Prediction of the Masses of Every Known Particle (as of 2008),
Step 2, Part 1

ELECTRON

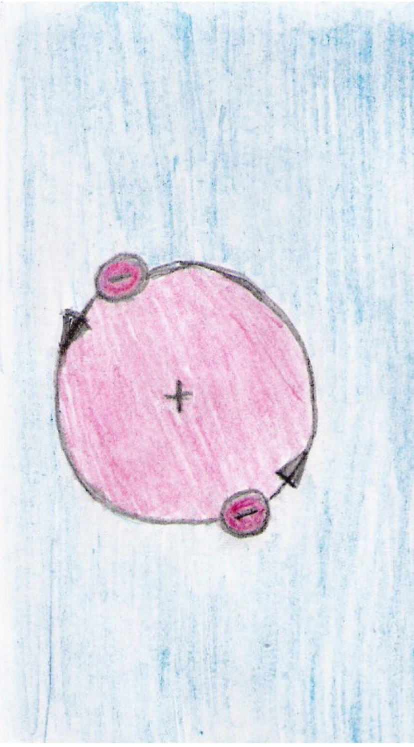

Figure 1. An electron is composed of two semions orbiting about each other.

PION

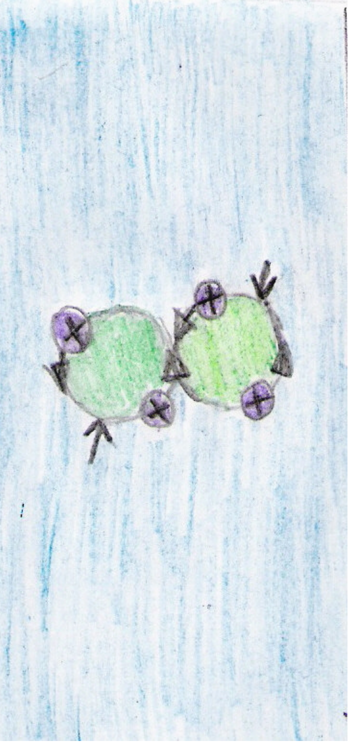

Figure 2. A net zero spin pion is composed of two orbiting pairs of orbiting quartons.

by Gordon L. Ziegler and Iris I. Koch

About the covers: The drawings illustrate the electrino structure of key particles in the particle physics model by Gordon L. Ziegler. Quartons, semions, and unitons are different flavors of electrinos in the model. The viewgraphs were hand drawn by John Blacklaw, Illustrator and Orneda F. Ziegler.

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Benevolent Enterprises
P.O. Box 1162
Olympia, WA 98507-1162 USA
ben_ent100@msn.com

Authors
Gordon L. Ziegler and Iris I. Koch
P.O. Box 1162
Olympia, WA 98507-1162 USA
ben_ent100@msn.com

PREFACE

The masses of every known particle (as of 2008) in the first three energy states (unflavored, strange, and charmed) are arranged to be calculated from first principles in this book and successive books to be, making use of the data in "Prediction of the Masses of Every Particle, Step 1", by the authors. This feat is impossible in the Quark Model, the Standard Model, the String Theory, and the Many Dimensional Theory. It is possible only with the Electrino Fusion Model of Elementary Particles with the Electrino Hypothesis that fracton charges come in ± e, ± e/2, ± e/4, and ± e/8, not the Quark Hypothesis that fracton charges come in ± 2e/3 and ± e/3. All calculations in this book are either two body problems or single body problems. All particle bonds are assumed to be orbital bonds. For the different particle types, however, there are three different spin relations, which are taken as postulates. The errors in the calculation of masses may be due to the fact that the calculations are solely with the n and s parameters, omitting the l (elliptical) and m (tilt or magnetic) parameters. The calculations may be more accurate with those. All that is used in this paper are the Electrino Hypothesis, the Niels Bohr style of mass calculations, the spin postulates, the measured mass of the electron, and algebra. The results generally are calculated masses at one to four place accuracies as compared to the measured masses of the particles, where measurements have been made.

Particles in the ground state have only the energy of the intrinsic particles in that state. In higher states, the particles have not only the intrinsic energies, but also energies due to the additional angular momentum of the elevated states. The next two states (states 1 and 2), for the most part, are well behaved. Particles in higher states stir up pair production in the aether, and so are reduced in mass from what would be calculated according to the means employed in this book. Mass calculations for states 3 and higher are reserved for a Step 3 book.

It has been said, give a man a fish, and you have fed him for a day. Teach him how to fish, and you have fed him for a lifetime. Were this book complete and given to scientists finished, there would be given to them a fish. They would soon hunger for more. But this Part 1 of this book teaches people how to fish—how to calculate the masses of particles from first principles, so they can do it themselves—any particle in the first four energy states. Part 1 of this book includes only the first four chapters and the first few particles in Chapter 5, but it is enough to explain and illustrate how to calculate any particle in the first three energy states--even how to calculate the masses of baryons is illustrated in Chapter 1 in the neutron. Chapter 1 is a road map on how to calculate the masses of particles. This road map calculates even the basis for higher energy state particles, from which is subtracted the effects of pair production.

Of aid to the investigator is *Electrino Physics*, by Gordon L. Ziegler, Appendix B, "Structure of Known Particles." That work lists the structures of the masses to be calculated.

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Chapter 1

INTRODUCTION

1. First Things

The masses of particles cannot be calculated in the Quark Model, The Standard Model, the String Theory and the Many Dimensional Theory. It is not that the physicists have not yet figured out how to do it in those models. It is because it is impossible in those models. But it is possible to do this in a new Theory of Particle Physics—The Electrino Fusion Model of Elementary Particles. That feat is done in a prior paper ("Prediction of the Masses of Every Particle, Step 1") and this book (*Prediction of the Masses of Every Known Particle (as of 2008), Step 2, Part 1)* without tensors, matrices, Hamiltonians, Schrödinger's Equations, Isospin and many other advanced mathematical tools and concepts. This book will use only the Niels Bohr style of particle mass calculation, three spin postulates, the measured mass of the electron, algebra, and the Electrino Hypothesis—that fractional charged particles come in ±e, ±e/2, ±e/4, and ±e/8, not in ±2e/3 and ±e/3 of the Quark Hypothesis.

The next thing to consider is that every known particle (except photons) can be constructed with various states of electrons, various states of pions, various states of neutrons, and various combinations of those particles. Because in the new theory there is a postulate that smooth symmetrical charge distributions cannot have detectable spin, the theory does not allow electrons to be spinning point charges. In the new theory electrons are composed of two half particles (semions) orbiting about each other at the speed of light. Pions are composed of four fourth charges (quartons)—two orbiting one way, the other two orbiting the same way, and the two pairs of quartons orbiting the opposite way. A neutron is composed of a whole e particle (uniton) orbited by an electron (which is composed of two half charges orbiting about each other). Now if we could predict the masses of various states of electrons, pions, and neutrons, and learn how to put them together in compound particles and learn how to calculate the masses of multi-particle particles, we would learn how to predict the masses of almost every particle (photons excepted). We did the first step in the "Step 1" paper. Through the Electrino Hypothesis, Neils Bohr style of mass calculations, and algebra, we predicted the known electron, pion, and neutron family members to two to four place accuracies. Our challenge in this book is to make a road map on how to do all the step 2 calculations of all the known particles in the first four states (states 0, 1, 2, 3) of the well behaved particles. The higher masses of higher states stir up pair productions—which complications are beyond the scope of this book.

The quark and lepton model of particle physics divides charges in quarks to ± 2e/3 and ± e/3. The electrino model of particle physics does not do that. Instead, it divides charges in electrinos to ± e, ± e/2, ± e/4, and ± e/8. The electrino model of particle physics does not hold that the quark and lepton model of particle physics is correct. Nevertheless, to facilitate cross referencing with the existing data, this book will employ quark model titles and classifications in the subsequent classification of particles.

The chonomic structures contained in the following material are the author's, but most of the particle data come from [1, 2]. The author's chonomic structures in this book are induced from the following eight criteria: particle charge, spin, parity, mass, spin feasibility, preceding particles (to avoid duplication), decay schemes, and the Pauli Exclusion Principle. The use of isospin in the precursor data instead of the simple charge made the author's work difficult; so too the convention of listing any charge π as π, and decay products of baryons as N . . ., where N can stand for many different baryons. For accurate results, please change to precise reporting conventions. These results are highly valuable, and worth doing right.

This book proves that all known matter, light, and gravitons can better be constructed of electrinos rather than quarks and leptons. All particles may be formulated with yachons and echons , or with +, -, o's, and ●'s. Almost all particles can be formulated with +, -, o's, and n's, where n is composed with + and ●, and where n in ground state is the neutron. The key to understanding chonomics is in [3], Chapter 10.

The particle data below are formatted similarly for each particle: first on the left is a particle symbol in a box. To the right is typically the isospin, spin, parity, etc. Below that is the measured mass. Then the particle symbol is repeated above the particle chonomic structure proper, as part of the particle structure. Then comes another mass. Originally it was the measured mass less the error terms. But we desire to make a change here—let us now make this mass the calculated mass from first principles. Below that is the chonomic grid. Right of the vertical line are the symbols of positively charged particles—to the left the negative particles. There are different levels in the grid representing different energy states. For more information, see [3] Chapter 10.

