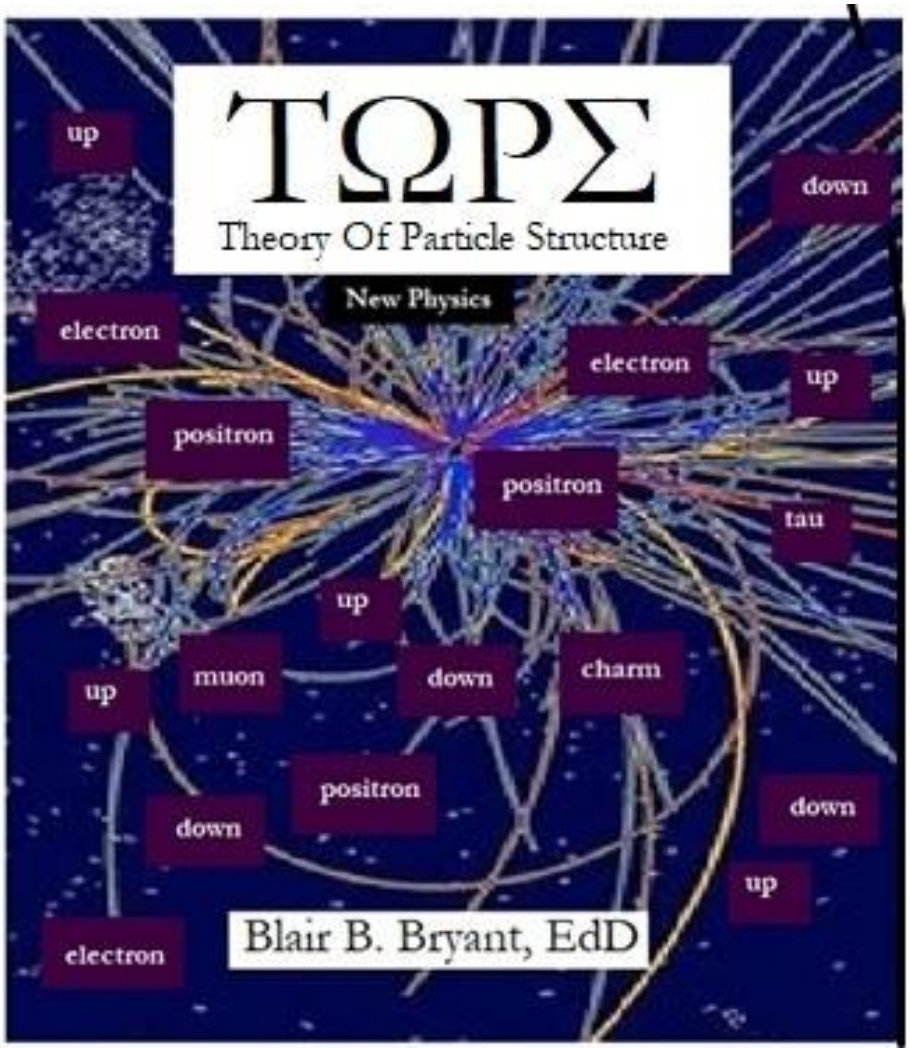

T, Ω, P, and Σ are Greek letters corresponding to the sounds of our English letters: T, O, R, and S. What I am trying to communicate here is the acronym, TOPS (Theory of Particle Structure). Most English readers would not recognize the Greek letter Π (pi) as having the sound of the English P and would wonder if I wrote the acronym as ΤΩΠΣ. Thus, I choose to be incorrect in Greek to better convey the ΤΩΡΣ concept to English readers. (Of course, I COULD have used the correct Greek letters ΤΩΡΣ and changed the name to Theory of Rotating Structures and been correct all the way around. But I prefer TOPS to mean the **Theory Of Particle Structures**.

[BBB 03/20/2021] *

INTRODUCTION

WELCOME TO THE WORLD OF TOPS!

This book is still a work in progress. There will be minor changes as I find and correct the inevitable errors I have made.

In writing this book, I wrote, edited, and revised in multiple places, often at the same time because I was learning as I wrote. Sometimes I found a new wrinkle in the math, so I needed to go back and make corrections in earlier and later formulas to accommodate the updated information.

But now, I think I have a consistent set of formulas and answers to the questions of the fundamental nature of the tiny particles of matter that I believe exist, and they make up EVERYTHING around us—from the smallest atom of hydrogen to the massive black hole at the center of our galaxy.

In some cases, I have formulas that I may have not checked thoroughly enough, and, in places, there may be 'simple' math errors in my algebra, so please be patient with me for I am NOT a good mathematician.

The basic TOPS concepts are now clear. They seem to be consistent with experimental evidence as I understand it, and I have calculated the dimensions of all the particles in the presently accepted Standard Model of Particle Structure. I have discovered several areas that appear to contradict several currently accepted principles of Physics and provide a faith-based testimony about how I believe I was led to these TOPS concepts

The skeptic will find it easy to dismiss my work because I do not follow current theories. But current theories do not cover much of the 'WHAT IF?' material I present herein, and I have been forced to develop new equations to extend Newtonian principles to the realm of the ultra-small where they obey the rigid rules of the Special Theory of Relativity. I suggest that you not judge this work based on current theories but test it against itself to see if you can find any truth within it.

I am almost certainly not 100% right, but just MAYBE, I am not 100% wrong.

Blair B. Bryant, September 9, 2022

Prayer of Teilhard de Chardin

Patient Trust

Above all, trust in the slow work of God.
We are quite naturally impatient in everything to reach the end without delay.
We should like to skip the intermediate stages.
We are impatient of being on the way to something unknown, something new.

And yet it is the law of all progress
that it is made by passing through some stages of instability—
and that it may take a very long time.

And so I think it is with you;
your ideas mature gradually—let them grow,
let them shape themselves, without undue haste.
Don't try to force them on,
as though you could be today what time
(that is to say, grace and circumstances acting on your own good will)
will make of you tomorrow.

Only God could say what this new spirit
gradually forming within you will be.
Give Our Lord the benefit of believing
that his hand is leading you,
and accept the anxiety of feeling yourself
in suspense and incomplete.

"Above all, trust in the slow work of God."

Pierre Teilhard de Chardin,
excerpted from ***Hearts on Fire***

Truth With a Capital T

Blair B. Bryant
August 10, 2021

1.
There is a Truth,
An Absolute Truth,
That begins with a Capital T,
THAT is the Truth,
The Absolute Truth,
THAT'S what I WANT to believe.

2.
As I deal with the strife
In my own human life,
I have no cause to believe,
I have found the whole Truth,
The Absolute Truth,
That begins with the Capital T.

3.
For my mind is small,
I don't KNOW it all,
I can just be the best I can be.
So, the truth that I find,
With MY human mind,
Must start with a lower-case t.

4.
But, in my concern,
That I might still learn,
More of that Capital T,
I've search'd all 'round
And occasionally found
A new gem that NOW, I can see.

5.
My heart leaps with joy,
It fills me with glee,
It broadens my soul, expanding me!
But now I am humbled, I must agree,
That even the truths I now can see,
Are yet a shadow–of the Capital T.

6.
I am quite certain, consider it true,
That God sees my efforts
With His glee, too!
When I pray for wisdom so I can see,
A bounty of Blessing pours over me,
'Tis one other notch in my lower-case t.

7.
When it comes to you,
I've found it is true,
I should listen to what you say,
But what's true to you,
May not be true to me,
We simply CAN'T think the same way!

8.
So, I won't judge you,
Because of YOUR view,
If your truth isn't going MY way.
And I will trust you,
To judge me not, too,
So, each can grow, our own way.

9.
So often we've heard,
'Let us trust in the Word'
So, hearken to what it can be.
A rod of iron, strong and true,
Guiding to a God-point view.
For HIS Word is a Capital T!

10.
The unknown is peeled,
And sometimes revealed,
By The God of the Capital T.
It repeatedly shows more
Of the ONE I adore,
My GOD with a Capital G.

Previews of Coming 'Findings'

STANDARD MODEL OF SUB-ATOMIC PARTICLES

	NEUTRINO	ELECTRON	UP QUARK	DOWN QUARK
CHARGE	0	-e	+2e/3	-e/3
SPIN	$\hbar/2$	$\hbar/2$	$\hbar/2$	$\hbar/2$
GENERATION				
FIRST	Electron Neutrino	Electron	Up	Down
SECOND	Muon Neutrino	Muon	Charm	Strange
THIRD	Tau Neutrino	Tau	Top	Bottom

STANDARD MODEL OF SUB-ATOMIC PARTICLES

THE TOPS STANDARD MODEL OF SUB-ATOMIC PARTICLES

	NEUTRINO	ELECTRON	UP QUARK	DOWN QUARK
CHARGE	0	-e	+2e/3	-e/3
SPIN	$\hbar/2$	$\hbar/2$	$\hbar/2$	$\hbar/2$
GENERATION	Neutito n2 (1,1)			
FIRST	Electron Neutrino n4 (2,2)	Electron (2,5)	Up (6,4)	Down (6,7)
SECOND	Muon Neutrino n10 (5,5)	Muon (5,8)	Charm (9,7)	Strange (9,10)
THIRD	Tau Neutrino n16 (8,8)	Tau (8,11)	Top (12,10)	Bottom (12,13)

THE TOPS STANDARD MODEL OF SUB-ATOMIC PARTICLES

Dimensions of the Sparqs & n2 Neutito

The physical properties of the n2 neutito (1,1) in the relativity state. The relativity state has a Lorentz Transformation gamma γ = 615 (at three significant figures).

RELATIVITY STATE (Chapter 6)

Charge

$y = +e/3 =$ $+5.33 \times 10^{-20}$ Coul
$z = -e/3 =$ -5.33×10^{-20} Coul

Radii γ Length Contraction

$r_{n2} = r_y = r_z =$ 6.76×10^{-13} m

Masses γ Mass Boost

$m_{n2} =$ $2.60\mathrm{X}10^{31}$ kg
$m_y = m_z =$ 1.30×10^{-31} kg

Frequency of rotation γ Time Dilation

$f_{n2} = f_y = f_\varphi =$ 7.05×10^{19} Hz

Rotational velocity

$u_{n2} = u_y = u_z = u_i = c = 3.00\times10^{8}$ m/sec

Ђ is called 'Thud' (Chapter 3) and is a physical constant which is common to Coulomb's Constant (k), the electric constant (ε_o), and the magnetic constant (μ_o). Ђ relates the spin of moving charges to the effect of 'heft' or mass through a distance. Ђ = 10^{-7} kg-m/Coul^2 (see Chapter 3) and is the constant which relates the magnitude of a rotating particle's CHARGE to that particle's MASS.

$\mu_o = 4\pi$Ћ
$\varepsilon_o = 1/(4\pi c^2$ Ћ$)$
$1/4\pi\varepsilon_o = k = c^2$ Ћ
$\varepsilon_o \mu_o = 1/c^2$

CHARACTERISTICS OF ALL STANDARD MODEL PARTICLES

NEUTRINOS	n2 (1,1)	n4 (2,2)		n10 (5,5)			n16(8,8)			n22(11,11)	
CHARGED			e(2,5)-1	up(6,4)+2/3	dn(6,7)-1/3	mu(5,8)-1	ch(9,7)+2/3	st(9,10))-1/3	tau(8,11)-1	tp(12,10)+2/3	bm(12,13)-1/3
mass xE-31 kg	2.60E-31	5.2E-31	9.1E-31	1.3E-30	1.69E-30	1.69E-30	2.08E-30	2.47E-30	2.47E-30	2.86E-30	3.25E-30
Planck Coef (P)	*1*	*1.414213562*	*1.870828693*	*2.236067977*	*2.549509757*	*2.549509757*	*2.828427125*	*3.082207001*	*3.082207001*	*3.31662479*	*3.535533906*
radius m	6.76E-13	9.57E-13	1.27E-12	1.51E-12	1.72E-12	1.72E-12	1.91E-12	2.09E-12	2.09E-12	2.24E-12	2.39E-12
freq Hz	7.05E+19	1.76E+19	5.76E+18	2.82E+18	1.67E+18	1.67E+18	1.10E+18	7.82E+17	7.82E+17	5.83E+17	4.51E+17
vel m/sec	3.00E+08	1.06E+08	4.58E+07	2.68E+07	1.81E+07	1.81E+07	1.32E+07	1.02E+07	1.02E+07	8.22E+06	6.78E+06
alpha	1.00E+00	3.54E-01	1.53E-01	8.94E-02	6.03E-02	6.03E-02	4.42E-02	3.42E-02	3.42E-02	2.74E-02	2.26E-02
h'/2	5.27E-35	5.27E-35	5.27E-35	5.27E-35	5.27E-35	5.27E-35	5.27E-35	5.27E-35	5.27E-35	5.27E-35	5.27E-35

Table 12-1: Characteristics of Standard Model Particles

Table 12-1 is a spreadsheet from the findings in Chapter 12 where I have brought the material from all chapters together.

Table 12:1 shows the characteristics of all fourteen of the Standard Model particles as they were derived from the Planck Coefficients (Ᵽ$_x$ from Chapter 2) as they apply to the particle's mass, radius, frequency of rotation, velocity, and α (from Chapter 5). Note that there are FIVE neutrinos--The first is the n2 neutito, which has probably not been detected and perhaps it never WILL be detected since it has so little mass and energy. Perhaps the last neutrino, the (11,11), is the most massive particle that has been named, 'the Higgs.'

The validity of all calculations depends upon the calculated mass of the n2 neutito (2.60×10^{-31} kg) and if that is proved to be incorrect, ALL values shown would also be incorrect. Nevertheless, Chapter 12 shows the value of the logic of a Planck's Coefficient in determining the values of these characteristics if one knows the particle's mass.

I leave it to minds greater than mine to prove or discredit the Theory of TOPS as presented in this book.

It is my genuine hope that others will find their TOPS journeys to be as fulfilling and rewarding as I found mine.

But I still do not know whether there really ARE yorks and zorks and have no idea how to prove that they are or are NOT genuine particles that make up EVERYTHING in the universe.

Nevertheless, I BELIEVE they do exist.

Blair B. Bryant
May 10, 2022

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PROLOGUE

WHAT IF???

THE BACKGROUND STORY

This is to inform those who know basic physics that I have developed an innovative approach to studying fundamental particles of matter. **I call this approach TOPS which stands for 'Theory Of Particle Structure.'**

In TOPS, there are just TWO fundamental particles, i.e., there can be nothing smaller than these particles and all other particles are made from them. I call these particles **yorks** and **zorks** and both are eternally spinning about their own axes with a 'spin' of h-bar/2 (**ħ/2**).

Yorks and zorks are identical in their mass, radii, frequencies, and velocities of their rotations. They differ only in their electric charges, with the york possessing a positive charge of +e/3, and the zork having a negative charge of -e/3. All particles in the Standard Model are composed of different combinations of yorks and zorks.

All my work has been under the normal assumptions of conservation of charge, mass/energy, and momentum following classical Newtonian physics, but being modified at the most fundamental level for the principles of Special Relativity. I believe that **our Creator has only one set of laws that govern His entire creation**, from the vast stretches of the universe to the smallest particles which make up EVERYTHING else at the lowest possible level.

Contrary to contemporary thinking, I believe Newtonian Physics applies to all levels and most of that which is currently considered to be 'weird, strange, and incomprehensible' may be mathematically manipulated with classical physics models, even in the universe of ultra-small particles. I want to invite all who may be interested in studying TOPS to join me as I explain the workings of TOPS in these pages.

But first, allow me to introduce myself to you so you have some idea who I am and how I came up with the idea that forms the basis of TOPS. I am a Christian, the Community of Christ by denomination, an ordained elder who deeply believes in the coming, peaceable Kingdom of God. At 90, I am reaching the end of this life and want to share what I believe that God has revealed to me in my new theory about particle physics.

I received an AA degree from Graceland College[1] in 1952, an AB in chemistry from University of Missouri in 1954, an Ed.M. in Guidance and Counseling from Boston University in 1972, and an EdD in Education from the University of California, in 1980. Note that there is no degree in physics anywhere in my background, and my only graduate course in physics was in 1967 from Trinity University in San Antonio, TX.

I had several very personal experiences dating back to my high school physics class and over the succeeding years. As a result, I developed a deep skepticism over some parts of what was being taught in my high school physics class of 1948-49. More specifically, I questioned the wave-particle duality of light and matter as taught. I also pondered how a sine wave represents electric and magnetic fields in a photon if a photon is a single packet of energy. And, I wondered, why do we obtain interference patterns in a double slit experiment? Current theories were not at all satisfactory to me.

Those questions continued to dog me when I attended our church junior college (Graceland College) and in my sophomore year (in 1952) I had a remarkable experience. In retrospect, I realize that experience was so powerful that it forced me OUT of further academic study of physics, but at the same time, it opened up a tiny window into a new concept that totally overwhelmed, excited, and consumed me!

The professor had drawn a helix on the chalkboard and was going to use that diagram to introduce the principles of integral calculus. Before he even started class, I studied his diagram and suddenly became aware that the perpendicular projection of a helix was a sine wave, and I was suddenly caught up with the idea of a photon being a particle following a helical path—a projected sine wave! As I pondered that, I reasoned that it could not be a single particle, for that would never follow a helical path without some balancing force. Thus, the photon must consist of two, oppositely charged particles following twin helical paths. I spent the entire class with a sense of awe in an 'electric' new awareness of something that I felt must be very important.

I liken that experience to having seen a tiny window into another world that I somehow knew, was wonderful, important, and of great value! But I had got only a tiny glimpse of that world at that time. For some reason I cannot explain, I trusted what I had seen and felt during that experience. I reveled in the excitement of that heightened awareness for the entire class hour.

[1] Now called Graceland University, the school was a Junior College when I graduated with an AA in 1952.

But my professor's points on introducing me to integral calculus were totally lost on me, and I must have missed some very important concepts to understanding the subject of calculus. As a result, I had a real struggle with calculus. I later told my chemistry professor (who was also my student advisor) I wanted to drop out of calculus class, and he told me I needed calculus to get my degree in chemistry.

So, I stuck with it and got a D on my mid-term exam--only by intensive memorization and extensive study did I manage to make a final grade of C. It was the closest I ever came to failing a course, and I resolved to not go ANY further with math of ANY kind. I got my AA degree and moved to the University of Missouri to continue studying chemistry. That was where I took my first undergraduate physics course, where, of course, I ran smack-dab into calculus. Again, I got by with studying principles of physics but not being able to follow the math.

It seemed that physics was not going to be my forte because I just could NOT do the calculus. I continued with a course in Physical Chemistry, where I started fast with a good score on my first exam. But soon, I ran into calculus which pulled my grades down. I **knew** I was never going to be a physicist! By the end of my junior year, I had also concluded I did not want to spend my life in a chemistry lab, but thought I would be a good chemistry teacher, so I started taking education courses, cutting back on the advanced chemical courses required for a BS and I eventually received an AB in Chemistry.

About six months after I graduated, I was drafted into the US Army where I found my career WAS to be in education AND physics. I never used my degree in Chemistry during my 38 years of working FOR the US Army as an educator, but the Chemistry degree was a door that allowed me to be sent to the Army X-ray School in San Antonio, TX after my basic training. I was at the top of my X-ray class and was taken out of the course to teach the **X-ray physics** portion of the course to a following class of fellow students before I even graduated! When my two years of Army service was up, having reached the rank of Corporal, the X-ray school offered me the same job as a civilian, and I spent a total of 15 years teaching soldiers the principles of X-ray physics. It was a very limited form of physics, but I loved the subject, and teaching. In 1967, I was offered a position at an Army Education Center in Germany, and advanced to other education and training positions in the Army.

While at the X-ray school, I took other physics and education courses to become a better X-ray physics teacher. All during those years in X-ray, I could not forget my Graceland experience about the helix. I never told anybody about it until I briefly shared it with my physics professor in 1967 as I was about to leave Trinity University and the X-ray school for a move to an education-oriented job in

Germany.“ "Forget about it!" my professor told me.” "No, I can't do that," I replied. There was something wonderful about that tiny glimpse into a new world that I had seen about 15 years earlier. It was just too important to forget about! I just KNEW it. But I had NO idea what to do with it except to ponder it repeatedly over the years.

I never saw that professor again, but it was in his class that I first learned of the possibility that there might be such things as quarks. They were not really accepted yet, he said, but they would have fractional charges of e/3 or 2e/3, if they existed at all. At the time, I wondered if that indicated that there might be an even smaller particle with a more fundamental unit of charge of e/3. But in 1967, that was just an idle speculation on my part.

Over the years I kept toying with the idea of a helical form of the photon from my Graceland experience but could make no sense of it. I just had the nagging feeling that there was something important in it and could not leave it alone, even after I retired from my work for the Army in 1993.

In April of 1999, I had open-heart surgery and I ‘died’ that day. The EMT team resuscitated me, but I did not remember the incident until several weeks later, when a nurse visiting me at home, looked at my medical history chart and blurted out, "I didn't know you had cardiac arrest!"

I spent a couple of months recovering from that surgery, most of it, not being able to leave the house, and I did a lot of thinking about my Graceland experience and what it might mean. By then, I had also heard that quarks were now an accepted scientific fact, but I had no idea of what quarks were. I also got to wondering about the new field of lasers and how packets of photons might exist if they were pairs of charged particles traveling in helical paths. I considered two photons and thought that if each had one negative and one positive particle following twin helical paths, it would seem logical that those four particles could form a regular **tetrahedron** with the first photon leading the second by a quarter of a wavelength. That **could** be how coherent light ‘bundles’ would be arranged in a laser beam.

The first Saturday (I think it was June 19, 1999) that I was permitted to drive myself, I went to the local library. It felt great getting out of the house on my own again! Scrounging through the stacks in the Physical Science section, I found a small book by Nobel Prize Winner, Richard Feynman. As I recall, it was titled, "The Third Lecture," or something like that.

According to the record of checkouts in the back of the book, I was the first person to check that book out for many years. I read the entire book that afternoon and evening.

That little book gave me insight as to the fractional charges on the up and down-quarks. There, I got my first introduction to the Standard Model with three generations of quarks, etc. But Feynman's idea of virtual particles popping out of nothing to trigger a particle reaction and just as fast disappearing into nothing, made no sense to me at all. That a graviton was ejected from an atom from half-way across our galaxy to me, and that every particle within me was sending out gravitons to every other particle in the universe….was that **really** the basis of gravitational attraction?? It seemed absurd that everything was sending gravitons back and forth to every other particle in the universe!

But I was hooked on quarks! Later that night, I took out a piece of paper and asked myself, "What IF there are even more fundamental particles than quarks, each with a charge of ±e/3?" and started writing.

By the time I got to bed, I had scribbled out a pattern that took hypothetical, tiny particles (I now call them yorks, zorks, and neutrinos). I started with a basic assumption that every particle in the Standard Model consisted of four components, a varying mix of yorks, zorks, and neutrinos and a pattern emerged. Eventually, however, I concluded the neutrino itself would consist of two yorks and two zorks and had discovered that different combinations of those two kinds of particles could fit together to form every particle in the Standard Model! For example, an up-quark with charge of +2e/3 would be made of 6 yorks (+e/3 for each) and 4 zorks (-e/3 for each) and I abbreviate the up-quark as (6,4)) for a composite charge of +2e/3. A down-quark would have a structure of (6,7) with a composite charge of -e/3. A charm is (9,7), and strange is (9,10). An electron is (2,5) and a muon is (5,8), an electron neutrino is (2,2) while a muon neutrino is (5,5). Each particle would have a matching antiparticle with an anti-electron or positron, being (5,2) and so on.[2]

I went to bed on a high of discovery! I felt the same kind of excitement that I had experienced in my calculus class, some 46 or so years earlier! Something had happened and I was captured by the new concepts!

---

[2] I soon adopted a standard approach by listing the particles in parentheses ( ), with a comma between them, always showing the number of yorks first. Thus, (6,4) would always mean a permitted Standard Model structure (an up-quark) consisting of six yorks and four zorks. When I consider a proton consisting of two up-quarks and one down-quark, the total number of particles would be [18,15] which is NOT a Standard Model structure, and thus is NOT permitted. Thus, permitted structures are shown in parentheses ( ), and the identification of the total numbers of particles being considered, is shown in brackets [ ].

By the 4th of July, I had double-checked my results and made cardboard models of each first-generation particle,[3] with attractive and repulsive electrical bonds (like those in the cubic model of a sodium chloride crystal) holding the particles together; and began to consider questions like:

1 How can a down-quark (6,7) change to an up-quark (6,4) in beta decay?[4]
2 How would the Fermilab's circular collider clash counter-rotating beams of protons and antiprotons to produce the showers of particles as detected?

My models seemed to work and conformed to the Standard Model. But was it realistic? Could there be something to the concept? I decided to see what sense I could make of it, so I started studying particle physics.

I have been working on this concept since 1999 and I call it TOPS (Theory of Particle Structure). Some of my most recent work on TOPS had been derived from the field of spectroscopy and I can calculate, for example, the radius of a hydrogen atom excited to orbit n=2 from the Lyman alpha spectral line (122 nm) strictly from theoretical application of TOPS principles and the results are NOT what Bohr proposed, because Bohr's proposed model for higher orbits does not fit the spectroscopic results. TOPS does. You can find how in Chapter 2.

One of my first 'successes' using TOPS was predicting which particles (matter and anti-matter) could be produced by high energy collisions such as those studied at the Fermilab (using proton-antiproton collisions). Once the CERN Large Hadron Collider (e.g., proton-proton) became operational, I tried the same approach to predict what CERN would find. A proton, for example, consists of two up-quarks (6,4) and one down-quark (6,7). How could a proton with the total number of yorks [18] and zorks [15] collide with another proton of [18,15]? What would be the particles in their decay? Surely, it would differ from proton/antiproton collisions ([18,15] vs [15,18]), even if they collided at the same energies.

There are multiple possible decay products, but I found that some seemingly possible decay products from CERN LHC proton-on-proton collisions are unlikely to

---

3 The first model I made was made from five regular tetrahedrons of cardboard, taped together. I labeled the apexes of the joined tetrahedrons with 2y and 5z and was amazed to discover that in one particular arrangement, the two yorks formed a natural axis of rotation and was surrounded by 5 zorks. It LOOKED like it would be a stable structure! I sat transfixed as I stared at it, and announced in awe, 'THAT is an ELECTRON!'

4 It can't by itself. But, the surrounding space is full of muon neutrinos (5,5) that can occasionally interact with the up-quark to produce a down-quark. Here, for example, is an up-quark interacting with a n10 (5,5) neutrino to produce an antielectron. up (6,4) + n_{10} (5,5)⟶ [11,9] ⟶ down (6,7) + antielectron (5,2).

be produced (for example, while anti-electrons are produced in great profusion, there must be VERY few electrons[5] (because they started with so much positive charge). On the other hand, Fermilab's proton-antiproton collision experiments are able to produce all of the first two levels of the Standard Model particles, most in profuse quantities. At this point, the physical evidence from many experiments (that have been available to me) confirms TOPS predictions.

Studying TOPS requires NO super mathematics. Personally, I am unable to do the simplest of calculus problems and am limited to doing algebra and some analytic geometry. TOPS depends on Classical Newtonian Physics modified by Special Relativity and taken down to the york/zork level of the smallest of all neutrinos, the (1,1) neutito that I also refer to as n2 (n, because it is a neutrino, and 2 because it consists of 2 elementary particles, a york and a zork).[6] At that point, Relativity takes over and quantizes all operations, but the basic physics remains Newtonian!

Thus, if one recognizes the basic Newtonian Physics of

$$\mathbf{F=ma = ke^2/r^2 =mv^2/r}; \quad \text{and} \quad \mathbf{E=F*d = h\text{-}bar*c/\lambda = mc^2},$$

he/she knows enough to comprehend what I have done, and I am interested in talking physicists through the basic concepts of TOPS. Current quantum mechanics equations are not necessary—e.g., we only need to use Planck's Constant in predicting the wavelength of a photon produced by an orbital shift in the hydrogen atom. I show you how to do it in Chapter 2 and it does NOT involve the Rydberg Constant—just classical Newtonian physics modified by Special Relativity.

I am not particularly interested in contacting theoretical physicists at this point. I tried that many years ago and nobody would listen. I did not have many of the details down at that point. But, even today, unless I can find three 'peers' who have published in the field, and they will all vouch for my work, no publisher will even look at a paper for a scientific journal, no matter what truth it may hold. Thus, most people in the field will not look at my work because I do not know ANY particle physicists, and I have absolutely no kind of degree in physics. Thus, I have ZERO professional credibility. I will start contacting physicists after I get the math all settled and can state the dimensions of the york, zork and electron. I will not have

[5] Here is one rare example of products possible from the decay of the conglomerate produced in a high energy proton-proton collision that will produce an electron. Each proton contains 18 yorks and 15 zorks, for a total of [36,30]. Products produced are one Top quark (12,10), one up-quark (6,4), one down-quark (6,7), two antielectrons (5,2) each, and one electron (2,5). All yorks and zorks must be accounted for with TOPS and NO non-Standard Model particles may be produced.

[6] The 'n' stands for 'neutrino' and the 2 indicates the number of yorks/zorks that comprise it.

the book really done by then but will have everything scientific all worked out mathematically for the critical inspection of physicists. After I publish the book on-line, I may make continual revisions to correct errors and otherwise edit the material. But, at that point, I believe I will have a sufficiently satisfactory document to present for study of the new TOPS concepts.

You may note that at the stage when I started this Prologue, that I still do not have the math worked out. This book is part of the process of doing that theoretical science. I will know when I have finished when I get the results we can test in the real world.

What I have is a faith and trust in a HIGHER POWER that reveals His secrets to intelligent men who have their ears tuned to listen for His gentle guidance and who earnestly seek to find TRUTH. I have a firm trust in Newtonian Physics, and I question current concepts or theories that reject Newton's formulas as they apply to the microcosm. I believe I have received multiple instances of enlightenment regarding the smallest of particles that make up all matter, and just before the Table of Contents in this book, I have listed the values of mass, radius, velocity, and frequency of the smallest of all particles, the (1,1) neutito which I conceive to be the smallest possible particle in the universe. I call that section, "Previews of Coming Findings." As I write this, I do not know exactly what those values are. This book is my approach to sharing how I received and integrated those multiple inspirations and arrived at those values.

So, what I need is people who know basic Newtonian Physics (but are NOT tied down to current quantum mechanics theories), to review what I have done and try to pick it apart. I am human and make mistakes, especially in math where a single error can make a result that is several orders of magnitude too large or too small even if the concept behind the math is sound. I need someone to find my mistakes.

My problem is that my findings do not fit any of the currently held theories and even run quite contrary to several conventionally, and universally held, theories. It is going to take some very patient and broad-minded physicists to be willing to spend the time to study my work when they passionately believe in the quantum theories as taught today.

I believe that good science is a process of unveiling or revealing what has previously been hidden from the combined knowledge of man, and in science we form new theories to 'explain' what we find in experimental research. In religion, we call it **revelation—an uncovering of knowledge previously unknown**. I believe that I have had some basic truths **revealed** to me and want to share them with science as a new theory!

On the way of my 22 years of TOPS study, I have discovered some interesting things:

Rotating Electric Charge is the source of all mass.

Each photon possesses an inherent mass of 1.30×10^{-31} kg PLUS the mass equivalent of hf_{φ}, where f_{φ} is the frequency of the photon. I call hf_{φ} the 'triggering energy' and THAT is all the energy it can give up when the photon is absorbed.

The simplest neutrino (1,1) has the same inherent mass as a photon plus an equal amount of mass due to other types of energy.

The radius of the smallest neutrino is 6.76×10^{-13} m.

The physical components of h-bar are the mass, velocity, and radius of a rotating particle; and we may use information from a known particle situation, to predict properties of other particles using h-bar.

The true meaning of Sommerfeld's 'fine structure constant.'

The theory of, and how to calculate, the physical dimensions of an excited hydrogen atom from purely theoretical consideration of spectroscopic analysis of energy exchanges, without using Rydberg's constant.

There is something physically and mathematically wrong with Heisenberg's Uncertainty Principle as it is currently understood.

There is a reason there is so little anti-matter in the universe when it 'theoretically' SHOULD have been created in the same amount as the matter that is all around us.

I started this book before I understood most of those things. Thus, it is through the process of writing the logic and calculations that I stumbled onto much of what you find here. As I progressed, I repeatedly, had to go back to previously written material and incorporate my new calculations and discoveries into older thinking. Thus, this book is the result of continual calculations, editing, rewriting, and integrating new thoughts with old. Think of this book as the evolution of what was originally, a quite simple question, 'What IF?'.

Physicists are going to find it easy to find fault with my quite-apparent lack of knowledge of current quantum physics. I do not operate from high level statistical mathematics, but from basic Newtonian physics as applied to the most fundamental of all particles, which must also obey the laws of Special Relativity.

To use TOPS, one must ignore some of the assumptions of current theories. Chapter 1 will present the TOPS assumptions and that is where one should concentrate in evaluating my work.

As I understand current thought, the single electron in the 'cloud' of a hydrogen atom is considered by many, to be a statistical 'smear' of that electron in all possible locations within the atom. Although I cannot follow the math that leads to that conclusion, I understand that it is based on Heisenberg's Uncertainty principle.

That position is universally held **although** spectrographic analysis shows that very specific wavelengths of light are produced **as if the electron DID shift between fixed circular orbits** and not randomly as it would be if the electron were spread all around the volume of the atom**.** I find that disconnect very, very uncomfortable.

In my opinion, the 'electron cloud' of a hydrogen atom's single electron, should not be seen as being haphazardly smeared all around the atom (statistically sometimes even found **in** the nucleus?), but rather to move in discretely defined, virtually-circular orbits that are moving so rapidly (millions of billions orbits per second and are continually in precession around the nucleus) that they APPEAR to be everywhere at a fixed distance from the nucleus at any point in time.

To me, this is a very good reason to question the validity of Heisenberg's Uncertainty Principle and I will plan to do that and go even further in Chapter 13.

In the meantime, I welcome the reader to a new experience. Most of what follows in this book is well known to science. Some of it is brand new. Most of it is a blend of old and new. I think the reasoning behind the new material is sound and request that, although there must be places where I AM dead wrong, that the reader will keep an open mind for the places where I just MIGHT be right.

But what if all this TOPS stuff is really nonsense? Perhaps there are no yorks and zorks and their 'existence' simply follows my question, 'What IF???' that I followed that night in 1999. I will let the classical mathematics speak for themselves.

This is NOT a Textbook

I probably could have condensed this book to about 20% of its current length by leaving out a lot of development detail and giving my readers only the results of derivations. But I never intended for it to be a textbook. Almost from the beginning, I planned to cover HOW I obtained the results, following a conviction that I was headed in the right direction even though I had no idea how it would come out.

Almost from the beginning, I was using simple physics, so simple that I believe that a High School AP physics student should be able to understand it. I decided I would not try to write it to impress the academic world, so I targeted the text for a B+ AP physics student as my audience. If THAT AP student can understand TOPS, the university professor most certainly can.

Tre result of this approach, however, means that the professor will want to skip over explanations (that are 'old hat' for him) that I think are important for the AP HS student to know to learn about TOPS. While I realize it will be the professors that will ultimately either support or refute my theories, Sorry Prof! You are NOT my target audience, but you are welcome to read along with the grade B+ AP student to learn about TOPS in a simplified manner.

I wrote nothing until I had pretty well mastered the understanding of the reduced Planck's Constant, ħ, but I had spent many years to get there. Thus, I had a rather clear concept of the three major components of ħ, mass, radius, and frequency in terms of the operation of h in an atom of hydrogen. By then, I had developed the conviction that I would be able to calculate the radii of each hydrogen atom orbit from the measured wavelengths of the hydrogen atom's characteristic radiation from the spectrographic data that had been gathered by scientists from around the world for over a century.

When I started this project, my logic was something like this: A given wavelength of light (λ_φ) would be produced by a fixed quantum of energy (hf_φ) and would possess a frequency of (f_φ) that would be produced by a shift of electron from an initial outer electron shell of the atom at orbit (n_i) with an initial rotational frequency (f_i) to a final inner shell (n_f)

having a final frequency (f_f). From this, I should be able to calculate the radius and rotational velocity of the electron in each orbit.

I chose the Lyman Series of wavelengths because those were the lowest energy photons that included all orbits of the hydrogen atom. By the time I had calculated the corresponding photon frequencies of each Lyman series orbit, I was confident that I would be able to work out the entire sequence for all variables. That is when I announced to my family that I had made a breakthrough in my theories and started writing Chapter 2 (late spring 2020).

By that time, I had a pretty good idea the general direction I would work for the entire book. Very early on, I made a conscious decision to include all my work so any high school physics student with a GPA of 3-4 would be able to follow what I had done and understand it. I therefore needed to express what I was thinking and doing in a narrative fashion and demonstrate it mathematically.

I had three reasons to do this. First, I needed to do it to prove that I could teach others the basic principles of TOPS and I was confident that the concepts could be readily understood by my target audience, the typical high school physics student. Second, I needed a complete package that was internally consistent, even though I did not know how to get there, or how it would turn out. Third, as a minister, I wanted to demonstrate that God will lead those who search for truth and I wanted to give the flavor of a journey of faith, following that search for truth by asking, 'What IF?' and following it through. 'Where He leads me, I will follow!' THAT is my testimony.

Do I think I have a Theory of Everything? Of course not. I expect to continue learning even after I die from this world—maybe throughout eternity!

Is there room for improvement in my work? Of COURSE! I welcome constructive criticism and want to share what I have discovered with others.

I have tried to document my progress in solving the problems of TOPS. I did not know how it would turn out when I started, but I HAD a conviction that I was on the right track and that, if I persisted and followed the always-available leadings of the 'ONE WHO KNOWS ALL' that I would end up with a consistent theory that would help advance the understanding of science in a simple way.

Thus, I present this book as a log of my evolving thinking as I followed a journey of Faith in God, in Science, and in ALL people who are seeking the TRUTH. For Truth is where you find it.

WELCOME TO THE WORLD OF TOPS!

QUO VADIS?[7]

Please ponder how YOU may be affected by these proposed concepts.

Blair Bryant

May 24, 2020

[7] Latin: Literally, 'Where are YOU going?' You will find this question at the end of every chapter. What are **YOU** going to do because of what you read in this book? How will it affect YOUR work?

Chapter 1 - The World of TOPS

There are certain things that tend to drive a physicist's mind to utter distraction! What physicist is not befuddled by the 'weird' things that occur in the subatomic world—things such as:

Why do we get interference patterns in double-slit experiments--are we dealing with waves or particles? Perhaps it is some odd mixture of both?

What is the meaning of Sommerfeld's Fine Structure constant, $\alpha = 0.0072973$, which is remarkably close to the inverse of the number 137?

What is the source of mass? I once read an estimate that, considering all known contributions to the energy of an electron, we cannot account for more than about 1% of the electron's mass!

The Matter/Anti-matter Paradox: Conventional Physics holds that at time of the Big Bang matter and anti-matter were made in equal amounts. Somehow, matter got the upper hand and became overwhelmingly dominant. Where did the anti-matter go?

Dark Matter: Only about 5% of the universe is visible—glowing stars and galaxies. That means 95% cannot be seen or detected with instruments. What is out there that holds all the missing matter that we cannot see?

How is it possible that when one separates two 'entangled' particles by great distances, that making a change in one of the particles, immediately affects the other one, far, far away (it is said that Einstein once called it 'spooky action at a distance')?

These questions are deeply uncomfortable, but every physicist must live with them because repeated experiments have demonstrated that things are not as nice and orderly as they would like to be seen by experimental physicists. Most physicists manage to ignore such questions for normal work, but those questions are always THERE bugging the dickens out of those 'in the know'! A frequent word for the persistence of these questions is 'weird.' …WHY?

The scientific mind tries to develop new theories to explain away the persisting laboratory observations. At this point, however, these questions continue to plague the best minds in the field, for nobody has been able to resolve the counterintuitive laboratory results. It seems that the more we know about the world about us, the less we can understand the why of the things that we observe happening.

In 1927, there was a meeting (The Solvay Conference) of some of the greatest minds of the day (most of them Nobel Prize winners in Physics or Chemistry) in the city of Brussels, Belgium. The question before the conference was how to make sense of the contradictory evidence they were finding in their double-slit experiments using photons and electrons. Einstein was there, as were Bohr, Heisenberg, Planck, Schrödinger, Dirac, Pauli, etc. Werner Heisenberg presented a theory of 'Uncertainty' which stated that it was impossible to know things with certainty because the more one knew about the momentum of a particle, the less certain one COULD be about its position. Einstein was very reluctant to accept the principle, but eventually gave in, commenting something like, 'God does not play dice.' Thus, Heisenberg's Uncertainty Principle became an accepted, scientific 'fact.' According to Heisenberg, one simply CANNOT possibly know what will happen so you may as well forget about even **trying** to figure it out!

Like every other student of physics, these questions bothered me, too. Oh, for the days when 'everything made sense.' Well, ALMOST everything.

My 1952 Graceland College experience[8] dealt with a concept that a photon of light was a rotating particle, following a helical path. By the end of my heart surgery convalescence in 1999, my concept had developed to the point of assuming that light consists of a moving pair of oppositely charged particles and that a laser beam ("coherent light") consisted of pulses of those light particles marching together and spaced a quarter of a wavelength apart.

This all seemed to make sense and I ignored the claims that, 'You cannot use Planck's constant at the atomic level. A photon is both a wave and a particle.' This standard viewpoint was not answering my questions. Was there really something TO my hunches regarding the nature of the photon?

That was when I went to the library where I found Feynman's book, 'The Third Lecture.' I needed to get some idea of current theories so I could understand what quarks were. I thought I could examine the nature of a photon later. That book described the double-slit experiments and introduced me to the Feynman Diagrams. I

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8 See this book's Prolog for that experience. It is expanded upon in Appendix D.

had a lot of trouble with some of the concepts of the Feynman diagrams with photons, electrons, gluons and quarks. Some of Feynman's diagrams violated my sense of order--virtual particles, appearing out of nothing to initiate a reaction and then disappearing back into nothing?? That made no sense to me.

But that book gave me an idea of the nature of quarks as compared with the limited concept of atomic structure I had known in the past. I also had some basic principles in mind for what I would find after I had read Feynman's book on June 15, 1999.

First, I questioned the concept that annihilation of particles could take place. Yes, it made sense that the particles could react to form photons, but to become NOTHING but pure energy of a photon, did not make sense. Of course, it **has** been observed that a positron (= anti-electron) and an electron DO react (and disappear) to form one or more high energy photons. But, to me, there must be some other explanation than saying that the particles cease to exist with that burst of gamma energy and that is all there is to it! In what form would that energy be? Something had to carry that energy and it seemed logical that 'something' had to be mass, after all, $E= mc^2$. Mass of what? Some sort of particle?

It was at that point that three, different concepts came together in my mind. 1) Mass/energy had to be conserved; 2) My concept that a coherent laser beam consisted of two or more packed photons (two charged particles) locked in step by ¼ wavelength apart; and 3) the idea that quarks must be made of more fundamental particles, each of which possessed a charge of $\pm e/3$. Those particles HAD to be immutable and indestructible! They just could not simply cease to exist.

I also questioned the commonly held concept that there was some inherent weak force within a radioactive atom that triggered it into undergoing transmutation by ejecting energy from the nucleus. Yes, we know that there are three types of radiation emitted from radioactive atoms, alpha, beta, and gamma rays. The first two are charged particles and the third is a neutral high-energy photon. But all atoms of a single isotope of, for example, radium, are identical. At the same time, all radium atoms (of the same isotope) are 'top heavy'—their nuclei are unstable to the same degree, and they all will eventually decay, kicking particles or photons out of the nucleus to become more stable. What causes one particular atom to undergo emission of radiation while the rest of the atoms in that speck of radium are NOT affected, and remain as radium until another one of them, apparently quite randomly, fires off another particle or photon?

All radium atoms (of a specific isotope) are identical in their makeup. Nothing within the individual atom, could do that, I reasoned. Which radium atom would fire off first was purely random and totally unpredictable. There must be some random encounter, from OUTSIDE of the atom, that was randomly triggering the decay action. This, along with other reading I had been doing, led me to the conclusion that our universe is very sparsely, but quite evenly filled with a sea of particles that would give the opportunity for an occasional random encounter to trigger radioactive decay of any particular atom. Along with a given kind of atom's internal stability (say, radium), but also by random, but statistically, predictable encounters with one of these triggering particles, would explain why a particular atom would be the first to undergo decay. It must be the difference in degree of instability of another kind of radioactive atom that would cause it to have a different half-life from radium—not some 'weak force' within the atom.

Going over Feynman's Standard Model, I thought that perhaps it was a particular radium atom's random encounter with an occasional passing neutrino that could trigger a beta decay reaction. There would be no change in total charge if it were a neutrino, but because a different charge DID result from such an encounter, there must be a matching opposite charge that was also ejected to keep total charge constant.

And that was about where I was mentally, on the evening of June 15, 1999, when I sat in my living room with a single sheet of paper and asked myself, **'What IF there was a more fundamental particle with a fractional charge of -e/3? There would also have to be a matching charge of +e/3!'**

That started my study that became TOPS. The scope of TOPS did not emerge full-grown. But the Standard Model concept evolved from it that night. The rest of it grew slowly and was the result of much study, contemplation, and in some cases, sudden inspiration. Understanding grew in multiple areas, first concentrating in one area, and then shifting to another, allowing growth in the first area to mature and consolidate with changes in other areas over a period of about 23 years.

In the early years, I tried to publish a TOPS paper, but was far from being ready enough to 'go public.' I did discover that it would be necessary to have at least THREE peer reviews of my work in preparation for publication in a respected journal. I knew no physicists who studied such things. Nobody of any expertise knew of me or what I was doing. I had an aerospace engineer friend with whom I shared a few TOPS concepts and one day I blurted out to him, "I'll show them! I will calculate the mass of an electron based on TOPS!"

Well, here I am, some 15 or so years later, and I have yet to calculate the mass of an electron based on TOPS. What I **have** done, is calculate the mass of the york and zork in terms of the known mass of the electron, assuming it has the TOPS structure that I believe it has. [The following was added on June 4, 2022: I have also calculated the mass, radius, frequency of rotation and rotational velocity of ALL Standard Model particles. This information can be found in Chapter 12.]

Most of my studies have centered on Planck's Constant ($h=6.63\text{x}10^{-34}$ j-sec) and its buddy, h-bar ($\hbar = h/2\pi = 1.05\text{x}10^{-34}$ j-sec). For some reason, that constant resonated with me from my basic course in college Physics in 1954. We did not dwell much on ħ in that course, but it was introduced regarding spectroscopy in some way that I have forgotten. Somehow, I knew its value was important, but I couldn't seem to remember THAT value, $6.63\text{x}10^{-34}$. Preparing for my final exam in Physics, I scratched that value in tiny figures onto my slide rule for possible reference during the exam. We didn't have calculators back in 1953 and were required to take our slide rules into the exam room. It turned out that the exam never covered Planck's Constant and I didn't need to 'cheat.' To this day, I don't know whether I would have used that information if it had been on the test. I expect I would have, because I scratched that value on my slide rule 'just in case.' It was the only time in school, that I was tempted to cheat, and I was so very relieved that the exam did not tempt me.

But I just knew Planck's Constant was important! I don't know how I knew that, because we had spent so little time on it in class. At that time, I don't think I COULD have used it on a test because, I did not know what it really meant—I just KNEW it was IMPORTANT!

In my TOPS studies of ħ I wondered what it meant—it HAD to mean something! I kept coming back to that question, 'WHAT is angular momentum?' Finally, I went back to basic Newtonian Physics. I finally realized that Newton had become my fallback position when I came up against something I did not understand. Just 'what IS angular momentum' became an important question to study. I had been studying the Bohr atom of hydrogen and decided to calculate the angular momentum where the electron was in orbit n=1, based on Newtonian physics. It was not an area we had studied in depth in my physics class. But when I was in high school physics class, I had spent quite some time trying to understand the more basic concept of Moment of Inertia and decided to calculate the angular momentum of the hydrogen atom in its ground state. TO my great surprise, I came up with the value of $1.05 x 10^{-34}$ j-sec! "Why THAT'S ħ!" I exclaimed to myself when I realized it!

That was the beginning of understanding that ħ was not JUST a constant—it had real MEANING in terms of what was going on in a hydrogen atom. Furthermore, I found that ħ always is the product of the specific components of mass, radius, and frequency, and ALWAYS gives the same answer (or, in some cases, exactly half of that value) regardless of what particle I was studying!

WOW!!!!

I have now spent many YEARS studying ħ. I don't know how many spiral notebooks I have filled with ħ calculations, but I have a cardboard box that is FILLED with those spiral notebooks, and I am confident I have lost some of them--somewhere. Almost every page ends with no conclusions, for in most of them, I was just exploring, trying to understand some basic concept. Almost all the notebook pages are incomplete, but each page in the notebook represents where my mind was going at that particular point in time--and because I make LOTS of mistakes in my calculations, and I repeatedly diverted to follow other 'rabbit trails,' I often gave up for the moment, deep in frustration of an elusive concept, such as 'what is the mass of a york?' Or, 'if its radius is doubled, why isn't the frequency halved?' Or, 'why does this show a velocity GREATER than c?' I don't know why I kept those books because there is no way I, nor anybody else, could use them—they are too fragmentary, but I still have lots of those notebooks—just sitting—in a box.[9]

I do not recommend my method of studying ħ. It was not at all efficient. But, I had so many different things going on in my mind that I found I often could not concentrate on just ONE thing and follow it to its logical conclusion—I had to learn other physics that I had never needed before: areas such as angular momentum as related to rotational velocity; how rotational or angular momentum differs from linear momentum; how potential energy is due to separated electrical charges; how magnetic moment produces potential energy; how to calculate the specific wavelength of a photon produced when an electron within a hydrogen atom shifts from one specific orbit to another; and on, and on, and on…. And I had to try to integrate known Newtonian Physics (that I felt I had been barely introduced to) along with my new

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[9] This is June 8, 2021, over a year after I wrote this material. I have been reviewing and editing prior to publishing this book. This process of discovery of ħ is still going on! Just today, I became aware of yet another aspect of the use of ħ in the photon. Thus, my understanding of ħ is still expanding.

concepts of TOPS. In all this background study, I was really beginning to understand some areas of physics that I had never studied before.

Once I felt I had a basic concept down, it was time to try to subject it to math, and I am NOT a good mathematician! So, as I said earlier, I made a lot of mistakes and frequently gave up on one area simply because my mind could no longer keep these concepts together, mathematically.

At those times, my mind needed a rest. Sometimes, I got quite logical results and wrote a big 'SAVE' and drew a box around it. But mainly, I got such contrary results that I scratched through a calculation, wrote, 'No Way!' next to it, and occasionally, I simply flopped back and prayed, "God, what am I doing wrong?"

Unfortunately, I didn't offer that prayer often enough. Eventually, I realized that it was during those occasional times that I DID lay it before the Lord like that, it seems I soon got a sudden flash of inspiration that brought a few things closer together in my mind. I knew I should have had that prayerful attitude all along, but I was working SCIENCE, not religion and sometimes I thought I should be able to work through this problem on my own. I really believe that I was led to new concepts at multiple critical times, but the growth always seemed to come in small incremental steps. As a rule, I was NOT given massive hunks of new concepts that fell immediately in line. My human logic formed the structure that led to current conclusions, but there was a lot more to it than just my human mind. I attribute that added 'umph!' to The Higher Power that slowly led me to where I am now. In saying that, I do NOT mean to imply that I now think that I know it all!

I frequently would go to bed but sleep just would not come because my mind was turning over some concept or mathematical representation of what I had been working on. Or if I did quickly drop off to sleep, I often woke up a couple of hours later with my mind working through a particular part of the problem. During those endless hours, I often continued the process of sorting out the concepts and how they could be manipulated. Sometimes, I got a lot done during those hours of sleep, partial sleep, and even those long hours of NO sleep.

> [I am adding this paragraph after I wrote the preceding text last night. It is June 1, 2020, and I had an interesting experience early this morning. I was dreaming of my writing from the night before, about the puzzling aspects of physics that I mentioned at the start of this chapter. Two things came into focus during my sleep.

First, I realized that contemporary physics holds that the CERN LHC[10] uses colliding beams of protons with the assumption that if they can get the speed high enough, they will have the energy needed to convert energy to mass to make new particles such as the Top quark. TOPS, on the other hand, would view this as impossible, because energy IS mass and what is being done at the LHC is smashing the existing protons together so hard that they fuse the combined particles momentarily, so they become large enough to produce larger particles from the smaller ones! As a result, in TOPS, the larger particles are always unstable and will decay to lower-level particles until they get to the stable, first-Generation of up and down-quarks and electrons. I do not know why I never understood that distinction between traditional physics concepts and my TOPS conclusions, but in my dream state, it was 'perfectly obvious' to me that was the case.

Then, I heard a voice from afar asking the question, "Why is anti-matter so scarce in your world?" Immediately, I answered in my own voice, "Because the anti-matter particles decay until there is nothing left but neutrinos and photons." There was no delay in my response to that question, but it was not anything that had occurred to me in the previous 20+ years of labor on TOPS. It was a new concept to me but seemed intuitively obvious once I had thought of it. I awoke immediately and spent the next two hours lying in bed, mentally going through many different decay products to make sure that all decay cases would produce neutrinos which were matter and anti-matter mirror-images of each other. I have now put pencil to paper to do sample decay charts and have added an additional chapter to this book so I can share that information with others. See Chapter 8. I knew this matter/anti-matter issue was another problem to physicists so I thought I must add it to my list of puzzles at the beginning. You will now find it there. I share this dream with the reader because it is quite representative of unusual ways that things were revealed to me over time. BBB]

I do not consider TOPS to be 'mine' in the sense that I alone, 'dreamed it up.' I feel I was LED to a gradually expanding understanding of an entirely new concept and I attribute it to The Higher Power that I call GOD.

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[10] CERN is the European scientific agency which operates the particle accelerating complex located on the border of Switzerland and France. The world's largest accelerator, it is called the Large Hadron Collider.

At any rate, with all of the false starts and reboots, I was learning, and things were coming together. But it took something like 20 years to get to the point of being able to place confidence in what I was doing so the math could begin to make sense. Before that, even though my convictions about the direction I was going were strong, I had nothing substantial to show to anyone. I needed to document my work. It was then, that I decided to start drafting this book, even though I did not have the mathematics done to the point I felt was sufficient to back up my 20 years of dabbling with the TOPS concepts. But the Covid-19 pandemic was upon us, and it looked like a suitable time to be alone to concentrate my effort on TOPS.

Everywhere I looked, I found ħ. But ħ is not the only area I studied and included in my notebooks. I often would become overwhelmed by the enormity of the problems I faced with TOPS and would drop the subject, weary with the effort. But then some other aspect would come up—it might be a new thought on mass, and how different forms of energy might add up to new values to contribute to total mass of a particle; or how a specific wavelength of light is produced when an excited hydrogen atom electron shifted from a higher orbit back into a lower orbit; or what is the velocity of the electron in orbit $n=2$; or what is the significance of Sommerfeld's Fine Structure Constant α; or, why do some of my calculations sometimes give a velocity that exceeds the speed of light?

But, even when I thought I was working on a different subject area, it turned out that most of them DID deal with ħ. So, over, and over, I returned to the study of that mercury-slippery ħ!

You will find that the next chapter (2) is devoted to ħ alone! An in-depth study of Planck's Constant is most illuminating! It was during my intensive delving into ħ that I discovered some interesting concepts that seemed to answer some of the puzzling aspects or 'weirdness' of the quantum world that I alluded to at the beginning of this chapter.

But I warn the reader, don't get your hopes up too high! TOPS concepts do not solve all of the mysteries or weirdness of quantum physics. Nevertheless, I invite you to study TOPS from the following chapters, because I feel confident that SOME of those questions WILL be answered in this book, but they will be answered from a TOPS perspective.

So, let us delve more deeply into the basic concepts and assumptions of TOPS to gain insights as to how much of the 'weirdness' of sub-atomic particles may be understood.

The Key Concepts of TOPS

I propose a new approach to studying the structure of matter. I call this approach the Theory of Particle Structure (TOPS). TOPS requires some minor, but significant changes in thought processes from today's standard fare on the Standard Model as shown in Feynman's book. TOPS does not replace the Standard Model. Instead, TOPS is an extension of Feynman's Standard Model, building on the foundation of quarks, leptons, photons and hadrons that is the basis of Feynman's traditional Standard Model. Since Feynman's book was published ('The Third Lecture'), the Standard Model has been 'updated' to show the 'Strong' and 'Weak' Forces, Gluons and Bosons, and the model has done a fine job of describing the structure of matter and providing a basis for predictions of experimental observations for several decades. But even the updated version of the Standard Model always leaves physicists with inexplicable infinities, contradictory conclusions, and some very difficult and puzzling questions.

From this point on in this chapter, I will be referring to the original Standard Model that I first encountered when reading Feynman's book. I did not accept the added portions of strong and weak forces or gluons when I first read the book and did not know of the updates to include gluons and bosons until fairly recently. Feynman's original Standard Model sorted matter into several categories or families: there were various kinds of neutrinos; the electron and its relatives the muon and tau; quarks of several levels of complexity and types; and photons. TOPS attempts to describe the substructures of each of these original Standard Model particles.

Many physicists have concluded that the 'laws of physics' at the quantum level are vastly different from the Newtonian equations which rule our everyday lives. Most physicists, however, would agree that there SHOULD be a given set of equations which can describe the behavior of a particle on the quantum level; be extendable through the mechanical physics of our Newtonian world of experience; and out to the greatest cosmological distances. But there seems to be little agreement among today's physicists about what or how that ideal set of laws may be accomplished.

The spinning of a child's toy top may be defined in Newtonian terms of angular momentum (e.g., $L = I\omega$), and, to me, that relationship defines a TOPS particle's spin as well. Many of today's typical physicists make no attempt to reconcile any given particles' spin with the reality of something like a child's toy top that is rotating on the kitchen floor. A physicist once wrote me saying that when it comes to particle spin, 'I just ignore it.' In TOPS, such spin (e.g., $S = \hbar/2$) is an essential element within the existence of the particle. In the following pages, we will attempt to explain how some Newtonian and quantum equations are the same.

I believe that TOPS provides an approach which can bridge conceptual gaps and demonstrates that Newtonian physics is just as applicable at quantum and cosmological levels as it is to our daily lives. This book is an attempt to show that TOPS can provide those conceptual connections which link all levels of physics, but this book will NOT be a complete description of TOPS. Nevertheless, it is important to provide some insights of TOPS as an introduction to the conceptual basis. Once we have that conceptual basis, we will show how the Newtonian equations apply on the quantum level.

TOPS Definitions and Axioms

TOPS requires a bit of redefining of terms. The physics of TOPS is not vastly different from that as conventionally taught, but TOPS has a few peculiarities which require new ways of thinking about matter. The following TOPS definitions and axioms are provided to guide our thinking on TOPS.

Definitions:

MATTER: Matter consists of only two kinds of immutable particles which have these characteristics: They possess charge, mass, rotate, occupy space and are incompressible.[11] The two kinds of matter are YORKS and ZORKS and, they are identical in all respects except for their charge. The york has a positive unit of charge equivalent to 1+/3 the charge on an electron. The zork has a negative unit of charge equivalent to -1/3 that of the electron. Collectively, yorks and zorks are called Sparqs. Particles of TOPS matter DO possess mass—the yorks and zorks simply possesses the smallest possible units of charge and mass; and occupy space. At present, Sparqs

[11] The one possible exception to being incompressible is within a black hole. See 'Rho hole' in Chapter 14.

are assumed to be disk-shaped and are never found in isolation but always in specific combinations of two or more. They may be neither created nor destroyed.

ENERGY: There is no such thing as 'pure energy' apart from mass, but there are many forms of energy which may be converted from one form to another.

MASS: Mass is an expression of the energy content of a particle. There are several contributions to mass within the particle, therefore, mass is summative. The energy from each contribution is added to make up the total mass-energy of the particle, i.e., $\Sigma E \equiv \Sigma m(c^2)$.

CONSERVATION LAWS: The following conservation Laws are assumed for TOPS:

> **Matter is conserved.** Matter (Sparqs=yorks and zorks) may be neither created nor destroyed. Under high energy conditions, Sparqs may be smashed into each other to rearrange and form new particles. When this occurs, the total number of Sparqs which are contained in the structure of that particle, is the same as the number of Sparqs which are reconfigured into new particles. Thus, Sparqs are neither created nor destroyed, but MAY be recombined into new configurations.
>
> **Charge is conserved.** A negative charge remains negative in all situations. Likewise, a positive charge always remains positive. The net charge of all Sparqs entering into a particle interaction is equal to the net charge of all products of that interaction. This is a consequence of the conservation of Matter which is made of yorks and zorks which are totally conserved.
>
> **Momentum is conserved,** but rotational or angular momentum is different from linear or translational momentum. Both Linear and Rotational (Angular Momentum) are conserved in all particle interactions.
>
> **Energy is conserved.** Although the form of energy may be changed to another form, and may dissipate into the surroundings, energy is not created or destroyed. Total Energy of a particle is equivalent to its total mass, i.e., $\Sigma E \equiv mc^2$. The internal energy of a particle is manifested as its rest mass.[12] The source of all mass/energy is Electrical charge, (E_q) —the more charge, the

[12] **(In Tops, The Mass-Energy relationship is NOT simply a mass-energy conversion factor in which mass may be converted to energy or energy into mass. It is a statement that mass and energy are two different views of the same thing. That which has energy has mass, and vice versa.)**

greater the energy and (mass) and the mass is collocated with the charge. The charge contribution to the inherent mass within the elementary particles accounts for about half of the total mass, but it is because of the relativity gamma boost of spinning at the speed of light (c) that increases its charge-based inherent mass to its relativity level. Other contributions to the mass of electrons and quarks, and, in the higher order particles are:

1) **Structural Coulomb (Electric) energy,** (E_q) i.e., the potential energy involving the attractive and repulsive electric fields which bind the york-zork particles within the particle's structure. It is the same as the 'Electrical Binding Energy.'

