Advanced Electrino Physics

ELECTRON PION

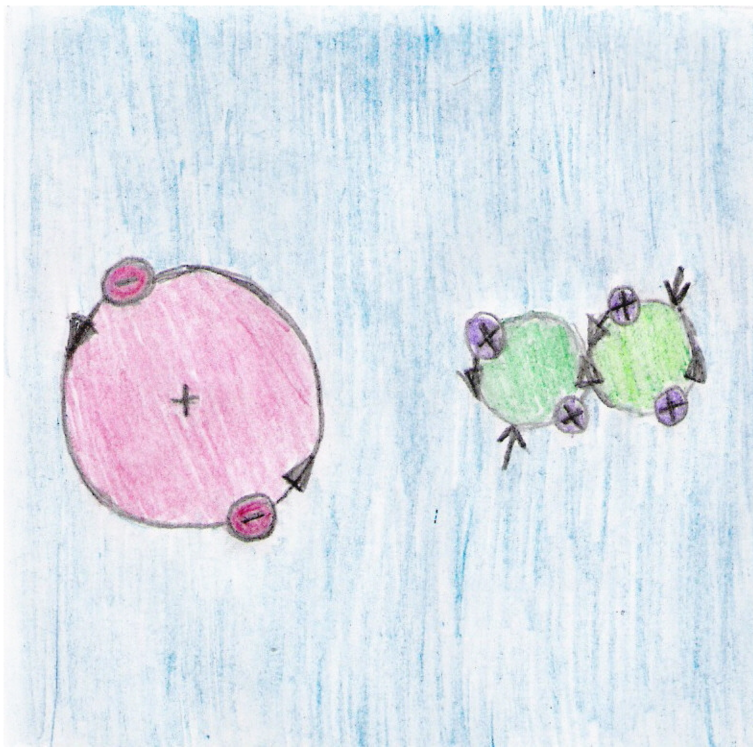

Figure 1. An electron is composed of two semions orbiting about each other.

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

by Gordon L. Ziegler

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. Other drawings in the book were done by Richard Cowley and Bruce Picket.

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PREFACE

Current models of physics, advanced as they are, cannot calculate the masses of elementary particles from first principles. The Electrino Fusion Model of Elementary Particles, however, is now at the stage when such calculations can be made. This book will calculate the masses of all the fundamental whole particles up to state 5, from which the masses of all other particles up to state 5 can be calculated

The models of the g/2 factors expressed in this book have undergone a radical transformation since when this book was first released. At first it was stated in the Preface that “there currently was not enough information available to construct a model of the g-forces of other particles” [than of electrons and muons]. Later in the book, however, was copied rudimentary estimates of most of the fundamental whole particle g/2 factors, upon which the calculation of other masses depend. The selection of g/2 factors, in previous editions, was not complete. And there were errors—indexing errors and sign errors—in the original g/2 factors. Every attempt will be made to get it complete and correct in this revised copy of this book.

CONTENTS

Chapter 1

FUSION OF QUARTONS

This book, *Advanced Electrino Physics*, continues the presentation of the material started in the book, *Electrino Physics*, but beyond the scope of that book. The first subject in that category is the fusion of quartons. While the author long believed that ionized quartons could fuse to semions, he did not know how to fuse bound quartons (as in pions, kaons, and D-ons), because those are zero spin particles and are bosons. They can go right through each other without colliding. Therefore they were not like positrons and electrons, of which the author theorized how to fuse the semions or anti-semions in them. The boson character of quarton systems presented a long insurmountable barrier in the author's mind to theorizing how to fuse quartons in bound systems.

The second crack in that barrier occurred as a result of conversations with Iris Koch, the author's sister, on the structure of pions. While ground state pions apparently have in them two quartons orbiting one way and two quartons orbiting the same way, and the two pairs of quartons orbiting the opposite way, we discussed a possible four-body state of the orbits being at right angles to each other, or other relative angles. We realized that pions, kaons, and D-ons could change relative orbit angles freely depending on energy state conditions.

The first crack in that barrier occurred years ago as a result of the author observing boson gravitons being ripped apart as the magnetic field in electrons tried to realign the orbits of the positrons and electrons in the gravitons, as seen in balancing decay schemes in chonomic equations for leptons.

On March 18, 2007, those ideas were put together in the author's mind. He first thought of realigning the quarton orbits in pions through a strong magnetic field. Seconds later he was impressed of doing it by means of a fast electron. He then looked in the 80th Edition of the *CRC Handbook of Chemistry and Physics*[1] to see if he could see any annihilation γγ decay modes for pions. He could see none. He could see none also for the D particle. But he found such a decay mode for kaons: $K^+ \rightarrow \pi^+\gamma\gamma$. He was at first surprised to see the π^+ particle in the decay products. But then he immediately saw that that π^+ did not come directly from the K^+ particle. It was the tag along left over particle with an electron in an unobserved electron neutrino colliding with the kaon. The electron was the active particle in the neutrino collision. First it realigned the orbits of the quartons in the kaon to make them fuse to two anti-semions in a positron. Second it annihilated with the resultant positron, leaving behind the left over pion. The pion in the reaction is a sure signature of the neutrino, proving this reaction did not occur naturally by other means.

Almost immediately the author thought of doing this artificially using high speed electrons rather than neutrinos. The electrons would be more controllable than neutrinos. In that case, $K^+ + e^- \rightarrow \gamma\gamma$. There would be no π^+ in this reaction. Using the skills taught in *Electrino Physics*[2] Chapter 10, Appendix A, and Appendix B, we can write chonomic equations for these two reactions:

Observed $K^+ \rightarrow \pi^+\gamma\gamma$.

```
                Collision,                   annihi-
  K+    νe >0i  fusion    γ       γ         lation     π+      γ       γ
493.. <0.0001 q.p.1      0       0         q.p.2     139..     0       0
  |       |      |        |       |           |          |       |       |
 ___     ___    ____     ___     ___      _________     ___     ___     ___
  |o  +   |   →  |    +   |   +   |   →       |      →   |   +   |   +   |
 ___     ___    ____     ___     ___      _________     ___     ___     ___
  |      -|o    -|o+     •|•     •|•       ••|••o        |o     •|•     •|•

 0|0     1|½    1|1    -1|-1    1|1    2-1|1          0|0     1|1   -1|-1
 ---     ---    ---    -----    ---      ----          ---     ---   -----
 0|0     ½|1    0|1      0|-1   0|1       0|1          1|1     0|1     0|-1
      |_________|       |_______________|
       unobserved          unobserved
        particle            particles
```

An unobserved high speed electron neutrino, with ½ħ positional-kinetic angular momentum, collides with a K^+. The magnetic field of the electron in the neutrino penetrates the K^+, which is made up of two orbiting pairs of quartons, and rotates the axes of the orbiting quartons to the same direction. The four quartons then fuse to two semions of a positron, which annihilates with the neutrino electron, leaving the neutrino π^+ and two oppositely directed energized pre-existing annihilaton photons (gammas).

Theorized $K^+ + e^- \rightarrow \gamma\gamma$.

```
                collision,                    annihi-
  K+        e-     fusion    γ        γ    lation      γ       γ
 493…     0.51…   q.p.1      0        0    q.p.2       0       0
 _|_       _|_     _|_      _|_      _|_    __|__     _|_     _|_
 _|o   +   _|_  →  _|_   +  _|_   +  _|_ →  __|__  →  _|_  +  _|_
  |        -|      -|+      •|•      •|•    ••|••     •|•     •|•

 0|0      0|-½     0|0     -1|-1    1|1   1-1|0       1|1    -1|-1
 ---      ----     ---     -----    ---   -----       ---    -----
 0|0      ½|0      0|0      0|-1    0|1     0|0       0|1      0|-1
                         |_____________|
                           unobserved
                            particles
```

An axial spin, high speed electron, with ½ħ positional-kinetic angular momentum, collides with a positive kaon. The magnetic field of the electron penetrates the kaon, which is made up of two orbiting pairs of quartons, and rotates the axes of the orbiting quartons to the same direction. The four quartons then fuse to two semions of a positron, which annihilates with the accelerated electron, leaving the oppositely directed energized pre-existing annihilation photons (gammas).

The first reaction is already observed and reported. This gives us confidence that the similar second reaction may take place as theorized. The reaction might be spin orientation sensitive. So the experimenter should not give up at a first failure. The end product is worth it. It could help relieve our energy crisis.

By targeting anti-kaons with positrons, similarly to above, fusions and annihilations would occur. By targeting anti-kaons with electrons, stable electrons would be produced by anti-quarton fusion. No annihilation would occur. Also, in either case, the second law of thermodynamics would be reversed by these reactions, if the repetition rate were kept down. This could be an alternate method to that reported in Chapter 16 of *Electrino Physics*[3] for reversing the order to disorder arrow in the second law of thermodynamics. This might be done at an existing large accelerator laboratory. This may infuse new interest in the accelerators.

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[1]SUMMARY TABLES OF PARTICLE PROPERTIES, January 1, 1998, Particle Data Group, as quoted by *CRC Handbook of Chemistry and Physics, 80th Edition*, David R. Lide, Editor-in Chief (Boca Raton: CRC Press, 1999), pp. **11**-1 to **11**-49.

[2]Gordon L. Ziegler, *Electrino Physics* (P.O. Box 1162, Olympia, WA 98507-1162 USA; e-mail: ben_ent100@msn.com: Book available for downloading free at http://some.sytes.net/BE/. Unpublished copies circulated by the author for $75.00 for book or $10.00 for CD, 2007) over 550 pages.

[3]*Ibid*.

Problem Set 1

1. What characteristic of quarton systems presented a long insurmountable barrier in the author's mind to theorizing how to fuse quartons in bound systems?

2. What is the second crack in that barrier that occurred?

3. What is the first crack in that barrier that occurred years ago?

4. How were those ideas put together in the author's mind?

5. Did the author find an annihilation natural decay for pions?

6. Why is that a tremendous blessing?

7. What quarton particle did the author find that did have a listed annihilation natural decay?

8. What unobserved particle is involved in the fusion of that particle.

9. What additional unobserved particles are involved in the annihilation of that resultant particle?

10. What value of positional-kinetic angular momentum occurs in the fusion of this particle that never occurred in any lepton decay in *Electrino Physics* Appendix A?

11. What values of positional-kinetic angular momentum occurred in lepton decay in *Electrino Physics* Appendix A?

12. In your opinion, is the value of positional-kinetic angular momentum in question 10 proper? Is it possible?

Why? Would any lower positive value of positional-kinetic angular momentum, other than zero, ever be observable?

13. The $K^+ \rightarrow \pi^+\gamma\gamma$ decay scheme occurs naturally. In this reaction, does the π^+ come from the K^+ directly, as by knocking the K^+ echon down to the lower energy state? Where does the π^+ in the above reaction come from?

14. What decay scheme do we hope can be induced artificially?

15. What would be the only observed products of such a reaction?

16. Why, even if the reaction worked, might it not work the first time it was tried?

17. How could stable electrons be produced by quarton fusion?

18. Would such a reaction reverse the order to order disorder arrow in the second law of thermodynamics?

19. Would this require a high repetition rate with a high beam current of anti-kaons, or a low repetition rate with a few anti-kaons?

20. What would undoubtedly occur in the public perception of accelerators if this latter reaction occurred?

Chapter 2

HARMONIZING PARTICLE SPINS

In early editions of *Electrino Physics*, Chapter 6, in Postulate 8 and later derivations for the electron in Section IIIA, the calculated spin of the electron is $\hbar$, whereas the traditional spin of the electron is $\hbar / 2$. The explanation in the model is that $\hbar$ is the total spin of the electron, whereas $\hbar / 2$ is the observable spin of the electron.

The difference between total spin and observable spin is due to the structure of the particles. All particles are mass singularities. However much spin there may be inside a mass singularity, the only amount of spin that is observable from a mass singularity is due to the fracton on the side from which the spin is measured traveling at the speed of light at the event horizon of the mass singularity. The observer can observe no velocity faster than the speed of light, so he can observe only the spin that can be communicated at the event horizon of the singularity. The actual velocity of the fracton electrinos in the singularity may greatly exceed the speed of light (see the next chapter), but the greatest spin sense observable from the singularity can only be communicated at the event horizon of the black hole. Also, the observer cannot see *through* the mass singularity to see the fracton electrino on the opposite side of the singularity. That electrino contributes to the total spin of the particle, but not to the observable spin of the particle. For semion systems, the total spin may range from $\hbar \, to \, \infty$ (see next chapter), but the observable spin is only always $\hbar / 2$, because only one semion is observable at a time, with an effective mass of half the particle, at the radius r, and traveling at the maximum of the speed of light.

In the case of electrons, the two semions actually travel at the speed of light in their orbit. But their system is a mass singularity. The observer can only observe the effect of one semion. Half the mass of the electron times the radius of the electron times the speed of light c equals $\hbar / 2$. That is the observable spin of the electron. The total spin of the electron takes into consideration the contributions of both semions. We have, then, two times half the mass of the electron, or the mass of the electron times the radius of the electron times the speed of light c equals $\hbar$.

For a muon, the semions actually orbit in the mass singularity at 11.7062 c (see next chapter, Section I). This makes the total spin for the muon equal to $11.7062\hbar$. But the observable spin of the muon (and all simple semion systems) again, as explained above, is just $\hbar / 2$. No matter what the energy state of the semion system, the observable spin is the same. This is the angular momentum that can be conveyed and transferred in particle collisions.

The spin dynamics of mass singularites are strange but simple. Mastering this bit of science will greatly help in the study of the rest of this book.

Problem Set 2

1. What is the total spin of the tauon?

2. What is the observable spin of the tauon?

Chapter 3

PREDICTED MASSES OF CHARGED LEPTONS

So as this book may prepare the way for the calculation of the masses of every known particle, and may predict so far undetected particles, this book will here repeat, under a new title, Chapter 21 of *Electrino Physics.*

A. Introduction

In early chapters of *Electrino Physics*, the idea was expressed that electrons, muons, and tauons were just energy states of one particle system—and similarly for pions, Kaons, and D-ons as well as other particle sets. The author thought to solve for the various energy states like Niels Bohr solved for the energy states in hydrogen in 1913.[1] Bohr's calculational framework has been very helpful as a guide to the author in solving for the velocities, radii, and masses of particles in elevated states. This chapter will calculate these things. However there are many significant differences in the calculations. These will be pointed out.

B. The Bohr Atom

Bohr's results followed from algebraic derivations from a few postulates:

"1. The electrons move in orbits restricted by the requirement that the angular momentum be an integral multiple of $h/2\pi$, that is, for circular orbits of radius r, the electron velocity v is restricted by

$$mvr = \frac{nh}{2\pi} \tag{3-1}$$

and furthermore the electrons in these orbits do not radiate in spite of their acceleration. They were said to be in stationary states."[2]

"2. Electrons can make discontinuous transitions from one allowed orbit to another, and the change in energy, E-E' will appear as radiation with frequency

$$\nu = \frac{E - E'}{h} \tag{3-2}$$

An atom may absorb radiation by having its electrons make a transition to a higher energy orbit."[3]

3. Bohr obtained another relevant calculational equation simply by balancing the Coulomb electric force against the centrifugal force.

$$\frac{kq_e^2}{r^2} = \frac{m_e v^2}{r}, \tag{3-3}$$

where $k = 1/(4\pi\varepsilon_0)$, and q_e is the charge of the electron.[4]

4. "The energy of an electron in an orbit is the sum of its kinetic and potential energies:

$$E = E_{kinetic} + E_{potential} \tag{3-4}$$

$$= \frac{1}{2}m_e v^2 - \frac{kq_e^2}{r}.\text{"}^5 \tag{3-5}$$

C. Electron Energy Levels in Hydrogen

Performing simple algebraic operations, Bohr was able to solve for the orbital velocity v, the radius r, and the energy E.