The symbols in the grid are combinations of -, +, o, and ● or n. These are not charge symbols, they represent the spins of the relevant particles. The symbol – stands for spin – ½ ħ, or – ½ h/2π, of a particle in the particle system. The symbol + stands for a particle with + ½ ħ spin. The symbol o stands for a particle with net zero orbital spin like the pion. The symbol ● stands for a zero spin nearly point charge. The ●'s are found only in ground state energy levels, and are used in this book only in the definition of photons and neutrons. The symbol n has an intrinsic spin + on the opposite side of the vertical chonomic line from the n, and has an orbital spin -1 to add with other orbital spins in the particle. Higher state n's, of course, have ground state ●'s, but elevated +'s on the opposite side of the vertical chonomic line from the n.

2. The Science of Calculating the Masses of Elementary Particles

It is appropriate now to explain the science of calculating the masses of elementary particles from the information in their chonomic structures. This work was done for charged leptons, the pion family, and the neutron family in [4, 5]. (The neutron family calculations are modified at the end of this chapter, and the pions in Chapter 5.) The first two families were of particles composed simply of orbiting fractons in containment. The neutron family calculations are more complex, but are a good explanation of the science of calculating the masses of systems in the chonomic structures.

In order to abbreviate the requisite labor in the calculations involved in this book and take advantage of previous results, we will reverse some of the order of the calculations. Instead of combining the v_o^2 and solving for m (a little wrong), we will henceforth solve for the m's and combine masses employed in the particles. Some of the masses will be masses previously calculated in "Prediction of the Masses of Every Particle, Step 1." Some of the masses will be masses associated with the potential energies and kinetic energies of the orbits binding the masses together. The previously calculated masses include their g/2 factors and fractions combining their kinetic and their potential energies. We will have to include both terms in the calculations of each orbital mass associated with the particles on the face of the chonomic grid for the particle in question.

The first consideration in calculating the mass of an elementary particle is to carefully examine its chonomic structure. Are there symbols on more than one state level? Or are the symbols all on one level? Is there more than one symbol on the same side of the vertical chonomic line? By inspection, determine how many different orbits are needed to bind the symbol particles together without gluons. Symbols on the same side of the vertical chonomic line (including of more than one energy state) can all be held together by means of the electric strong force—where the aether travels faster than the speed of light, the radii are made imaginary, and like charges attract. All the sub-particles in an elementary particle obey the Pauli Exclusion Principle—that is no two sub-particles in a particle have the same set of parameters—the identical state. Thus the sub-particles in a binding orbit can all get along together, because they are a subset of a Pauli Exclusion Principle compliant set.

There can be another strong force binding orbit for the charges on the other side of the vertical chonomic line. And there can be an overall binding orbit of both sides of the vertical chonomic line by the meso-electric force—where the aether travels slower than the speed of light, the radii are real, and opposite charges attract.

For each binding orbit, there must be an equation balancing the respective electrical force in the orbit with the inertial force in the orbit. For the Niels Bohr style calculation and approximation of the respective mass associated with the orbit, the orbit is considered to be circular. The inertial centrifugal force is calculated from circular centripetal acceleration.

The electrical force calculation for an orbit requires the identification of what the central particle in the orbit is. It is likely to be of an elevated state, or at least to be an n or an o particle. If a central particle can be identified, its charge is multiplied by the sum of the charges of the rest of the sub-particles in the orbit (for orbits binding like particles). This product is a part of the balancing equation (see Equation (1-1) for a sample).

In the event a central particle cannot be found, and the particle is totally symmetric, the particle acts like a two body problem, and a ½ must be put before the inertial side of the equation (see Equation (1-2) for a sample). In this case, one half of the charge of the sub-particles of the particle must be multiplied by the other half of the charge of the sub-particles of the particle in the electrical product portion of the balancing equation.

The mass term in the inertial side of the balancing equation is (m/4) for quarton orbits, (m/2) for semion orbits, and (m/1) for all whole particle orbits—irrespective of mass.

The mechanic for overall orbits for oppositely charged sub-particles is similar, except it is an orbit of all the positively charged particles (bound) with all the negatively charged particles (bound). The electric term in the balancing equation is the sum of all the positive charges times the sum of the negative charges, where there is an extra minus sign because opposite charges attract.

Let us now give four examples of the relationships between aspects of particle chonomic structures and their respective orbital balancing equations. We start with the faster than c aether mediated positively charged particle inner binding orbit for the W particle.

W

J = 1
Charge = ±1 e
Mass m = 80.398 ± 0.025 GeV

```
     W
     ?
3    |__
2    |__
1   -|o-
0    |

  1-1|-1
     |
```

This is the chonomic structure for the W particle. The total spin is -1 ħ, which comes from the two – ½ ħ intrinsic spins on the face of the grid. The total orbital spin is 0—that is, 1 ħ from one binding orbit and – 1 ħ from the other binding orbit. The positive sub-particles (on the right side of the vertical chonomic line) require a faster than c binding orbit to bind like charges. That orbit of positive particles and the negative charge (on the left side of the vertical line) require a slower than c binding orbit to bind opposite charges with the meso-electric force. Thus this particle requires two binding orbits.

The binding orbit we wish to consider in this sample is the binding orbit of the positive particles. The o particle (pion) is much heavier than the – particle (positron). Therefore we take the pion to be the central particle in this problem. Therefore we take the single body approximation in the balancing equation. All the particles in these orbits are whole particles, so m is divided by 1. Both the pion and the positron have +1e/1 charge. The rest of the balancing equation is defined in [5]. We then have the following sample balancing equation for like charged sub-particles in the W particle:

$$1(m/1)v_0^2/r = (e/1)^2 \Big/ 4\pi\varepsilon_0\alpha^{(N/B)+1}r^2 . \tag{1-1}$$

η

$I^G(J^{PC}) = 0^+(0^{-+})$
Mass m = 547.853 ± 0.024 MeV

```
      η
   548.008 806
3     |__
2     |__
1   -+|+-
0     |

   1-1|0
      |
```

This is the chonomic structure for the η particle. The total spin is 0 ħ, which comes from the intrinsic spins on the face of the grid canceling out and the orbital spins canceling out—that is, one binding orbit has 1 ħ spin, another binding orbit has – 1 ħ spin, and the overall binding orbit has 0 ħ spin. The negative sub-particles (on the left side of the vertical chonomic line) require a faster than c binding orbit to bind like charges. That binding orbit of negative particles and the binding orbit of the positive charges (on the right side of the vertical line) require a slower than c binding orbit to bind opposite charges with the meso-electric force. Thus this particle requires three binding orbits.

The binding orbit we wish to consider in this sample is the binding orbit of the negative particles. The + particle (electron with + ½ ħ spin) is very slightly lighter than the – particle (electron with – ½ ħ spin). But to all intents and purposes the – and + particles have the same mass. The binding orbit is virtually symmetric. There is no central particle in this problem. Therefore we take the two body approximation in the balancing equation. We put a ½ before the inertial side of the balancing equation. All the particles in these orbits are whole particles, so m is divided by 1. Both electrons have -1e/1 charge. The rest of the balancing equation is defined in [5]. We then have the following sample balancing equation for like charged sub-particles in the η particle:

$$\frac{1}{2}(m/1)v_o^2/r=(-e/1)^2\Big/4\pi\varepsilon_0\alpha^{(n/b)+1}r^2 \tag{1-2}$$

We wish now to consider the overall binding orbit of the W particle. Because of the positively charged o sub-particle, the orbit is way out of balance and symmetry. The whole positive binding orbit acts as a central particle for the positive and negative overall binding orbit. We therefore use the single body approximation in this case, with whole particles and positive and negative terms in the electric term. (The negative particle has an extra negative sign because opposite charges attract in this case.) For reasons to be explained later, the pion o acts as though it has 2e instead of 1e in the balancing equation.

$$1(m/1)v_o^2/r=(--e)\left(2e+e\right)\Big/4\pi\varepsilon_0\alpha^{(N/B)+1}r^2 \tag{1-3}$$

The opposite sides of the chonomic structure of the η particle are balanced. Therefore we make the two body approximation.

$$\frac{1}{2}(m/1)v_o^2/r=(--2e)\left(2e\right)\Big/4\pi\varepsilon_0\alpha^{(n/b)+1}r^2 \tag{1-4}$$

There will be times when it will not be easy to determine whether you should calculate according to the single body problem or by the two body approximation. They are both approximations. Just approximate the best you can.

Calculating the balancing equations for the binding orbits of a particle is not the end of the matter. They each have to be converted to masses and summed with every other mass in the particle. The first step in solving the balancing equations is to simplify them by the methods in [5]. Then they may be solved by utilizing what the authors call the spin relations (solved for r). There is a separate spin relation for the electron family, the pion family, and the neutron family [5]. As far as the spin relation is concerned, the families extend to higher energy states as well as to charge conjugates. But all *that* is included in the calculated masses from the intrinsic spins on the face of the chonomic grid. What we need here are the spin relations to be used with the balancing equations of the binding orbits. Use the spin relation for the central particle or the most massive sub-particle in the two body problem or the most positive sub-particle where about equal.