2) **Structural Magnetic energy, (E_μ)** is continually produced because charged yorks and zorks spin about a mid-point of the particle (essentially forming a current passing through a loop of a specific area and producing a magnetic field). It is the same as the 'Magnetic Binding Energy.'

3) **Spin energy** (E_s) which is the mechanical (Kinetic) energy bound within any spinning object.

The basic principle, however, is that TOPS Mass-Energy is Conserved--it is neither created nor destroyed, but it is also summative (i.e., total energy = charge/mass energy plus structural Coulomb energy, plus structural magnetic energy, plus spin energy). Thus, **in TOPS ALL of the previously mentioned energy types contribute to the total mass of any particle**. Overall, the most dominant form of energy/mass comes from rotating charges within the structure, found at the Sparq level (i.e., the york and the zork).

Translational Energy: Translational Energy (E_T) of particles is NOT a part of the rest mass of a particle because it is not related to the structural content of the internal structures of subatomic particles. Rather, it is added to the intrinsic 'rest mass' of each particle's inherent structure, as described above. It is due to the translational or linear motion of the particle through space in the macro world. In the case of the photon (of spin S= 1), however, the energy of movement of the particle through space (at a velocity = c) contributes to the mass of the photon in a minor way—most of the mass of a typical photon, however, is in the two Sparqs of which it is composed. Photon energy contribution over and above that of the two Sparqs is the 'Triggering Energy' $E_\varphi = hf$. The total energy of a photon will be addressed in Chapter 3.

Standard Model--TOPS Families

Neutrino Charge=0, spin = ½ [neutito(1,1), electron(2,2) , muon(5,5), tau(8,8)]

Photon Charge=0, spin = 1 [(1,1)$_{\varphi}$]

Electron Charge= -e, spin = ½ [electron(2,5), muon(5,8), tau(8,11)]

Up-quark Charge=+2e/3, spin = ½ [up(6,4), charm(9,7), top(12,10)]

Down-quark Charge= -e/3, spin= ½ [down(6,7), strange(9,10), bottom(12,13)]

Table 1-1: STANDARD MODEL--TOPS FAMILIES

The Standard Model

Although Feynman spoke of gluons and other such hypothetical particles, they were not a part of the Standard Model as I understood it in 1999. The original Standard Model from Feynman's book lists three families of four basic kinds of particles: Neutrinos which possess 0 charge; particles possessing a charge of + or – 1 times that of the electron; and two kinds of quarks, those having ±1/3 that of the electron and the other having ±2/3 that of the electron.

STANDARD MODEL OF SUB-ATOMIC PARTICLES

	NEUTRINO	ELECTRON	UP QUARK	DOWN QUARK
CHARGE	0	-e	+2e/3	-e/3
SPIN	$\hbar/2$	$\hbar/2$	$\hbar/2$	$\hbar/2$
GENERATION				
FIRST	Electron Neutrino	Electron	Up	Down
SECOND	Muon Neutrino	Muon	Charm	Strange
THIRD	Tau Neutrino	Tau	Top	Bottom

The Standard Model as adapted from Dr. Richard Feynman's book, 'The Third Lecture'

Figure 1-1 The Standard Model

According to current theory, neutrinos have ZERO charge and are of three types: the electron neutrino, the muon neutrino, and the tau neutrino (Figure 1-1). Electron types of particles have a charge of ±e). Quarks possessing a ±e/3 charge are called: the down-quark, the strange quark, and the bottom quark. Those of ±2e/3 charge are the up-quark, the charm quark and the top quark.

Each particle possesses a corresponding antiparticle, some of which are the same identical particle (e.g., the neutrinos). For charged particles an anti-up-quark possesses a charge of -2e/3 and an anti-down-quark possesses a charge of +e/3.

Figure 1-2 shows the entire original Standard Model with the york-zork makeup (in parentheses) suggested by the TOPS model. Here, the photon has the same Sparq content as the n2 neutito, but the charges are arranged differently (See Chapters 3 and 4).

THE TOPS STANDARD MODEL OF SUB-ATOMIC PARTICLES

	NEUTRINO	ELECTRON	UP QUARK	DOWN QUARK
CHARGE	0	-e	+2e/3	-e/3
SPIN	$\hbar/2$	$\hbar/2$	$\hbar/2$	$\hbar/2$
GENERATION	n2 (1,1)			
FIRST	Electron Neutrino n1 (2,2)	Electron (2,5)	Up (6,4)	Down (6,7)
SECOND	Muon Neutrino n10 (5,5)	Muon (5,8)	Charm (9,7)	Strange (9,10)
THIRD	Tau Neutrino n16 (8,8)	Tau (8,11)	Top (12,10)	Bottom (12,13)

Figure 1-2 The Standard Model using TOPS Structures

There are three families (generations) of particles which vary in structural complexity. The fourth-generation structures are hypothetical but follow the same pattern as the known three-Generations. These structures have predictable geometric structures which produce precisely the same charges of the particles in the conventional Standard Model (along with their anti-matter analogs) which have been found in nature or in particle accelerators. The TOPS parenthetical numbers respectively represent the numbers of yorks (charge: +e/3) and zorks (charge: -e/3) included within the specific particle. By convention, the number of positively charged yorks is shown first. Thus, the up-quark (6,4) has six yorks and 4 zorks.

Preview of Coming Attractions!

At this time, the TOPS version of the Standard Model appears adequate to represent all subatomic particles known to modern science. Thus, a hydrogen atom consists of a single proton (which is comprised of two up-quarks (6,4) + (6,4) and one down-quark (6,7)) plus an orbiting electron (2,5); and has a total Sparq content of [20,20], so it is electrically neutral.

ALL of these particles are subject to just a few basic physical constants.

Electron charge	$1.6021766208(98)\times10^{-19}$ C
TOPS electric charge*	$5,340588\times10^{-20}$ C
Electric constant (vacuum permittivity)	$8.854187817...\times10^{-12}$ F·m^{-1}
Magnetic constant (vacuum permeability)	$12.566370614...\times10^{-7}$ N·A^{-2}
Planck constant	$6.626070040(81)\times10^{-34}$ J·s
Reduced Planck constant	$1.054571800(13)\times10^{-34}$ J·s
Speed of light in vacuum	299792458 m/s
Thud	10^{-7} kg-m/C^2

* The TOPS electric charge is exactly 1/3 of the electron's charge.

While we COULD use the more accurate values shown above, the accuracy of any mathematic product is limited by whatever factor has the **fewest significant figures**. This book is intended to deal with basic CONCEPTS and avoids getting into great detail in the math. Therefore, all calculations will include just three significant digits of these constants.

Note that the gravitational constant is not included. The gravitational effect is so slight at the individual particle level, that the gravitational attraction between any two particles has no effect on either. All the listed constants are involved as demonstrated in the following chapters.

The speed of light is involved in every chapter in some way.

Chapter 2 emphasizes the Reduced Planck constant and demonstrates that there is a mathematical structure within that constant. It also introduces a new concept, the **Planck Coefficient**, and the Reduced Planck constant is also in almost every chapter in some way.

Chapter 3 delves into the structure of the n2 neutito, the smallest of all possible particles in nature and introduces a **'new' physical constant, Thud**.

Chapter 4 introduces a new model of the photon and proposes the existence of proto-photons which absorb energy to become photons of all energies.

Chapter 5 probes the 'real meaning' of Sommerfeld's Fine Structure Constant, $\alpha = .00729\ldots$

. Chapter 6 examines the Lorentz gamma boost $\boldsymbol{\gamma}$**,** its effect on the mass of TOPS particles, and derives its value for the n2 neutito.

Chapter 7 proposes general geometric structures of more complex TOPS particles from the electron through the proton and neutron. But this chapter is going to remain incomplete because I do not know how to do the detailed vector analysis necessary in calculating the balancing forces—I therefore will provide some general guidelines that it seems TOPS would suggest for the analysis of each particle.

Chapter 8 shows all decay routes that I can imagine for all TOPS particles, while Chapter 9 applies those approaches to general radioactivity at the atomic level. I probably will not complete Chapter 9 but hope it eventually shows the way toward a better understanding of radioactivity.

Chapter 10 analyzes Annihilation Radiation from a TOPS perspective and from that, establishes the dimensions of individual yorks, zorks to include masses, radii, velocities, etc.

Chapter 11 is a continuation of Chapter 10 and was separated primarily to avoid having too much material in a single chapter.

Chapter 12 brings calculations from earlier chapters together by analyzing, n2, and n4 neutrinos, and emphasizes magnetic energy and the use of Planck's Coefficients to determine the properties of subatomic particles.

Chapter 13 will address areas of contemporary physics which disagree with TOPS.

Chapter 14 will ask questions about where science should go from TOPS. It will suggest a few experimental experiments that may verify or reject TOPS principles.

Chapter 15 is my testimony about how I received the insights that have become this entirely innovative approach to studying particle physics.

None of this came easy. Except for the very beginning, none of it came fast. All of it was new to me, and I have agonized over parts of it for years.

Nevertheless, I consider my last 22 years of study to have been a wonderful experience and have no regrets at all about it. It remains to be seen how it will affect the world of modern physics. Have I clarified anything? Or is it all just a dream of 'What If?'

Blair Bryant, July15, 2021

WELCOME TO TOPS!

QUO VADIS?

I INVITE YOU TO BECOME INVOLVED IN DETERMINING WHETHER THERE IS ANYTHING AT ALL TO TOPS.

Chapter 2 - Planck's Constant and Planck Coefficients

You have probably never heard of a Planck's Coefficient, but many of you probably know Planck's Constant VERY well! Thus, we will start with Planck's Constant--and show how it relates to a coefficient which has the potential to calculate the previously unknown, physical properties of particles.

Planck's Constant is a constant: that means it is always the same and never changes in value. It is a measurement of angular momentum of all spinning subatomic particles. Thus, it also has a physical meaning, and is called the 'spin' of a particle. It is represented by the letter **h;** and has a value of about 6.63×10^{-34} joule-sec. A related constant derived from Planck's Constant, is **h-bar**, sometimes referred to as the **Reduced Planck's Constant** which is represented by the symbol, **ħ**.

There is a simple relationship between **h** and **ħ** such that:

$$\hbar = h/2\pi$$

The Theory Of Particle Structure (TOPS) relies heavily on Planck's Constant.

While the double use of **h** and **ħ** is a bit confusing, when we use these symbols in TOPS regarding Standard Model particles, we will normally be using the Reduced Planck's Constant, **ħ** which is used to measure the angular momentum of subatomic particles--of not just some, but of ALL subatomic particles. A spinning particle has a spin of either 1 or ½, i.e., **ħ** or **ħ/2**, and each particle is specified by its appropriate spin. Later in this chapter, we will explain the reason for these different, but distinct values of spin.

> The TOPS consequence is that EVERY known particle has an angular momentum of either **1ħ** or **½ħ** and is spinning like a child's toy top at a fixed rate. **ħ** is a property of **ALL** spinning, subatomic particles. Even light obeys the Law of Spin: **ħ, that I consider to be the Divinely Created, Law of Spin**.

Nobel Prize physicist Leon Lederer referred to the 'Higgs' particle as being the 'God Particle,' but whatever the Higgs might be, it is only ONE of the particles in nature, all of which obey the Law of Spin. Thus, I prefer to think of spin as a fundamental characteristic of all particles. Spin is a God-given feature that pervades the entire universe. It is a Divine attribute that has ruled EVERYTHING from the moment of creation. Scientists call that moment the 'Big Bang.' The book of Genesis starts the Bible with, 'Let there be Light!' To me, both concepts started with nothing, produced a sudden, creative burst of light to produce **EVERYTHING!!** To me, the two concepts are one and the same event, simply being viewed through two different lenses.

Many very brilliant minds find the concepts of **science and religion** to be in stark contradiction with each other. Advocates on both sides often distrust each other and ridicule the opinions of people on the 'other side' for they choose to consider them as opponents. As a scientist and a minister, I see those disciplines as fitting together like a hand in a glove. As far as I am concerned, science is continually tearing away the veil of hidden truths that have persisted from the moment of creation, and through science, our understanding about the nature of creation is being unfolded as **new revelation** to man. Religion tells us the sequence of the creation from the perspective of the ancient author who first wrote the book of Genesis. Science studies physics, biology, and geological features in its struggles to tell us the SEQUENCE and HOW creation 'happened.' Interestingly the sequences of the Genesis account and science are remarkably alike—even to the degree that Genesis says that birds were created before mammals, in agreement with a rather recent consensus among biologists that birds descended from dinosaurs. I wonder why…….?

Anyway, at the very moment of creation/Big Bang, EVERYTHING in the universe was created, each particle, spinning at a fixed angular momentum, and that has not changed in the last 13 or so billion years. Those particles are still spinning and will continue spinning with no slowing or hesitation, far into a time of infinity.

As I have indicated earlier, the TOPS model assumes that all subatomic particles are spinning like toy tops. TOPS also assumes that the laws of physics are the same from our world of real, daily life, to the microcosmic world, down to the size of an atom and yet even smaller. In the other direction, those laws extend into the infinity of the mega-universe to include the black holes at the centers of distant galaxies and the near-infinite distances stretching from galaxy to galaxy, to the edge of the universe. We do not understand all those laws, for much about them still remains hidden—but the laws themselves have been there since the Big Bang of the Creation!

To my mind, the Creator did not make different sets of laws depending upon the magnitude of the surroundings in which we conduct our scientific studies.

Planck's Constant is a fundamental law of nature, and it applies to all levels of existence of all matter.

In this chapter, I will attempt to quantify Planck's Constant to demonstrate the universality of the laws of rotating particles.

Now, we do not use Planck's Constant for our physical world where we may be more concerned about the weight of a bunch of bananas we buy; for Planck's Constant's sole application is in the realm of the ultra-small. Nevertheless, the principle of angular momentum (spin) at the size of the atom is essentially the same as the angular momentum of a child's toy top spinning on a kitchen floor—or to the spiraling disk of billions of stars circling any galaxy. While many will hold that Planck's Constant only holds for atom-sized particles, and that it is somehow quite different from the angular momentum that governs the spinning of a child's toy top; I will maintain that it is identical, except that in those tiny dimensions, the laws of special relativity take over and quantize everything that happens within those ultra-small regions of the universe.

TOPS assumptions are a bit different from conventional concepts and I will be using only TOPS concepts in my derivations. Those who are not acquainted with TOPS may find their conventional concepts appear to be violated and may object to my conclusions on that basis. But the TOPS procedures and assumptions do NOT have to be the same as those associated with science as it is understood at this time. For example, those of us who have visited the United Kingdom (England) are aware that 'they' drive on the left side of the road, the 'wrong way' to those of us who drive on the right. We have different laws that apply to our different country's drivers. As long as the American driver keeps on the left side of the road IN ENGLAND, he is probably going to avoid an accident over there. As long as the English driver stays on the right side of the road in the USA, he is probably going to avoid an accident here. That does not make either set of laws 'incorrect.' They are simply accepted rules for a particular location, and things are OK as long as you obey those rules in the appropriate locations.

I will give a brief example to illustrate how TOPS treats spinning particles the way it does. Take the terms 'mass' and 'energy' for example. Einstein's remarkable insight (a revelation to science at the time) gave us $\mathbf{E = mc^2}$ over 100 years ago. Conventional physicists see that equation as meaning that a given amount of mass (**m**) may be converted into an equivalent energy of $\mathbf{mc^2}$ as if it were EITHER mass OR energy. They point to the tremendous energy released in an atomic bomb as an example. They also consider that a photon with energy of **hf** is massless, using the understanding that nothing with measurable mass can travel at the speed of light. TOPS, on the other hand, sees the same equation as meaning that energy and mass are two distinct aspects of the same thing. Look at a coin—say a quarter--and it has two sides, a head and a tail. You can look at either the head side OR the tail side—they LOOK different, but the coin is still a quarter. Thus, in TOPS, a photon which has an energy of **hf possesses a mass = ħ /rc**.[13] How can mass travel at the speed of light? That's easy from the TOPS perspective, because light CAN and DOES travel at the speed of light, even though it possesses energy/mass. [14]

Thus, please be accepting of the different concepts in TOPS. The proof of the value of TOPS should come with the mathematical results we get, and those results should not be rejected just because TOPS is not using the concepts of conventional quantum physics.

We humans live in the realm of Avogadro's Constant, where $6x10^{23}$ molecules[15] of water that all together makes up just over half an ounce of water, barely a good swallow. Recall that there are just two atoms of hydrogen in a single water molecule! Suppose we multiplied that single water molecule a thousand times. Even a tiny drop with a **thousand** molecules of water, would still be so small that it would be invisible to the eye, and its mass (weight) could not be measured on the most accurate balance in the best chemistry lab! This does not mean the differences do not exist, but simply concludes that they are too small for us to recognize.

The point here, is that at our world-space realm of existence, the quantizing effects of the small features of the universe on the ultra-tiny particles, are completely swamped by the sheer magnitude of the quantity of particles that we live with, and the mysterious relativity-induced quantizing effects of the atom sized universe totally disappear at our level of experience. The fundamental laws, however, remain viable at all levels of existence.

To start our discussion of Planck's Constant, I would like to consider a single unexcited Bohr atom of hydrogen. The hydrogen atom consists of a single proton with a mass (m_p) of about $1.67x10^{-27}$ kg, in the atom's center, with a single electron with a mass (m_e) of $9.11x10^{-31}$ kg, orbiting the proton, some $5.29x10^{-11}$ meters away[16]

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13 E=hf = mc^2. The basis for the derivation of above value for mass follows in a couple of pages.

14 We shall address this issue in Chapter 4.

15 For those not familiar with scientific notation, 10^{23} means 1 followed by 23 zeros or 100000000000000000000000. Thus, $6x10^{23}$ is 6 followed by 23 zeros and this is equivalent to 600 billions of trillions of those water molecules in that sip-sized volume of water!

16 Similarly, 10^{-11} meter means 1 divided by 1 followed by eleven zeros, so $5.29x10^{-11}$ means 5.29 divided by 100000000000 or 5.29 hundred billionth of a meter.

(this is the Bohr radius of the atom in the first orbit, and we can call that distance r_{o1}) with a frequency (f_{o1}) of rotation at 6.62×10^{15} Hz. The ratio of the mass of the proton (m_p) to that of the electron (m_e) is about 1836 (m_p/m_e), so by far, most of the mass of the hydrogen atom is in the nucleus. I will not go into the derivation of those values, for they are routine physics and derive from the BALANCE of the **Coulomb Law attraction** between unlike charges against the **Centrifugal force that tries to fling the particles apart.** I will give the equations and allow the reader to validate the values above.

Coulomb Force = Centrifugal Force

$$\frac{\mathbf{k * (+e * -e)}}{\mathbf{r^2}} = \frac{\mathbf{m_e * v^2}}{\mathbf{r}}$$

We will now calculate the angular momentum (L_H) of that hydrogen atom using the above values and **classical** Newtonian physics. The angular momentum ($\mathbf{L_H}$) of the hydrogen atom is:

$\mathbf{L_H = I_e * \omega_e}$ where $\mathbf{I_e}$ is the moment of inertia of the orbiting electron, where $\mathbf{I_e = m_e * r_{o1}^2}$ and $\boldsymbol{\omega_e}$ is the angular velocity of an electron in orbit n=1 ($\boldsymbol{\omega_e = 2\pi f_{o1}}$).

Using the provided values, we get:

$\mathbf{L_H = I_e * \omega_e}$

$L_H = m_e r_{o1}^2 * 2\pi f_{o1}$

$L_H = 9.11 \times 10^{-31}\ \text{kg} * (5.29 \times 10^{-11})^2\ \text{m}^2 * 2\pi(6.62 \times 10^{15})\ \text{Hz}$

$\mathbf{L_H = 1.06 \times 10^{-34}\ kg\text{-}m^2/sec} = \hbar$ joule-sec

Now that is ALMOST the same value as the Reduced Planck's Constant, ħ![17]
Note that we used classical Newtonian physics to derive that value.

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[17] The small difference between two answers in this equation would be less if we used more than three significant figures in each portion of the calculation. Thus, if we used sufficiently more accurate values, we would get even closer to the currently accepted value of **$\hbar = 1.054571817 \times 10^{-34}$ j-sec.**

Thus, we will find that $\mathbf{\hbar = m_e * r_{o1}^2 * 2\pi * f_{o1}}$. Each of those factors of $\mathbf{\hbar}$ has a fixed value! AND these combined factors are always equal to $\mathbf{\hbar}$.[18]

While this result may come as no surprise to some people, many will find it astonishing because they tend to think of Planck's Constant as simply being a naturally occurring constant. Instead of being **just** a constant, we should think of Planck's Constant as having the **structural components of mass, radius, and frequency** of rotation! That does not change the fact that $\hbar$ IS a natural constant but gives us a lot more insight as to how different particles of different masses, radii, and frequencies are actually related within that constant.

There is even more insight to be obtained by considering that $\mathbf{2\pi r_{o1}}$ is the circumference of the electron's orbit and that multiplying the circumference by the frequency of rotation provides the instantaneous (tangential) velocity of the orbiting electron which I will call $\mathbf{u_{o1}}$ rather than v. The $_{o1}$ indicates 'orbit 1.' Thus,

$\mathbf{u_{o1} = 2\pi r_{o1} f_{o1}}$ is for the first orbit and $\mathbf{u_{o2} = 2\pi r_{o2} f_{o2}}$ is for the second orbit.

> [The use of **u** rather than **v** is a personal preference because I like to always be reminded that THIS velocity is NOT linear, but orbital=circular. I, therefore, reserve **v** to represent linear velocity and **u** to represent rotational velocity. While it may not bother some to use v in this setting, there are times when the distinction between linear and rotational velocity is VERY important, and I use the **u** as an ever-present reminder to make sure I do not confuse the different situations when it is important. BBB]

Because of the inclusion of velocity $\mathbf{u_{o1}}$ and differing information regarding other aspects of a rotating particle, we have three exactly equivalent equations of the Reduced Planck's Constant *as it applies to the first orbit of a hydrogen atom*:[19] I will refer to this set of identities as being 'expanded forms' of Planck's Constant.

$$\mathbf{\hbar_{o1} = \hbar = m_e * 2\pi r_{o1}^2 * f_{o1} = m_e * r_{o1}^2 * 2\pi f_{o1} = m_e * u_{o1} * r_{o1}} = 1.05 \times 10^{-34} \text{ j-sec}$$

---

[18] This is true of all Spin=1 particles in which all of the mass is at a distance r **from** the center of rotation, and the Moment of Inertia = mr^2. For particles with a Spin=1/2 we always find half of that value because the mass is distributed AROUND the point of rotation so the Moment of Inertia = ½ mr^2, characteristic of a classical disk or cylinder (but NOT of a sphere which has a Moment of Inertia of $_{2/5}$ mr^2.

[19] The subscripts on mass, radius, and frequency help us to keep like factors together. For example, it is important to note that m_e is the mass of an electron and is NOT the same as m_p the mass of a proton. Similarly, r_{o1} is the radius of the n=1 orbit of the hydrogen atom, while r_{o2} is the radius of the n=2 orbit. While $\hbar$ applies to both the proton and the electron, and to both orbits n=2 and n=1 of the hydrogen atom, it does NOT apply if we attempt to mix the different situations.

Sometimes one form of **ħ** is more useful than the other, but all are equivalent expressions.

When it comes to photons (indicated by the subscript $_\varphi$) which travel at the speed of light,

$\mathbf{\hbar_\varphi = \hbar = m_\varphi * c * r_\varphi} = 1.05 \text{ x}10^{-34}$ j-sec

The key point here, is that Planck's Constant is a composite number which applies across all regions of our universe. **We can use a known combination of these factors that apply to a known particle structure, to predict the particle structure factors of an entirely different particle, if we can identify factors that do NOT change plus, a single factor that applies to the second particle. From that single factor we can identify a unique coefficient from which we can define all aspects of that second particle.**

We will now continue with our example of the hydrogen atom to illustrate this fundamental factor which I will call a **Planck's Coefficient**, and represent it by **Ᵽ**.

Planck's Coefficient, Ᵽ

Ᵽ is NOT a universal constant but it IS a unique number which is characteristic of the particle(s) in question. Every particle has its own value for **Ᵽ**. We will start our discussion of Planck's Coefficients by continuing with our Bohr hydrogen atom for orbit n=2.

For orbit n=1, Planck's Constant was quantified in expanded form as:

$\mathbf{\hbar_{o1} = m_e * 2\pi r_{o1}^2 * f_{o1} = m_e * r_{o1}^2 * 2\pi f_{o1} = m_e * u_{o1} * r_{o1}} = 1.05 \text{ x}10^{-34}$ j-sec

Likewise, for orbit n=2 we obtain:

$\mathbf{\hbar_{o2} = m_e * 2\pi r_{o2}^2 * f_{o2} = m_e * r_{o2}^2 * 2\pi f_{o2} = m_e * u_{o2} * r_{o2}} = 1.05 \text{ x}10^{-34}$ j-sec

Of course, $\mathbf{\hbar_{o1} = \hbar_{o2}}$ because Planck's Constant IS a constant. Since we are dealing with a rotating electron in both orbits (well below the speed of light), the mass of the electron is the same in both situations, i.e., $\mathbf{m_{eo1} = m_{eo2}}$. The radius, however, is different, with $\mathbf{r_{o2} > r_{o1}}$, so in THIS situation, the frequency of rotation must change such that $\mathbf{f_{o2} < f_{o1}}$ to keep $\mathbf{\hbar_{o1} = \hbar_{o2}}$.

But note that the **radius**' effect on the magnitude of $\boldsymbol{\hbar_{o1}}$ is to the SQUARE while the effect on the frequency is to the first Power.

$$\boldsymbol{\hbar_{o1} = m_e * r_{o1}^2 * 2\pi f_{o1}}$$

This means that a rather small increase in the radius (going from $\mathbf{r_{o1}}$ to $\mathbf{r_{o2}}$) would produce a much greater decrease in the frequency (going from $\mathbf{f_{o1}}$ to $\mathbf{f_{o2}}$). Now, let us divide $\boldsymbol{\hbar_{o1}}$ by $\boldsymbol{\hbar_{o2}}$. **This will give us a value of 1, because $\boldsymbol{\hbar_{o1} = \hbar_{o2}}$!**

$$\boldsymbol{\frac{\hbar_{o1}}{\hbar_{o2}} = \frac{m_e * u_{o1} * r_{o1}}{m_e * u_{o2} * r_{o2}} = \frac{m_e}{m_e}\;\frac{u_{o1}}{u_{o2}}\;\frac{r_{o1}}{r_{o2}} = 1}$$ [20]

Since the mass of the electron does not change when the orbits change (at this low a velocity), we may cancel the $m_e/\, m_e$ ratio leaving us with,

$$\boldsymbol{\frac{u_{o1}}{u_{o2}}\;\frac{r_{o1}}{r_{o2}} = 1} \qquad \text{OR,} \qquad \boldsymbol{\frac{u_{o1}}{u_{o2}} = \frac{r_{o2}}{r_{o1}}}$$

[Note that in THIS case we have an inverse relationship between the orbital radius and rotational velocity. BBB]

and this means that the larger the radius, the smaller is the tangential velocity! Because $\boldsymbol{\hbar}$ is a constant, this means that the dimensions of each particle are predictable, and we should be able to calculate the parameters of any kind of particle if we know a couple of facts in how it relates to a known situation such as the mass or radius of the orbiting electron of a hydrogen atom. This will be the purpose of Planck's Coefficient, $\boldsymbol{\text{Þ}_{21}}$. (The inclusion of the subscript shows that this value applies only to the electron shift from orbit n=2 to n=1.) The consequence of finding the numerical value of $\boldsymbol{\text{Þ}_{21}}$, is that we know that

$$\boldsymbol{r_{o2} = r_{o1} * \text{Þ}_{21}; \quad u_{o2} = u_{o1}/\text{Þ}_{21}; \quad \text{and} \quad f_{o2} = f_{o1}/\text{Þ}_{21}^{2}.}$$

Before we analyze $\boldsymbol{\text{Þ}}$ in more detail, we will look at another example from the hydrogen atom.

The Proton's Orbit in a Hydrogen Atom

Again, considering the electron in orbit n=1 of the hydrogen atom, let us consider what is happening with the proton/nucleus. We normally think of the proton as being

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20 In SOME cases, this approach will NOT give a correct answer! In THIS case, however, the results are valid. For other particles, one must be careful NOT to use a Planck's Coefficient relationship using $\underline{\hbar_{o1}} = \underline{m_e * u_{o1} * r_{o1}}$. The correct form to avoid the error is: $\hbar_{o2} = m_e * 2\pi r_{o2}^2 * f_{o2}$. For the correct approach, see Chapter 12 where the error is identified and corrected.

motionless at the center while the electron frantically whirls around it—but that is not strictly true. Of course, we usually don't think of the earth as wobbling as the moon orbits it, either--but in actuality, there is a (moving) neutral point[21] (out in space) between the earth and the moon; and BOTH bodies are moving in orbits around that point! That is also true of the proton, but on a much smaller scale. Thus, we propose to take our Planck's Constant for the electron in the first orbit, $\mathbf{r_{o1}}$, and calculate the proton in its n=1 orbit, $\mathbf{r_{p1}}$ from the following relationship.

$$\frac{\hbar_{o1}}{\hbar_{p1}} = \frac{m_e * u_{o1} * r_{o1}}{m_p * u_{p1} * r_{p2}} = \frac{m_e}{m_p} \; \frac{u_{o1}}{u_{p1}} \; \frac{r_{o1}}{r_{p1}} = 1$$

$$\frac{\hbar_{o1}}{\hbar_{p1}} = \frac{m_e}{m_p} \; \frac{u_{o1}}{u_{p1}} \; \frac{r_{o1}}{r_{p1}} = 1$$

It is important to note that the frequency of rotation of both the electron and proton are the SAME (i.e., $\mathbf{f_{o1} = f_{p1}}$), for both particles are orbiting the same point, always being on opposite sides of that same point. We also know that the mass of the proton is about 1836 times that of the electron, so that term can be rewritten as 1836 $\mathbf{m_e}$ and we can cancel the $\mathbf{m_e}$. Thus, we have:

[21] This point is called the Lagrange point.

$$\frac{\hbar_{o1}}{\hbar_{p1}} = \frac{\cancel{m_e}}{1836\cancel{m_e}}\ \frac{u_{o1}}{u_{p1}}\ \frac{r_{o1}}{r_{p1}} = 1 \qquad \text{OR,}$$

$$\frac{u_{o1}}{u_{p1}}\ \frac{r_{o1}}{r_{p1}} = 1836$$

We know that $f_{o1} = f_{p1}$, so that ratio can cancel; and, that $u_{o1} = 2\pi r_{o1} f_{o1}$, and $u_{p1} = 2\pi r_{p1} f_{p1}$, so we can rewrite the previous equation as:

$$\frac{\cancel{2\pi} r_{o1} \cancel{f_{o1}}}{\cancel{2\pi} r_{p1} \cancel{f_{p1}}}\ \frac{r_{o1}}{r_{p1}} = \frac{r_{o1}^2}{r_{p1}^2} = 1836 \qquad \text{OR,}$$

$$\frac{r_{o1}}{r_{p1}} = (1836)^{1/2} = 42.85 = Þ_{ep}$$ which is our **Planck's Coefficient** for this situation!

This value of $Þ_{ep}$ = 42.85 is good when we compare the proton mass and dimensions to the electron mass and when the frequencies of rotation are the same. It will NOT work for other situations, so we identify it by the subscript $_{ep}$ to indicate it refers to the ratio of the difference masses of the **electron** and **proton**. But, knowing that $Þ_{ep}$ = 42.85, we can determine that $\mathbf{m_{p1} = m_e * Þ_{ep}^2}$; $\mathbf{r_{p2} = r_{o1} * Þ_{ep}}$; $\mathbf{u_{p1} = u_{o1} * Þ_{ep}}$; **and** $\mathbf{f_{o2} = f_{o1}}$.

Proof of Planck's Coefficient

We determined the value of Planck's Coefficient *for the condition of the electron and proton orbits* to be, $Þ_{ep} = (1836)^{1/2} = 42.85$. This is **the only condition** in which THIS particular value of **Þ** may be used. **All other situations** will require calculation of a different value of **Þ** based on the nature of the situation.

In this particular situation, since the mass of the proton is 1836 times GREATER (by $Þ_{ep}^2$) than the electron, the radius of the proton orbit will be decreased by $Þ_{ep}$; and, because the frequencies are the same, the velocity will be decreased by $Þ_{ep}$.

Using the same procedures as in the derivations of $Þ_{ep}$ **and** $Þ_{21}$ above, let us apply this factor to the $\hbar_{p1}$ line (the proton orbit n=1) and each factor will become:

$\mathbf{m_p} = \mathbf{Þ_{ep}^2 (m_e)}$; $\mathbf{u_{p1}} = \mathbf{u_{o1}/Þ_{ep}}$; and, $\mathbf{r_{p1}} = \mathbf{r_{o1}/Þ_{ep}}$, so…

$$\frac{\hbar_{o1}}{\hbar_{p1}} = \frac{m_e}{m_p}\;\frac{u_{o1}}{u_{p1}}\;\frac{r_{o1}}{r_{p1}} = 1$$

which becomes:

$$\frac{\hbar_{o1}}{\hbar_{p1}} = \frac{\cancel{m_e}}{\text{Þ}_{ep}^{2}\,(\cancel{m_e})}\;\frac{\cancel{u_{o1}}}{\cancel{u_{o1}}/\text{Þ}_{ep}}\;\frac{\cancel{r_{o1}}}{\cancel{r_{o1}}/\text{Þ}_{ep}} = 1$$

and canceling the Þ_{ep} values in both numerator and denominator, gives:

$$\frac{\hbar_{o1}}{\hbar_{p1}} = \frac{\cancel{m_e}}{\cancel{\text{Þ}_{ep}^{2}}\,(\cancel{m_e})}\;\frac{\cancel{\text{Þ}_{ep}}\,\cancel{u_{o1}}}{\cancel{u_{o1}}}\;\frac{\text{Þ}_{ep}\,\cancel{r_{o1}}}{\cancel{r_{o1}}} = 1$$

and EVERYTHING cancels, thus, verifying equality!

[Note that in **this electron/proton example**, the frequency remains constant so the radius and velocity are directly related—doubling the radius would double the velocity. Compare that with the previous example in which we compared the electron in orbit1 vs orbit2 where the relationship was inverse, i.e., doubling the radius would reduce the velocity to half. The situations are different so we have different results, but we can still use the appropriate Planck's Coefficient, **Þ** to new situations. BBB]

This result that the Planck's Coefficients cancel within each $\hbar$ verifies that this constant works because $\hbar_{o1}=\hbar_{o2}$. **Unfortunately, ANY constant can be made to render this result of $\hbar_{o1}/\hbar_{o2} = 1$.** That does not mean that we did anything wrong, but we must be aware that this process would work for the value of **Þ** to be equal to ANY non-dimensional constant such as π, **e**, or even the number of apples in a barrel! HOWEVER, the value of 42.85 is the ONLY value that will yield the relative values between the orbits of the electron and proton in a hydrogen atom. Planck's Coefficient may be effectively used if we DO know a factor that is unchanged (in the proton/electron case we know the frequency is unchanged but we know the ratio of the two masses; in the $\hbar_{o1}/\hbar_{o2}$ case the masses are unchanged, but we have YET to find the value of Þ_{21}, so we must calculate the relationships mathematical relationship in EITHER ONE of the other variable dimensions in finding Planck's Coefficient, Þ_{21}.

Before we move on, let us go back and try to make the calculations to find the mass, velocity, radius, and frequency of the electron in orbit n=2 when we know the factors in orbit n=1.

The factors that we know are: $m_e = 9.11\text{x}10^{-31}$ kg; $r_{o1} = 5.29\text{x}10^{-11}$ m; $f_{o1} = 6.62\text{x}10^{15}$ Hz, and the value of u_{o1} may be calculated directly:

$$u_{o1} = 2\pi r_{o1} f_{o1} = 2\pi * 5.29\text{x}10^{-11} * 6.62\text{x}10^{15} = 2.20\text{x}10^{6}\ \text{m/sec.}$$

At this point we still do NOT know the value of $Þ_{21}$ which we need to find the values of the unknown radius ($\mathbf{r_{o2}}$), frequency ($\mathbf{f_{o2}}$), and velocity ($\mathbf{u_{o2}}$). That is what we need to address next.

We know that the energy shift of the electron dropping from the level of n=2 to n=1 ($\mathbf{E_{21}}$) in the hydrogen atom is the same as the energy of the emitted photon ($\mathbf{E_{\varphi 21}}$). From many measures of solar and star spectra, we know that the electron shift from orbit=2 to orbit=1 produces a photon with a wavelength ($\lambda_{\varphi 21}$) of **1.20 x10^{-7} m.**[22] With photons, the product of frequency ($f_{\varphi 21}$) and wavelength = the speed of light (c= 3.00x10^{8} m/sec), so,

$$\mathbf{f_{\varphi 21} * \lambda_{\varphi 21} = c.}$$

Thus, the frequency of the photon produced by that shift of electron from n=2 to n=1 is $\mathbf{f_{\varphi 21} = c/\lambda_{\varphi 21}}$ = 3.00x10^{8} m/sec/1.20x10^{-7} m = **2.50x10^{15} Hz.** From that frequency, we can readily find the energy of the photon ($\mathbf{E_{\varphi 21}}$) that is emitted, as,

$$\mathbf{E_{21} = E_{\varphi 21} = h_{\varphi 21} * f_{\varphi 21}} = 6.62\text{x}10^{-34} \text{ j-sec} * 2.50\text{x}10^{15} \text{ Hz} = \mathbf{1.66x10^{-19}} \text{ joule}$$

That energy ($\mathbf{E_{21}}$) is also the difference in potential energy between orbit n=2 and orbit n=1 in the excited hydrogen atom. Right now, we will not worry about those specific values of potential energy. We will simply continue using our formulas using $\hbar_{o1}$ and $\hbar_{o2}$ as we have above, for we are now attempting to derive the general formulas rather than the specific values of a unique situation at this point.

Just as $\mathbf{E_{\varphi 21} = \hbar_{\varphi 21} * f_{\varphi 21}}$; $\mathbf{E_{o1} = \hbar_{o1} * f_{o1}}$, and $\mathbf{E_{o2} = \hbar_{o2} * f_{o2}}$.

The energy shift between orbit2 and orbit1 is $\mathbf{E_{21} = E_{o1} - E_{o2} = E_{\varphi 21}}$. Thus,

$$\mathbf{E_{\varphi 21} = \hbar_{\varphi 21} * f_{\varphi 21} = \hbar_{o1} * f_{o1} - \hbar_{o2} * f_{o2}}$$

But, since $\mathbf{\hbar_{\varphi 21} = \hbar_{o1} = \hbar_{o2}}$, we can cancel the $\hbar$ to give: $\mathbf{f_{\varphi 21} = f_{o1} - f_{o2}}$

Earlier, we said that there would be some Planck's Coefficient, $Þ_{21}$ such that we could find the value of the frequency of $\mathbf{f_{o2}}$, and we said it would look like:

$$\mathbf{f_{o2} = f_{o1}/Þ_{21}^{2}}.$$

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[22] In the field of spectroscopy, wavelengths of photons are normally given in nanometers (nm= 10^{-9} m) and this wavelength is given as 120 nm. I however prefer to keep ALL units in standard SI form to avoid having to change units during calculations.

We will, therefore, make that substitution to find the value of $\mathbf{Þ_{21}}$.

$$\mathbf{f_{\varphi 21}} = \mathbf{f_{o1}} - \mathbf{f_{o2}}$$
$$\mathbf{f_{o2}} = \mathbf{f_{o1}} - \mathbf{f_{\varphi 21}}$$
$$\mathbf{f_{o2}} = \mathbf{f_{o1}/Þ_{21}^2}$$
$$\mathbf{f_{o1}/Þ_{21}^2} = \mathbf{f_{o1}} - \mathbf{f_{\varphi 21}}$$
$$1/\mathbf{Þ_{21}^2} = (\mathbf{f_{o1}} - \mathbf{f_{\varphi 21}})/\mathbf{f_{o1}}$$
$$\mathbf{Þ_{21}^2} = \mathbf{f_{o1}}/(\mathbf{f_{o1}} - \mathbf{f_{\varphi 21}})$$
$$\mathbf{Þ_{21}^2} = 6.62 \mathrm{x} 10^{15}/(6.62 \mathrm{x} 10^{15} - 2.50 \mathrm{x} 10^{15}) = 1.61$$
$$\mathbf{Þ_{21}} = \mathbf{1.27}$$

Since we know the values of both $f_{\varphi 21}$ and f_{o1}, we can calculate the value of $Þ_{21}$!

> [Of course, our calculations would be more accurate if we were to use more precise values (four or more significant figures) for each of the variables for orbit 1, but we will stick to the 3-significant-figure accuracy because that is all the accuracy we can expect at the level of three significant figures. BBB]

Knowing the value of $Þ_{21}$, we can now calculate the magnitudes of the properties of the second orbit of the hydrogen atom! We find from known values:

$r_{o1} = 5.29 \mathrm{x} 10^{-11}$ m, $u_{o1} = 2.20 \mathrm{x} 10^6$ m/sec; $f_{o1} = 6.62 \mathrm{x} 10^{15}$ Hz; $Þ_{21}^2 = 1.61$, $Þ_{21} = 1.27$;
and because we also know: **$r_{o2} = r_{o1} * Þ_{21}$; $u_{o2} = u_{o1}/Þ_{21}$; and $f_{o2} = f_{o1}/Þ_{21}^2$**; SO….

$r_{o2} = 6.72 \mathrm{x} 10^{-11}$ m; $u_{o2} = 1.73 \mathrm{x} 10^6$ m/sec; and $f_{o2} = 4.11 \mathrm{x} 10^{15}$ Hz

We have one more step to go to make the formulas generic so they can be applied to ANY hydrogen atom orbit. A photon is emitted as an electron shifts from orbit 2 to orbit 1 (using the specific $_{21}$ shift as a starting point). To make the equations generic to the photon of any orbital shift (from any initial to any final orbit), change the $_2$ to the initial orbit to $_i$ and the $_1$ to the final orbit $_f$. Noting that we can cancel the **ħ** from both sides of each Energy equation; (we use $_i$ for the initial orbit and $_f$ for the final orbit);

Specific to electron shift 21

$$E_{21} = E_{\varphi 21} = \hbar_{\varphi 21} * f_{\varphi 21}$$

$$f_{\varphi 21} = f_{o1} - f_{o2}$$
$$f_{o2} = f_{o1} - f_{\varphi 21}$$
$$f_{o1}/\text{Þ}_{21}^2 = f_{o1} - f_{\varphi 21}$$
$$1/\text{Þ}_{21}^2 = (f_{o1} - f_{\varphi 21})/f_{o1}$$
$$\text{Þ}_{21}^2 = f_{o1}/(f_{o1} - f_{\varphi 21})$$

Generic to any initial-to-final shift orbits

$$E_{if} = E_{\varphi if} = \hbar_{\varphi if} * f_{\varphi if}$$

$$f_{\varphi if} = f_{of} - f_{oi}$$
$$f_{oi} = f_{of} - f_{\varphi if}$$
$$f_{of}/\text{Þ}_{if}^2 = f_{of} - f_{\varphi if}$$
$$1/\text{Þ}_{if}^2 = (f_{of} - f_{\varphi if})/f_{of}$$
$$\text{Þ}_{if}^2 = f_{of}/(f_{of} - f_{\varphi if})$$

This relationship also gives an easy way for physicists to find where, in a solar spectrum, to search for the particular spectral line that represents the wavelength (λ_{if}) of a photon of light (in meters) that is produced by a given shift in orbital frequencies.

$$\lambda_{\varphi if} = c/f_{\varphi if} = c/(f_{of} - f_{oi})$$

Why is Spin Always Either ħ OR ħ/2?

The reason for this seeming oddity is in classical physics and relates to the moment of inertia of a rotating object. I am now going to quote a succinct definition of 'moment of inertia' from the web site: [Moment of Inertia - Formulas, MOI of Objects [Solved Examples] (byjus.com)]

> Moment of inertia is defined as the quantity expressed by the body resisting angular acceleration which is the sum of the product of the mass of every particle with its square of a distance from the axis of rotation. Or in more simple terms, it can be described as a quantity that decides the amount of torque needed for a specific angular acceleration in a rotational axis. Moment of Inertia is also known as the angular mass or rotational inertia. The SI unit of moment of inertia is kg m^2.

In TOPS, Moment of Inertia is represented by $L=I\omega$, where $\omega=2\pi f$, and $I=d_m mr^2$, with d_m being a fixed fraction based on how the mass is distributed within a rotating object—I call d_m the **mass distribution constant**.[23]

The moment of inertia (I) of any object is determined by how the mass is distributed within the object. If the structure of the object were to be lop-sided it would wobble as it rotated, and the degree of wobble would be proportional to the square of the frequency of rotation. Such wobbling at the high frequencies involved

23 You probably won't find this term in any other physics book because, I coined the term **mass distribution constant,** feeling that there was no adequate definition for the resulting fraction, and that this wording pretty well described what the fraction does.

in very tiny rotating particles would tend to shake them apart. Thus, in TOPS, all rotating subatomic particles are assumed to be symmetrical, so they are dynamically balanced and, thus, they spin freely at a fixed velocity, and entirely without any friction to slow them down. The moment of inertia of such a rotating, symmetrical body depends on the distance of each increment of mass from the center point of rotation.

The mass distribution (d_m) constant for a **sphere** rotating about its own axis is 2/5. The mass distribution constant for any cylindrical or thin-disk-shaped object is ½. WHY? The sphere has many more increments of mass near the center of rotation than out toward the periphery of the particle.

When ALL of the mass is at a distance r from the center of rotation, the d_m =1. Thus, if the center of rotation is OUTSIDE of the particle (such as with the electron orbiting the nucleus of a hydrogen atom), d_m=1. Thus, the moment of inertia is always the product of $d_m mr^2 = mr^2$ (i.e., $d_m = 1$), and for all such rotating particles at the subatomic scale, the spin is always **ħ. THIS IS A FUNDAMENTAL LAW OF NATURE. When ALL the mass of a particle is at the same distance, r from the center of rotation, d_m=1 and the spin is always ħ.**

If, however, a symmetrically rotating subatomic particle is rotating about its OWN center point, the rotating mass is evenly distributed WITHIN the particle and the spin will always be ħ/2. This is because the energy/mass is evenly distributed within the particle and is generating a cylinder with d_m=1/2 as it rotates in space. The moment of inertia of a cylinder- or thin disk-shaped Standard-Model particle is ħ/2. Except for the photon, all Standard Model particles have a spin of ħ/2 because each is spinning around its own axis and is generating a tiny, cylindrical-shaped structure in space.

There is NO known Standard Model object that possesses a d_m=2/5. This is the reason that TOPS has rejected the sphere as being the shape of any Standard Model particle.

If you learned anything new in this chapter….

QUO VADIS?

WHAT ARE YOU GOING TO DO ABOUT IT?

If you found any errors in this material, I would appreciate it if you would tell me about them. I sometimes cannot recognize my errors.

Thank you for your cooperation.

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Chapter 3 - Charge: the Source of Mass

One of the major problems in modern physics is identifying the source of mass. Everyone recognizes that mass exists, but, until recently, we have been unable to account for more than about 1% of the source of energy to account for that mass that we KNOW is there.

After years of studying TOPS, I think I have finally discovered the source of the energy that gives mass to all objects. Actually, physicists should KNOW that source, for it stares us in the face every time we use Coulomb's Law. It was my study of TOPS that led me to my current conclusions.

TOPS holds that all matter is made of only two kinds of fundamental particles and calls them yorks and zorks. If these tiniest of all particles do exist, they possess an identical charge of e/3, either positive (the york) or negative (the zork). Those charges are spinning on their axes at a high rotational velocity. When charged particles move, they generate magnetic fields which either attract or repel the magnetic fields of other spinning yorks and zorks. That attraction/repulsion results in a binding energy within the particle and THAT binding energy is the source of the **inherent mass** of a particle. (*I feel uncomfortable calling this mass the 'rest mass' because that little bugger has NEVER been at rest! It has been spinning at the velocity of light since it was created in year 0*. BBB) Later, we will find that there is a **relativity** boost (Chapter 6) due to the particles' rotational velocity which is close to the speed of light. It is that relativity boost which greatly increases the inherent mass to produce its **relativity mass**. Thus, **mass is a manifestation of spinning electric charge!**

Because this electric and magnetic energy of a particle is usually treated as a combined, electro-magnetic effect, we do not usually 'see' the individual processes of Coulomb attraction/repulsion as opposed to the magnetic attraction/repulsion, and this masks what is going on within the particle. It is not that physicists do not KNOW that charge and mass are related, for the formulas clearly include the mass in there, but they do not understand HOW they can be related. This chapter will attempt to provide an explanation from the TOPS perspective.

Essentially, TOPS holds that mass/energy is a consequence of the spinning electric charges (Sparqs) at the fundamental level of structure of the particles within all matter (and anti-matter).

Thus, we are now going to illustrate the HOW that the charge and mass are related, by way of an analysis of the two smallest of all TOPS particles: the (1,1) neutito, the smallest member of the family of neutrinos; and the similar, (1,1)φ proto-photon.

Balance of Axial Forces

Again, IF they really DO exist, yorks or zorks never exist separate from each other—they always come in **combinations** of mixed numbers of yorks (+e/3) and zorks (-e/3) which **always** result in particles with combined charge of 0, ±e/3, ±2e/3, or ±e. We make this assumption because, in the multiple thousands of measurements made in particle accelerators, world-wide, no one has ever found evidence of smaller or different charges. Those particles having a charge of 0 are either neutrinos or photons. Those particles having a charge of ±e/3 (down, strange, bottom) or ±2e/3 (up, charm, top) are quarks; and those having ±e are in the electron family (electron, muon, tau). The inclusion of ± means that each particle has a matching anti-matter component of the opposite charge structure, with the neutrinos and photons being **exceptions because they possess equal numbers of yorks and zorks and are their own anti-matter particles.** [24]

The structure of these particles follows specific rules such that many combinations of yorks and zorks are not permitted. For example, a hypothetical combination [3,1] would have a charge of +2e/3 but is not a permitted structure so it cannot exist. Perhaps, I should rephrase that as, "There is no structure which can be electrically, magnetically, and spatially balanced with a [3,1] structure, so such a particle cannot exist." The balances in electric and magnetic forces, along with the geometric structure of every particle, must result in a spin that is stable, sustainable, and unchangeable.

The smallest quark is the **up** with a structure of (6,4) and the next generation of quark with a charge of +2e/3 is the **charm** (9.7), with the **top** quark being (12,10). **Note that there is a [3,3] added to the structure of any permitted particle to form the next generation particle.** Knowing this, we can predict the 'permissible' composition of a theoretical Fourth-Generation particle having a charge of +2e/3, so its permissible structure would be (15,13) which I presently call 'sol'. Thus, the **down-quark** (6,7) is followed by **strange** (9,10), and **bottom** (12,13) with a proposed, Fourth-Generation particle being called 'terra' (15,16); and the **electron** (2,5) is followed by the **muon** (5,8), the **tau** (8,11) and a hypothetical Fourth-Generation (11,14) particle which I have started calling the 'klingon'.

But the smallest possible Sparq combination is the neutrino which I call the n2 'neutito' (1,1). We will study the neutito first because it is the simplest of all particles of matter and the forces holding these particles together are the same forces that hold EVERY more massive particle together. We treat the shape of the neutito (1,1) as one, disk-shaped

[24] Later we shall find that this is the reason we live in an 'all-matter' world. See Chapter 8.

york parallel with one, coexisting, disk-shaped zork separated by a distance d_y+d_z with both particles, spinning in the same direction, at a rotational velocity of $u_y = u_z$.

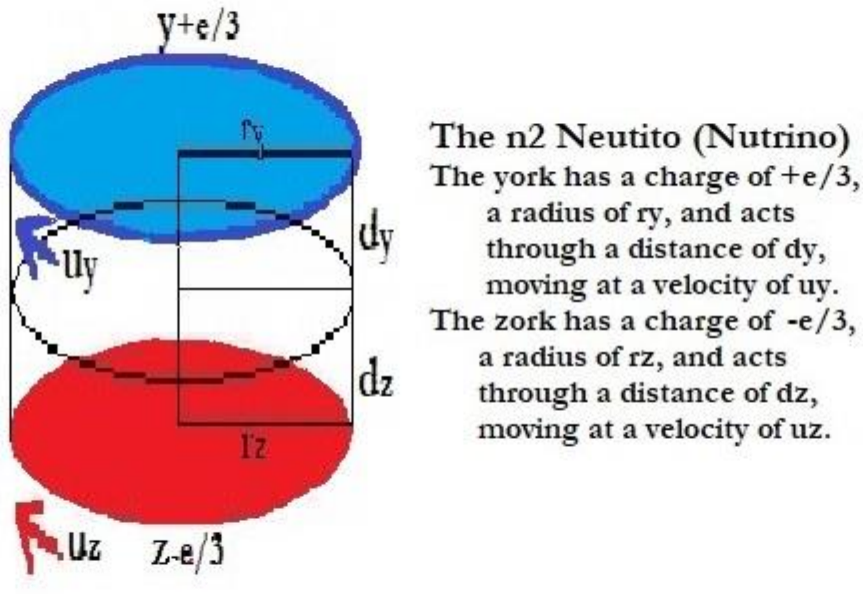


Figure 3-1 The n2 Neutito

Coulomb Attraction

There are two, extraordinarily strong, equal-but-opposing, axial forces that bind the **n2 neutito** (1,1) into the smallest possible, and inseparable, indivisible TOPS particle. The first force (F_{qn2}) is the **Coulomb attraction** between the oppositely charged particles. But if that were the only force within the particle, the opposite charges would pull the particles together until they stacked like alternating-color poker chips. +-+-+-+-, etc. This does NOT happen because that Coulomb force is exactly balanced by a **magnetic repulsion** ($F_{\mu n2}$) that is also generated when the charged particles rotate. Currently, physicists call this force the 'Strong Force,' but TOPS holds that it really is due to repulsive magnetic fields.

Magnetic Repulsion vs Coulomb's Law Attraction

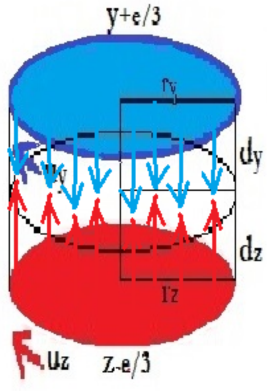
One of the earliest things one learns in a physics class is that a force is the product of a mass and its acceleration (F = ma), and force is measured in the SI units of Newtons (kg-m-sec^{-2}). Now, Coulomb's Law has no mention of mass in the equation. In its place is c^2, and that fact bothers physicists no end! They know it is true, but they cannot explain it. But physicists do have a constant, **k which relates electric charge and a distance to mass.** The constant, k is telling us that the product of two charges **is expressed as a mass divided by the distance** between the charges.

Turn that around, and it seems to also imply that a proportional amount of energy/mass is operating at a fixed distance between the charges and that mass is proportional to the charge SQUARED. In other words, potential **energy/mass is a natural consequence of separated charges which are rotating.**

In essence, a TOPS neutito consists of a single york holding the smallest possible positive charge (+e/3), separated by a distance (d_y+d_z) from the zork, which holds the smallest possible negative charge (-e/3). That neutito has been spinning since its creation, whether it was at the Big Bang or the result of a particle decay. It has not lost charge or velocity at any point, and never will—it NEVER 'runs down.'. It is the universe's smallest possible capacitor, it contains a fixed amount of energy, and is most likely, the most pervasive particle in the universe (because any larger-particle decay ultimately produces the lowest-energy-possible 'ash' of (1,1)φ photons and (1,1) n2 neutitos which have even less energy than the photon). Thus, neutitos are at the absolute bottom of any energy-package decay. (We will discuss particle decay in Chapter 8.)

There are two, equal-but-opposing, axial forces that bind the **n2 neutito** (1,1) into the smallest possible indivisible particle. The first force (F_{qn2}) is the **Coulomb attraction** between the oppositely charged particles. As we said earlier, if that were the only force within the particle, the opposite charges would pull the particles together until they stacked like poker chips. +-+-+-+-, etc. Normally, this does NOT[25] happen because that Coulomb force is exactly balanced by a **magnetic repulsion** ($F_{\mu n2}$) that is generated whenever charged particles rotate. I propose that this magnetic repulsion is the source of the nuclear Strong Force that physicists recognize must exist, but it appears that science does not yet recognize that the **magnetic moment is the probable source** of that energy.

[25] With the possible exception being the black hole, which is addressed in Chapter 14.



Both particles are spinning clockwise so both possess a spin in the downward direction. The magnetic moment, however acts in opposite directions for positive and negative charges, as indicated by colored arrows. Thus, our illustration shows N-N pole repulsion which attempts to push the yorks and zorks apart. It is the equal attraction forces of opposite electric charges and the magnetic repulsion that permanently keeps the two n2 particles 'frozen' to each other.

Figure 3-2 Opposing Magnetic Forces in the n2 Neutito

TOPS would suggest that only the crushing pressure of a super-dense, black hole can push those two particles closer together than they naturally are in the neutito.

TOPS assumes that yorks and zorks are indivisible, indestructible, and cannot exist alone—they must always be a part of a structure which has bonds of attraction and repulsion between separated pairs of the yorks and zorks. The Coulomb attraction and repulsion of one particle are opposed by magnetic repulsion and Coulomb attraction of the other. Thus, **every composite particle has a natural balance of the forces that maintains that particle's structure.** The Coulomb force (in Newtons) is:

$$F_q = \frac{k\,(q_1 x q_2)}{d^2} \quad N$$

and the potential energy resulting from the Coulomb force acting through the distance d, separating the charges is:

$$E_q = F_q{*}d = \frac{k\,(q_1 x q_2)}{d} \quad \text{joule}$$

Coulomb's Law describes how two charges (q_1, q_2) are attracted or repelled when separated by the square of the distance (d) between them, F_q is the force in Newtons (kg-m-sec^{-2}). If both charges are positive, OR if both charges are negative, the Coulomb force is repulsive—both situations yield a positive force value (a **plus x plus** yields a positive value, but so does a **minus x minus**!). But, if one charge is negative and the other is positive, the Coulomb force is attractive, and the sign of the force is negative in value because a **plus x minus** is always a minus. The **k** is called Coulomb's Constant, and k = $9.00\text{x}10^9$ (kg-m^3-sec^{-2}-Coul^{-2}).

Coulomb's Constant, **k** is sometimes replaced by an exactly equivalent expression $\mathbf{1/4\pi\varepsilon_o}$ in which ε_o is called the '**electric constant,**' which has the value of $8.85\text{x}10^{-12}$ F/m so the value of $\mathbf{1/4\pi\varepsilon_o}$ is equal to Coulomb's Constant, $\mathbf{k} = 9.00\text{x}10^{9}$ kg-m^{3}-Coul^{-2}-sec^{-2}.

What is not so readily comprehended, is that along with the electric constant, ε_o**,** we also have the **magnetic constant**, μ_o, with a quantitative value of, $\mu_o = 4\pi\ \text{x}10^{-7}$ (kg-m-Coul^{-2}). Furthermore, ε_o and μ_o have a unique relationship such that: ε_o times $\mu_o = 1/c^2$ where, c is the speed of light!

> [I don't know about others, but I find these concepts to be especially mind-boggling! I have spent many hours trying to sort out what is going on, usually ending in a seemingly, endless loop of twisted thought that always seemed to have two central elements—the speed of light SQUARED, as being central to the issue; and there is a commonality of the factor, 10^{-7} kg-m/Coul^2 in BOTH ε_o AND μ_o.
>
> Note: I am developing the formulas as I go in this book. I originally wrote the previous paragraphs several months ago and had not yet mastered these concepts—I just had the faith that I was headed in the right direction! The reader probably won't see the full impact of these connections until Chapter 12 because I think THAT is where the logic of all of this, will eventually all come Together! BBB 10/24/2020.]

I finally discovered that one of the solutions to my mind-numbing confusion, centered on using both the electric and magnetic forces together, rather than trying to analyze them separately. Only then, did I find a math equation that produced a result which related charge and mass for both electric and magnetic constants!

I think the easiest way to explain this is to show the results I obtained and how they are related. First, I will introduce a 'new' physical constant and THEN, I will attempt to explain the consequences.

THUD[26]

There is a generally unrecognized physical constant which I call '**THUD**,' which I represent by the character **Ћ. Thud** specifies the relationships among **electric charge force, the magnetic force, the distance, and mass**.