"To begin, multiply both sides of Eq (3-3) by r to see

$$\frac{kq_e^2}{r} = m_e v^2 . \tag{3-6}$$

The term on the left hand side is the potential energy. So the equation for the energy becomes

$$E = \frac{1}{2} m_e v^2 - \frac{kq_e^2}{r} = -\frac{1}{2} m_e v^2 . \tag{3-7}$$

Now we just need to figure out what the velocity, v is equal to, so solve Eq (3-1) for r,

$$r = \frac{n\hbar}{m_e v} . \tag{3-8}$$

Plug this into Eq (3-6),

$$kq_e^2 \frac{m_e v}{n\hbar} = m_e v^2 . \tag{3-9}$$

Then divide both sides by $m_e v$ to see

$$\frac{kq_e^2}{n\hbar} = v . \tag{3-10}$$

Now we can put in this value for v into the equation for energy, and then also plug in the values for k and ħ, and we'll obtain the energy of the different levels of hydrogen:

$$E_n = \frac{-1}{2} m_e \left(\frac{kq_e^2}{n\hbar} \right)^2 \tag{3-11}$$

$$= \frac{-1}{2} m_e \left(\frac{1}{4\pi\varepsilon_0} q_e^2 \frac{2\pi}{nh} \right)^2 \tag{3-12}$$

$$= \frac{-m_e q_e^4}{8h^2 \varepsilon_0^2} \frac{1}{n^2}. \tag{3-13}$$

Or, after substituting values for the constants,

$$E_n = \left(-13.6\ eV\right) \frac{1}{n^2}. \tag{3-14}$$

Thus, the lowest energy level of hydrogen (n = 1) is about -13.6 eV. The next energy level (n = 2) is -3.4 eV. The third (n = 3) is -1.51 eV, and so on. Note that these energies are less that zero, meaning that the electron is in a bound state with the proton. Positive energy states correspond to the ionized atom where the electron is no longer bound, but is in a scattering state."[6]

D. Three More Quantum Numbers

"Bohr had pictured the electron orbits around the atomic center as being perfectly circular, but this was too simple. There are very few perfect circles in nature, and orbits in atoms are no exception.

"Later, in 1916, the German physicist Arnold Sommerfeld refined Bohr's 'easy' picture with one a bit more complex. In this modified view the electron orbits were not circular, but elliptical. But there are many kinds of ellipses possible (certainly more than one), and this changed the calculations in subtle ways, as each ellipse has a slightly different angular momentum. To take account of the possibility of elliptical orbits, Sommerfeld introduced another number; the **orbital quantum number** (sometimes called the "angular momentum quantum number"), which usually had the symbol "L" [or "l"]. . . .

"Like the principal quantum number, the orbital quantum number can have values of 0, 1, 2, 3, 4, etc., but only up to a whole number value of one **less** than the electrons principal quantum number (i.e. up to a value of n – 1). . . .

"There are two more quantum numbers associated with each electron; the **magnetic quantum number** written as **m**, and the **spin quantum number**, written as **s**. . . .

"To make it easy to picture what is going on, the magnetic quantum number can be thought of as defining the amount of "tilt" there is to the orbit.

"The possible values for **m** follow the same rules as for **L**, except that negative numbers are now allowed (the "tilt" of the orbit can be either "up" or "down"). So for **n = 2**, the possible values for **m** would be 0, 1, or -1. . . .

"There are only two possible values for **s** [spin] for any value of **n**. These values are usually written as +1/2 and -1/2, meaning either a clockwise spin or an anticlockwise spin.

"But what do these numbers tell us about the electrons?

"Austrian physicist Wolfgang Pauli worked out the significance of these numbers in 1925. He suggested that no two electrons in any given atom could have exactly the same values for all four quantum numbers.

"This became known as the **Pauli exclusion principle – 'No two electrons in any atom may have the same set of quantum numbers'.**"[7]

E. Accuracies of the Models

The Neils Bohr Model was a close but not an exact fit to the measured data. The Sommerfeld Model of electron orbital ellipses, taking into account relativistic effects, gave a slightly better fit to the measured data. But as Thayer Watkins[8] demonstrates, no atomic structure model has a perfect fit to the measured data, and the Bohr Model is not much worse than the more advanced models. The fit is best between orbits of low quantum mechanical parameters n, and is worst between orbits of high quantum mechanical parameters n. At its best, the error can be as low as -0.01234 of 1%. But at its worst, the error can be at least as bad as -1.44546 of 1%.

These also are about the errors of the masses of charged leptons calculated in the next sections. Science has had 97 years to get the energies of the atom perfect, and has not done it. We should not hold back, therefore, until our model of energy states of semion orbits is perfect. We should publish a first cut mass model that is as close to the measured values as Bohr was to his measured values. The model we will advance in the next sections of the energies of semion orbits will be analogous to the Bohr model—not taking into account elliptical orbits, tilted orbits, or varying relativistic effects. There will be room for others to refine the model.

F. Differences of Semion Orbits with Electron Orbits

There are a number of differences between semion orbits and electron orbits:

1. Semions have e/2 charge. Electrons have whole e charge.
2. Each particle is a miniature black hole. The electron orbits as in Bohr's Model are exterior to black holes. The half charged particles called semions orbiting in charged leptons orbit inside black holes. This makes a difference in the force equation. The force for electrons in their orbit is $e^2/1 \cdot 4\pi\varepsilon_0\alpha^0 r^2$. The force on semions instead is $e^2/4 \cdot 4\pi\varepsilon_0\alpha^1 r^2$.
3. Semion orbits are a two body problem instead of a one body problem of electron orbits.
4. Semions orbit faster than the speed of light. Electrons orbit atoms slower than the speed of light.
5. The electron mass in the Bohr Model is the constant m_e. The semion mass in the outer non-relativistic frame is a variable.
6. Angular momentum in Bohr's atom is a function of n. But in our particles, the angular momentum is a function of not only n, but of 1/b.
7. Between the models, standing waves have coincidence under different conditions. Instead of $C = n\lambda$ for electron orbits, $bC = n\lambda$ for semion orbits.
8. It is relatively easy to ionize electrons from orbit. It is virtually impossible to ionize semions from orbit. It is as though the semions are contained in a speed of light boundary which they cannot pass.
9. Because the semion orbits, with the addition of the gravitational aether velocity v, are faster than the speed of light c, the electric force between the semions is reversed in sense, and the sign on the potential energy is changed.

G. Deriving Particle States

Deriving particle states is one orbital level deeper than deriving electron orbital states that Niels Bohr did. The calculations are similar, but significantly different. Instead of treating the situation as a one body problem, we must treat the situation as a two body problem, with two equal semions in orbit about each other. This introduces an extra ½ into the expression of the centrifugal force.

Instead of n standing waves λ working out even in one circumference C, as in Bohr's model of electron orbits, we allow n standing waves λ to work out even in b circumferences C. This intelligence yields the following equation:

$$bC = n\lambda \,. \qquad (3\text{-}15)$$

This reduces to

$$\lambda = \frac{bC}{n} = \frac{2\pi br}{n} \,. \qquad (3\text{-}16)$$

The energy of the particle system is reduced by 1/b.

$$E = \frac{h\nu}{b} = \frac{2\pi\hbar\,\nu}{b} = \frac{2\pi\hbar c}{b\lambda} = \frac{n\hbar c}{b^2 r} = mc^2 \,. \qquad (3\text{-}17)$$

By the last equation in the above chain of equations, we see

$$r = \frac{n\hbar}{b^2 mc} . \qquad (3\text{-}18)$$

To Eq. (3-18) we add the balancing of the force due to charge on the semions with the centrifugal force on the semions. The effective mass of a semion is half the mass of the whole particle in the outer non-relativistic frame.

We use this mass of the semion in the centrifugal force along with the ½ from the two body problem. The velocity v_o is greater than c, and must increase when the energy increases. In the electric type force side of the equation, the charge of the semion is e/2.

Different particle systems are in different order black holes. The force must depend on the order of black hole the particle system is in. Like the strong force and the electric force differ in strength by a power of 1/α, the forces in different orders of black holes differ by powers of 1/α. The electric type force expression, in the right side of Eq. (3-19), we expect to depend on a power of 1/α. To be in harmony with measured results and Eq. (3-16), we want the power of 1/α to be related to n/b. Also, we want the power for the electron to be such that the power of α is 1 when n = 0. We therefore take the power of α for electrons and higher charged leptons to be n/b + 1. Completing the balancing of forces equation, we have

$$\frac{1}{2}\frac{m}{2}\frac{v_o^2}{r} = \left(\frac{e}{2}\right)^2 \frac{1}{4\pi\varepsilon_0 \alpha^{(n/b)+1} r^2}. \qquad (3\text{-}19)$$

The first ½ in the equation is from the two body nature of the problem, converting it to a one body problem.

Thanks to the two body nature of the problem, all of the numeral constants in the above equation cancel out. $e^2/4\pi\varepsilon_0\alpha$ can be factored out as ħc. One r can cancel out of the two sides of the equation. The equation then looks like the following:

$$mv_o^2 = \frac{\hbar c}{\alpha^{n/b} r}. \qquad (3\text{-}20)$$

Combining Eq. (3-20) with Eq. (3-18), we can solve for v_o:

$$v_o^2 = \frac{b^2}{n\alpha^{n/b}} c^2, \tag{3-21}$$

$$v_o = \left(\frac{b^2}{n\alpha^{n/b}} \right)^{1/2} c. \tag{3-22}$$

H. Deriving Semion Orbit Energy Levels and Masses

We have solved for v_o in terms of our parameters n and b. We can now plug that formula into the relationship for particle energy to obtain the energy levels of semion orbits, and thus the particle masses. We could blindly continue to employ m in the equations, but it is our desire to solve for m in terms of m_e. We therefore take the special case of m_e in the following equations. The kinetic, potential, and total energies of the semion system can be expressed as

$$Energy_{total} = Energy_{kinetic} + Energy_{potential}. \tag{3-23}$$

$$m_T c^2 = +\frac{1}{2} m_e v_o^2 - \left\{ -\frac{b^2 m_e c^2}{n\alpha^{n/b}} \right\}, \tag{3-24}$$

where Eq. (3-18) is substituted for r in Eq. (3-20) to obtain the potential energy fraction in Eq. (3-24). Substituting Eq. (3-21), where appropriate, into Eq. (3-24), we obtain

$$m_T c^2 = +\frac{m_e}{2} \frac{b^2}{n\alpha^{n/b}} c^2 + \frac{b^2 m_e c^2}{n\alpha^{n/b}} \tag{3-25}$$

$$= \frac{3b^2}{2n\alpha^{n/b}} mc^2. \tag{3-26}$$

The measurable mass term of the semion system is

$$m_T = \frac{3b^2}{2n\alpha^{n/b}} m_e . \qquad (3\text{-}27)$$

The expression above in Eq. (3-27), derived from first principles, applies for a term in a series of terms for any charged lepton. But the mass of a particle equals that term plus a series of all previous terms back to that for the electron, where n and b equal zero (see Eq. (3-28)).

$$m_j = \left\{ \frac{3b_j^2}{2n_j\alpha^{n_j/b_j}} + \frac{3b_{j-1}^2}{2n_{j-1}\alpha^{n_{j-1}/b_{j-1}}} + \ldots + \frac{0}{0\alpha^{0/0}} \right\} m_e . \qquad (3\text{-}28)$$

The right most term in Eq. (3-28) is defined as 1.0.

To calculate this in general, we must have a definition of n, b, and j:

j	0	1	2	3	4	5 . . . .
n	0	1	3	6	10	15 . . . .
b	0	1	2	3	4	5 . . . .

Table 3-1

The first three n and b are tested. Higher n and b are calculated. We expect both n and b to increase with j. We expect $n_j - (n_{j-1})$ to be b_j.

Finally, just as the mass is a series of terms, all other force terms are added by multiplying by half the g-factor for the given particle. For the muon, the net mass is the sum of the terms according to Eq. (3-28) times half the g factor for the muon, or 206.5539 m_e times $|g_\mu/2|$, or

206.5539 m_e |-1.001 165 919 8|, equals 206.7948. . . m_e, which is 1.000128 times the measured amount, 206.768262 m_e. That is 0.0128 of 1% error, which is almost the same error as the most accurate comparison of the theoretical Bohr Model of orbital differences to the measured values for orbital electrons. With what data we have to work with, our model is quite accurate.

There are only two usable g/2 factors that are available that are measured which can be used in calculating masses—for the electron and the muon. Fortunately, the tie is close enough between particle masses and particle g/2 factors that calculated g/2 factors can be tested by the measured masses of the particles. We will begin employing calculated g/2 factors in this and the next two chapters.

I. Fathoming the Orbital Velocities

Let us name the electron e_0, the muon e_1, and the tauon e_2. Then, for those particles and higher particles, Eq. (3-22) solves for the orbital semion velocities v_o:

Particle	Semion Orbital Velocity v_o
e_0	1.0000 c
e_1	11.7062 c
e_2	46.2480 c
e_3	167.8300 c
e_4	593.0600 c
e_5	2070.9000 c

Table 3-2

Compared to Einstein's Special Theory of Relativity, these are very high velocities. But these are velocities in a black hole. Velocities in a black hole should have no limit.

Gravity escapes the bounds of a black hole, and communicates the sense of the mass of the black hole.

J. Theorizing the Radii of Semion Orbits

This model also theorizes the radii of the semion orbits in charged leptons:

Particle	Radius of Semion Orbit r
e_0	1.0 ħ/mc
e_1	1.0 ħ/mc
e_2	3/4 ħ/mc
e_3	6/9 ħ/mc
e_4	10/16 ħ/mc
e_5	15/25 ħ/mc,

where m is the mass of the given charged lepton—not just the mass of the electron.

Table 3-3

K. Predicted Masses of Charged Leptons

This model theorizes and predicts the masses of any charged leptons where the particles do not stir up pair production. In that case, the mass basis is calculated from which the effects of pair production are subtracted.

Charged Lepton	Mass Term (times m_e)	Predicted Mass	Measured Mass[9]
e_0	1.000 000	1.000 000	1.000 000
e_1	205.553 998	206.793 657	206.768 262
e_2	3 208.351 955	3 418.859 771	3 477
e_3	42 252.446 72	45 720.562 03	
e_4	527 591.661 1	573 928.381 1	

Table 3-4

This model does not predict a limited number of charged leptons (which we now observe). It predicts an infinite number of charged leptons, the next two of which are e_3 and e_4 in the above table.

The calculations in this chapter are for charged leptons. Similar calculations could be made for the quartons in the pion family. Other particle sets could be calculated by taking into account the Chonomic structures of the given particles. All the fundamental whole particles up to state 5 are calculated in the next chapter, from which all other particles up to state 5 may be calculated. Accompanying the calculation of fundamental masses in Chapter 4, is the calculation of the associated fundamental g/2 factors in Chapter 5. Because of pair production, only the particle masses of charged leptons up to tauons will correspond closely to the calculated values. But the calculated values of higher state particles could be useful as bases for subtracting the effects of pair production from them.

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[1]Stephen Gasiorowicz, *Quantum Physics* (New York: John Wiley & Sons, 1974), p. 15.

[2]*Ibid*.

[3]*Ibid*.

[4]"Bohr model," *Wikipedia*, the free encyclopedia, http://en.wikipedia.org/wiki/Bohr_model.

[5]*Ibid*.

[6]*Ibid*.

[7]Professor John Blamire, "Atomic Structure—The mystery of . . .—. . .the quantum atom," Exploring Life @

BIOdotEDU, http://www.brooklyn.cuny.edu/bc/ahp/LAD/C3/C3_elecPos_02.html.