When r is eliminated from a balancing equation by the use of the appropriate spin relation, there is solved an expression for v_o^2 that is sort of an exponential polynomial. In going from the polynomials to mass factors, in general, the polynomials have to be multiplied by m_e / c^2 times the kinetic-potential energy factor times the g/2 factor.

Calculations are not alone for intrinsic masses on the chonomic grid. Masses can and must be calculated for orbits beside intrinsic orbits.—for binding orbits.

As for energy factors, ●'s have 0 energy factors, n, +, and – sub-particles have 3/2 energy factors and o sub-particles have 2 for the energy factor, because there are three orbits in the same containment (black hole), and v_o^2 can be negative as well as positive in the black hole. The energy factor for many particles is 1, where the kinetic energies cancel out. Binding orbits have the energy factor of their central particle or the most massive sub-particle in the two body problem or most positive sub-particle if about equal.

The first thing to know about g/2 factors is that they include the influence of all the forces active in the particle. The electrical medium in space has a preponderance of excess negative charged electrons. Electrons are the test charges in electrical fields. Negatively charged particles act one way in that field. Positively charged particles act another way in the field. The negatively charged particles do not have the meso-electric term (where opposite charges attract) in their g/2 factors. The positively charged particles do have the meso-electric term in their g/2 factors. The meso-electric term subtracts more and more from higher and higher energy state g/2 factors, and makes a measurable difference in ground state, making oppositely charged particles not simple charged conjugates.

The neutron has an interesting g/2 factor. Neutrons have positive cores, but they do not have positive strong force terms in their g/2 factors. They have negative strong force terms. [6] What can account for this? Dots may be obscured by black holes, whereas – particles in the neutron (electrons), are outside the black holes and not obscured. The +1 strong force of the dot is obscured. The -1 strong force of the – particle (electron orbiting the dot uniton) in the g/2 factor is not obscured. Therefore, to all appearances, the negative strong force replaces the positive strong force in the neutron. The same goes for the electric and magnetic terms.

The anti-neutron family has + 1 strong force term from the orbiting positron (see above), no meso-electric term, and the charge conjugate of all the other terms as the neutron family member.

A binding orbit uses the g/2 factor of its central particle or the highest mass sub-particle (including n) or most positive particle. Calculations are best if energy factor and g/2 factor are multiplied separately with each polynomial, and the masses summed up.

Once the exponential polynomial is multiplied by m_e / c^2, the energy factor, and the g/2 factor, there is still one step that must be made before summing all the sub-masses in a table: The number you have arrived at is a mass factor, not the total mass of the particle you are considering, unless your particle is in the absolute ground state or the relative ground state (state 1). For any state above relative ground state, the masses of all lower states of the particle family must be added to the mass factor to yield the mass in question. Then all the masses of all the sub-particles may be added together in a table for the mass of the particle in question. This includes previously calculated intrinsic masses on the face of the chonomic grid, as well as mass equivalents calculated for the binding orbits.

3. Postulates

A number of postulates are useful in the overall science of the United Field Theory and Unified Particle Theory—including the postulates for calculating the masses of elementary particles. All the following postulates are utilized in this volume except the fourth.

1. Parsimony Principle: The Universe is constructed according to the simplest design possible to account for the many varied natural phenomena. [3] (Chapter 6).

2. The author learned how to unite and predict many of the constants, forces, and particles, given but one simple formula:

$$\frac{0\ \textit{arbitrary mass unit}}{0} \equiv M_0(arb.\ ma.\ u.), \qquad (8\text{-}1)$$

M_0 is the strong mass of a whole particle in the relativistic frame as seen by an observer at rest, 0 in the numerator on the left side of the equation is the mass of a whole particle (uniton) at rest, and 1/0 is the gamma factor transforming the non-relativistic frame to the relativistic frame when the uniton travels at exactly the speed of light. Many fundamental constants, forces, and particles in the Universe can be derived from this simple definition. [3] (Chapter 8).

3. The one measured mass that needs to be input in this model is the mass of the electron: The mass of the electron was previously measured to be 0.510 998 910(13) MeV. [1].

4. The spin relation (solved for r) for electrons orbiting atoms is: $r = \dfrac{n\hbar}{m_e v}$. [4].

5. The spin relation (solved for r) for the electron family of particles is: $r = n\hbar / b^2 mc$. [5].

6. The spin relation (solved for r) for the pion family of particles is: $r = n^2\hbar / bmc$. [5]

7. Besides the spin relation of the electron family member intimately involved with the dot and the neutron overall binding orbit, the spin relation (solved for r) for the neutron family of particles is: $r = N\hbar / Bmc$. [5].

8. Pauli Exclusion Principle applied to sub-particles in particles: No two sub-particles in a particle can have the same set of parameters. Also, no two mass factors in a particle can have the same j subscript.

9. Conservation law of particle parameters: Once a set of sub-particle parameters is determined, they must stay the same throughout the sub-particle calculations.

10. The states of the meso-electric terms can be calculated by taking particle number p minus 1 for the pion family, p plus 0 for the positron family, and p/2 plus 1 for the neutron family times the corresponding n times $\pi\alpha$.

4. Rest Mass of the Dot Uniton

The author has long known that the relativistic mass of the uniton is

$$M_0 = -i\left(\frac{\hbar c}{G}\right)^{1/2} \approx -i\ 2.176\ 44(11)\ x\ 10^{-08}\,kg.\text{[3] (p. 184).}$$

The author did not know until recently, however, what the non-relativistic mass of the uniton is. That can be deduced easily from Postulate 2 read backwards. On the right side of the definition is M_0--the strong mass of the uniton. The uniton has no spin and no translational motion in the relative rest frame. Therefore the aether speed traveling through its charge surface is precisely ± c—the speed of light. The gamma factor is precisely $1/0$. Then by definition, the rest mass of the uniton is 0.

The zero rest mass of the uniton does not jeopardize the balancing equations. The source of attraction between particles is charge, not mass. And the inertia is not calculated for the dot uniton, but for the other orbiting particle(s).

5. Redoing the Neutron

The calculated mass of the neutron turns out slightly different if we 1) add the polynomials and multiply by the energy factor [5], or 2) multiply the polynomial by the energy factor and add the sub-masses. In the first case, the polynomials have to be added at right angles, and only three sub-particles or binding orbits can be included in the treatment of the particle. In the second case, that is no problem. There can be an infinite number of sub-masses to add. The authors choose this latter method, even though it yields a slightly greater error from the measured result.

The overall binding orbit in the neutron can have the B parameter no less than 2. This is because of the Pauli Exclusion Principle. See Chapter 5, under the π^0 particle, page 26.

Postulate 9 would stipulate that the B, N for the g/2 factor for the neutron be the same as the B, N for the exponential polynomial for the neutron binding orbit—namely 2, 3, not 3, 6 as calculated in [5, 6]. To correct this, we have to calculate a new g/2 evaluation table for the neutron (see Table 1-1 below). Differing values of n in the g/2 factors make little difference in the mass because they are alternately added and subtracted, averaging out (they make a little difference). What makes a significant difference in the g/2 factors is the meso-electric term. Fortunately, the meso-electric term calculated in the original neutron g/2 factor [6] was calculated correctly. That is why the original neutron g/2 factor gave so close to the right value. The positive and negative signs were correct also. They should be the same in the current calculation of the neutron g/2 factor (see Table 1-1 below).

The equation for the meso-electric term in the neutron depends on your system of numbering the neutron family members. If the negative spin members were omitted in your system, there would be no division by 2 in the meso-electric term. The variable p in the equation is just the subscript of your neutron family particle considered. Whatever the p, the term is $bn\pi\alpha$. The parameter n in the equation is just your n or N in your b, n or B, N parameters for the particle considered.

Table 1-1

n_2 g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	-1	-1.000 000 000 000 0
meso-electric	$-bn\pi\alpha$	-0.137 551 854 732 7
electric	$-\alpha / 2\pi$	-0.001 161 409 727 8
magnetic	$-\alpha^2 / 16\pi^2$	-0.000 000 337 218 1
$weak_1$	$+\alpha^2 / 8\pi$	+0.000 002 118 804 0
$weak_2$	$-3\alpha^3 / 4\pi$	-0.000 000 092 770 0
$weak_3$	$+3(32\alpha)^1 \alpha^3 / 4\pi$	+0.000 000 021 831 6
$weak_4$	$-3(32\alpha)^3 \alpha^3 / 4\pi$	-0.000 000 001 181 3
$weak_5$	$+3(32\alpha)^4 \alpha^3 / 4\pi$	+0.000 000 000 275 8
$weak_6$	$-3(32\alpha)^5 \alpha^3 / 4\pi$	-0.000 000 000 064 4
$weak_7$	$+3(32\alpha)^6 \alpha^3 / 4\pi$	+0.000 000 000 015 0
$weak_8$	$-3(32\alpha)^7 \alpha^3 / 4\pi$	-0.000 000 000 003 5
$weak_9$	$+3(32\alpha)^8 \alpha^3 / 4\pi$	+0.000 000 000 000 8
$weak_{10}$	$-3(32\alpha)^9 \alpha^3 / 4\pi$	-0.000 000 000 000 2
total calculated g/2 factor for neutron		-1.138 711 554 770 8

With the revised g/2 factor for the neutron, we can calculate a rough estimate for the mass of the neutron. (The calculations do not include the l and m parameters, so they will not be perfect. But they have two place accuracy.)