Thud (**Ћ**) is the **charge-to-mass conversion factor** with a value of**:**

$\text{Ћ} = 10^{-7}$ kg-m/Coul^2

Consider the value of Coulomb's Constant (k). k = $\mathbf{c^2}$ m^2/sec^2 **x10^{-7} kg-m/Coul^2**. Thus, **$k = c^2 \times \text{Ћ}$**. Thus, **Ћ** is not a NEW constant—it has been buried in Coulomb's constant all along. **Ћ,** is also in the magnetic constant, for $\mu_o = 4\pi\,\text{Ћ}$ (kg-m-Coul^{-2}), which **is the factor which determines the relationships among charge, mass, and distance in magnetism**! **AND,**

Ћ is in the electric constant, as $\varepsilon_o = 1/(4\pi\, c^2\, \text{Ћ})$**!**

Thus, **Ћ applies to both the electric and magnetic constants**, as well as to Coulomb's Constant, **k. The interrelationships among these constants are**, as follows:

$$\mu_o = 4\pi\,\text{Ћ}$$
$$\varepsilon_o = 1/(4\pi\, c^2\, \text{Ћ})$$
$$1/4\pi\varepsilon_o = k = c^2\,\text{Ћ}$$
$$\varepsilon_o\, \mu_o = 1/c^2$$

Now, μ_o **is applicable to only the magnetic field portion of the neutito (based on its magnetic moment), and** ε_o applies only to the electric field due to the separation of charges. Recall also that the mass **is where the charge is, so Ћ is also where the mass is!** The physical constant **Ћ** is in BOTH electric and magnetic energy equations, but once you multiply $\varepsilon_o\, \mu_o = 1/c^2$, and you will notice that the **Ћ**

[26] Searching for a 'name' for this constant, I wanted something that conveyed the concept of 'heft' to show the source for mass. The word 'thud' comes from an old joke which I summarize here. In cheap housing areas noise from adjacent apartments is frequent. It seems that John's upstairs neighbor wore heavy work shoes and when he came home from his late shift at night, he had the habit of removing his first shoe and allowing it to drop to the floor with a THUD. A few minutes later, he would remove the other shoe and drop it to the floor with another THUD. His downstairs neighbor, John, was wakened every night by the THUD from upstairs and grumbled as he waited for the other shoe to drop so he could get back to sleep. John's wife got tired of John's griping about being wakened by the dropping shoes every night and she suggested that he 'nicely' go to his upstairs neighbor and tell him how his habit kept John from sleeping. The upstairs neighbor apologized and said he would try to break the habit, but that night he forgot his promise until he heard the THUD as he dropped his first shoe. Trying to make up for it, he gently lowered the second shoe to the floor, and he went to sleep. An hour later, he was awakened by John banging on his door, and shouting, "Drop the other shoe so I can go back to sleep!"

is GONE (actually, the coefficients of **4πƬ** (=4π10^{-7} kg-m) cancel out numerator to denominator—this leaves us with the UNITS of TWO distances that are quite different—r_y and $2d_y$)**!** When we treat the electric and magnetic fields separately, Thud is essential, but mathematically, **Ƭ appears** to cancel out when we combine the electric and magnetic effects (because **$\varepsilon_o\ \mu_o = 1/c^2$**)! The length dimension in the numerator of the magnetic equation, is always the radius (which determines the strength of the magnetic field) but in the denominator it is the axial distance between the york and the zork (= $2d_y$) for the electric field. Although it turns out that r_y=d_y in magnitude, those two distances are physically NOT the same and now we have found the relationship between r_y and $2d_y$ to assist in completion of the n2 neutito analysis.

We said that the length units of r_y and $2d_y$ '**appear**' to cancel out and that is the operative word here. **The Thuds** cancel out numerator to denominator, and the resulting mass disappears into the product of the mass ($m\cdot r_y$ for the magnetic constant) and distance ($m\cdot 2d_y$ for the electric constant). The weird reason for this **appearance** is in those two different lengths r_y and $2d_y$. T**hey represent two different measurements in the two Thuds** (as indicated in the preceding section). When we consider the axial distance in Coulomb's law, where **ε_o** holds sway, the appropriate distance is **$(d_y+d_z)=2d_y = 2r_y$** and the length is in the **denominator** of the electric Force equation. Thus, **a larger distance in d_y would result in a lesser Coulomb force between the york and zork but a larger radius of the Sparq would increase the magnetic force between them.**

The **μ_o** element in **the magnetic moment**, however, is **in the numerator** and depends NOT on the square of the charge separation $(d_y+d_z)^2$, but on the square of the radius of the Sparq disk (**$r_y^2 = r_z^2 = r_{n2}^2$**) which is in the numerator of the magnetic force equation and **the larger the radius, the greater would be the magnetic force between them!**

Thus, I think that one reason that it is so difficult to recognize that there is **inherent mass within charge**, is that while the UNITS of length appear to cancel out and, the surrounding coefficients of those units operate in accordance with the appropriate distances and produce the appropriate energies (thus including mass), the opposing forces automatically **balance because the axially oriented magnetic and electric forces are exactly equal but ACT in opposite in directions. Ƭ remains operative in relating charge-to-mass in both the electric and magnetic energy equations. It only LOOKS like there is only CHARGE (no mass) in there. The mass comes from the disappearing Thuds in both the numerator and denominator!**

Inherent Energy in the n2 Neutito

ENERGY ENERGY ENERGY

Total =Magnetic+Electric = Magnetic + Electric

$$\mathbf{E_{n2i} = (E_{\mu n2}) + E_{qn2i} = 2\,\frac{\mu_o\, i_z\, \mu_y}{r_y} + \frac{k\, q^2}{(2d_y)}} \qquad \textbf{(INHERENT energy)}$$

We need to point out a very significant fact about the E_{n2} equation, above. **This is the inherent energy, that which is produced from the rotation of the +e/3 and -e/3 charges themselves. This includes both the Coulomb potential energy and the magnetic energy produced by those charges in the inherent, or non-relativity state. Thus, this equation does NOT include the spin energy or relativity energy which is produced by the γ boost. Thus, this equation is limited to the inherent energy in the n2 neutito!**

The γ boost will result from the Lorentz Transformation which, in effect, boosts the mass/energy due to its rotation at almost the speed of light, some 3.00×10^8 m/sec. In Chapter 6 we will study the γ boost, so we will not plug in the known values to obtain the inherent energy of the neutito at this point--we will not discuss the theory behind the γ boost until Chapter 6. The remainder of this chapter discusses the balance of the electric and magnetic forces that act along the rotational axis of the n2 neutito. Its purpose is to establish the **$2d_y/r_y$ relationship** in the n2 neutito.

The $2d_y/r_y$ Relationship

We have suggested that the **magnetic** energy within the n2 neutito may be expressed by the relationship,

$\mathbf{E_{\mu n2} = [2\mu_o\, i_y\, \mu_y/r_y]}$ (Also recall that $2\pi r_y f_y = u_y$)

In this equation, the portion within the brackets divided by u_y^2 is the actual inherent **attributed MASS (due to magnetic energy of the rotating charges)** and the units are in joules, so attributed Energy = attributed mass x velocity^2 in joules! **Let us examine that relationship in a bit more detail.** (There are other sources of energy within the n2, and they provide other attributed mass and energy values. We will not address them right now, because we are concerned here, with only the **axial forces** and energies which affect the **$2d_y/r_y$ relationship**.)

Let us rearrange the final result of our equation for $E_{\mu n2}$ and analyze it to see if we can use a Planck's Coefficient to find the values of the n2's mass, radius, and frequency. First, we shall replace μ_o with $4\pi \text{Ћ}$, i_y with $(-e/6)f_y$, and μ_y with $i_y(\pi r_y^2)$, **noting that $i_y = -i_z$ and, $f_y = f_z$.**

$$E_{\mu n2} = \quad [2x\ 4\pi \text{Ћ}\ i_y\ (i_y \pi r_y^2)/r_y]$$

Inserting above values and rearranging, we obtain:

$$E_{\mu n2} = \quad [2\text{Ћ}\ (e^2/36)\ (4\pi\ \pi r_y^2\ f_y^2)/r_y] \qquad\qquad (2\pi r_y f_y = u_y)$$

$$E_{\mu n2} = \quad [2\text{Ћ}\ (e^2/36)\ (u_y^2)/r_y]$$

$$E_{\mu n2} = \quad [2\text{Ћ}\ (e^2/36)/r_y]\ u_y^2$$

Units of that formula are:

$$E_{\mu n2} = \quad [\text{Ћ}\ (kg\text{-}\cancel{m\text{-}Coul^{-2}})\ (e^2\cancel{(Coul^2)}/36)\ /\cancel{(m)}]\ u_y^2\ (m^2\text{-}sec^{-2}) \qquad \text{joule}$$

$$E_{\mu n2} = \quad \underline{[2\text{Ћ}\ e^2/36r_y]}\ u_y^2 \ \ \text{joule}$$

$$E_{\mu n2} = \quad \frac{[2\text{Ћ}\ e^2]}{36(r_y)}\ u_y^2 \ \ \text{joule}$$

Note that the expression in brackets is the mass *attributed to magnetism* in kilograms; and the result of the final expression is $kg\text{-}m^2\text{-}sec^{-2}$, or joules = energy!

(Note that this is only the energy due to the <u>magnetic moments</u> of the york and zork of the n2—it does not include the Coulomb potential energy (E_{qn2}) between them and does not address $2d_y$ the distances between the york and the zork as compared to the radii ($r_y = r_z$) of these particles.

We start by realizing that we have been dealing with the ENERGY of the magnetic field and not the forces which are generated by that field. Thus, to balance forces we need to establish the force due to the magnetic field. Knowing that E=Fd we can calculate that force.

$$E_{\mu n2} = \quad \underline{[2\text{Ћ}\ e^2]}\ u_y^2 \qquad = \quad \underline{[\text{Ћ}\ e^2]}\ u_y^2 \ \text{joule}$$

$$\mathbf{36(r_y)} \qquad\qquad \mathbf{18(r_y)}$$

And the magnetic **force** that produces this energy with a radius of r_y **but over an axial distance of 2d_y** is $F_{\mu n2} = E_{\mu n2}/2d_y$, so,

$$F_{\mu n2} = \frac{\mathbf{[Ћ\, e^2]\, u_y^2}}{\mathbf{18(r_y)(2dy)}} \quad N$$

And that force MUST equal the balancing,

Coulomb force (F_{qn2}) which is:

$$F_{qn2} = \frac{k\,(q_1 x q_2)}{d^2}$$

where q_1 is $+e/3$, q_2 is $-e/3$ (Coul), and the distance, d is now $(d_y+d_z) = 2d_y$.

For formula simplification, to use the electric constant we will replace Coulomb's constant, **k** with its equivalent value of $1/4\pi\varepsilon_o = \mathbf{c^2\, Ћ}$. Thus,

$$F_{qn2} = \mathbf{c^2}\, Ћ\, \frac{(+e/3)(-e/3)}{(2d_y)^2} = \frac{-\,\mathbf{c^2\, Ћ}\, e^2}{\mathbf{9(2}d_y)^2}$$

(The negative value indicates it is an attractive force.)

Adding the two opposing forces yields:

$$F_{qn2} + F_{\mu n2} = 0$$

$$\frac{\mathbf{-\,c^2\, Ћ\, e^2}}{\mathbf{9(2d_y)^2}} + \frac{\mathbf{[Ћ\, e^2]\, u_y^2}}{\mathbf{18(r_y)(2d_y)}} \mathbf{= 0} \quad N$$

After adding the negative term to both sides, rearranging terms, and cancelling out common factors, we find:

$$\frac{\mathbf{[\cancel{Ћ\, e^2}]\, u_y^2}}{\mathbf{\cancel{9x}2(r_y)\cancel{(2d_y)}}} = \frac{\mathbf{c^2\, \cancel{Ћ\, e^2}}}{\mathbf{\cancel{9}(2d_y)^{\cancel{2}}}}$$

$$\frac{\mathbf{u_y^2}}{\mathbf{2r_y}} = \frac{\mathbf{c^2}}{\mathbf{(2d_y)}}$$

But, What does THAT mean?

Let us rearrange the terms, thusly (this identifies the relationship between our two different distances, r_y and $2d_y$);

$$\underline{\mathbf{2r_y}} = \underline{\mathbf{u_y}}^{\mathbf{2}}$$

$$\mathbf{(2d_y)} \qquad \mathbf{c^2}$$

In Chapter 5 we will find that the ratio u/c has a value that we will call alpha (α) and in THIS very special case of the n2 neutito, $\alpha = 1$. We will demonstrate that in a bit, but we will not find conclusive evidence until Chapter 6. Thus, for the moment, we will use u/c=1, so the above equation yields:

$$(2d_y) = 2r_y \qquad \text{or,} \qquad 2d_y = 2r_y$$

This is saying that, in the n2 neutito, the distance between the york and zork ($2d_y$) is the same distance as $2r_y$ where $2r_y$ is the diameter of the york (or zork). Every tiny n2 neutito will fit into the volume of a cube of space that is $2r_y$ on each edge, with a total volume of $2r_y x 2r_y x 2r_y = 8r_y^3$. Once we find the value of $\mathbf{r_y}$ we will be able to identify that tiny volume, for **it is the smallest significant volume of space in the universe—there is no particle that can occupy less space than the n2 neutito. But we will not find the value of r_y until later—we have other concepts to study before we can do that.**

We will not divide both sides by 2 to obtain the value of d_y because ($2d_y$) is the value that relates the radius of the n2 to the distance ($d_y+d_z = 2d_y$) between the york and zork in the neutito. **THIS IS AN IMPORTANT RELATIONSHIP so, please allow me to continue pursuing it.**

The first reason this relationship is important, is that this ratio of distances allows us to reduce the number of unknowns in the equation, because we can place all length units in terms of the radius, rather than mixing in the distance between the york and zork! Try it! Balance the magnetic force against the Coulomb (electric) force using the ($2d_y/2r_y$) = 1 ratio. $F_{\mu n2i}$ remains the same as above, but when we substitute the (2dy) = $2\mathbf{r_y}$ equivalence in the electric force, $\mathbf{F_{qn2i}}$.

$$F_{qn2i} = \frac{c^2 \text{Ћ} e^2}{9(2d_y)^2} = \frac{c^2 \text{Ћ} e^2}{9(2r_y)^2} \qquad \textbf{Electric Force (in terms of } \mathbf{r_y}\textbf{).}$$

$$F_{\mu n2i} = \frac{[2\text{Ћ} e^2]\, u_y^2}{36(r_y)(2d_y)} = \frac{[\text{Ћ} e^2]\, u_y^2}{18(r_y)(2r_y)} \qquad \textbf{Magnetic Force}$$

Now these two forces MUST be equal and opposite for the n2 to exist! Thus, we will set them equal to each other, and cancel out common factors.

$$\underline{\text{Electric force}} = \underline{\text{Magnetic Force}}$$

$$F_{qn2i} = F_{\mu n2i}$$

$$\frac{c^2\, Ћ\, e^2}{9(2r_y)^2} = \frac{[e^2\, Ћ]\, u_y^{\,2}}{18(r_y)(2r_y)}$$

Cancelling out common terms,

$$\frac{c^2\, \cancel{Ћ}\, \cancel{e^2}}{\cancel{36\, r_y^{\,2}}} = \frac{\cancel{e^2}\, \cancel{Ћ}\, u_y^{\,2}}{\cancel{36\, r_y^{\,2}}}$$

Thus, all we have left over is:

$$c^2 = u_y^{\,2}$$

But of course, we have already said that, but it is noteworthy to repeat this fundamental fact about the n2 neutito:

$$c = u_y = u_z = u_{n2} \quad !!$$

We will prove this in Chapter 6.

You may recall from earlier in this chapter, that I said that I would try to find a Planck's Coefficient to separate the mass from the radius. So far, I have failed to do that. You will need to read Chapter 12 to find how to do that.

QUO VADIS?

I need help on this chapter. I have derived what I THINK is the formulas for the Energy and Force of the magnetic field within the neutito. (See Chapter 12 for the details.)

I have made several assumptions on which these calculations are based. Most notable of them is the assumption that the shape of the Sparqs is an infinitely thin disk with the single unit of e/3 charge being evenly distributed across the surface. The actual shape COULD be a sphere (but that

would have produced an angular momentum of 2/5 mr^2). It could have been a disk with all charge at the rim (but that would give it a moment of inertia of mr^2). Or, it could have been a thin ring that would produce a moment of inertia of $\hbar = \frac{1}{2}mr^2$. It could have been a thin rod of length 2ry, but that would generate a thin disk as it rotated. Thus, I chose the disk shape because it matched the angular momentum of all sub-atomic (except the photon) particles, $\hbar/2$.

I also assumed that the magnetic energy formula for the combined york/zork n2 neutito was twice the value of what it would have been for a single york or zork. If I am wrong on any of these assumptions, the relationship between $2d_y$ and r_y would be different and so would the masses and other dimensions that I have calculated.

While I have based this formula on what I believe are valid assumptions, I could be wrong. Also, I am not a mathematician and may well have made one or more rather simple algebra errors.

Thus, I request that someone who does have the ability to analyze this energy equation, do me the honor to check my logic for errors and provide feedback for correction. In future editions of this work, I will attribute credit to the first three individuals who submit INDEPENDENT alternative computations which agree with each other, in either confirming or correcting my work.

Chapter 4 - The Photon and Proto-Photon

The TOPS Photon

TOPS conceives the photon as consisting of two Sparqs, i.e., one york, and one zork, and it is designated as $(1,1)_\varphi$ to distinguish it from the smallest neutrino, the (1,1) neutito. The york and zork are separated by a fixed distance, r_φ (determined by the energy of the photon= hf_φ)), and orbit around each other in parallel helixes with each orbit traversing one wavelength (λ_φ) of linear distance. The two, helical paths always remain at the same distance r_φ from the axis of photon rotation. The photon possesses a linear velocity (the forward movement of both the york and zork) of c, the speed of light.

In Chapter 2 we found that hydrogen atoms have distinct orbital levels of both the proton in the nucleus, and the orbiting electron. When an electron shifts to a lower orbit, there is an appropriate shift in orbit of the proton and there is exactly the same amount of energy released as in each electron shift. Thus, with photons produced as a result of ANY atom's orbital shift, there are always two, identical, but oppositely directed photons that are produced.[27] This type of photon emission is called 'characteristic radiation' for the specific wavelengths of its photons are always the same and are characteristic of the kind of atom that emitted the photon--that specific wavelength is not to be found for any other kind of atoms. We thoroughly discussed that concept in Chapter 2.

But, a very natural question arises, 'Where do the york and zork of a photon come from?' An equally natural question is, 'Where do the york and zork go TO, when a photon is stopped and gives up its hf_φ energy? To answer those questions, we need to be comprehensive for logical explanations, but also, may well seem to be a bit redundant.

TOPS sees each orbital-shift photon as consisting of one york and one zork, with an ADDED triggering energy of hf_φ, and I propose that the york and zork of every photon originates in a VERY ubiquitous particle that is plentiful in a vast sea of unimaginably small particles which we **perceive** to be nothing but empty space. In that sea of particles, many are neutral in charge and can absorb energy to become a photon. TOPS calls these simple no-charge particles, with **proto-photons, $(2,2)_\varphi$**, being one possible example.

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27 This does not prohibit single-photon production from within a radioactive atom, where the ejecting atom is given the action/reaction shifts to conserve momentum.

Any uncharged particle (containing an even number of yorks and zorks) could conceivably serve as a package that can absorb energy and change into a photon. The Sparq arrangements of a TOPS **proto-photon** must be stable in the proto-photon form and readily able to absorb energy to become a photon. The photon, however, must also be able to release the triggering photon energy and revert to some other form of particle that contains the energy-spent-photon's york and zork.

When the proto-photon is in the vicinity of an **excited** hydrogen atom, for example, it can absorb the energy from an electron-shift to a lower orbit in the atom. The transferred energy (triggering energy, $E_\varphi = hf_\varphi$) immediately tilts the proto-photon's york and zork so the torque of each is directed in the same direction, the degree of tilt depending upon the amount of energy involved in the interaction. This converts the proto-photon to a photon traveling at the speed of light (c). The energy of the electron shift determines the degree of the york's tilt and thus the wavelength (λ_φ) of the resulting photon with the higher energy shift, producing a shorter wavelength in the photon. In the photon form, the york and zork orbit each other at a fixed distance ($d_\varphi = 2r_\varphi$) and travel in matching helical paths, moving forward at the velocity of light (c) for one wavelength (λ_φ) during a time of $T_\varphi = 1/f_\varphi$ sec and possess a **translational energy of hf_φ.** Thus, $c = \lambda_\varphi f_\varphi$. The relationship between the photon's helix radius (r_φ) and the wavelength is: $\lambda_\varphi = 2\pi r_\varphi$ and thus,

$$c = \lambda_\varphi f_\varphi = 2\pi r_\varphi f_\varphi.$$

It would seem, however, that the n2 (1,1) neutito cannot be involved in photon production. The n2 neutito is the absolute bottom of particle structure and cannot be divided or destroyed. Also, the nature of a photon requires the two Sparqs to spin in **opposite** directions with the planes of their disks being normal to the direction of photon motion along the helical path. Why is that?

TOPS presumes that the double magnetic-moment kick of oppositely rotating Sparqs drives the photon at the speed of light. With current understanding of TOPS structures, the photon's two Sparqs must spin in opposite directions. That is the only way that both particles' magnetic moments are pointed in the same, forward direction.

Although the n2 has two, oppositely charged Sparqs, they spin in the same direction and produce repulsive magnetic vectors that cause the magnetic n2 forces to counteract each other, to balance against the Coulomb forces, and to form a uniquely stable structure. I know of no high energy experiments that have demonstrated any evidence of the n2 neutito, let alone its dissociation into 'bare' yorks or zorks. We therefore conclude that the magnetic forces in the n2 are so strong that the n2 neutito

Sparq-pair is unbreakable with the possible exception being within the core of a black hole. Thus, an n2 neutito probably cannot be the source of the york and zork within the photon.

But what if we had two n2 isomeric neutitos[28] that could **exchange** one york (or zork) with the other isomer so directions of Sparq-spin in the proto-photon, were opposite in direction to produce a photon--could we have a candidate of the n2 as our elusive proto-photon? Even if we had two isomeric n2 neutitos (one N-pole and one S-pole) monopoles[29] that bonded together to form the smallest possible dipole magnet, it does not appear that an exchange of Sparqs from one monopole to the other, could occur to form an opposite-spin pair of Sparqs—one of the Sparqs would need to be flipped to rotate in the opposite direction and THAT would require a radical energy exchange within the particle, and thus, is another factor in ruling out the n2 as a serious proto-photon candidate.

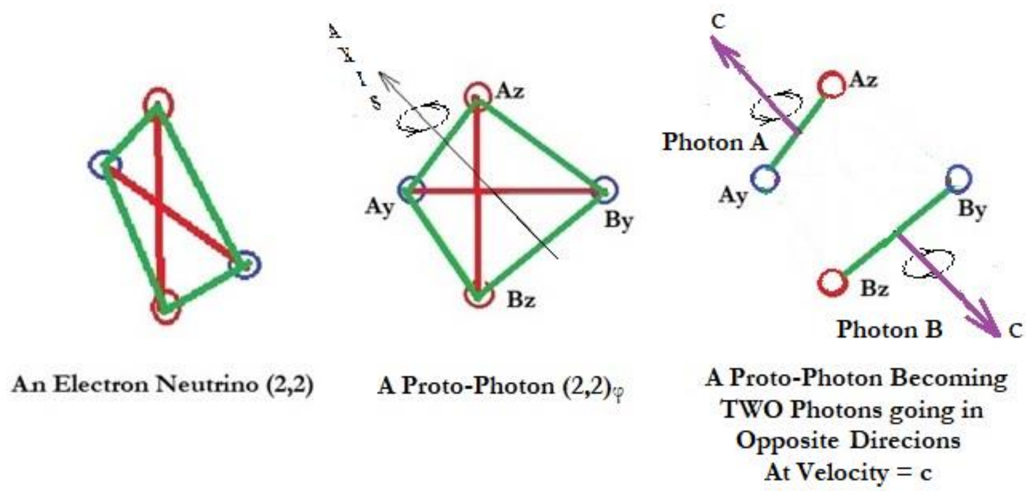

Figure 4-1 The Proto-Photon Becomes Two Photons

There appears to be a simple structure that can fill the bill in providing such a model. That is the irregular, tetrahedron-shaped (2,2) electron neutrino. (See Figure 4-1.) Even though there are slightly different distances in the attractive and repulsive bonds, the (2,2) is symmetrical and its yorks and zorks may be reoriented with only slightly different bond-lengths, Thus, the n4 appears to be susceptible to reorientation by a modest level of triggering energy (hf_{φ}) to become a pair of photons. I propose the following as a possibility.

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[28] n2 neutitos may exist in two forms, both with both Sparqs spinning in the same direction, but those directions are always opposite in direction. See the discussion of magnetic monopoles in Chapter 13.

[29] See Chapter 14 for discussion of magnetic 'monopoles.'

$(2,2)_\varphi + 2hf_\varphi = (1,1)_\varphi + (1,1)_\varphi = 2(½(2,2)_\varphi) = 2(1,1)_\varphi$

It appears that the planes of the (2,2) Sparqs may be oriented perpendicular to the axis of rotation and turn in opposite directions, so the basic requirements are met for ready conversion to two, separate photons. As the excited atom's orbital electrons shift, they release their potential energy, and this is what TOPS calls the **triggering energy**. At this point, two photons (using all four of the n4's Sparqs) immediately 'kick off' each other in opposite directions, both traveling at velocity c, and thus, conserving momentum.[30] From this point, we shall assume that the proto-photon is a (2,2) electron neutrino and will designate our proto-photon candidate as $(2,2)_\varphi$.

An Example of Energy Dissipation

I will now provide an example that illustrates how energy dissipation results in forming n2 neutito and Cosmic Background Radiation (CBR).

Let us start with a specific energy shift in a hydrogen atom's orbit from Chapter 2. The following excerpt from Chapter 2 gives the Planck Coefficient of the energy shift from orbit n=2 to orbit n=1 as being **$Þ_{21} = 1.27$.** This energy shift produces a single photon with a spectral line called Lyman α (wavelength = 122 nm $=1.22\text{x}10^{-7}$ m) with a frequency (f_φ) of $2.46\text{x}10^{15}$ Hz. Thus, the triggering energy of this photon $=hf_\varphi = 1.62 \text{ x}10^{-18}$ joule.

Here are the dimensions of a hydrogen atom's orbits n=1 and n=2 from Chapter 2.

> **$r_{o1} = 5.29\text{x}10^{-11}$ m, $u_{o1} = 2.20\text{x}10^{6}$ m/sec; $f_{o1} = 6.62\text{x}10^{15}$ Hz; $Þ_{21}^2 = 1.61$, $Þ_{21} = 1.27$;** and because we also know: **$r_{o2} = r_{o1} * Þ_{21}$; $u_{o2} = u_{o1}/Þ_{21}$; and $f_{o2} = f_{o1}/Þ_{21}^2$**; SO….
>
> **$r_{o2} = 6.72\text{x}10^{-11}$ m; $u_{o2} = 1.73\text{x}10^{6}$ m/sec; and $f_{o2} = 4.11\text{x}10^{15}$ Hz**

Now, suppose that a single, Lyman α photon was absorbed by another **excited** hydrogen atom, this time, the orbiting electron is in **orbit 4**. It would have sufficient energy to boost that electron from n=4 to n=5 and still have SOME energy left. The fifth orbit shift would not take ALL of the photon's energy, because it only takes the amount that shifts to THAT level. (It is easier to eject an outer electron than it is an inner one.) So, what happens to the REST of the photon's energy after boosting the atom's electron from orbit n=4 to n=5?

---

[30] We will discuss momentum issues in Chapter 11.

TOPS would say that the difference in energy would still be left IN THE PHOTON, so it would have changed direction, resulting in it having a longer wavelength and a lower frequency. BUT it would still just be a **lower energy photon, going in a slightly different direction**. Eventually, such a loss of energy from the photon could leave so little $\mathbf{hf_\varphi}$ energy in the final photon that it would finally revert to the n2 neutito state—the absolute bottom of the energy barrel—it would no longer be a photon.

TOPS suggests that this apparent petering out of the energy of the photons may be the reason we have the Cosmic Background Radiation (CBR). Those CBR photons just have not quite reached the 'rock bottom' energy of the n2 yet. Each of those super-low energy photons may continue its travel through space for thousands of years or more-–perhaps, MUCH more--without hitting anything and without gaining or losing energy. But when they DO finally interact with another particle, they may give up some translational energy to the other particle, they are then diverted in direction, and continue on, a bit less energetic--until it finally has lost all its translational energy and sits inertly as a single n2 neutito—the endpoint all of decay in the TOPS world.

As an actual example, a 2.6 GHz radiofrequency photon (i.e., the kind of wave produced in your microwave oven) has a wavelength of something like 12 cm (about 5 inches) but the actual duration of just one rotation ($T = 1/2\pi f_\varphi$) of the york in that 12 cm cycle is in an order of magnitude of about a BILLIONth of a second!

An example of a much shorter wavelength of visible light is the red colored photon in the Balmer Series of the hydrogen atom. This photon is produced when the electron shifts from orbit n=3 to orbit n=2 and has a wavelength of 656 nm (nanometers or $6.56\text{x}10^{-7}$ m) with a frequency of $4.57\text{x}10^{14}$ Hz. A shorter wavelength yet, is the 'hard' X-ray of $3\text{x}10^{19}$ Hz which has a wavelength of .01 nm, a hundred billionth of a meter!

Table 4-1 shows the relative dimensions of these three sample photon components. Note the following interesting points: Both the intrinsic spins of the york and zork are at the speed of light, as is the entire photon which is moving in the direction of propagation; The product of the frequency and wavelength is also the speed of light; the radius of the photon is $1/2\pi$ times the wavelength; for most photons, the mass of the original proto-photon $(2,2)_\varphi$ is far more significant than the 'photon' triggering energy/mass as currently understood ($m_\varphi = hf_\varphi/c^2$).

DIMENSIONS OF THREE SAMPLE PHOTONS

Photon Type	f_φ (Hz)	λ_φ (m)	r_φ (m)	(1,1) (kg)	+ m_φ (kg) (hf/c^2)	= Σm_φ (kg)
Microwave	2.6E9	1.2E-1	1.8E-2	1.3E-31	+ 1.9E-42	= 1.3E-31
Red Visible	4.6E14	6.6E-7	1.0E-7	1.3E-31	+ 3.4E-36	= 1.3E-31
'Hard' X-ray	3.0E19	1.0E-11	1.6E-12	1.3E-31	+ 2.2E-31	= 3.5E-31

Table 4-1: Dimensions of Three Sample Photons[31]

This is because the energy derived from the orbital shift (hf_φ) is typically exceedingly small as compared to the mass of the york-zork (the microwave example is 11 orders of magnitude lower in energy/mass than that of the york+zork!). It is not until we get to the extremely high energy X-rays that the hf_φ mass becomes significant and the total mass is the sum of the masses of the proto-photon and its variable hf_φ contribution.

Although it was said as indicated in Chapter 2,[32] it is important that the reader understand that the TOTAL energy of a TOPS photon is NOT just the **hf_φ energy** because it also includes the mass/energy of the two Sparqs AND the structural energy (i.e., half of the n4 proto=photon) from which it was made.

This means that the **TOTAL ENERGY OF A TOPS PHOTON IS:**

$$\mathbf{E_{\varphi tot} = \tfrac{1}{2}\, m_{n4}\, c^2 + hf_\varphi = m_{n2}\, c^2 + hf_\varphi!}$$ [33]

---

[31] The 1.30x10^{-31} kg value of the $(1,1)_\varphi$ column of Table 4-1 is the 'baseline' value of the Sparq masses of the york and the zork and does not include the added (and presently unknown) structural (Binding) mass/energy of the n4 proto-photon as indicated in the following paragraphs. We will not know that value until we obtain detailed analysis of all energy bonds within the n4 neutrino. (See Chapter 7 where we suggest approaches to such analysis.) The m_φ column will then include both that Binding energy AND the hf_φ triggering energy values.

[32] In Chapter 2 we said, "in TOPS, a photon which has an energy of **hf possesses a mass of h/c².**"

[33] The coefficient of ½ is required because each photon uses only HALF of the yorks and zorks of the n4 electron neutrino. The other half went into the second photon that was produced in the orbital shift. At this point we do not know the structural energy of the n4 neutrino—that will have to come from detailed vector analysis which will be done in Chapter 7—At this time, (07/10/2021) we know only the principle covered in this equation.

For MOST photons (including the entire visible spectrum), the hf_φ portion is the least significant factor and effectively, the photon mass resides in the 2.60×10^{-31} kg in the york and zork. However, when the hf_φ energy is on the order of 100+ KeV (The 'Hard' X-ray in Table 4-1), the photon has about twice the energy of the two Sparqs in the proto-photon from which it is made![34]

Conventional theory holds that normal emission from an excited hydrogen atom will result in a single photon which is produced when an outer electron shifts toward an empty orbit closer to the nucleus. TOPS holds that this is not quite accurate, for the proton in the nucleus is ALSO in a very tight, but distinct orbit. At the same instant that the electron shifts orbit, so does the proton! As we said in Chapter 2, the much more massive proton in its much smaller orbit shift will have the same amount of stored potential energy as does the electron (the greater the mass, the shorter is the shift in distance), so the two shifts produce two, identical, and diametrically opposite-directed photons, at the same time. Different kinds of atoms have different energy levels, so the photons that can be produced by any given atom are characteristic of that kind of atom but are different from all other kinds of atoms. Thus, the hydrogen atom's photon emissions are unique to the hydrogen atom.

We normally see only ONE of those two photons (the one coming into our eyes—the other photon went away from us) and we cannot tell which came from the energy shift in the nuclear orbit, or from that of the electron shift in its orbit, because the photons have the same energy and they are identical in energy.

In TOPS, we hold that we can NEVER have a single photon produced as a result of any energy change between an atom's orbits. There must ALWAYS be two, equal-energy photons moving in opposite directions, to satisfy the Conservation of Momentum and Energy requirements. In other situations (the cases in which only ONE photon is produced), there are other matter particles which absorb the photon's recoil energy and momentum, so as to conserve those laws of physics.

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[34] The consequence of this conclusion could be used to verify or reject the TOPS model. Einstein's proposed an experiment during a solar eclipse to support his Theory of General Relativity. That experiment verified that the paths of photons were diverted from a straight line. If a very high energy TOPS photon has significantly more mass/energy than a visible light photon in unwarped space, would that affect the deviation of its path as it skims past the surface of the sun in the same way as Einstein's prediction of a massless photon in a warped space? See Chapter 11 for a discussion on this kind of experiment.

Energy Exchange

In the process of energy exchange due to orbital shifts, two, separate, $(1,1)_\varphi$ photons are produced. The two photons 'kick-off' each other with one of the helical-path photons possessing a 'right-hand-screw' rotation of its twin helixes, while the other moves in the opposite direction with a 'left-hand-screw' rotation, thus, conserving momentum and energy, as indicated in Figure 4-1 (at beginning of this chapter). Assuming this, the baseline mass of the photon consists of one york and one zork, PLUS the mass of the triggering energy of hf_φ.

Thus, the proto-photon $(2,2)_\varphi$ is probably **at least one source** of yorks and zorks in photons. The yorks and zorks spin **in place at the speed of light (c), but, unlike the photon, proto-photons possess no significant translational energy. When the proto-photon absorbs any released triggering energy, it becomes a photon $(1,1)_\varphi$.**

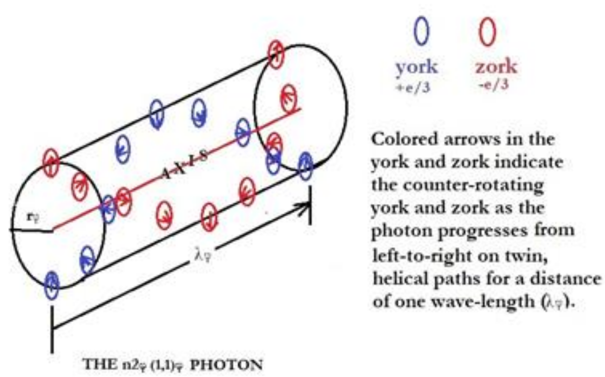

Figure 4-2 The TOPS Photon

When the proto-photon absorbs the hf_φ quantum of energy, it becomes a pair of photons, one of which is depicted in the illustration at Figure 4-2. This figure shows a single rotation of the york and zork (= 1 cycle, but each Sparq also spins around its helical path, rotating in opposite directions) as the photon pair traverses the distance of a single wavelength.

Two-photon production happens when there are TWO energy ejections from an excited atom because there are two energy shifts, one for the electron's orbital shift, and the other from the nucleus' orbital shift. Thus, we see that photons are likely made only **FROM** loosely linked neutrinos. Again, it appears that our best candidate for the proto-photon is the n4 (electron) neutrino $(2,2)_\varphi$.

Where the york and zork **GO** when a photon is stopped and releases its triggering energy is another matter. The triggering energy from TWO stopped photons will **not** reconstruct into a proto-photon $(2,2)_\varphi$—the two photons have been ejected from the emitting atom, going in exactly opposite directions, so they will never meet to recombine. The Second Law of Thermodynamics tells us that things become more chaotic over time (i.e., entropy increases). A boulder will not roll up a hill on its own—it would need to be pushed upwards by an external force. A non-physicist way of saying this is that 'energy runs downhill.' Reconstruction of $(2,2)_\varphi$ particles would take an input of energy and, left on its own, energy always dissipates, over time.

If only ONE photon is produced from a proto-photon, the york/zork pair takes the form of a single $(1,1)_\varphi$ photon (actually, ½ of an n4 neutrino)—and momentum is conserved by imparting translational energy to the other ½ of the n4 neutrino = an n2 neutito. If **that** photon is very low in energy--it joins with the Cosmic Background Radiation (CBR) that pervades the universe, for it is still a photon. When the CBR photon gives up all its triggering energy, the particle becomes an n2 neutito. This is the end of energy exchange for the normal n2 neutito—the former photon is now at its lowest energy state possible—even most of its translational energy is gone—it is a neutito. As we said earlier, the lowest energy particle in nature is the n2 neutito (1,1) and that particle is very tightly held together--the only place that n2 neutitos could be fused together to form a more compact particle, is in a black hole. The n2 neutito is the unreplenishable ash of the universe.

Any totally depleted photons would end up as n2 neutitos and they simply join the sea of all sorts of invisible particles that surround us in space. But the particles in that invisible sea, would also include the emissions of protons and other charged particles ejected from the stars—in the case of our sun, it is often called the 'solar wind.' In our (relatively) tiny area of the galaxy, that flow of particles goes away from the sun in all directions, so there is some degree of flow and thus **those** particles possess translational energy of $E= ½mv^2$. (Note that we are using v for velocity because it is characterized by linear motion and not rotational motion.) Some of the n2 neutitos may have a slight increase of mass due to their high linear velocities and the gamma boosts resulting from the Lorentz $\boldsymbol{\gamma}$ factor (See Chapter 6), but it seems that they **would never be able to change their rotational energy** to become photons.

The neutral particles (neutrinos and photons) are always in some degree of linear motion and thus possess a baseline energy of $m_x c^2$, with the $_x$ depending upon the type of individual particle. The motion of this vast sea of invisible particles, is in terms of the individual particles which are pretty much coming from all directions of the universe. With the exception of particles expelled from the thermonuclear reactions within the roiling stars themselves (e.g., **the solar wind)**, the particles in space only rarely are moving in the same general direction. There is such a low degree of attraction between these particles that they do not cling to each other or move in a general direction of flow. There is no movement of masses or clumps of the tiny particles of CBR or n2 neutitos. They do not undulate, and there is no evidence of any kind of waves among them, as a group, fluid, field, or clump. Each particle moves independently in a straight line unless it encounters some mass, and the ultra-tiny neutrinos normally pass right through the earth and everything else, for they have only a miniscule amount of translational energy, an almost zero volume, and normally react with NOTHING. They simply exist with very little linear momentum, just sitting in space.

BUT ALL OF THESE n2 PARTICLES ARE ETERNALLY SPINNING!
AND WILL NEVER
RUN DOWN.

In summary, when the proto-photon receives outside energy (hf_φ), each york and zork pair is oriented to orbit its partner once during a single photon cycle and both photons instantly take off at the speed of light, following twin helical paths. The triggering (hf_φ) energy of each photon pair is seen as being carried by its york and zork. If that photon is absorbed and gives off ALL its Triggering energy (hf), the york and zork remain as a totally depleted n2. If the photon's energy is only partially depleted, the york and zork continue as a depleted, lower energy photon and become a part of the CMR as illustrated in the next section.

Coherent Light

An investigation into a laser may provide a way that the two identical (i.e., same wavelength (λ_φ)) TOPS photons may link up going in the same direction and yet, conserve momentum by the processes of **reflection** and **connection**. It is proposed that, in a laser, a source of high-intensity/energy light is shined on, and absorbed by, a crystal whose molecular structure boosts many specifically targeted electrons in the crystal to a particular, higher energy state at the same time. To start the lasing process, one of those excited atoms emits two photons which are emitted going in opposite directions. At one end of the crystal is a totally **reflective** surface that bounces the photon back in the opposite direction where it passes other excited atoms, triggering them to also emit secondary photons, all of which have the same wavelength (which is characteristic of the kinds of atoms in the crystal). These reflected, secondary-photons, are envisioned to slip into a lock-step **connection** with the triggering action of the close passage of the original reflected photon, and each new photon attaches itself to the growing pulse of photons, with each new photon connecting and trailing the passing pulse by $\frac{1}{4}\lambda_{\varphi}$ wavelength.

Thus, such a laser would produce 'coherent radiation,' i.e., all of the photons would have the same wavelength and would be 'bundled' together in pulses of entwined photons that move as one. As said earlier, one end of the laser crystal is totally reflective and all photons which hit it are reflected back through the crystal. On the other end of the crystal, is a partially reflective surface which bounces many laser pulses back through the crystal again. There would be many back-and-forth reflections, and with each reflected pass, the pulse would pick up more secondary photons until finally a single, expanded pulse of many, lock-stepped photons would exit the partially reflective end of the crystal as a coherent laser beam in which ALL photons would have the same energy and wavelength. The remainder of this discussion assumes that this is the fundamental situation.

Figures 4-3 and 4-4 are patterns to make a 3-D model of a photon with one helical path for the york and one for the zork. Roll them up as directed and they will become cylinders including two helixes. Both depict a single cycle of the photon as the york (y) moves from Ay to By and zork (z) moves from Az to Bz.

Figures 4-5 and 4-6 are patterns to make similar 3-D models of a 2-photon laser pulse, the smallest coherent laser beam possible. The first photon is labeled A and it has two parts, **Ay** and **Az** where the y and z represent the york and zork of photon A, of which any photon is made. **By** and **Bz** are the york and zork of the second photon, B, which follows photon A by $\frac{1}{4}\ \lambda_{\varphi}$.

You may find it helpful to envision the coherent photon cylinder by copying both patterns and using clear tape to hold them together. Enlarge each picture so it pretty well covers the length of an 8½" x 11" sheet of paper.

Carefully cut out the rhombus AyByByAy at Figure 4-3 and use tape to affix the upper line Ay-By to the lower Ay-By. The result will be a cylinder which has a diameter ($2r_{\varphi}$) of about 1½" and a length (λ_{φ}) of about 4½". These measurements are about the same as the wavelength (12 cm) of the microwave photon shown earlier in this chapter (and in Table 4-1). The lines shown as **helix y** and **helix z** wrap around the cylinder and represent the helical paths of both the york (blue) and zork (red) in the microwave photon. The ovals represent the position of the york or zork at intervals of $\frac{1}{4}\lambda_\varphi$ wavelengths.

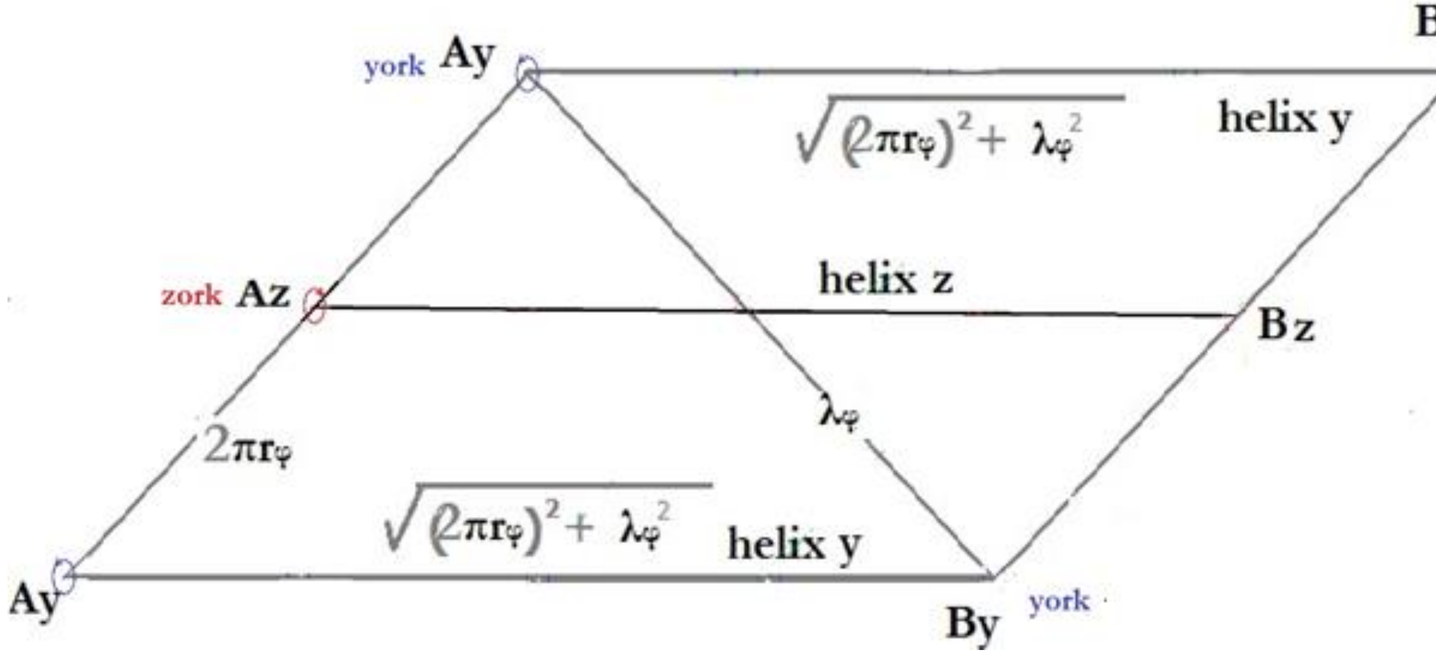

Figure 4-3 Pattern for Microwave Photon (Rhombus)

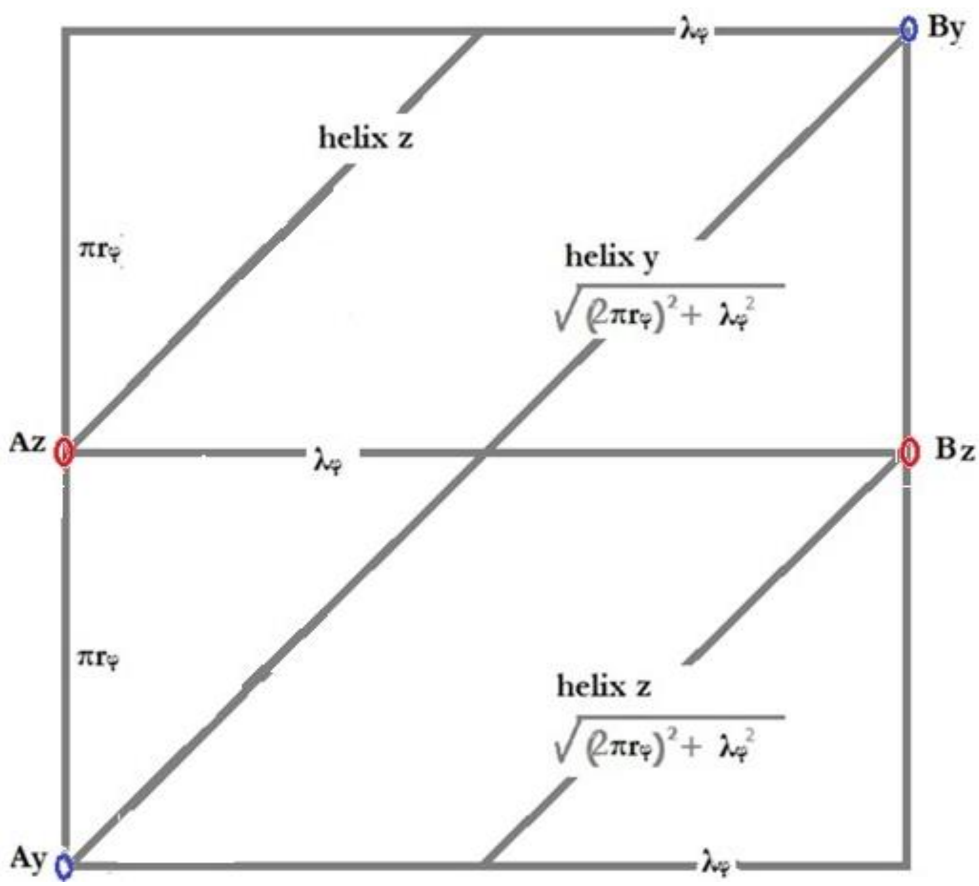

Figure 4-4 Pattern for Microwave Photon (Square)

Both Figures 4-3 and 4-4 are flattened cylinders (here shown as plane figures) of a two-photon laser pulse. In fact, they both produce the same sized cylindrical 3-D shape.

Geometrically, the two diagrams represent two different views of the same cylinder. As for the york and zork, their path of concern is just the **particular helix on which they travel.** The diamond shaped pattern emphasizes the helical paths of the york and zork, while the square pattern emphasizes the wavelength, λ_φ. We are going to do an Einstein-like thought experiment on how each of three participants (the york, the zork and Einstein) view the velocity-of-light situation with either the model from Figure 4-3 or 4-4.

Relativity

AN EINSTEIN-LIKE THOUGHT EXPERIMENT

Albert Einstein introduced drastic new concepts with his Special Theory of Relativity. Among them was the famous formula $E=mc^2$ which we use many times in this book. Another was Einstein's concept that the speed of light was a constant regardless of the situation of the observer, and in many cases multiple observers would see things quite differently. He explained this by thought experiments in which he imagined different observers 'riding' on miniature rocket ships along-side a moving system.

Using the cylinder model of the photon in either Figure 4-3 or 4-4, we are going to use an Einstein 'rocket' to observe what is happening in different situations from different perspectives. Keep in mind that in a photon, the york ALWAYS follows the path of helix y and the zork ALWAYS follows the path of helix z. Einstein is ALWAYS RIDING ON THE AXIS of the cylinder. For observational purposes, Einstein has set distance markers along the axis of the cylinder so the york, the zork and Einstein can all see the same markers when they move a specific fraction of the wavelength (λ_φ). Thus, the wavelength markings on the axis are common points of reference for all three observers: the york and the zork, and Einstein.

Ay represents the location of the york at the beginning of the movement and **By** represents the position of the york after it has traveled one wavelength (λ_φ), the straight-line distance covered by the photon in one wavelength) at the speed of light, but the york's concern is the path HE is taking, i.e., the york helix.

Similarly, **Az** represents the location of the zork at the start, and **Bz** represents the zork's location at the end of that same wavelength, so the zork's concern is HIS helical path.

Einstein is a neutral Referee and is riding a photon rocket along the axis of the cylinder, always having the york on one side of him and the zork on the other, always maintaining the same distances between them. Along the cylinder axis are distance markers of ¼ λ_φ,½ λ_φ, ¾ λ_φ, 1 λ_φ; and all three observers have telemetry that keeps track of all of these details as they speed along at the speed of light (so later, they can go back and replay what happened).

In our thought experiment, Einstein is riding his rocket down the central axis of the cylinder, half-way between the york and the zork, so Einstein is not 'on' the cylinder at all—he is at the middle of it, ALWAYS at a distance of r_φ from both the york and the zork. The york can see Einstein on his seemingly parallel path with the zork on the other side. Similarly, the zork sees the york on the other side of Einstein, but BOTH the york and zork sees his own path (the helix) as being a long, straight line which is running parallel with the cylinder axis. Both can see Einstein's distance markings along the cylinder axis so they can record their velocities as compared to the speed of light.

All three start at the same time and perceive that they have been traveling a straight-line distance of one wavelength and all note that they arrive at the end of that wavelength at the same moment. When each calculates his velocity (distance (λ_φ,) divided by time), he finds it's the same for all--the speed of light—always moving in the same direction and none of them have got ahead or behind any of the others. But you, the reader can see all of this from YOUR perspective: both the york and zork are obviously each taking a longer, curved path (the helix) which means they are traveling (from YOUR perspective) at (**2)$^{.5}$ times the speed of light**.

Einstein's point was that all observers will measure the speed of light to be a constant, c = $3x10^8$ m/sec from THEIR individual perspectives. As we now see, those perspectives are not always the same, but they all correctly measure the speed of light as a constant = c from THEIR perspectives.

Coherent light #2

Figure 4-5 depicts a 2-photon laser pulse with the movement of the yorks and zorks spaced at a ¼ wavelength interval. Figure 4-6 depicts the same microwave 2-photon laser pulse as Figure 4-5.

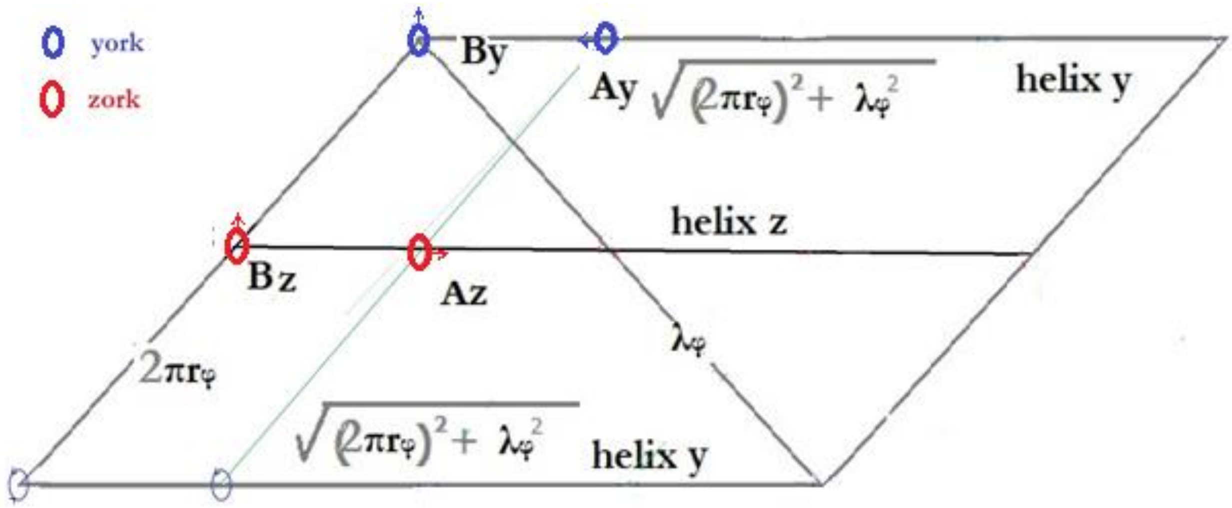

Figure 4-5 Pattern for 2 Microwave Pulse (Rhombus)

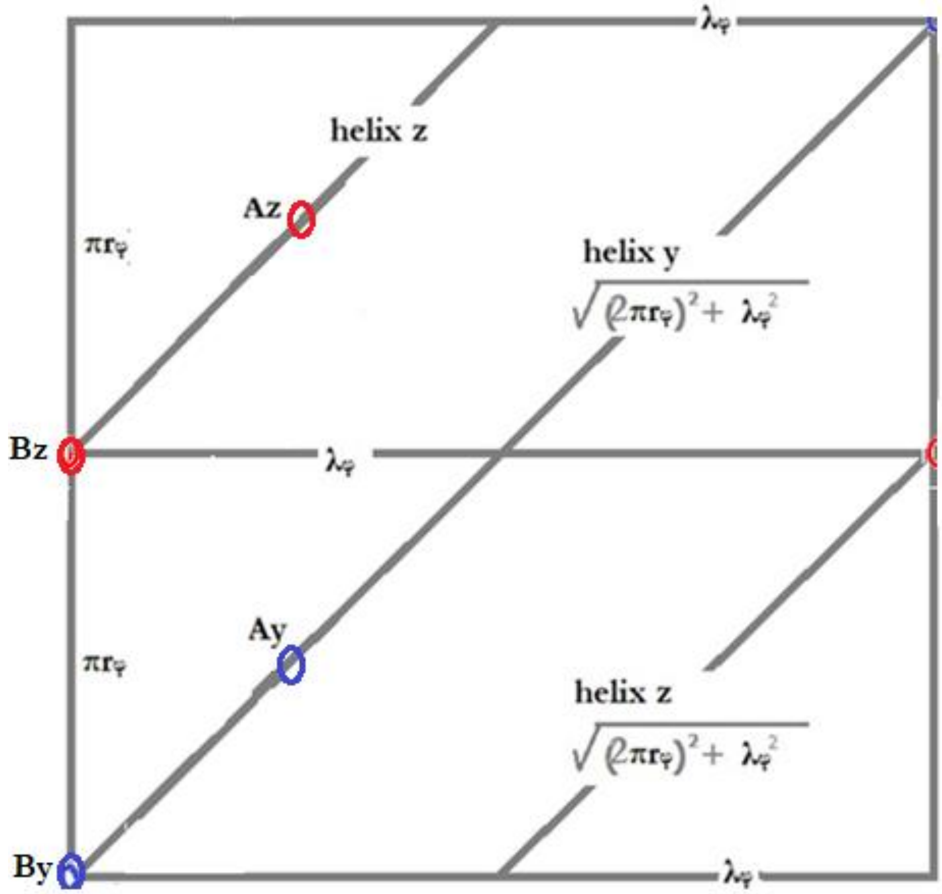

Figure 4-6 Pattern for 2 Microwave Pulse (Square)

In Figure 4-6, the **By** in the lower left is the same particle (a york) as the corner at the upper left. Similarly, the helix z at the top line is the same path as the Helix z track that is shown at the bottom. When one brings the top and bottom edges together a cylinder is formed with two twisting helical lines. In Figure 4-5, the emphasis is on the straight-appearing helical paths taken by the york and zork as they move through one wavelength λ_φ. In Figure 4-6, the emphasis is on the wavelength λ_φ.

Now, back to coherent radiation. Let us now consider what is happening to the yorks and zorks that make up the pulse of laser light. The smallest possible combination of coherent radiation consists of just two photons, one just a ¼ th of a wavelength ahead of the other and traveling exactly ¼ wavelength apart along their helical paths I find it instructive to consider what Einstein sees if he stays at the starting point and watches the moving arrangement of the four Sparqs in a 2-photon pulse of coherent radiation as it passes through the cylinder for ¼ wavelength.

In that ¼ wavelength, both the york and the zork of each photon has made ¼ of a rotation (but in opposite directions and are in relational positions as shown in the next figure which depicts the 2 photon 'coherent light' pulse as it moves away from Einstein, i.e., down the cylinder.

Einstein sees that **Ay** and **Az** have reached the $\frac{1}{4}\lambda_{\varphi}$ wavelength when **By** and **Bz** are just connecting to the end of the laser pulse at $\lambda_{\varphi}= 0$. When **Ay** and **Az** have reached the $2\lambda_{\varphi}/4$ position, **By** and **Bz** are at the $\lambda_{\varphi}/4$ position, still a quarter of a wavelength behind **Ay** and **Az**.

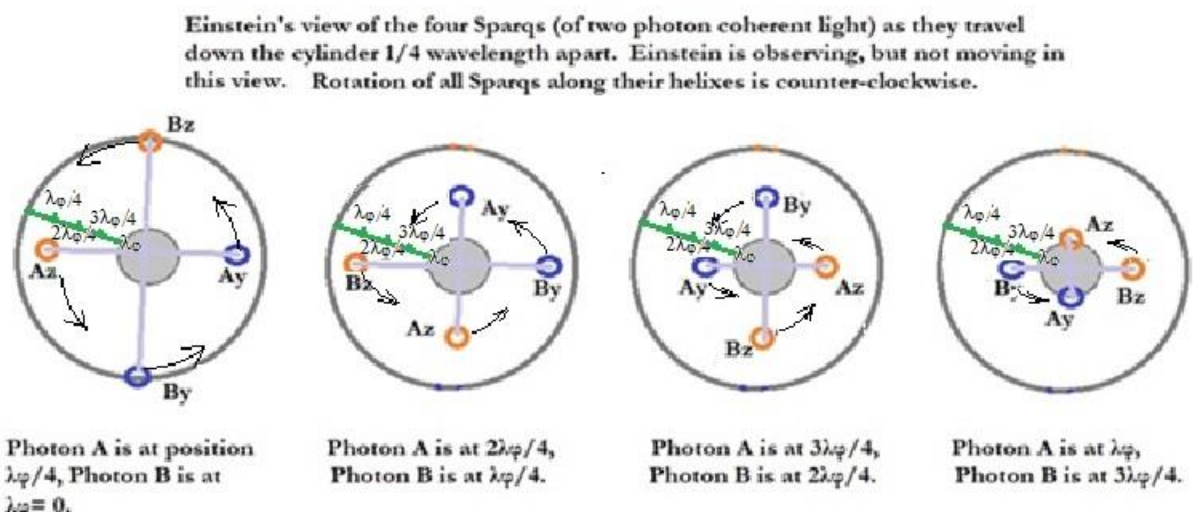

Figure 4-7 Einstein's View of 2 Photon Laser Pulse

Now, we will consider these two photons as if they were a single particle (still following the paired helical paths as in a photon). Compare the 2-photon laser pulse with the electron neutrino (2,2) which has the same Sparq content.[35]

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[35] Electron neutrinos and photons have the same Sparq content, but the yorks and zorks are oriented in different directions. In a photon, the Sparqs are spinning in opposite directions whereas in the neutrino structure, both particles are spinning in the same direction. Thus, the electron neutrino may be represented by (2,2) while $(2,2)_{\varphi}$ represents the 2-photon laser pulse.