[8]Thayer Watkins, "The Relativistic Bohr Model of a Hydrogen-like Atom," applet-magic.com: Silicon Valley, Tornado Alley & BB Island USA, http://www.applet-magic.com/relabohr.htm.

[9]*CRC Handbook of Chemistry and Physics*, 80th Edition, 1999-2000 (Boca Ratan: CRC Press, 1999), pp, **1**-4, **11**-3.

Problem Set 3

1. How many quantum numbers are there in the Electrino Model of mass calculations of charged leptons?

2. Does the author's model account for elliptical or tilted orbits?

3. How accurate is the author's prediction of the mass of the muon?

4. Why is the author's prediction of the mass of the tauon so inaccurate?

5. What charge do semions have?

6. What is the main difference between the force of electrons in their orbit and the force of semions in their orbit?

7. How many body problem are semions in orbit?

8. Do semions orbit slower than the speed of light or faster than the speed of light?

9. Do charged lepton semion orbital velocities follow Einstein's Special Theory of Relativity?

10. What difference in the mass is there between Bohr's Model and the author's model?

11. What different rule for the coincidence of standing waves in the particle does the author's model have as compared to Bohr's Model?

12. Are semions easy to ionize?

13. What reverses the sense of the potential energy in semion orbits?

14. What evidence is there that the mass in Eq. (3-18) is the overall mass of the charged lepton, not just the mass of the electron?

15. What forces are being balanced in Eq. (3-19)?

16. What factor occurs in the mass calculations due to both the kinetic and potential energies being positive?

17. What mass term for the charged lepton is derived from first principles?

18. How is that mass used in the calculation of the total mass of the particle?

19. What is n as a function of j? What is b as a function of j?

20. The Electrino Fusion Model of Elementary Particles predicts there will be how many different kinds of charged leptons in all?

21. This is a free question: Did you imagine that v_o should be so much above the speed of light for particles above electrons?

22. This is a free question: Are the radii of semion orbits a function of α? How?

Chapter 4

PREDICTION OF THE MASSES OF EVERY PARTICLE, STEP 1, REVISED

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PREFACE

The masses of charged leptons, anti-charged leptons, the pion family, the anti-pion family, the neutron family, and the anti-neutron family are here calculated to state 5, and the way is thereby paved for the calculation of the masses of every known particle. This feat is not possible in the Quark Model, the Standard Model, the String Theory, or the Many-Dimensional Theory. It is possible only with the 'Electrino Hypothesis' that fractional charges come in $\pm e$, $\pm e/2$, $\pm e/4$, and $\pm e/8$, not the Quark Hypothesis that fractional charges come in $\pm 2e/3$ and $\pm e/3$. This electrino hypothesis is the basis for the far-reaching theory 'Electrino Fusion Model of Elementary Particles'. All that is used in this paper is the Electrino Hypothesis and algebra. All calculations are for either two-body problems or single-body problems. All particle bonds are seen to be orbital bonds.

The derivation from first principles of the masses of six infinities of particles in this paper is a great test of the Electrino Fusion Model of Elementary Particles. Additional experimental tests for the Electrino Hypothesis are referenced in this chapter also.

In the theory here set forth, electrinos (octons, quartons, semions, unitons, and their anti-particles) are all trapped at or faster than the speed of light and cannot go slower than the speed of light, so cannot be detected directly. Therefore the basis of the theory is more mathematical than physical, derived from first principles. Yet the model makes many physical predictions—the masses of many known particles (below state 4) and calculates the basis of particles above that from which the masses are determined by subtracting out the effects of pair production. They are all predicted to two to four place accuracies.

1. Introduction

The masses of particles cannot be calculated in the Quark Model, The Standard Model, the String Theory, or the Many-Dimensional Theory. This is not that the physicists have not yet figured out how to do the calculations in these models. Rather, it is because the calculations are impossible in these models. But it is possible to do them in a new Theory of Particle Physics—The Electrino Fusion Model of Elementary Particles. That feat is accomplished in the present chapter and Chapter 5, without tensors, matrices, Hamiltonians, Schrödinger's Equation, Isospin and many other advanced mathematical tools and concepts. This paper will use only algebra and the Electrino Hypothesis, which says that fractional charged particles come in $\pm e$, $\pm e/2$, $\pm e/4$, and $\pm e/8$, not in the $\pm 2e/3$ and $\pm e/3$ of the Quark Hypothesis.

The next thing to consider is that every known particle (except photons) can be constructed with various states of electrons, positrons, various states of pions, anti-pions, various states of neutrons, anti-neutrons and various combinations of those particles. Because in the new theory there is a postulate that smooth symmetrical particles 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, various states of pions, and various states of neutrons, and their anti-particles, 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 every known particle—which is precisely what we intend to do in this series of books and papers.

We first derived the prediction of the masses of charged leptons in [1]. That paper discussed the historical relationship to the Bohr's atom, and gave a list of the differences in the calculations. Here we attempt to abbreviate those calculations to facilitate understanding. In this chapter we take a different approach than in the last chapter. In the last chapter we took into account only one or two exponential polynomials characteristic per particle to calculate the masses of the particles. In this chapter, we take into account every sub-particle and every binding orbit in the calculation of the masses of the particles. In this chapter, the sub-particles are all electrinos—semions and quartons. When considered apart from their orbits, they amount to at rest. And at rest they have zero mass. They have mass only in their orbits. Thus the sub-particles do not add any mass to the binding orbits. Thus the method amounts to the same as the historical method.

2. ELECTRON FAMILY CALCULATIONS

Particle states are one orbital level deeper than the electron orbital states that Niels Bohr derived. The calculations are similar, but significantly different. Instead of treating the situation as a one-body problem, we must treat the situation as a two-body problem, with two equal semions in orbit about each other. This introduces an extra ½ into the expression of the centrifugal force.

The proper spin relation for each particle family type is obtained by postulate (see Gordon L. Ziegler and Iris I. Koch, *Prediction of the Masses of Every Known Particle (as of 2008), Step 2, Part* 1 (http://benevolententerprises.org Book List) Chapter 1. It is easiest to derive the appropriate spin relation in stages. First there is what we may call the default spin relation, which may be calculated as follows

$$C = n\lambda \quad . \tag{4-1}$$

This reduces to

$$\lambda = C / n = 2\pi r / n \ . \tag{4-2}$$

The energy of the particle system solves as

$$E = h\nu = 2\pi\hbar\nu = 2\pi\hbar c / \lambda = n\hbar c / r = mc^2 \quad . \tag{4-3}$$

From the last equation in the above chain of equations, we see

$$r = n\hbar / mc \quad . \tag{4-4}$$

This we can take as a kind of default value of the spin relation for particles. But this calculates significantly too low mass values for the electron family members, requiring too much space warp and mass increase to renormalize the masses to the measured values. We need a modified spin relation for the electron family. While we could guess an infinite number of possible equations, the restraints on the equation are such that only one qualifies for the electron family. For the ideal nominal spin relation for the electron family, the equation should be in integral terms of powers of b and n, the relation should calculate mass values less than the measured values, but as high as possible. The calculations entail subsequent material. But the ideal nominal spin relation for electron family members is:

$$r = n\hbar / b^2 mc \tag{4-4a}$$

To Eq. (4-4a) (the nominal spin relation) we add the balancing of the force due to charge on the semions with the centrifugal force on the semions. The effective mass of a semion is half the mass of the whole particle in the outer non-relativistic frame. We use this mass of the semion in the centrifugal force along with the $1/2$ from the two-body problem. The speed v_0 is greater than c, and must increase when the energy increases. In the electric force side of the equation, the charge of the semion is $e/2$.

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=5), 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

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

The first $1/2$ in the equation is from the two-body nature of the problem, converting it to a one-body problem. The second $1/2$ in the equation is for the semion mass.

The numeral constants in the above equation cancel out. 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:

$$mv_o^2 = \hbar c/\alpha^{n/b}r \quad . \qquad (4\text{-}6)$$

Combining Eq. (4-6) with Eq. (4-4), we can solve for v_o:

$$v_o^2 = (b^2/n\alpha^{n/b})c^2 \quad , \qquad (4\text{-}7)$$

$$v_o = \sqrt{b^2/n\alpha^{n/b}}\,c \quad . \qquad (4\text{-}8)$$

3. DERIVING SEMION ORBIT ENERGY LEVELS AND MASSES

We have solved for v_o in terms of our parameters n and b which we can insert in energy Eq. (4-10). The mass m_T in Eq. (4-10) below, and subsequent calculated masses, depend on v_o, but m does not increase with v_o as in relativity. This is a non-relativistic calculation, and $m \equiv m_e$. The other parameters are not interchangeable, but come in matched sets of subscript j. Thus kinetic, potential, and total energies of the semion system can be expressed as

$$\text{Energy}_{\text{total}} = \text{Energy}_{\text{kinetic}} + \text{Energy}_{\text{potential}} \,. \qquad (4\text{-}9)$$

$$m_{\mathrm{T}}c^2 = +\tfrac{1}{2}m_{\mathrm{e}}v_o^2 - \left(-b^2 m_{\mathrm{e}}c^2 \big/ n\alpha^{n/b}\right) \tag{4-10}$$

where Eq. (4-4a) is substituted for r in Eq. (4-6) to obtain the potential energy fraction in Eq. (4-10). Substituting Eq. (4-7), where appropriate, into Eq. (4-10), we obtain

$$m_{\mathrm{T}}c^2 = +\frac{m_{\mathrm{e}}}{2}\left(b^2 \big/ n\alpha^{n/b}\right)c^2 + \left(b^2 m_{\mathrm{e}}c^2 \big/ n\alpha^{n/b}\right) \tag{4-11}$$

$$= \left(3b^2 \big/ 2n\alpha^{n/b}\right)m_{\mathrm{e}}c^2 \tag{4-12}$$

Eq. (4-12) calculates a term of mass in a charged lepton (not counting the $g/2$-factor).

$$m_{\mathrm{m}} = \left(3b^2 \big/ 2n\alpha^{n/b}\right)m_{\mathrm{e}} \quad .$$

Mass is a volume thing, and must be integrated from $r = r_j$ to $r \to \infty$ in discrete terms. The expression above in Eq. (4-12), derived from first principles, applies for such a term (not counting the $g/2$-factor) in a series of terms for any charged lepton. The zeroth term must be defined as m_{e} [see Eqs. (4-13, 4-14)].

$$m = \left\{ \frac{3b^2 m_{\mathrm{e}}}{2n_j\alpha^{n_j/b_j}} + \frac{3b^2 m_{\mathrm{e}}}{2n_{j-1}\alpha^{n_{j-1}/b_{j-1}}} + \ldots + m_{\mathrm{e}} \right\} \tag{4-13}$$

$$m = m_j + m_{j-1} + m_{j-2} + \ldots + m_{\mathrm{e}} \quad . \tag{4-14}$$

For the electron, $m = m_{\mathrm{e}}$. For the muon, there is one term besides the electron, where $b_j = 1$. For the tauon, there are two terms beside the electron, *etc*.

To calculate this in general, we must have a definition of n, b, and j. From the paragraph above Eq. (4-5), we have

j	0	1	2	3	4	5	...
n	0	1	3	6	10	15	...
b	0	1	2	3	4	5	...

Table 4-1

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

Finally, just as the mass is a series of terms, all other force terms are added by multiplying by half the g-factor for the given particle. For the muon, the net mass is the sum of the terms according to Eq. (4-14) times half the g-factor for the muon, or $206.553\,9995 \times m_{\text{e}}$ times $|\, g_{\mu} / 2 \,|$, or $206.553\,9995 \times m_{\text{e}}$ times $|-1.001\,165\,9207$ [2], equals $206.794825 \times m_{\text{e}}$, which is 1.000128 times the measured amount, $206.768\,2823(52) \times m_{\text{e}}$ [2]. That is 0.0128 of 1% error, which is almost the same error as the most accurate comparison of the theoretical Bohr Model of orbital differences to the measured values for orbital electrons. [3] With what data we have to work with, our model is quite accurate.

4. FATHOMING THE ORBITAL VELOCITIES

Let us name the electron e_0, the muon e_1, and the tauon e_2. Then, for those particles, and higher particles, Eq. (4-8) solves for the semion orbital speeds v_{o}:

particle →	e_0	e_1	e_2	e_3	e_4	e_5
semion orbit						
speed $v_o\ / \ c$	1.0000	11.7062	46.2482	167.8341	593.0664	2070.9822

Table 4-2

In Einstein's Special Relativity Theory, these are very high speeds!

5. THEORETICAL RADII OF SEMION ORBITS

This model also predicts the radii of the semion orbits in charged leptons:

particle →	e_0	e_1	e_2	e_3	e_4	e_5
semion orbit						
radius $r_0 \times mc / \hbar$	1.0	1.0	$3/4$	$6/9$	$10/16$	$15/25$

Table 4-3

where m is the mass of the given charged lepton—not just the mass of the electron.

6. PREDICTED MASSES OF CHARGED LEPTONS

This model predicts the masses of any charged leptons below state 4. Above state 3 the model predicts bases, from which are subtracted the influence of pair production—to obtain the observed mass of the particles. Five calculated values are given in the next Table. The first three (e_0 through e_2) have been measured already. The remaining two are bases predictions that can be used for further calculations. In the Table, measured $g/2$ factors are from reference [2] adapted; predicted $g/2$-factors are from the next chapter. The measured g/2-factors have error terms. The calculated do not.

charged lepton	b	n	predicted $3b^2 / 2n\alpha^{n/b}$	predicted m / m_e less g/2-factor	meas. or calc. g/2-factor
e_0	0	0	included	included	included
e_1	1	1	205.553 999	206.553 999	-1.001 165 920 7(06)
e_2	2	3	3,208.351 955	3,414.905 954	-1.001 157 653 130 0
e_3	3	6	42,252.446 73	45,667.352 68	-1.001 165 744 339 1
e_4	4	10	527,591.661 1	573,259.013 8	-1.001 167 869 438 8

Table 4-4

charged lepton	b	n	predicted m / m_e	measured m / m_e [8]
e_0	0	0	1.000 000 000	1.000 000 000
e_1	1	1	206.794 824	206.768 28
e_2	2	3	3,418.859 23	3,477
e_3	3	6	45,720.589 12	
e_4	4	10	573,928.505 2	

Table 4-5

This model does not predict that the number of charged leptons is limited (corresponding to what we now observe). It predicts an infinite number of charged leptons, the next two of which are e_3 and e_4 in the above Table.