Table 1-2

Sub-particle	B	N	polynomial	energy factor	g/2 factor	sub-mass m/m_e	predicted $m\,MeV$	measured $m\,MeV$
Dot uniton						0.000 000 00		
Electron						1.001 159 65		
Bind. orbit	2	3	$B/N\alpha^{N/B}$	3/2	-1.138 711 554 770 8	1826.693 720		
						1827.694 880	933.950 0915	939.56536 [1]

6. Black Hole Renormalizations

Though calculating the full mass approximation for a particle is a simple though prodigious process (see Chapter 5, η particle), it appears that calculating just the outer binding orbit yields a closer approximation to the measured mass of the particle. The sub-particles and inner binding orbits are in a black hole. The over-all binding orbit is outside a black hole. It may be that the event horizon of the black hole renormalizes the g/2 factors of the inner sub-particles and binding orbits to ± 1.0, but not the g/2 factors of the outer orbit. Starting with Chapter 5, $f_0(600)$, the authors will calculate only the outer binding orbits, unless for some reason the results are far from the measured masses.

7. Higher State Particles

The information in this chapter is sufficient to calculate the mass of any particle in the bottom four energy states and the basis of any higher state particle from which mass is subtracted due to pair production. But if you start out at random and pick a higher state to begin with, you may find that the higher state particle shares the same polynomial, energy factor, and g/2 factor with one or more lower state particles. The higher state particle is not solved by finding a new polynomial, energy factor, or g/2 factor. It is found by selecting a new b, n pair for the polynomial and the g/2 factor. But to obtain the mass of a higher state particle, the mass of all the lower state particles that share the same polynomial must be summed with the new mass factor. So you will have to solve some lower state particles first.

8. Designing g/2 Factors

It is a quirk of nature that the body of the weak$_1$ term for the electron and positron g/2 factors is $\alpha^2/8\pi$, whereas it is $\alpha^2/4\pi$ for all other g/2 factors, In designing your g/2 factor, be sure to keep that in mind.

Negative charged particles do not have meso-electric g/2 factor terms. All positively charged particles do have meso-electric g/2 factor terms. The bodies of all other g/2 factor terms are as listed in the electron g/2 factor evaluation table [6] (see also this chapter, p. 9). The only differences come in the leading signs of the terms and the leading constants to the weak_2 and higher weak terms. For the electron and anti-pion families, the strong force, electric force, and the magnetic force terms have leading – signs. The same terms have + signs for the positron and pion families. The neutron and anti-neutron families have opposite signs for the first three non-meso-electric terms than one would expect. The neutron has negative initial signs instead of positive ones.

The signs for the weak terms are the most confusing: they alternate with successive weak terms. They alternate with charge conjugates. They alternate with higher energy states in a given family. And they have unknown relationships between different family types. How can we make sense of this system? Since without fail the weak terms alternate in sign in a given particle g/2 factor, we only need to know the sign of the weak_1 term in any given particle g /2 evaluation table. The other weak term signs will alternate down surely and correctly.

How can we know the weak_1 term sign for any given particle g/2 evaluation table? Each particle can be characterized by two symbols: particle charge and particle b. The electron and muon calculated g/2 factors were carefully correlated to the measured g/2 factors. So they can be an anchor to our whole system. From the correlated calculations, we observe that the electron has negative charge, has b = 1, and a weak_1 term sign of +. (The electron and anti-electron have b = 0 for their exponential polynomials, the anti-electron has b = 0 also for its meso-electric term. The electron and anti-electron, however, have b = 1 for their g/2 factors. That is the value we are interested in this section.) We can alternate the signs for any number of higher energy states in the electron family. We have one data point confirmed in the correlated calculations of the muon g/2 factor. We are on the right track.

We can take the charge conjugate of the electron and the electron g/2 factor table. We find the weak_1 sign for the positron to be -. We can alternate the signs for any number of higher energy states in the positron family. We then have the following table of values:

Table 1-3

Particle	charge	b	weak_1 sign
Electron	-	1	+
Muon	-	2	-
Tauon	-	3	+
Positron	+	1	-
Anti-muon	+	2	+
Anti-tauon	+	3	-

These values are for fairly sure. But what are the values for different particle families? The authors do not know, but they do venture a guess: The pion has + charge and b = 1 for its g/2 factor, so take the sign to be the same as the known particle with like characteristics, namely the positron— -. The neutron has + charge and b = 2. Therefore it should be the same sign as the anti-muon—+. Even if for some reason you get a + for a -, or a – for a +, your calculation would be the same within five significant figures, and have two significant figures compared to the measured value.

9. Calculating Different States

The following information is not needed in this volume or the next (Prediction of the Masses of Every Known Particle (as of 2008), Step 2, Part 1. Or . . . Step 2, Part 2), but is needed in Part 3 and in every successive part. Except for neutrinos, particles in elevated states have elevated real masses. To calculate these elevated masses from first principles, one has to take into account a factor depending on the number of the elevated state. This is the same problem Niels Bohr faced in energy states of electrons in hydrogen. One of his postulates was that in the system the angular momentum must be an integral multiple of h/2π. For elevated states in the chonomic structures, the relation is the same, except that, where there are multiple particles in various elevated states, the integral multiple for each particle type must be summed for the overall net integral multiple for the system.

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[1] C. Amsler *et al.* (Particle Data Group), PL **B667**, 1 (2008) (URL: http://pdg.lbl.gov).

[2] S. Eidelman et al. (Particle Data Group), Phys. Lett. B **592**, 1 (2004) (URL: http://pdg.lbl.gov)

[3] Gordon L. Ziegler, *Electrino Physics* (http://www.benevolententerprises.org Book List.)

[4] Gordon L. Ziegler and Iris Irene Koch, "Prediction of the Masses of Charged Leptons," Galilean Electrodynamics **20** (6), 114-118 (2009).

[5] Gordon L. Ziegler and Iris Irene Koch, "Prediction of the Masses of Every Particle, Step 1," **Galilean Electrodynamics**, Summer 2010, Vol. 21, SI No.3, pp. 43-49.

[6] Gordon L. Ziegler and Iris Irene Koch, "An Update on g/2 Factors," **Galilean Electrodynamics**, Summer 2010, Vol. 21, SI No.3, pp. 50-55.

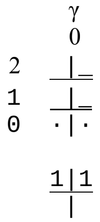
Chapter 2

GAUGE AND HIGGS BOSONS

GAUGE AND HIGGS BOSONS

γ

I(J^{PC}) = 0,1(1^{--})
Mass m < 1 x 10^{-18} eV
Charge q < 5 x 10^{-30} e
Mean life τ_{γ} = Stable



The gamma or photon is the one particle that cannot be constructed of electron, pion, or neutron family members. [1] (p. 43). That is because the fundamental whole particle the neutron is not elementary. It is composed with a zero spin nearly point charge uniton and an electron orbiting it. It is a piece of the neutron—-the uniton—-and anti-uniton that compose the photon. The uniton has mass $-i\ 2.176\ 44(11)\ x\ 10^{-08}\ kg$. [2] (Chapter 6, Eq. (6-17)). The anti-uniton has minus that quantity, or +i times the value. The net charge mass of the photon is the uniton mass plus the anti-uniton mass, or 0. [2] (Chapter 6, Eq. (6-14)). But the photon probably cannot be summed at once. It has the uniton and the anti-uniton on opposite sides of a black hole. Only one can be seen at any one time. The photon has charge and mass oscillations as it travels along the light path axis. To be sure, the photon has time average zero mass and charge. But the photon has energy by virtue of its oscillation: $E = h\nu$. The photon has orbital spin of $\pm 1\hbar$ and travels at the speed of light.

Let us try out the mass calculating procedure developed in the last chapter, to see if it gives us the right value for the photon. The uniton and anti-uniton are held together by the meso-electric force in slower than light non-relativistic calculations, even though their aether velocities exceed the speed of light. We observed this peculiarity also in calculating many matter masses. [1] (p. 44). The balancing equation is

$$\frac{1}{2}(m/1)v_0^2/r = (--e)(e)\Big/4\pi\varepsilon_0\alpha^{(n/b)+1}r^2 \qquad (2\text{-}1)$$

The $e^2/4\pi\varepsilon_0\alpha$ can be factored out as $\hbar c$. One r can cancel out of the two sides of the equation. The equation then looks like the following:

$$mv_{\mathrm{o}}^2 = 2\hbar c / \alpha^{n/b} r \quad . \qquad (2\text{-}2)$$

The spin relation for the dot uniton is $r = n\hbar / bmc$. (2-3) [1] (p. 48)

Combining Eq. (2-2) with Eq. (2-3), we can solve for v_o^2:

$$v_{\mathrm{o}}^2 = (2b / n\alpha^{n/b}) c^2 \, . \qquad (2\text{-}4)$$

Multiplying both sides by m_e / c^2 , we have

$$energy / c^2 = mass = (2b / n\alpha^{n/b}) m_e . \qquad (2\text{-}5)$$

The above exponential polynomial has an infinite number of solutions, depending on b and n, for an infinite number of possible energy states. But the photon, composed of a dot and an anti-dot, has only one state—ground state. Let us solve for ground state for the photon by setting b and n equal to 1. Equation (2-5) then becomes

$$\mathrm{m} = \left(2 / \alpha\right) m_e \, . \qquad (2\text{-}6)$$

Now let us derive the energy factor. The kinetic energy of the dot and anti-dot cancel out, because the mass of the dot is positive and the mass of the anti-dot is negative—making positive and negative kinetic energy. The photon has potential energy. Whatever it is, the energy of the photon is 1 times it. Thus the energy factor for the photon is 1.