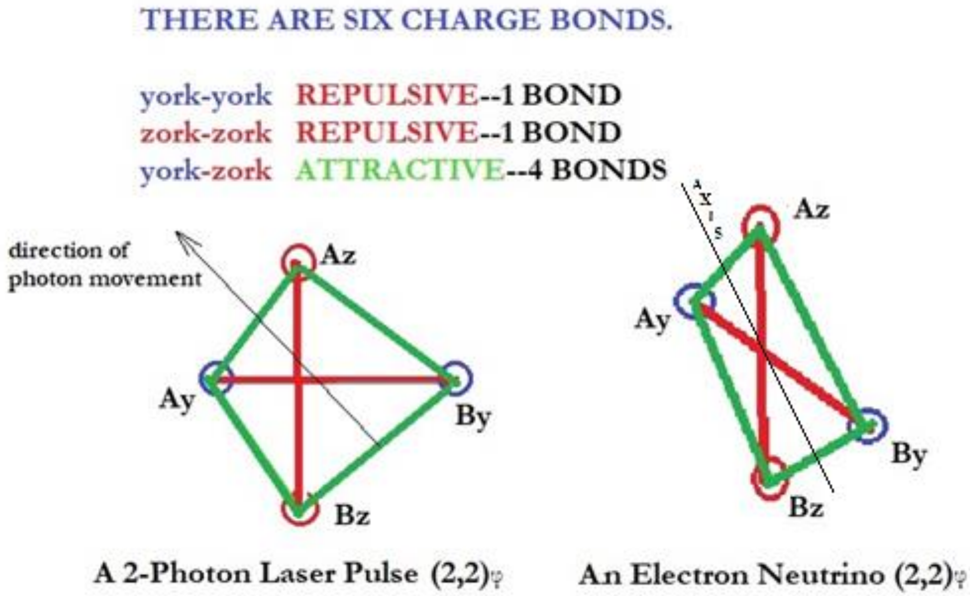

Figure 4-8 Electric Bonds in 2 Photon Laser Pulse and (2,2) Neutrino

In Figure 4-8, BOTH (2,2) particles are spinning. The 2-photon laser pulse will go at the speed light, in an either clockwise or counter-clockwise direction, in a double helical path, the second photon following the first by $\frac{1}{4}\lambda_{\varphi}$.[36] Theoretically, as a neutrino, the (2,2) neutrino has three degrees of freedom, i.e., it may spin around any axis that connects the midpoints of the two, repulsive bonds; OR to the midpoints of EITHER of the oppositely oriented attractive bonds. As a $(2,2)_{\varphi}$ proto-photon (electron neutrino), the particle will be spinning with only one degree of freedom, i.e., around the axis with the least distance between the particles (to conserve angular momentum and be able to become two photons).

Note that the two yorks and two zorks of a 2-photon laser pulse $(2,2)_{\varphi}$, form the vertices of a regular tetrahedron and are of the same apparent Sparq composition (2,2) as the electron neutrino. Similarly, a single photon $(1,1)_{\varphi}$ has the same Sparq composition as a neutito (1,1). Even though it is obvious that a photon is NOT a neutrino, it is not so obvious as to why when both have the same overall york-zork structure of (1,1).

---

[36] Because there always two photons produced, one will spin clockwise and the other, counterclockwise. At present, there is no way to tell which is which, but they will always move in opposite directions.

To determine that reason, we must analyze the york-zork charge (Coulomb) **direction** as opposed to the same particles' magnetic moments **direction**. Coulomb attraction or repulsion is relatively simple. It is always directed along the line connecting the two charged particles, regardless of the orientations of those charges in space. Magnetic moment, however, is always directed perpendicular to the plane of rotation of the magnetizing charge. Thus, if the particles are not spinning parallel to each other or around the same external axis, one must find the appropriate relative particle orientations (angle) among the spinning components as a part of the vector analysis for magnetic attraction.

We can rely on two basic principles, however: In our matter world, Coulomb charge attraction is ALWAYS associated with magnetic repulsion; and Coulomb charge repulsion is ALWAYS associated with magnetic attraction!

This follows from two rules-of-thumb: 1) that spin direction is determined by the 'right-hand-rule' regardless of the sign of the charge. When the charge rotation is clockwise, the right hand is held with the fingers pointing in the direction of charge rotation (clockwise) the spin is 'down' pointing in the direction of the thumb. Thus, a spin in the counter-clockwise direction results in an 'up' spin; 2) magnetic moment uses the 'right-hand-rule' for the positive charge and the 'left-hand-rule' for the negative charge, with the thumb pointing in the North magnetic direction for both cases.

When magnetic moment directions are in opposition (either N-N or S-S) we have magnetic repulsion. When magnetic moment directions are in the same direction (N-S, or S-N) the forces are attractive. Accordingly, if we have Coulomb attraction, we also have magnetic repulsion in an equal amount, so **there is always a point of stasis which binds every pair of spinning charged particles together at a fixed distance, just as we saw with the neutito in Chapter 3. In larger particles, the spin velocity is reduced depending on the total energy content, but the particle's spin is always either ħ** or **ħ/2**, with **ħ** being the value for those particles which are spinning around a central point (or axis) that is OUTSIDE of their own centers of mass, and **½ħ** for those which are spinning around their own centers of mass.

In a 2-photon laser pulse, all bonds (both attractive and repulsive) are of the same length and the entire pulse is balanced, but in the electron neutrino the **repulsive bonds will be longer than the attractive bonds.** One needs to be able to do detailed, vector analysis to determine the balance points of **Coulomb vs magnetic** forces and I do not have that skill. Therefore, I must pass that task on to those more skilled in vector analysis.

Now, I wish to summarize what I think we know about the TOPS photon. The mass of the photon is the sum of half of the proto-photon mass (i.e., ½ m_{n4}) plus the triggering energy ($\Delta E = hf_{\varphi}$) divided by c^2.

The photon, itself, is the proto-photon (2,2)φ material energized into either one or two particles (photons), in each of which, both the york and zork follow an entwined pair of helical paths with $\mathbf{r}_{\varphi}$ being the radius of the helixes; with $\boldsymbol{\lambda}_{\varphi}$ being straight-line distance covered during one cycle; and c being the speed of light. There are no restrictions on the frequency ($\mathbf{f}_{\varphi}$), so the triggering energy (ΔE) is infinitely variable. When the photon is stopped or absorbed, it gives up the energy (ΔE) and the photon returns to its lowest energy form and becomes a part of the Cosmic Background Radiation (CBR) which pretty much uniformly surrounds us from all parts of the universe.

$m_{\varphi} = (\frac{1}{2} m_{n4}c^2 + \hbar 2\pi f_{\varphi})/c^2 = m_{n2} + hf_{\varphi}/c^2$ [37]
$r_{\varphi} = c/2\pi f_{\varphi}$
$u_{\varphi} \approx c = \lambda_{\varphi} f_{\varphi}$ (CONSTANT velocity)
f_{φ} = INFINITELY VARIABLE
$E_{\varphi TOT} = \frac{1}{2} m_{n4} c^2 + \hbar 2\pi f_{\varphi}$
$\Delta E = \hbar 2\pi f_{\varphi} = hf_{\varphi}$ (This is the triggering energy of the photon.)

[I am not going to do the math calculating the corresponding Planck Coefficients and vector analysis at this point, because I think I have pointed the way to do that and do not want to spend more time doing what others can do more efficiently. I have other parts of this book to write before I pass on! Bbb May 6, 2021.

[37] For visible light and most other photons, $\hbar 2\pi f_{\varphi}$ is MUCH smaller than m_{n2}, so the effect of $\hbar 2\pi f_{\varphi}$ **is negligible. Not until the energy reaches around ultraviolet radiation to 100KV x-rays do we begin to see $\hbar 2\pi f_{\varphi}$ take over the bulk of the mass of a photon.** $\lambda_{\varphi} = 2\pi r_{\varphi}$ and thus, $c = \lambda_{\varphi} f_{\varphi} = 2\pi r_{\varphi} f_{\varphi} = u_{\varphi}$.

The 'Flip Side' of the CBR

This is being written on the morning of July 17, 2021.

When I finished working on this chapter last night, I thought I had just finished this chapter and was ready to post it to my book. The part I had just 'finished' was earlier in the text where I referred to the CBR as being near the bottom of the energy 'graveyard' or the 'ash' of all matter of the universe. Earlier, I had stated that photons had to be made two at a time and I had gone to bed about 1:00 am this morning.

My mind was in a disturbed state, I was thinking about the n2 as being the endpoint of existence of the matter all around us, and I had a very depressing dream.

I was alone in a large, industrial area of a strange city. I had been in the company of friends with whom I had gone to a large conference of some type, but I had wandered off by myself for some time before I realized I was alone. I had no idea where I was, where I had been, where I had gone, or where my friends were. I had no money, no phone, no way to contact home. I was lost. I felt so alone.

I suddenly awoke and my alarm clock showed it was just after 6:00 am and I felt a great relief—IT WAS JUST A DREAM!

But along with that relief, I had a sudden awareness that, what I had written the night before should NOT be disturbing to me because, I now knew some little detail that I had not known before I had gone to bed--There was a 'flip side' of the CBR that I had not recognized the night before!

Point a radio telescope out into the depth of the Universe—Anywhere, in Any direction, at Any time and listen. Science can amplify those tiny little photon blips into audible sounds, and if you listen carefully, you hear a continual hisssssssssssssss. That is the evidence of the CBR. It is not really a continuous hiss in the sense that it is a tone like the key striking a taut string on a piano, a tone that lingers and slowly dies away. The CBR hiss is more like the continuous sizzle of a hot frying pan—distinct little blips of sound that have no tone—the CBR sounds like just a vast collection of random, separate, tiny sound bites.

So, what IS the 'flip side' of the CBR that occurred to me?

I wakened, suddenly aware that every photon in the CBR was a candidate for becoming the elusive proto-photon of an INDIVIDUAL photon that I was seeking! Every photon may gain or lose energy when it encounters another object. CBR photons were almost depleted of energy, but they were also READY to accept any triggering shift of energy that would make them into a higher energy photon, be it a particle of light, a radar beam, an ultraviolet ray, an X-ray or WHATEVER kind of electromagnetic radiation that some triggering energy would generate!

Our Universe is CHOCK FULL of proto-photons, just waiting for an energy exchange to convert them to higher energy photons! It does not matter where the triggering energy and a CBR photon came FROM—they are THERE and their energies will be expressed as photons, traveling at the unimaginable velocity of the speed of light, some $3x10^8$ meters per second!—until they hit something else to give up or take on energy.

HOW AMAZING!

WHAT A MARVELOUS MANIFESTATION OF THE POWER OF THE CREATOR IN REVEALING THIS TO ME!

"Let there be light. And there WAS light!"

Genesis 1:2

I am not going to modify what I wrote last night, even though I realize now, that I was partly in error. It is not necessary to have a proto-photon—the ultra-weak CBR photons are already there to pick up triggering energy and become higher energy photons! I leave it to the reader to understand that when I wrote that text, I just had not been enlightened as to that detail, yet. I will retain the text stating my inferior understanding as I wrote it, because the logic is still there, and it may prove valuable to SOME reader in the future. My experience was a wonderful example of how new understanding unfolds from the old and is just one more testimony as to the infinite number of ways that the Lord can reveal himself to any man or woman who will try to attune him/herself to the Creative Spirit that made it ALL. It is also a humbling experience to admit when one is wrong. I need to strive for humility and recognize my own flaws. I hope others can find more flaws in my reasoning and assist in improving and expanding on what I have learned.

Blair Bryant

QUO VADIS?

Would YOU be able to do the vector analysis and determine the relative distances between pairs of particles in the photon and electron neutrino (2,2)?

Can you identify a target star that will appear very close to the sun during the total eclipse of 2024? A key feature of that star would be that it emitted characteristic X-rays, gamma rays, or high energy ultraviolet radiation as well as visible light. See Chapter 13 for a short description of the suggested experiment. Do we NEED to wait for an eclipse, or could any of our space telescopes or satellites be capable of catching such X-ray and/or visible-light-emitting stars for comparison of deviations of photon paths due to their different masses? Or, is there any difference in paths at all due to different masses/energies?

Chapter 5 - The Role of Alpha (α)

In the first chapter, I started by listing some of the 'weird' things that puzzle physicists. One of the most profoundly pondered puzzles is the meaning of Sommerfeld's Fine Structure Constant, α and its inverse, ~137. These two numbers have puzzled physicists for about 100 years. I have copied two short items from Wikipedia, to give some idea of the depth of many physicists' frantic searching for the meaning of α. **"Just what IS α?"**

https://en.wikipedia.org/wiki/137_(number)#In_physics

> **"Physicist Leon M. Lederman numbered his home near FermiLab 137 based on the significance of the number to those in his profession. Lederman expounded on the significance of the number in his book *The God Particle: If the Universe Is the Answer, What Is the Question?*, noting that not only was it the inverse of the fine-structure constant, but was also related to the probability that an electron will emit or absorb a photon—i.e., Feynman's conjecture. He added that it also "contains the crux of electromagnetism (the electron), relativity (the velocity of light), and quantum theory (Planck's constant). It would be less unsettling if the relationship between all these important concepts turned out to be one or three or maybe a multiple of pi. But 137?" The number 137, according to Lederman, "shows up naked all over the place", meaning that scientists on any planet in the universe using whatever units they have for charge or speed, and whatever their version of Planck's constant may be, will all come up with 137, because it is a pure number. Lederman recalled that Richard Feynman had even suggested that all physicists put a sign in their offices with the number 137 to remind them of just how much they do not know."**
>
> **"Wolfgang Pauli, a pioneer of quantum physics, died in a hospital room numbered 137, a coincidence that disturbed him."**

Richard Feynman's work was seminal--it finally provided a theoretical framework for the study of particle physics, enabling physicists to predict particle interactions. Feynman's model tied together what was once a meaningless hodge-podge of experimental observations of many dozens of disorganized, weird particles, which made absolutely no sense, and Feynman, among others, gave us our current, foundation in the Standard Model. Feynman had a brilliant mind and was a whiz at mathematics. But my much more limited mind has no ability to grasp things the way Feynman did. All I can say is that, while TOPS does not view particle interactions in any way like Feynman's diagrams, Feynman prepared the way with a usable working model for a particle physicists' everyday work.

Feynman's speculation that α might be the probability of an electron emitting or absorbing a photon is wrong from a TOPS perspective, and I need to tell you why

I think that. In TOPS, electrons do not emit photons—it is ENERGY shifts of electrons from one orbit of an atom to a lower orbit that produces photons. TOPS photon emission was covered at length in Chapters 2 and 4 and there is nothing related to a probability of photon emission. The energy shifts in all atoms are rigidly determined. IF an electron from any particular atom shifts from orbit n to orbit n-1, a VERY SPECIFIC photon WILL be emitted. There is no probability involved, except for P=1. It certainly is not P=.00729 = α.

Now α is a pure number—that means it has no dimensions. It is not a measure of anything like mass, radius, velocity, force, energy, eggs, apples, or kumquats. It is just a pure number whose inverse is right at 137.036, so close to 137 that some people have worked hard-–and for a long time--to try to prove it should be **exactly** 137. No one has ever succeeded in that proof and alpha remains an enigma to most physicists.

The measured value of α (at about 0.007297) was named, 'The Fine Structure Constant' by Arnold Sommerfeld when he published his paper in 1916. Sommerfeld's work was based on spectral analysis of the hydrogen atom emissions that was done by Michelson and Morley in 1887. The earliest interpretation was that α is 'the ratio between the velocity of the electron in the first circular orbit of the relativistic Bohr atom to the speed of light in the vacuum.' https://en.wikipedia.org/wiki/Fine-structure_constant

I agree with that original assessment. Lots of very smart people including Feynman, have tried to make α mean even more than that. Because these very smart people are so recognizably smart, their suggestions and conjectures have often been blindly accepted by the scientific community who make no claim to really understand α. Another example of α given in the previously cited Wikipedia web site is the 'Anthropic Principle' which makes absolutely no sense to me. I give this only as an example of the great, speculative lengths that some people have made regarding α.

> **'The anthropic principle is a controversial argument of why the fine-structure constant has the value it does: stable matter, and therefore life and intelligent beings, could not exist if its value were much different. For instance, were α to change by 4%, stellar fusion would not produce carbon, so that carbon-based life would be impossible. If α were greater than 0.1, stellar fusion would be impossible, and no place in the universe would be warm enough for life as we know it.'**

While that may sound very learned, it provides nothing in understanding what α really is. At the end of Chapter 3, I said we would discuss α in this chapter. This is the beginning of that discussion.

I have no way of disproving any of the proposed meanings that have been ascribed to Sommerfeld's Fine Structure Constant. I am not smart enough to do that. I would, however, suggest that other, much smarter people look a lot deeper and not take the currently accepted explanations as being valid without good reason. I maintain **that α is nothing more than what it was originally thought to be—the ratio of the rotational velocity of the electron in the first Bohr orbit to the speed of light. It certainly IS that!** Please read on to follow my rationale.

What IS α?

The above-quoted Wikipedia article also gives some equivalent formulas for calculating the value of α. The following is copied from that web site.

Some equivalent definitions of α in terms of other fundamental physical constants are:

$$\alpha = \frac{1}{4\pi\varepsilon_0}\frac{e^2}{\hbar c} = \frac{\mu_0}{4\pi}\frac{e^2 c}{\hbar} = \frac{k_e e^2}{\hbar c} = \frac{e^2}{2\varepsilon_0 ch} = \frac{c\mu_0}{2R_K} = \frac{e^2 Z_0}{2h} = \frac{e^2 Z_0}{4\pi\hbar}$$

where:

- e is the elementary charge (:= 1.602 176 634 × 10^{-19} C);
- π is the mathematical constant pi;
- h is the Planck constant (:= 6.626 070 15 × 10^{-34} J⋅s);
- $\hbar = \frac{h}{2\pi}$ is the reduced Planck constant (:= $\frac{6.626\,070\,15 \times 10^{-34}\ \text{J}\cdot\text{s}}{2\pi}$);
- c is the speed of light in vacuum (= 299 792 458 m/s);
- ε_0 is the electric constant or permittivity in vacuum (or free space);
- μ_0 is the magnetic constant or permeability in vacuum (or free space)
- k_e is the Coulomb constant;
- R_K is the von Klitzing constant;
- Z_0 is the vacuum impedance or impedance in free space.

I suggest that these 'values of α' are equivalent statements and all are based on experimental evidence relating to the first orbit of the hydrogen atom. I, however, am not familiar with the R_K and Z_0 constants, so I could be

wrong on those two constants. I also suggest that those statements could all be rewritten using Thud (Ђ –See Chapter 3) as a physical constant.

Please allow me to give my calculations relating to α. You will find my basic formulas in the above list.

Keep in mind that Coulomb's Constant,

$k = 1/4\pi\varepsilon_o = c^2 \times 10^{-7} = c^2$ Ђ kg-m/Coul^2 (See Chapter 3 for Ђ='Thud')

$\boldsymbol{\alpha = k\, e^2/(\hbar c) = c^2 \times 10^{-7}\, e^2/(\hbar c) = c \times 10^{-7}\, e^2/\hbar = 7.2973 \times 10^{-3} \approx 1/137}$

$\boldsymbol{\alpha = k\, e^2/(\hbar c)}$ But using the first expression, we get:

$\boldsymbol{\alpha(\hbar c) = k\, e^2}$ and by dividing both sides by the square of a distance, r_{o1}^2 we get:

$\boldsymbol{\alpha(\hbar c)/r_{o1}^2 = k\, e^2/r_{o1}^2}$ which we readily see is the force formula of Coulomb's Law! Thus, we can apply that equation to the force acting on an electron orbiting a hydrogen atom nucleus at distance r_{o1}.

$\boldsymbol{F_Q = \alpha(\hbar c)/r_{o1}^2 = k\, e^2/r_{o1}^2}$ But that force is exactly equal to the centrifugal force ($F_C = m_e\, u_{o1}^2/r_{o1}$) holding the electron in orbit, and, we now have:

$\boldsymbol{F_Q = \alpha(\hbar c)/r_{o1}^2 = k\, e^2/r_{o1}^2 = F_C = m_e\, u_{o1}^2/r_{o1}}$

I am now going to eliminate some unessential elements of those equalities.

$\boldsymbol{\alpha(\hbar c)/r_{o1}^2 = k\, e^2/r_{o1}^2 = m_e\, u_{o1}^2/r_{o1}}$ to obtain a simplified equality, or,

$\boldsymbol{\alpha(\hbar c)/r_{o1}^2 = m_e\, u_{o1}^2/r_{o1}}$ Rearranging the terms in the second expression gives the equivalent expression,

$\boldsymbol{\alpha(\hbar c)/r_{o1}^2 = (m_e\, u_{o1}\, r_{o1})\, u_{o1}/r_{o1}^2}$ We can now do some cancelling (we did this in chapter 2, where we saw that $\boldsymbol{\hbar = m_e\, u_{o1}\, r_{o1} = 1.05\text{x}10^{-34}}$ **j-sec**).

Plugging the values of the n=1 orbit of the hydrogen atom from Chapter 2 into the above equation, we find $u_{o1} = 2.19\text{x}10^6$ m/sec.

$\boldsymbol{\alpha(\cancel{\hbar}c)/\cancel{r_{o1}^2} = (\cancel{\hbar})\, u_{o1}/\cancel{r_{o1}^2}}$ Leaving us with the interesting relationships for the hydrogen atom in the n=1 orbit:

$$\alpha_{o1}\, c = u_{o1} = 2.19\text{x}10^6 \text{ m/sec} \quad \textbf{and} \quad \alpha_{o1} = u_{o1}/c \approx 1/137$$

THERE is the elusive 137! Now, as far as I can see, that is about all there is to alpha (α_{o1}). It is quite simply, the measure of the ratio of the velocity of the electron in the FIRST orbit (n=1) of the Bohr atom of hydrogen to the speed of light. The only place in spectroscopy that you can find evidence of that particular ratio is in the first orbit of hydrogen where n=1. This limits spectroscopy using the Fine Structure Constant (α_{o1}) to the Lyman Series where EVERY shift starts at some outermore orbit and ends at the FIRST orbit. There are other spectral shifts in the hydrogen spectrum, but only the Lyman series ends in the first orbit. The lowest energy photon emitted in the Balmer Series, for example, is a red band which results from an electron shift from n=3 to n=2. The next Balmer Series photon is blue and results from the shift, n=4 to n=2. All spectral lines from the Balmer Series result from shifts into the n=2 orbit where the value of $\boldsymbol{\alpha_{o2} = u_{o2}/c = .00577 \approx 1/173}$. **The value of alpha for n=3 is,** $\boldsymbol{\alpha_{o3} = u_{o3}/c = .00544 \approx 1/184}$. (See Chapter 2 for details.)

Thus, if Sommerfeld had used the VISIBLE spectrum (the Balmer Series) instead of the ultraviolet spectrum (the Lyman Series) that he got from Michelson and Morley's measurements, he would have got the value of alpha as being:

$\alpha_{o2} = u_{o2}/c = .00577 \approx 1/173$ and everyone would suddenly have 'gone ape' about trying to find out what the number **173** REALLY MEANT!

Every Spinning Particle has a Unique α

In TOPS, the result is that EVERY PARTICLE HAS ITS OWN VALUE OF ALPHA and there is nothing mystical or universal that I can find about 137!

At the start of this chapter, we copied multiple equivalents of α from Wikipedia. I believe that ALL those equations were derived from the spectrum of hydrogen but ONLY from those orbital shifts ending in orbit n=1, and all are equivalent expressions. In my opinion, there are NO independently different meanings for alpha. It is not a universal constant as is h-bar, and, in MY opinion, it applies only to the n=1 orbit of the hydrogen atom! I certainly am willing to reconsider that opinion if someone can demonstrate that any of those equations are truly independent of the n=1 orbit of the hydrogen atom.

It appears to me those past efforts to ascribe further meanings to this dimensionless ('pure') number, 137 were speculative and futile, and have led us down many wrong paths. Let us simply accept it for what it is: **α is the ratio of the rotational velocity (u_{o1}) of the electron to the speed of light when the electron is in orbit n=1 of the hydrogen atom.**

For the orbital electron in the second orbit of the Hydrogen atom where r_{o2} = 6.69×10^{-11} m (note that r_{o2} is LARGER than $r_{o1} = 5.29 \times 10^{-11}$ m). The velocity u_{o2} is SMALLER than that of u_{o1} in the second orbit; SO, we get a SMALLER value of alpha! We know the values of the constants h, c and k will not change, so it can only be the value of alpha which changes! Thus, from here on, we note that we need to add subscripts to alpha as well as to the other elements of the equations, so we always know **which α** we are really talking about. For example (α_{qo2} indicates that the Coulomb force is due to charge in the second orbit),

$$\mathbf{F_{qo2} = \alpha_{o2}(\hbar c)/r_{o2}^2}$$

This α_{o2} applies to the hydrogen atom orbit n=2. We will not show detailed calculations of ALL higher order orbits, but Table 5-1 shows the appropriate values for the first four orbits which the reader may verify on his/her own.

Orbit n=	Mass	Radius	Frequency	Velocity*	Alpha	h-bar*
	xE-31(kg)	xE-11(m)	xE+15(Hz)	xE+6(m/s)	xE-3	xE-34(j-s)
n	m_e	r_{on}	f_{on}	u_{on}	α_{on}	$\hbar$
1	9.11	5.29	6.58	2.19	7.30	1.06
2	9.11	6.69	4.12	1.73	5.77	1.05
3	9.11	7.09	3.66	1.63	5.44	1.05
4	9.11	7.25	3.50	1.60	5.32	1.06

*** $\hbar = m_e\, u_{on}\, r_{on}$ and $u_{on} = 2\pi\, r_{on}\, f_{on}$**

Table 5-1: Dimensions of the Hydrogen Atom (First Four Orbits Only)

As should be expected, the angular momentum of every electron in every orbit is the ever constant, ħ.

Alpha, α, is directly proportional to velocity, u. There are three factors in Planck's Constant, $\hbar = m\, u\, r$. Velocity u is one of them. **ħ rules all** in the subatomic world. Wherever we find rotational velocity, we will also find **some** α. Thus, **it should not be surprising that α may be used as a Planck's Coefficient Þ** (Chapter 2).

While α is different for each orbit of the hydrogen atom, if we DO know the value of alpha in ANY ONE of the orbits of hydrogen, we can calculate the α for all orbits of hydrogen. Generalizing that statement, if we know the value of α for ANY, particular orbit of any kind of atom, we should be able to calculate it for all orbits of that kind of atom from $\hbar = m\, u\, r$ and the value of Þ = α. (See Chapter 2.)

The value of α = 1 for the following particles: Sparqs (yorks and zorks), and photons. For all other particles, the value of α = u/c.

AND, FOR TOPS, THAT IS ALL THAT ALPHA IS!

(Quoth the Raven, 'Nothing More!') [38]

[38] Apologies to Edgar Allen Poe. Sorry. Just couldn't resist it! BBB

NEVERTHELESS, there is one MORE thing about alpha that I find very instructive. That is the role of alpha in generating the 'gamma boost' due to the Special Relativity of Einstein. But that is a new subject which we will cover in the next chapter. For now, however, let us just accept that alpha is quite variable. Sommerfeld's alpha is just the specific example of the ratio of the orbital velocity of the n=1 electron in the hydrogen atom to the speed of light.

QUO VADIS?

What do YOU think about alpha now?

How does this understanding affect YOUR work?

Chapter 6 - The Relativity Gamma Boost (γ)

We all know that it was Albert Einstein who introduced the famous equation, **$E = mc^2$**, but I had no idea HOW Einstein came up with that brilliant concept. In all my 22 years of work with **ħ** I have taken Einstein's equation for granted and never knew how he got it. Last week, (mid-September, 2020) I **think** I got it. It relates to this chapter on the **γ** boost in mass and energy. By Chapter 12 we will attempt to 'tie it all together.'

We do not usually think of energy on a small scale when we use the Newtonian equation, $E = \frac{1}{2} mv^2$. In macro-physics, we 'know' that if the pilot doubles the velocity of an airplane going from say, 30 miles per hour on the runway to 60 miles per hour (i.e., double the speed) to become airborne, that the plane will have achieved FOUR times the kinetic energy as at 30 mph--because energy varies by the square of the velocity. That is all very good, for everyday use in our macro-world. We can trust that relationship to hold even for the same airliner traveling at 300 miles per hour at a 40,000 feet altitude. There, the kinetic energy of that plane is 100 times as much as it is at 30 mph on the ground. That relationship holds for all practical purposes in our macro-world.

But 300 mph is practically standing still, when compared to the velocities of the tiniest of particles which are spinning at those almost-unimaginable speeds ALL THE TIME. We have seen that the n2 neutito is spinning virtually at the speed of light, some 186,000 miles per SECOND. In the metric system of the SI units we have been using in TOPS, that velocity is called c, and has a magnitude of VERY close to 300000000 (3.00×10^8) m/sec. **Only the photon actually travels AT the speed of light. The n2 neutito spins ALMOST at the velocity c.**

The speed of light is a staggering velocity when we consider it from the standpoint of our daily lives. If I had a super rocket that **could** travel at that speed, it would take me less than a second (about one sixtieth of a second) to go from my home in the Washington, DC area to visit my grandson in San Francisco, CA some 3000 miles away. If I only had a super 'bullet train' that could travel at **only** one tenth the speed of light, I could get there in about a sixth of a second. If had only a super bicycle that could travel at only **one hundredth** of the speed of light, I could go that distance in about one and a half second. From our viewpoint, those fractions of a second are rather insignificant.

Comparatively, however, in the incomprehensible vastness of outer space, the speed of light appears sluggish. It takes about 4½ years for a photon to travel (at the speed of light) from our **closest** star neighbor, Proxima Centauri before it reaches a telescope on earth so we can see it. Proxima Centauri is our closest star neighbor, but our sun and Proxima Centauri (which is relatively near us) are both on **this** edge of the Milky Way galaxy. The **other side** of the galaxy is something like 100,000 light-years away, so the light we see from THERE has been traveling for 100,000 years before it reaches our telescopes. If we were to see a star from that region go nova, we would be seeing a brilliant explosion that really happened 100,000 years ago—that star wouldn't be there now—it would have disappeared 100,000 years ago--even though we are just now seeing its growing brightness in our telescope. And that is only in OUR galaxy. Andromeda, our **nearest** galactic neighbor, is an astonishingly long distance away, some 2.5 MILLION light years away, so it has taken the light from that galaxy 2,500,000 years to reach us! And that is our **closest** galactic neighbor!

But in this book, we are studying the world of the ultra-SMALL and the speed of light, at that level, is astonishingly fast. At the atomic level, the electron spinning about a hydrogen atom's nucleus in its n=1 orbit, is going relatively slowly—only about 2.19×10^6 m/sec. That is less than ONE percent of the speed of light and that means the electron is racing around that single atom at 6.62×10^{15} cycles per second—and that is almost 7 million billion times EVERY SECOND!

In TOPS, we calculate that the smallest of particles, the yorks and zorks, are traveling almost AT the speed of light, so the n2 neutito is spinning ALMOST at that speed (even more than 99.9999% of the speed of light--Chapter 3).

In TOPS, we identify a velocity as **u**, rather than **v or c**, because it is a velocity of rotation (in $2\pi r$ radians per second and that is NOT really the same thing as a straight-line velocity, for which TOPS reserves the label, **v** (m/sec)).

Many of the super-speed subatomic particles are spinning at velocities that cause a **significant boost** in the mass because of its higher frequency of rotation. The degree of that boost is determined by how close **u** is to **c**. At relatively low velocities, the boost will be minor. For example, as we saw above, the velocity of spin of an electron about the orbit n=1 of a hydrogen atom is 'only' about 2190000 (2.19×10^6) m/sec—that is around 1400 miles per second, comparable to going roughly the distance from the Atlantic to the Pacific Ocean—in about TWO SECONDS! But that electron DOES have some boost (about half of one percent) in its energy over what it would be if it were at rest in space. Its velocity is greater in orbit n=1 than when it is in the orbit n=2, but its kinetic energy of spin is much smaller than that of the electron's own inherent spin. I am now going to try to give some sense the great variability of the **γ** boost in energy and mass.

The Gamma Boost in TOPS

In the last chapter, we said that the velocity **u**, was related to the speed of light by the following relationship. $\boldsymbol{\alpha_x = u_x/c}$. The value of α and the value of $\boldsymbol{\gamma}$**,** are related. This relationship is called the Lorentz Transformation and it is a consequence of an object's velocity approaching the speed of light. Traditionally, the Lorentz Transformation is expressed as:

$$\boldsymbol{\gamma = 1/(1-\beta^2)^{1/2}} \qquad \textbf{where Lorentz' } \boldsymbol{\beta = v/c}\textbf{.}$$

In TOPS, we designate the velocity as u rather than v, because it is a rotational velocity rather than linear velocity, so, Lorentz' $\beta = u/c$. As we saw in the last chapter, in TOPS, we call $u/c = \alpha$, so actually, the **TOPS' α is the same thing as the Lorentz β! Thus, Lorentz' γ equation may be written both ways!**

$$\begin{array}{cc} & \textbf{Lorentz} \qquad \textbf{TOPS} \\ \boldsymbol{\gamma =} & \boldsymbol{1/(1-\beta^2)^{1/2} = 1/(1-\alpha^2)^{1/2}} \end{array}$$

Conceptually, I think I understand the basic idea of Lorentz transformations, but I am not a mathematician and cannot follow much of higher mathematics! I do algebra reasonably well, but I make lots of errors. Thus, I must trust (i.e., have faith) that the mathematicians have the formulas well in hand and trust that Lorentz was correct. I interpret this formula for gamma (γ) to apply the way to understand how velocity boosts the inherent mass, so it becomes the 'relativity mass.' Essentially, this formula means that a relativity mass of m_{rel} is produced by multiplying its inherent m_i [39] by γ, so,

$$\boldsymbol{m_{rel} = \gamma\, m_i}, \qquad \text{and } \textbf{Lorentz' } \boldsymbol{\gamma} \textbf{ is } \boldsymbol{\gamma = 1/(1-\alpha^2)^{1/2}}.$$

Note that γ is a function of α, that is, for any value of α, there is only one value for γ. We can also calculate α if we know the value of γ.[40]

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[39] The subscript $_i$ means 'inherent'. Thus, m_i is the inherent mass that a rotating body would have IF it were rotating at its (theoretical) velocity of u_i.

[40] Note that mathematically, there are TWO roots of $\boldsymbol{\alpha}$ for any value of $\boldsymbol{\gamma}$**,** but only the positive root is meaningful in MY understanding.

$\alpha = (1 - 1/\gamma^2)^{1/2} = ((\gamma^2 - 1)/\gamma^2)^{1/2}$

Note also, that when one uses Lorentz' γ with an α that is almost = 1, we are dividing by a number that very closely approaches ZERO. Division by zero is prohibited as being an undefined mathematical operation. If we COULD accelerate an object to the speed of light so $\alpha = 1$, γ would be infinitely large. As it is, as α approaches 1 (where the velocity u ALMOST = c), γ can become very large. Thus, u may approach c VERY closely, but α CANNOT be exactly 1 (except for the photon which does travel AT the speed of light). From this point on, I will often use **the designation $u_{(c)}$ to indicate the value of u~=c, and we will still use the relationships of $u_{(c)}=2\pi r_x f_x$.**

At the present, I use the Lorentz transformation by replacing the (v) in the γ formula, with a (u) in accordance with TOPS conventions. **Again, note that Lorentz' β is the same as Sommerfelt's α for the n=1 orbit of the hydrogen atom!**

In TOPS, however, we use α in a more general way, so it fits any particle and, $\alpha_x = u_x/c$, where x indicates any subatomic particle. (See Chapter 5.)

I make these changes because I want to make certain that I distinguish between linear velocity (v) and rotational (angular) velocity (u = 2πrf), both of which may be measured in meters/sec. Both linear velocity (v) and angular velocity (u) are vector quantities, but the linear velocity vector points in the same direction as the linear motion, while **the vector of angular velocity always points toward the center of rotation** (which is perpendicular to the ever-changing direction of circular motion!).

When we replace v^2/c^2 with $u^2/c^2 = \alpha^2$, and realize that in the n2 neutito, $\alpha^2 \approx 1$, we can see that the missing mass comes from the relativity mass boost of the particles which are spinning at (or VERY near) the speed of light!

THUD Revisited

As we introduced in Chapter 3, there is a physical constant which I call '**THUD**,'_which I represent by the character **Ћ,** and which specifies the relationships among **electric charge, distance, and mass**. This is a repetition of that short section of Chapter 3.

Thud (**Ћ**) is the **charge-to-mass conversion factor** with a value of**:**

Ћ = 10^{-7} kg-m/Coul^2

Consider the value of Coulomb's Constant (k). k = **c^2** m^2/sec^2 **x10^{-7} kg-m/Coul^2**. Thus, **k = c^2 x Ћ**. Thus, **Ћ** is not a NEW constant—it has been buried in Coulomb's constant all along. But **Ћ,** is also in the magnetic constant, μ_o = 4**π Ћ** (kg-m-Coul^{-2}), which **is the factor which determines the relationships among charge, mass, and distance in magnetism**! **AND,**

Ћ is in the electric constant, as ε_o = 1/(4π c^2 Ћ)!

Thus, **Ћ applies to both the electric and magnetic constants**, as well as to Coulomb's Constant, **k. The interrelationships among these constants are**, as follows:

μ_o = 4π Ћ
ε_o = 1/(4π c^2 Ћ)
1/4πε_o = k = c^2 Ћ
ε_o μ_o = 1/c^2

The Energy in Balancing the Electric Force Against the Magnetic Force in a Neutito

Consider again, the n2 neutito (1,1,) as described earlier in Chapter 3. Coulomb's Law specifies the electric contribution of the axial FORCE (F_q) between the rotating yorks and zorks. We have no recognized formula for calculating the exactly equal axial magnetic forces between them, but in subatomic particles it is typically called the Strong Force (those forces which binds the nucleus together in spite of the Coulomb forces of repulsion due to the concentration of multiple protons in a tiny nucleus, all with a repulsive positive charge). The magnetic contribution is normally ignored, being treated as a combined entity called the electromagnetic energy, all forms of which are a part of the electromagnetic spectrum (i.e., photons).

I propose that there IS a way to quantify both the electromagnetic Force and the electromagnetic Energy, but it should be done by a formula which balances the Magnetic Forces WITH the Coulomb Forces which also carry energy as we saw in Chapter 3.

Since it is not likely that the reader has encountered this approach before, we probably need to divert a bit to further explain the rationale for this proposed formula for magnetic energy. You will find more discussion on the mathematics of **Ћ** and how it affects mass/energy, in Chapter 12. The following discussion does not include all of the logic embodied in Chapter 12, but what is shown here, should be sufficient for use in THIS chapter.

In TOPS, the following expression represents the magnetic ENERGY (E_μ) contained in the current loop of radius $\mathbf{r}_z$ of each charge. (From the energy, we can later calculate the magnetic Force (F_μ) that acts to balance the Coulomb force (F_q).) We will start by calculating the energy of the interaction between the york and the zork. The rationale for this equation will be covered in detail, later in the book.

> $\mathbf{E_{\mu n2} = 2\mu_o\ i_y\ \mu_y/r_{n2}}$ where $\boldsymbol{\mu}_o$ is the magnetic constant; $\mathbf{i}_y$ is the current produced when the york spins about its axis; and $\boldsymbol{\mu}_y$ is the magnetic moment of the york; the radius, $\mathbf{r}_{n2}$ **is the same for** the york, the zork and the n2.

The constant '2' is required **in the numerator** because the rest of the expression deals only with the magnetic energy of the york and we need to consider the zork's exactly equal energy content due to magnetism from the zork. Thus, we have an expression that includes the magnetic moment of one Sparq interacting with the magnetic moment of the other. Thus, both interacting effects of the york and zork are subsumed into this single formula.

$$\mathbf{E_{\mu n2} = 2\mu_o\ i_y\ \mu_y/r_{n2}}$$

Before moving on, we need to address the currents, i_y and i_z. The current generated by the charge on the york (+e/3) with the assumption that the charge is being evenly spread over the rotating disk. If all the charge were at the **rim** of the Sparq disk, we would have an analogous situation to the macro-world of a current flowing in a single loop of wire with a radius of $\mathbf{r}_y$ (or $\mathbf{r}_z$) in which the current i_y would be $(+e/3)f_y$. Spreading that charge evenly over the **surface of a nonconducting disk**, however, would give us a current of just ½ that amount, so the effectiveness of the magnetism formed by that current i_y would be ½ as much, or $\mathbf{i}_y = (+e/6)f_y$ and that would be the same for the zork. SI units for energy from this equation are: joule= kg-m^2-sec^{-2}.

Now let us go to the proposed formula for the energy of the magnetic field in the inherent state of the n2 neutito. This is the equation ONLY for the (potential) **magnetic energy** within the n2 and does not include the equal amount of **potential electrical energy** bound in the Coulomb forces. The following material is expanded upon in Chapter 12 but is briefly summarized here.

The Coulomb energy (E_{qn2}), the magnetic energy, and spin (kinetic) energy constitute the total inherent mass/energy of the n2. We, however, are going to leave the spin energy out of the following discussion at this point, for the spin forces are normal to the axis and have no effect on the balance between the electric and magnetic fields in the axial direction. Thus, the following discussion is limited to those two, equal, and opposite forces along the axis.

As we noted in Chapter 5, $\alpha_x = u_x/c$ and this is a very important concept in TOPS so will now spend some time going over some details that lead to this conclusion:

$$\mathbf{m_{rel} = \gamma\ m_i}$$

Refer to Table 6-1 which shows the specific values of γ for each of some conveniently selected values of alpha.

Note that the relativity boost (**γ**) at a velocity of 0.9 times the speed of light would multiply the miniscule charge's inherent mass by a factor of about 2.30! But, as we will soon see, the n2 neutito, the most elementary of particles (i.e., the yorks and zorks; and the neutito which is formed with their union) are spinning even faster than 9/10 of the speed of light!

Table 6-1: The Alpha/Gamma Table

ALPHA/GAMMA TABLE $\alpha x = ux/c$		
Value Lorentz Factor γ =(1/(1-a2))^.5		
α =	γ =	
0.00729	1.000027	*(ao1)*
0.1	1.005038	
0.2	1.020621	
0.3	1.048285	
0.4	1.091089	
0.5	1.154701	
0.7	1.40028	
0.9	2.294157	
0.99	7.088812	
0.999	22.36627	
0.9999	70.71245	
0.99995	100.0013	

All more massive particles (i.e., electrons and quarks) will be spinning at significantly lower velocities at which the relativity boost of the Lorentz factor $\boldsymbol{\gamma}$ has much less significance and usually may be ignored entirely. For example, note that at the value of Sommerfeld's α = .00729…. = α_{o1} is MUCH less than .1 at which value the value of $\boldsymbol{\gamma}$ is about 1.005%, and that is an increase of only half of one percent.

Since $\gamma = 1/(1-\alpha^2)^{1/2}$; we can find the following relationship between γ and α when α ranges from 0 to slightly < 1: $(1-\alpha^2) = 1/\gamma^2$. Let us now demonstrate the principle of using γ as a **Planck's Coefficient** which we will generalize as $Þ_{rel} = \gamma_{rel}$ as introduced in Chapter 2—the $_{rel}$ subscript indicates this is the value of gamma which produces the **relativity** boost in mass. In Chapter 2, we used the following example of the hydrogen atom at orbit n=1 for a Planck's Coefficient that we called $Þ_{21}$ because it represented a hydrogen atoms electron energy shift from orbit n=2 to n=1.

Let us repeat a portion of that section for review. (Please recall from Chapter 2 that m_e is the mass of an electron; $_{o1}$ and $_{o2}$ indicate the first and second orbits of an electron in the hydrogen atom. Here, we are dividing $\hbar_{o1}$ by $\hbar_{o2}$ so the result of each set of equations =1. $Þ_{21}$ is the Planck's Coefficient for finding the appropriate changes in the electron's shift from orbit n=2 to n=1.) We calculated that value (in Chapter 2) to be: **$Þ_{21}$ =** 1.27, but that particular value is not relevant to this discussion. Following is the equation as shown in Chapter 2.

$$\frac{\hbar_{o1}}{\hbar_{o2}} = \frac{m_e * 2\pi r_{o1}^2 * f_{o1}}{m_e * 2\pi r_{o2}^2 * f_{o2}} = \frac{m_e * r_{o1}^2 * 2\pi f_{o1}}{m_e * r_{o2}^2 * 2\pi f_{o2}} = \frac{m_e * u_{o1} * r_{o1}}{m_e * u_{o2} * r_{o2}} = \frac{1.05 \times 10^{-34} \text{ j-sec}}{1.05 \times 10^{-34} \text{ j-sec}} = 1$$

We are now correcting an error we made in Chapter 2. The cause for that error is explained in Chapter 12. There, we explained that the use of the $\underline{\hbar}$ form including the velocity (u) sometimes gives misleading results, so we will modify that portion by ignoring the velocity term. We will not go into the reasons for that error at this point, for it is fully explained in Chapter 12. Thus, we remove the portion of the equation using u. (In this particular case, however, the velocity portion is NOT misleading.

$$\underline{\hbar_{o1}} = \underline{m_e * 2\pi r_{o1}^2 * f_{o1}} = \underline{m_e * r_{o1}^2 * 2\pi f_{o1}} = \underline{1.05 \text{ x}10^{-34} \text{ j-sec}} = 1$$
$$\hbar_{o2} = m_e * 2\pi r_{o2}^2 * f_{o2} = m_e * r_{o2}^2 * 2\pi f_{o2} = 1.05 \text{ x}10^{-34} \text{ j-sec}$$

In this example, we are dealing with the SAME kind of particle, an electron, so m_e is the same for both orbits[41] because the velocities of both orbits are well below that needed for a significant γ boost, but,

$\text{Þ}_{21} r_{o1} = r_{o2}$; and $f_{o1}/\text{Þ}_{21}^2 = f_{o2}$, and thus,

$$r_{o1} = \frac{r_{o2}}{\text{Þ}_{21}}; \qquad \text{and } f_{o1} = \text{Þ}_{21}^2 f_{o2}$$

$$\hbar_{o1} = m_e \; 2\pi r_{o1}^2 \; f_{o1} \quad = \; m_e \; r_{o1}^2 \; 2\pi f_{o1} \qquad = 1.05 \text{ x}10^{-34} \text{ j-sec}$$

Now, substitute the $_{o1}$ values with the Planck's Coefficient $\text{Þ}_{21} \, _{o2}$ values to get:

$$\hbar_{o1} = m_e \; \frac{2\pi r_{o2}^2}{\text{Þ}_{21}^2} \; \text{Þ}_{21}^2 f_{o2} = m_e \; \underline{r_{o2}}^2 \; 2\pi \; \text{Þ}_{21}^2 \, f_{o2} = 1.05 \text{ x}10^{-34} \text{ j-sec}$$

Note that the Planck Coefficients cancel so we have proved that

$$\hbar_{o1} = m_e \; 2\pi r_{o1}^2 \; f_{o1} = \; \hbar_{o2} = m_e \; 2\pi r_{o2}^2 \; f_{o2} \; = \hbar = 1.05 \text{ x}10^{-34} \text{ j-sec}$$

Note that in each expression (between the equal signs), the Þ_{21} factors cancel numerator to denominator, thus keeping the value of $\hbar$ constant. But note that these formulas are ONLY for photon emission resulting from the shift of an electron in orbit n=2 to orbit n=1 of the hydrogen atom. Other

[41] As we said earlier, $\alpha_{o1} = 0.00729$ for the first orbit of the hydrogen atom. The resulting value of the γ boost is so small that it may be ignored. The value of α_{o2} results in an even smaller γ boost so, the mass has no significant change or γ boost as a result of this minor energy shift.

situations will also use ħ, but they will have other values of the Planck Coefficient, depending upon the specific conditions of the situation.

So, it turns out that $\hbar_{o1}=\hbar_{o2}$ as expected, but how do we use a Planck Coefficient to find the relationship between the velocities, u_{o1} and u_{o2}? Since,

$u_x = 2\pi r_x\, f_x$ All we need to do is apply the same Planck Coefficient ($Þ_{21}$) to the radius and frequency that we did in our ħ equation. Doing so, we find:

$$r_{o1} = \frac{r_{o2}}{Þ_{21}}; \qquad \text{and } f_{o1} = Þ_{21}{}^2 f_{o2}$$

$$u_{o1} = 2\pi r_{o1}\, f_{o1} = \frac{2\pi\, r_{o2}\, Þ_{21}{}^2 f_{o2}}{Þ_{21}}$$

$$u_{o1} = 2\pi r_{o2}\, Þ_{21} f_{o2} = u_{o2}\, Þ_{21}$$ And,

$$\mathbf{u_{o1} = u_{o2}\, Þ_{21}}$$

This exercise is a good demonstration that **ħ** is truly a constant regardless of the velocity, radius, or frequency of rotation.

Now let us apply **γ** to show how relativity boosts the mass AND changes for other factors of the ħ equations. Starting with our basic relationship,

$\mathbf{\hbar_x = \hbar =} = m_x\ 2\pi r_x{}^2\ f_x$

let us rewrite that in terms of inherent mass, radius, and frequency in **two conditions**:

1) **before** the boost where we have m_i, r_i; and f_i in the **inherent state**, and,

2) **after** the boost where we have m_{rel}, u_{rel} r_{rel}, and f_{rel}, i.e., the **relativistic** values.[42]

Note that right now, we are testing what happens when the relativistic $u_{rel} = u_{(c\}} = c$. Again, the objective of this exercise is to see if the Planck's Coefficient can help us separate the mass from the radius so, hopefully, we can solve for BOTH

42 Actually, the values of u_i and u_{rel} are the same because while the radius decreases with the Lorentz contraction, the frequency is increasing by exactly the same amount (because **u=2π rf**) so the velocity in both the inherent and relativity states is the same = c, a constant.

values. Whether or not we can achieve that task, I think the following exercise develops insights into the variability and dependability of **ħ.**

$\hbar_i = \hbar = m_i\, u_i\, r_i$

$\hbar_{rel} = \hbar = m_{rel}\, u_{rel}\, r_{rel}$

But ħ is a constant so,

$\hbar_i = m_i\, u_i\, r_i = \hbar_{rel} = \hbar = m_{rel}\, u_{rel}\, r_{rel}$

$m_i\, u_i\, r_i = m_{rel}\, u_{rel}\, r_{rel} = \hbar$ [We have already concluded $u_i = u_{rel} = u_{(c\}} = c$, so,]

$m_i\, r_i = m_{rel}\, r_{rel} = \underline{\hbar}/c$ And,

$$\mathbf{\underline{\hbar/c} = m_{rel}\, r_{rel} = 3.50\text{x}10^{-43}\ kg\text{-}m\ !!!}$$ [43]

That equation would be very manageable if it referred only to an electron orbiting a hydrogen atom at the speed of light because we know the rest mass of the electron. That, however, is far from the case, since the actual orbital velocity in the n=1 orbit is u_{o1}= 2.19x10^6 m/sec, and α_{o1}= 7.29x10^{-3} as we saw in the previous chapter. Thus, for the hydrogen atom, we need to recognize that $u_{o1} = \alpha_{o1} c$ = 2.19x10^6 m/sec. At that velocity, we now have,

$$\mathbf{\hbar/c = (m_{oi}\, r_{oi})\, \alpha_{o1} = 3.50\text{x}10^{-43}\ kg\text{-}m}$$

Now, if we were dealing with an orbital electron where we have S=1, we could figure the radius as we did in Chapter 2, because we KNOW the mass of an electron is 9.11x10^{-31} kg and we know the value of α_{o1} = 0.00729. (The value of the radius in the hydrogen atom, n=1 is 5.29x10^{-11}m.)

But, at this time, we can't separate the mass and radius to solve for either mass or radius, when we do not know the value of the velocity (u) or α_x! Note also, that this relationship will hold for all particles of Spin =1. But, for particles possessing a spin of S= ½ (such as neutrinos, quarks, and electrons), we have an added problem: We must figure out just which of the three variables (m, f, or r) in ħ can vary to absorb that fraction of ½. (After more thorough study, we conclude that it is the **product** of ($\hbar = \underline{m\, r^2\, 2\pi f}$) and not just f that is halved) This is also one reason that the calculation of ħ/c, shown above is NOT correct. Again, see Chapter 12 for full explanation.) The following DISCUSSI)ON was written before I realized that it was the *product* of $mr^2 2\pi f$ was going to be affected by the fact that these particles actually

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[43] This number is incorrect. I am leaving it here because I want to document my thinking at the time I wrote this. See Chapter 12 for the correct application of the Planck's Coefficient. The correct answer is 1.75x10^{-43} as per Chapter 12.

possess a spin of ħ/2. The material has been retained as originally written to demonstrate how my understanding changed on the subject. It also includes some correct logic that is NOT changed by virtue of a broader understanding of ħ. Details of the changes in understanding are addressed in Chapter 12.

> DISCUSSION: The mass is not going to change except for our gamma boost, but, similarly, the radius will be foreshortened by the same gamma factor, so the mass and radius can't otherwise change. Obviously, the 2π factor is geometric, relating to the circular rotation of the particle, and THAT is constant and cannot change. This leaves us only a frequency shift—how often the particle rotates per second. Thus, we conclude that **the particle's frequency of rotation is free to adjust** to whatever the other combinations of fixed factors may be, in order to satisfy the fundamental physical law that all subatomic particles have a spin of either ħ or ħ/2.

Recall from Chapter 2 where we said the energy of a photon was quantized according to the frequency of the photon, i.e., E= **ħ2πf = hf**. Thus, if we double the frequency, we get double the energy content of a photon. That is also true with the n2 neutrino. This is a general rule that applies not just to the photon, but to all rotating subatomic structures. Thus, if we have an angular momentum (spin) of ħ/2, the mass and radius are not changing,[44] but the frequency in S=ħ/2 particles will be cut in half of that in S=ħ particles.

Thus, because of the Lorentz Contraction,

$Þ_{rel} = \gamma$; and, $Þ_{rel}\, m_{ei} = m_{erel}$ the radius must **decrease** by $Þ_{rel} = \gamma$. So,

$$\mathbf{r_i / Þ_{rel} = r_i/\gamma = r_{rel}}$$

It is important to understand that **γ has the effect of reducing the length dimension by the same amount that it increases the mass dimension**. This is often referred to as the Lorentz Contraction of length. As a matter of fact, the Lorentz contraction also influences the time dimension to produce Time Dilation. (Here, time (T) is the duration or 'period' of a single rotation where T= 1/2πf. Since T is DECREASED by **γ** dilation, the same **γ** boost is reflected as an INCREASE in the frequency, to f_{n2rel}.) Thus, we will now demonstrate that we also need to use the Planck Coefficient on the frequency of rotation of the particle. I find it illuminating to look at the entire ħ equation, so we get a complete picture of what happens when

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[44] Actually, BOTH mass and the radius are changed by the gamma boost factor, but these changes offset each other so the product mr remains the same as we shall soon see. But we still have to have a spin of ħ/2.

we use the γ boost to include the relativistic nature of the relationship between the inherent and relativistic forms of ħ when using $Þ_{rel} = \gamma_{rel}$ with the following Planck Coefficient relationships: **These γ boost values will be seen to change** in Chapter 12 where we catch the error in logic..

$\mathbf{m_{erel} = Þ_{rel}\, m_{ei} = \gamma\, m_{ei}}$	Mass boost
$\mathbf{r_{rel} = r_i / Þ_{rel} = r_i/\gamma}$	Length Contraction
$T_{rel} = T_i/Þ_{rel} = T_i/\gamma$	Time Dilation, and because,
$\mathbf{f_{rel} = Þ_{rel}\, f_i = \gamma\, f_i}$	$T_i = 1/2\pi f_i$ = Frequency boost

So, now let us see how these Plank's Coefficients impact our equations for ħ when going from the state of inherent mass to the state of relativistic mass.

$$ħ_i/c = ħ/c = \alpha_x m_i\, r_i$$

$$ħ_{rel}/c = ħ/c = \alpha_x(\cancel{Þ_{rel}}\, m_i)\, \frac{r_i}{\cancel{Þ_{rel}}} = \alpha_x m_{rel}\, r_{rel} = \mathbf{ħ_i}/c = \alpha_x m_i\, r_i = \mathbf{3.50x10^{-43}\ kg\text{-}m}$$ [45]

The value of ħ itself, does NOT CHANGE because the $\gamma = Þ_{rel}$ times the frequency boost in the numerator cancels the $\gamma = Þ_{rel}$ contraction of the radius in the denominator AND, thus, the value of ħ is UNCHANGED! However, even though the internal makeup of ħ is unchanged, once we multiply the frequency by γ, the ENERGY may be changed by a significant amount! Here is the math demonstrating that γ boost.

$$E_{\mu n2i} = \mathbf{(m_{n2i}\, u_{yi}\, r_{yi})(2\pi f_{yi})}$$

$\mathbf{E_{\mu n2i} = (ħ)(2\pi f_{yi}) = hf_{yi}}$ **This again, is INHERENT energy.**

$\mathbf{E_{\mu n2rel} = (ħ)(2\pi f_{yrel}) = hf_{yrel}}$ **And this is RELATIVITY energy, which we obtain from the γ boost.**

$$\mathbf{E_{\mu n2rel} = \gamma E_{\mu n2i} = (ħ)(2\pi\, \gamma f_{yi}) = \gamma h f_{yi}}$$

Thus, if we knew the value of the relativity energy, we could get the γ boost factor, by simply dividing the relativistic energy by the inherent energy!

Thus,

$$\gamma = \frac{\mathbf{E_{\mu n2rel}}}{\mathbf{E_{\mu n2i}}} = \frac{\mathbf{(\cancel{ħ})(\cancel{2\pi}\ \gamma f_{yi})}}{\mathbf{(\cancel{ħ})(\cancel{2\pi}\ f_{yi})}} = \frac{\mathbf{\gamma f_{yi}}}{\mathbf{f_{yi}}} = \gamma \quad \mathbf{!!!}$$

---

[45] This number is incorrect. I am leaving it here because I want to document my thinking at the time I wrote this. See Chapter 12 for the correct application of the Planck's Coefficient.

So, it would SEEM that, to find the value of gamma we need only take the relativity spin energy of the particle as hf_{rel} and divide it by the inherent energy hf_i! Unfortunately, it gets more complicated than that because we don't know the value f_i. We can calculate the inherent energy in terms of 4π, Ћ, and e^2, etc., but we always end up with the product of mass and radius and it appears to be impossible to nail down an exact value for either factor, so **we can't calculate the specific value of either of them using the Gamma Boost, γ**!

Another approach to separating the mass from the radius might be to calculate the γ boost from a known value of α or u. In the case of the n2 neutito (Chapter 3), we know that $u_{(c\}} \sim= c$ so α must be VERY CLOSE to 1. As a practical matter, it is much easier to calculate a precise value of α from a known value of γ. This is because a relatively large γ yields an α value which requires adding a couple more 9s to the velocity u =0.9999 c, etc., as α gets closer and closer to 1. Thus, considering α from Chapter 5,

$$\gamma = 1/(1- \alpha^2)^{1/2}$$
$$\alpha = (1 - 1/\gamma^2)^{1/2}$$
$$u = c\,\alpha$$
$$u = c\,(1 - 1/\gamma^2)^{1/2}$$

According to our Table 6-1 shown earlier in this chapter, the gamma boost at the velocity of an electron in orbit n=1 of a hydrogen atom (where α =.00729), amounts to only 3 parts in a hundred thousand in γ! **Thus, if we know the Sparq makeup of any relatively high velocity, rotating subatomic particle, it would seem logical that we SHOULD be able to determine the mass, radius, and frequency that produce a particular velocity of the particle. We will soon attempt to approach the problem from this viewpoint and will use the n2 neutito from Chapter 3 as our starting point.**

Two Kinds of Mass/Energy

But before we do that, we need to introduce a concept of particle mass. The details of this concept have plagued me for over the last year and a half while I have been writing this book. I now think I have a good grasp of the problem and this concept will be mathematically demonstrated in Chapters 10 and 12 but it is necessary to present the basic idea at this point in order to determine the Gamma Boost for an n2 neutito. Thus, the following material may be considered to be a 'preview of coming attractions.'

There are three sources of energy/mass in ANY particle. Exactly HALF the fundamental mass of any particle resides in the charge of each Sparq. Each york with a charge of +e/3 has a Sparq mass of 0.65×10^{-31} kg. The zork Sparq mass is exactly the same as the york, i.e., 0.65×10^{-31} kg. Thus, the n2 neutito has a total Sparq mass of 1.30×10^{-31} kg. The other ½ of the particle's mass is split equally between the electric and magnetic Binding energies, so ¼ of the mass is derived from the electric Binding energy and ¼ is derived from the magnetic Binding energy. This is an example of *attributable mass* which will be further explained in Chapters 10 and 12.