7. MASSES OF THE POSITRON FAMILY

The positron family g/2 factors are the charge conjugates of the electron family g/2 factors, except they have additional terms for the meso-electric force. Otherwise, the mass tables for the positron family are the same as the mass tables for the electron family. We will denote the positron as $-e_0$.

charged lepton	b	n	predicted $3b^2/2n\alpha^{n/b}$	predicted m/m_e less g/2-factor	meas. or calc. g/2-factor
$-e_0$	0	0	1.000 000 000	1.000 000 000	+1.001 159 652 163 3
$-e_1$	1	1	205.553 999	206.553 999	+0.978 240 603 367 5
$-e_2$	2	3	3,208.351 955	3,414.905 954	+0.863 605 798 397 4
$-e_3$	3	6	42,252.446 73	45,667.352 68	+0.588 510 179 140 9
$-e_4$	4	10	527,591.661 1	573,259.013 8	+0.084 145 509 583 9

Table 4-6

charged lepton	b	n	predicted m/m_e	measured m/m_e [8] assumed from charge conjugance
$-e_0$	0	0	-1.001 159 652	-1.0
$-e_1$	1	1	-202.059 508 6	-206
$-e_2$	2	3	-2,949.132 583	-3,477
$-e_3$	3	6	-26,875.701 90	
$-e_4$	4	10	-48 237.171 84	

Table 4-7

8. NEW CALCULATIONAL TOOL

We wish to employ a new tool, never employed by the authors before. We wish to use it first with the electron. With the electron, semions orbit at c in the non-relativistic frame, and also orbit at c in the relativistic frame. In the non-relativistic frame, electrons also have a very small radial aether velocity v, and a radial aether speed c in the relativistic frame. Until now, the authors did not know how to calculate v, or know what it was. But v^2 is related to c^2 by the inverse square of the outer radius r_e, as compared to the inner radius R_0. In other words,

$$v^2 = -c^2 R_0^2 \big/ r_e^2 \qquad (4\text{-}15)$$

What about higher members of the electron family? The orbital velocity squared v_{0j}^2 of the innermost mass term of an electron family member in the inner relativistic frame is

$$v_{0j}^2 = \left(b^2 / n\alpha^{n/b}\right) c^2 \quad . \tag{4-16}$$

The orbital velocity squared in the innermost mass term of an electron family member in the outer non-relativistic frame is apparently the same. In fact, the inward and outward aether velocity squared at the surface of the orbit in the relativistic frame for the innermost mass term is apparently the same. The v^2 from the non-relativistic frame is yet to be determined. Let us try the inverse square relationship discovered above for the electron.

$$v_{rj}^2 = \frac{b_j^2\, c^2}{n_j \alpha^{n_j/b_j}} \frac{(-)R_0^2 n_j \alpha^{n_j/b_j}}{b_j^2} \frac{1}{r_j^2} = -\frac{c^2\, R_0^2}{r_j^2} . \tag{4-17}$$

The radial aether velocity in the relativistic frame is affected by the increased mass, as is also the radius in the relativistic frame, but the radial velocity of the aether in the non-relativistic frame calculates simply with c, R_0, and r_j in Eq. (4-17). The radius r_j and velocity v_{rj} are different in each shell of mass. Therefore only an effective total aether velocity is associated with an effective radius of the whole particle.

Eqs. (4-15, 4-17) give us a new v^2 to solve gravitational problems with. We equate it to the v^2 in the relativistic approximation of the escape velocity:

$$v^2 = GM / r = -c^2 R_0^2 / r^2 \tag{4-18}$$

$$Mr = -c^2 R_0^2 \big/ G = -c^2 (-\hbar G) \big/ G c^3 = \hbar / c \quad .(4\text{-}19)$$

This is another important identity in particle physics.

We have now calculated from first principles the masses of e_3 and e_4—as yet undetected particles—as well as the electron, muon, and tauon. We could do the same for more particles. We turn now to the second portion of the calculation from first principles of the masses of every particle—the calculation of the masses of the pion family.

9. PION FAMILY CALCULATIONS

The first thing to consider in calculating the masses of the members of the pion family is the pion family calculations are very different from the electron family calculations. The electron family member has only one orbit of half particles (semions). A pion family member has three orbits in it—one of two fourth charges (quartons) orbiting one way, one of two other quartons orbiting the same way, and one of the two pairs of quartons (similar to semions) orbiting the opposite way.

The next thing to do is to calculate the velocity and velocity squared of each of the three orbits and a composite velocity for the whole system. Now let us repeat the calculation of the electron family members, making the changes necessary for the pion. Following the least action type calculations similar to what we did for the spin relation for the electron family, we find that whereas the spin relation was $r = n\hbar / mv$ for electrons orbiting atoms and $r = n\hbar / b^2 mc$ for the electron family of particles, the pion family has the spin relation $r = n^2 \hbar / bmc$. Therefore we take $bC = n^2 \lambda$ for the pion family members. This reduces to

$$\lambda = bC / n^2 = 2\pi br / n^2 . \qquad (4\text{-}20)$$

The energy of the particle system solves for

$$E = h\nu = 2\pi\hbar\nu = 2\pi\hbar c/\lambda = n^2\hbar c/br = mc^2 \quad . \qquad (4\text{-}21)$$

By the last equation in the above chain of equations, we see

$$r = n^2\hbar/bmc \quad . \qquad (4\text{-}22)$$

To Eq. (4-22) we add the balancing of the force due to charge on the quartons with the centrifugal force on the quartons. The effective mass of a quarton is one fourth of the mass of the whole particle in the outer non-relativistic frame. We use this mass of the quarton in the centrifugal force along with the $1/2$ from the two-body problem. The velocity v_o is greater than c, and must increase when the energy increases. In the electric type force side of the equation, the charge of the quarton is $e/4$.

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. (4-23), 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 singularity). 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

$$\frac{1}{2}\frac{m}{4}\frac{v_o^2}{r} = (e/4)^2 \Big/ 4\pi\varepsilon_0\alpha^{(n/b)+1}r^2 \quad . \tag{4-23}$$

The $1/2$ in the equation is from the two-body nature of the problem, converting it to a one-body problem. The first $1/4$ in the equation is for the quarton non-relativistic effective mass.

Some of the numeral constants in the above equation cancel out. 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:

$$mv_o^2 = \hbar c/2\alpha^{n/b}r, \; where \; v_o > c \quad \text{or} \quad n, b > 0 \quad . \tag{4-24}$$

Combining Eq. (4-24) with Eq. (4-22), we can solve for v_o:

$$v_o^2 = (b/2n^2\alpha^{n/b})c^2 \quad , \quad b, n > 0 \quad , \tag{4-25}$$

$$v_o = \sqrt{b/2n^2\alpha^{n/b}}\, c \quad , \quad b, n > 0 \quad . \tag{4-26}$$

Both inner quarton orbits in pion family members have Eqs. (4-25, 4-26) as the solutions of the velocity and velocity squared for those orbits. Now let us determine the orbital velocity and velocity squared of the overall orbits of quarton pairs in the pion family members. We will use Eq. (4-22) again. But Eq. (4-23) is modified to Eq. (4-27).

$$\frac{1}{2}\frac{m}{2}\frac{v_o^2}{r} = (e/2)^2 \Big/ 4\pi\varepsilon_0\alpha^{(n/b)+1}r^2 \tag{4-27}$$

Reducing Eq. (4-27) similar to Eq. (4-23) and combining with Eq. (4-22) yields

$$v_{\mathrm{o}}^2 = (b/n^2\alpha^{n/b})c^2 \quad , \quad b,\ n > 0 \tag{4-28}$$

$$v_{\mathrm{o}} = \sqrt{b/n^2\alpha^{n/b}}\,c \quad , \quad b,\ n > 0 \tag{4-29}$$

This is the velocity and velocity squared of the overall orbits of the quarton pairs in the pion family members.

Now we need to arrive at a composite orbital velocity and velocity squared for the whole quarton system. Since the centers of the two quarton orbits orbit at right angles to the velocities of the quarton orbits at those points, we can treat the velocities at right angles to each other, and add the squares of the velocities to obtain the total v_{T}^2. The velocities squared of the inner quarton orbits are each half the magnitude of the velocity squared of the overall orbit. The sum of the square of the three velocities, then, is

$$v_{\mathrm{T}}^2 = (2b/n^2\alpha^{n/b})c^2 \quad , \quad b,\ n > 0 \tag{4-30}$$

$$v_{\mathrm{T}} = \sqrt{2}\,\sqrt{b/n^2\alpha^{n/b}}\,c \quad , \quad b,\ n > 0 \tag{4-31}$$

10. DERIVING PION FAMILY ENERGY LEVELS AND MASSES

We have solved for v_{T} in terms of our parameters n and b which we can insert in energy Eq. (4-34). The mass m in Eq. (4-33) and subsequent calculated masses depend on v_{T}, but m_v (the mass multiplying v_{o}^2 in the calculations) does not increase with v_{o} as in relativity. This is a non-relativistic calculation, and $m_v = m_{\mathrm{e}}$. [See Eq. (4-34).] The other parameters are not interchangeable, but come in matched sets of subscript j. Thus kinetic, potential, and total energies of the semion system can be expressed as

$$\text{Energy}_{\text{total}} = \text{Energy}_{\text{kinetic}} + \text{Energy}_{\text{potential}} \qquad (4\text{-}32)$$

Though we have already calculated v_{T}^2, and can insert that in Eq. (4-34), it is interesting to see equivalent calculations in terms of the potential energy of the overall orbit of quarton pairs:

$$\frac{1}{4}E_{\mathrm{p}} + \frac{1}{4}E_{\mathrm{p}} - \frac{1}{2}E_{\mathrm{p}} + \frac{1}{2}E_{\mathrm{p}} + \frac{1}{2}E_{\mathrm{p}} + \frac{1}{1}E_{\mathrm{p}} = 2E_{\mathrm{p}} = mc^2 \,, \qquad (4\text{-}33)$$

where the first three terms are kinetic energies, and the last three terms are potential energies of the orbits, where Eq. (4-22) is substituted for r in Eq. (4-24) to obtain the potential energy fraction in Eq. (4-33), and where

$$E_{\mathrm{p}} = m_v v_{\mathrm{o}}^2 = (b / n^2 \alpha^{n/b})\, m_v c^2 = (b / n^2 \alpha^{n/b}) m_{\mathrm{e}} c^2 \qquad (4\text{-}34)$$

The calculable mass term of the quarton pair orbiting quarton pair system (less the g/2 factor) is

$$m_j = \left(2b_j \middle/ n_j^2 \alpha^{n_j / b_j} \right) m_{\mathrm{e}} \quad . \qquad (4\text{-}35)$$

Mass is a volume thing, and must be integrated from $r = r_j$ to $r \to \infty$ in discrete terms. The expression above in Eq. (4-35), derived from first principles, is a term in a series of terms in a natural calculation of the mass of the pion family member. The sum of the terms is equal to m.

$$m = m_j + m_{j-1} + m_{j-2} + \ldots + m_{\pi} \quad . \qquad (4\text{-}36)$$

For the pion, $m = m_{\pi}$. For the kaon, there is one term besides the pion, where $b_j = 2$. For the D-on, there are two terms beside the pion, *etc* (this is without the g/2-factors).

The first author thought there should be no g/2-factors for the pion family members. But there must be $g/2$-factors after all for the pion family members. The strong term must be +1.0 instead of -1.0. And the most variable term is a term for the meso-electric force, not included in the electron $g/2$-factor. It should be $-(p-1)n_{p-1}\pi\alpha$.

We can now write an equation for the mass of the term j of the pion family members, taking into account the contribution of each quarton orbit and the overall orbit of the quarton pairs, but not counting the $g/2$-factors. We take care to differentiate m_j from m. We now have

$$m_j = 2\, b_j m_e \Big/ n_j^2 \alpha^{n_j/b_j} \quad . \tag{4-37}$$

11. PREDICTIONS OF THE MASSES OF THE PION FAMILY

We now present a table of the predicted (calculated from first principles) and the measured values of the masses of the pion family. [5] In the Table, pions shall be symbolized by π_1, kaons by π_2, D-ons by π_3, and higher particles by π_4, π_5, *etc*.

Particle	b	n	Calculated $2b/n^2\alpha^{n/b}$	Predicted m/m_e less $g/2$-factor	Calculated [7] $g/2$-factor
Pion π_1	1	1	274.071 999	274.071 999	+1.001 157 533
Kaon π_2	2	3	712.967 101	987.039 100	+0.978 240 603
D-on π_3	3	6	3,129.810 86	4,116.849 96	+0.863 605 798
π_4	4	10	17,586.388 7	21,703.238 6	+0.588 510 179
π_5	5	15	114,372.469	136,075.707	+0.084 145 509

Table 4-8

Particle		b	n	Predicted m/m_e	Measured m/m_e [8]
Pion	π_1	1	1	274.389 246	273.132 05
Kaon	π_2	2	3	965.561 724	966.101
D-on	π_3	3	6	3,555.335 4	3,658.75
	π_4	4	10	12,772.576	
	π_5	5	15	11,450.159	

Table 4-9

12. MASSES OF THE ANTI-PION FAMILY

The anti-pion family g/2 factors are the charge conjugates of the pion family g/2 factors, except they do not have terms for the meso-electric force. Otherwise, the mass tables for the anti-pion family are the same as the mass tables for the pion family. We will denote the anti-pion as $-\pi_1$.

Particle	b	n	Calculated $2b/n^2\alpha^{n/b}$	Predicted m/m_e less $g/2$-factor	Calculated [7] $g/2$-factor
Anti-Pion $-\pi_1$	1	1	274.071 999	274.071 999	-1.001 157 533
Anti-Kaon $-\pi_2$	2	3	712.967 101	987.039 100	-1.001 165 912
Anti-D-on $-\pi_3$	3	6	3,129.810 86	4,116.849 96	-1.001 157 653
$-\pi_4$	4	10	17,586.388 7	21,703.238 6	-1.001 165 744
$-\pi_5$	5	15	114,372.469	136,075.707	-1.001 157 869

Table 4-10

Particle		b	n	Predicted m/m_e	Measured* m/m_e [8]
Anti-Pion	$-\pi_1$	1	1	274.389 246	273.132 05
Anti-Kaon	$-\pi_2$	2	3	988.189 900	966.101
Anti-D-on	$-\pi_3$	3	6	4,123.340 2	3,658.75
	$-\pi_4$	4	10	12,721.975	
	$-\pi_5$	5	15	11,133.682	

*assumed from charge conjugance

Table 4-11

13. NEUTRON FAMILY CALCULATIONS

The third particle type—the neutron family—is different from the other two particle types. The neutron is a baryon, and, like all baryons, has affecting the mass calculations not only a relativistic imaginary-axis massive core, but also a real-axis light weight core—the uniton. Electron family members orbit about this massive core particle.

Instead of the balancing of the electric force and the inertial force in Eq. (4-39) starting with a 1/2, as in Eqs. (4-5), (4-23), and (4-27), because of the two-body nature of those problems, Eq. (4-39) starts with a ‘1’, because of the single body nature of the neutron family problem.

Just as each previous particle family type has a different spin relation, least action method of calculation for the neutron family has a still different spin relation. With the neutron family orbits, we will use B and N to differentiate them from b and n in the electron family orbits (also used in these calculations).

$$r = N\hbar / Bmc \quad . \tag{4-38}$$

Let us balance the force equation for the neutron family.

$$1(m/1)v_o^2/r = (e/1)^2 \Big/ 4\pi\varepsilon_0\alpha^{(N/B)+1}r^2 \quad . \qquad (4\text{-}39)$$

Using the techniques under Eq. (4-5), this reduces to

$$mv_o^2 = \hbar c \Big/ \alpha^{N/B} r \quad . \qquad (4\text{-}40)$$

Combining this with Eq. (4-38), we obtain

$$v_{on}^2 = (B/N\alpha^{N/B})c^2 \quad . \qquad (4\text{-}41)$$

This is the orbital velocity squared for the neutron orbit of the electron family member. We have to combine that with the orbital velocity squared for the electron family member v_{oe}^2, which is solved in Eq. (4-7), and is

$$v_{oe}^2 = (b^2/n\alpha^{n/b})c^2 \quad . \qquad (4\text{-}42)$$

There is a region where v_{on} relative to v_{oe} is faster, and a region where it is slower, but the average of the absolute value of v_{on} and average absolute value v_{oe} are at right angles to each other and can be added by squaring them. The process is clarified in Eq. (4-43).

$$v_{Tn}^2 = \left[(B/N\alpha^{N/B}) + (b^2/n\alpha^{n/b})\right]c^2 \qquad (4\text{-}43)$$

By multiplying the quantity in Eq. (4-43) by m_e we obtain the potential energy of the neutron family system. By multiplying the potential energy of the neutron family members by $3/2$, we obtain the total energy including the kinetic energy in the neutron. By dividing by c^2 we obtain the mass m of the neutron family member. Each particle has a $g/2$-factor. [7] The result for $+1/2$ spin is in Eq. (4-44).

$$m_{\mathrm{p}+1/2} = \frac{3}{2}(g/2)_{\mathrm{p}}\left[(B/N\alpha^{N/B}) + (b^2/n\alpha^{n/b})\right]m_{\mathrm{e}} \quad (4\text{-}44)$$

Unitons are different from other whole-body systems. There are no elevated states of unitons themselves. The only elevated states associated with unitons are with orbiting particle systems surrounding the unitons. This feature of unitons apparently is reflected in the property that uniton systems have only one shell of mass. The sum of the velocity and thus mass components of the electron family member and the neutron system is not compounded by layers of mass shells. That typical stage of calculations will be left out of baryon calculations.