Now let us derive the g/2 factor for the photon. The photon is held together by the fine structure meso-electric force where opposites attract. But the g/2 factor is in units of m / m_e . When the mass is zero, as is the case of the photon, the g/2 factor is precisely zero.

Since we are dealing with the ground state in the photon, there is no need to add up different state mass factors. The mass of the photon is thus the reduced polynomial times the energy factor times the g/2 factor:

$$m = \left(\left(2 / \alpha\right) m_e\right)\left(2\right)\left(0\right) = 0 \, , \qquad (2\text{-}7)$$

which is in harmony with centuries of scientific opinion.

g
or gluon

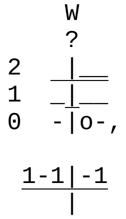
$I(J^P) = 0(1^-)$

Mass m = 0
SU(3) color octet

There are no gluons in the electrino system.

W

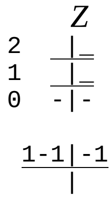
J = 1
Charge = ±1 e
Mass m = 80.398 ± 0.025 GeV (measured at velocities close to the speed of light)



With the charge and spin listed with the *W* particle, it evidently has chonomic structure similar to ρ(770)$^{\pm}$ or K*(892)$^{\pm}$ or D*(2010)$^{\pm}$ or B* or etc. The *W* particle has listed with it [3] a very large momentum. The W particle could be one of the above particles at high velocity. It is impossible to say which one, however, until the W particle is stopped and measured near rest. Chonomic structures, measured and calculated masses of the above first three particles can be found in this book at the respective particle listings. The measured mass of the W particle (80.398 (25) GeV) exceeds the mass of the B* particle (5412.8(13) MeV), which exceeds the maximum mass of the well behaved particles in this book. Thus the W particle exceeds the limits set for this book.

Z

J = 1
Charge = 0
Mass m = 91.1876 ± 0.0021 GeV (measured at velocities close to the speed of light)



This particle is similar to the π^0. In fact, with a relativistic transformation, it may be equal it. The isospin notwithstanding, the π^0 also has zero net charge. Its J is 0, but transforms to J = 1 at the speed of light, just as for the Z. As with the W particle, the Z particle exceeds the mass limits of the well behaved particles set for this book.

Higgs Bosons – H^0 and $H^{\pm}$, Searches for

H^0 Mass m > 114.4 GeV, CL = 95%
H_1^0 **In Supersymmetric Models**
Mass m > 92.8 GeV, CL = 95%

A^0 Pseudoscalar Higgs Boson in Supersymmetric Models
Mass m > 93.4 GeV, CL = 95% tanβ>0.4
$H^{\pm}$ Mass m > 79.3 GeV, CL = 95%
No formulation in system.

Unknown heavy or light bosons, searches for, are not covered in this book. This book covers known particles.

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[1] Gordon L. Ziegler and Iris Irene Koch, “Prediction of the Masses of Every Particle, Step 1,” **Galilean Electrodynamics**, Summer 2010, Vol. 21, SI No.3, pp. 43-49.

[2] Gordon L. Ziegler, *Electrino Physics*, http://www.benevolententerprises.org/ Book List. For paper copy, contact ben_ent100@msn.com.

[3] C. Amsler *et al.* (Particle Data Group), PL **B667**, 1 (2008) (URL: http//pdg.lbl.gov).

Chapter 3

FRACTONS

QUARKS

No formulation of quarks in the electrino system.

ELECTRINOS

Except for unitons, electrinos cannot be shown as symbols on the chonomic grid. The chonomic grid is for whole particles. Except for unitons, electrinos are fractons, or fractional charged particles; and unitons act like fractons. They never come alone. They always come with another particle—an anti-uniton in photons, or electrons in neutrons.

"In addition to the electric self potential mass, the uniton or any electrino has kinetic mass in the electrino relative rest frame. The aether field is not static. Every portion of charge in the uniton is traveling at speed c relative to the aether. Therefore m_q or M_q has kinetic energy also. If m_q had a small velocity relative to the aether, its kinetic energy E_{kin} would be $\frac{1}{2} m_q v^2$. But since $v^2 = - c^2$, we take the relativistic form $E_{kin} = -m_q c^2$. The total fundamental mass of the uniton is $M_q + (-M_q) = 0$. The total absolute value mass is $|M_q| + |-M_q| = 2M_q = M_0$, which is the imaginary Planck mass, composed simply of the following constants:

$$M_0 = -i\left(\frac{\hbar c}{G}\right)^{1/2}. \qquad (3\text{-}1)$$

Numerically it is

$$M_0 \approx -i\ 2.176\ 44(11)\ x\ 10^{-08} kg.[1] \qquad (3\text{-}2)$$

$$R_0 = \frac{2GM_q}{-c^2} = i\left(\frac{\hbar G}{c^3}\right)^{1/2} \approx i\ 1.616\ 252(81)\ x\ 10^{-35} m. \quad (3\text{-}3)$$

"The physical size of the uniton is very small—essentially a point charge. But it is imaginary in radius. The mass in the relative rest frame is very large on particle scales. But it is minus imaginary. Essentially the radius of the uniton has been relativistically contracted and the mass relativistically increased. The circumferences of the uniton, however, are not in the direction of aether motion. We might think they are not contracted. But they are. The circumference is 2π times the relativistic imaginary radius. The relativistic particles are relativistic throughout.

“Semions and quartons (1/2 and 1/4 charges) are also of interest to us. From equations parallel to [1] Equations (6-7) through (6-18) we see that, while the fundamental masses of the particles are all zero, the absolute value masses and radii are:

$$m_{quarton} = 1/4\ m_{uniton} \approx -i\ 5.441\,1(03)\ x\ 10^{-09}\,kg. \qquad (3\text{-}4)$$

$$r_{quarton} = 1/4\ r_{uniton} \approx i\ 4.040\ 63(21)\ x\ 10^{-36}\,m. \qquad (3\text{-}5)$$

$$m_{semion} = 1/2\ m_{uniton} \approx -i\ 1.088\ 22(06)\ x\ 10^{-08}\ kg. \qquad (3\text{-}6)$$

$$r_{semion} = 1/2\ r_{uniton} \approx i\ 8.081\ 26(41)\ x\ 10^{-36}\,m. \qquad (3\text{-}7)$$ ” [1] (Chapter 6, Section II E).

The above electrino masses are all from the relativistic frame, and are precise. The non-relativistic electrino masses are not unique, but depend on the particle they are found in. For instance, the non-relativistic semion mass equals $(1/2)m_e$ or $(1/2)m_\mu$ or $(1/2)m_\tau$ or etc. The non-relativistic quarton mass equals $(1/4)m_\pi$ or $(1/4)m_K$ or $(1/4)m_D$ or etc.

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[1] Gordon L. Ziegler, *Electrino Physics*, http://www.benevolententerprises.org/ Book List. For paper copy, contact ben_ent100@msn.com.

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Chapter 4

LEPTONS

e J = ½

Mass m = 0.510998910 ± 0.000000013 MeV
= (548.57990943 ± 0.00000023) x 10^{-6} u

$$\left(m_{e^+} - m_{e^-}\right)/m < 8\,x10^{-8},\ CL = 90\%$$

$$|q_{e^+} + q_{e^-}|/e < 4\,x10^{-8}$$

Magnetic moment μ = 1.0011596521811 ± 0.0000000000007 μ_B

$$\left(g_{e^+} - g_{e^-}\right)/\,g_{average} = (-\,0.5 \pm 2.1)\,x10^{-12}$$

Electric dipole moment d = (0.07 ± 0.07) x 10^{-26} e cm
Mean life τ > 4.6 x 10^{26} yr, CL = 90%

```
       e
  0.510 998 910
   2  __|_
   1  _|_
   0  -|

      0|-½
       |
```

The electron mass is the one particle mass that has to be input from the measured value. $m_e = 9.109\ 382\ 15(45)\ x\ 10^{-31}\ kg.$ [1]

μ J = ½

Mass m = 105.658367 ± 0.000004 MeV
= 0.1134289256 ± 0.0000000029 u
Mean life τ = (2.197019 ± 0.000021) x 10^{-6} s (S = 1.1)
Magnetic moment μ = 1.0011659208 ± 0.0000000006 eℏ/2m_μ

```
       μ
  105.671929
   2  __|_
   1  -|_
   0   |

      0|-½
       |
```

m_μ / m_e is already calculated in [2], [3], and [4]. $m_e = 0.510\ 998\ 910\ldots MeV$. Parameters l (elliptical) and m (tilt or magnetic) are not included in any of the calculations in this book—a potential source of errors in the calculations.