Thus, the total mass of the n2 neutito is 2.60×10^{-31} kg with the following breakout:

Sparq mass york	**= 0.65×10^{-31} kg**
Sparq mass zork	**= 0.65×10^{-31} kg**
Binding energy mass magnetic	**= 0.65×10^{-31} kg**
Binding energy mass electric	**= $\underline{0.65 \times 10^{-31}\ \text{kg}}$**
Total mass n2	**= 2.60×10^{-31} kg**

Comparing Inherent and Relativity Measures of the n2 Neutito

From that Sparq mass, we can determine all other characteristics of the n2 neutito! We will not do those final calculations until Chapter 12, but it is important to do part of it to show the relationship between the characteristics of the Inherent n2 and the Relativity n2 particles when we have a gamma boost of $\gamma = 615$ which will be derived later in this chapter. For the moment, let us see the results without the supporting math.

	INHERENT n2 [46]		RELATIVITY n2
Pirel = 615^.5 = 24.8	**24.79919354**		
Massi n2 inherent = mrel/ (Pirel^2)	**4.22764E-34**	mn2rel=	**2.60E-31**
radiusi = rrel/Pirel	**2.72784E-14**	rn2rel=	**6.76E-13**
freqi = firel*Pirel^4	**2.66767E+25**	fn2rel=	**7.05E+19**
veli =2*Pi*ri*fi=	**4.57225E+12**	un2rel=	**3.00E+08**
h'/2 = mn2i*2*Pi*ri^2*fi = (spin)	**5.27286E-35**		**5.27E-35**

Table 10-1: Comparing Inherent and Relativity Properties of the n2

We are using the Planck's Coefficient[47] $\text{Þ}_{irel} = \gamma^{½} = 615^{½} = 24.8$ in making the calculations. Thus, **the relativity mass of the n2 is**

$$\mathbf{m_{n2rel} = (m_{n2i})\ \text{Þ}_{irel}^{2} = (4.23\text{x}10^{-34})615 = 2.60\text{x}10^{-31}\ kg}$$

and other characteristics are calculated in Chapter 12. For those who would like to do the math themselves, the following factors convert inherent values to relativity values (again recall that $\text{Þ}_{irel} = \gamma^{½} = 615^{½} = 24.8$).

$$\mathbf{r_{n2rel} = (r_{n2i})\ \text{Þ}_{irel}}$$

$$\mathbf{f_{n2rel} = (f_{n2i}) /\ \text{Þ}_{irel}^{4}}$$

Note that I said that the mass of the n2 is 2.60x10-31 kg is a 'preview of coming attractions.' We haven't proved that yet and in a few subsequent chapters we will keep searching for what that value should be. In some places we keep trying to separate the mass from the radius but are using the wrong value. I will try to keep doing this until we prove that is the correct value of the m_{n2}. I retain the errors because I want to document the thought processes that lead up to the final proof.

There are three sources of energy/mass in ANY particle. Exactly HALF the fundamental mass of any particle resides in the charge of each Sparq. Each york with a charge of +e/3 has a Sparq mass of $0.65\text{x}10^{-31}$ kg. The

[46] Use only the first three significant figures in this column. These are spreadsheet calculations but since we used only three significant figures in making the calculations, figures in the fourth position and beyond are inaccurate.
[47] The Planck's Coefficient was introduced in Chapter 2.

zork Sparq mass is exactly the same as the york, i.e., 0.65×10^{-31} kg. Thus, the n2 neutito has a Sparq mass of 1.30×10^{-31} kg. The other ½ of the particle's mass is split equally between the electric and magnetic Binding energies, so ¼ of the mass is derived from the electric Binding energy and ¼ is derived from the magnetic Binding energy. This is an example of *attributable mass* which will be further explained in Chapters 10 and 12.

Thus, the total mass of the n2 neutito is 2.60×10^{-31} kg with the following breakout:

Sparq mass york	**= 0.65×10^{-31} kg**
Sparq mass zork	**= 0.65×10^{-31} kg**
Binding energy mass magnetic	**= 0.65×10^{-31} kg**
Binding energy mass electric	**= $\underline{0.65 \times 10^{-31}\ \text{kg}}$**
Total mass n2	**= 2.60×10^{-31} kg**

γ For an n2 Neutito

Now just HOW did we get that gamma boost VALUE of $\boldsymbol{\gamma = 615^{1/2}}$ **for the n2 neutito?** Keep in mind that we are looking only at the Binding energy and not Sparq energy here, for we know the Sparq mass-radius product from some equations we used in Chapter 3. We are going to derive the value of $\boldsymbol{\gamma}$ for the n2 neutito, and to do that many people probably need some review of details we have already covered.

Please reconsider this paragraph from Chapter 3.

> "Before moving on, we need to address the currents, i_y and i_z. The current is generated by the charge on the york is +e/3 being evenly spread over the rotating disk. If all the charge were to be **at the rim** of the Sparq, we would have an analogous situation to the macro-world of a current flowing in a single loop of wire in which the current i would be (+e/3)f Amperes."

When, however, we have a flat disk spinning around its center, we assume the charge is uniformly distributed across the surface of the disk. A tiny increment of charge at the rim gives the maximum current and its resulting magnetism, while the same sized increment at the axis would produce NO magnetism at all. When one 'averages out' the increments of charge at all different distances from the axis of rotation, we have a total current of just ½ that which we would have if the charge were all on the rim of the disk. Thus, the effective current is $\mathbf{i_y} = ½(+e/3)f_y$ or $\mathbf{i_y} =$

$\mathbf{(+e/6)f_y}$ Amperes. Other pertinent factors in our magnetic energy equation ($\mathbf{E_{\mu n2}}$) are:

$$\mathbf{Ћ = 10^{-7}}\ \text{kg-m/Coul}^2\mathbf{;} \quad \mathbf{\mu_o = 4\pi Ћ;} \quad \mathbf{\mu_y = \mu_z = i_y\ \pi r_y^2 = i_z\ \pi r_z^2}$$

The Coulomb force and energy inherent in the **attraction** between the opposite charges of the york and zork, operates only in **the axial direction** in the neutito. There is, however, a mass attributable to the rotating charges and that mass has an effect on **the radial Centrifugal force** and the resulting **kinetic energy in the radial direction.** The Coulomb force is an axial force ONLY, and its strength depends only upon the magnitude of the distance between the two charges, and it is irrelevant **to the perpendicular Coulomb force**, that they are spinning around the axis.

Thus, the magnetic moment has an **opposing, repulsive** effect on the force in the **axial direction** within the n2, but it has no effect on the **radially oriented, centrifugal force** of the spinning particle-pair. The axial and radial force directions are perpendicular (normal to) each other. Thus, the axial forces and centrifugal forces due to magnetism don't even recognize the existence of each other!

Now we know the physical value of all the factors, except for $r_y = r_z$ (for the rotating magnetic forces) and $d_y = d_z$ (for the axial forces).

You may well note that the factor of 2 is in the equation because the magnetic energy due to the zork is the same as that of the york, so the total magnetic energy of the n2 is twice that of the york alone. [We will attempt to bring all of the pertinent information together in Chapter 12.] NOTE: The following equations deal with the INHERENT Binding energy state, and NOT to the relativity state.

We will start with the magnetic (Binding) energy of the combined n2 Sparqs.

$\mathbf{E_{\mu n2} = 2\ \ \mu_o\ \ \ i_y\ \ \ \mu_y\ \ /r_y}$	The r_y is the radius of the current loop (Sparq disk) that generates the magnetic field.
$\mathbf{E_{\mu n2}} = 2\text{x}\ \ \mathbf{4\pi Ћ\ \ i_y\ \ i_y\ \pi r_y^2/r_y}$	
$\mathbf{E_{\mu n2}} = 2\text{x}\ \ \mathbf{4\pi Ћ\ \ i_y^2\ \ \pi r_y^2\ /r_y}$	Calculate i_y and insert into equation.
$\mathbf{E_{\mu n2}} = 2\text{x}\ \mathbf{4\pi Ћ\ (-e/6)^2\ f_y^2\ \pi r_y^2/r_y}$	Rearranging terms gives,

$\mathbf{E_{\mu n2}} = 2\text{x}\ \mathbf{Ћ\ (e^2/36)\ 4\pi^2 r_y^2 f_y^2/r_y}$ Simplifying, and knowing $u_y=2\pi r_y f_y$,

$$\mathbf{E_{\mu n2}} = 2\text{x}\ \frac{\mathbf{Ћ\ (e^2/36)}}{\mathbf{r_y}}\ \mathbf{u_y}^2$$

$$\mathbf{E_{\mu n2}} = \frac{\mathbf{Ћ\ e^2}}{\mathbf{18(r_y)}}\ \mathbf{u_y}^2 \quad \text{(joule)}$$

BUT this is not the total energy of the neutito—it is only the inherent Binding energy contribution of the **magnetic** (**μ**) moments of the york AND zork. Remember, the **electric** (**q**) contribution must also be added to the give the **total Binding** energy of the n2 in the inherent state and we need to give those initial states the **γ** boost! We also need to get a spin of ħ/2.

For a long time, I sought to somehow include Kinetic Energy (KE) into the particle structure as another form of energy (other than Binding Energy). I finally concluded that the KE consideration WAS the source of the gamma boost and that there are no other energy factors to include within TOPS particles. Thus, the energy considerations are:

BINDING ENERGY = TOTAL ENERGY/2

Total BE = γxINHERENT BE$_{\mathbf{i}}$ **= RELATIVITY BE**$_{\mathbf{rel}}$

Energy=Magnetic+Electric = Magnetic+Electric = ½Total

$$\mathbf{\Sigma E_{n2rel} = \gamma(E_{\mu n2i} + E_{qn2i}) = \gamma\left(\frac{2\mu_o\, i_z\, \mu_y}{2r_y} + \frac{kq^2}{(2d_y)}\right) = ½ m_{n2rel}c^2}$$

$$\mathbf{C \quad + \quad B \quad = \quad A}$$

Note that the last energy equation (**A**) is exactly HALF the particle's total energy and is exactly the same as the sum of the gamma boosted (**B+C**) Binding energies. This is because half of the mass of any particle is the Sparq mass. That means that the inherent Binding energy within the parentheses is boosted **γ** times. We also know that the magnetic energy at **C** is the same as the electric energy at **B** so we need to calculate from only one of those two equations.

We can now make the following conclusions: **The electric Binding energy (B) is half of the total Binding energy (B+C); and thus, the electric Binding**

energy of the york and zork interaction is ¼ of the total energy of the n2 neutito.

The simplest and most unambiguous of those equations is at **B**, the electric energy and we now know that is ¼ the total energy of the n2 system. From Chapter 3, we also know that $2d_y = 2r_y$. After all, we are trying to determine the mass and radius of the n2, so, perhaps we can work with just the electric energy formula to calculate those values from the value of the γ boost.

$$\underline{\mathbf{B} \quad = \mathbf{B} \quad = \quad \mathbf{A}}$$

$$\frac{\gamma k q^2}{2d_{yi}} = \frac{\gamma k q^2}{2r_{yi}} = \tfrac{1}{4} m_{n2rel} c^2$$

$$\frac{\gamma k q^2}{2r_{yi}} = \tfrac{1}{4} m_{n2rel} c^2$$

Rearranging terms and knowing that q = e/3 Coul, $k = c^2Ћ$, $Ћ = 10^{-7}$ kg-m/Coul^2, we must have a spin of $\hbar/2 = 5.25 \times 10^{-35}$ j-sec, and solving for γ, we have:

$$\gamma = \frac{(\tfrac{1}{4} m_{n2rel} c^2)(2r_{yi})}{k(e/3)^2}$$

$$\gamma = \frac{(\tfrac{1}{4} m_{n2rel} c^2)(2r_{yi})(9)}{ke^2} = \frac{(\tfrac{1}{4})(2 \times 9)\ (m_{n2rel} c r_{yi}) c}{c^2 Ћ\, e^2} = \frac{(4.5)\ \hbar c}{c^2 Ћ\, e^2} = \frac{(4.5)\hbar}{c\, Ћ\, e^2}$$

(Recall that ($m_{n2rel} c r_{yi} = \hbar$.) After we cancel c, we find that the last expression is ALL composed of CONSTANTS! Thus, when we substitute the values for all those constants, **we can solve for γ directly. Furthermore, all units cancel and $\gamma_{\underline{n2}}$ is therefore a dimensionless constant which is unique to the n2 neutito, so, we shall call it $\gamma_{\underline{n2}}$.**

$$\gamma_{\underline{n2}} = \frac{(4.5)\ \hbar}{c\, Ћ\, e^2} = 4.5 \frac{(1.05 \times 10^{-34}\ \text{kg-m}^2/\text{sec})}{(3.00 \times 10^{8}\text{m/sec})(10^{-7}\text{kg-m/Coul}^2)(1.60 \times 10^{-19}\text{Coul})^2}$$

$$\gamma_{\underline{n2}} = 615 \qquad \textbf{(using 3 significant figures for our constants)}$$

Should we try to be more precise in our calculations? Doing the same calculations using FIVE significant figures for all constants, we obtain:

$\gamma_{\underline{n2}}$ **= 617** $\alpha_{\underline{n2}}$ **= 0.99999(87)** $u_{\underline{n2}}$ **= c = 2.9979 x10⁸ m/sec**

(using 5 significant figures for our constants)

Theoretically, it would seem that we could calculate an even more precise value for $\gamma_{\underline{n2}}$ **to any degree of precision we desired**, as long as each factor used had the same degree of precision. The presumed improved precision, however, is only an illusion, for, whether you use $\gamma_{\underline{n2}}$ = 615 or 617, the value of α_{n2} is so close to 1.0000 that the mathematical differences between α_{n2} and 1; and, between u_{n2} and c, the speed of light, are absolutely irrelevant.

Before we finish this chapter let us contemplate the magnitude of the $\gamma_{\underline{n2}}$ boost in that simplest of all particles existing in nature, the n2 neutito. What we have done is take the known relativity mass of the n2 neutito and divide it by the inherent mass of the n2 neutito to find the gamma factor for the neutito.

$\mathbf{m_{rel} = \gamma\, m_i}$, and, **Lorentz' γ is** $\boldsymbol{\gamma = 1/(1-\alpha^2)^{1/2}}$

But note that we have also solved for alpha (α_{n2} = .9999987 c) **and proved that for the Sparqs, their rotational velocities = c for all practical purposes.**

At the lowest level of particle existence, **mass results from charged particles. Those particles are held together by the Binding energies of the balanced electric and magnetic forces, and they rotate at the speed of light. The n2 neutito is the tiniest of all particles, but every unit of that rotating charge is expressed as a mass acting through a distance. At that level (the inherent mass), after being boosted by 615 times by the γ factor, we obtain the relativity mass-distance on those charges. It is only $3.50\text{x}10^{-43}$ kg-m,[48] as we saw earlier in this chapter and is the lightest (**least massive**) of all particles in the universe!**

By the time we get to Chapter 12, we hope to see that this, the tiniest of all units of mass-distance, will produce our unit of mass per unit of meter-Coulomb and will allow us to separately calculate the mass of the york and zork! Thus, every unit of spinning charge will produce a given mass, which we will eventually be able to measure in terms of kg/Coul.

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[48] This number is incorrect. I am leaving it here because I want to document my thinking at the time I wrote this. See Chapter 12 for the correct application of the Planck's Coefficient.

QUO VADIS?

Are you interested in contributing?

Chapter 7 - The Electron and Higher Order Particles

I AM PUBLISHING THIS BOOK WITHOUT MUCH IN THIS CHAPTER BECAUSE COMPLETION WILL TAKE MATHEMATICS THAT IS BEYOND MY PERSONAL ABILITIES. THE GROUNDWORK HAS BEEN DONE IN EARLIER CHAPTERS AND I KNOW THERE ARE MANY OTHERS WHO ARE MORE CAPABLE THAN I WHO CAN CONTINUE THE QUEST. I THEREFORE, PRESENT THE FOLLOWING AS REPRESENTING MY PRESENT LEVEL OF UNDERSTANDING AND FULLY REALIZE THAT I DO NOT KNOW WHERE IT WILL EVENTUALLY GO. Bbb 08/08/2021.

Principles of TOPS Structural Analysis

The n2 neutito is the simplest of all subatomic structures that exists alone in nature, and that structure has been described in detail in Chapters 3 and 6. Nevertheless, the basic principles on which the n2 neutito structure is based, remain the same for all higher order structures. For convenience, we will describe those basic principles and will provide illustrations that appear to meet those criteria in the First-Generation particles.

Each particle must be electrically consistent (i.e., the sum of all electrical charges must be the same) with the corresponding Standard Model particle. Example: The electron must have a total charge of -1e and the TOPS model of the electron consists of 2 yorks (at +e/3 each) and 5 zorks (at -e/3 each). This gives +2e/3 and -5e/3 for a composite charge of -3e/3 = -1e for the TOPS electron.

In all composite particles, the york and zork are rotating at the speed of light (i.e., $u_y = u_z = c$). In the electron, for example, all seven **Sparqs** are spinning at that speed, at all times. This does NOT mean that each Standard Model particle, itself, is spinning at the speed of light—just those Sparqs that comprise those first-generation particles are spinning at that fixed velocity. That will also be true of the higher order particles—the Sparqs are always spinning at c, but larger composite particles themselves (such as electrons, quarks, neutrinos, and photons, nucleons, and atoms), spin at a slower rate so the ratio $\alpha_x = u_x/c < 1$. The more Sparqs in a particle, the smaller will be the value of u_x and α_x.

Thus, the mass **of each Sparq** within any particle's structure must be the same regardless of the structure of the particle. Example $m_{ys} = m_{zs} = 0.65\text{x}10^{-31}$ kg, regardless of the quantities of each kind of Sparq within the particle.

But THESE ARE ONLY SPARQ MASSES AND NOT TOTAL MASSES of the larger particles. We often add the subscript $_s$ **to each particle to clarify that this attributable mass applies only to the Sparq mass.** For each specific particle, the Sparq masses must be supplemented by adding the equivalent structural (or binding) energy/mass (due to separation of charge and the magnetic energy/mass) to give the TOTAL mass of the particle.

Sparq Masses For 1st Generation Particles

(Does NOT include binding energy of the larger particles)[49]

$m_{ys} = m_{zs} = 0.65\text{x}10^{-31}$ kg
$m_{n2s} = m_{ys} + m_{zs} = 2m_{ys} = 2m_{zs} = 1.30\text{x}10^{-31}$ kg
$m_{n4s} = 2m_{ys} + 2\,m_{zs} = 4m_{ys} = 4m_{zs} = 2.60\text{x}10^{-31}$ kg
$m_{es} = 2m_{ys} + 5m_{zs} = 7m_{ys} = 7m_{zs} = 4.55\text{x}10^{-31}$ kg
$m_{ups} = 6m_{ys} + 4\,m_{zs} = 10m_{es} = 10\,m_{zs} = 6.50\text{x}10^{-31}$ kg
$m_{dns} = 6m_{ys} + 7\,m_{zs} = 13m_{ys} = 13\,m_{zs} = 8.45\text{x}10^{-31}$ kg

The TOTAL mass of each of each of the larger particles (the electron and quarks) ALSO includes the *attributed masses (*δm) from the following energies: the *attributable* masses due to the binding energy (= magnetic energy and electric charge-separation energy).

By the time we add the binding energy, the kinetic energy (and any other energy that I have been unable to determine), we have exactly DOUBLE the relativistic energy. Thus, for most purposes, I will drop the $_s$ subscript and double the Sparq mass value, so it reflects the relativistic mass in most future uses of m_y and m_z.

To this point, I have concluded that the Sparq energy (e.g., m_{ys}) is always HALF of the total relativistic energy. That principle appears to hold for the n2 neutito (1,1), the electron neutrino (2,2), the electron (2,5). and the muon neutrino (5,5). **If** that relationship holds for all Standard Model particles, this means that **half**

[49] See Chapter 11 for the manifestation of the Binding Energy within the electron. This book will not attempt to provide similar analysis for other Standard Model particles, but the methodology of Chapter 11 should pave the way for others to continue the study of TOPS.

the mass of all particles is due to the Sparq mass and all other energy/mass within a given particle is due to those Other Energy factors.

If that assumption is not correct, a vector analysis of each particle will be required to establish the correct values for binding and any other energies. Table 7-1 assumes that this principle is correct.

TABLE 7-1: Sparq Masses in The Standard Model According to TOPS

		SPARQ MASSES OF ALL STANDARD MODEL PARTICLES							
NEUTRINOS		n2 (1,1)	n4 (2,2)	n10 (5,5)	n16(8,8)	n22(11,11)			
mass xE-31 kg		1.30E-31	2.60E-31	6.50E-31	1.04E-30	1.43E-30			
CHARGED	e(2,5)-1	up(6,4)+2/3	dn(6,7)-1/3	mu(5,8)-1	ch(9,7)+2/3	st(9,10))-1/3	tau(8,11)-1	tp(12,10)+2/	bm(12,13)-1/3
mass xE-31 kg	4.55E-31	6.50E-31	8.45E-31	8.45E-31	1.04E-30	1.24E-30	1.24E-30	1.43E-30	1.63E-30

All Sparqs must be symmetrically arranged, either ON the axis of rotation, OR rotating at the same distance from that axis. All Sparqs must be spinning in the same direction within the structure. All Sparqs must be spinning with their planes being parallel to each other within the structure, i.e., the axis of rotation of each Sparq must EITHER coincide with the axis of rotation of the larger structure, OR be parallel to it, AND must be aligned in the direction of the velocity vector (in either direction). These requirements impose a structure that consists of series of rigid, electromagnetic- bonded frameworks.

Anti-matter particles have the same structure as their matter twins, but the numbers and sequence of yorks and zorks are reversed. In the case of neutrinos, the numbers of yorks and zorks are the same and the matter and anti-matter particle are one-and-the-same particle. (In the following illustrations, only the up- and down-quarks have anti-matter illustrations shown as examples. Second- and Third-Generation particles have the same basic structure but with [3,3] or [6,6] added to lengthen the axis of rotation.)

The Electron (and Positron)

We will start by assuming the following structure for an electron **which has a Sparq structure of (2,5).**

There are two alternate possible structures that will be suggested. The first is the one that was thought to be correct from the very beginning of my

TOPS studies and I will identify that as the 'star' shaped electron/positron, but the second is more in line with all other structures containing odd numbers of Sparqs. Which is more correct will probably be revealed by vector analysis of the two options.

The Star-Shaped Electron and Positron

Five zorks orbit in a plane, 72° apart, around a pair of yorks which form the axis of rotation. Because the two yorks are so close together and, are located at the dead-center of rotation, the structure acts as a thin disk as it rotates and thus, has a spin of 1/2. (Figure 7-1)

The TOPS electron is radially symmetrical and consists of five, identical tetrahedrons: ABFG, BCFG, CDFG, DEFG, EAFG. **See Figure 7-1. Note that all tetrahedrons share the same two yorks at the axis.**

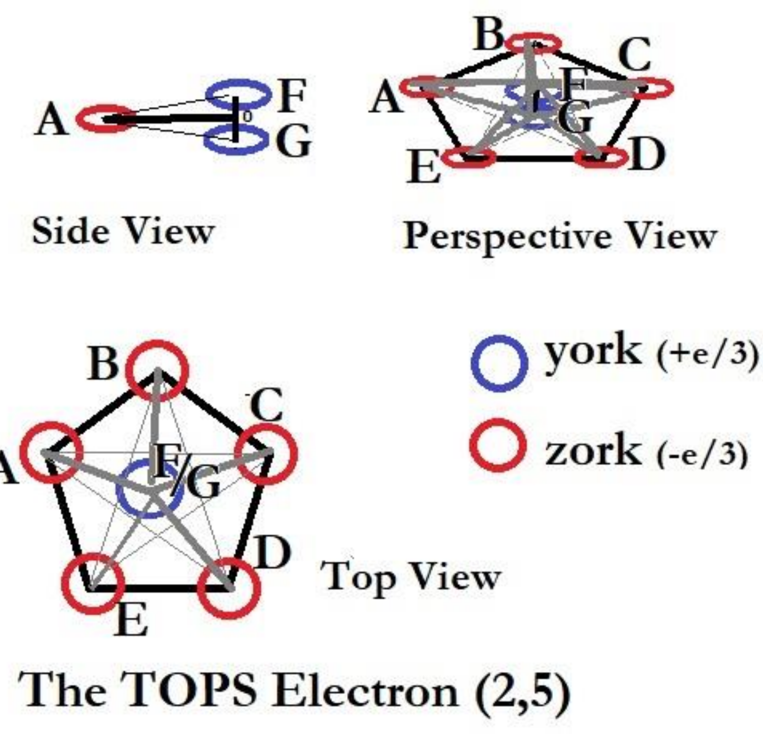

Figure 7-1 The Star-Shaped Tops Electron

When calculating forces, ALL forces must balance to provide a dynamically stable particle. Axial forces must include both Coulomb and magnetic attraction/repulsion along the rotational axis and this is where the primary bonding takes place. This is a consequence of the rigid requirement that the Coulomb force between the york and zork must be equal to the magnetic forces generated when the york and zork spin at the speed of light. Those opposing forces, operating through the same distance (between the york and zork), produce two, locked-energy regions around the axis of rotation.

The five, peripheral zorks generate orbitally initiated magnetic fields, but those fields are open-ended and many of the magnetic lines 'dangle' out in space[50] with no competing Coulomb energy to oppose them. Rigorous, vector analysis will be essential in determining the energy content within these structures. As in Newtonian physics, rotational (centrifugal) forces must balance radial electrical forces.

When calculating mass, ALL forms of energy must be considered. Each type of energy has a mass attributable to it and all energies within a given particle are summative. See Chapters 10 and 12 for brief discussions on *attributable mass*.

When combining Sparqs to form larger TOPS structures, each Sparq will retain its own characteristics of size, mass, velocity, etc., within the parameters of Special Relativity. Its spin, mass, and size does not change or add to the larger particle, for — it already IS part of the particle and, it is any other energies that must be included in calculating total particle mass, etc. of larger, composite particles. Example: In the electron, we have 7 Sparqs, each with the same mass, size, spin. Those attributes do not get doubly added when considering the electron as a whole, for that Sparq mass is already embedded. What must be added, is the Binding energies, both electrical and magnetic. Thus, in calculating the mass of the electron, we need to take the charge-separation Binding energy among those seven Sparqs and then consider all OTHER forms of energy, such as the potential energy of separated charges (Coulomb's Law), the magnetic energy of the entire electron (i.e., the magnetic moments of the 5 peripheral zorks as they spin around the electron's F/G axis) PLUS the spin (kinetic) energy (=hf/2). At this point, we do not believe there are any other kinds of energy in TOPS particles.

The electron's structure is (2,5). (The anti-matter positron's structure would be (5,2)). There are 7 total Sparqs, so each Sparq has 6 electrical bonds with other Sparqs for a total of 6+5+4+3+2+1=21 electrical bonds. Some of those bonds are at angles to the axis of rotation, and some of the Sparqs are

50 It is possible that gravitational attraction results from the 'dangling' magnetic lines of force of each particle lining up with infinitely extending magnetic fields in space.

ON the axis of rotation. All of this must be considered in calculating total energy.

Note that the electron structure is stable because it is symmetrical, i.e., all yorks are at the same distance (r_y=AO=BO=CO=DO=EO) from the FG axis of rotation, with angles AOB=BOC=COD=DOE=EOA=72°, ABO=BCO, etc.=54°, ACO, etc.=18°; FAO, etc.= θ (to be determined through vector analysis).

The following factors must be included in the vector analysis of the electron: There are 5 repulsive potential energy electric bonds at AB, BC, CD, etc.; there are 5 repulsive bonds at AC=BD, etc.; there are 10 attractive bonds at AF=AG=BF, etc.; and 1, very strong repulsive bond at FG which is at the axis of the electron. The magnetic bond at FG is **attractive** and must be balanced with the sum of **repulsive** Coulomb bonds acting on F and G (which is reduced by the 10 very small attractive electrical bonds between the FG axis and each peripheral zork, at sin θ at both F and G). The magnetic forces at F and G are axially oriented and do not affect the zorks at A,B,C,D,E, but the rotation of A,B, etc., around FG, WILL generate a magnetic field for the electron as a whole, so there will be 5x m_z (=3.25×10^{-31} kg) units of mass orbiting at a distance of AO = r_e) at a velocity of u_e, and that will constitute the kinetic energy of the system.

Note, however, that F and G are ON THE AXIS and contribute nothing to the spin energy—only the five peripheral zorks are a common distance (r_e) from the center of the electron. Thus, the moment of inertia of the electron is $I_e = 5m_z r_e^2$, its kinetic energy is $E_{eKE} = ½\, m_e\, u_e^2$, and the rest-mass energy of the electron is $E_e = m_e\, c^2$.

I do not possess the mathematical skills to conduct the vector analysis. Thus, I will leave that task to those who can do it effectively.

Nevertheless, I believe we have already found the best method to obtain a good estimate of the dimensions of the electron. In Chapter 10 you will find that we calculate the mass of the n2 neutito from one possible form of the annihilation of an anti-matter positron as it interacts with a matter-electron. A similar approach will be described for the electron in that chapter.

Thus, the electron is essentially a thin disk and will possess a spin of S=½ at the velocity of u_e (see Chapter 12). Once all the non-Sparq energies have been added, subtract them from $m_e c^2$ (=8.20×10^{-14} kg- m^2/sec^2) to obtain the calculated values of electron mass (m_e), rotational velocity (u_e), the value of α_e, and its frequency (f_e) of rotation.

The Cylindrical Electron and Positron

But the Star-shape is not the only possible geometric form of the electron. Suppose the electron axis had THREE, equally-spaced Sparqs on it (arranged yzy). This is what TOPS calls the 'Cylindrical Electron Form.'

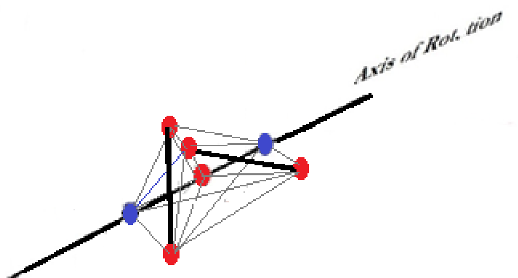

Figure 7-2 The Cylindrical Electron Form

This possible form of the electron does NOT generate a disk but a structure more like a cylinder as it spins about its axis and it is more related to the structure of the down-quark with odd numbers of Sparqs on the axis, as shown later in this chapter.

Note that all Sparqs in this model are either on the axis or are equidistant from the axis.

All aspects of the Star-Form structure need to be considered in the vector analysis of the Cylindrical Electron form, but here we will not spell them out in the detail we used with the Star-Form narrative.

The Up-Quark and Higher Order Neutrinos

In the case of the up-quark, and neutrinos, these structures are always oppositely charged Sparqs with the successive pairs arranged 90^{o} apart and all at the same distance from the axis, but they generate a cylindrical shape as they rotate. (Figure 7-3)

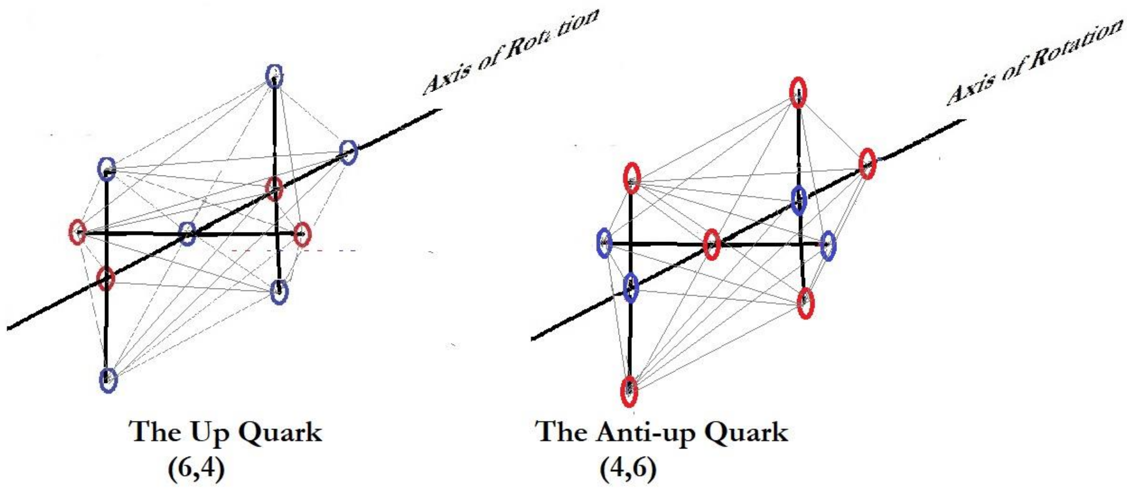

Figure 7-3 The Up-Quark Family (Even numbers of Sparqs)

(Also, Neutrinos, n4 and above, but with NO Sparqs on the axis.)

The up-quark family includes the Charm and Top quarks and all neutrinos from n4 and up-type of quarks. Higher orders of the family are extensions of [3,3] added to the length of the axis. Note that all members of this family have even numbers of Sparks and that all Sparqs are either on the axis of rotation or are at the same fixed distance from that axis.

For the +2e/3 family of quarks, however, the cluster of Sparqs in the core or axis are a focus of the binding energy. The presence of the particles on the axis do NOT affect the Spin energy, but the Up, Charm, and Top should all have the same radii! Because of their different Sparq content, they will have different Sparq masses and binding energies.

This essential pattern also holds for the entire neutrino family above the n2 neutito, except that, for NEUTRINOS, the Sparq-pairs are always opposite in charge and there is NO Sparqs on the rotating axis to form a core. As for the neutrinos, their yorks and zorks are all at the common radius-distance from the axis and all contribute to the spin energy. (See Figure 7-3.) Thus, the analysis of these two particles will have quite different angular momenta and their radii will be different even though BOTH the up-quark and the n10 neutrino, have the same number of Sparqs.

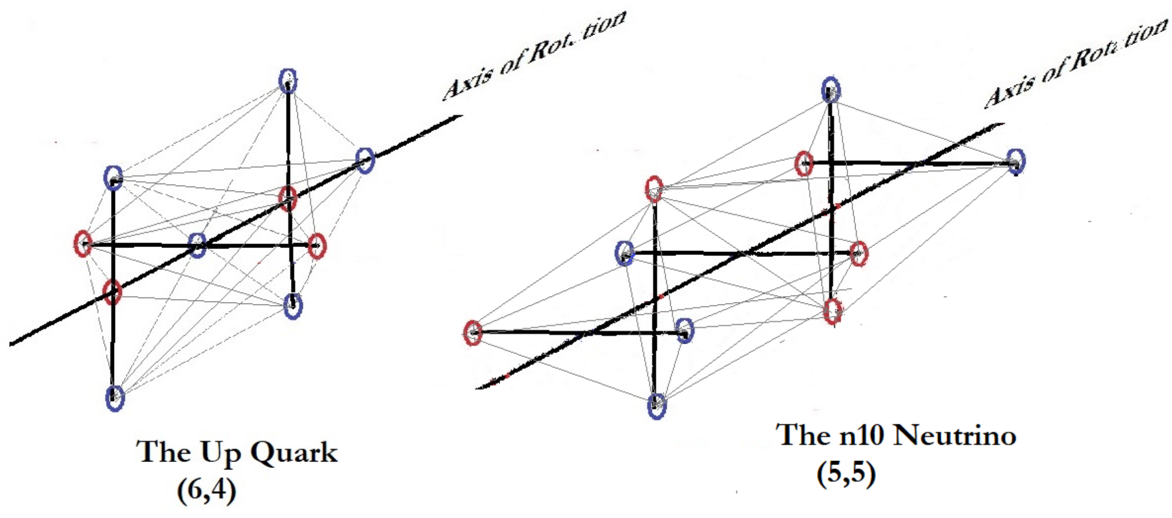

Figure 7-4 The Up-Quark vs the n10 Neutrino

The Down-Quark

In the case of the down-quark these are based on tetrahedron-shapes, each of which consists of two yorks and two zorks, one of which is **on** the axis of rotation and other three are **equally space**d, 120º apart, with the entire structure sweeping out a cylindrical shape as it rotates in space. All Sparqs that are NOT on the axis are equidistant from the axis. (Figure 7-5)

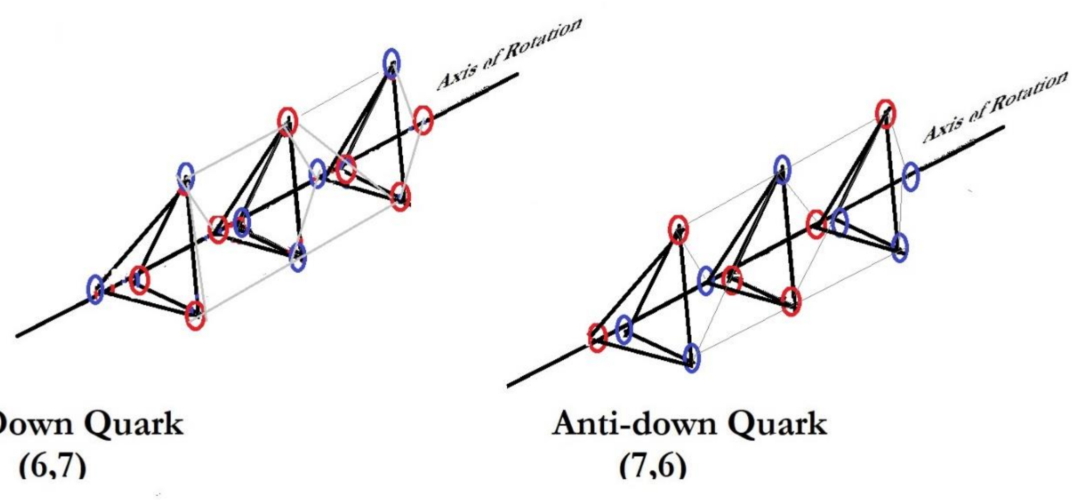

Figure 7-5 The Down-quark Family (Odd number of Sparqs)

Note for both the up- and down-quarks, there are clusters of tetrahedrons, each with 2 yorks and 2 zorks and that the rotation of each quark around its axis of rotation would generate a cylindrical shape so it has a spin of ½. Higher orders of the family (Strange and Bottom) are extensions of [3,3] added to the length of the axis.

The up- and down-quarks must be analyzed in a similar way as the electron. Both quarks are symmetrical as is the electron, but angles are different.

Because they have more Sparqs, however, means that there are more electrical bonds, complicating the issue of analysis. Magnetic bonds also appear in the geometry of oppositely charged particles which have the same axis of rotation, especially in the down-quark, where they are closer together than in the up-quark. Magnetic bonds, however, always operate at the axis or core of a particle, where there is a geometric relationship in which the Sparqs' planes of rotation have a common axis of rotation. Because the electric forces must equal the magnetic forces, the spacing between adjacent Sparqs on the core (where they are all ON the axis) will be fixed for a single particle. The angular momentum of that particle will be based upon the number of Sparqs that are NOT on the axis of rotation.

Nucleons

When considering the nucleus, we are getting to the point of ATOMIC structure. There is common agreement that a proton consists of two up-quarks and one down-quark. TOPS predicts that those particles are in continual orbital motion, just as Sparqs themselves are rotating in the smaller realm, and the electrons are orbiting the nucleus in the larger, atom-sized realm. Accordingly, TOPS predicts a consistent orbital structure of the quarks within the nucleon.

In TOPS, the proton is seen to be formed from two up-quarks orbiting one down-quark. The proton is permitted to stand alone in atomic structure. Thus, in atomic structure, the proton may be neutralized by an electron to form a hydrogen atom.

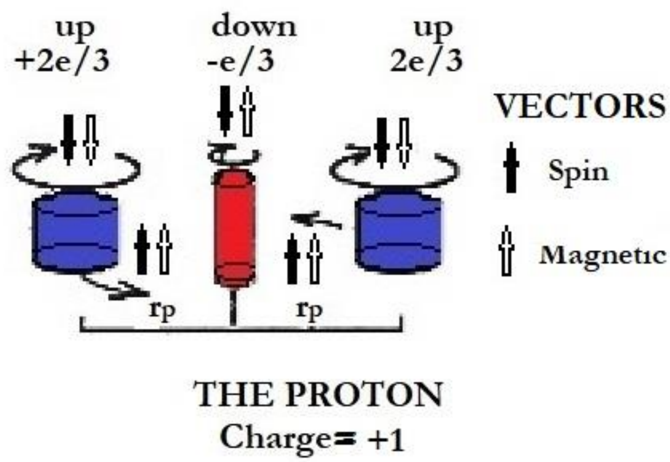

Figure 7-6 Nucleons--The Proton

In TOPS, the neutron is seen to be formed from two down-quarks orbiting one up-quark, but the neutron does not stand alone except for the hydrogen atom. Otherwise, it is always found attached to one or more protons.

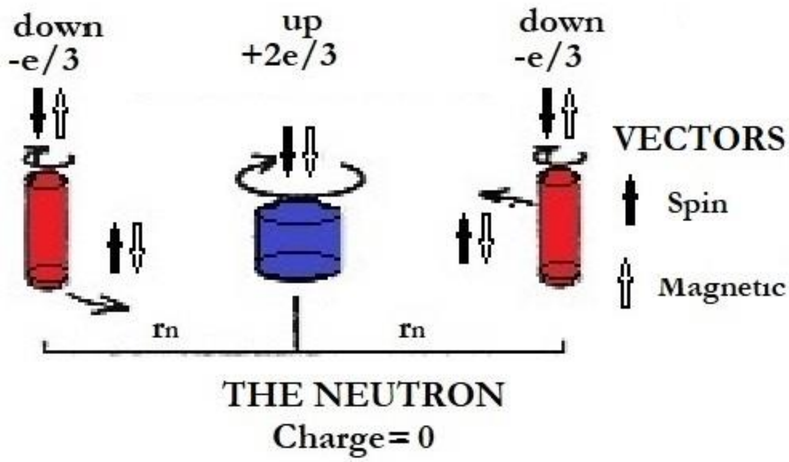

Figure 7-7 Nucleons--The Neutron

Nuclei of Atoms

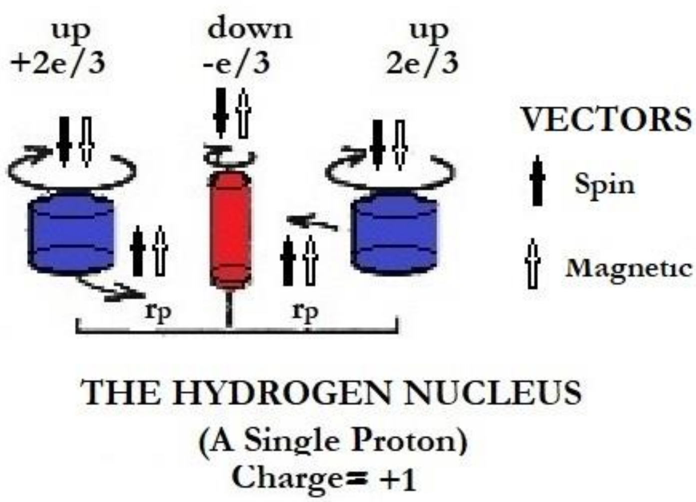

Figure 7-8 Nucleons--The Hydrogen Nucleus

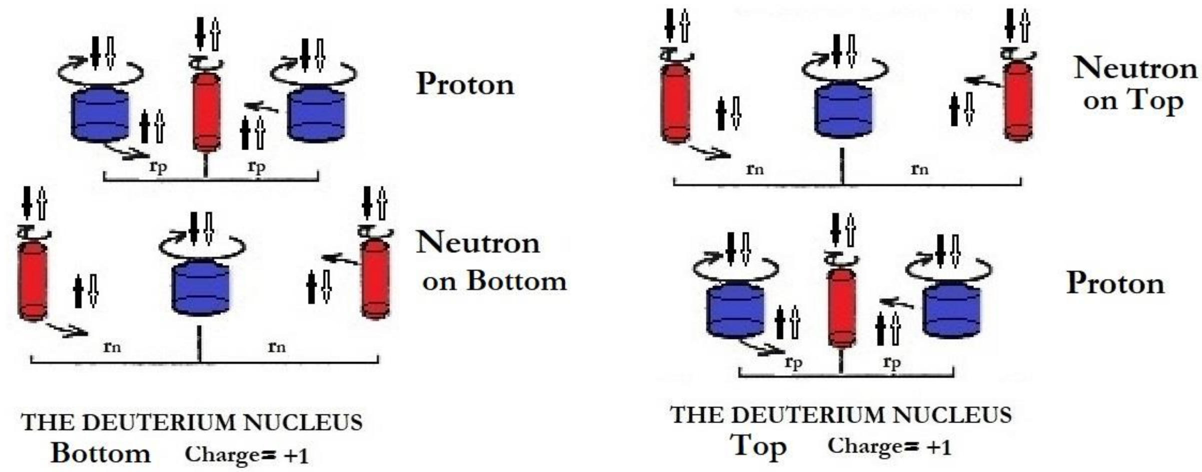

Figure 7-9 Nucleons--The Deuterium Nucleus

Except for cases of atom decay, the neutron does not stand alone, it is always found attached to one or more protons. In the case of the hydrogen atom, the added neutron produces a deuterium nucleus. This about doubles the mass of the atom, but it still has the chemical properties of hydrogen. It is expected that the proton and neutron are 'locked' together in that they spin about a common axis at identical velocities with the down-quark of one nucleon always linked with the up-quark of the other nucleon. Thus, the two particles rotate at the same velocity and frequency. This linkage is assumed because the opposite charges would be matched and would produce an attractive Coulomb force on each other, but would also be generating a balanced, repulsive magnetic force on each other. There are TWO forms of the deuterium nucleus as shown in 7N-4. For lack of a better term, I call them 'Neutron on Top' and 'Neutron on Bottom.'

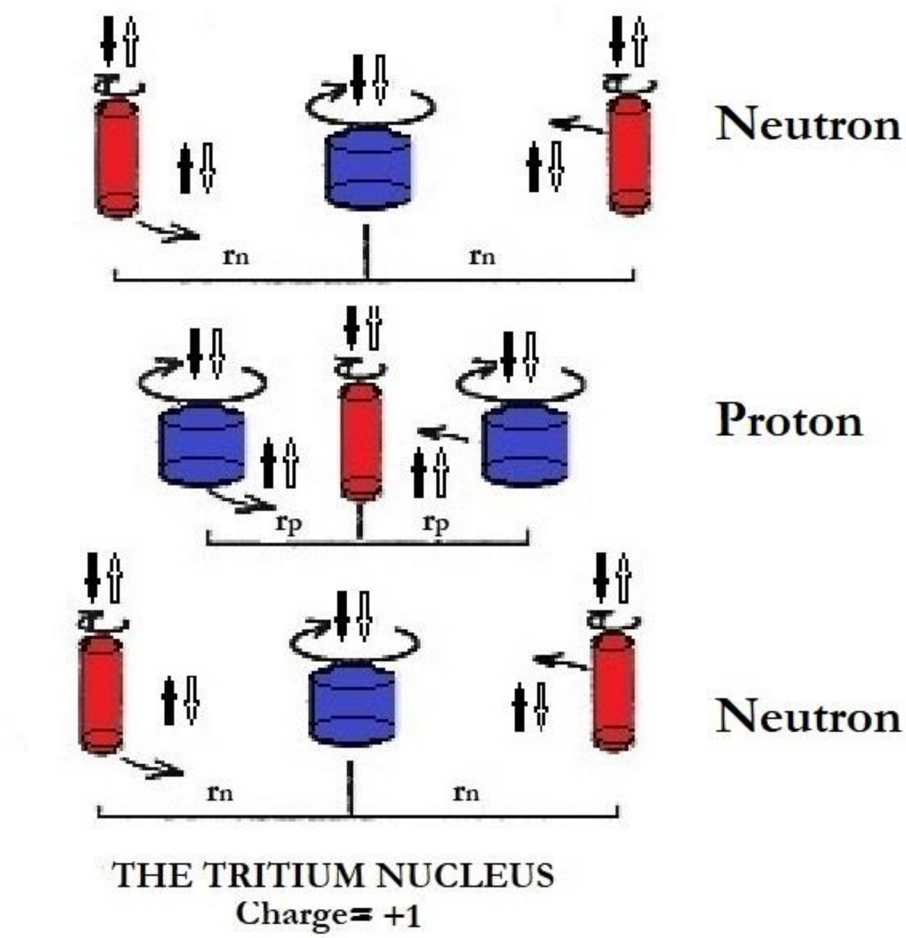

Figure 7-10 Nucleons--The Tritium Nucleus

There is only one form of Tritium, and it is formed from a proton sandwiched between two neutrons. The Tritium atom with a neutron sandwiched between two protons is an isotope or form of helium.

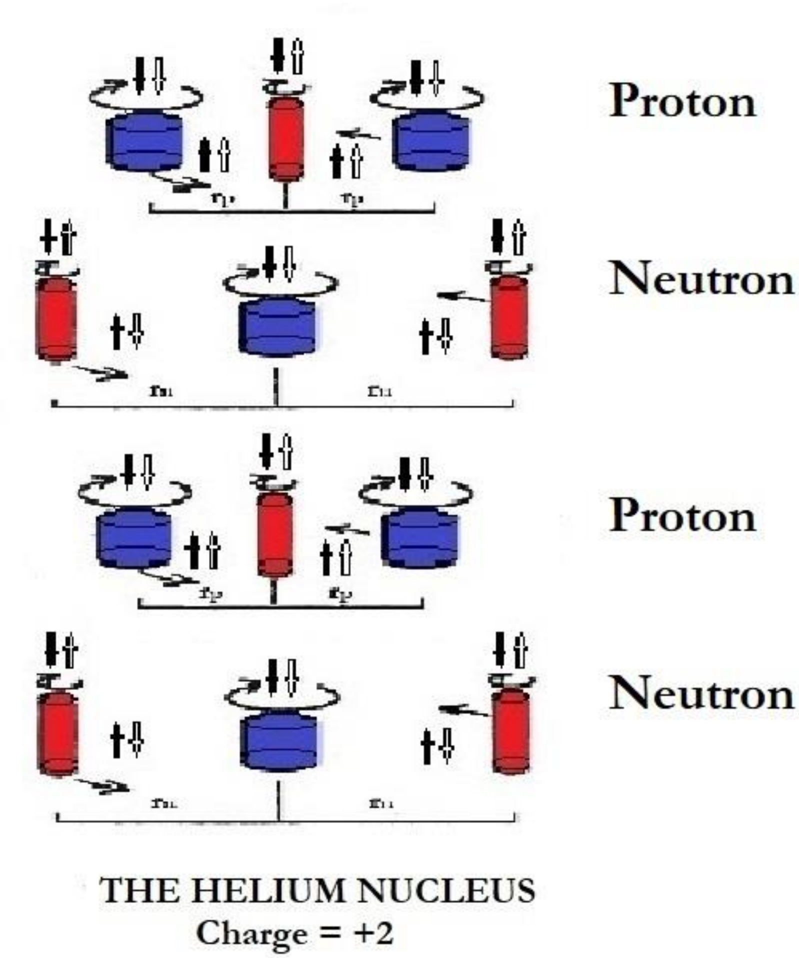

Figure 7-11 Nucleons--The Helium Nucleus

Adding a proton to the nucleus of a tritium atom would produce a helium atom. As in the deuterium nucleus, there are two possible arrangements of the protons and neutrons. Figure 7N-6 shows only the 'Neutron on Bottom' form, but the 'Neutron on Top' form is also possible.

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QUO VADIS?

Chapter 8 – Particle Decay and the Matter/Anti-Matter Paradox

Introduction to Particle Decay

This chapter provides the reason that TOPS structures prohibit anti-matter from coexisting with matter. This is not to say that anti-matter does not exist, for we see its inescapable evidence in cosmic rays and the particle sprays in our huge colliders such as the Large Hadron Collider (LHC) at CERN on the French/Swiss border.

From the TOPS viewpoint, the LHC has two, counter-rotating beams of protons that are smashed into each other, momentarily fusing the contents of both protons into a single, larger conglomerate particle, before it flies apart (decays) into a multitude of smaller particles, some of which have charges and others which are electrically neutral.

But those high energy sprays of particles are in the process of losing energy by breaking down into ever smaller particles, and many of those explosive changes are happening within the tiniest fraction of a second, so most of those particles are often existing in an excited state for a very short time. We never actually 'see' these particles because they are way too small to see, but the huge detectors surrounding the point of collision register their existence many times as they pass through magnetic fields of known strength, each particle, triggering multiple sensors which track the particle paths.

The magnetic fields cause charged particles to make curved paths which are recorded by super computers which gather every 'ping' from the detectors and save the patterns to digital memory. Later, the computers calculate each charged particle and generate pictures of each track. A curved track indicates the presence of a charged particle, and the direction and radius of the curve gives information on the charge and mass of the particle. If one track suddenly stops, it indicates a collision or change in charge. A track change indicates a decay of some invisible (neutral) particle and new tracks may appear, going in different directions from that point.

The LHC whirls hydrogen nuclei (protons) around a circular path at close to the speed of light (better than 99% of light speed). Current theory holds that these protons are made of three quarks, two up-quarks and one down-quark. Refer to the TOPS Standard Model and considerations in Chapter 7 for the proposed structures for each higher order TOPS particle.

Note that the TOPS up-quark consists of six yorks and four zorks (6,4) so there are twelve yorks and eight zorks in the two up-quarks. There are also six yorks and seven zorks in a down-quark, so the proton consists of a total of [18,15] particles in a single proton. Thus, when the LHC slams two protons together, there are [36,30] total particles which momentarily fuse and immediately begin to decay into permitted structures.[51] Note the use of parentheses ( ) which identify TOPS Standard Model (permitted) structures. Permitted structures include those which produce structures having a charge of 0e, ±1e, or more whole number times that of the electron. For example, at the atomic level, a hydrogen atom's single, -1e charged electron, orbits around a single, +1e charged proton. Except for the simplest atom, hydrogen, all atoms also have at least one neutral particle called the neutron. Because all atoms are made of electrons, protons, and neutrons, we may have a composite charge of units of 0e, ±1e, ±2e, ±3e, etc., at the atom level—we never find fractional charges at that level.

The discovery of quarks in the mid-1960s complicated things. Quarks are also permitted particles, with the down-quark having a fractional charge of -e/3 and the up-quark having a fractional charge of +2e/3. But 'free' quarks are not permitted and are detected only in the tiny fraction of a second following the initial collision. Each quark's fractional charge is always balanced by one or two other quarks' fractional charge(s) at the atom level. Thus, a proton consists of two up-quarks (at +2e/3 each) and one down-quark (at -e/3). The proton's net charge at the atomic level is the sum of its charges and that is always multiples of +e (i.e., for the udu proton, {+2e/3 + (-e/3) + 2e/3} = {+4e/3 + -e/3} = 3{+e/3} = +1e. The neutron is neutral because it consists of two down-quarks (at -e/3 each) and one up-quark (at +2e/3) and balances out at 0e, because 2(-e/3) + (+2e/3) = 0e.

The TOPS model of the up-quark is $(6,4)^{+2e/3}$, i.e., it is made of 6 yorks and 4 zorks and has a composite charge of +2e/3. The TOPS model of the down-quark is $(6,7)^{-e/3}$. We usually do not show the charge so, (6,4) represents an up-quark, and (6,7) represents a down-quark and we mentally note that there are two excess fractional e/3 charges on the up-quark and only one on the down-quark. To find the next higher

[51] Permitted structures are those which are in the TOPS Standard Model and their anti-matter counterparts. A theoretical structure of ~~[1,4]~~ would have the same charge as an electron, but there is no TOPS Sparq structure that would give the charge of the electron except for (2,5). Drawing the line through the ~~[1,4]~~ indicates it is NOT a permitted structure.

generation of quark in the up family, simply add [3,3] to get a new structure of (9,7) for the charm quark, and (9,10) for the strange quark. Add another [3,3] to charm and you get the top quark at (12,10) and the bottom is (12,13).

This simple rule, +[3,3] pattern produces all PERMITTED higher order members of the TOPS Standard Model. NO OTHER COMBINATIONS OF SPARQS ARE PERMITTED. Thus, if one should find a proposed decay series of permitted particles and is left with ANY fragment such as [4,5], this is NOT a permitted pattern of decay. If any such fragment must result (and all particles must be accounted for), the hypothetical decay pattern must be rejected, for that supposed particle cannot exist. The entire sequence of daughter particles needs to be in the PERMITTED category or that decay pattern is not permitted.

The use of brackets [ ] indicates the total number of yorks and zorks (always in that sequence, left-to-right) that are available for consideration in particle decay options. Note that the Sparqs in brackets do NOT indicate any particular structural organization--they only show how many of each type of particle are available for decay at the point of impact. You may think of the brackets as indicating a very-momentary composite without structure at all, for it immediately begins the process of decay to smaller and more stable structures.

Consider the 'positron-emission' decay, in which the up-quark, decays into a down-quark. This does NOT happen on its own in TOPS. It only happens when a highly unstable, and relatively rare neutrino (n10, n16, or n22) randomly collides with an up-quark in a proton.[52] The result is that the up-quark will change to a down-quark and the kind of atom changes because the proton has been changed to a neutron. This decay will NEVER happen with an up-quark in a neutron, for that would make the particle have THREE down-quarks and NO up-quarks, a non-permitted structure. Note that (5,2) is anti-matter--a positively charged anti-electron.

n10 up → +e down
(5,5) + (6,4) → [11,9] → (5,2) + (6,7)

Again, note that the up-quark (6,4) changes to a down-quark (6,7) with an anti-matter electron (a positron) being produced in the decay. The bracketed [11,9] simply indicates that the combination of the n10 and the up-quark has a total of 11 yorks and

52 An up-quark in a neutron cannot change into a down-quark, for that would constitute a NON-permitted structure consisting of three down-quarks. An up-quark in a proton can change to a down-quark, the result becoming a permitted neutron.

9 zorks and this number cannot change, for that is all there IS available to keep all particles in a 'permitted state.' But note that 'permitted state' condition also includes the higher level of atomic structure. Thus, one of the proton's two up-quarks may decay into a down-quark, changing the proton to a neutron. (The opposite is also true. In a neutron, one of the two down-quarks may change to an up-quark, changing it to a proton. We will show those decay paths in the following pages.)

First-Generation Particles CANNOT Decay

We will now demonstrate that the First-Generation MATTER particles CANNOT decay by themselves, because at least one unpermitted structure would result. The following examples show only to the n4 electron neutrino because the n4 neutrino may only decay to (1,1) n2 neutrinos or (1,1)φ photons, as demonstrated above. (An unpermitted structure is shown with a cross-out as in ~~[4,-1]~~ when such an unpermitted particle would have to result. The repeated use of NO is just a strong reminder that this proposed decay pattern is NOT permitted because at least one proposed particle is NOT PERMITTED.)

Can we change the??

Up (To an electron?) -e
(6,4) NO→ [6,4] NO→ (2,5) + ~~[4,-1]~~ NO, an up-quark cannot decay to
an electron! NOT PERMITTED.

Up (To an n4?) n4
(6,4) NO→ [6,4] NO→ (2,2) + ~~[4,2]~~ NO, an up-quark cannot decay to
An n2 neutrino! NOT PERMITTED.

Down (To an electron?) -e
(6,7) NO→ [6,7] NO → (2,5) + ~~[4,2]~~ NO, a down-quark cannot decay to
an electron! NOT PERMITTED.

Down (To an n4?) n4
(6,7) NO→ [6,7] NO→ (2,2) + ~~[4,5]~~ NO, a down-quark cannot decay to an
electron neutrino.

The antiparticles are permitted the same kind of decay as matter particles. Thus, this short list includes every possible decay route from Generation Three particles down to the smallest possible particles, the n2 neutitos (1,1) and photons

(1,1)φ which represent the indivisible 'ash' of the universe. Whenever a **(1,1)φ** photon is produced, it is carrying away all the remaining, energy which TOPS calls the Triggering Energy.

Thus, ALL First-Generation particles are already in their lowest possible energy states and can never decay into smaller particles.

Alternative Results of Electron/Positron 'Annihilation'

There are multiple ways that electron/positron combinations can decay according to the TOPS rules. This process is called Annihilation Radiation (AR), for it always produces one or more high-energy AR photons. I do not know whether all the following AR possibilities are possible or demonstrable in the laboratory, but regardless of WHICH AR alternatives predominate, note that the electron and positron no longer exist AS SUCH. Conventional physics calls that process 'annihilation' and hold that all evidence of the electron/positron pair have been changed into photon energy, but in TOPS, we assume that the yorks and zorks in those two particles do NOT cease to exist—they have just decayed to component neutrinos and photons which have the same components (yorks, zorks, and energy), but are arranged differently. Here, we demonstrate some of the TOPS theoretical possibilities of 'annihilation' of an electron (2,5) and its anti-matter counterpart, the positron (5,2).

.