We see the mass of the neutron is a combination of two calculable terms. The N's and n's are calculable from the B's and b's [see the paragraph above Eq. (4-5)]. For orbital spin -1, for all neutron family members, the B for all neutron family members is 2. On the other hand, the minimum b and n are 0, where $v_{\mathrm{o}}^2 \equiv c^2$ and $m \equiv m_{\mathrm{e}}$.

The neutron family members all have $J = 1/2$ and parity +. They all have unitons for core particles. They all have an electron family member with $\hbar/2$ intrinsic spin orbiting around the uniton with $\hbar$ orbital spin. The only things that differentiate the neutron family members are the energy states of the particles. Yet all the observed particles with these properties have different, seemingly unrelated, traditional names. Those observed so far are n, Λ, Ξ^0, and Λ_b^0. To show the neutron related nature of those particles, we shall name those same particles n_1, n_2, n_3, etc.

With the neutron family members, there is too much information to put in one Table. We will divide the information into three Tables:

B	N	$B / N\alpha^{N/B}$	b	n	$b^2 / n\alpha^{n/b}$
2	3	1,069.450 652	0	0	1.000 000 000
3	6	9,389.432 606	1	1	137.035 999 7
4	10	87,931.94351	2	3	2,138.901 304
5	15	857,793.5224	3	6	28,168.29782
			4	10	351,727.774
			5	15	4,288,967.612

Table 4-12

Particle		B	b	spin	Calculated m/m_e less $g/2-$ *factor*	$g/2-$ *factor*
n	n_1	2	0	−	1,604.675 978	
	n_2	2	0	+	1,605.675 978	-1.138 709 508 199 4
Λ	n_3	2	1	−	1,672.693 978	
Ξ^0	n_4	2	1	+	1,809.729 978	-1.413 821 308 537 3
Λ_b^0	n_5	2	2	−	2,6 73.626 63	
	n_6	2	2	+	4,812.527 934	−1.918 180 234 323 7
	n_7	2	3	−	15, 688.324 89	
	n_8	2	3	+	43, 856.622 71	−2.720 563 803 661 4

Table 4-13

Particle		B	b	spin	Predicted m/m$_e$	*Measured* m/m_e [8]
n	n_1	2	0	–	1,827.259 793	1,838.683 6
	n_2	2	0	+	1,828.398 503	1,838.683 6
Λ	n_3	2	1	–	≈ 2133	2,183.337
Ξ^0	n_4	2	1	+	2,558.634 805	2,573.1
$\Lambda_b{}^0$	n_5	2	2	–	≈ 4,452	
	n_6	2	2	+	9,231.295 959	
	n_7	2	3	–	≈ ???	
	n_8	2	3	+	119,314.740 3	

Table 4-14

The $B/N\alpha^{N/B}$ and $b^2/n\alpha^{n/b}$ in Table 4-12 can be massaged into the masses of the neutron family. First it must be realized that particles can have $-1/2$ spin as well as $+1/2$, though the Summary Tables of Particle Properties, January 1, 1998, Particle Data Group [5] lists only $1/2$ spin particles in its listings, covering both signs. In actuality, the $-1/2$ spin particles are separate from the $+1/2$ spin particles, and their masses must be calculated separately. The $+1/2$ spin particles can be obtained by adding the particular $B/N\alpha^{N/B}$ to the particular $b^2/n\alpha^{n/b}$ and multiplying by $3/2$ to include the kinetic energy with the potential energy. The $-1/2$ spin particles can be obtained by adding $1/2$ times the particular $b^2/n\alpha^{n/b}$ to $3/2$ times the particular $B/N\alpha^{N/B}$ to include the kinetic and potential energies. This is not including the $g/2$-factors. Our method of deriving the $g/2$-factors calculates them only for plus spin particles.

Thus minus spin $g/2$-factors and predicted m/m_e can only be approximated by this method.

14. MASSES OF THE ANTI-NEUTRON FAMILY

The anti-neutron family g/2 factors are the charge conjugates of the neutron family g/2 factors, except they do not have terms for the meso-electric force. Otherwise, the mass tables for the anti-neutron family are the same as the mass tables for the neutron family. We will denote the anti-neutron as –n.

Particle		B	b	spin	Calculated m/m_e less $g/2-$ *factor*	$g/2-$ *factor*
n	n_1	2	0	–	1,604.675 978	
	n_2	2	0	+	1,605.675 978	+1.001 157 581 402 2
Λ	n_3	2	1	–	1,672.693 978	
Ξ^0	n_4	2	1	+	1,809.729 978	+1.001 165 840 761 8
Λ_b^0	n_5	2	2	–	2,6 73.626 63	
	n_6	2	2	+	4,812.527 934	+1.001 157 750 552 7
	n_7	2	3	–	15, 688.324 89	
	n_8	2	3	+	43, 856.622 71	+1.001165 619 453 0

Table 4-15

Par-ticle		*B*	*b*	spin	Predicted m/m_e	*Measured* m / m_e * [8]
n	n_1	2	0	–	?	1,838.683 6
	n_2	2	0	+	1,607.534 678	1,838.683 6
Λ	n_3	2	1	–	≈ 2133	2,183.337
Ξ^0	n_4	2	1	+	1,811.839 834	2,573.1
$\Lambda_b{}^0$	n_5	2	2	–	≈ 4,452	
	n_6	2	2	+	4,818.099 638	
	n_7	2	3	–	≈ ???	
	n_8	2	3	+	43,907.742 82	

*assumed from charge conjugance

Table 4-16

15. FORWARD LOOK

This concludes the derivations and calculations in this paper. We have calculated more particles than each of the measured electron family, the pion family, and the neutron family. Actually, in the equations is presented six infinities of particles. From these, and a careful formulation of the rules for the calculation of the masses of composite particles, can be calculated the masses of every particle except photons, which can be calculated separately. We are doing that in *Prediction of the Masses of Every Known Particle (as of 2008)*, *Step 2* and *Step 3* (http://benevolententerprises.org Book List).

In the event that experiment proves these mass predictions, there are other relevant experiments that can be made to test the Electrino Fusion Model of Elementary Particles. These are largely written in Ref. [7] Chapt. 9.

16. CONCLUSION

This chapter has predicted the masses of five charged leptons, five anti-charged leptons, five members of the pion family, five members of the anti-pion family, as well as four members of the neutron family and four members of the anti-neutron family. The formulas and tables show how to predict the masses of many more particles of the electron, pion, and neutron families. No other model of physics can do this. Therefore the Electrino Model of Elementary Particles should be carefully considered, and the further tests, described in Ref. [7], Chapter. 9, funded and carried out. Further solved particles, as well as a roadmap on how to calculate the masses of any particle below state 4, may be found in *Prediction of the Masses of Every Known Particle (as of 2008), Step 2, Part 1*, by the authors (http://benevolententerprises.org Book List).

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Chapter 5

PATTERN g/2 FACTORS

This chapter succeeds “An Update on g/2 Factors” in the original Chapter 5 in *Advanced Electrino Physics*. That paper was a timely advance in the field, but it contained errors. Also it was incomplete. It had g/2 factors for fundamental matter particles—the electron family, the pion family, and the neutron family. But it did not include g/2 factors for their anti-particles, which, because of the meso-electric terms for positive but not negative particles, are not simple charge conjugates to the matter particles. This chapter corrects the original matter g/2 factors in Chapter 5, and adds the corresponding g/2 factors for the antimatter fundamental particles. With all the g/2 factors in this chapter, you can calculate any particle mass up to state 3, and any particle mass basis up to state 5. (The mass basis is the calculated mass before the effects of pair production are subtracted to yield the measured mass.)

Of the b’s and n’s in the particles, the b’s are particularly confusing. For instance, for the electron and anti-electron (the positron) b = 0 for the exponential polynomials, for the anti-electron b = 0 for the meso-electric term in the g/2 factor, but for the electron and anti-electron b = 1 for the rest of the g/2 factor terms. If it did not, and if b = 0 for the electron g/2 factor also, the mass of the electron would be zero, and the Universe as we know it would not be possible. Also for the pion and anti-pion b = 1 for the exponential polynomials and the g/2 factors, except b is reduced 1 in the pion meso-electric term in the pion g/2 factor. If it were not, the proton would not be stable, and the Universe as we know it would not be possible. The b’s start at 2, not 0 or 1, in the exponential polynomials, the meso-electric term, and the g/2 factors all three in the neutron and anti-neutron.

Table 5-1
Electron family
Electron e_0 g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	-1	-1.000 000 000 000 0
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 $g_e/2$		-1.001 159 652 163 3
compare measured $g_e/2$		-1.001 159 652 181 1(08) [1]

Table 5-2
Electron family
Muon e_1 g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	-1	-1.000 000 000 000 0
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
$weak_2$	$+3\alpha^3/4\pi$	+0.000 000 092 769 9
$weak_3$	$-3(32\alpha)^1\alpha^3/4\pi$	-0.000 000 021 663 1
$weak_4$	$+3(32\alpha)^3\alpha^3/4\pi$	+0.000 000 001 181 2
$weak_5$	$-3(32\alpha)^4\alpha^3/4\pi$	-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 1

total calculated g/2 factor for muon -1.001 165 912 489 6
compare measured g/2 factor muon -1.001 165 920 7(06)

Table 5-3
Electron family
Tauon e_2 g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	-1	-1.000 000 000 000 0
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
$weak_2$	$-6\alpha^3/4\pi$	-0.000 000 185 539 9
$weak_3$	$+6(32\alpha)^1\alpha^3/4\pi$	+0.000 000 043 663 1
$weak_4$	$-6(32\alpha)^3\alpha^3/4\pi$	-0.000 000 002 362 5
$weak_5$	$+6(32\alpha)^4\alpha^3/4\pi$	+0.000 000 000 551 6
$weak_6$	$-6(32\alpha)^5\alpha^3/4\pi$	-0.000 000 000 128 8
$weak_7$	$+6(32\alpha)^6\alpha^3/4\pi$	+0.000 000 000 030 0
$weak_8$	$-6(32\alpha)^7\alpha^3/4\pi$	-0.000 000 000 007 0
$weak_9$	$+6(32\alpha)^8\alpha^3/4\pi$	+0.000 000 000 001 6
$weak_{10}$	$-6(32\alpha)^7\alpha^3/4\pi$	-0.000 000 000 000 3

total calculated g/2 factor for tauon -1.001 157 653 130 0

Table 5-4
Electron family
e_3 g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	-1	-1.000 000 000 000 0
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
$weak_2$	$+10\alpha^3 / 4\pi$	+0.000 000 309 233 2
$weak_3$	$-10(32\alpha)^1 \alpha^3 / 4\pi$	-0.000 000 072 210 6
$weak_4$	$+10(32\alpha)^3 \alpha^3 / 4\pi$	+0.000 000 005 937 6
$weak_5$	$-10(32\alpha)^4 \alpha^3 / 4\pi$	-0.000 000 001 919 4
$weak_6$	$+10(32\alpha)^5 \alpha^3 / 4\pi$	+0.000 000 000 214 7
$weak_7$	$-10(32\alpha)^6 \alpha^3 / 4\pi$	-0.000 000 000 050 1
$weak_8$	$+10(32\alpha)^7 \alpha^3 / 4\pi$	+0.000 000 000 011 7
$weak_9$	$-10(32\alpha)^8 \alpha^3 / 4\pi$	-0.000 000 000 002 7
$weak_{10}$	$+10(32\alpha)^9 \alpha^3 / 4\pi$	+0.000 000 000 000 6
$weak_{11}$	$-10(32\alpha)^{10} \alpha^3 / 4\pi$	-0.000 000 000 000 1
total calculated g/2 factor for e_3		-1.001 165 744 339 1

Table 5-5
Electron family
e_4 g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	-1	-1.000 000 000 000 0
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
$weak_2$	$-15\alpha^3 / 4\pi$	-0.000 000 463 849 8
$weak_3$	$+15(32\alpha)^1 \alpha^3 / 4\pi$	+0.000 000 103 316 0
$weak_4$	$-15(32\alpha)^3 \alpha^3 / 4\pi$	-0.000 000 005 633 7
$weak_5$	$+15(32\alpha)^4 \alpha^3 / 4\pi$	+0.000 000 001 315 5
$weak_6$	$-15(32\alpha)^5 \alpha^3 / 4\pi$	-0.000 000 000 307 2
$weak_7$	$+15(32\alpha)^6 \alpha^3 / 4\pi$	+0.000 000 000 071 7
$weak_8$	$-15(32\alpha)^7 \alpha^3 / 4\pi$	-0.000 000 000 016 7
$weak_9$	$+15(32\alpha)^8 \alpha^3 / 4\pi$	+0.000 000 000 003 9
$weak_{10}$	$-15(32\alpha)^9 \alpha^3 / 4\pi$	-0.000 000 000 000 9
$weak_{11}$	$+15(32\alpha)^{10} \alpha^3 / 4\pi$	+0.000 000 000 000 2
total calculated g/2 factor for e_4		-1.001 167 869 438 8

Table 5-6
Positron family
Anti-electron $-e_0$ g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	$+1$	+1.000 000 000 000 0
meso-electric	$-bn\pi\alpha$	-0.000 000 000 000 0
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 $-e_0$ +1.001 159 652 163
3

Table 5-7
Positon family
Anti-muon -e_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	$-bn\pi\alpha$	-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
$weak_2$	$-3\alpha^3/4\pi$	-0.000 000 092 769 9
$weak_3$	$+3(32\alpha)^1\alpha^3/4\pi$	+0.000 000 021 663 1
$weak_4$	$-3(32\alpha)^3\alpha^3/4\pi$	-0.000 000 001 181 2
$weak_5$	$+3(32\alpha)^4\alpha^3/4\pi$	+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 1

total calculated g/2 factor for –e_1 +0.978 240 603 367 5

* b is advanced 1, n is advanced according to second paragraph in the chapter.