τ

J = ½

$$Mass\ m = 1776.84 \pm 0.17 MeV$$

```
             τ
         1747.03
2         -|_
1         _|_
0          |

          0|-½
           |
```

m_τ / m_e is already calculated in [2], [3], and [4]. $m_e = 0.510\ 998\ 910 ... MeV.$

Neutrinos

ν_e

J = ½

Mass m >0i MeV
< 0.000003 MeV

```
          νe imaginary mass  = −2M0   M0 ≈ −i 2.176 44(11) x 10^−08 kg. [4]
         real mass  = 0
2         _|_
1         _|_
0         -|o

          1|½
           |
```

The calculations for the neutrinos are almost identical to that of the photon in Chapter 2. The neutrinos travel faster than the speed of light, so employ the relativistic imaginary masses. The relativistic electron has positive M_0 (negative imaginary value) mass. The pion, while technically having positive mass also, has effective negative mass, because its charge is opposite that of the electron. It has effective negative $–M_0$ (positive imaginary value) mass. The net order energy mass = 0. The absolute value entropy energy mass = $-2M_0$ (positive imaginary value). This calculation holds true for all neutrinos.

ν_μ

J = ½

Mass m < 0.19 MeV, CL = 90%

```
         νμ imaginary mass  = −2M0   M0 ≈ −i 2.176 44(11) x 10^−08 kg. [4]
         real mass  = 0

2          _|_
1          -|_
0           |o

           1|½
            |
```

Because ν_μ and ν_τ etc. also travel faster than the speed of light, we know that their pion state also has a single $-M_0$ imaginary mass value. The mass is the same as calculated above.

$\boxed{\nu_\tau}$ J = ½

Mass m < 18.2 MeV, CL = 95%

ν_τ imaginary mass $= -2M_0 \quad M_0 \approx -i\ 2.176\ 44(11)\ x\ 10^{-08}\, kg.$[5]

real mass $= 0$

```
2   -|_
1   _|_
0    |o

    1|½
     |
```

---

[1] http://physics.nist.gov/cuu/Constants/

[2] Gordon L. Ziegler and Iris Irene Koch, “Prediction of the Masses of Every Particle, Step 1,” **Galilean Electrodynamics**, Summer 2010, Vol. 21, SI No.3, pp. 43-49.

[3] Gordon L. Ziegler, *Advanced Electrino Physics* (http://www.benevolententerprises.org Book List.)

[4] Gordon L. Ziegler and Iris Irene Koch, “Prediction of the Masses of Charged Leptons,” **Galilean Electrodynamics**, November/December 2009, Vol. 20, No. 6, pp. 114-118.

[5] Gordon L. Ziegler, *Electrino Physics*, 2008, http://www.benevolententerprises.org/ Book List. For paper copy, contact ben_ent100@msn.com.

Chapter 5

LIGHT UNFLAVORED MESONS
(S = C = B = 0)

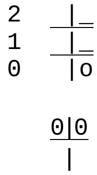
$\pi^{\pm}$

$I^G(J^P) = 1^-(0^-)$

Mass m = 139.57018 ± 0.00035 MeV (S = 1.2)

π^+

137.002 202 MeV



This particle mass was calculated already in “Prediction of the Masses of Every Particle, Step 1” in [1] and [2]. However, the pion g/2 factor upon which the calculation was based was incorrect. So we redo the pion g/2 evaluation table and mass calculation.

The Pauli Exclusion Principle works only for whole particles or larger particles. For instance, four fourth particles and three binding orbits in the pion all have b, n equal to 1, 1—the minimum, whereas two whole particles and a binding orbit in the neutron have to have all different b, n—giving the neutron binding orbit the minimum of b = 2. The Pauli Exclusion Principle and the numbering system dictate the form of the expression in the meso-electric term. For instance, $(p/2+1)=2=b$ for the neutron; whereas $p=b=1$ for the pion. The full g/2 factor meso-electric term for the pion family is $-pn_p\pi\alpha$.

Since n = 1 in the pion, the weak forces as well as the meso-electric term all have the minimum in the pion g/2 factor.

Table 5-1
π_1 g/2 Factor Evaluation with 2006 α

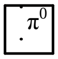
force:	g/2 factor term:	numerical value:
strong	$+1$	+1.000 000 000 000 0
meso-electric	$-pn_p\pi\alpha$	-0.022 925 309 122 1
electric	$+\alpha/2\pi$	+0.001 161 409 727 8
magnetic	$+\alpha^2/16\pi^2$	+0.000 000 337 218 1
$weak_1$	$-\alpha^2/4\pi$	-0.000 004 237 608 1
$weak_2$	$+\alpha^3/4\pi$	+0.000 000 030 923 3
$weak_3$	$-(32\alpha)^1\alpha^3/4\pi$	-0.000 000 007 221 0
$weak_4$	$+(32\alpha)^3\alpha^3/4\pi$	+0.000 000 000 393 7
$weak_5$	$-(32\alpha)^4\alpha^3/4\pi$	-0.000 000 000 091 9
$weak_6$	$+(32\alpha)^5\alpha^3/4\pi$	+0.000 000 000 021 4
$weak_7$	$-(32\alpha)^6\alpha^3/4\pi$	-0.000 000 000 005 0
$weak_8$	$+(32\alpha)^7\alpha^3/4\pi$	+0.000 000 000 001 1
$weak_9$	$-(32\alpha)^8\alpha^3/4\pi$	-0.000 000 000 000 2
total calculated g/2 factor for pion		+0.978 232 224 237 0

We use the new g/2 factor to calculate the mass of the $\pi^\pm$ in Table 5-2:

Table 5-2

particle	b	n	polynomial	energy factor	g/2 factor	sub-mass m/m_e	predicted m MeV	measured [4] m MeV
Pion $(\pi^\pm)$	1	1	$2b/n^2\alpha^{n/b}$	1	+0. 978 232 224	268.106 061	137.001 905	139.570 18(35)

Since we are omitting the l and m parameters in these calculations, it is reasonable to expect our estimates of the masses of the particles to be on the low side.



$I^G(J^{PC}) = 1^-(0^{-+})$

Mass m = 134.9766 ± 0.0006 MeV (S = 1.1)

```
        π0
  137.002 202 MeV
2   _|_
1   _|_
0   -|-

    1|0
     |
```

The mass of this particle is approximately equal to that of the masses of the $\pi^\pm$ particles. However, chonomic decay schemes show that the structure is entirely different—composed of an electron and positron orbiting. Both the electron and the positron rotate in a counter clockwise direction in this view. Because the electron has negative charge and induces a negative magnetic moment here, historically the counter clockwise spinning electron has been considered negative or down spin following the left hand rule. The positron also has negative or down spin because of negative mass. The total spin on the face of the grid is minus 1, which cancels with the plus 1 orbital spin, to yield a total 0 spin for the particle.

The electron has the electron family g/2 factor [3]. The positron has the opposite signs of all the electron g/2 factor terms plus the negative meso-electric term ($-\pi\alpha$). This difference in g/2 factor means the masses of the electron and the positron do not quite cancel out. See Table 5-4. The positron g/2 factor is calculated in Table 5-3.

Table 5-3

Positron g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	+1	+1.000 000 000 000 0
meso-electric	$-pn_p\pi\alpha$	-0.022 925 309 122 1
electric	$+\alpha/2\pi$	+0.001 161 409 727 8
magnetic	$+\alpha^2/16\pi^2$	+0.000 000 337 218 1
$weak_1$	$+\alpha^2/8\pi$	-0.000 002 118 804 0
$weak_2$	$-\alpha^3/4\pi$	+0.000 000 030 923 3
$weak_3$	$+(32\alpha)^1\alpha^3/4\pi$	-0.000 000 007 221 0
$weak_4$	$-(32\alpha)^3\alpha^3/4\pi$	+0.000 000 000 393 7
$weak_5$	$+(32\alpha)^4\alpha^3/4\pi$	-0.000 000 000 091 9
$weak_6$	$-(32\alpha)^5\alpha^3/4\pi$	+0.000 000 000 021 4
$weak_7$	$+(32\alpha)^6\alpha^3/4\pi$	-0.000 000 000 005 0
$weak_8$	$-(32\alpha)^7\alpha^3/4\pi$	+0.000 000 000 001 1
$weak_9$	$+(32\alpha)^8\alpha^3/4\pi$	-0.000 000 000 000 2
total calculated g/2 factor for positron		+0.978 234 343 041 2

The π^0 has one overall binding orbit, for which we make the following calculations.

The ideal nominal spin relation for electron family members is [1], [2] (Chapter 4) (Postulate 5 in the system (Chapter 1)):

$$r = n\hbar / b^2 mc \qquad (5\text{-}1)$$

To Eq. (5-1) (the nominal spin relation) we add the balancing of the force due to charge on the electron and positron with the centrifugal force on the electron and positron.

In the following equation, the leading 1/2 is from the two-body problem. The second 1 is for a whole mass. The third and fourth 1 in the following equation is for whole charges.

The speed v_o is greater than c, and must increase when the energy increases. In the electric force side of the equation, the charge of the electron is $-e/1$.