-e +e → n10	COMMENTS
(2,5) + (5,2) → [7,7] → (5,5) + (2,2)	n10 neutrino+electron neutrino (n4)
↳ **(5,5) + (2,2)φ**	n10 neutrino + n4 proto-photon
↳ **(5,5) + 2 (1,1)φ**	n10 neutrino + 2 **(1,1)φ** Photons called **Annihilation Radiation (AR).**
↳ 3**(2,2) + (1,1)φ**	Three electron neutrinos **+ (1,1)φ** Photon called **Annihilation Radiation (AR).**
↳ 6**(1,1) + (1,1)φ**	Six n2 neutitos and **one AR.**

In the last case ALL energy, except for the Binding Energy (BE) in the 6 n2 neutitos, is converted into a single high energy gamma ray (AR photon). This mode is also called **Annihilation Radiation (AR) but this particular AR has twice the energy of those previous decay's AR.**

Note that all final products of this interaction result in particles we call MATTER and fit into the Standard Model. Later in this chapter we will show that ALL 'annihilation' reactions result in smaller MATTER particles. **Note also, that it is not necessary that all of these decays actually exist! Here, we are only considering all possible paths that would produce permitted particles. We KNOW that the final path (where ALL energy is emitted as a single gamma ray) exists because it has been measured numerable times and is called 'Annihilation Radiation (AR).' As far as TOPS is concerned, however, this AR does NOT have quite as much energy as is conventionally taught. The reason for this discrepancy will be covered in Chapter 10.**

Instability of Muon Neutrinos

Like all higher order generations of the Standard Model, n10 muon neutrinos are unstable. Because of that instability, they react readily with permitted First Generation Matter quarks as follows:

n10 up → +e down	
(5,5) + (6,4) → [11,9] → (5,2) + (6,7)	up converts to down with +e
↳ 6(1,1) + (1,1)φ	annihilation radiation (AR)
n10 down → up muon	
(5,5) + (6,7) → [11,12] → (6,4) + (5,8)	down converts to up with muon emission (but the muon also decays as will be seen later)
n10 -e → -e n10	
(5,5) + (2,5) → [7,10] → (2,5) + (5,5)	with no effective change, so there is NO observable interaction between an n10 and ±e

Decay of Higher Order Quarks and Leptons

Higher order quarks and leptons decay to lower order particles of the same variety of MATTER. For example, Top decays to Charm which decays to Up in the presence of n10 neutrinos as follows:

Top n10 Charm n16

(12,10) + (5,5) → [17,15] → (9,7) + (8,8) → (5,5) + [3,3]

↳ 4 (2,2) ↳ (2,2) + (1,1)

↳ 4 (2,2)φ ↳ (2,2)φ + (1,1)φ

↳ 8 (1,1)

↳ 8 (1,1)φ

Charm decays to Up.

Charm n10 Up n16

(9,7) + (5,5) → [14,12] → (6,4) + (8,8) → (5,5) + [3,3]

↳ 4 (2,2) ↳ (2,2) + (1,1)

↳ 4 (2,2)φ ↳ (2,2)φ + (1,1)φ

↳ 8 (1,1)

↳ 8 (1,1)φ

Bottom decays to Strange which decays to Down in the presence of n10 neutrinos in several alternate ways as follows:

Bottom n10 Strange n16

(12,13) + (5,5) → [17,18] → (9,10) + (8,8) → (5,5) + [3,3]

↳ 4 (2,2) ↳ (2,2) + (1,1)

↳ 4 (2,2)φ ↳ (2,2)φ + (1,1)φ

↳ 8 (1,1)

↳ 8 (1,1)φ

Strange n10 Down n16

(9,10) + (5,5) → [14,15] → (6,7) + (8,8) → (5,5) + [3,3]

↳ 4 (2,2) ↳ (2,2) + (1,1)

↳ 4 (2,2)φ ↳ (2,2)φ + (1,1)φ

↳ 8 (1,1)

↳ 8 (1,1)φ

Tau decays to Muon which decays to Electron in the presence of n10 neutrinos in several alternate ways as follows:

Tau n10 Muon n16
(8,11) + (5,5) → [13,16] → (5,8) + (8,8) → (5,5) + [3,3]
↳ 4 (2,2) **↳ (2,2) + (1,1)**
↳ 4 (2,2)φ **↳ (2,2) + (1,1)φ**
↳ 8 (1,1)
↳ 8 (1,1)φ

Muon n10 Electron n16
(5,8) + (5,5) → [10,13] → (2,5) + (8,8) → (5,5) + [3,3]
↳ 4 (2,2) **↳ (2,2) + (1,1)**
↳ 4 (2,2)φ **↳ (2,2) + (1,1)φ**
↳ 8 (1,1)
↳ 8 (1,1)φ

Higher order ANTI-quarks and ANTI-leptons **may** decay to lower order particles of the same variety of anti-matter. **MAY**, however, is an operative condition here. These equations show all PERMISSIBLE particle decays, but we know that sometimes **all** available energy is converted into one, very energetic gamma ray photon with the balance of the Sparqs becoming n2 neutito ash with minimal mass. In this kind of case, the theoretically alternate permissible decays will not exist. Note that even IF there are intermediate decay particles, **the final products of anti-matter are now also MATTER!** ANTI-Top decays to ANTI-Charm which decays to ANTI-Up in the presence of **n10 neutrinos which are often regenerated** during the decay, in alternate ways as follows:

ANTI-Top n10 ANTI-Charm n10
(10,12) + (5,5) → [15,17] → (7,9) + (8,8) → (5,5) + [3,3]
↳ 4 (2,2) **↳ (2,2) + (1,1)**
↳ 4 (2,2)φ **↳ (2,2) + (1,1)φ**
↳ 8 (1,1)
↳ 8 (1,1)φ

ANTI-Charm n10 ANTI-Up n16 n10

(7,9) + (5,5) → [12,14] → (4,6) + (8,8) → (5,5) + [3,3]
↳ 4 (2,2) ↳ (2,2) + (1,1)
↳ 4 (2,2)φ ↳ (2,2) + (1,1)φ
↳ 8 (1,1)
↳ 8 (1,1)φ

ANTI-Bottom may decay to ANTI-Strange which decays to ANTI-Down in the presence of n10 neutrinos in alternate ways as follows:

ANTI-Bottom n10 ANTI-Strange n16 → n10
(13,12) + (5,5) → [18,17] → (10,9) + (8,8) → (5,5) + [3,3]
↳ 4 (2,2) ↳ (2,2) + (1,1)
↳ 4 (2,2)φ ↳ (2,2) + (1,1)φ
↳ 8 (1,1)
↳ 8 (1,1)φ

ANTI-Strange n10 ANTI-Down n16 → n10
(10,9) + (5,5) → [15,14] → (7,6) + (8,8) → (5,5) + [3,3]
↳ 4 (2,2) ↳ (2,2) + (1,1)
↳ 4 (2,2)φ ↳ (2,2) + (1,1)φ
↳ 8 (1,1)
↳ 8 (1,1)φ

ANTI-Tau decays to Anti-Muon which decays to ANTI-Electron in the presence of n10 neutrinos in alternate ways as follows:

ANTI-Tau n10 Anti-Muon n16 → n10
(11,8) + (5,5) → [16,13] → (8,5) + (8,8) → (5,5) + [3,3]
↳ 4 (2,2) ↳ (2,2) + (1,1)
↳ 4 (2,2)φ ↳ (2,2) + (1,1)φ
↳ 8 (1,1)
↳ 8 (1,1)φ

Anti-Muon n10 ANTI-Electron n16 → n10

(8,5) + (5,5) → [13,10] → (5,2) + (8,8) → (5,5) + [3,3]

↳ 4 (2,2) **↳ (2,2) + (1,1)**

↳ 4 (2,2)φ **↳ (2,2) + (1,1)φ**

↳ 8 (1,1)

↳ 8 (1,1)φ

ANTIMATTER WILL EVENTUALLY BE ANNIHILATED TO SOME FORM OF MATTER

But some matter-anti-matter combinations will NOT involve annihilation because unpermitted structures would have to be produced. Here are a few examples where annihilation of matter and antimatter will or will NOT take place and whether Annihilation Radiation (AR) is produced.

Can the positron annihilate with an up??

+e + up???

(5,2) +(6,4) NO→ [11,6] NO lower order particle can be produced from this except for the positron plus NON-PERMITTED fragments. NO AR is produced.

Can the positron annihilate with a charm??

+e + charm???

(5,2) +(9,7) → [14,9]

↳ (6,4) + (8,5) up + anti-muon

↳ [13,8] + (1,1)φ AR YES

↳ (6,4) + (5,2) + 2(1,1)φ 2AR but +e regenerated. For a total of 3 ARs, but there is still an antiparticle.

Can the positron annihilate with an anti-charm??

+e + anti-charm???

(5,2) +(7,9) → [12,11] NO

↳ (2,5) + ~~[10,6]~~

↳ (5,2) + ~~[5,4]~~

↳ (6,4) + ~~[4,2]~~

NON-PERMITTED fragments. NO AR produced.

Can the positron annihilate with a down??

+e + down???

(5,2) + (6,7) → [11,9] → up + tau neutrino

↳ **(6,4) + (8,8) But there is NO AR!**

Why Do We Live in a Matter-Only Universe?

But why are the antiparticles not represented in our universe in the same way as matter particles?

BECAUSE, EVERY ANTI PARTICLE WILL COMBINE AND DECAY, WITH A MATTER PARTICLE AS FOLLOWS: (Since we have already shown all decay products of higher orders of matter and the rules would be the same for anti-matter, we will consider only Generation One particles of anti-matter. Note that Annihilation Radiation (AR) is shown in **bold type face.**):

Up ANTI-Up Photons and/or Neutrinos

(6,4) + (4,6) → [10,10] → 2 (5,5) → 10 (1,1)

↳ 9(1,1) + **(1,1)φ**

Down ANTI-Down Photons and/or Neutrinos

(6,7) + (7,6) → [13,13] → (5,5) + (8,8) → 13 (1,1)

↳ 12(1,1) + **(1,1)φ**

-e ANTI-Electron Photons and/or Neutrinos

(2,5) + (5,2) → [7,7] → (5,5) + (2,2)

↳ 6(1,1) + **(1,1)φ**

Up ANTI-Down ANTI-Electron and/or Neutrinos

(6,4) + (7,6) → [13,10] → (5,2) + (8,8) → 13 (1,1)

↳ (8,8) + 7(1,1) + **(1,1)φ**

(The resulting anti-electron (5,2) would have a subsequent AR event with another matter particle as shown above.)

Down ANTI-Up Electron Neutrinos and Photons
(6,7) + (4,6) → [10,13] → (2,5) + (8,8) → 8(1,1)
↳ (2,5) + 7(1,1) + **(1,1)φ**

Note that, once we get down to the neutrino level, all the particles are their own antiparticles, so, at the neutrino and photon levels, they are still matter! This is KEY to the understanding of why we do not have antiparticles in our macro-world.

THE END RESULT OF ALL ANTI-MATTER PARTICLE DECAY IS PHOTONS AND NEUTRINOS WHICH ARE ALSO MATTER (!!), ALBEIT THE LOWEST LEVEL OF SUBATOMIC PARTICLES OF MATTER.

Except for those very transient, anti-matter particles involved in decay, this process always keeps our universe in the ALL-MATTER mode. This balance, however, comes at a price. We are destroying hunks of organized matter structures (the Standard Model structures) and are reducing them to the smallest possible particles—light which we can (sometimes) see, and the neutrinos which we cannot see, feel, smell, hear, or sense in any way.

Every time we smash two protons together and get a shower of particles, the amount of matter always exceeds that of anti-matter. All the anti-matter is reduced to ashes of either photons that travel until they hit our eyes or something else to give off their energy, or to unreactive neutrinos. It seems to me that these invisible neutrinos are good candidates for the 'missing' Dark Matter of the universe.

This would explain why our universe is overwhelmingly made of matter when current theory suggests that matter and anti-matter SHOULD have been created in equal amounts.

I do have an alternate suggestion if it turns out that my conclusion above, is wrong based on TOPS not being a valid model. Perhaps, at the time of the Big Bang, that matter and anti-matter **were** produced in equal amounts, but that **the Big Bang was the event that blew them apart.** If so, most matter would have gone in one direction and most anti-matter would have gone in the other direction.

The consequence of this is that the small amount of matter that ended up in the anti-matter-half of the universe would combine with anti-matter and decay into neutrinos and photons. Similarly, the small amount of anti-matter that came in the matter-half of the universe would also decay into the exact, same particles photons and neutrinos.

But if this were the answer, why can't we SEE the anti-matter half of the universe? **I would say we WOULD see it and in the same way we see the matter universe. The anti-matter atoms would act in the same way that matter atoms do in emitting energy.** Thus, the photons produced in an anti-matter star would be identical to those that come from a similar matter star. We can't tell the difference since all we can 'see' of the universe consists of photons and the rare, few high-energy neutrinos that we manage to capture, and those particles are identical in Sparq makeup regardless of the half of the universe in which they originated.

AND THAT IS ALL THERE IS TO
THE MATTER/ANTI-MATTER PARADOX.

Dark Matter—It's EVERYWHERE!

I believe it is also the answer to where most of the Dark Matter resides.

IT'S EVERYWHERE, IT'S EVERYWHERE!!!

What do I mean, 'It's Everywhere?'

Taking a TOPS perspective, I mean simply, that everything there is in the universe is matter and, MOST of it is totally invisible to us in our daily lives. Most of that matter is at the 'ash' end of the universe, starting at the very bottom of the Standard Model chart--in short, all neutrinos, invisible photons, and proto-photons. The n2 neutitos are neutrinos, particles which rarely interact with ANYTHING—but they are shot out, in their profuse numbers, sent flying by the billions, from the thermonuclear reactions in the heart of every roiling star, far across the universe—flying on and on, ever further and further from their original sources, but each flying in a different direction--and so small that they rarely even touch a larger particle in their millions of years of space travel to our earth. By far, most of the larger particles they DO touch are totally unaffected and allow them to pass through, unimpeded in any way.

The only particles that we can **see** are the photons which are also sent out by the same stars that ejected the n2 neutitos, but all we can **see,** are those relatively small numbers which affect the retinas in our eyes—the visible spectrum of red, orange, yellow, green, blue, and violet. But there is a vast world of photons that do not affect our vision, those at the low energy level below the red, and those at the higher energy level than the violet. These photons possess Sparq masses like those of the n2 neutito, but by far the most of them are dark and totally invisible to the human eye. Human ingenuity, however, has allowed us to develop scientific instruments that can measure almost any photon, even those that are invisible to our eyes.

Thus, our earth, and indeed, the entire universe, is awash in a continuously moving sea of these particles, coming from all directions, and going to all directions, and most of which are not detectable at all. But, while the bombardment of those particles is ever-present, there is no sense of directional flow, because each particle has its own path and no one direction is preferred over another, unless it passes a near-by mass in its journey through space. Each particle is separate and unaffected by the others, so they exhibit no 'drag' as they pass right through us in space.

TOPS conceives of the universe being pretty much constant in the overall density of these, the tiniest of all particles, except for the regions near black holes. They have very little mass and even when they are swept up and consumed by a black hole in massive numbers, their absorption adds little to the total mass of the growing black hole.

But what of the larger particles in the Standard Model? What of the electron, the up-quark and down-quark of the First-Generation? Are they a part of this 'sea of invisible particles?

Free electrons are plentiful in the sea of flying particles. So are the nuclei of atoms, especially of hydrogen and helium. These high-speed nuclei are ejected from stars—some of those stars are exceptionally active, much more so than those that generate primarily photons and neutrinos. These nuclei are sometimes called 'cosmic rays', but they are not photons, and they are not gamma rays (which are high-energy photons). Cosmic rays are highly energetic particles (atomic nuclei) possessing exceptionally high energies because they are moving so fast, and each one will create a massive shower of charged particles as it is drastically slowed down when it enters the earth's atmosphere. Upon entering the earth's atmosphere, they collide with other atoms and produce showers of daughter particles, some of which may be quarks. 'Free' quarks can exist only momentarily, for they will cluster together to form protons and neutrons, in ordinary atoms.

But, from a TOPS perspective, nowhere in space will we find free quarks—the quarks are always bound together to make protons, neutrons, or mesons (all mesons contain one matter quark PLUS one anti-matter quark). These combined quarks make up atomic nuclei which constitute the cosmic rays.

But, what of higher order of particles in the Second-Generation of the Standard Model? These particles are produced in large particle accelerators and most likely are also produced in nature in the stars throughout the universe. The problem with these particles is not in their production, but in their imminent destruction through decay. Most of their half-lives are so short that even those that might be made in the sun would decay into up- and down-quarks and immediately combine to form neutrons and protons within a fraction of a second. Thus, from a TOPS understanding, we will find only one kind of higher order quarks in the sea of interstellar particles that pervades the world we live in it. The only higher order particles are the n10 and n16 neutrinos which trigger decay in the First-Generation particles in the Standard Model. These particles may also trigger decay of higher order particles, and **the reason the n10 neutrinos are still out there in the sea of flying particles, is that they are often regenerated** during other forms of decay! These neutrinos are not visible to the eye, to an electroscope, to a telescope, to anything other than a neutrino detector which will detect far less than 1% of the neutrinos that are out there. They are INVISIBLE to us humans. They are there, but they are totally dark.

Most of what is in this invisible sea surrounding us all, passing through our bodies and the entire planet, are the most fundamental of particles, the n2 neutitos, the ash of all particle decay, the photons beyond the visible range of our eyes, and the proto-photons--the material from which all photons are made— that are at the very bottom of the Standard Model structures.

IT'S EVERYWHERE!

BUT IT IS NOT VISIBLE—IT IS VERY DARK!

QUO VADIS?

Chapter 9 - Particle Decay in Atomic Structures

Atomic Decay

To this point, we have been discussing decay on the sub-atomic perspective. This is totally appropriate, because I am now going to assert that every particle decay that we have outlined in this chapter, applies to our everyday world of science. Thus, the question is, HOW?

From a TOPS perspective, everything on the sub-atomic scale applies to the next larger world—the world of atoms. The purpose of this discussion is to propose HOW sub-atomic decay is related to radioactivity, which is where we see the results of sub-atomic decay in our macro-world.

In nature, all forms of particle decay are the result of instability within the structure of an atom. In the Fermilab or CERN accelerators, however, physicists go beyond the realm of nature when they use huge accelerators to smash sub-atomic particles together. Currently, most physicists consider that the products of such collisions are produced from the high energy accelerators, thus changing kinetic energy to mass. From a TOPS perspective, physicists' study what happens to the now-unstable particles that are momentarily fused during the collisions. In nature, these high energy conditions are matched only in the depths of stars undergoing fusion of basic particles into larger particles.

In its heady, pre-CERN days of activity, Fermilab created anti-protons (TOPS (15,18)) and stored them at low velocities in a circular vacuum tube where they were retained and preserved until the scientists diverted the anti-matter beam into the accelerator, and head-on collided the anti-matter beam with a beam of ordinary protons (18,15). From a TOPS perspective, the immediate result was a fusion of the two particles into a [33,33] conglomerate, which was totally unstable, and immediately the conglomerate began the process of decay to more stable structures.

At CERN, two, counter-rotating, circular beams of protons (18,15) are smashed into each other--one pair would momentarily fuse into a massive conglomerate of [36,30] which also would immediately begin the process of decay to more stable structures.

Current theories would suggest that since protons and anti-protons have almost the same mass, if you accelerated them to the same collision velocities, you should have the same energy and should have similar results in the 'creation' of the new particles, with the Annihilation Radiation that resulted from the decays.

TOPS, however, says that we cannot get more out of a collision than we put into it, and everything that comes out of the collision must result in permissible particles. This would seem to imply that the results of the two different kinds of collisions (producing [33,33] and [36,30] conglomerates) would produce quite different results from the different kinds of decays. Note that both kinds of collisions have the same number of Sparqs and there is very little difference in the masses of the proton and neutron. In TOPS, however, the ratio of yorks to zorks is quite different.

I am not going to debate which viewpoint is correct because I do not have access to any of the data and what I have discovered, is that the two approaches have sometimes produced similar predictions. I will simply state that I feel very confident that the results of the two kinds of experiments yield quite different results and I will continue this discussion based on the TOPS assumptions to that effect. In our daily lives, most of us do not experience nature with accelerators, and I will not discuss accelerators further in this chapter. My purpose of this chapter is to show how the principles of subatomic particle decay that have been discussed in earlier chapters, have a direct effect on the larger world of atomic structure.

Radioactivity

Pierre and Marie Curry isolated radium from radioactive pitchblende ore, in 1902, shortly after the discovery of highly penetrating X-rays in 1895. Scientists from around the world were caught up with these materials and new types of radiation. It was soon discovered that there were three basic kinds of radioactivity. **Alpha particles** were positively charged particles which turned out to be the nuclei of helium atoms; **beta rays** turned out to be **either electrons or positrons** the electrons positively charged anti-matter twin; **gamma rays** were electromagnetic rays—high energy photons that were like X-rays in their ability to penetrate deeply into many solid objects. Over time, further research revealed that radioactive atoms could also eject protons and protons from the nucleus and that the nuclei of some radioactive atoms even captured electrons from their own orbits to reduce the instability of their overly heavy nuclei.

During this discussion, however, we will pretty much stay with the alpha, beta, and gamma rays. Two of these three types of radioactivity are related to the decay of sub-atomic particles that have been covered in this or earlier chapters.

Instability within an atom is a complex issue. In general, however, the larger an atom is, the more positive charges (protons) it has in the nucleus. The number of protons in the nucleus determines the KIND of atom it is—e.g., all hydrogen atoms have 1 proton. All helium atoms have 2 protons; lithium has 3, etc. The proton and neutron weigh almost the same, so both contribute to the atomic weight of an atom.

As covered in the latter part of Chapter 7, the natural repulsion between positive charges in the nucleus is moderated by the presence of neutrons because of the magnetic attraction between the adjacent protons and neutrons. Hydrogen is the only kind of atom that has a bare proton in the nucleus--for larger atoms to be stable, there usually are at least as many neutrons as there are protons. But hydrogen CAN have one, or even two neutrons, so there are three different kinds of hydrogen. All three forms would chemically combine with oxygen to make water. Those hydrogen atoms which have the same number of protons, but different numbers of neutrons, are called **isotopes** of hydrogen and all three hydrogen isotopes have different distinctive weights because of the differences in numbers of neutrons—zero, one, or two.

ALL kinds of atoms have two or more possible combinations of neutrons that are found in nature, and most of the smaller atoms have at least one **stable** isotope. Stable isotopes do not decay. All types of atoms, however, have at least one **unstable** isotope because some combinations of protons and neutrons that are outside the most stable combinations. The simplest atom of all is hydrogen, but there are three isotopes of hydrogen, all of which have just one proton. The simplest hydrogen nucleus has NO neutrons, and this is by far the most common kind of hydrogen. Another hydrogen atom (called deuterium) has a single neutron, and the third type (tritium) has two neutrons.

For a given type of atom, among these different numbers of neutrons, there is usually one or more combination that is quite stable, i.e., it is not radioactive because it does not decay. But, in many atoms just one extra (or one too few) neutron renders an instability in the nucleus structure and the atom is susceptible to making a nuclear energy change that makes things more stable. The change results in some particle or energetic photon being ejected from the atom's nucleus to provide a more stable nuclear arrangement.

The presence of different numbers of neutrons allows for more complicated nuclei of atoms. Thus, except for the most common atom of all (hydrogen) there are almost always more neutrons in an atom than there are protons. In the relatively few atoms where this is not true, most of those isotopes are radioactive and soon decay to simpler atoms by ejecting a positron from the nucleus (+beta decay). Once we get beyond the first line of the periodic table, we find that there are usually more neutrons than protons, and, sometimes, many more. As an example, my '*Handbook of Chemistry and Physics*'[53] shows that almost 70% of all copper atoms are the non-radioactive $_{29}Cu^{63}$ isotope with 29 protons and 34 neutrons but the lightest copper isotope of all, is the $_{29}Cu^{58}$ which has 29 of each—all the lighter copper isotopes are +beta emitters. The heaviest isotope of copper is $_{29}Cu^{68}$ with 39 neutrons, and the heaviest three isotopes are all -beta emitters.

Some arrangements of protons vs neutrons are just a little unstable and those atoms tend to have longer half-lives.[54] That means they tend to keep their structures, and it takes a very rare, and critical event,[55] to trigger a radioactive change in those nuclei, but some structures are so unstable that the atom is very susceptible to an energy-triggering event, and almost immediately, it changes to a more stable structure, usually kicking out excess energy as **alpha, beta, or gamma** radiation.

We will start by discussing alpha particles, alpha emission, or alpha radiation, as it is also frequently called.

Alpha Emission

An alpha particle consists of two protons and two neutrons, packaged together, and it is identical to the nucleus of a helium atom. Neutrons and protons are usually bundled together, with the most stable arrangement being two of each, forming the alpha particle—a helium atom that has no electrons rotating about it. Alpha emission is most commonly found in exceptionally large atoms (larger than the lead nucleus) which have an overall excess of particles within their nuclei. Ejection of the alpha

53 63rd edition. Yes, I know it is woefully out of date, but it is what I have.

54 The half-life is the length of time for a given kind of a radioactive isotope to decay to half its original number of atoms.

55 In TOPS, the critical event is seen to be the necessary arrangement in **relative spatial positions** of the susceptible atom and the entering of a random neutron that triggers the energy release mechanism.

particle changes the kind of atom, lowering the number of protons by two and the number of weight particles by four.

Alpha radiation is highly ionizing, which means the high-velocity alpha particles ejected from the nucleus runs into other atomic structures, knocking out their electrons, as soon as it leaves the atom. Just a few centimeters of air will absorb the energy of alpha particles, and at the end of that short track, each alpha particle will capture two electrons from surrounding atoms and become a neutral helium atom. While the alpha particle gives up its energy and quickly disappears, it is highly damaging to human tissue and was the most damaging of all types of radiation to the early scientists who studied the new field of radioactivity.

Alpha emission is characteristic of most of large atom decay, and its susceptibility to decay is caused by the excess particles (depending upon the kind of atom) from which it is made. Alpha emission is not affected by the york-zork composition of subordinate quarks—it is due to the imbalance of the nuclei of larger atoms and affects only higher order atomic structure. Alpha emission, however, always involves a change in the nucleus by which the Atomic Number of the element is decreased by two units and the Atomic Weight is decreased by four units. In other words, the atom kind and weight are changed. Any change in the kind of atom is termed 'Transmutation.'

We will not spend more time discussing alpha radiation because transmutation involves changes in the **kind** of atom, and that changes the numbers of orbiting electrons in the atom, and that is a chemical issue which TOPS does not attempt to address at this time.

Beta emission also changes the kind of atom because either a positive or negative charge is ejected from the nucleus. But the reason for beta emission involves the structure of either a proton or neutron in the nucleus which IS a TOPS issue.

¯Beta Decay

Beta particles include both negatively charged electrons and their anti-matter counterpart, the positrons (or anti-electrons). Both forms of beta particles are produced when there is an imbalance of protons and neutrons within an atom. If there is an excess of protons, that extra proton has been bound to a neutron, as we find in the case of the ^{3}He nucleus. This ^{3}He nucleus consists of two protons and **one neutron**, while the ^{4}He nucleus has the more stable structure of two protons and **two neutrons**. See Figure 9-1. The radioactive isotope of hydrogen is called Tritium, which contains two neutrons, and is less stable than ^{1}H or ^{2}H. The ^{3}H nucleus may convert to a ^{3}He nucleus which has only one neutron. Thus, the decay of ^{3}H to ^{3}He occurs when one of the two ^{3}H neutrons undergo a conversion to become a proton. At the same time, the nucleus ejects a $^{-}$Beta particle which is identical to an electron. This is known as $^{-}$Beta Decay.

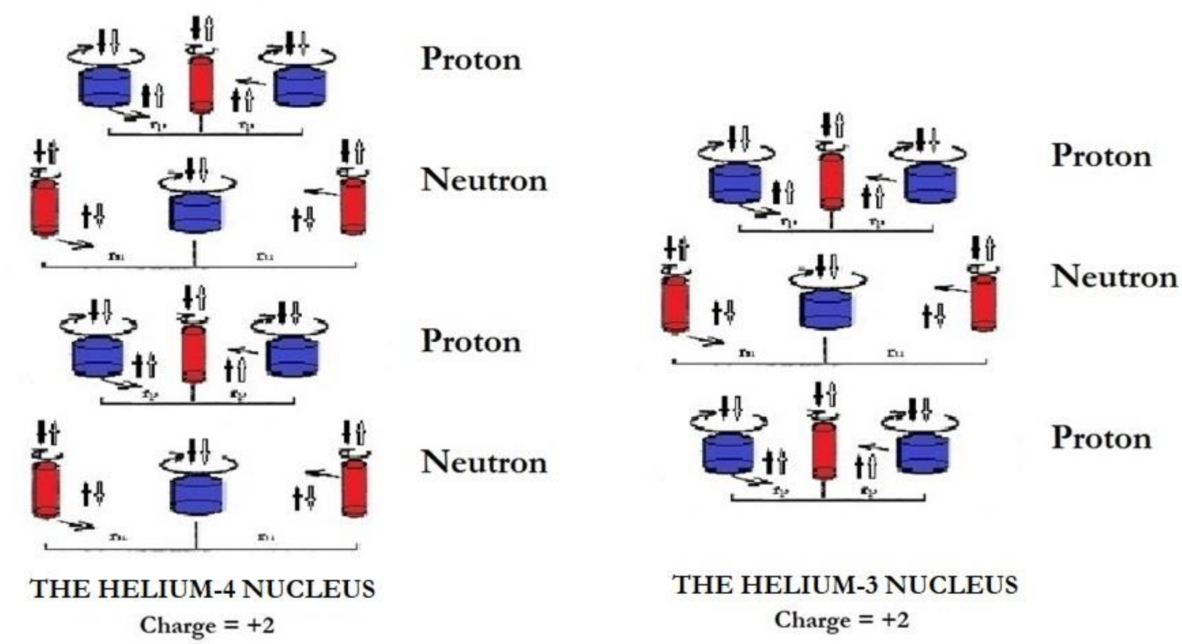

Figure 9-1 Two Isotopes of Helium

Figure 9-2 illustrates how an n10 neutrino may trigger a down-quark to change to an up-quark and an electron. The portion in the blue box represents the nucleus and shows this change. The particles shown to the right of the blue box are ejected from the nucleus. The resulting duu transitional proton must then shift quark positions when the Coulomb forces push the two up-quarks apart and both up-quarks attract the down quark to form the new proton structure.

Following is an alternate decay chart that illustrates the entire $^{-}$Beta Emission process to include the unchanging d.u portion of the neutron. See Figure 9-2.

Neutron + n10 → Proton + $^{-}$**Beta** + n4 + n2

d.u.d + (5,5) → d.u(6,4) + **(2,5)** +(2,2) + (1,1)

d.u(6,7) + (5,5) → u.d.[11,12] → d.u.u + **(2,5)** +(2,2) + (1,1)

↳ → u.d.u + **(2,5)** **+**(2,2) + (1,1)

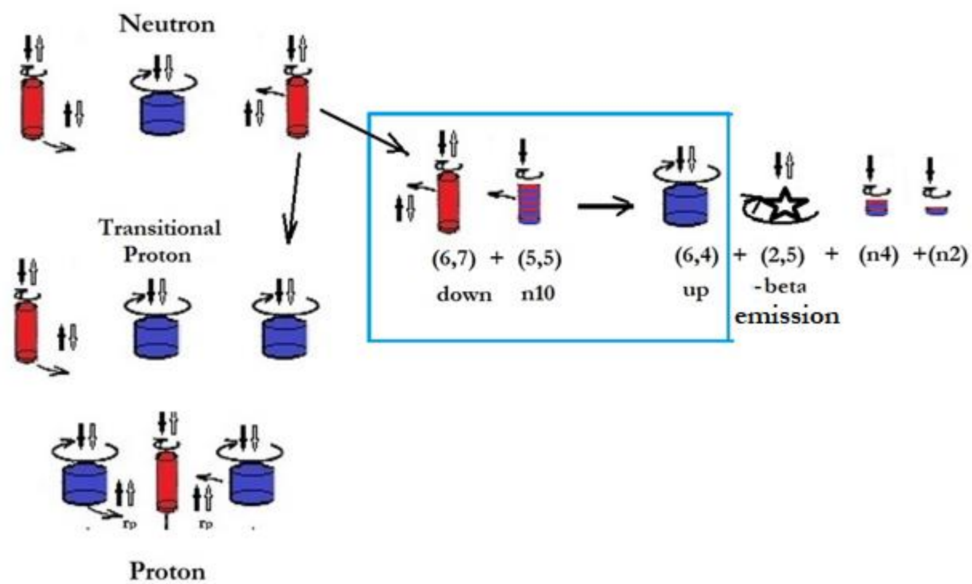

Figure 9-2 A Down-quark Changes to an Up-quark with -Beta Emission

Notice that we have a negatively charged $^{-}$Beta particle produced in this reaction, but the Atomic Number of an atom undergoing $^{-}$Beta decay is always one more than the atom from which the decay originated.

$^{+}$Beta Decay

Similarly, Figure 9-3 illustrates how an n10 neutrino may trigger a down-quark to change to an up-quark and a Positron. Again, the portion in the blue box shows this change and to the right of the blue box is the anti-electron, but with NO Neutrinos being produced!

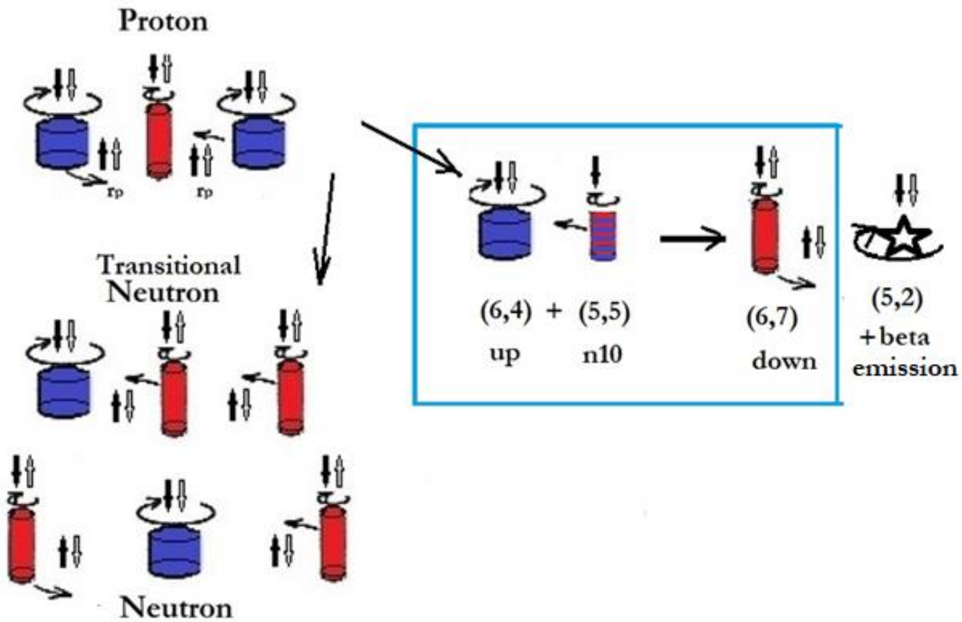

Figure 9-3 An Up-quark Changes to a Down-quark with +Beta Emission

Recall that a proton consists of two up-quarks and one down-quark (u.d.u). Whenever we have $^{+}$beta emission (an anti-electron is ejected from the nucleus), and the atom is changed to the next smaller kind of atom because it has lost a positive charge from the nucleus of an atom. In TOPS, this action results from the decay of a proton interacting with a stray neutrino (either n10 or n16) in which a down-quark is changed to an up-quark and THAT is a decay issue which changes the proton to a neutron. With $^{-}$beta emission, an up-quark changes to a down-quark, which action, changes the neutron to a proton. This, in turn changes the atom to the next larger kind of atom, i.e., the Atomic Number is increased by 1. All beta emission results in 'Transmutation' or change in the kind of atom involved.

Following is an alternate decay chart that illustrates the entire $^{+}$**Beta** process to include the unchanging u.d portion of the Proton.

Proton + n10 → Neutron + $^{+}$**Beta**

u.d.u + (5,5) → u.d(6,7) + **(5,2)**

u.d.(6,4) + (5,5) → u.d.[11,9] → u.d.d + **(5,2)**

↳ → d.u.d + **(5,2)**

Notice that we have a positively charged $^{+}$Beta particle produced in this reaction, but the Atomic Number of an atom undergoing $^{+}$Beta decay is always one less than the atom from which the decay originated.

Electron Capture

In some cases, radioactive decay results from a nucleus capturing an orbital electron from the same atom. Known as 'Electron Capture,' in TOPS this action is seen as being the reverse of **-**beta decay with a catalytic-type initiation by a rare n10 (muon neutrino = (5,5)) in a collision with an up-quark in a proton. The process is seen to be catalytic in that the initiating n10 is regenerated. The result is that the proton changes into a neutron and the new atom has had its Atomic Number decreased by 1 to become a lighter atom and two photons are emitted in opposite directions. The basic process is like the reverse of the **-**beta emission, i.e., one up-quark in the proton is changed to a down-quark, changing the composition to that of a neutron as shown in Figure 9-2. The captured electron most probably comes from the K-shell where n=1, but it seems that other electrons might also be captured in which case there would be different energies (characteristic of the value of n) added to the photons. As the atom reduces its Atomic Number by 1, to refill that shell, the atom will also pull in a more outer-shell electron, producing another pair of photons of an energy/frequency/wavelength which is also characteristic of the new type of atom.

Proton **+ -e + n10** → Neutron + 2 photons **+ n10**
u d u d u d
(6,4)(6,7)(6,4) + **(2,5) + (5,5)** → [25,25] → (6,7)(6,4)(6,7) + 2(1,1)ϕ + **(5,5)**

Recognizing the catalytic nature of the (5,5) electron neutrino, we can simplify the equation by treating it as being:

Proton **+ -e** → n10 → Neutron + 2photons
u d u d u d + 2(1,1)ϕ
(6,4)(6,7)(6,4) + **(2,5)** → [20,20] → (6,7)(6,4)(6,7) + 2(1,1)ϕ

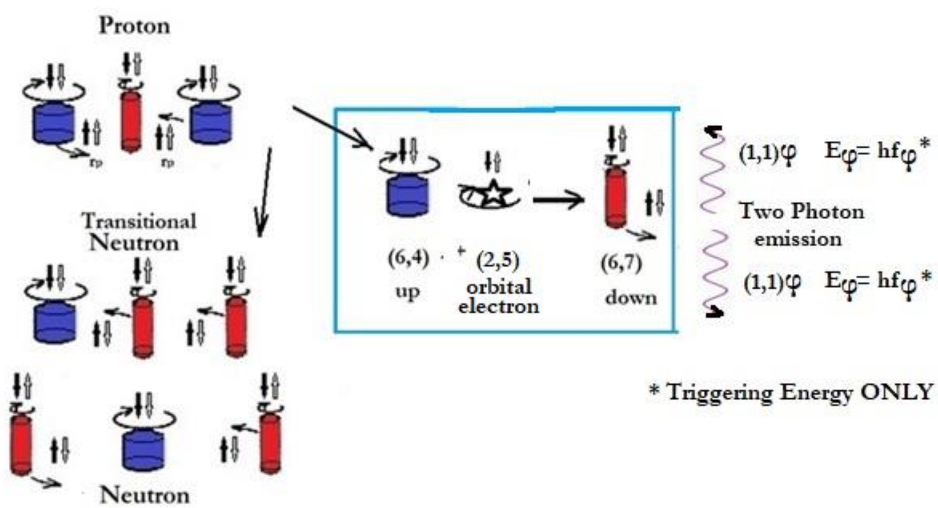

Figure 9-4 Electron Capture

Recall that a proton consists of two up-quarks and one down-quark (u.d.u). Whenever we have **electron capture,** (two photons are ejected from the nucleus), and the atom is changed to the next smaller kind of atom because it has effectively lost a positive charge from the nucleus of an atom. In TOPS, this action results from the decay of a proton interacting with a stray neutrino (either n10 or n16) in which a down-quark is changed to an up-quark and THAT is a decay issue which changes the proton to a neutron. All beta emission and electron capture result in 'Transmutation' or change in the kind of atom involved.

To see how the math works for electron capture we will wait until Chapter 11 where we will find it as 'Case 6.'

Gamma Emission

Some radioactive atoms emit high energy gamma ray photons in their decay. TOPS would interpret something like the following to explain this process.

In the larger atoms, there are more protons and neutrons in the nucleus than there are in smaller atoms. The strength of the magnetic links between the alternately stacked protons and neutrons (See Figure) depends upon the distance between those nucleons. Increasing the numbers of nucleons increases the magnetic forces and forces the protons closer to each other. The decrease in distance between the nucleons increases the repulsive Coulomb forces and increases the potential energy content of the nucleus.

An initiating n10 or n16 neutrino initiates a triggering event, releasing some of the excess potential energy to energize a passing microwave (CMB) photon (a proto-photon) to receive the energy and it leaves the nucleus as a high-energy photon. Loss of that Binding Energy relaxes the attraction between nucleons and leaves a more stable nucleus. There is no change in charge on the shifted nucleus, so the 'relaxed' atom retains its original 'kind' of atom, i.e., the Atomic Number and Atomic Weight are both unchanged. It is suggested that since ALL subatomic particles are in a state of constant spinning, that there must be some energy shift within the nucleus when gamma radiation is emitted. These may be considered to be 'Binding Energy' within the nucleus.

There must be some mechanism by which that Binding Energy is quantized or structured within the nucleus and the following discussion considers some possible variations in energy states. See Figure 9-5.

If a gamma-emitting isotope is also undergoing simultaneous emission of another energy particle (such as an alpha or beta particle emission, or electron capture), the energy/momentum considerations are easy to follow for the gamma ray, aa we saw in Chapter 8. **If, however, a situation occurs in which only a gamma-ray photon is emitted, the logic becomes more distorted, for, how can energy be emitted without violating the laws of Conservation of Mass, Energy, and momentum?** For that kind of situation, the following discussion is presented for consideration: Certain structural nuclei tend to be more stable than others, even among lighter atoms. Clusters of helium type of domains (two protons with two neutrons) within the nucleus tend to be more stable than atoms having odd numbers of protons.

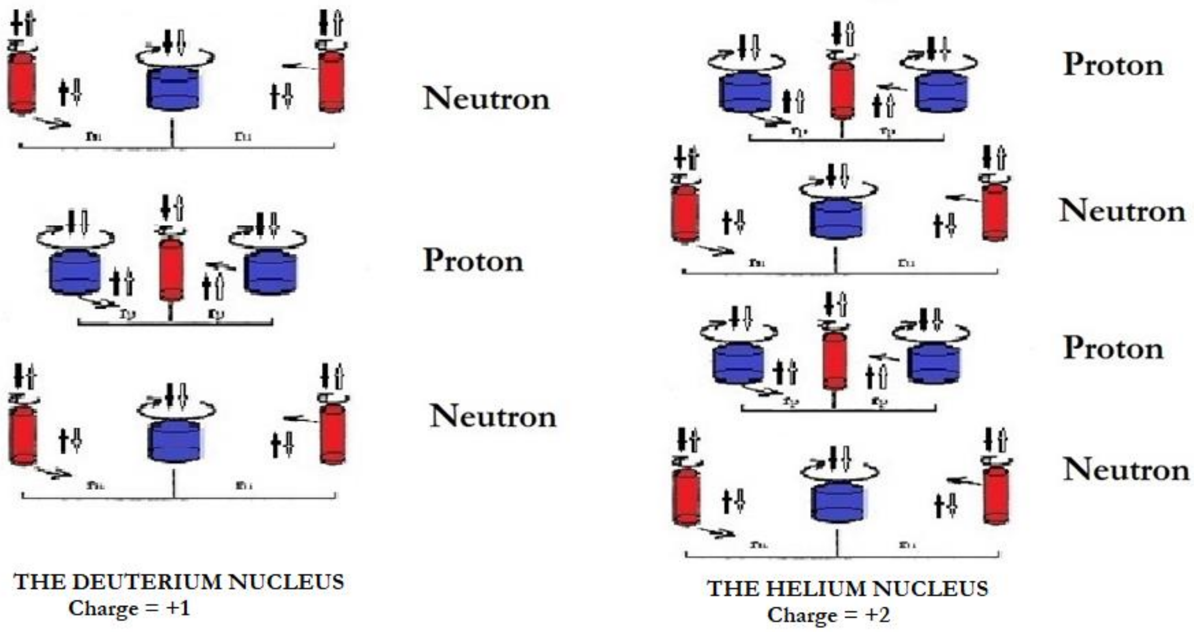

Figure 9-5 Inter-Nucleon Spacing in Deuterium and Helium

Thus, atoms with even Atomic Numbers in some multiple of 4 units of AtomicWeight starting with Helium tend to be more plentiful and more stable than other types of atoms which surround them in the Periodic Table. The addition of one or two neutrons in the nucleus of a common, stable isotope will typically form a heavier isotope of that same kind of atom, which tends toward greater nuclear stability. Perhaps these generalizations indicate that there are multiple, possible (binding) energy configurations available in the nucleus depending upon the nuclear configuration. Perhaps there are domains of spinning helium-configurated nuclei which can flip in direction, depending upon possible differences in directions of particle spin. Perhaps there is some form of spherical 'shell-structure' of nuclear-spin orbits, just as there are spherical shells of the orbiting electrons in common atoms. At this time TOPS has no suggestions as to how such variations in energy levels can exist.

Thus, it is assumed that the protons and neutrons pairs are 'locked' together, so they rotate at the same velocities. If this is so, the up-quarks of the proton would have a greater magnitude of charge with more Coulomb attraction, and the proton radius would then be smaller than that of the neutron. The consequence would be that, while the center quarks are oppositely charged and maintained at a fixed distance apart, the outer quarks would be somewhat offset from each other and lose some of the magnetic forces that hold the two nucleons together.

It is also assumed that the spacing between adjacent proton and neutron is diminished by adding an additional proton or neutron as indicated in Figure 9-5. The reason for making this assumption is that the addition of each nucleon increases the magnetic repulsion that must exist when we have opposite charges attracting each other.

Another factor that might contribute to the different energy states in an atom's nucleus is that there are some physical isomers of nuclear structure. We encountered that in Chapter 7 where we had said that there were two possibilities of arrangements of the helium nucleus. For example, Figure 9-5 shows a helium nucleus—If you were to take the neutron off the BOTTOM of the nucleus and place it at the top, you would have a slightly different arrangement from that of Figure 9-5.

Yet another factor might be that all nuclear particles are not spinning as shown in Figure 9-5. A 'flip' of the spin of one or more quarks within a given nucleon could produce energy differences.

From my limited understanding at this point, any or all of those factors could combine to give different energy levels within a nucleus, depending upon their prevalence and Coulomb/magnetic interactions. I do not have the mathematical ability to analyze such interactions and must leave it to those who do, but I provide the above information hoping that someone will attempt that kind of analysis and each of these variables (perhaps with other factors I do not recognize).

Regardless of the true cause of different energy levels within the nucleus of a given isotope, IF THERE IS NO ADDITIONAL EJECTION OF MATERIAL FROM THE NUCLEUS, there must be some kind of energy difference within the structure, such that a given isotope may be in at least two different energy states within the nucleus and also be able to emit the 'excess' energy in the form of a high-energy photon without changing either the Atomic Number, or the Atomic Weight**.**

Summary of Radioactive Decay

The point of this chapter is to show that normal radioactive decay of individual quarks is responsible for Transmutation decay as shown in Chapter 8. In every case, there is a change in the nucleus which affects the initiating atom by producing a new kind of atom. When we find an alpha particle ejected from the nucleus, the Atomic Number of the new daughter particle is reduced by two and the Atomic Weight is reduced by four. But when an up-quark is changed to a down-quark, the Atomic Number is reduced by one with no practical change in Atomic Weight. Also, when a down-quark is changed to an up-quark, the Atomic Number is increased by one and the Atomic Weight is not changed.

QUO VADIS?

Chapter 10 - Searching for the Mass of the TOPS n2

While I was doing some editing my work on particle decay in Chapter 8, I realized I needed to include the concept of Annihilation Radiation (AR) from a TOPS perspective. I knew little about the subject so, I needed to study AR. Oh, I had learned that AR existed—an electron and its anti-matter mirror image, the positron, simply cannot bear to be together. Apparently, both particles disappear, and, with the electron and a positron pair, we should get a pair of powerfully penetrating photons of .511 MeV.[56] The energy of that photon is about five times the top side of the energy output of a typical diagnostic medical X-ray machine operating at 100 KeV!

If there is anything at all valid about the TOPS concept, it must address what happened to the charges and the energy that was in those two oppositely charged particles. Conventional physics says charge is conserved and the AR process yields no change in charge. TOPS says that the Sparqs do NOT cease to exist when Annihilation occurs, and not only their charges, but also their masses must also be accounted for.

I had provided a quick answer in Chapter 8 and thought I had pretty much solved the problem. But, later, I asked myself just HOW would the AR process work? I did a bit of research to see what the AR energies would be like. I was surprised to find that there is a wide spread of energies of AR photons that are produced, so it was 'back to the drawing board' for studying AR for me. That HAS to be explainable in TOPS!

If the electron and positron both have a mass-equivalent of energy of .511 MeV ($=9.11\text{x}10^{-31}$ kg), why do we not get two AR photons of that energy and no other energy? Somewhere in one of the web sites I was reviewing, it indicated that different energy photons were due to the 'Doppler Effect.'

That seemed logical—prior to the AR process, those electrons and positrons were moving toward each other. If they were moving in roughly the same direction when they interacted, their kinetic energies would be added producing a 'blue-shift' in the AR, depending upon their angles of attack to each other. If they approached at a wider angle, there would be different momentum and energy considerations, resulting in lesser 'blue shift'—yes, that seemed to make sense from a TOPS perspective.

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[56] Later in this chapter, we will find that the actual photon energy is somewhat less than .511MeV because of the presence of other types of Energy (e.g., Binding Energy) that goes into translational momentum/energy of the daughter particles. I used the value of .511MeV because that is what current physics models tell us and that was the starting position in Chapter 8.

But then, I read about Positronium, an 'atom' consisting of an electron and a positron orbiting each other, much like an atom of hydrogen! That too, was logical, but I had never heard of it before. At this point, I discovered that there were two kinds of Positronium, depending upon the spin relationship between the two charges. And the two kinds of spin orientations yielded either even numbers of AR photons, or odd numbers of AR photons!

I am not going to try to 'explain' these relationships based on current physics concepts. The informed reader will readily see that I do not fully understand the implications of these findings from a conventional physics position because I do not have the background to do so. Thus, I am going to provide a link to a Wikipedia article on Positronium and leave it for the reader to study. Positronium - Wikipedia

I also found interesting information regarding use of Positronium in PET scan[57] examinations of the human body at:
Positronium: Review of symmetry, conserved quantities and decay for the radiological physicist - Harpen - 2004 - Medical Physics - Wiley Online Library

I will trust that this information and the energy formulas and findings are valid but have no idea how they were derived. My function in this book, is to try to rationalize these findings in terms of TOPS concepts, because TOPS has to be able to provide some kind of answers to those kinds of questions if it is valid in any way. Thus, the following discussion is my attempt to explain the AR radiation in terms of TOPS concepts of the photon.

[57] Positron emission tomography is a functional examination of human tissues using positron-emitting radioactive isotopes in conjunction with an x-ray examination. This type of procedure enhances diagnostic evaluations of normal x-ray procedures that were used during my period of teaching X-ray physics to US Army soldiers during the 1970s.

Current TOPS-related Understanding of Annihilation Radiation

We covered particle decay in Chapter 8 where we did provide a short section on Annihilation Radiation (AR). We did not attempt to subject the concepts into concrete, numeric examples at that point. In this chapter, we will move to that next step, i.e., providing some numeric examples by way of illustration. We may still not have the information that is needed to provide specific numbers because we have not yet done the vector analysis that may be necessary to establish the forces and binding energies of the higher order particles as suggested in Chapter 7.

Thus, some of the numbers I will apply in this chapter, may be estimates at this stage. I provide those numbers to suggest the direction of thought that it appears will be necessary from where I sit at THIS point in time (mid-August, 2021).

It appears that Annihilation Radiation (AR) provides some hints that will give us a way to establish the mass of the york and zork. I will attempt to explain the logic of this approach in this chapter. I will use the TOPS concepts in these explanations.

Structure of the Positron which Decays thru Annihilation Radiation

The structure of the hydrogen atom is spherical. While each electron's orbit of the hydrogen nucleus is circular in shape, that circle is very subtly and imperceptibly warped. The positively charged proton at the nucleus is spinning and is, then, continuously generating a magnetic field. The magnetic field of the proton remains perpendicular to the plane of the proton's spin, but WAIT… That magnetic field has been perturbed to a very tiny degree by the magnetic field the ELECTRON generated in making its single orbital rotation. That tiny change in the nuclear magnetic field direction continues with the next orbit, with the electron tugging the nucleus a bit every time it goes around. Each orbit of the electron is slightly changed, and the result is a precession of the orbit which, over the time of a few hundred millionth of a second or so, assumes the shape of a sphere. This is so, because, that electron is spinning in orbit n=1 at 2.19×10^{6} m/sec, some 6.62×10^{15} (Hz) times per second. That is almost 7 MILLION, BILLIONS of times EVERY second!

Positronium, however, has no nucleus. (See the Wikipedia excerpt, Positronium - Wikipedia.) The electron and positron both orbit each other about a common center, but there is absolutely NOTHING at that center. The planes of the two particles' individual rotations, are in exactly the same plane as their orbital motion around each other. Thus, there is no shifting, magnetic moment of a nucleus to be subtly pulling that plane out of its position from one rotation to the next. The consequence of this is that the shape of the Positronium 'atom' would be a flat disk, and not a sphere. In some cases, physicists can use magnetic fields to control the position or slant of that disk for Positronium. They can't do that at all, with the spherical hydrogen atom.

I claim no special knowledge about AR, but here is my current TOPS interpretation on what physicists have discovered about AR.

Figure 10-1 illustrates the three types of AR. Note that the **only** difference between the ortho- and para- forms of Positronium is in the spins of the (red) electron (as indicated with up and down spin arrows). The spins of the positron (blue) are shown to be the same direction (down). The orbital spins of both the electron and positron are in the down direction in both Positronium diagrams.

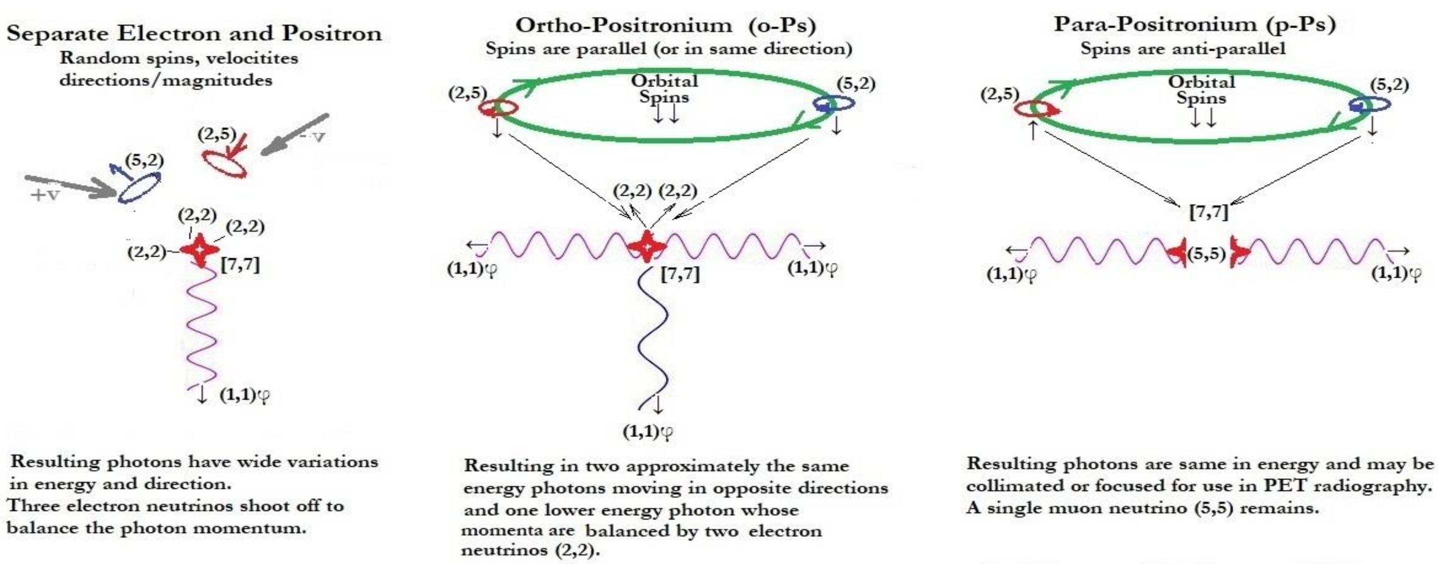

Figure 10-1 Three Types of Annihilation Radiation

There are three basic types of AR (Annihilation Radiation) and, this is how they are currently perceived to work from a TOPS perspective.

Direct AR Production

A free positron, encounters an electron and undergoes AR, producing a single high energy photon of an energy of about 500 KeV (equivalent to $9.11x10^{-31}$ kg) and neutrinos. This happens EVERY time a positron is produced but does NOT form Positronium before AR takes place. This AR varies in the directions the photon goes and the total energy (and thus, the wavelength) content is random, depending upon the Doppler effect according to the different velocities and directions of movement of the particular electron and positron involved prior to AR production.

Ortho-Positronium AR Production

After a very short lifetime, an atom of ortho-Positronium collapses so the positron and electron meet and undergo AR producing an **odd number** of photons (usually 3) and at least two neutrinos. All the energy from the decay products adds up to the mass/energy of the original electron and positron (2x 500 KeV). This happens about ¾ of the time we have AR produced from Positronium. There are multiple options of how the products (AR photons and neutrinos) move in terms of energy and directions and physicists cannot control the outcomes of this decay process.

Para-Positronium AR Production

After a very short lifetime, an atom of para-Positronium collapses so the positron and electron meet and undergo AR, producing an **even number** of lower-energy AR photons (usually 2) and a single, non-momentum-bearing n10 muon neutrino. All of the products' energy (about 1 MeV) adds up to the mass/energy of the electron plus that of the positron. This AR production happens about ¼ the time we have AR from Positronium. The resulting AR is collimated, with both AR photons going in opposite directions when the planes of rotation are controlled. We don't get much of this AR, but this means we can make THIS kind of AR go where we want it to go and do what we want it to do.

Three Imaginary Trips

I am now going to take us on an imaginary trip along-side three positrons.

Imagine the roiling surface of the sun, surging with the thermonuclear action of converting hydrogen into helium. Suddenly, we observe a solar flare, an exceptionally large explosion which throws tons of charged particles out into space and toward the earth. In that solar flare, are **three positrons** which we will name TOM, DICK, and HARRY, and they have been blasted so strongly that they move toward the earth at one tenth the speed of light, some 18,600 miles PER SECOND. For the metric-minded, that is about the same as 30,000 km/sec. At that speed, it would take about 80 minutes for TOM, DICK, and HARRY to reach the distance from the sun to the moon's orbit and about 13 seconds later, it would reach the earth's outer atmosphere.

Imagine TOM, DICK, and HARRY to be traveling together until they hit the rarified air, high in the atmosphere. As you travel with them, you note that all three positrons are spinning the in a clockwise direction—physicists would say they are all spinning pointing 'down.'[58] Thus, all three act essentially the same way as they strike the rare molecules in the vacuum of space just above the earth's atmosphere. Those rare molecules are primarily water, nitrogen, oxygen, and carbon dioxide (from lightest to heaviest molecules, in order of decreasing relative abundance).

For simplicity, let us say they all run into only water molecules, the most probable situation. For further simplicity, let us say they hit only one hydrogen atom in the water molecule and that ionizes the molecule splitting the water molecule into an excited hydrogen ion H+ and a hydroxide radical $(OH)^-$. This kind of action requires energy to rip the molecule apart, so the positron has been slowed a bit when it hits another water molecule, which it also ionizes, and that collision slows the positron even more. On the average, TOM, DICK, and HARRY will be moving from one molecule of water to the next, in about the same way, always slowing with each collision and leaving behind a cascade of ionized water molecules.

Now, none of them, TOM, DICK, nor HARRY, can undergo Annihilation Radiation decay while it is a high-flying particle. Only when it is slowed sufficiently that it can find an electron and be near it long enough so AR can occur. We are also going to put our AR sensor/counter in a uniform magnetic field to see what happens to TOM, DICK, and Harry.

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58 Spin direction is determined by using the 'right-hand Rule.' Hold your right hand in a loose fist with the thumb extended. The curved fingers are aligned with the direction of particle spin and the thumb points in the direction of the spin. For a clockwise spin, the thumb is pointed down.

TOM

Let us follow TOM as he reaches that low-enough velocity to undergo AR with the electron. As soon as the TOM and the electron enter the magnetic field, both particles will shift so their spins are parallel to the magnetic field. TOM doesn't go far before he finds himself approaching the electron that is going pretty much the same direction as TOM. That means that TOM is close enough and for long enough for that particular electron to have AR occur, and SUDDENLY, TOM fuses with the electron, produces six n2 neutrinos and ONE 9.11×10^{-31} kg photon (= $hf\varphi$) where we find the photon's frequency, $f\varphi = 1.24 \times 10^{20}$ Hz. That is 124000000000000000000 cycles per second—124 billion, billion cycles—EVERY SECOND!