Table 5-8
Positron family
Anti-tauon $-e_2$ 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 6
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
$weak_2$	$+6\alpha^3/4\pi$	+0.000 000 185 539 9
$weak_3$	$-6(32\alpha)^1\alpha^3/4\pi$	-0.000 000 043 663 1
$weak_4$	$+6(32\alpha)^3\alpha^3/4\pi$	+0.000 000 002 362 5
$weak_5$	$-6(32\alpha)^4\alpha^3/4\pi$	-0.000 000 000 551 6
$weak_6$	$+6(32\alpha)^5\alpha^3/4\pi$	+0.000 000 000 128 8
$weak_7$	$-6(32\alpha)^6\alpha^3/4\pi$	-0.000 000 000 030 0
$weak_8$	$+6(32\alpha)^7\alpha^3/4\pi$	+0.000 000 000 007 0
$weak_9$	$-6(32\alpha)^8\alpha^3/4\pi$	-0.000 000 000 001 6
$weak_{10}$	$+6(32\alpha)^9\alpha^3/4\pi$	+0.000 000 000 000 3

total calculated g/2 factor for $-e_2$ +0.863 605 798 397
4

Table 5-9
Positron family
$-e_3$ g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	$+1$	+1.000 000 000 000 0
meso-electric	$-bn\pi\alpha$	-0.412 655 564 198 2
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
$weak_2$	$-10\alpha^3/4\pi$	-0.000 000 309 233 2
$weak_3$	$+10(32\alpha)^1\alpha^3/4\pi$	+0.000 000 072 210 6
$weak_4$	$-10(32\alpha)^3\alpha^3/4\pi$	-0.000 000 005 937 6
$weak_5$	$+10(32\alpha)^4\alpha^3/4\pi$	+0.000 000 001 919 4
$weak_6$	$-10(32\alpha)^5\alpha^3/4\pi$	-0.000 000 000 214 7
$weak_7$	$+10(32\alpha)^6\alpha^3/4\pi$	+0.000 000 000 050 1
$weak_8$	$-10(32\alpha)^7\alpha^3/4\pi$	-0.000 000 000 011 7
$weak_9$	$+10(32\alpha)^8\alpha^3/4\pi$	+0.000 000 000 002 7
$weak_{10}$	$-10(32\alpha)^9\alpha^3/4\pi$	-0.000 000 000 000 6
$weak_{11}$	$+10(32\alpha)^{10}\alpha^3/4\pi$	+0.000 000 000 000 1
total calculated g/2 factor for $-e_3$		+0.588 510 179 140 9

Table 5-10
Positron family
$-e_4$ g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	$+1$	+1.000 000 000 000 0
meso-electric	$-bn\pi\alpha$	-0.917 012 364 884 9
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
$weak_2$	$+15\alpha^3 / 4\pi$	+0.000 000 463 849 8
$weak_3$	$-15(32\alpha)^1 \alpha^3 / 4\pi$	-0.000 000 103 316 0
$weak_4$	$+15(32\alpha)^3 \alpha^3 / 4\pi$	+0.000 000 005 633 7
$weak_5$	$-15(32\alpha)^4 \alpha^3 / 4\pi$	-0.000 000 001 315 5
$weak_6$	$+15(32\alpha)^5 \alpha^3 / 4\pi$	+0.000 000 000 307 2
$weak_7$	$-15(32\alpha)^6 \alpha^3 / 4\pi$	-0.000 000 000 071 7
$weak_8$	$+15(32\alpha)^7 \alpha^3 / 4\pi$	+0.000 000 000 016 7
$weak_9$	$-15(32\alpha)^8 \alpha^3 / 4\pi$	-0.000 000 000 003 9
$weak_{10}$	$+15(32\alpha)^9 \alpha^3 / 4\pi$	+0.000 000 000 000 9
$weak_{11}$	$-15(32\alpha)^{10} \alpha^3 / 4\pi$	-0.000 000 000 000 2
total calculated g/2 factor for $-e_4$		+0.084 145 509 583 9

Table 5-11
Pion family
Pion 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	$-(b-1)n\pi\alpha$	-0.000 000 000 000 0
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		+1.001 157 533 359 2

Table 5-12
Pion family
Kaon π_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	$-(b-1)n\pi\alpha$	-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
$weak_2$	$-3\alpha^3/4\pi$	-0.000 000 092 769 9
$weak_3$	$+3(32\alpha)^1\alpha^3/4\pi$	+0.000 000 021 663 1
$weak_4$	$-3(32\alpha)^3\alpha^3/4\pi$	-0.000 000 001 181 2
$weak_5$	$+3(32\alpha)^4\alpha^3/4\pi$	+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 1
total calculated g/2 factor for π_2		+0.978 240 603 367 5

Table 5-13
Pion family
D-on π_3 g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	$+1$	+1.000 000 000 000 0
meso-electric	$-(b-1)n\pi\alpha$	-0.137 551 854 732 6
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
$weak_2$	$+6\alpha^3/4\pi$	+0.000 000 185 539 9
$weak_3$	$-6(32\alpha)^1\alpha^3/4\pi$	-0.000 000 043 663 1
$weak_4$	$+6(32\alpha)^3\alpha^3/4\pi$	+0.000 000 002 362 5
$weak_5$	$-6(32\alpha)^4\alpha^3/4\pi$	-0.000 000 000 551 6
$weak_6$	$+6(32\alpha)^5\alpha^3/4\pi$	+0.000 000 000 128 8
$weak_7$	$-6(32\alpha)^6\alpha^3/4\pi$	-0.000 000 000 030 0
$weak_8$	$+6(32\alpha)^7\alpha^3/4\pi$	+0.000 000 000 007 0
$weak_9$	$-6(32\alpha)^8\alpha^3/4\pi$	-0.000 000 000 001 6
$weak_{10}$	$+6(32\alpha)^9\alpha^3/4\pi$	+0.000 000 000 000 3
total calculated g/2 factor for π_3		+0.863 605 798 397 4

Table 5-14
Pion family
π_4 g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	$+1$	+1.000 000 000 000 0
meso-electric	$-(b-1)n\pi\alpha$	-0.412 655 564 198 2
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
$weak_2$	$-10\alpha^3/4\pi$	-0.000 000 309 233 2
$weak_3$	$+10(32\alpha)^1\alpha^3/4\pi$	+0.000 000 072 210 6
$weak_4$	$-10(32\alpha)^3\alpha^3/4\pi$	-0.000 000 005 937 6
$weak_5$	$+10(32\alpha)^4\alpha^3/4\pi$	+0.000 000 001 919 4
$weak_6$	$-10(32\alpha)^5\alpha^3/4\pi$	-0.000 000 000 214 7
$weak_7$	$+10(32\alpha)^6\alpha^3/4\pi$	+0.000 000 000 050 1
$weak_8$	$-10(32\alpha)^7\alpha^3/4\pi$	-0.000 000 000 011 7
$weak_9$	$+10(32\alpha)^8\alpha^3/4\pi$	+0.000 000 000 002 7
$weak_{10}$	$-10(32\alpha)^9\alpha^3/4\pi$	-0.000 000 000 000 6
$weak_{11}$	$+10(32\alpha)^{10}\alpha^3/4\pi$	+0.000 000 000 000 1

total calculated g/2 factor for π_4 +0.588 510 179 140 9

Table 5-15
Pion family
π_5 g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	$+1$	+1.000 000 000 000 0
meso-electric	$-(b-1)n\pi\alpha$	-0.917 012 364 884 9
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
$weak_2$	$+15\alpha^3/4\pi$	+0.000 000 463 849 8
$weak_3$	$-15(32\alpha)^1\alpha^3/4\pi$	-0.000 000 103 316 0
$weak_4$	$+15(32\alpha)^3\alpha^3/4\pi$	+0.000 000 005 633 7
$weak_5$	$-15(32\alpha)^4\alpha^3/4\pi$	-0.000 000 001 315 5
$weak_6$	$+15(32\alpha)^5\alpha^3/4\pi$	+0.000 000 000 307 2
$weak_7$	$-15(32\alpha)^6\alpha^3/4\pi$	-0.000 000 000 071 7
$weak_8$	$+15(32\alpha)^7\alpha^3/4\pi$	+0.000 000 000 016 7
$weak_9$	$-15(32\alpha)^8\alpha^3/4\pi$	-0.000 000 000 003 9
$weak_{10}$	$+15(32\alpha)^9\alpha^3/4\pi$	+0.000 000 000 000 9
$weak_{11}$	$-15(32\alpha)^{10}\alpha^3/4\pi$	-0.000 000 000 000 2
total calculated g/2 factor for π_5		+0.084 145 509 553 9

Table 5-16
Anti-pion family
Anti-pion $-\pi_1$ g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	-1	-1.000 000 000 000 0
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 $-\pi_1$		-1.001 157 533 359 2

Table 5-17
Anti-pion family
Anti-kaon $-\pi_2$ g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	-1	-1.000 000 000 000 0
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
$weak_2$	$+3\alpha^3 / 4\pi$	+0.000 000 092 769 9
$weak_3$	$-3(32\alpha)^1 \alpha^3 / 4\pi$	-0.000 000 021 663 1
$weak_4$	$+3(32\alpha)^3 \alpha^3 / 4\pi$	+0.000 000 001 181 2
$weak_5$	$-3(32\alpha)^4 \alpha^3 / 4\pi$	-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 1

total calculated g/2 factor for $-\pi_2$ -1.001 165 912 489 6

Table 5-18
Anti-pion family
Anti-D-on $-\pi_3$ g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	-1	-1.000 000 000 000 0
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
$weak_2$	$-6\alpha^3/4\pi$	-0.000 000 185 539 9
$weak_3$	$+6(32\alpha)^1\alpha^3/4\pi$	+0.000 000 043 663 1
$weak_4$	$-6(32\alpha)^3\alpha^3/4\pi$	-0.000 000 002 362 5
$weak_5$	$+6(32\alpha)^4\alpha^3/4\pi$	+0.000 000 000 551 6
$weak_6$	$-6(32\alpha)^5\alpha^3/4\pi$	-0.000 000 000 128 8
$weak_7$	$+6(32\alpha)^6\alpha^3/4\pi$	+0.000 000 000 030 0
$weak_8$	$-6(32\alpha)^7\alpha^3/4\pi$	-0.000 000 000 007 0
$weak_9$	$+6(32\alpha)^8\alpha^3/4\pi$	+0.000 000 000 001 6
$weak_{10}$	$-6(32\alpha)^7\alpha^3/4\pi$	-0.000 000 000 000 3

total calculated g/2 factor for $-\pi_3$ -1.001 157 653 130 0

Table 5-19
Anti-pion family
$-\pi_4$ g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	-1	-1.000 000 000 000 0
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
$weak_2$	$+10\alpha^3 / 4\pi$	+0.000 000 309 233 2
$weak_3$	$-10(32\alpha)^1 \alpha^3 / 4\pi$	-0.000 000 072 210 6
$weak_4$	$+10(32\alpha)^3 \alpha^3 / 4\pi$	+0.000 000 005 937 6
$weak_5$	$-10(32\alpha)^4 \alpha^3 / 4\pi$	-0.000 000 001 919 4
$weak_6$	$+10(32\alpha)^5 \alpha^3 / 4\pi$	+0.000 000 000 214 7
$weak_7$	$-10(32\alpha)^6 \alpha^3 / 4\pi$	-0.000 000 000 050 1
$weak_8$	$+10(32\alpha)^7 \alpha^3 / 4\pi$	+0.000 000 000 011 7
$weak_9$	$-10(32\alpha)^8 \alpha^3 / 4\pi$	-0.000 000 000 002 7
$weak_{10}$	$+10(32\alpha)^9 \alpha^3 / 4\pi$	+0.000 000 000 000 6
$weak_{11}$	$-10(32\alpha)^{10} \alpha^3 / 4\pi$	-0.000 000 000 000 1

total calculated g/2 factor for $-\pi_4$ -1.001 165 744 339 1

Table 5-20
Anti-pion family
$-\pi_5$ g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	-1	-1.000 000 000 000 0
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
$weak_2$	$-15\alpha^3 / 4\pi$	-0.000 000 463 849 8
$weak_3$	$+15(32\alpha)^1 \alpha^3 / 4\pi$	+0.000 000 103 316 0
$weak_4$	$-15(32\alpha)^3 \alpha^3 / 4\pi$	-0.000 000 005 633 7
$weak_5$	$+15(32\alpha)^4 \alpha^3 / 4\pi$	+0.000 000 001 315 5
$weak_6$	$-15(32\alpha)^5 \alpha^3 / 4\pi$	-0.000 000 000 307 2
$weak_7$	$+15(32\alpha)^6 \alpha^3 / 4\pi$	+0.000 000 000 071 7
$weak_8$	$-15(32\alpha)^7 \alpha^3 / 4\pi$	-0.000 000 000 016 7
$weak_9$	$+15(32\alpha)^8 \alpha^3 / 4\pi$	+0.000 000 000 003 9
$weak_{10}$	$-15(32\alpha)^9 \alpha^3 / 4\pi$	-0.000 000 000 000 9
$weak_{11}$	$+15(32\alpha)^{10} \alpha^3 / 4\pi$	+0.000 000 000 000 2

total calculated g/2 factor for $-\pi_5$ -1.001 157 869 438 8

Table 5-21
Neutron family
Neutron 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

Table 5-22
Neutron family
Ξ^0 n_4 g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	-1	-1.000 000 000 000 0
meso-electric	$-bn\pi\alpha$	-0.412 655 564 198 2
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
$weak_2$	$+6\alpha^3/4\pi$	+0.000 000 185 539 9
$weak_3$	$-6(32\alpha)^1\alpha^3/4\pi$	-0.000 000 043 663 1
$weak_4$	$+6(32\alpha)^3\alpha^3/4\pi$	+0.000 000 002 362 5
$weak_5$	$-6(32\alpha)^4\alpha^3/4\pi$	-0.000 000 000 551 6
$weak_6$	$+6(32\alpha)^5\alpha^3/4\pi$	+0.000 000 000 128 8
$weak_7$	$-6(32\alpha)^6\alpha^3/4\pi$	-0.000 000 000 030 0
$weak_8$	$+6(32\alpha)^7\alpha^3/4\pi$	+0.000 000 000 007 0
$weak_9$	$-6(32\alpha)^8\alpha^3/4\pi$	-0.000 000 000 001 6
$weak_{10}$	$+6(32\alpha)^9\alpha^3/4\pi$	+0.000 000 000 000 3
total calculated g/2 factor for n_4		-1.413 821 404 960 0

Table 5-23
Neutron family
n_6 g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	-1	-1.000 000 000 000 0
meso-electric	$-bn\pi\alpha$	-0.917 012 364 884 9
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
$weak_2$	$-10\alpha^3/4\pi$	-0.000 000 309 233 2
$weak_3$	$+10(32\alpha)^1\alpha^3/4\pi$	+0.000 000 072 210 6
$weak_4$	$-10(32\alpha)^3\alpha^3/4\pi$	-0.000 000 005 937 6
$weak_5$	$+10(32\alpha)^4\alpha^3/4\pi$	+0.000 000 001 919 4
$weak_6$	$-10(32\alpha)^5\alpha^3/4\pi$	-0.000 000 000 214 7
$weak_7$	$+10(32\alpha)^6\alpha^3/4\pi$	+0.000 000 000 050 1
$weak_8$	$-10(32\alpha)^7\alpha^3/4\pi$	-0.000 000 000 011 7
$weak_9$	$+10(32\alpha)^8\alpha^3/4\pi$	+0.000 000 000 002 7
$weak_{10}$	$-10(32\alpha)^9\alpha^3/4\pi$	-0.000 000 000 000 6
$weak_{11}$	$+10(32\alpha)^{10}\alpha^3/4\pi$	+0.000 000 000 000 1

total calculated g/2 factor for n_6 -1.918 170 115 437 6

Table 5-24
Neutron family
n_8 g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	-1	-1.000 000 000 000 0
meso-electric	$-bn\pi\alpha$	-1.719 398 184 208 4
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
$weak_2$	$+15\alpha^3/4\pi$	+0.000 000 463 849 8
$weak_3$	$-15(32\alpha)^1\alpha^3/4\pi$	-0.000 000 103 316 0
$weak_4$	$+15(32\alpha)^3\alpha^3/4\pi$	+0.000 000 005 633 7
$weak_5$	$-15(32\alpha)^4\alpha^3/4\pi$	-0.000 000 001 315 5
$weak_6$	$+15(32\alpha)^5\alpha^3/4\pi$	+0.000 000 000 307 2
$weak_7$	$-15(32\alpha)^6\alpha^3/4\pi$	-0.000 000 000 071 7
$weak_8$	$+15(32\alpha)^7\alpha^3/4\pi$	+0.000 000 000 016 7
$weak_9$	$-15(32\alpha)^8\alpha^3/4\pi$	-0.000 000 000 003 9
$weak_{10}$	$+15(32\alpha)^9\alpha^3/4\pi$	+0.000 000 000 000 9
$weak_{11}$	$-15(32\alpha)^{10}\alpha^3/4\pi$	-0.000 000 000 000 2
total calculated g/2 factor for n_8		-2.720 563 803 661 4

