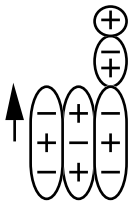


dud
Anti-proton

NEUTRONS



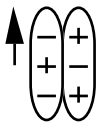
udu-
Neutron



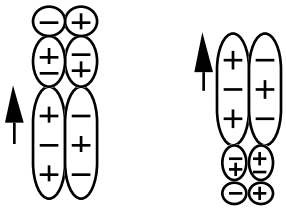
dud+
Anti-Neutron

A.3 Bosons

NEUTRAL PIONS

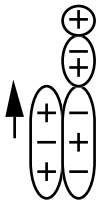


First Order Neutral Pion; $u\bar{u}$

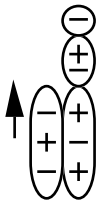


Second Order Neutral Pion; $^{-}ud^{+}$; $u\bar{u}$

CHARGED PIONS



First Order Positive Pion; ud^{+}; $u\bar{d}$



First Order Negative Pion; du^{-}; $d\bar{u}$

INTERMEDIATE VECTOR BOSONS

W+

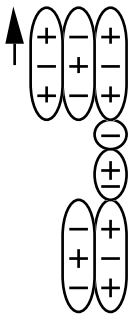
W-

Z Naught

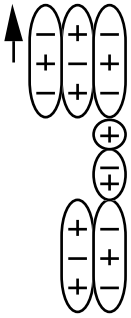
A.4 Hyperons

HYPERONS

Lambda

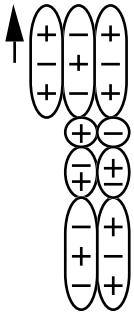


Lambda

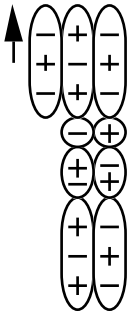


Anti-Lambda

Charged Sigmas Positive

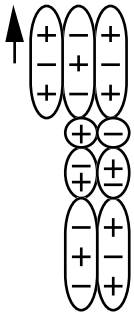


Positive Sigma

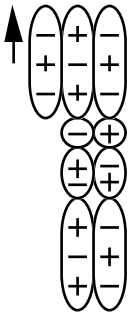


Anti-Positive Sigma

Charged Sigmas Negative



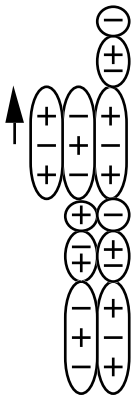
Positive Sigma



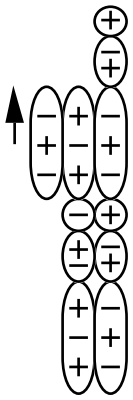
Anti-Positive Sigma

HYPERONS (CON'T)

Neutral Sigmas

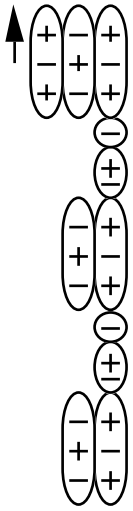


Neutral Sigma

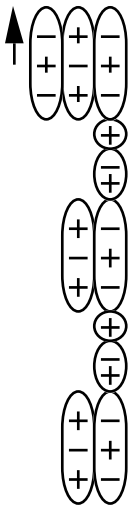


Anti-Neutral Sigma

Charged Xi



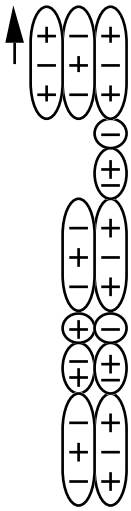
Negative Xi



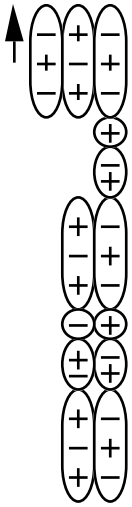
Anti-Negative Xi

HYPERONS (CON'T)

Neutral Xi

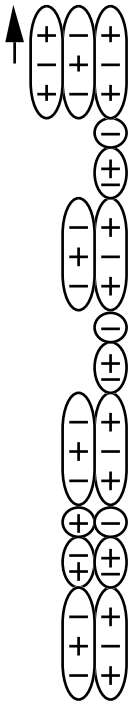


Neutral Xi

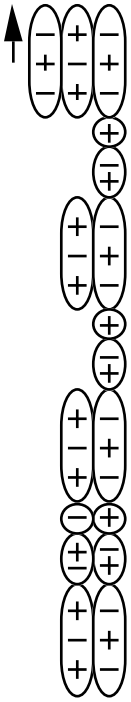


Anti-Neutral Xi

Omega



Omega Minus



Anti-Omega Minus