TOM has just undergone Direct Annihilation Radiation decay and that radiation can fire off in any direction regardless of the magnetic field. The direction depends on the directions of travel of Tom and his interacting electron. If you watched it happen a thousand times, you probably would **never** see the scattering direction be exactly the same as what you witnessed with TOM. But WHATEVER direction it goes, that photon has almost the same amount of energy, depending only on slight variations of the path that TOM took as he approached the electron and the relative velocities of both particles due to the Doppler Effect.

DICK

Now, let us follow DICK as he is slowed down by the water molecules in the upper atmosphere. When DICK has been slowed ENOUGH to be susceptible to AR, he approaches an electron coming pretty much from the **opposite** direction. Using the Right-hand rule, you note that the electron is spinning in a DOWN direction, so it is spinning in the same direction as DICK. As DICK and the electron approach each other, just slightly to the side of one another, their opposite charges attract each other and they slip into orbit around each other, forming an 'atom' of ortho-Positronium. There are specific orbits of Positronium and the orbit which is formed is determined by the closeness of the positron to the electron on that capture path.

Just as in the hydrogen atom, those particles in higher Positronium orbits, can shift closer to its partner, giving up a photon that is **characteristic** to Positronium. (If it started in Positronium orbit n=4 and momentarily dropped to orbit n=3, a lower energy photon would be produced than if it went from n=4 directly to n=2. The greatest energy would be when it fell from n=4 to n=1 in a single shift, but the total energy in the multiple shifts will always add up to be the same total energy as there would be in the n=4 to n=1 shift.)

THAT energy is NOT AR energy—it is characteristic of Positronium and not AR. If we took a few nanoseconds to wait for the AR process, we would then see the electron and DICK spiral into each other, fusing and then decaying into 3 or 5 AR photons (with 3 being the most probable) and some neutrinos that carry away excess momentum.

DICK has just undergone ortho-Positronium Annihilation Radiation decay, and that radiation can fire off in any direction. The magnetic field lines point up for both DICK and his interacting electron, that is, the two particles have parallel spins. If you watched it happen a thousand times, you would never see an exact scattering direction, apparently the same as what you witnessed with TOM. But WHATEVER direction those two photons go, they have the same amount of energy, depending only on slight variations of how closely DICK approached the electron and the relative velocities of both particles due to the Doppler Effect.

HARRY

Now, let us follow HARRY as he is slowed down by the water molecules in the upper atmosphere. When HARRY has been slowed ENOUGH to be susceptible to AR, he approaches an electron coming from the opposite direction. Using the Right-hand rule, you note that the electron is spinning in an UP direction, so it is spinning in the OPPOSITE direction as HARRY because of the magnetic field. As HARRY and the electron approach each other, just slightly to the side of one another, their opposite charges attract each other and they slip into orbit around each other, forming an 'atom' of para-Positronium. There are specific orbits of Positronium (just as in the case of DICK's example), and which orbit is formed is determined by the closeness of HARRY to the electron. Any orbital shifts will produce Annihilation radiation characteristic of Positronium, just as with DICK's example.

HARRY has just undergone para-Positronium Annihilation Radiation decay BUT the AR photon radiation does NOT fire off in just any direction. The magnetic field lines up both HARRY and his interacting electron, but the two particles have ANTI-parallel spins. If you carefully watched it happen a thousand times, you would find that the two AR photons are shot off in **e**xactly opposite directions, perpendicular to the plane of the orbiting para-Positronium atom! You would also note that a non-momentum-bearing muon neutrino (5,5) is produced at very center of the event. Also, characteristic radiation of Positronium will be produced, just as with DICK, but those characteristic radiation events happen **before** AR production. The energies of the two photons will be the same, but some of the total energy has been used to make the (5,5,) neutrino so the photons will possess less energy and longer wavelengths than those with DICK.

Now, WHY is all this important? There are several reasons it is important to **me, personally**. First, I discovered AR is produced at ANY time that positrons enter our world. It is evidence that this is the way that antimatter particles are destroyed to maintain our ALL-MATTER corner of our universe.

Second, I now have some idea why medical science can use AR in PET scans to diagnose some medical conditions—scientists can control the direction of the photons in para-Positronium decay by means of an external magnetic field, and that's not true in other forms of AR decay.

But, as for the theory of TOPS, it is **most important**, because it is **how we can determine the mass of a single york or zork**! That is the subject of the next section, but before we do that, we must spend a bit of time defining our masses. Recall that in Chapter 7 we said that there was a Sparq mass such that $\mathbf{m_{ys}} = \mathbf{m_{zs}}$ = $\mathbf{0.65x10^{-31}}$ **kg**. That is true for every Sparq regardless of what kind of particle it is in. We also said that we were primarily interested in the relativity mass of the object which also includes the Binding Energy within the particle, and that is what we would be using in most of our work after that point. That value has been calculated for multiple particles, all of which are TWICE the $\mathbf{m_{ys}} = \mathbf{m_{zs}}$ value so we were going to use $\mathbf{m_y} = \mathbf{m_z} = \mathbf{1.30x10^{-31}}$ **kg. This is because the total Other energies/masses appear to always**[59] **be equal to the Sparq values!**

In discussing AR, however, we are forced to go back to the $\mathbf{m_{ys}} = \mathbf{m_{zs}}$ = $\mathbf{0.65x10^{-31}}$ **kg Sparq mass** value because the Binding Energy (which we will call the Other Energy') is spread out in the different daughter or product particles in the AR decay. Thus, in the following examples, $\mathbf{m_{ys}} = \mathbf{m_{zs}} = \mathbf{0.65x10^{-31}}$ **kg** when we are speaking of the Sparqs' energy/mass NOT including 'Other' energy (which is spread among other particles), and we will use $\mathbf{m_y} = \mathbf{m_z} =$ 1.3$\mathbf{0x10^{-31}}$ **kg** when the 'Other Energy' **is** included within the particle.

[59] This is at least true of all particles produced in AR decay. At this point I do not yet know whether that applies to ALL other particles, but that seems to be true.

Direct Positron Decay to Annihilation Radiation

From Chapter 8 we saw that the mutual annihilation of an electron and its anti-matter equivalent (the positron) had two possibilities that included permissible particles at all stages of decay. From my more recent research regarding AR, I have concluded that there are potentially more possibilities for Positronium decay than shown in Chapter 8, and we need to revise that material. Using the electron/positron decay pattern from Chapter 8, to which we add more for interpretation as,

TOPS TOPS
Electron Positron
-e +e → n10 n4
(2,5) + (5,2) → [7,7] → (5,5) + (2,2)
↳ **(5,5) + (2,2)φ** [60]
↓ ↓
↳ **(5,5) + 2(1,1)φ PET Scan using para-Positronium 2**
↳ **3(2,2) + (1,1)φ Ortho-Pos 1, OR, Dir. AR Production**
↳ **3(1,1)+4(1,1)φ PET Scan using para-Positronium 4**
↳ **4(1,1)+3(1,1)φ Ortho-Positronium 3**
↳ **5(1,1) + 2(1,1)φ PET Scan using para-Positronium 2**
↳ **6(1,1) + (1,1)φ Direct AR Production**

The different varieties of Positronium decay differ only in the number of photons (the number shown at the end of the line) vs neutrinos that are produced and in the difference in binding energies that is converted to AR photons. Since neutrinos are notoriously difficult to detect, we may never know whether all these varieties of AR are actually produced, but that is not important for the purpose of the following calculations. The lower number of photons in a reaction, results in higher energy AR gamma emission, because the lower number of photons mean more n2 neutitos will be produced with their Binding Energy subtracting energy that otherwise goes into the AR photon(s). For the purposes of this chapter, these possibilities are probably not really important.

The reason it makes little difference is that **it is the single photon in the final line, it is the Direct AR Production method, which provides the information needed in calculating the value of the mass of the york and zork.**

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[60] In this case, the (5,5) neutrino absorbs the reaction momentum (going in the opposite direction as the photons) of the double-photon Coherent packet with the photons one quarter wavelength apart. See Chapter 4. In the next example, the two photons kick-off each other and move in opposite directions, leaving the non-momentum-bearing (5,5) neutrino alone in space.

To see why, let us examine the implications of the simplest form of Direct AR Production.

TOPS TOPS
Electron Positron

$$\mathbf{e^- + e^+ \rightarrow}$$

$$\mathbf{(2,5) + (5,2) \rightarrow [7,7]}$$

$$\mathbf{\Rsh\ 6(1,1) + (1,1)\varphi}$$

The six (1,1) n2 neutitos have previously been described as, the 'ash' of the universe. Once we get down to that level, there is no energy other than the electric and magnetic energy, within the n2 neutito—ALL of the n2's energy is the electric and magnetic energy between the two Sparqs that holds it together. I will now call this energy, the SPARQ ENERGY. The n2 neutito CANNOT lose that SPARQ ENERGY and the n2 cannot GAIN any more energy except for the trivial, low-translational energy of its linear motion.

We will now assume that all of the energy in the photon is the sum of its (1,1) Sparqs mass/energy $(m_{ys}+m_{zs})u_e$ plus its hf_φ 'triggering energy.'

This is NOT the same as the assumption we made earlier in Chapter 10. Here we are adding the $(m_{ys}+m_{zs})u_e$ energy to the hf_φ 'triggering energy' and that assumption gives us a starting point to recognize that we MAY have other energy considerations that will cause us to 'tweak' that assumption, so all energy and momentum considerations are taken into account. Earlier, in this chapter we estimated 'triggering energy' equivalence is 9.11×10^{-31} kg, i.e., the mass of the positron from which that energy came. This will allow us to roughly calculate the value of the SPARQS ENERGY! In the next chapter, I plan to do that more precisely based on the momentum of the particles.

Determining the Mass of the n2 Neutito

Let us analyze the **Direct form of AR** production in terms of TOPS particles, TOPS structures, and masses. (All mass values shown are x10^{-31} kg.)

TOPS Particles	**6x n2 +**	**($2m_y$ + AR)**
+Positron + -Electron =	**Neutrinos +**	**Ann Rad photon**

(5,2) + (2,5) → [7,7] → 6(1,1) + (1,1)φ

MASS (x10^{-31} kg) **PARTICLES**

9.11 + 9.11 → 18.22 → 6(1,1) + [(1,1) + 9.11 (AR)]

We have now annihilated both the positron and electron. Now, in TOPS we cannot destroy the Sparqs that are in the positron. We started off with 14 Sparqs in the electron and positron. That means we must have 14 Sparqs in the products of the decay reaction. For simplicity, **let us assume that the mass of the positron is totally converted to the hf_φ triggering energy** to make the AR photon (that is what the textbooks tell us happens). That would mean that the former electron's Binding Energy is evenly divided among the 14 Sparqs to become the Binding Energy of the seven remaining n2 particles. That would also mean the remainder of the energy (with a mass of 9.11) is contained within the particles that are left.

If we subtract the Sparqs mass from the total, what we have left, is all the 'Other Mass/Energy' = 9.11 (x10^{-31} kg triggering mass), and, we find:

~~9.11~~ + 9.11 → [~~9.11~~+ 9.11] → 7(1,1) + ~~+ 9.11~~

9.11 → 9.11 → 7(1,1)

This is saying that seven n2 neutitos (1,1) have the same 'Other Energy' mass as a single electron (9.11x10^{-31} kg) or positron. **This would mean that the Sparqs mass is exactly HALF of the total mass of the electron or positron**.

Based on this, we can estimate the mass of a single n2 neutito. [BOTH m_{n2} and m_y include Binding Energy (BE) plus the Sparqs mass of $m_{ys} = m_{zs} = m_{n2}/2$.] All of the following expressions must be true relating to the total mass of the n2 neutito (m_{n2}).

$$\mathbf{m_{n2}} \approx \frac{\mathbf{18.2x10^{-31}}}{\mathbf{7}} \approx 2.60x10^{-31} \text{ kg}$$

$$6\ m_{n2} \approx 18.2x10^{-31} - (m_y+m_z) \quad \text{OR,}$$

$$6\ m_{n2} + \underline{(m_y+m_z)} \approx 18.2x10^{-31} \text{ kg}$$

Since, the neutito has only two, equal-sized elements, one york and one zork, and the total mass of the york = the total Sparqs mass of the zork,

$$\mathbf{\frac{m_{n2s}}{2} = m_{ys} = m_{zs} = \frac{2.60x10^{-31}}{2}\ kg = 1.30x10^{-31}\ kg}$$

Note that this Sparqs-mass value is precisely 1/14th of the masses of the combined electron and positron! AND, we have now discovered the masses of the n2 neutito and of all yorks and zorks, regardless of the particle they are in. The attentive reader will note that we have chased that elusive value since Chapter 3, and, to this point, always have been unable to discover that mass as being separate from the radius of the n2. So NOW, we can do that bit of math and feel confident that we can soon calculate the OTHER dimensions of these tiny particles!

These particle masses will be considered fixed for the rest of the book, but the **properties** of the AR radiation we **assumed earlier in this chapter,** do NOT yield quite the right results. The next chapter will deal with the process of determining the actual values of mass, momentum and energy involved with AR resulting from annihilation of a positron with an electron.

Before we finish with this chapter, we need to clear up another bit of the haze that could block our understanding of the mass within any particle. We will make the final calculations in Chapter 12 where we will attempt to pull it ALL together.

Attributable Mass

Let us note that these masses are actually what TOPS calls the *attributed masses* and not the total mass of the particle. There are several sources of energy within any particle. Each source of energy produces an equivalent unit of mass and the sum of all energies divided by c^2 is the total relativity mass.

In general, the mass of any object x, is the sum of all its *attributable masses* (δm_x) within particle x. This may be expressed mathematically as: $m_x = \Sigma\delta m_x$. In the case of the n2 neutito described in the above material, this is,

TOTAL			SUM OF ALL
MASS		=	ATTRIBUTABLE MASSES
$\mathbf{m_{n2rel}}$ **=**	$\boldsymbol{\gamma\delta m_{n2i}}$	**=**	$\boldsymbol{\delta m_{\mu yrel} + \delta m_{\mu zrel} + \delta m_{Qrel}}$

The $\delta m_{\mu yi}$ expression is the inherent *mass attributable to* the magnetic moment of **the york** and includes **only the magnetic** Binding Energy of the york that holds the particle together and the gamma boost (due to its rotational velocity being ~c) produces the *attributable* mass at the relativity level.

The $\delta m_{\mu zi}$ expression is the inherent *mass attributable to* the magnetic moment of **the zork** and includes **only the magnetic** Binding Energy that holds the particle together and the gamma boost due to its rotational velocity being ~c boosts the *attributable* mass at the relativity level.

The δm_{Qi} expression is the relativity *mass attributable to* the electric charge separation between the york and the zork and includes the york/zork **Coulomb Binding Energy** that holds the particle together, and the gamma boost due to its rotational velocity being ~c, boosts it to the relativity level.

We often will not use the delta (**δ**) designation when we add the attributable masses but must realize that this is what we mean when we add the *attributable masses* together to obtain the total mass of the resultant particle.

Thus, the *attributable masses* of the n2 neutito consist of the Sparqs mass ($\delta m_{ys}+\delta m_{zs}$) = 1.30x10^{-31} kg; $\delta m_{B\mu}$, the Binding Energy mass due to magnetic moment; and δm_{BQ}, the Binding Energy mass due to separated charge. The sum of all of them is the total relativity mass of the particle, which, for the n2, is 2.60×10^{-31} kg, exactly TWICE the Sparqs' masses.

QUO VADIS?

Chapter 11 - Particle Mass, Momentum, and Energy

In TOPS, mass is conserved. That means that each unit of mass must appear in both sides of a decay equation. In the case of annihilation radiation (AR) with an electron (2,5) and positron (5,2) 'destroying' each other, we have a total of 14 Sparqs in the combined electron and positron. That means that after the decay, we must STILL have 14 Sparqs, no matter what form they are in.

Also, in TOPS, momentum is conserved. **Momentum is mass x velocity**. That means that for each unit of a mass times its velocity (**v**), that same momentum must appear on both sides of a decay reaction. If one particle has a higher mass than the other, it must also have a lower velocity so the product, **mv** is always the same. Now we started AR with one electron and one positron, but the end-product is one or more photons plus other mass-carrying particles, half of the momentum will be shooting off in one direction and half will be going in the opposite direction. In the product side of the equation, the total mass of the electron and positron AR decay products, must be converted to a new total momentum that must be shared equally among all particles going in the OPPOSITE directions. Note that we are using **v** rather than **u** for linear velocity, for THAT is what contributes to the particle's momentum. But note that **linear momentum is NOT dependent upon a particle's inherent rotational velocity, u—for any given particle, u is a constant—forever! That rotation never speeds up, slows down, or stops.**

Also, in TOPS, energy is conserved. But energy is the product of the momentum x velocity, or $\mathbf{E=mv^2}$. Thus, once we know the momentum relationship between the mass and velocity of any ONE particle, we can readily calculate its energy and momentum.

ALL THREE conservation laws (Matter, Energy, Momentum) must be conserved in any kind of decay. In TOPS, we know the masses of each tiny particle. Thus, whenever we do calculations on decay we must also, determine the momentum breakout.

Momentum Considerations in AR Decay

I think it is now time to explore Annihilation Radiation (AR) a little more deeply, for there are yet more possibilities of AR available and we only **estimated** the energy of AR earlier in Chapter 10. Each of the following examples gives rise to one of multiple numbers of photons and the corresponding wavelengths of the AR photons that are produced. Until we obtain detailed vector analysis of all Standard

Model particles to determine Binding Energies of each type, we may not be able to set fixed values for what happens, but perhaps our experimental particle physicist experts can become prepared to design experiments which can verify the following possible decay routes.

Recall the 'Tom, Dick, and Harry' examples discussed in Chapter 10.

TOPS **TOPS**
Electron **Positron**
-e +e
(2,5) + (5,2) → [7,7]
↳ 6(1,1) + (1,1)φ **Direct AR Production**

For Direct AR production (Tom), there is a single AR photon produced, and the balancing momentum is absorbed by the 6(1,1) n2 neutitos that are also produced. Thus, the AR photon moves in a particular direction and the daughter products move in the opposite direction. But note that some of the particles produced could be n4 or even n10 neutrinos, giving rise to even more decay routes and momentum considerations, as are shown in the following decay examples.

Recall also, that Ortho-Positronium AR (Dick) produces only ODD-numbers of photons, most usually, only ONE photon at a time. Para-Positronium AR (Harry) produces only EVEN-numbers of photons, most usually TWO at a time. In the following decay routes, the final number in the identifying line is the number of photons produced in that proposed decay. [61]

e- + e+ →
(2,5) + (5,2) → [7,7]
↳ 6(1,1) + (1,1)φ **Direct AR Production**
↳ 4(1,1) + (2,2) + (1,1)φ **Ortho-Positronium AR 1**
↳ 1(1,1) + (5,5) + (1,1)φ **Ortho-Positronium AR 1**
↳ 2(1,1) + 2(2,2) +(1,1)φ **Ortho-Positronium AR 1**
↳ 5(1,1) + 2(1,1)φ **PET Scan using para-Positronium 2**
↳ 4(1,1) + 3(1,1)φ **Ortho-Positronium AR 3**
↳ 3(1,1) + 4(1,1)φ **PET Scan using para-Positronium 4**

[61] The three kinds of AR shown in this list, will NOT all have the same wavelengths because the different neutrinos that are produced will have different Binding Energies and the differences will result in wavelengths which are characteristic of which mode is actually occurring.

↳ 2(1,1) + 5(1,1)φ   Ortho-Positronium AR 5
↳ 1(1,1) + 6(1,1)φ   PET Scan using para-Positronium 6
↳ 0(1,1) + 7(1,1)φ   Ortho-Positronium AR 7

In this chapter we are going to calculate the Binding Energy for each of five possible paths, and thus, predict the AR spectrum lines that correspond to each.

> [On theoretical considerations, I would suggest that the proposed products in the final line (Ortho-Positronium AR 7) should be impossible because there is no way for a single photon to be produced without at least ONE other particle to absorb the momentum in the direction opposite to that of the odd AR photon. Thus, we must discuss the momentum of the photon on which this conclusion is based.]

The TOPS photon consists of one york and one zork orbiting each other carrying an infinitely variable amount of 'Triggering energy,' and traveling forward, at the speed of light. The masses of the photon's york and zork do not change and always move at the speed of light. Consequently, the value for the momentum (p_φ) of ANY photon is the sum of the momentum of the two Sparqs plus the momentum of the triggering energy, hf_φ, or,

$$p_\varphi = (m_{ys}+m_{zs})v_\varphi + hf_\varphi/c.$$

But, for a photon, $v_\varphi = c$. Thus, the first term is a constant and **for most photons**, the triggering energy in the second term is so close to 0 that we can ignore it when we are using only three significant figures in all factors in our formulas.

In Chapter 2 we studied the Characteristic radiation which is emitted from an excited hydrogen atom. Characteristic photons are always created in pairs (one from energy of the orbital electron shift and one from the nuclear orbital shift) and, the photons are going in opposite directions, so their photons always have equal, and opposite momentum as pointed out in Chapter 2.

With AR, however, when we have odd numbers of photons emitted, there is always one photon that has no matching photon to offset the photon's momentum, so that odd photon must 'kick-off' against one or more **other** particles. In addition, **in AR, the energy is so high that the hf_φ/c element of the momentum equation becomes very significant and must now be considered.**

As we noted in Chapter 4, the 'triggering energy' is ALL the energy that the photon can give up when it is absorbed. If a photon lost all its hf_φ energy, it would become a quiescent n2 (m_{n2}=2.60x10^{-31} kg) neutito which has NO translational velocity, (i.e., v=0) and thus, has NO momentum.[62] Physicists typically use p to indicate momentum, so, in principle, $p_x = m_x v_x$.

Knowing the masses of the m_{ys} and m_{zs}, and noting that the photon velocity does not change, we can readily see that the momentum of **a low energy[63]** photon is a constant:

$$\mathbf{p_\varphi = (m_{ys}+m_{zs})v_\varphi = (1.30x10^{-31})c = 3.90x10^{-23}\ kg\text{-}m/sec.}$$

Since momentum MUST be conserved, some other particle or group of particles must carry away that same momentum ($3.90x10^{-23}$ kg-m/sec) **in the opposite direction during the decay process!** As previously noted, if that other particle is a photon, momentum is conserved regardless of its energy, for both photons 'kick off' each other with the same energy and momentum. If the other particle is one or more neutrinos, the reacting momentum will be equally shared among the other particles depending upon their masses.

Let us consider this AR decay reaction[64] in which the combined Sparqs of the electron and positron decays into a single, high-energy AR photon and six, identical n2 neutitos:

$$\mathbf{[7,7] \quad \rightarrow \quad 6(1,1) + (1,1)\varphi}$$

As we saw above, a low energy photon has a momentum of $3.90x10^{-23}$ kg-m/sec. That means that for the high-energy AR decay, the six n2 neutitos must carry away the same $3.90x10^{-23}$ kg-m/sec PLUS the hf_φ/c momentum of the photon, but in the opposite direction. (We assume that because all six particles possess the same mass, that they will all be 'kicked-back' at the same velocity.) Now the Sparqs' masses cannot change (because their recoil velocities are well below the level of significant mass changes due to relativity effects), the photon velocity cannot change, but the daughter particles' velocities CAN and DO. Thus, in terms of TOPS linear momentum and using **an approximation**, $f_\varphi = 1.24x10^{20}$ Hz, $hf_\varphi/c = 80.1x10^{-15}$ kg-m/sec (this assumes that all the energy of the positron is converted to photon energy and this is not quite true), and thus, the total momentum of all six n2s should be the same as the total momentum of the photon,

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62 This is a good example of why we should not mix up rotational velocities of subatomic particles (each of which eternally spins at some constant velocity, u_x) and translational velocity, v which is infinitely variable *up to* the constant and maximum, speed of light = c..

63 Note that we can ignore the low value, hf_φ/c component of the formula for low energy photons.

64 For AR we MUST consider the energy of the hf_φ/c component in the momentum equation. We will now assume that all of the energy of the positron is converted into the AR photon. With this approach, $f_\varphi = 1.24x10^{20}$ Hz. This is not going to be exact, but gives us an approximation regarding the value of the hf_φ/c component.

$6p_{n2} = 6(m_{ys}+m_{zs})v_{n2} = p_\varphi = (m_{ys}+m_{zs})c + hf_\varphi/c$ [65]

$6p_{n2} = 6(1.30\text{x}10^{-31}\text{ kg})v_{n2} = p_\varphi = (1.30\text{x}10^{-31}\text{ kg})c + 9.11\text{x}10^{-31}{*}c$ **kg-m/sec**

[You may wonder how the hf_φ/c element becomes $9.11\text{x}10^{-31}{*}c$. Note that hf_φ is the triggering energy of the photon which is also = $m_\varphi c^2$. The mass (m_φ) of the photon, then is hf_φ/c^2 and the momentum (=$m_\varphi c$) is hf_φ/c. At this point, we are using the assumption that all the energy of the positron is converted to the AR photon and the mass of the photon would then be the mass of the positron which is $9.11\text{x}10^{-31}$ kg, but we are about to prove the AR has LESS energy than that. We will address the discrepancy in this chapter.]

The equation involved then, is,

$6p_{n2} = 6(1.30\text{x}10^{-31}){*}v_{n2} = p_\varphi = (1.30\text{x}10^{-31})c + 9.11\text{x}10^{-31}{*}c$ **kg-m/sec**

$6(1.30\text{x}10^{-31})v_{n2} = (1.30\text{x}10^{-31})c + 9.11\text{x}10^{-31}{*}c$

$(7.80\text{x}10^{-31})v_{n2} = (1.30\text{x}10^{-31} + 9.11\text{x}10^{-31}){*}c$

$(7.80\text{x}10^{-31})v_{n2} = (10.4\text{x}10^{-31}){*}c$ Since we know c, we should Be able to calculate v_{n2}.

$v_{n2} = (10.4\text{x}10^{-31}){*}3.00\text{x}10^8/7.80\text{x}10^{-31}$

$v_{n2} = 4.00\text{x}10^8$ m/sec

But THAT is MORE than the speed of light and THAT cannot be! Obviously, something is wrong with the assumption that the energy of the positron is the same as hf_φ.

Thus, not ALL the 'Other Energy' from the positron goes into the AR photon, as we will soon see. The reason? We are dealing only with the Sparqs' masses here and the Sparqs' masses are fixed at $0.65\text{x}10^{-31}$ kg each. In addition, we have the inherent presence of one york and one zork in the photon. **Thus, the total energy in the AR photon must be LESS than that in the positron from which it is made!** The AR must have less energy than we have assumed, or we would have come out with $v_{n2}<c$.

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[65] The letter p is commonly used to mean 'momentum' so p_{n2} means the momentum of the n2 particle. The reader is cautioned NOT to confuse the momentum p, with a Planck's Coefficient, **Þ** (from Chapter 2).

As another illustration, I am going to look at another AR possibility in which there is only one AR photon produced. In the following example, the momentum of one AR photon is divided among FOUR momentum-bearing particles, two n2 neutitos, and two n4 electron neutrinos.

e- + e+ →
(2,5) + (5,2) → [7,7]
↳ 2(1,1) + 2(2,2) +(1,1)φ Ortho-Positronium AR 1
2xn2 +2xn4 + AR photon

The most equitable split of energy would be that half the AR photon energy would go to one n4 neutrino and one of the n2 neutitos pairs, and the other half would go to the other n4 and n2 neutitos. We will also assume that the division of energy occurs proportional to the mass of the particles that receive the momentum from the AR energy. Thus, 2/6 of the energy will be associated with each n4 neutrino and 1/6 with each n2 neutito. I suggest that the reader apply this distribution to see.

AR Momentum = m_{n4} Momentum + m_{n2} Momentum
$(m_{n2}+hf_{\varphi}/c^2)c = m_{n4}v_{n4} + m_{n2}v_{n2}$

Thus, we conclude that each n2 neutito will carry away one sixth of the momentum of the photon. That is because there are six pairs of mass units (Sparqs) in the daughter particles (regardless of what size the particles are), while there is only one pair in the photon which is traveling at the speed of light. That will always be true when we have a SINGLE photon produced. When photons are produced in pairs, their momentums offset each other because they always have equal energies. But when we have a higher order of odd numbers of photons, the distribution of momentum will have one odd pair to check out.

e- + e+ →
(2,5) + (5,2) → [7,7]
↳ 4(1,1) + 3(1,1)φ Ortho-Positronium AR 3
↳ 2(1,1) + 5(1,1)φ Ortho-Positronium AR 5

I will leave it to the reader to do the math for these AR decay patterns, for these figures are based on approximations. But it should be obvious that when we have only four pairs of daughter particles (instead of six in the previous examples), that the velocity must increase to one fourth the speed of light and when we have only two pairs kicking off against a single photon, that velocity will be increased to half the speed of light.

I will now make three generalizations regarding the results that one will find in these examples.

Momentum will be distributed among the daughter particles proportional to their masses.

The more massive each daughter particle is, the slower will be its velocity.

The more particles that are produced in the AR decay, the less massive each particle will be and the lower will be its velocity.

Translational and Rotational Velocities

Before we move on, I want the reader to note that we have used the symbol **v** rather than u for translational velocity in our momentum calculations. This is one of those situations in which **it is most important to recognize the difference between linear or translational velocity** as opposed to rotational velocity that we have been using for spinning particles throughout this book.

There is no connection at all between these two velocities. TOPS uses **u** to represent **rotational** velocity which rigidly follows the rules of h and ħ which determine the SPIN of a particle. The tiny n2 neutito is spinning at the astonishing speed of light (with α_{n2}= 1) and it will NEVER slow down or run out of that motion. On the other hand, the velocity driving a particle away from the AR decay process is occurring at a much slower velocity. That translational momentum acts in a straight line and may be transferred to other particles as it collides with them. The value of the translational velocity of v_{n2}=.25*c that we found in our first example, is fixed only because of momentum considerations in its formation.

We will find that **translational** velocity is infinitely variable—it is predictable because momentum is always conserved, but it varies according to its varying conditions that drive it. On the other hand, the rotational values for any given kind of spinning particle are **always the same,** and is related to the particle's inherent mass, and radius, with the (rotational) velocity being constant, strictly following the natural law of ħ (See Chapter 2). The electron spinning around the nucleus in the first orbit of the hydrogen atom is also determined by ħ, but it is traveling in orbit at the fixed, but relatively trivial rotational velocity of, u_{o1}= 2.19x10^6 m/sec, with the value of

Sommerfeld's Fine Structure Constant, α_{o1}= 7.29x10^{-3}. **That velocity in the n=1 orbit of the hydrogen atom will never change—it is 'locked in' by the Law of Planck's Constant, h.**

In a double-slit experiment, the conditions of an electron passing through a slit and hitting a screen, are dealing with the variable, linear (translational) velocity of the electron v, and not its fixed, spin velocity **u**. The linear velocity of that type of electron motion depends only upon the accelerating voltage applied to the electron and not upon the intrinsic (ħ and **fixed**) spin of that electron. Thus, attempting to apply Planck's constant (or the reduced Planck's constant) to that variable, linear velocity is fruitless, meaningless, misdirected, and leads to impossible conclusions.

Consideration of Energy in AR Decay

Now let us return to the subject of the mass within a particle by considering the energy of the rotating particles.

Since energy is momentum times velocity, everything we said about momentum holds for the energy resulting from nuclear decay. We discussed momentum first, for that relationship between the linear speed of light (c) and the 'kick-back' momentum velocity (v) is essential in our analysis and understanding of what happens in nuclear decay. But energy is conserved, just as momentum is, and that will give us insight in considering the Other Energy within particle structure.

To start, we will return to the example of annihilation radiation (AR) decay where we assumed the masses were related by the relationship (recall that m_{B-} and m_{B+} are the mass equivalences due to Binding energy of the electron and positron, respectively). The combined Sparqs of those two particles gives us a total mass of 14 Sparqs and those 14 s are redistributed in AR decay as follows:

$$[7,7] \rightarrow 6(1,1) + [(1,1)\varphi]$$

$$\text{MASS} \rightarrow \text{MASS}$$

$$[7m_{ys}+7m_{zs}+m_{B-}+m_{B+}] \rightarrow 6(m_{ys}+m_{zs}) + [(m_{ys}+m_{zs})+hf_{\varphi}/c^2]$$

Now, let us consider this from the energy aspects of the same process.

$$\text{ENERGY} \rightarrow \text{ENERGY}$$

(in combined electron and positron) (6 n2 neutitos + [AR photon])

$$[7m_{ys}+7m_{zs}+m_{B-}+m_{B+}]c^2 \rightarrow 6(m_{ys}+m_{zs})v^2 + [(m_{ys}+m_{zs})c^2 + hf_{\varphi}]$$

I am now going to subtract common factors (the Sparq energy of the 7 yorks and 7 zorks) from both sides of the energy equation, to get what I will call 'Other Energy' (E_O) which cannot change, for that energy was in the original electron and positron. This is the energy that was over, and above, that of the individual Sparqs and this is the triggering energy that is inherent in the AR photon.

$$\text{OTHER ENERGY} \rightarrow \text{OTHER ENERGY}$$

$$E_O = [m_{B-}+m_{B+}]c^2 \rightarrow hf_{\varphi}$$

This logic provided the basis for our **earlier assumption that the 'triggering energy' of the photon was the same as the sum of 'Other Energies' (E_O) in accordance with current TOPS concepts of AR. Note that the Eo is all available energy from the electron and positron structures but does not include the Sparq masses.** It has nothing to do with the energy content of the products of the AR radiation decay except that they MUST be the same in value. In the products of that decay, we have only the fixed mass/energy of the six daughter n2 neutitos, with their translational kinetic energy and the photon which contains two Sparqs and the 'triggering energy.'

That admitted assumption gave us a 'ballpark' estimate but recall that it yielded a velocity that exceeded the speed of light. Now surely, we can get closer to the correct answer **without making that obviously WRONG assumption**. All we need to do is take the recoil momentum with the actual energy of the six n2 neutitos and work backwards to how much energy is available for that triggering energy in the photon! THAT will account for conservation of both momentum and energy, i.e., it will consider every factor regarding mass within the products of decay.

$$\text{OTHER ENERGY} \rightarrow \text{OTHER ENERGY}$$

$$E_O = [m_{B-}+m_{B+}]c^2 \rightarrow hf_{\varphi}$$

We do not need to be concerned about what the separate value of Binding energies, because **hf provides a closer measure of the total Other Energy (E_O). We know that the Eo is exactly HALF of the Sparq energy in the particle.**

We are now going to make a closer assumption relating the distribution of the Eo. Since the positron's mass is $9.11x10^{-31}$ kg, and we know that the Eo is half of that value = $4.55x10^{-31}$ kg! Now assume that half of THAT energy would be distributed among the six n2 neutitos and the other half is the energy available for AR production. Thus, the energy that is converted to AR is $2.28x10^{-31}$ kg xc^2, and thus, (remember that we are using another assumption here.)

$$\mathbf{E_O /2 = \quad hf_\varphi/2 = 2.28x10^{-31}\ kg\ xc^2 = 20.5x10^{-15}\ j}$$

Since we know the value of h, we can directly calculate the frequency of the AR photon, using our assumption!

$$\mathbf{f_\varphi = (2/h)(20.5x10^{-15}\ j) = 5.18x10^{19}\quad Hz}$$

Again, those values of energy and frequency are only approximations that are based on the assumption that half of the Eo energy goes into the photon and half into the six n2 neutitos. But that assumption also gives only an approximation because it is simply not quite true!

I am now going to attempt to be even more definitive in determining these values by calculating the actual distribution of Eo energy by calculating the reaction, element-by-element. Recall that we calculated the momentum of the six recoil n2 neutrinos. Because the n2 recoil velocities are evenly distributed among the six neutitos, the velocity of each n2 (v_{n2}) is c/6. Energy is proportional to the square of the velocity so, $v_{n2}^2 = c^2/36$, and $(v_{n2}^2+c^2) = 37c^2/36$.

AR Production in the TOPS Model

(Case 1: Single Photon, Six n2 Emissions)

COMBINED PARTICLES

(2,5) + (5,2)		**n2 neutitos**		**photon**
[7,7]	$\rightarrow$	**6(1,1)**	**+**	**[(1,1)φ]**

ENERGY IN $\rightarrow$ ENERGY OUT

$(m_{e-} + m_{e+})c^2 \rightarrow 6(m_{ys}+m_{zs})(c^2+v_{n2}^2) + [(m_{ys}+m_{zs})c^2 + hf_{\varphi}]$

A **B** **C** **D** **E**

Where **A** is the combined masses of the electron and positron,
B is the 12 Sparqs within the 6 n2 neutitos, @1.30E-31 kg, ea
C is divided into two parts; the c^2 portion represents the mass contribution of the Sparqs to ANY particle and the v_{n2}^2 portion represents the translational velocity imparted to the six n2 to account for the momentum of the photon,
D is the Sparq mass (equivalent to that of **B**) of the photon,
E is the remaining energy that constitutes the 'Triggering Energy' of the photon.

A **B** **C** **D** **E**

$(2\text{x}9.11\text{x}10^{-31})c^2 \rightarrow 6(1.30\text{x}10^{-31})(c^2(37/36) + (1.30\text{x}10^{-31})c^2 + hf_{\varphi}$

$\mathbf{164\text{x}10^{-15}\ j \rightarrow 72.2\text{x}10^{-15}\ j + 11.7\text{x}10^{-15}\ j} + hf_{\varphi}\ \mathbf{j}$

$\mathbf{164\text{x}10^{-15}\ j - 72.2\text{x}10^{-15}\ j - 11.7\text{x}10^{-15}\ j} \rightarrow hf_{\varphi}\ \mathbf{j}$

$\mathbf{80.1\text{x}10^{-15}\ j} \rightarrow hf_{\varphi}\ \mathbf{j = 6.63\text{x}10^{-34}\ j\text{-sec x } f_{\varphi}}$ Hz

Dividing both sides by Planck's Constant, h, yields the frequency of the photon.

$f_{\varphi} = \mathbf{80.1\text{x}10^{-15}\ j/6.63\text{x}10^{-34}\ j\text{-sec} = 1.21\text{x}10^{20}}$ Hz

Research tells us that the broad, fuzzy[66] wavelength (λ_{AR}) of the AR photon at this frequency is around:

$$\lambda_{AR} = 2.48 \times 10^{-12}\ \mathrm{m}$$

The mass equivalent of the 'triggering energy' of the AR photon 80.1×10^{-15} j/c^2 is **7.20×10^{-31} kg, significantly less than the 9.11×10^{-31} kg** that we assumed as an estimate, in the last chapter.

That fact and that experimental observation of that specific spectral line would lend credence to the TOPS model. A Wikipedia graph of experimental evidence shows the AR spectral line is about 2.43×10^{-12} m and, considering that we have been using only three significant figures, that would seem to be evidence that the AR treatment in the TOPS model of the photon might well be valid.

The part of the above equation that deals with the Sparq energy of a single m_{n2} (and NOT its relativity mass equivalent of twice that value--See equation element C) is: $E_{mn2s} = (m_{ys}+m_{zs})c^2 = (1.30 \times 10^{-31}\ \mathrm{kg})c^2 = 11.7 \times 10^{-15}$ j.

The **total** Sparq mass within the AR annihilation of an electron with a positron is exactly the sum of the two masses. Together, they contain 14 Sparqs. Looking at the above equations, those Sparqs are in equation elements B and D. When multiplied by c^2, we obtain exactly half of the energy content of the two original particles. That means that all Other energy within the electron and positron is ALSO half of the total energy. That also means that every Sparq contributes half of the mass/energy that we find in the electron.

We have now established the Sparq mass of the n2 neutito as being 2.60×10^{-31} kg, with the Sparq masses of the york and zork being exactly HALF of that, i.e., 1.30×10^{-31} kg. This confirms our Chapter 7 assertion that, the relativity mass of the n2 is 2.60×10^{-31} kg, just twice that of the number of Sparqs within it. Since we have established this principle for the n2, n4 and electron, we will now assume that it also applies to all larger Standard Model particles.

Thus, we now assume that the total mass of ANY subatomic particle is 2x #Sparqs x 0.65×10^{-31} kg.

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[66] This lack of specificity of the wavelength is attributed to the different velocities and directions, of the electron and positron as they interact when they annihilate each other and is called the Doppler Effect.

So, with this assumption, the most massive of all Standard Model particles is the Bottom quark (12,13) which has a mass of $2*25*.65\text{x}10^{-31}$ = $32.5\text{x}10^{-31}$ kg and the masses of all other particles are just as readily determined.

Determination of other properties of all particles will be covered in Chapter 12.

There is another single-photon AR decay that produces yet another neutrino variety, the electron neutrino, n4. We will study that as Case 2.

(Case 2: Single Photon, Four n2, and One n4 Emissions)

COMBINED PARTICLES

(2,5) + (5,2)		**n2 neutitos**	**+ n4 +**	**photon**
[7,7]	$\rightarrow$	**4(1,1)**	**+ (2,2)+**	**[(1,1)φ]**

First, we must calculate the momentum which is shared among the 4 n2 neutitos and the single n4 neutrino.

Again, the momentum of the single AR photon remains unchanged at:

$$p_\varphi = (m_{ys}+m_{zs})u_\varphi = (1.30\text{x}10^{-31})c + hf_\varphi = 3.90\text{x}10^{-23} + hf_\varphi \text{ kg-m/sec,}$$

but the same reactive momentum is evenly shared among the five daughter products of the decay (4 n2 and 1 n4).

$$4(1.30\text{x}10^{-31}\text{ kg})v_{n2} + (2.60\text{x}10^{-31}\text{ kg})v_{n4} = 1.30\text{x}10^{-31}c \quad \text{kg-m/sec, OR,}$$

$$5.20\text{x}10^{-31}\text{ kg } v_{n2} + 2.60\text{x}10^{-31}\text{ kg } v_{n4} = 1.30\text{x}10^{-31}c \quad \text{kg-m/sec,}$$

AND, divide by the common factor, $1.30\text{x}10^{-31}$ kg to get:

$$4v_{n2} + 2v_{n4} = c$$

Since the momentum is evenly divided among the five daughter neutrinos, we must ALSO have:

$4v_{n2} = 2v_{n4}$ **THUS,**

$4v_{n2} + 4v_{n2} = c$ **making $v_{n2}/c = 1/8$, $(v_{n2}/c)^2 = 1/64$ AND,**

$2v_{n4} + 2\,v_{n4} = c$ **making $v_{n4}/c = ¼$, $(v_{n4}/c)^2 = 1/16$, THUS,**

$(c^2+v_{n2}^2) = 65c^2/64 = 9.14\text{x}10^{16}$ m/sec

$(c^2+v_{n4}^2) = 17c^2/16 = 9.56\text{x}10^{16}$ m/sec

Now let us insert these values into our energy equation for this form of AR decay.

COMBINED PARTICLES

(2,5) + (5,2) → 4(1,1) + (2,2) + (1,1)φ

ENERGY IN → ENERGY OUT

$$\underset{\mathbf{A}}{(m_{e-}+ m_{e+})c^2} \rightarrow 4\underset{\mathbf{B}}{(m_{ys}+m_{zs})}\underset{\mathbf{C}}{(c^2+v_{n2}^2)}+\underset{\mathbf{B'}}{(2m_{ys}+2m_{zs})}\underset{\mathbf{C'}}{(c^2+v_{n4}^2)}+[\underset{\mathbf{D}}{(m_{ys}+m_{zs})c^2} + \underset{\mathbf{E}}{hf_{\varphi}}]$$

Where **A** is the combined masses of the electron and positron,

B is the 8 Sparqs within the 4 n2 neutitos,

C is divided into two parts; the c^2 portion represents the mass contribution of the Sparqs to ANY particle and the v_{n2}^2 portion represents the translational velocity imparted to the four n2 to account for the momentum of the photon,

B' is the 4 Sparqs within the single n4 neutrino,

C' is divided into two parts; the c^2 portion represents the mass contribution of the Sparqs to ANY particle and the v_{n4}^2 portion represents the translational velocity imparted to the n4 to account for the momentum of the photon,

D is the Sparq mass (equivalent to that of **B**) of the photon,

E is the remaining energy that constitutes the 'Triggering Energy' of the photon.

A	B	C	B'	C'	D	E

$(2x9.11x10^{-31})c^2 \rightarrow 4(1.30x10^{-31})(65/64)c^2 + (2.60x10^{-31})(17/16)c^2 + (1.30x10^{-31})c^2 + hf_\varphi\ \mathbf{j}$

$\mathbf{164x10^{-15}\ j \rightarrow 47.5x10^{-15}\ j + 24.9x10^{-15}\ j + 11.7x10^{-15}\ j} + hf_\varphi\ \mathbf{j}$

$\mathbf{164x10^{-15}\ j - 47.5x10^{-15}\ j - 24.9x10^{-15}\ j - 11.7x10^{-15}\ j} \rightarrow hf_\varphi\ \mathbf{j}$

$\mathbf{79.9x10^{-15}\ j} \rightarrow hf_\varphi\ \mathbf{j = 6.63x10^{-34}\ j\text{-}sec\ x\ f_\varphi}\ \text{Hz}$

$f_\varphi = \mathbf{79.9x10^{-15}\ j/6.63x10^{-34}\ j\text{-}sec = 1.21x10^{20}}\ \text{Hz}$

and, again, the wavelength (λ_{AR}) of the AR photon of this frequency is:

$\boldsymbol{\lambda_{AR} = 2.48x10^{-12}\ m}$

Note we now have TWO different neutrino types produced in the same decay process BUT, **the frequency and wavelength of the AR photon are the same in Cases 1 and 2**. The velocities of the neutrinos, however, are different. How about what happens with the third type of single-photon AR emission? We will call that Case 3.

But before we tackle Case 3, let us note that we have again confirmed the findings of Case 1, that the Sparq mass of the n2 neutito as being $1.30x10^{-31}$ kg, with the Sparq masses of the york and zork being exactly HALF of that, i.e., $0.65x10^{-31}$ kg, each. But we have also found that the mass of the n4 neutrino is exactly twice that of the neutito, so $m_{n4} = 5.20x10^{-31}$ kg, again, just twice that of the number of Sparqs within it.

(Case 3: Single Photon, Two n2, and Two n4 Emissions)

COMBINED PARTICLES

$\mathbf{(2,5) + (5,2) \rightarrow 2(1,1) + 2(2,2) + (1,1)\varphi}$

Again, the momentum of the single AR photon remains unchanged at:

$p_\varphi = (m_{ys}+m_{zs})u_\varphi = (1.30x10^{-31})c =$ **$3.90x10^{-23}$ kg-m/sec,**

but the same reactive momentum is now evenly shared among the four daughter products of the decay (2 n2 and 2 n4).

$2(1.30x10^{-31}\,kg)v_{n2} + 2(2.60x10^{-31}\,kg)v_{n4} = 1.30x10^{-31}c$ kg-m/sec, OR,

$2.60x10^{-31}\,kg\,v_{n2} + 5.20x10^{-31}\,kg\,v_{n4} = 1.30x10^{-31}c$ kg-m/sec, AND, divide by the common factor, $1.30x10^{-31}$ kg to get:

$2v_{n2} + 4v_{n4} = c$

Since the momentum is evenly divided among the four daughter neutrinos, we must have:

$2v_{n2} = 4v_{n4}$ **THUS, we obtain the similar values for momentum that we did in Case 2, but in reverse order—in general, the more massive particles are traveling at slower velocities. Thus,**

$4v_{n4} + 4v_{n4} = c$ **making $v_{n4}/c = 1/8$, $(v_{n2}/c)^2 = 1/64$ AND,**

$2v_{n2} + 2\,v_{n2} = c$ **making $v_{n2}/c = ¼$, $(v_{n4}/c)^2 = 1/16$, THUS,**

$(c^2+v_{n2}^2) = 17c^2/16 = 9.56x10^{16}$ m/sec **and,**

$(c^2+v_{n4}^2) = 65c^2/64 = 9.14x10^{16}$ m/sec

ENERGY IN $\rightarrow$ ENERGY OUT

$$\underset{\mathbf{A}}{(m_{e-}+m_{e+})c^2} \rightarrow 2\underset{\mathbf{B}}{(m_{ys}+m_{zs})}\underset{\mathbf{C}}{(c^2+v_{n2}^2)}+2\underset{\mathbf{B'}}{(2m_{ys}+2m_{zs})}\underset{\mathbf{C'}}{(c^2+v_{n4}^2)}+[\underset{\mathbf{D}}{(m_{ys}+m_{zs})c^2} + \underset{\mathbf{E}}{hf_\varphi}]$$

Where **A** is the combined masses of the electron and positron,
B is the 4 Sparqs within the 2 n2 neutitos,
C is divided into two parts; the c^2 portion represents the mass contribution of the Sparqs to ANY particle and the v_{n2}^2 portion represents the translational velocity imparted to the two n2 to account for the momentum of the photon,

B' is the 8 Sparqs within the two n4 neutrinos,

C' is divided into two parts; the c^2 portion represents the mass contribution of the Sparqs to ANY particle and the v_{n4}^2 portion represents the translational velocity imparted to the two n4 to account for the momentum of the photon,
D is the Sparq mass (equivalent to that of **B**) of the photon,
E is the remaining energy that constitutes the 'Triggering Energy' of the photon.

A B C B' C' D E

$$(2x9.11x10^{-31})c^2 \rightarrow 2(1.30x10^{-31})(65/64)c^2) + 2(2.60x10^{-31})(17/16)c^2) + (1.30x10^{-31})c^2 + hf_\varphi \mathbf{j}$$

$$\mathbf{164x10^{-15}\ j} \rightarrow \mathbf{24.9x10^{-15}\ j} + \mathbf{47.5x10^{-15}\ j} + 11.\mathbf{7x10^{-15}\ j} + hf_\varphi \mathbf{j}$$

$$\mathbf{164x10^{-15}\ j} - \mathbf{24.9x10^{-15}\ j} - \mathbf{47.5x10^{-15}\ j} - 11.\mathbf{7x10^{-15}\ j} \rightarrow hf_\varphi \mathbf{j}$$

$$\mathbf{79.9x10^{-15}\ j} \rightarrow hf_\varphi \mathbf{j}$$

$$f_\varphi = \mathbf{79.9x10^{-15}\ j/6.63x10^{-34}\ j\text{-}sec} = \mathbf{1.21x10^{20}}\ \text{Hz}$$

and, again, the wavelength (λ_{AR}) of the AR photon of this frequency is:

$$\boldsymbol{\lambda_{AR} = 2.48x10^{-12}\ m}$$

And we conclude that regardless of the mix of daughter particles, **the single-photon AR radiation will always have the same energy, but it is somewhat LESS than the mass/energy of the annihilated positron**.

It is important to note that this constant, energy value applies only to one kind of AR decay and in the case of single-photon production, a single energy of AR photon is produced. There are other modes of decay that produce TWO or more photons of AR and the resulting photons will have LESS energy as we will soon see.

(Case 4: Double AR Photon, and One n10 Emission)

When we have TWO photons emitted, we do NOT need to calculate momentum of recoiling particles because the two photons 'kick-off' against each other with equal momentum. Thus, we can go directly to the proposed AR decay and evaluate it without momentum considerations FOR OTHER (daughter) particles.

COMBINED PARTICLES

(2,5) + (5,2)		**n10**		**photons**
[7,7]	→	**(5,5)**	**+**	**2(1,1)φ**

$$\text{ENERGY IN} \rightarrow \text{ENERGY OUT}$$

$$\underset{\mathbf{A}}{(m_{e-} + m_{e+})c^2} \rightarrow \underset{\mathbf{B}}{(5m_{ys}+5m_{zs})}\underset{\mathbf{C}}{(c^2+v_{n10}^2)} + \underset{\mathbf{D}}{2(m_{ys}+m_{zs})c^2} + \underset{\mathbf{E}}{2hf_\varphi}$$

Where **A** is the combined masses of the electron and positron,
B is the 10 Sparqs within the single n10 neutrino,
C is the velocity contribution but, the translational velocity $v_{n10} = 0$ because the two, oppositely directed hf_φ (photon) components, counteract to conserve momentum.
D is the Sparq mass (equivalent to that of **B**) of the 2 photons,
E is the remaining energy that constitutes the 'Triggering Energy' of the 2 photons which are equal in energy.

Note that the sum of (BxC)+D= $(7m_y+7m_z)c^2$, exactly the content of the original electron and positron.

A		B	C	D	E

$$(2\text{x}9.11\text{x}10^{-31})c^2 \rightarrow (6.50\text{x}10^{-31})(c^2+0^2) + [(2.60\text{x}10^{-31})c^2 + 2\,hf_\varphi]$$

$$\mathbf{164\text{x}10^{-15}\ j} \rightarrow \mathbf{58.5\text{x}10^{-15}\ j} \mathbf{+ 23.4\text{x}10^{-15}\ j} + 2hf_\varphi\ \mathbf{j}$$

$$\mathbf{164\text{x}10^{-15}\ j} - \mathbf{58.5\text{x}10^{-15}\ j} - \mathbf{23.4\text{x}10^{-15}\ j} \rightarrow 2hf_\varphi\ \mathbf{j}$$

$$\mathbf{82.1\text{x}10^{-15}\ j} \rightarrow 2hf_\varphi\ \mathbf{j}$$

And thus,

$f_\varphi =$ **$(82.1\text{x}10^{-15}/2)$ j/$6.63\text{x}10^{-34}$ j-sec** Hz so, for **each** single photon,

$f_\varphi = 6.19\text{x}10^{19}$ Hz.

NOTE THAT THIS IS JUST HALF OF THE FREQUENCY AS WHEN WE HAVE A SINGLE PHOTON PRODUCED! This should not be surprising, for it is the frequency of the photon that determines the photon energy, but the wavelength (λ_{AR}) of the AR photon of this frequency is:

$\lambda_{AR} = 2.48\text{x}10^{-12}$ m

and, this is TWICE the wavelength of the Single-photon AR. Again, no surprise here, since half of the frequency should result in double the wavelength as in $c = \lambda_\varphi f_\varphi$.

But wait! There is yet ANOTHER option possible for double-photon AR decay.

(Case 5: Double Photon, and Five n2 Emissions)

COMBINED PARTICLES

(2,5) + (5,2) [7,7]

↳ 5(1,1) + 2(1,1)φ

Note again, that with two photons, there is again, no excess photon momentum to account for. Thus, any daughter particle produced during a two-photon AR production, will have ZERO AR-associated velocity/momentum and those five n2 neutito daughter particles will just remain pretty much hovering near each other in space while the two photons shoot away from each other at the speed of light.

ENERGY IN → ENERGY OUT

$$\underset{\mathbf{A}}{(m_{e-}+m_{e+})c^2} \rightarrow 5\underset{\mathbf{B}}{(m_y+m_z)}\underset{\mathbf{C}}{(c^2+v_{n2}^2)} + \underset{\mathbf{D}}{2(m_y+m_z)c^2} + \underset{\mathbf{E}}{2hf_\varphi}$$

Where **A** is the combined masses of the electron and positron,
B is the 10 Sparqs within the five n2 neutitos,
C is the velocity contribution but, the translational velocity $v_{n2} = 0$ because the two, oppositely-directed hf_φ components, counteract to conserve momentum, and

have no effect on the five quiescent, n2 neutitos.
D is the Sparq mass (equivalent to that of **B**) of the 2 photons,
E is the remaining energy that constitutes the 'triggering Energy' of the 2 photons which are equal in energy.

A **B** **C** **D** **E**

$$(2x9.11x10^{-31})c^2 \rightarrow 5(1.30x10^{-31})(c^2+0^2) + [2(1.30x10^{-31})c^2 + 2hf_\varphi]$$

$$\mathbf{164x10^{-15}\ j} \rightarrow \mathbf{58.5x10^{-15}\ j} + \mathbf{[23.4x10^{-15}\ j} + 2hf_\varphi\ \mathbf{j]}$$

$$\mathbf{164x10^{-15}\ j} - \mathbf{58.5x10^{-15}\ j} - \mathbf{23.4x10^{-15}\ j} \rightarrow 2hf_\varphi\ \mathbf{j}$$

$$\mathbf{82.1x10^{-15}\ j} \rightarrow 2hf_\varphi\ \mathbf{j}$$

$$hf_\varphi = \mathbf{41.1x10^{-34}\ j}$$

$$f_\varphi = \mathbf{41.1x10^{-15}\ j/6.63x10^{-34}\ j\text{-}sec} = \mathbf{6.20x10^{19}}\ \text{Hz}$$

The wavelength (λ_{AR}) of the AR photon of this frequency is:

$$\boldsymbol{\lambda_{AR}} = \mathbf{4.84x10^{-12}\ m}$$

NOTE that the photon energies produced from *both Cases* of double-photon AR decay routes are the SAME as that produced from a single-photon (80x10^{-15} j). That same energy, however, is split between the two photons, so each photon has half of that energy. Nevertheless, the energy within an AR photon is NOT the same as that of the electron from which it conventionally is presumed to be made!

Recall from Chapter 9 that we discussed the issue of Electron Capture in which the nucleus of some very large kinds of atoms will capture one if its own orbital electrons. This reduces the Atomic Number by 1 without significant change of mass, but that will always produce a new kind of atom. We now present Case 6 that shows the math of this reaction.

(Case 6: Double Photon from Electron Capture)

$$\begin{array}{ccccccc} \text{Proton} & + \ \mathbf{-e} & \rightarrow \text{n10} \rightarrow & \text{Neutron} & + & \text{2photons} \\ \cancel{u \ d}\ u & & & d\ \cancel{u \ d} & + & 2(1,1)\phi \end{array}$$

$$(\cancel{6,4})(\cancel{6,7})(6,4) + \mathbf{(2,5)} \rightarrow [20,20] \rightarrow (6,7)(\cancel{6,4})(\cancel{6,7}) + 2(1,1)\phi$$

We will now simplify this by deleting an up quark and a down quark from both sides of the equation as shown. This will simplify things for the calculations.

REACTING PARTICLES

$$\begin{array}{ccccc} \text{up} & + \ \mathbf{-e} & \rightarrow \text{n10} \rightarrow & \text{down} & + \ \text{2photons} \\ u & & & d & + \ 2(1,1)\phi \end{array}$$

$$(6,4) + \mathbf{(2,5)} \rightarrow [8,9] \rightarrow (6,7) + 2(1,1)\phi$$

$$\begin{array}{lclll} \text{ENERGY IN} & \rightarrow & \text{ENERGY OUT} & & \\ u + e- & & d & \text{Photon Sparqs} & \text{Trig Energy} \\ (m_u + m_{e-})c^2 & \rightarrow & (6m_y+7m_z)c^2 & + 2(m_{ys}+m_{zs})c^2 & + 2hf_\varphi \\ \mathbf{A} & & \mathbf{B} & \mathbf{C} & \mathbf{D} \end{array}$$

Where **A** is the combined masses of the up quark and electron,[67]
B is the 13 Sparqs within the down quark,
C is the Sparq mass of the 2 photons,
D is the Binding energy that constitutes the 'Triggering Energy' of the 2 photons which are equal in energy.

[C+D] is the total mass/energy of both photons.

A **B** **C** **D**

$$(13.0+9.11)\text{x}10^{-31}\text{x}c^2 \rightarrow 13(1.30)\text{x}10^{-31}\text{x}c^2 + [2(1.30)\text{x}10^{-31}\text{x}c^2 + 2hf_\varphi]$$

$$\mathbf{199x10^{-15}\ j} \rightarrow \mathbf{152x10^{-15}\ j} + \mathbf{[23.4x10^{-15}\ j} + 2hf_\varphi \mathbf{\ j]}$$

$$\mathbf{199x10^{-15}\ j} - \mathbf{152x10^{-15}\ j} - \mathbf{23.4x10^{-15}\ j} \rightarrow 2hf_\varphi \mathbf{\ j}$$

$$\mathbf{23.6x10^{-15}\ j} \rightarrow 2hf_\varphi \mathbf{\ j}$$

$$hf_\varphi = \mathbf{11.8x10^{-34}\ j}$$

[67] For masses of specific quarks, etc., refer to Table 12-1.

f_{φ} **= 11.8x10^{-15} j/6.63x10^{-34} j-sec = 1.78x10^{19}** Hz

The wavelength (λ_{EC}) of each photon of this frequency is:

λ_{EC} = 1.69x10^{-11} m

This wavelength, however, is a **baseline wavelength** for there will be a fixed amount of energy added to the above level because of the added potential energy of the falling, captured electron. That amount of energy will be dependent upon WHICH orbital electron is captured. The minimum of that energy would correspond to the capture of an electron in the n=1 orbit. It is possible that this is the ONLY electron which may be captured, but if other orbital captures are possible, each will have its own energy level and result in a wavelength which is slightly shorter than the baseline, 1.69x10^{-11} m and will be characteristic of the kind of atom in which the electron capture occurred. Thus, any spectral lines resulting from the electron capture will be sharply defined, for the energy levels will be very specific while AR spectral lines will be blurred due to Doppler effects of continuously varying velocities of the electron and positron.

Summary of Findings

Let us now summarize our findings from the five Cases of AR decay.

1. **The AR photon energy is NOT the same as the annihilated electron or positron—some of that energy may go into the Other Energy of the daughter particles as Kinetic Energy.**

2. **The frequency and wavelength of the AR photon for single photon production:**
   a. **AR Photon frequency is the same, regardless of the daughter products. (1.21x10^{20} Hz)**
   b. **Thus, the photon wavelengths are also the same (2.48x10^{-12} m).**

3 The frequency and wavelength of the AR photon for double photon emission:
   a. Photon frequency is about half that of single photon emission. ($6.20\text{x}10^{19}$ Hz)
   b. Thus, the wavelength is about twice that of single photon emission ($4.84\text{x}10^{-12}$ m).