Table 5-25
Anti-neutron family
Anti-neutron $-n_2$ g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	$+1$	+1.000 000 000 000 0
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
$weak_2$	$+3\alpha^3/4\pi$	+0.000 000 092 769 9
$weak_3$	$-3(32\alpha)^1\alpha^3/4\pi$	-0.000 000 021 663 1
$weak_4$	$+3(32\alpha)^3\alpha^3/4\pi$	+0.000 000 001 181 2
$weak_5$	$-3(32\alpha)^4\alpha^3/4\pi$	-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 1
total calculated g/2 factor for $-n_2$		+1.001 157 581 402 2

Table 5-26
Anti-neutron family
$-\Xi^0$ $-n_4$ g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	$+1$	+1.000 000 000 000 0
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
$weak_2$	$-6\alpha^3/4\pi$	-0.000 000 185 539 9
$weak_3$	$+6(32\alpha)^1\alpha^3/4\pi$	+0.000 000 043 663 1
$weak_4$	$-6(32\alpha)^3\alpha^3/4\pi$	-0.000 000 002 362 5
$weak_5$	$+6(32\alpha)^4\alpha^3/4\pi$	+0.000 000 000 551 6
$weak_6$	$-6(32\alpha)^5\alpha^3/4\pi$	-0.000 000 000 128 8
$weak_7$	$+6(32\alpha)^6\alpha^3/4\pi$	+0.000 000 000 030 0
$weak_8$	$-6(32\alpha)^7\alpha^3/4\pi$	-0.000 000 000 007 0
$weak_9$	$+6(32\alpha)^8\alpha^3/4\pi$	+0.000 000 000 001 6
$weak_{10}$	$-6(32\alpha)^7\alpha^3/4\pi$	-0.000 000 000 000 3

total calculated g/2 factor for $-n_4$ +1.001 165 840 761 8

Table 5-27
Anti-neutron family
$-n_6$ g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	$+1$	+1.000 000 000 000 0
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
$weak_2$	$+10\alpha^3 / 4\pi$	+0.000 000 309 233 2
$weak_3$	$-10(32\alpha)^1 \alpha^3 / 4\pi$	-0.000 000 072 210 6
$weak_4$	$+10(32\alpha)^3 \alpha^3 / 4\pi$	+0.000 000 005 937 6
$weak_5$	$-10(32\alpha)^4 \alpha^3 / 4\pi$	-0.000 000 001 919 4
$weak_6$	$+10(32\alpha)^5 \alpha^3 / 4\pi$	+0.000 000 000 214 7
$weak_7$	$-10(32\alpha)^6 \alpha^3 / 4\pi$	-0.000 000 000 050 1
$weak_8$	$+10(32\alpha)^7 \alpha^3 / 4\pi$	+0.000 000 000 011 7
$weak_9$	$-10(32\alpha)^8 \alpha^3 / 4\pi$	-0.000 000 000 002 7
$weak_{10}$	$+10(32\alpha)^9 \alpha^3 / 4\pi$	+0.000 000 000 000 6
$weak_{11}$	$-10(32\alpha)^{10} \alpha^3 / 4\pi$	-0.000 000 000 000 1
total calculated g/2 factor for $-n_6$		+1.001 157 750 552 7

Table 5-28
Anti-neutron family
$-n_8$ g/2 Factor Evaluation with 2006 α

force:	g/2 factor term:	numerical value:
strong	$+1$	+1.000 000 000 000 0
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
$weak_2$	$-15\alpha^3 / 4\pi$	-0.000 000 463 849 8
$weak_3$	$+15(32\alpha)^1 \alpha^3 / 4\pi$	+0.000 000 103 316 0
$weak_4$	$-15(32\alpha)^3 \alpha^3 / 4\pi$	-0.000 000 005 633 7
$weak_5$	$+15(32\alpha)^4 \alpha^3 / 4\pi$	+0.000 000 001 315 5
$weak_6$	$-15(32\alpha)^5 \alpha^3 / 4\pi$	-0.000 000 000 307 2
$weak_7$	$+15(32\alpha)^6 \alpha^3 / 4\pi$	+0.000 000 000 071 7
$weak_8$	$-15(32\alpha)^7 \alpha^3 / 4\pi$	-0.000 000 000 016 7
$weak_9$	$+15(32\alpha)^8 \alpha^3 / 4\pi$	+0.000 000 000 003 9
$weak_{10}$	$-15(32\alpha)^9 \alpha^3 / 4\pi$	-0.000 000 000 000 9
$weak_{11}$	$+15(32\alpha)^{10} \alpha^3 / 4\pi$	+0.000 000 000 000 2
total calculated g/2 factor for $-n_8$		+1.001 165 619 453 0

Chapter 6

RADIOACTIVE WASTE-FREE REACTOR

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Abstract

Nuclear reactors do not give off carbon gases, and so could help fight global warming. But they have such nasty and dangerous radioactive wastes, which stay active and dangerous for centuries. What we need is a powerful, radioactive waste-free, inexpensive reactor. The author proposes one in this paper. The technical name for such a reactor is Electrino Fusion Power Reactor (EFP Reactor). Electrino is the author's name for tiny electric particles that compose all light, matter, and gravitons in the authors' new Grand Unification Theory (GUT). The main difference between the Standard Model and the new GUT is that fracton charges in the GUT come in ± e, ± e/2, ± e/4, and ± e/8; whereas fracton charges in the Standard Model come in ± 2e/3 and ± e/3. The change in fracton charges did not lead to untenable particle structures. The author induced the structures of every known particle according to the scheme in the GUT. They all worked out all right. And whereas it takes 61 elementary particles to build known light and matter in the Standard Model, it takes only one according to the GUT. The GUT has deeper levels of symmetry and lower orbits. This paper develops the features of the radioactive waste-free EFP Reactor using the new GUT.

1. Elementary Particle Fusion

In the new GUT (which, by the way, is called Electrino Fusion Model of Elementary Particles), the particles are held together by symmetrical orbits, not glued together by gluons. The quarks, with ± 2e/3 and ± e/3 fracton charges, do not lend themselves to stable, symmetrical orbits, but the electrinos, with ± e, ± e/2, ± e/4, and ± e/8 fracton charges, do. In the model, photons are composed of heavy positive and negative whole charges orbiting about each other, and traveling together at the speed of light; electrons are made up of like light half charges orbiting about each other; and pions are made up of two orbiting pairs of like light fourth charges orbiting about each other. Notice the symmetry. Notice the orbits. Notice the space between the particles. Notice the individuality of the particles—bound only by the speed of light barrier and orbital mechanics.

It is important to notice the velocities of the particles and their behaviors at those velocities. All fractons (called electrinos in the model) travel either just slightly faster than the speed of light, or significantly faster than the speed of light. The point is, they all travel faster than the speed of light. For the light ones, this affects their radii—making them imaginary. This affects their force. Whereas slow like-charges repel, faster than c like-charges attract. This affects the potential energy of particles. This makes deep potential wells at the top of potential hills for the potential energy of charged particles. This affects the perceived mass-energy of the particles—positive instead of negative.

Faster than c like-charges attract. Negatively charged like half charges traveling just faster than c orbit around each other forming electrons. If the electrons never collide with any other electrons—at least not with sufficient energies—the half particle inertias in them cause the half charges to orbit always opposite each other—never approaching each other. But if electrons collide with each other with over 938 MeV each, four half charges come near to each other. The four half charges are not all held opposite each other. They all attract each other. What will happen? One half charge from one electron will be attracted to one half charge from the other electron. Nothing will stop the half charges. They will travel until they contact each other. What happens then? They are like charged. They form a new particle with twice the half charge—in other words a whole charge. We could say the half charges fuse to a whole charge.

When high energy electrons collide, not only do two half charges from opposite electrons fuse, the other two half charges on the opposite side fuse. We have four half charges from two electrons fusing to two whole charges. What then?

It is profitable at this juncture to assign fracton or electrino structures to simple particles. Pions are composed of four positive fourth charges in the manner already explained in the abstract. Electrons are made of two light weight negative half charges. Neutrons are constructed of a heavy positive whole particle orbited by an electron. If the constituents of pions were fused to the constituents of electrons, it would be to positive electrons—positrons—antimatter. If the sub-particles of negative electrons were fused to the heavy whole core particles of neutrons, it would be to negative core neutrons—antimatter. If we started with the opposite charges of above, the particles would fuse to matter instead of antimatter. Every time there is a fusion of electrinos, there is a switch from matter to antimatter or visa versa.

What would happen to the negative half charges in electrons fused to whole particles above? The half charges would be negatively charged matter. The whole charges would be negatively charged core particles of antimatter—anti-protons and anti-neutrons. The anti-core-particles would scavenge from the graviton sea the remaining portions of anti-protons and anti-neutrons. The resultant anti-protons and anti-neutrons would drift into local protons and neutrons and annihilate them, giving off gamma rays, which could be converted into electricity. This is the foundation of the science of the radioactive waste-free EFP Reactor. The electricity comes from processed gamma rays, which come from the annihilation of protons and anti-protons and neutrons and anti-neutrons, which come from anti-protons and anti-neutrons, which come from negative heavy whole core particles (antimatter), which come from the fusion of half particles in electrons, which come from the collision of electrons above 938 MeV each electron, with like spins in the center of mass frame.

2. Efficiencies

Before electrons can have fusion of their half particles, they must be accelerated to at least the masses of protons—938.27231 ± 0.00028 MeV [1]—roughly at least 939 MeV. That is a necessary energy investment into the process. When the particles fuse, there follows an annihilation of both a proton and an anti-proton or a neutron and an anti-neutron. Nearly twice as much energy in gamma rays results as was invested in the acceleration of electrons. At first this sounds good. But then we realize we must be more than 50 per cent efficient over-all in order to be self-sustaining and be an energy source using this energy phenomenon. That is hard to achieve. State of the art accelerator efficiency in 1988 was itself only 50% [2]. While individual steam turbine efficiencies were as high as 96.1%, the world record steam turbine gross efficiency recently was 48.5% [3]. That is an overall efficiency for our process of less than 24.25%. And we need 50% to break even, let alone have a surplus to become a new power source!

If we get away from the expansion of gases and turn to the gamma absorption of layer upon layer of stacked photovoltaic cells shielding the gamma source, we can achieve over 90 percent energy efficiency. This is one important way to make Electrino Fusion Power. Except for the fusion of the constituents of electrons, this would be totally within the known laws of physics. But it would have a couple of drawbacks: It would have to be built in a strong containment building; and the electricity extraction of the gamma field would have to be by many layers of photovoltaic cells. And the photovoltaic cells would degenerate in time and become radioactive.

3. A Surprising Turn

The author put this process on the back burner until he would receive greater light upon the subject. Things took a surprising turn. Through fusing the sub-particles of positive electrons—positrons—in theory, he learned how to reverse the order to disorder arrow in the second law of thermodynamics. That is huge! That is a way to reverse aging, disease, and decay processes—to make old people young again and back out all diseases from existence! Let us read what he first wrote about the process and the phenomenon.

> "The explanation that is usually given as to why we don't see broken cups gathering themselves together off the floor and jumping back onto the table is that it is forbidden by the second law of thermodynamics. This says that in any closed system disorder, or entropy, always increases with time. In other words, it is a form of Murphy's law: Things always tend to go wrong! An intact cup on the table is a state of high order, but a broken cup on the floor is a disordered state. One can go readily from the cup on the table in the past to the broken cup on the floor in the future, but not the other way round.
>
> "The increase of disorder or entropy with time is one example of what is called an arrow of time,

something that distinguishes the past from the future, giving a direction to time." [4]

4. Electrino Model and 2nd Law

The natural tendency of leptons in beta decay is that the parent lepton combines with one or more gravitons to produce more particles. In all natural reactions, the order energy of the resultant particles is less than or equal to the order energy of the original particles.

1. Negative Energies. Let us consider antimatter more carefully. "In the Dirac theory also, *the permissible energy values for a free particle range from* $+mc^2$ *to + 4 and from* $-mc^2$ *to -4*. The first of these results is of course just what we expect for a free particle—that its total energy can have any value greater than its rest energy. But the second result is quite puzzling, since it implies the existence of states of *negative total energy*." [5] Anderson in 1932 discovered positrons in cosmic radiation. These were regarded as Dirac's negative energy particles. "The first two solutions of the Dirac equation . . . clearly describe a free electron of energy E and momentum **p**. The two negative energy electron solutions . . . are to be associated with the antiparticle, the positron." [6]

However, in the annihilation it is not $(+mc^2) + (-mc^2) = 0$, but $2mc^2$ is the result of annihilation. [7] There is something strange going on with the minus signs in these equations. The calculations are inconsistent.

Maybe there are two kinds of energy considered. One we can call entropy energy E_S. In the annihilation reaction, $\#+mc^2\# + \#-mc^2\# = 2mc^2$. Entropy energy is the higher value. The other energy is order energy E_O. In order energy the same reaction is $(+mc^2) + (-mc^2) = 0$.

Let us consider entropy energy and order energy for particle decay schemes. There are a few decay schemes where no negative order energy (anti-matter) is introduced in the right hand side of the decay schemes. In those few instances, the final order energy is equal to the initial order energy (when kinetic energy is taken into account). But in most cases, a trace of negative order energy (anti-matter) is introduced into the right side of the decay schemes. There is nothing on the left hand sides of the decay schemes to correspond to this addition of a trace of negative order energy on the right sides of the decay schemes. Therefore, total order energy is less on the right hand sides of the decay schemes than on the left hand sides (if only by a trace). A few decay schemes introduce a lot of antimatter (as K^-) on the right side of the decay scheme. The loss of order energy in the systems is greater in those cases. But in every case, for all natural processes, the order energy final is # the order energy initial, or

$$\Delta E_0 \leq 0. \qquad (1)$$

Let us check the order energy for electron electrino fusion reactions. Electrons made energetic by acceleration (as heavy as protons) fuse and form anti-protons. Matter is converted to anti-matter. Entropy energy is conserved, but not so order energy. Order energy is reduced in the extreme from +938 MeV to -938 MeV or more for each electron fused (two electrons are fused in each reaction). The order-disorder arrow for electron electrino fusion points in the usual direction. The system does obey the second law of thermodynamics.

2. Reversing the Order to Disorder Arrow. What would happen if we fused the electrino constituents of positrons instead of the electrino constituents of electrons? Entropy energy E_S would again be conserved. Entropy would be increased. However, order energy E_O would go from -2 x 938 MeV to +2 x 938 MeV—from disorder to order. The order to disorder arrow would be reversed. This would be a reaction that would be prohibited by the second law of thermodynamics—unless the strong gravitational force that fuses the anti-semions would be stronger than the second law of thermodynamics (which otherwise governs weak interactions). The stronger of the strong gravitational force and the second law of thermodynamics should be determined by experiment. More rides on that one experiment than perhaps on any one other experiment in this generation. If it is found that strong gravity is stronger than the second law of thermodynamics, then order can be restored at first in a small area, then for the whole earth.

Here we see that the entropy arrow of time and the order to disorder arrow of time are separate and distinct, and are not one and the same thing. While all the reactions the author has studied increase entropy, the fusion of positron anti-semions reverse the order to disorder arrow, making more order out of the disorder.

Positron constituent electrino fusion might not only take the electrinos from disorder to order. It could make other physical processes in a local area go from disorder to order. The positron fusion not only violates the second law of thermodynamics, it reverses the order to disorder arrow of that law in a local area, making other processes in that area reverse. Let us consider that process more to see how it might be regulated.