Each particle is a miniature mass singularity, and communicates with the outside world through powers of α (the Fine Structure Constant). The electric force expression, in the right side of Eq. (4-2), we expect to depend on a power of $1/\alpha$. The numerator of the power of alpha must be what makes the mass increase in the particle—namely the shells of mass from the radius r_j to $r \to \infty$, which can be totaled by taking $(b+1)$ (pairing of shells) times $b/2$ (number of pairs of shells). The denominator in the power of α should be b (the power of attenuation through j orders of mass shells). Also, we want the power for the electron to be such that the power of α is 1 when $n = (b^2+b)/2 = 0$. We take the power of α for electrons and higher charged leptons to be $n/b+1$. Balancing the forces, we have

$$\left(1/2\right)(m/1)v_o^2 / r = (--e/1)(e/1) \Big/ 4\pi\varepsilon_0 \alpha^{(n/b)+1} r^2 \; . \qquad (5\text{-}2)$$

The $e^2/4\pi\varepsilon_0\alpha$ can be factored out as $\hbar c$. One r can cancel out of the two sides of the equation. The equation then looks like the following:

$$m v_o^2 = 2\hbar c / \alpha^{n/b} r \quad . \qquad (5\text{-}3)$$

Combining Eq. (5-3) with Eq. (5-1), we can solve for v_o:

$$v_o^2 = (2b^2 / n\alpha^{n/b})\, c^2 \quad , \qquad (5\text{-}4)$$

$$v_o = \sqrt{2b^2 / n\alpha^{n/b}}\; c \quad . \qquad (5\text{-}5)$$

For the π^0 binding orbit, the exponential polynomial is $\left(2b^2 / n\alpha^{n/b}\right)$. The polynomial times the energy factor times the g/2 factor equals the mass factor, which in case of a relative ground state particle is the mass we seek of our selected particle. Because the mass of the positron is negative the mass of the electron, all the kinetic energies in the π^0 cancel out and equal 0. The potential energy utilizes Eq. (5-4). The energy factor equals 0 + 1 = 1. [We are not calculating what the potential energy is, but how many times the potential energy the total energy is.] Since the electron and positron are anti-equal, we select the more positive particle as the one for the g/2 factor for the π^0 binding orbit--that is the positron.

Since the polynomial times the energy factor is defined to be 1.000 in the electron, m/m_e in the sub-particle is equal to the negative of the electron g/2 factor, which is 1.001 159 652 163 1. The positron g/2 factor is the negative of the electron g/2 factor, except there is subtracted from it a meso-electric term $(p+1)n_{p+1}\pi\alpha$, which for the positron equals -0.022 925 309. The g/2 factor for the positron is +0.978 234 343 041 2.

Putting it all together we have:

Table 5-4

Full particle approximation

Sub-particle	B	N	polynomial	energy factor	g/2 factor	sub-mass m/m_e	predicted m MeV	measured m MeV
Electron						1.001 159 65		
Positron						-0.978 234 34		
Bind. orbit	1	1	$2B^2/N\alpha^{N/B}$	1	+0.978 234 343	268.106 642		
Total						268.129 567	137.013 916	134.9766(06)

Outer binding orbit approximation

Sub-particle	B	N	polynomial	energy factor	g/2 factor	sub-mass m/m_e	predicted m MeV	measured m MeV
Bind. orbit	1	1	$2B^2/N\alpha^{N/B}$	1	+0.978 234 343	268.106 642	137.002 202	134.9766(06)

The predicted mass of the π^0 is nearly the same as the predicted mass for the $\pi^{\pm}$, despite different structures, and is slightly higher than it due to the influence of the intrinsic mass terms of the electron and the positron, which do not count in the mass calculation of the $\pi^{\pm}$. It is reasonable that our estimate of the $\pi^{\pm}$ should be a bit low, because we are omitting the l and m parameters from our calculations. The difference in the measured masses of the $\pi^{\pm}$ and π^0 is evidently due to different methods of measuring fermions and neutral bosons.

For the π^0 particle, the correct B parameter for the binding orbit is 1, like for the electron and positron sub-particles in the particle. (N is not a true parameter, because it is not independent of B.) Why should it not be 2 like the neutron binding orbit because of the Pauli Exclusion Principle? There is another parameter involved—mass—which is + for the electron, - for the positron, and 0 for the overall binding orbit. Those are all different, so the B value for all the π^0 sub-particles can be 1 without there being a Pauli Exclusion Principle violation. But in the neutron, the mass of uniton is 0, so the mass of binding orbit bears the same sign as that of the electron, which is a Pauli Exclusion Principle violation, if B stays 1 for all sub-particles in the neutron. Therefore we advance B to 2 in the neutron binding orbit.

A table of relative b or B and n or N is useful henceforth in this book:

Table 5-5

j	0	1	2	3	4	5	6	7
n	0	1	3	6	10	15	21	28
b	0	1	2	3	4	5	6	7

Both n and b increase with j. We know $n_j - n_{j\text{-}1}$ to be b_j.

$\boxed{\eta}$

$I^G(J^{PC}) = 0^+(0^{-+})$
Mass m = 547.853 ± 0.024 MeV

```
     η
    548.008 806  MeV
2   __|__
1   __|__
0   -+|+-

  1-1|0
     |
```

From the chonomic structure we see that there are four sub-particles in this particle. We have no gluons in this model to stick them together. We have only orbital bonds to hold them together. It takes three orbits to hold all the particles together—one orbit faster than the speed of light to hold the negative and positive spin electrons together, one orbit faster than the speed light to hold the negative and positive spin positrons together, and one orbit slower than the speed of light, where opposites attract and the meso-electric force prevails, to bond the electrons and positrons.

The four sub-particles in this particle all have different masses. The – spin electron has the negative of its g/2 factor for its mass $/m_e$. But what about the + spin electron? It would be very difficult to find its mass on the search engines. And if you could find it, it would be a very imprecise number. Fortunately, we can modify the electron g/2 factor to get the g/2 factor for the + spin electron. The + spin electron has the opposite magnetic moment of the – spin electron. Therefore, we can simply reverse the sign on the magnetic term of the electron g/2 factor to make a + spin electron g/2 factor. This is like adding 2 x 0.000 000 337 218 1 to -1.001 159 652 163 1 [3] to obtain -1.001 158 977 726 9 for the g/2 factor for the + spin electron. The negative of this in this case is the mass $/m_e$ of the + spin electron.

The mass $/m_e$ of the – spin positron is the negative of the g/2 factor of the positron (-0.978 234 343 041 2). Now the g/2 factor of the – spin positron can be modified for the + spin positron by reversing the magnetic term, which is like subtracting 2 x 0.000 000 337 218 1 from the positron g/2 factor. The mass $/m_e$ of the + spin positron is the negative of that resultant g/2 factor, or -0.978 233 668 605 0. We put these values in Table 5-6.

Now let us calculate the sub-masses for the three binding orbits in the η particle. The balancing equations for two of the three binding orbits for the η particle are derived already in Chapter 1.

Orbit 1 (negatively charged like particles)

$$\frac{1}{2}(m/1)v_o^2/r=(-e/1)^2\Big/4\pi\varepsilon_0\alpha^{(n/b)+1}r^2\ . \tag{5-6}$$

The spin relation is $r=n\hbar/b^2mc$. (5-7)

Polynomial 1 equals $2b^2/n\alpha^{n/b}$. (5-8)

There are no oppositely massed particles in this orbit. Therefore the kinetic energies in this orbit do not cancel out. The energy factor for this orbit is 3/2. The g/2 factor is that of the heaviest sub-particle—the electron—which is -1.001159 652 163 1.

Orbit 2 (positively charged like particles)

$$\frac{1}{2}(m/1)v_o^2/r=(+e/1)^2\Big/4\pi\varepsilon_0\alpha^{(n/b)+1}r^2\ . \tag{5-9}$$

The spin relation is $r=n\hbar/b^2mc$. (5-10)

Polynomial 2 equals $2b^2/n\alpha^{n/b}$. (5-11)

There are no oppositely massed particles in this orbit. Therefore the kinetic energies in this orbit do not cancel out. The energy factor for this orbit is 3/2. The g/2 factor is that of the heaviest sub-particle—the positron—which is +0.978 234 34.

Orbit 3 (oppositely charged particles with meso-electric force)

$$\frac{1}{2}(m/1)v_o^2/r=(--2e/1)(+2e/1)\Big/4\pi\varepsilon_0\alpha^{(n/b)+1}r^2\ . \tag{5-12}$$

The spin relation is $r=n\hbar/b^2mc$. (5-13)

Polynomial 3 equals $8b^2/n\alpha^{n/b}$. (5-14)

There are oppositely massed particles in this orbit. Therefore the kinetic energies in this orbit do cancel out. The potential energies add instead of cancel. Therefore the energy factor for this orbit is 1. The g/2 factor is that of the most positive sub-particle—the positron—which is +0.978 234 343 041 2.