We guess the desired relationships for reversing the order to disorder arrow in the second law of thermodynamics through dimensional analysis. We want to solve for r, the maximum radius in which the reversed law would be effective. There is a way we can obtain a length from combinations of our variables and constants. That way is in the right hand side of Eq. (2). The whole expression is the thermodynamic relation we are seeking. The thermodynamic relation is:

$$(\Delta E_o)_t > 0 \textit{ where } r < \frac{(\Delta E_o)_1\, c}{ik}, \qquad (2)$$

where E_o is the order energy–the positive or negative energy in the pair production of particles; ΔE_o is the change in the order energy, where $(\Delta E_o)_t$ is the change in the total order energy of the system, and where $(\Delta E_o)_1$ is the change in the order energy for a single source reaction—for a positron fusion reaction it is approximately 2 x 10^9 eV/collision x 1.6 x 10^{-19} joules/eV = 3.2 x 10^{-10} joules/collision; c is the speed of light—approximately 3.0 x 10^8 m/s; we shall solve for the effected radius r; i is the beam current in each beam in Coulombs per second (we will solve for 10^{-11}); k is the ratio of particle energy to particle charge. This energy per charge is the accelerated energy of the particle (roughly 1 x 10^9 ev times 1.6 x 10^{-19} joules/ev = 1.6 x 10^{-10} joules) divided by the charge of each positron (q = 1.6 x 10^{-19} coulombs), which equals 10^9 joules per coulomb. The collision efficiency eff is not needed in this equation, because the result is not in particles, but is already in collisions.

Incredibly, the lower the current, the bigger the radius of the affected area. And the greater the current, the smaller the radius of the effected area. With 10^{-11} A beam currents, the effected radius r solves for 9.6 meters—roughly 10 meters, which describes a small area—less than a tenth of an acre.

To get an idea of the positron beam currents needed to reverse the order to disorder arrow of the second law of thermodynamics in what size of affected radius, see Table 1 below.

For an area the size of	r	beam current
House	10 m	10 pA
4 football fields	100 m	1 pA
community	1 km	100 fA
city	10 km	10 fA
Israel	160 km	0.6 fA
U.S.	2,400 km	0.04 fA
World	13,000 km	0.008 fA
Sun	1.7E11 m	6E-22 A

Table 1. Beam currents versus affected radius for reversal of the order to disorder arrow of the second law of thermodynamics.

Remarkably enough, the affected area of second law reversal calculates to increase with the reduction of positron beam current. Area control is merely a matter of timed gating of the positrons in the positron-positron collider. [8]

5. Rate of Reversed Aging

The author will now calculate the rate at which reverse aging will occur in the calculable radius of the active Refresher: The beginning energy of the host particles (positrons) from which the fusion process takes place is $2m_ec^2$ per individual reaction. The ending energy of the host particles (protons) to which the fusion process tends is $2m_pc^2$ per individual reaction. $\frac{\Delta E_p}{\Delta E_{e^+}} = \frac{+2m_pc^2}{-2m_ec^2} \approx -1836.$ This is a unit less expression from the available energy terms. What we seek is another unit less expression $\frac{\Delta t_r}{\Delta t}$, where t is the normal time during which a person or object ages, and t_r is the reverse time (negative) during which a person or object un-ages. The quotient is the relative rate of un-aging compared to aging. This also is a unit less quotient. What use of particle fusion parameters can yield such a unit less quotient? What terms are available to derive such a unit less quotient? What about the first terms and unit less quotient? If we equate them, we have $\frac{\Delta t_r}{\Delta t} \approx -1836.$ Reverse time would be negative and 1836 times as fast as forward aging time. Forward aging of 100 years would be un-aged in 19.89 days. Forward aging of 1 year would be un-aged in approximately 4.77 hours of machine time.

6. Miracle Working Power of the Refresher 1

The theoretical discovery of the order to disorder arrow in the second law of thermodynamics reverser (Refresher 1 for short) was a surprising turn, and engrossed the author for several years. By simply reversing the natural arrows between ordered events, many miraculous results were found to take place in theory.

What does it mean that the order to disorder arrow in the second law of thermodynamics is reversed? Events naturally come in order indicated by the arrows:

Healthy young adult→aging→wrinkles→aging→
cancer→death→cremation→scattering ashes

Reversing the order to disorder arrow in the second law of thermodynamics means all the arrows between the ordered events are turned around. The old and diseased become young and healthy. The clock is not really reversed. Adults do not become children again and disappear to extinction. The system just tends to maximum order, which is at young adulthood. Children still grow up to maximum order at young adulthood.

Many similar reversals can occur in the animal kingdom and the environment. The author imagined many marvelous things, but virtually forgot about the EFP Reactor.

7. EFP Reactor in the Field of the Refresher 1

Finally the thought came, "What would occur if the EFP Reactor were in the field of a Refresher? The concepts of the effects assembled slowly. The accelerator electronics would not have resistive heating in the field. As a result the accelerator would be room temperature superconductive. There would not be any need for cryogenic energy losses. The accelerator would be 100% efficient.

Reversing the order to disorder arrow in the second law of thermodynamics greatly affects all things with which we are familiar. But what would it do photovoltaic cells in a high energy gamma field? Outside the Refresher field, photovoltaic cells in the high energy gamma field would become damaged. They would become more and more damaged with time. This is a form of aging. What would happen if the aged photovoltaic cells were put in an order reversed Refresher field? The cells would un-age back to the original condition. What would happen if photovoltaic cells in an order reversing Refresher field were exposed to high level gamma radiation? They would not become damaged or aged. What would happen to the power that would ordinarily be absorbed in the aging process? Would it not be added to the power converted from radiation to electricity in the photovoltaic cells?

But what about the miscellaneous heating that would occur to photovoltaic cells in a high level radiation field outside an order reversing field of a Refresher? The heating process, though not necessarily damaging and aging, also occurs as an ordered process in the second law of thermodynamics. If the order to disorder reversed field of the Refresher were added, the photovoltaic cells would be cooled down. Heating would not occur in the field. What would happen to the power ordinarily lost to heating? Would not it be added to the power converted from radiation to electricity in the photovoltaic cells?

But what about the gamma photons that would not age the photovoltaic cells or heat them, but would pass through them without affecting them? What if the Refresher field were added, what would then take place? The next question can resolve this question. Is the shielding loss included in the order to disorder arrows in the reaction equations? Yes. Then with the addition of the Refresher field, the elusive photons would return or never penetrate the photovoltaic cells. What would happen to that power? Would not it be added to the power converted from radiation to electricity in the photovoltaic cells? This result is the hardest to take. We need experiment to settle this. If this paragraph were not true, we would expect it would take layers upon layers—many feet of photovoltaic cells piled on top of each other to stop the gamma photons. But if this paragraph is true, then gamma rays as well as sunlight could be stopped by a single layer of photovoltaic cells in the order to disorder in the second law of thermodynamics reverser of the Refresher. In the reversed field, the photovoltaic cells should be 100% efficient.

An EFP Reactor must be built and operate in the field of a Refresher.

While an individual photovoltaic cell may be 100% efficient, it would not be possible to cover every spot around the reactor with photovoltaic cells. But it should be possible to achieve 60% to on the order of 100% efficiency—enough for the source to be self-sustaining and an energy source.

8. What about Radioactive Wastes?

As we now experience the second law of thermodynamics, neutrons + products → neutron activation products. Reverse that and activation products become deactivated and neutrons are given off. Another reaction involving neutrons: $n \rightarrow p + e + \text{anti } \nu_e$. Reverse that and neutrons are produced. In the field of the Refresher 1, neutrons appear stable. Also in the field, radioisotopes are all backed out of existence. As long as the Refresher 1 field is on, the EFP Reactor will be radioactive waste free.

With two or three layers of photovoltaic cells to absorb the gamma rays that leak through the cracks between photovoltaic cells, nearly 100 percent efficiency energy conversion would be possible in the order reversed state.

This would save the need for layers upon layers of photovoltaic cells for shielding and energy conversion. Also the rapid denaturing of any radioisotopes produced would mean that there would not need to be such strong large containment buildings for the process. Also the photovoltaic cells would not age, degenerate, or become radioactive. In every way the second law reversed facility would be safer and more efficient than the same facility without the reversal of the second law of thermodynamics.

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Chapter 7

Is the Standard Model the Best Model?

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Abstract

For several decades the Standard Model of Physics has maintained dominance in the field—virtually unchallenged. Some, like Griffins, however, have grumbled about its lack of parsimony and lack of uniqueness in particles and particle structures. Another sign of its weakness is its inability to calculate the masses of the particles from first principles. There is a new model of physics, however, that can handle all three objections to the Standard Model nicely. The new model is the Electrino Fusion Model of Elementary Particles. The new model is more symmetric than the Standard Model, and has a deeper orbital level. This paper studies the weaknesses of the Standard Model and how they are all answered by the new model.

1.0 Parsimony

Griffiths [1] (p. 48) brought out that the Standard Model (Quark-Lepton Model) requires 61 different “elementary” particles (three different colors of quarks and anti-quarks, leptons and anti-leptons, gluons, etc.) to make up known matter, light, but not gravitons. That is a lot of “elementary” particles! The quark-lepton system is not very parsimonious.

The new model can boil all particle structures down to copies of a single particle. In the first place, most particles are found to be composite particles of six different whole particles—the whole particles are made up four fourth charges, two half charges, and one whole charge. But fourth charges, half charges, and whole charges can all be fusion states of eighth charges. Everything in the Universe can be constructed of eighth charges and anti-eighth charges. And eighth charges and anti-eighth charges could come together in a compound particle similar to light. So instead of 61 "elementary" particles, the new model has one "elementary" particle—or at most two.

Four fourth charges can have different energy states in particles—pions, kaons, and D-ons, etc. in orbits similar to Neils Bohr's Atom [2]. Two half charges can have different energy states in particles—electrons, muons, tauons, etc. in orbits similar to Neils Bohr's Atom [2]. The whole charges do not have higher energy states or orbits, except for two half particles orbiting about them at different energy states as in neutrons (n), Λ, Ξ^0, Λ_b^0, etc. particles [2].

Don't bother looking for eighth charges, quarter charges, or half charges—for they are all fractional charges, and all fractional charges are trapped going at or faster than the speed of light. They cannot be detected in real dimensions. They are as invisible as quarks.

The reason for such a difference in parsimony between the Standard Model and the new model (Electrino Fusion Model of Elementary Particles) is the Quark Model divides fractional charges into $\pm 2e/3 \; and \; \pm e/3$, whereas the Electrino Model divides fractional charges into $\pm e, \pm e/2, \pm e/4, and \pm e/8$. There are several other important differences between the models, but that is the most important difference.

2.0 Uniqueness

Griffins [1] grumbled also about the lack of uniqueness in the quark particle structures. The particles came in the

Eight Fold Way, and the first and eighth particle had the same quark structure. There was no structural parameter to differentiate the particles in the Quark Model. In Griffith's eyes, this was a weakness of the Standard Model.

In the author's *Electrino Physics* [3] is an exhaustive list of known particles in Appendix B. In the Draft Appendix B, the author assigned what he believed to be a unique structure to each particle, based on eight criteria: particle charge, spin, parity, mass, spin feasibility, preceding particles (to avoid duplication), decay schemes, and the Pauli Exclusion Principle. So far the mass constraints have been ball park mass only. But the author is busy calculating the masses of all the known particles fairly precisely according to the style of calculations in [2]. The full calculations will undoubtedly reveal mistakes in structure assumptions, at which time they will be corrected. But a completely unique assignment of particle structures through electrinos appears doable.

3.0 Calculation of Particle Masses

It is a weakness of the Standard Model that it cannot calculate the masses of elementary particles from first principles, but must input measured masses into the model as in [4]. Following the Electrino Hypothesis that fracton charges come in ±e, ±e/2, ±e/4, and ±e/8 and calculations similar to that for the Bohr Atom, the Electrino Model can calculate masses of known particles to two to four place accuracies for common particles. The following are samples from [2]:

Table 1

Particle		Calculated m / m_e	Measured m / m_e See ref. below.
muon	e_1	206.794 824 4	206.768 28
tauon	e_2	3,418.859 230	3,477
pion	π_1	274.389 246	273.132 05
kaon	π_2	965.561 724	966.101
D-on	π_3	3,555.335 4	3,658.75

Particle		Calculated m	Measured m [5]
muon	e_1	105.671 929 9 MeV	105.658 367(04) MeV
tauon	e_2	1,747.033 340 MeV	1,776.84(17) MeV
pion	π_1	140.212 605 6 MeV	139.570 18(35) MeV
kaon	π_2	493.400 988 5 MeV	493.677(16) MeV
D-on	π_3	1,816.772 514 MeV	1,869.62(20) MeV

Some calculated and measured masses of some particles of the electron and pion families.

Some calculations in the model are predictions of unmeasured particles:

Table 2

Particle	Predicted m/m_e	Measured* m/m_e [8]
Positron	-1.001 159 652	-1.0
Anti-Muon	-202.059 508 6	-206
Ant-Tauon	-2,949.132 583	-3,477
Anti-Pion	274.389 246	273.132 05
Anti-Kaon	988.189 900	966.101
Anti-D-on	4,123.340 2	3,658.75

*assumed from charge conjugance

The calculated values are so different than the assumed values that these measurements would make good tests of the model. For more particles, as well as the actual calculations, see [2].

4.0 Summary

The Standard Model with quarks and leptons has three major weaknesses treated in this paper. The new model (Electrino Fusion Model of Elementary Particles) doesn't have those weaknesses. In those areas, its answers are satisfactory.

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UNITON NEUTRON

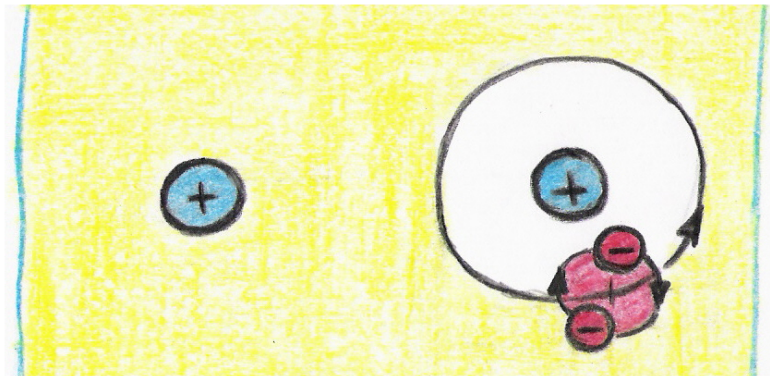

Figure 3. A uniton is a whole electrino. It is the core particle of protons and neutrons and is half of photons. They never come alone.

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

PROTON NEUTRINO

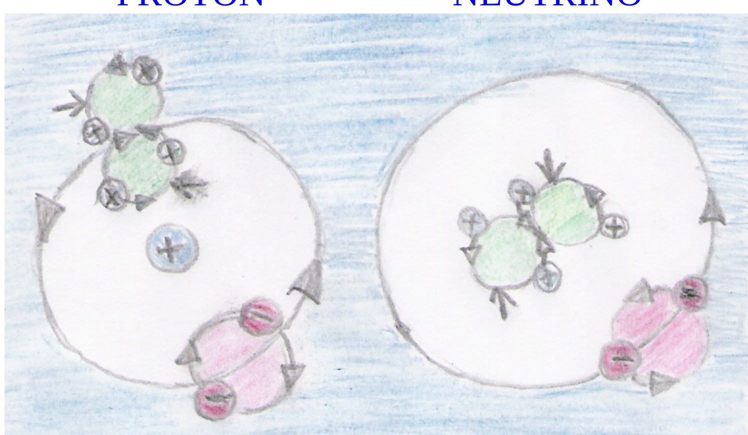

Figure 5. A proton is an electron and pion orbiting a uniton.

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