Putting it all together we have:

Table 5-6

Full particle approximation

Sub-particle	b	n	polynomial	energy factor	g/2 factor	sub-mass m/m_e	predicted m MeV	measured [4] m MeV
- Spin Electron						1.001 159 65		
+Spin Electron						1.001 158 97		
-Spin Positron						-0.978 234 34		
+Spin Positron						-0.978 233 66		
Orbit 1	1	1	$2b^2/n\alpha^{n/b}$	3/2	-1.001 159 652 163 1	412.062 036		
Orbit 2	1	1	$2b^2/n\alpha^{n/b}$	3/2	0.978 234 343 041 2	-402.159 963		
Orbit 3	1	1	$8b^2/n\alpha^{n/b}$	1	0.978 234 343 041 2	1072.426 569		
Total						1082.374493	553.092 185	547.853(24)

Outer binding orbit approximation

Orbit 3	1	1	$8b^2/n\alpha^{n/b}$	1	0.978 234 343 041 2	1072.426 569	548.008 806	547.853(24)

.

$f_0(600)$
or σ

$I^G(J^{PC}) = 0^+(0^{++})$

Mass m = (400-1200) MeV

```
f0(400-1200)
  548.008 807 MeV
 2  __|_
 1  _|_
 0  o|o

   1-1|0
      |
```

Orbit 1 (oppositely charged particles with meso-electric force)

For reasons to be explained later, the balancing equation for this problem is:

$$\frac{1}{2}(m/1)v_0^2/r = (--2e/1)(+2e/1)\Big/4\pi\varepsilon_0\alpha^{(n/b)+1}r^2 . \quad (5\text{-}15)$$

The spin relation is $r = n^2\hbar/bmc$. (5-16)

Polynomial 1 equals $8b/n^2\alpha^{n/b}$. (5-17)

There are oppositely massed particles in this orbit. Therefore the kinetic energies in this orbit do cancel out. The potential energies add instead of cancel. Therefore the energy factor for this orbit is 1. The g/2 factor is that of the most positive sub-particle—the pion—which is +0.978 234 343 041 2.

Outer binding orbit approximation

Sub-particle	b	n	polynomial	energy factor	g/2 factor	sub-mass m/m_e	predicted m MeV	measured [4] m MeV
Orbit 1	1	1	$8b/n^2\alpha^{n/b}$.	1	0.978 234 343 041 2	1072.426 569	548.008 807	547.853(24)

Now a word is in order explaining why there are $2e/1$'s in the electric term instead of e/1's. Without the additional 2's, the balancing equation, energy factor, as well as the g/2 factor for the pion would be identical to that of the positron. That is not reasonable. The pion is much more massive than the positron. The pion is four quartons in the 1 fusion state. The electron is four quartons in the 2 fusion state. The 2 fusion state is lighter than the 1 fusion state. We need to modify the electric factor by a term for the fusion state of the whole particle. We could divide the electric terms only if we multiplied by a renormalizing constant 2. For the positron, you have $\left(2e/2\cdot 1\right)=\left(e/1\right)$. For the pion, you have $\left(2e/1\cdot 1\right)=\left(2e/1\right)$.

$\boxed{\rho(770)^{\pm}}$

$I^G(J^{PC}) = 1^+(1^{--})$
Mass m = 775.49 ± 0.34 MeV

```
          ρ+
 758.084 547 1 MeV
   2  _|__
   1  _|__
   0  -|o-

    1-1|-1
       |
```

The inner particles do not all cancel out in this case. There remains:

Intrinsic masses	m/m_e
Pion	274.389 246

Inner binding orbit

For reasons to be explained later, the balancing equation for this problem is:

$$1(m/1)v_0^2/r=(+e/1)(+2e/1)\Big/4\pi\varepsilon_0\alpha^{(n/b)+1}r^2 . \qquad (5\text{-}18)$$

The spin relation is $r=n^2\hbar/bmc$. (5-19)

Polynomial 1 equals $2b/n^2\alpha^{n/b}$. (5-17)

Energy factor 3/2

g/2 factor 0.978 234 343 041 2

Orbital mass $/m_e$ 1 402.159 963 4

Outer binding orbit

$$1(m/1)v_o^2/r = (--e/1)(+3e/1)\Big/4\pi\varepsilon_0\alpha^{(n/b)+1}r^2 \,. \qquad (5\text{-}18)$$

The spin relation is $r = n^2\hbar/bmc$. (5-19)

Polynomial 2 equals $3b/n^2\alpha^{n/b}$. (5-20)

Energy factor 2

g/2 factor 0.978 234 343 041 2

Orbital mass $/m_e$ 2 804.319 926 7

Total m/m_e 1480.869 136

m MeV ρ(770)$^\pm$ calculated	m MeV ρ(770)$^\pm$ measured [4]
756.722 514 4	775.49(34) Full width Γ = 149.4 ± 1.0 MeV

ρ(770)^0

$I^G(J^{PC}) = 1^+(1^{--})$-
Mass m = 775.49 ± 0.34 MeV (S = 1.8)

```
        ρ⁰
   1096.017 616 MeV
2     ___|__
1     ___|__
0     -o|o-

     1-1|-1
        |
```

Though this particle is balanced, it is a four body problem—necessitating a single body treatment instead of a two body treaetment.. All the intrinsic masses and inner orbital masses here will tend to cancel, leaving the outer binding orbit for mass approximation.

Outer binding orbit

$$1(m/1)v_{\mathrm{o}}^2/r = (--3e/1)(+3e/1)\Big/4\pi\varepsilon_0\alpha^{(n/b)+1}r^2 \;. \qquad (5\text{-}18)$$

The spin relation is $r = n^2\hbar/bmc$. (5-19)

Polynomial equals $9b/n^2\alpha^{n/b}$. (5-20)

Energy factor	2
g/2 factor	0.978 234 343 041 2
Orbital mass $/m_e$	2412.959 78

m MeV $\rho(770)^{\pm}$ calculated	m MeV $\rho(770)^{\pm}$ measured [4]
1233.019 818	775.49(34) Full width Γ = 149.4 ± 1.0 MeV

The measured mass is high for the $\rho(770)^{\pm}$ and low for the $\rho(770)^{0}$.

To be continued. Given time, the authors could continue to work on this book. But this book is about how you can do it yourselves. Many hands make light work. The work could be done quickly if apportioned out to many people.

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[1] Gordon L. Ziegler and Iris Irene Koch, "Prediction of the Masses of Every Particle, Step 1," **Galilean Electrodynamics**, Summer 2010, Vol. 21, SI No.3, pp. 43-49.

[2] Gordon L. Ziegler, *Advanced Electrino Physics* (http://www.benevolententerprises.org Book List.)

[3] G.L. Ziegler and I.I. Koch, "An Update on g/2 Factors," **Galilean Electrodynamics**, Summer 2010, Vol. 21, SI No. 3, pp. 50-55, .

[4] C. Amsler *et al.* (Particle Data Group), PL **B667**, 1 (2008) (URL: http://pdg.lbl.gov).

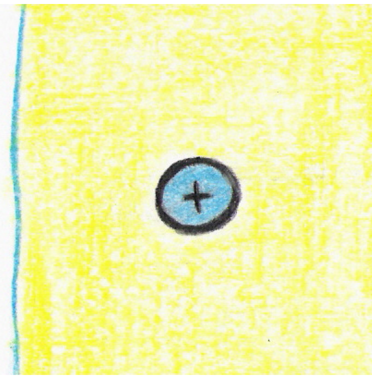

Figure 3. A uniton is a whole electrino. It is the core particle of protons and neutrons and is half of photons. They never come alone.

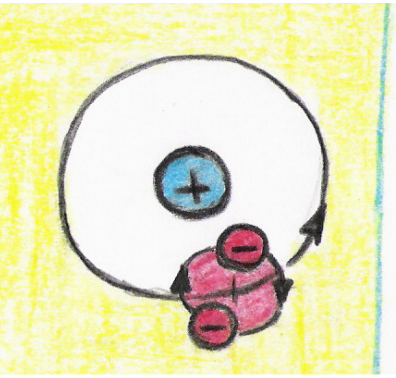

Figure 4. A neutron is a pair of orbiting semions orbiting about a uniton. The total charge is zero.

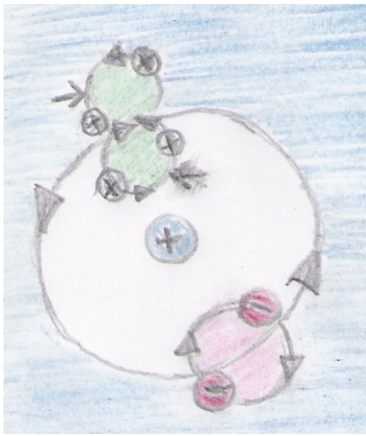

Figure 5. A proton is an electron and pion orbiting a uniton.

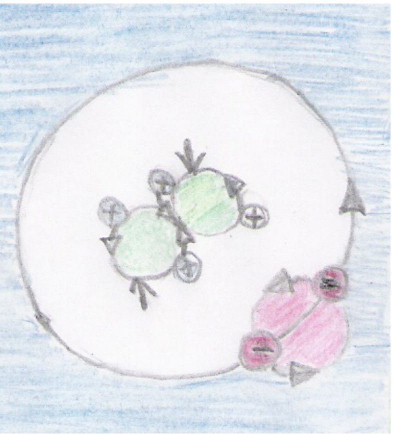

Figure 6. A neutrino is an an electron orbiting a pion, and traveling near c.