4 The mass of the n2 neutito not only includes the mass from Sparq energy ($m_{ys}+m_{zs}$)= $1.30\text{x}10^{-31}$ kg and all Other energy (m_{Os}) which is exactly equal to the Sparq energy, so the total mass of the n2 is $2.60\text{x}10^{-31}$ kg.

5 The total mass of the n4 is $5.20\text{x}10^{-31}$ kg.

6 The total mass of the n10 is $13.0\text{x}10^{-31}$ kg.

Finally, I believe we have all the information we need to complete our analysis of the n2 neutito and, in Chapter 12, we will move to assemble our previously calculated equation elements to theoretically determine all dimensions of the electron from the mass of an electron!

QUO VADIS?

As suggested earlier, the Total Solar Eclipse of 2024 might be used to validate the TOPS hypothesis that the total mass of a photon is

$$m_\varphi = m_{n2} + hf_\varphi/c^2.$$

Because the mass equivalent of hf_φ/c^2 is so small compared to m_{n2} for low energy photons (as previously noted), this will require spectral analysis of high energy characteristic radiation of large atoms, far beyond the ultraviolet radiation of the solar spectrum. Such an experiment might also test the currently held assumption that photons possess no mass at all.

Chapter 12 - Bringing it ALL Together

The Traditional View of the Electron Mass (m_e)

Conventional physics holds that the mass of an electron is 9.11×10^{-31} kg. That is the value it would HAVE to be IF all the energy in a positron were converted to a single photon of energy .51 MeV which is the approximate Annihilation Radiation energy given off when the positron is annihilating an electron.

This seems logical if the positron and electron are elementary particles with no mass-containing subordinate structures. That would also apply to the Annihilation Radiation photon—it too, would have no mass, because the traditional view is that a photon possesses no mass. The traditional electron is elementary, i.e., it is not made of smaller particles. Similarly, the traditional photon is an elementary packet of energy and possesses no smaller particles, but it has no mass. In short, conventional physics holds that there are NO more-elementary particles of matter than quarks, electrons, neutrinos, and photons.

The traditional logic is:

Only massless photons of light and their close relatives, the neutrinos, can travel at the speed of light. (Logic: Nothing but light can travel at the speed of light because any mass that was traveling at that velocity would become infinitely heavy.)
One electron undergoing annihilation with a positron, emits a PAIR of .51MeV photons.
A .51MeV photon converts to a mass of 9.11×10^{-31} kg.
Therefore, the electron mass is 9.11×10^{-31} kg.

Fundamentally, the mass of the positron is taken as being the energy of the photon that is produced, following the traditional assumption that all the energy of the positron is converted to a massless photon of energy = hf_φ. Thus, traditional physics holds that the mass of a positron (**m_{e+}**) is:

$$m_{e+} = 0.51 \text{ MeV} = 9.11 \times 10^{-31} \text{ kg}$$

From now on, I am not going to use the mass equivalence in terms of MeV and will stick with the SI units, kg. This mass is not directly measurable—there is no scale small enough to measure anything that small. Experimental physicists calculate m_e from a constant that we CAN measure experimentally; **$e/m_e = 1.76 \times 10^{11}$ C/kg**.

This $e/m_e = 1.76x10^{11}$ C/kg ratio was originally experimentally derived by using a Cathode Ray tube which has adjustable electric and magnetic fields which may be tuned to offset each other. A vertical electric field is adjusted to exactly nullify the effect of a horizontal (perpendicular), fixed magnetic field, which otherwise, would bend a beam of electrons in a cathode ray tube. We know the value of the charge on an electron. Figure 12-1 is a diagram of an early-era Cathode Ray Tube (CRT) to illustrate how J. J. Thompson first measured the value of e/m after he discovered the electron in 1897.

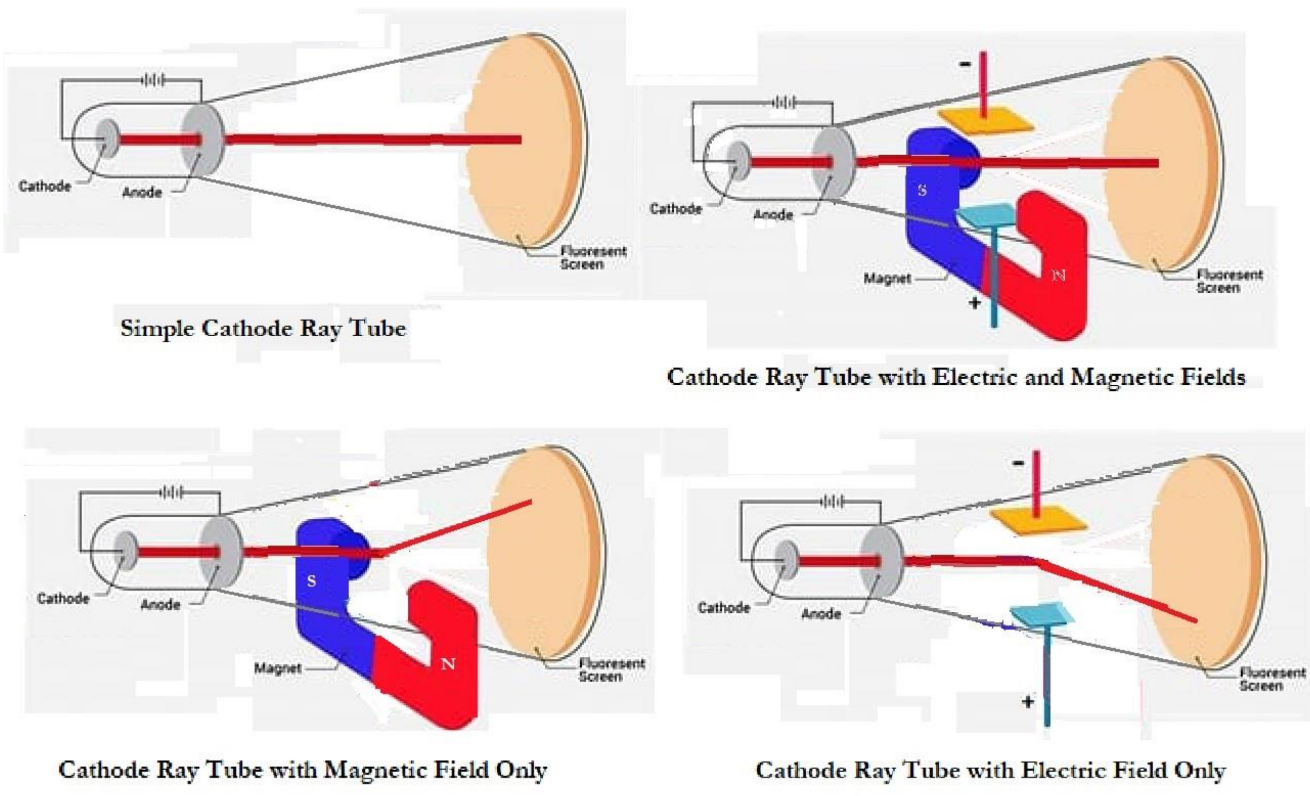

Figure 12-1 Cathode Ray Tubes with and without Magnetic and Electric Fields

Most of the air has been removed from the tube (leaving a pressure of only about .01 mm Hg) but there are always a few ionized molecules floating about in any vacuum. When the battery is inserted between the cathode and anode as shown in Figure 12-1, a voltage is generated across the tube and any ions available, will immediately begin to rush across the tube, their directions of flow being determined by whether they are negatively or positively charged. On their journey, those ions crash into neutral molecules within the tube and that further ionizes the low-pressure gas, generating more charged particles. This causes a continuous current to flow in the tube. About half of that current consists of electrons which are forced away from the cathode to the anode by the voltage. The other half of the current consists of positively charged (ionized) atoms that move in the opposite direction. There is a hole in the center of the anode, and this allows some electrons to pass through the anode, forming an electron beam (shown in red). When each electron strikes the fluorescent screen at the end of the tube, it shows a flash of light at the point of impact.

When a magnet is placed so its magnetic field is across the CRT (as shown, lower left) the electron beam (shown in red) will be deflected upwards and we will observe that the flashes of light rise on the fluorescent screen—if we reversed the direction of the magnetic field, the electron beam would be deflected downwards.

If we removed the magnet and inserted two electrodes as shown at the lower, right, the negative plate at the top would deflect the electron beam downward. Again, if we reversed the charges on those electric plates, the electron beam would be deflected upward.

When we have **both** magnetic and electric fields, we can balance out the magnetic deflection of the electron beam by simply modifying the amount of charge (the voltage) between the cathode and anode.[68]

If we carefully adjust the voltage of the electric field, we can offset the magnetism's affect that would try to deflect the electron beam. Experimentally, Thompson found that a perfect balance between electric and magnetic deflections yields the ratio $e/m_e = 1.76\text{x}10^{11}$ C/kg. Once Robert Millikin discovered the value of the charge on the electron ($1.60\text{x}10^{-19}$ Coul), he simply divided it by $1.76\text{x}10^{11}$ C/kg to find the value of m_e ($9.11\text{x}10^{-31}$ kg). J. J. Thompson's work was done in 1897 and Millikin's in 1909. From that point, and to this day, the electron is considered by most physicists, to be an elementary particle, i.e., they believe that there are no smaller particles to be found. I am now going to challenge that assumption and suggest that there are just TWO smaller elementary particles that make up EVERYTHING in the universe, including the electron. I believe that the result we found earlier in Chapter 12, that the AR energy/c^2 is LESS than the mass of the positron from which it is made, makes a strong argument that conventional physics is somewhat off in its present concepts.

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[68] This is the basic principle on which the old-fashioned CRT TV tubes operated.

We have already introduced the TOPS york and zork which I believe are the most fundamental, or elemental of all particles.

The TOPS Concept of Particle Structure

It should be noted that the e/m_e ratio of conventional physics, relates the **charge of an electron** to the **mass of the electron** = $1.76\text{x}10^{11}$ Coul/kg and that IS a conversion factor of Coulombs to equivalent kilograms **FOR THE ELECTRON**. The **correct TOPS** conversion in this case, is the ratio of the **charge of one york to the mass of one york**, i.e., $(e/3)/m_y = 8.21\text{x}10^{11}$ Coul/kg. We would find the two ratios are the SAME when we consider that the charge ratio is 3/1 while the mass ratio is 1/14 (the Sparq mass of the york is 1/14 the mass of the electron= $0.65\text{x}10^{-31}$ kg). **Check the math!**

$$\mathbf{3/1 \times 1/14 = 3/14}$$

$$\mathbf{(3/14)\text{x}8.21\text{x}10^{11}\ Kg/Coul = 1.76\text{x}10^{11}\ Kg/Coul}$$

I take this as validation that the TOPS math has been done right, at least on THIS point. A conventional physicist of today would deny that a charge inherently possesses mass. In TOPS the $1.76\text{x}10^{11}$ Coul/kg value is the ratio of the charge of an electron **in Coulombs**, to its mass and IS also a conversion factor. In my opinion, **they are BOTH conversion factors for converting charge to mass. One is in terms of the electron and the other in terms of a Sparq. The mass of a single Sparq is $0.65\text{x}10^{-31}$ kg, and its charge is $e/3=.533\text{x}10^{-19}$ Coul, but its Coulomb/kg ratio is $8.21\text{x}10^{11}$ Coul/kg.**

TOPS considers matter and energy to be two faces of the same thing—If an object possesses mass, it also possesses energy, and vice versa. Thus, a photon $(1,1)_\varphi$ possesses an energy content of hf_φ, and thus, would possess mass of hf_φ/c^2. TOPS suggests that all photons consist of two, oppositely charged sub-atomic particles (one york and one zork) which possess Sparq mass (due to their spinning charges) and the differences in photon energy are reflected in how close those two particles are together, AND THIS SPACING (r_φ) determines the wavelength, frequency, and total energy of the photon.

TOPS would further suggest that the mass of any sub-atomic particle (including the electron and photon) exists in three forms: an *attributed* mass which derives from the magnetism produced by individual Sparqs (rotating electric charges: yorks and zorks); the *attributed* mass due to potential energy produced by the separation of the yorks and zorks, PLUS the kinetic energy that results from the rotation of the previous *attributed* masses as a result of their spins.

In TOPS, it is the structural (magnetic and electric) Binding Energy that is changed to a photon in Annihilation Radiation and the charge-induced mass (that *attributed* to magnetic, electric energy) remains unchanged, because Sparqs are conserved.

The consequence of that statement is simple: **For every unit of two charges separated by a distance, there is a fixed unit of energy/mass.** TOPS calls this the Sparq energy/mass. There is a fixed ratio between the charge on a york and its mass/distance ratio, no matter WHAT particle that york may be in. The ratio between the charge on a zork and its mass is also constant just as is the ratio of the charge of an electron to the electron's mass/distance ratio. Thus, we will find the ratio $+e_y/3m_y = -e_z/3m_z$ is a constant but it is NOT a direct coulomb/mass conversion constant because it does not include any distance that is included in Thud. Here is the value of that constant.

$$+e_y/3m_y = -e_z/3m_z = 1.60\text{x}10^{-19}\ \text{Coul}/3*(0.65\text{x}10^{-31}\ \text{kg}) = 8.21\text{x}10^{11}\ \text{Coul/kg}$$

This is simply saying that the ratio of the charge of a york divided by the mass of the york is a constant. But again, this is not just a charge-to-mass conversion! So, what IS the way that we obtain a mass from charge?

As we said in Chapter 3, "[M]ass is a manifestation of moving electric charge!" Since all Sparqs are spinning, ALL Sparqs are moving, and exhibit the property-dimension that we call 'mass.'

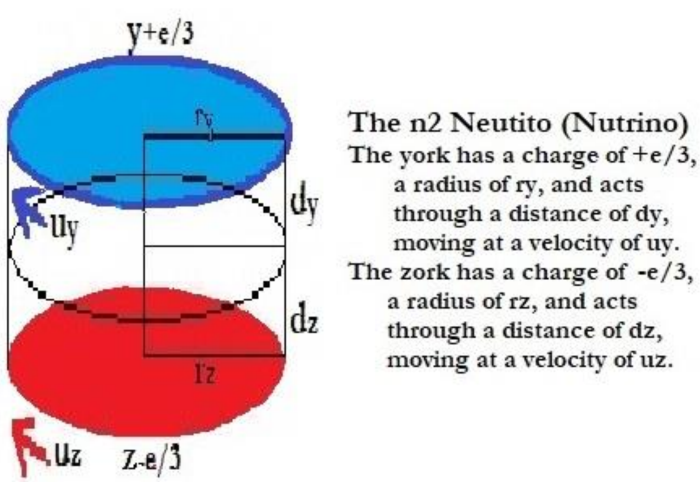

Figure 12-2 The n2 Neutito

Let us consider Coulomb's Law which describes the force between two charges, one york and one zork, separated by a distance d_y+d_z in a n2 neutito as shown in Figure 12-2. This was thoroughly covered in Chapter 3 but is summarized here to show its conformity with other mathematical aspects.

Coulomb's Law enables us to calculate the **electric** force due to attraction or repulsion that results when we separate two charges q_1 and q_2 by a distance, d. If both charges are **alike, the force is repulsive**—if one has a negative charge and the other is positive, the force is **attractive**. (i.e., unlike charges attract).

$$F_q = \frac{k(q_1 x q_2)}{d^2} \quad \text{N}$$

Coulomb's Constant, **k = 4πЋ**[69] (kg-m-Coul^2) is the conversion factor for changing electric charge to mass. Consider this, because where there is a force operating through a distance, there is also potential energy. This energy results from the Coulomb force acting **through the distance d** (energy results when we multiply a Force times a distance), so the **electrical** energy involved in this charge separation situation is E_q.

$$E_q = F_q{*}d = \frac{k(q_1 x q_2)}{d} \quad \text{joule}$$

But TOPS maintains that where there is energy—there is also mass. And the *attributed* mass association with this energy is:

$$\boldsymbol{\delta m_q = E_q/c^2}$$

Now, δm_q is NOT the total mass of the particle—it is only the mass which is ***attributed to*** **the electric component of the particle's energy**. There are other energies which contribute their own *attributed* masses to the particle, but δm_q is due to just the separation distance of the two charged particles due to Coulomb's Law.

Magnetic Force acting through a distance provides ANOTHER *attributed* mass element and we will discuss that next.

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69 Ћ is a part of the electric constant, the magnetic constant, and Coulomb's Constant. See Chapter 3.

The Magnetic energy Equation

In Chapter 3 we said we could calculate the magnetic energy within the n2 neutito from the following equation:

$E_{\mu n2} = \quad 2\boldsymbol{\mu_o}\, i_y\, \boldsymbol{\mu}_y/\mathbf{r_y}$ (SI units for energy: joule= kg-m^2-sec^{-2})

Since it is not likely that the reader has encountered this approach before, we will thoroughly explain the rationale for this proposed formula for magnetic energy, even though it was developed in Chapter 3. This equation is derived from the magnetic constant $\boldsymbol{\mu_o}$, the magnetic moment of the proposed york, which has a charge of +e/3, and its counterpart, the zork with a charge of -e/3, and the r_y is the radius of both Sparqs, the york and the zork. As stated in Chapter 3, this equation incorporates the **magnetic energies of both Sparqs in the n2 and that accounts for the coefficient 2 in the equation**. WITHOUT that 2 coefficient, we have only the magnetic energy of the york, but the zork has exactly the same amount of energy and needs to be included for the total energy.

$\boldsymbol{\mu_o}$ is the magnetic constant, and, like Coulomb's Constant, $\mathbf{k = c^2}$ **Ћ** [70] (kg-m-Coul^2), $\boldsymbol{\mu_o} = \mathbf{4\pi}$ **Ћ** is the conversion factor for changing **magnetic moment** produced by rotating charge, to mass. These subjects were introduced and discussed in Chapter 3 but are repeated here as a part of the full explanation of the TOPS concepts.

TOPS **assumes**[71] that the york and zork are flat disks. If all of the charge on a york or zork were to be concentrated at **the rim** of the Sparq disk (with NO charge on the surface), the total current that produces the repulsive magnetic fields in the neutito would be the sum of the two currents (those caused by rotation of the york and the zork. (Both currents exist, and both are producing magnetic fields which oppose each other, but they are separated by the distance $2d_y$.) When, however, the charge is uniformly distributed over the **surface** of the non-conducting disk (as we assume in TOPS), the true **currents are just half** of those rim values because a nonconducting spinning charged, disk produces only **½** of the current we would have

[70] Ћ is a part of the electric constant, the magnetic constant, and Coulomb's Constant. See Chapter 3.

[71] We recognize this is an assumption and that it is possible that it is a sphere or cylinder. Nevertheless, we treat it as a disk because the moment of inertia (I) is known to be ½ and that is not true of a sphere. If further research should prove it is another shape, this will produce somewhat different results, but, until that time, our calculations are based on this assumption.

if all charge were concentrated at the rim of the disk.[72] This is because the small increments of charge near the axis do not generate as much current (or magnetism) as similar small increments near the rim. Also, note that $f_y=f_z$.

Of course, the positive current of the york is rotating in the same direction as the negative current of the zork. (See Figure 12-2). This means that the magnetic moments of the york and the zork are in opposition to each other, i.e., $i_y = ½ (+e/3)f_y$, and $i_z= ½ (-e/3)f_z$, but, externally, the sum of the two currents is ZERO (equal, but opposite charges traveling in the same direction at the same time would cancel each other out)! Thus, for our TOPS n2 neutito:

$\mathbf{i_y = ½\ f_y(+e/3) = f_y(+e/6)}$ and,

$\mathbf{i_z = ½\ f_z(-e/3) = f_z(-e/6)}$ (SI units for current: Amperes = Coul-sec^{-1})

The magnetic moment (μ_{n2}) of the neutito includes the interaction between the magnetic forces of the two currents (i_y and i_z) that produce counter-acting magnetic moments. While the currents are equal, their magnetic forces **act** opposite in directions. (If two magnetic fields are directed in the SAME direction, they reinforce each other with an attractive force, rather than oppose each other.[73]) Thus, we will recognize that two near-by rotating (around the same axis) charges are always in a mode of magnetic attraction or repulsion, such that **the magnetic and electric forces always act counter to each other, and there is ALWAYS a fixed, stable distance between the two charges that maintains the fixed distance along the particles' rotational axes.** (Note, however, that while the york and zork electric and magnetic FORCES are equal and opposite, and, while the net current is zero, **their magnetic fields and ENERGIES are not cancelled, but are additive**.) As with all measures of **magnetic moment (μ),**

$\mu_y = i_y A_y$ [74] Where A_y is the surface area of the york-disk = πr_y^2, SO,

$\mu_y = i_y \pi r_y^2$ (SI units for magnetic moment: Coul-m^2-sec^{-1} OR, Amp-m^2)

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72 I do not know how to derive the effective current generated by a rotating, non-conducting charged disk. I take the word of the mathematicians who can use calculus to do that routine calculation. I have seen the derivation but cannot follow the mathematics due to mu lack of mathematical ability in calculus.

73 If we have electric attraction, we always have magnetic repulsion, and vice versa.

74 μ_y is exactly analogous to the Bohr Magneton (μ_B). μ_y applies to a york in a n2 neutito, and μ_B applies to the electron in the hydrogen atom at orbit n=1.

Now let us return to the proposed formula for the energy of the magnetic field in the n2 neutito. Without the coefficient, 2, the following equation would be for the york only. The energy for the zork is exactly the same, so the total magnetic energy of the n2 neutito is TWICE that of the york, alone, and that accounts for the factor of 2. The **total magnetic energy** embodied within the two-particle n2 is thus,

$$E_{\mu n2} = 2\ \mu_o \quad i_y \quad \mu_y \quad / r_y$$

$$E_{\mu n2} = 2\ (4\pi Ћ)\ (f_y(+e/6))\ ((f_y(+e/6)(\pi r_y^2))/r_y$$ [75]

$$E_{\mu y} = 2x\ 4\pi\ Ћ\ \ (e^2\ f_y^2/36) \quad \pi r_y^2/r_y$$

$$E_{\mu y} = 2\ Ћ\ \ (e^2/36)\ \ 4\pi^2 r_y^2\ f_y^2/r_y \qquad \text{(rearrange terms)}$$

$$E_{\mu y} = 2\ (e^2/36)\ \ Ћ\ (4\pi^2 r_y^2 f_y^2)/r_y \qquad \text{(rearrange terms and, } 2\pi r_y f_y = u_y)$$

$$\mathbf{E_{\mu y} = 2\ (e^2/36)\ \ x10^{-7}\ u_y^2/r_y} \qquad (Ћ = 10^{-7}\ \text{kg-m-Coul}^{-2})$$

$$\mathbf{E_{\mu y}} = 2\ \mathbf{[(e^2/36)\ \ x10^{-7}/r_y]\ u_y^2}$$

$$\mathbf{E_{\mu y} = \ [(e^2/18)\ \ x10^{-7}/r_y]\ u_y^2}$$

At this point it is reasonable to question why the r_y factor appears in the denominator. This is because of Thud (Ћ = **x10^{-7} kg-m/Coul^2**—Chapter 3). When we multiply Ћe^2, we obtain units of kg-m $\mathbf{u_y^2}$ and that is joules-m and not energy (joules) as in mu_y^2. We, therefore, need to divide joule-m by r_y to obtain the energy of the york, in joules.

The distance involved in the **electric charge** FORCE has the squared distance in the denominator (it is the axial distance between the york and the zork) because that is the distance factor that determines the strength of the magnetic force in the axial direction (the distance ($d_y+d_z = 2d_y$) **between** the york and the zork), i.e., for the magnetic force is directed along the axis of the rotating structure. The **radius** of each Sparq in the **numerator**, determines the magnitude of the electric currents produced by the rotating pair of particles, and thus, it also determines the magnetic force, which is produced normal to the plane of the current flow. Thus, the magnitude of the magnetic **force** is a function of the radius but the axial distance between the york and zork centers (d_y+d_z)= $2d_y$ is the appropriate distance aligned with the axial magnetic force. To balance the **electric force of Coulomb's Law**, that distance is in the **denominator** in order to balance the magnetic force against the electric force! Note

[75] For THUD (Ћ), see Chapter 3. At this point the product of the negative and positive charges yields a negative charge which indicates electrical attraction. We have omitted the negative value because we have magnetic repulsion and that is what we are calculating here.

that the larger the radius (in the numerator), the greater is the magnetic force, but the larger the distance BETWEEN the Sparqs (in the denominator), the LESS is the magnetic force.

As we said, these two magnetic energies (i.e., those of the york and zork) are quantitatively the same, the **TOTAL magnetic energy** of the n2 ($\Sigma E_{\mu n2}$) is the sum of energies of the york and zork together. Thus,

$$\mathbf{\Sigma E_{\mu n2} = E_{\mu y} + E_{\mu z} = 2\,(e^2/36)\,x10^{-7}\,u_y^{\,2}/r_y} \qquad (\text{Ћ}= 10^{-7}\ \text{kg-m-Coul}^{-2})$$

$$\mathbf{\Sigma E_{\mu n2} = E_{\mu y} + E_{\mu z} = (e^2/18)\,x10^{-7}\,u_y^{\,2}/r_y}$$

$$\mathbf{E_{\mu n2} = [(e^2/18)\ x10^{-7}/r_y]\,u_y^{\,2}} \qquad \textbf{(Note again: } \mathbf{2\pi r_y f_y = u_y}\textbf{)}$$

Note that the last expression is in the form of $E = mv^2$ which is KINETIC ENERGY, so, $\mathbf{m_{\mu n2} = (e^2/18)x10^{-7}/r_y}$. Note, again, that $m_{\mu n2}$ is **NOT** the total mass of the n2 neutito ($\mathbf{m}_{n2}$) but is only the *mass attributable* to the **magnetic** energy (m_μ) of the neutito. As we said in the previous section, there is a similar *mass attributable* to the attractive **electrical** bond (m_Q) between the york and zork. See Chapter 6 for determination of these values for the n2 neutito. Note again, the TOPS concept of the *mass attributable* aspect of mass.

Reconsideration of What we have Done

So, how did we get there? We started with the basic TOPS assumptions of Chapter 1 and followed them through Newtonian physics modified by Einstein's relativity in Chapters 2 through 6.

> **TOPS posits that the electron is NOT the most elementary of subatomic particles. On the contrary, TOPS proposes that ALL particles in the universe are composed of the most elementary particles of all, and in TOPS, these particles are called Sparqs. There are only two kinds of Sparqs (yorks and zorks), and they are identical having all things in common except for the sign of their electric charges. The charge on the york =+e/3, while the charge on the zork=−e/3.**

Chapter 1 provided the basic concepts of TOPS and described how the most elementary of particles (the yorks and zorks) are structured to produce every one of the particles in the conventional Standard Model of subatomic particles.

Subsequent chapters have built on the concepts outlined in Chapter 1, with Chapter 2 focusing on the primacy of the 'Reduced Planck's Constant' (ħ) which regulates **everything** that goes on in ALL spinning subatomic particles. Chapter 2, however, emphasized the use of ħ in **photons** generated because of the ejection of energy resulting from specific electron shifts between concentric, spherical orbital paths in the hydrogen atom.

Chapter 3 was the first chapter to really address the issues that TOPS has with conventional physics. That was where I first tried to quantify the relationship between the charge and mass—I found that a york with a charge of +e/3 converts to a mass of some 0.65×10^{-31} kg regardless of the kind of particle it is in. I had a pretty good idea about where I was going, but the math had some interesting, but puzzling features that led me down several 'rabbit trails' that gave conflicting results. This question, however, was the heart of the TOPS 'doctrine' so I continued looking for a way to separate the resulting mass from the radius. Every time I saw a flaw in my logic, I had to change the math to match it, so, time after time, I returned to update Chapter 3 and other pertinent chapters as my understanding grew.

In retrospect, I was hasty in posting Chapter 3 to my web site www.abookunsealed.com. The astute reader will note that it was in Chapter 3 that I first strived to find that charge-mass relationship, always seeming to end with the product of the mass and the radius, without being able to nail the value of either one of them so I could establish the value of the other. That problem persisted as I developed the following chapters.

In August of 2021, I went back to redo significant portions of Chapter 3 and as of right now (August 29, 2022) have done that several times, because I have repeatedly received new insights and corrected the math. But, because of work on Chapters 10 and 11, I now know how to quantify the mass of the n2 neutito from the concept of Annihilation Radiation (AR).

When I first started working on Chapter 3, I thought I knew where I was going, but knew I needed to cover other concepts before the reader could comprehend how I got to my results.

I introduced a new model of the photon (Chapter 4), but to clarify the issue of velocity of rotation, I also needed to clarify the meaning of Sommerfeld's Fine Structure Constant α (Chapter 5), which I had discovered while preparing Chapter 2. I also needed to calculate the Lorentz gamma boost (**γ** in Chapter 6) and show how it impacted the charge-mass/radius connection at the lowest, or inherent level of particle structure. I had developed parts of Chapter 7 regarding the structure of higher order particles and have updated some of that, but I will not finish that portion of the book because the required vector analysis is beyond my mathematical capability. I provide Chapter 7 only to give general guidelines and insights as to how I think we should proceed for those who will ultimately do that work.

Parts of Chapter 8 on particle decay, had been drafted early, for I had done much of that work much earlier and it was a part of what provided the theoretical basis of my work on TOPS in the Standard Model the first place. I had already written a draft of Chapter 8 on particle decay but did not originally know that was where I would eventually connect the charge-mass relationship to Annihilation Radiation. Chapter 9 applied the particle decay to higher order (atomic) structures). Thus, I had to include Chapters 8 and 9 and rewrite THEM before I could attempt to pull all these concepts into a consistent theory.

I found a 'gold mine' in calculating AR photon emission and began writing Chapter 10 to use that information to find how to calculate mass of the n2 neutito. By the time I discovered that AR 'gold,' I was understanding more and more, far beyond the lowly n2. In fact, I had developed so much additional material that I decided to break that material into two chapters. Thus, Chapter 10 discusses the general nature of the AR decays and Chapter 11 gets to specifics, relying on the principle of conservation of momentum and concluding with the various particles produced by single, and double AR photon emissions.

It is at THIS point, that I THINK I have 'all the ducks in order.' Accordingly, I will now start the process of calculating all the dimensions of the electron, the lowest order of the non-neutrino, Standard Model particles.

In this chapter, I will go back to conclusions made in earlier chapters. Some of them I will discuss in some detail, but others will provide only the values found in those earlier chapters.

Bringing it ALL Together

Our objective in this chapter is to take all the pertinent information that we gathered from earlier chapters and combine them to discover the properties of the electron, itself. First, let us repeat the concept of *attributable mass*.

The mass of any object x is the sum of all of its *attributable masses* (δm_x) within particle x*,* which may be expressed mathematically as: $m_x = \Sigma\delta m_x$. In the case of the n2 neutito described in the above material, this is,

$$\mathbf{m_{n2i} = \Sigma\delta m_{n2i} = \delta m_{\mu yi} + \delta m_{\mu zi} + \delta m_{Qi}}$$ [76]

I have added the subscript $_i$ because these attributable masses are actually the inherent masses because we have not yet included the γ boost (Chapter 6) due to the rotation of the n2 which is spinning ALMOST at the speed of light.

Common logic says that we KNOW there IS some, unknown, but fixed value of r_{yi}, but unless we know what that value is (or the value of the mass, or the value of f_{yi} (any ONE of them!) we APPEAR TO have no way of knowing what that mass value is! Nevertheless, we CAN calculate the magnitude of the γ boost (γ =615), as we have already done in Chapter 6. **In that γ boost derivation, the unknown value of r_{yi} canceled out, numerator to denominator** because we were dealing with balanced forces, so we didn't need to know its value**.** **We needed only to set the forces equal.** But, in evaluating the energy, we have no such luck! Fortunately, we discovered how to find the relativity mass of the n2 neutito (m_{n2} =2.60x10^{-31} kg) from Annihilation Radiation (AR) in Chapters 10 and 11, and we will use that result to determine the radius of the n2 neutito and ultimately, all the dimensions of the electron, itself.

Pertinent Factors we have Discovered

$\mathbf{q = y = z = \pm e/3 = .533\text{x}10^{-19}}$ **Coul**	Chapter 1
$\mathbf{u_y = u_z = 2\pi\, r_y f_y = c = 3.00\text{x}10^8}$ **m/sec**	Chapter 2
$\mathbf{\hbar = m_y\, u_y\, r_y = m_y\, 2\pi r_y^2 f_y = 1.05\text{x}10^{-34}}$ **j-sec**	Chapter 2
$\mathbf{\hbar/2 = \frac{1}{2} m_y u_y r_y = \frac{1}{2} m_y 2\pi r_y^2 f_y = .527\text{x}10^{-34}}$**j-sec**	Chapter 2
$\mathbf{2d_y = 2r_y}$	Chapter 3
Ћ = 10^{-7} kg-m/Coul^2	Chapter 3

[76] Note that δm_{n2i} is only the sum of all inherent masses. Once that gets boosted by the $\boldsymbol{\gamma}$ factor to become a relativity mass, δm_{nrel} is the kinetic energy (spin mass) of the particle. For the n2 this δm_{n2rel} is only half of the total rest mass of the particle.

i_y = i_z = (e/6)f_y Coul/sec Chapter 3

μ_o = 4π Ћ Chapter 3

k = c^2 Ћ Chapter 3

Photon energy=hf_φ Chapter 4
(Triggering energy only—NOT including the TOPS' m_{ys}+m_{zs})

α_x = u_x/c Chapter 5

ħ/2c = m_{rel} r_{rel} = 1.75x10^{-35} kg-m [77] Chapters 6/12

$\gamma_{\underline{n2}}$ = 615 Chapter 6

m_{n2s} = 1.30x10^{-31} kg (Sparq mass)[78] Chapter 10

m_{n2rel} = 2.60x10^{-31} kg (Incl BE mass)[79] Chapter 10

m_{yrel} = m_{zrei} = m_{n2rel}/2 = 1.30x10^{-31} kg Chapter 10

m_{ys} = m_{zs} = m_{n2s}/2 = 0.65x10^{-31} kg Chapter 10

spin energy = ½$m_x u_x^2$ = ½hf_x = ½$m_x c^2$ Chapter 10

m_{n4} = 5.20x10^{-31} kg Chapter 11

m_{n10} = 13.0x10^{-31} kg Chapter 11

We have one more thing to cover before we complete this chapter. Many years ago, I said I wanted to determine the mass of the electron from theoretical considerations. After years of striving to get the background to do that, I finally concluded that we already KNEW the mass of the electron and that it was **the finding of all OTHER dimensions of the electron** that was important—what are the inherent radius, rotational velocity, and frequency of the spinning electron? I

77 This is just HALF of what was calculated in Chapter 6. It is corrected in Chapter 12
78 Excludes Binding Energy mass.
79 Includes Binding Energy and any Other Energy mass in the particle.

finally concluded that we might be able to do THAT because experimentally, we do know the mass of the electron is $9.11x10^{-31}$ kg.

The next section deals with my efforts to find those other dimensions.

Energy in the Electron

First, we know that every electron has a mass of **= $9.11x10^{-31}$ kg,** and because an electron has 7 Sparqs (2,5), the Mass (m_y or m_z) is **$9.11x10^{-31}$ kg/7 = $1.30x10^{-31}$ kg. This value includes all forms of energy in the electron. On the other hand, we know from Chapter 10, the 7 (in the electron) Sparqs' charge equivalent masses alone, is $4.55x10^{-31}$ kg.**

> [The night I came to that conclusion, I went to bed, satisfied that I had finally determined that value, and slept soundly. But something I do NOT remember had occurred during my sleep, for when I awakened the next morning, I somehow immediately KNEW that this was exactly HALF the total mass of the electron ($9.11x10^{-31}$ kg). It didn't take long to do that bit of math on paper to prove it, but I had not been aware of that specific relationship the night before. I had gone to sleep, content with just knowing what the charge-equivalent Sparq mass WAS—THAT was a major finding to me, but the awareness that the exact relationship was exactly **50% Sparq/50% Other Energy mass** was just 'icing on the cake,' and knowing THAT, made the discovery even sweeter!]

Electron mass/2 = Sparq mass in electron
$9.11x10^{-31}$ kg/2 = $4.55x10^{-31}$ kg

Precisely half of the mass of the electron is due to its Sparq Mass and half of it is due to the Binding Energy (**BE=** electric and magnetic **Potential Energy**) and kinetic energy of the rotating structure within the electron. As I stated in Chapter 7, I do not have the mathematical skills required to do the vector analysis needed in calculation of the Binding Energy. Nevertheless, it seems we DO know the magnitude of most of that mass/energy from THIS relationship. Since the Sparq mass is $4.55x10^{-31}$ kg, the OTHER half of the mass is due to the Binding Energy plus Kinetic energy = $4.55x10^{-31}$ kg[80] and the corresponding Binding Energy plus Kinetic energy within the electron must be $4.55x10^{-31}$ kg x c^2 = $4.10x10^{-14}$ joule.

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[80] It is possible that there are some other yet-unknown forms of energy within the electron. This approach, however, would include ALL the 'Other Energy' that could eventually be identified.

Errors in Calculations

The Annihilation Radiation by **Direct AR Production** equivalent mass value of .51 MeV has been confirmed many times, so TOPS takes that as a given. There is, however, a flip-side to this value, because TOPS sees this value as being the equivalent of only FIVE of the seven Sparqs in the electron/positron. The other two Sparqs are **WITHIN that $9.1\text{x}10^{-31}$ kg equivalent photon! Thus, the TOPS photon energy must include NOT ONLY the hf_φ** photon-triggering energy from structural energy but must also include the m_yc^2 and m_zc^2 energy values as well.

From this, we readily see that the Annihilation Radiation ($_{AR}$) photon mass-equivalent must add the masses of the york and zork TO the photon-triggering energy ($\Sigma E_{Q\mu s}/c^2 = hf_{AR}/c^2$).

Classical physics says the photon's energy is, $\mathbf{E_{\varphi AR} = hf_{\varphi AR}}$, but TOPS carries that further and says,

$$\mathbf{E_{\varphi AR} = (m_{yi}+m_{zi}) + hf_{\varphi AR} = m_{\varphi AR}\, c^2 = (m_{yi}+m_{zi}+\delta m_\varphi)c^2}$$

Where $\mathbf{\delta m_\varphi}$ **is the** mass attributed to the photon's triggering energy (= $9.11\text{x}10^{-31}$ kg). We now know that the mass of $m_{yi} = m_{zi} = .65\text{x}10^{-31}$ kg, and we know the values of the physical constants h and c, so we should be able to calculate the energy of the AR photon and its total mass, and frequency!

$$\mathbf{E_{\varphi AR} = m_{\varphi AR}\, c^2 = (m_y + m_z + (\delta m_\varphi))c^2}$$

$$E_{\varphi AR} = \quad ((.65 + .65 + \mathbf{9.11})\text{x}10^{-31})\text{x } 9.00\text{x}10^{16}$$

$$\mathbf{E_{\varphi AR} = 9.37\text{ x}10^{-14}}\text{ joule}$$

$$\mathbf{m_{\varphi AR} = m_y + m_z + \delta m_\varphi = 10.41\text{ x}10^{-30}}\text{ kg}$$

$$\mathbf{hf_{\varphi AR} = \delta m_{\varphi AR}\, c^2 = 8.20\text{ x}10^{-14}}\text{ joule (Triggering Energy)}$$

$$\mathbf{f_{\varphi AR} = \frac{\delta m_{\varphi AR}\, c^2}{h} = \frac{8.20\text{ x}10^{-14}}{6.63\text{ x}10^{-34}} = 1.24\text{ x}10^{20}}\text{ Hz}$$

Thus, the TOPS total energy equivalence of the AR photon is $9.37\text{x}10^{-14}$ j; its equivalent mass is $10.41\text{x}10^{-30}$ kg; and the frequency of that photon is $1.24\text{x}10^{-20}$ Hz.

OOPS! This thinking is flawed! We proved it in Chapter 11! Where we found that the wavelength of the AR was ALWAYS less than the theoretical value associated with the hf energy of the photon. That means that the AR photon has LESS energy in it than the .51MeV that we are taught in conventional physics.

Errors in Thinking

At that point, it seemed that our problem was to determine how much the Kinetic Energy would be. Once we know that, we can subtract the KE from the $4.55\text{x}10^{-31}$ kg to get the BE. This was the beginning of a long struggle to calculate the BE or KE (for once we knew one, we could readily calculate the other. I anticipated a short study to accomplish that goal. BUT it was NOT going to be that easy. It would be almost a year from when I thought I needed to back up and take a different tack before the concept bore fruit. We will proceed to the fruit in the following section.

I have presented that false-track material in the above paragraphs because it did not work, and I need to show the corrected math. But there may be some kernels of truth within those efforts that may help others in continuing the study of TOPS, so I want to make the logic and failures available for reference. Thus, I will transfer that incorrect material to Appendix C and anyone that wants may dig into it to see if there is anything of value that will help them in their journey to understand the World of TOPS.

In the previous chapters, you may find several places where I give this footnote: "This number is incorrect. I am leaving it here because I want to document my thinking at the time I wrote this. See Chapter 12 for the correct application of the Planck's Coefficient."

Well, here we are in Chapter 12, and it is time to correct the thinking that went into that calculation. Here is what we presented in Chapter 6. **Note that it is WRONG—we will show WHY shortly**:

$$\hbar_i = \hbar = m_{ei}\, u_i\, r_i$$

$$\hbar_{rel} = \hbar = m_{erel}\, u_{rel}\, r_{rel}$$

But, ħ is a constant so,

$\hbar_i = m_i\, u_i\, r_i \;=\; \hbar_{rel} = \hbar = m_{erel}\, u_{rel}\, r_{rel}$

$m_i\, u_i\, r_i \;=\; m_{rel}\, u_{rel}\, r_{rel} = \hbar$ [We have already concluded $u_i = u_{re} = u_{(c\}} =$ c, so,]

$m_i\, r_i \;=\; m_{erel}\, r_{rel} = \underline{h}/c$ And,

$$\underline{\hbar/c} = m_{rel}\, r_{rel} \quad = 3.50\text{x}10^{-43} \text{ kg-m}$$

So, why is this wrong?

Well, it is not COMPLETELY wrong for the n2 neutito, for that particle is spinning right AT the speed of light. BUT there are two things that are a problem here. First, if you multiplied ħ = mur out for each particle, you would get a spin of ħ = $1.05\text{x}10^{-34}$ j-sec and current science says we should be getting **ħ/2 = $5.27\text{x}10^{-35}$ j-sec** for ALL the Standard Model particles, except for the photon.

Thus, the proper spin result should be,

$\hbar/2c = m_{rel}\, r_{rel} \qquad = 1.75\text{x}10^{-35}$ kg-m

We cannot use that value for OTHER particles because not only are r and u going to change, but u does NOT change in the way I calculated it—I ASSUMED, that u_{n2}=c, a constant. Actually, u_{n2} **IS** c and that DOES NOT change, but u_x DOES change with **larger** particles, but **in a different way** from how I calculated it. Read on for the reasons. Remember that a Planck's Coefficient is a calculated value which applies to all h factors in a manner consistent with the **specific** conditions in the problem we are solving.

The situations are different. In Chapter 2, I was comparing the masses of the proton against the electron, and the proton's orbital radius against the electron's orbital radius, but in THAT situation, **the frequencies of the proton and electron HAVE to be equal**, so the effect of mass difference (**$m_{p1} = m_e$*$Þ_{ep}^2$**) HAS to be balanced against the effect of the radius (**$r_{p2} = r_{o1}$*$Þ_{ep}$**). Thus, **$m_{p1}/m_e = Þ_{ep}^2 = 1836$ and,**

$m_{p1} = m_e$* $Þ_{ep}^2$; $r_{p2} = r_{o1}$*$Þ_{ep}$; $u_{p1} = u_{o1}$*$Þ_{ep}$; and $f_{o2} = f_{o1}$.

In working on Chapter 12, when I finally put the Planck's Coefficient in the format I used in Chapter 2, it became clear that I needed a Planck's Coefficient that was SQUARED for the mass, but **the FREQUENCIES WOULD ALSO HAVE TO CHANGE**! In Chapter 2, the frequencies HAD TO BE THE SAME because the rotation of the proton had to be the same as the electron! In Chapter 6, I was using $\hbar = m_{ei}\, u_i\, r_i$ but that did not consider what I finally realized, was the necessary change in frequency. I SHOULD also have been using the format of $\boldsymbol{\hbar = m_{n2}\, 2\pi r_{n2}^2\, f_{n2}}$ and the value of $\boldsymbol{\text{Þ}_{en2} = (m_e/m_{n2})^{.5} = (9.11/2.60)^{.5} = 1.87}$. Thus, when comparing the n2 to the electron,

$m_e = m_{n2} * \text{Þ}_{en2}^2$; $r_e = r_{n2} * \text{Þ}_{en2}$; and $f_e = f_{n2}/\text{Þ}_{en2}^x$ with the exponent, x needing to be determined for calculation of the frequency where $\text{Þ}_{en2} = 1.87$.

$$\boldsymbol{\hbar = m_{n2}\, 2\pi r_{n2}^2\, f_{n2} = (m_{n2}*\text{Þ}_{en2}^2)*(2\pi)*(r_{n2}^2*\text{Þ}_{en2}^2)*(f_{n2}/\text{Þ}_{en2}^x) = m_e\, 2\pi r_e^2\, f_e = \hbar}$$

$$\uparrow \qquad\qquad\qquad \uparrow \qquad\qquad \uparrow$$

Now, because Þ_{en2}^2 multiplies both the mass **and** the radius squared, we have Þ_{en2}^4 in the numerator, and the only way that the Planck Coefficient will cancel in the denominator, is if the exponent, **x=4** in the denominator. Thus, knowing that **Þ_{en2} = 1.87 and x=4, we can find the values of r_e and f_e.** Doing the calculations, we find $r_e = 1.27\text{x}10^{-12}$ m; $f_e = 5.76\text{x}10^{18}$ Hz, as we see under the electron in Table 12-1.

Now, let us note the effect on u_e, its velocity of rotation. There was another error in thinking here. I was using the **$\hbar$ =mur** form of Planck's Constant in my calculations. This was bad logic, and I SHOULD have been using the $\hbar = m\, 2\pi r^2 f$ format. THIS is the reason **one should not use the $\hbar$ =mur** form of Planck's Constant when working with Planck's Coefficients. Recall that the velocity $u_x = 2\pi r_x f_x$. so, for an electron, its intrinsic spin velocity is:

$$u_e = 2\pi\, r_e\, f_e = 2\pi(1.27\text{x}10^{-12}\text{x } 5.76\text{x}10^{18}) = 45.9\text{x}10^6 = .459\text{x}10^8 \text{ m/sec}$$

Let us see how that figures out using the Planck's Coefficient **Þ_{en2} = 1.87 and x=4**, when we know the values from the n2 neutito.

$$u_e = 2\pi\, r_e\, f_e = 2\pi\, r_{n2}*(\boldsymbol{\text{Þ}_{en2}})*f_{n2}/(\boldsymbol{\text{Þ}_{en2}})^4 = 2\pi\, r_{n2}*(1.87)*f_{n2}/(1.87)^4$$

$$u_e = 2\pi\, r_e\, f_e = 2\pi\, r_{n2}*f_{n2}/(\boldsymbol{\text{Þ}_{en2}})^3 = 2\pi\, r_{n2}*f_{n2}/(1.87)^3 = 2\pi\, r_{n2}*f_{n2}*(1.87)^{-3}$$

Recalling from Chapter 3, $u_{n2} = 2\pi\, r_{n2}*f_{n2} = c$ so,

$$u_e = 2\pi\, r_{n2}*f_{n2}/(1.87)^3 = c/(1.87)^3 = c*(1.87)^{-3} = .459\text{x}10^8 \text{ m/sec}$$

and that is exactly what we calculated above, thus demonstrating that the intrinsic velocity of the spinning electron varies by the third power of the Planck Coefficient for the electron. The value of α_e is $u_e/c = .459x10^8/3.00x10^8 = .153$ and no particle other than the n2 neutito and n4 neutrino, has a larger value of α than the electron. Thus, we will know without calculation, that the rotational velocity u_x of any lepton is going to be less than that the rotational velocity u_e of the electron--the larger the particle, the lower will be its rotational velocity and the smaller will be its α.

Calculation of Dimensions of the Electron

Now that we know how to determine the radius of the electron from the known electron mass it is easy to use this Planck's Coefficient from the n2 neutito values, and the format in determining all other dimensions of the electron is: (Remember, the spin must be ħ/2, so,

$$\hbar/2c = m_{rel}\, r_{rel} \quad = 1.75\text{x}10^{-35} \text{ kg-m})$$

$Þ_{en2} = (m_e/m_{n2})^{.5}$ so, $\mathbf{Þ_{en2} = (9.11/2.60)^{.5} = 1.87}$

$m_e = m_{n2} * Þ_{e2}{}^2 \quad = \mathbf{2.60\text{x}10^{-31}\, kg * 1.87^2 = 9.09\text{x}10^{-31}\ kg}$

$r_e = r_{n2} * Þ_{en2} \quad = \mathbf{6.76\text{x}10^{-13}\ m * 1.87 = 1.26\text{x}10^{-12}\ m}$

$f_e = f_{n2} * Þ_{en2}{}^{-4} \quad = \mathbf{7.05\text{x}10^{19}\ Hz/1.87^4 = 5.76\text{x}10^{18}\ Hz}$

$u_e = u_{n2} * Þ_{en2}{}^{-3} \quad = \mathbf{3.00\text{x}10^8\ m/sec/1.87^3 = .458\text{x}10^8\ m/sec}$

$\alpha_e = u_e/c \quad = \mathbf{.458\text{x}10^8/3.00\text{x}10^8 = .153}$

No wonder my quick estimation of the h=mur form of Planck's Constant was in error in earlier stages of this book!

I would not have made that error if I had used the expanded content of **ħ, i.e., $\mathbf{\hbar = m_{n2}\ 2\pi r_{n2}{}^2 f_{n2}}$**. I am now warning others of this error and caution them **NOT to use the ħ =mur form when working with Planck Coefficients.**

CHARACTERISTICS OF ALL STANDARD MODEL PARTICLES

NEUTRINOS	n2 (1,1)	n4 (2,2)		n10 (5,5)			n16(8,8)			n22(11,11)	
CHARGED			e(2,5)-1	up(6,4)+2/3	dn(6,7)-1/3	mu(5,8)-1	ch(9,7)+2/3	st(9,10))-1/3	tau(8,11)-1	tp(12,10)+2/3	bm(12,13)-1/3
mass xE-31 kg	2.60E-31	5.2E-31	9.1E-31	1.3E-30	1.69E-30	1.69E-30	2.08E-30	2.47E-30	2.47E-30	2.86E-30	3.25E-30
Planck Coef (P)	*1*	*1.414213562*	*1.870828693*	*2.236067977*	*2.549509757*	*2.549509757*	*2.828427125*	*3.082207001*	*3.082207001*	*3.31662479*	*3.535533906*
radius m	6.76E-13	9.57E-13	1.27E-12	1.51E-12	1.72E-12	1.72E-12	1.91E-12	2.09E-12	2.09E-12	2.24E-12	2.39E-12
freq Hz	7.05E+19	1.76E+19	5.76E+18	2.82E+18	1.67E+18	1.67E+18	1.10E+18	7.82E+17	7.82E+17	5.83E+17	4.51E+17
vel m/sec	3.00E+08	1.06E+08	4.58E+07	2.68E+07	1.81E+07	1.81E+07	1.32E+07	1.02E+07	1.02E+07	8.22E+06	6.78E+06
alpha	1.00E+00	3.54E-01	1.53E-01	8.94E-02	6.03E-02	6.03E-02	4.42E-02	3.42E-02	3.42E-02	2.74E-02	2.26E-02
h'/2	5.27E-35	5.27E-35	5.27E-35	5.27E-35	5.27E-35	5.27E-35	5.27E-35	5.27E-35	5.27E-35	5.27E-35	5.27E-35

Table 12-1: Characteristics of Standard Model Particles

Table 12-1 is a complete list of all particles in the Standard Model as it applies to TOPS. Knowing the values of all parameters of the electron, for example, allows us to calculate the corresponding parameters of any other Standard Model particle. (ANY particle can be the starting point for any other particle, but Table 12-1 values were calculated from the mass and radius of the n2 neutito as determined in earlier chapters.)

The master formulas for using a Planck's Coefficient to determine the characteristics of ANY particle of known mass, m_x from the known characteristics of the n2 neutito are:

$\mathbf{Þ_{xn2}} = (m_x/m_{n2})^{.5}$ so,

$m_x = m_{n2} * \mathbf{Þ_{xn2}}^2$

$r_x = r_{n2} * \mathbf{Þ_{xn2}}$

$f_x = f_{n2} * \mathbf{Þ_{xn2}}^{-4}$

$u_x = u_{n2} * \mathbf{Þ_{xn2}}^{-3}$

$\alpha_x = u_x/c$

Notice that the spin of these particles is
$\hbar/2 = 5.27 \times 10^{-35}$ j-sec, just as required in current theory of particle physics!

One might think that my error cost me about a year of frustration and fruitless work, and, in a way, it did prevent me from getting the right answers much earlier. But that year of struggling led to me having a much better understanding of the operation of the **Divine Law of Spin** on which all these calculations are based!

So, I started this book with the hydrogen atom spectrum and discovered the Planck Coefficient concept and learned that one must be careful how one calculates the Planck Coefficient for any particular particle. Thus, I will appropriately, I end the book with using the Planck Coefficient to define the properties of all subatomic particles. I think I have done my job and the rest of this book is going to be simply padding and expansion of material I have already written.

The basic MATH has been done!

Now I am not cock-sure I have made no mistakes, for I have made MANY mistakes while writing this book. Thus, I feel confident that some smart people are going to be able to point out my errors. I expect that. I WANT that because I am on a search for TRUTH, with a Capital T, but I doubt I have achieved perfection in this work. So, please find my errors.

Thus, I welcome constructive criticism. But dismissing my book just because it does not agree with current theories, does not find truth—it obscures it. Therefore, I would like to receive **constructive** criticism. Where I am WRONG, I want to correct it.

But I am now 90 years old and realize my time in this world is limited. Thus, while I may continue making minor changes in this book on a limited basis, I will not have the stamina and will to defend it personally for very long. Consequently, I will pretty much leave this book AS IT IS and hope that people smarter than me will pick up the truths that ARE within and manage to discard any fables that I have generated on my own.

For me, it is hard to tell the difference in many things.

Separating my Trash to Find NEW Treasure?

I have now corrected the MATH errors—all of them, I hope. Everything seems to be consistent—at least in MY understanding.

During the writing of earlier chapters, I was trying to separate the mass from the radius so I could find ALL the dimensions of the electron. But many of the calculations I was working on led to dead-ends for that purpose. I COULD have just erased all of my dead-end work, but was leery of throwing away the mathematical evidence of the different thought processes I was using. After all, SOME of the calculations might lead someone else in a direction they may not think of going on their own. Thus, I am extracting those sections from the chapters where I was working on them and have saved them in Appendix C. You won't find the correct answers in there, but if you study them, you just MIGHT be stimulated to see something I was unable to find.

Thus, I want you to feel free to dig through my 'trash' to see if you can find any new 'treasures.' Do whatever you want with Appendix C material.

QUO VADIS?

What are YOU going to do with the Truths you find herein?

Do you have any evidence that any of the TOP'S concepts are incorrect?

Chapter 13 - TOPS Issues with Conventional Physics

There are several areas of conventional physics that seem to be incompatible with TOPS.

Sommerfeld's Fine Structure Constant

$\alpha = 0.0072973$, which is very close to the inverse of the number 137. What does it mean? Conventional physics says α is a common constant 'found all over the place' while TOPS says α is simply the ratio of the velocity of rotation of the electron to that of light in orbit n=1 of a hydrogen atom. See Chapter 5.

The source of mass

To this point, considering all known contributions to the energy of an atom, conventional Physics cannot account for more than about 1% of the mass of a hydrogen atom! TOPS has calculated the mass of all fundamental particles of the hydrogen atom along with their radii and velocities of rotation. See CHAPTER 12 where all energy elements are brought together to account for the mass of ALL subatomic particles in the Standard Model.

The Matter/Anti-matter Paradox

Conventional Physics holds that at the time of the Big Bang matter and anti-matter were made in equal amounts. Somehow, matter got the upper hand and became overwhelmingly dominant. Where did the anti-matter go? TOPS says that any antimatter simply decays into lower order matter particles and thus, all we ever see is matter. See Chapter 8.

Annihilation Radiation

Conventional Physics holds that an electron and a positron annihilate each other to form two photons of .511 MeV each. Experimental evidence shows that the AR produce forms photons of LESS energy than .511 MeV. Why? TOPS gives the reasons and calculates the actual energy of the photons that are produced. See Chapter 10.

Dark Matter

Only about 5% of the universe is visible—glowing stars and galaxies. That means 95% cannot be seen. What is out there that holds all the missing matter that we cannot see? TOPS sees most of that missing mass in undetected n2 neutitos which are the ash of all decay. See Chapter 8.

Entanglement

How is it possible that when one separates two 'entangled' particles by great distances, that making a change in one of the particles, immediately affects the other (it is said that Einstein once called it 'spooky action at a distance')? Sorry about this one. At present, TOPS has no idea how entanglement can work, if entanglement DOES exist.

Uncertainty Principle

Why do we get interference patterns in double-slit experiments--are we dealing with waves or particles? See the following topic on the Uncertainty Principle.

In Memoriam of Uncertainty

The Uncertainty Principle was introduced at a meeting of some of the biggest names in physics and chemistry, held in Brussels Belgium in 1927. Quoting from Chapter 1, we said,

> "… some of the greatest minds of the day (most of them Nobel Prize winners in Physics or Chemistry) in the city of Brussels, Belgium. The question before the conference was how to make sense of the contradictory evidence they were finding in their double-slit experiments using photons and electrons. Einstein was there, as were Bohr, Heisenberg, Planck, Schroedinger, Dirac, Pauli, etc."

At that conference, Werner Heisenberg presented a theory of 'Uncertainty' which stated that it was impossible to know things with certainty because the more one knew about the momentum of a particle, the less certain one COULD be about its position. Einstein was very reluctant to accept the principle, but eventually gave in, complaining something like, 'God does not play dice.' Thus, from Einstein's inability to refute Heisenberg's logic, the Uncertainty Principle became an accepted, scientific 'fact.' According to Heisenberg, one simply CANNOT know what will happen and you may as well forget about even TRYING to figure it out! I now want to tackle that 'sacred cow' of Uncertainty, at least as it applies to ħ.

I will do so in two ways: from the standpoint of logic; inappropriateness of the equation to how Heisenberg applied it; and a mathematical debunking of Heisenberg's application of that equation. I will then, provide a few suggestions for some of the 'true' reasons for the confusing observations. No, I still do not know the reasons for the interference patterns in a double-slit experiment but perhaps these suggestions may help to find them.

Quite aside from TOPS, **there is no mathematical or physical support for Heisenberg's Uncertainty Principle to include ħ.** In my opinion, its only purpose is to give a pseudo-mathematical justification for not even attempting to find the REAL reasons for the known interference patterns in double-slit experiments of the day. In that, Heisenberg was extraordinarily successful at that conference, for today, after almost 100 years, physicists the world over, are still teaching the Uncertainty Principle and USE that (what I think is totally bogus) as an excuse to not search further for physical reasons for the interference patterns.

His equation, Heisenberg said, meant that it was impossible to accurately know BOTH the **momentum** of a moving particle AND the **position** where it would strike a screen after passing through a double-slit experiment—if it is impossible to know, why try? In my opinion, Heisenberg was right only in that one does not know where a given particle will strike. He was so successful in selling that Uncertainty Principle that most scientists since that time have taken his pseudo-mathematical excuse to heart and no longer even **try** to determine the real causes for the observed interference patterns.

Look up the 'Uncertainty Principle' on the web and you will find several slight variations, but almost all have ħ, the 'reduced Planck's Constant' in them. Sometimes it is ħ or ħ/2.

As I recall, the equation for the Uncertainty Principle that I was taught was:

$$\Delta x \, \Delta p \geq \hbar$$

Heisenberg's application of ħ to the equation was inappropriate for the following two very fundamental reasons:

Reason 1

The double slit experiments with electron beams (called 'Cathode rays' at the time) considered them to be tiny spheres with a mass m_e (of $9.11x10^{-31}$ kg) moving in a straight-line velocity v_e for a momentum of $p=m_ev_e$ (kg-m/sec) and being deflected by an unknowable distance of x (m) on the screen.

Since the mass was known and the velocity could be calculated from the voltage that propelled the electrons, the p was easily calculatable within a measurable degree of accuracy. The problem was that the spot x where the electron hit the screen was all over the place and x could not be calculated with any degree of precision.

Multiplying the momentum times any random position x, gave the units kg-m^2/sec or joule-sec. Those are the same units we find in ħ so, from that perspective, Heisenberg's equation seems to make sense.

In 1927 the electrons used in the double slit experiments were thought of as being particles and physicist knew their mass. They thought of the electrons as spherical particles like bullets that were being shot through the slit.

The experimenters at this time, knew the mass of the electron and could control its velocity. Thus, they could readily calculate the momentum of the electrons when they encountered the slit. But when the electrons hit the screen on the other side of the slit, they were all over the place—up, down, right, left. There seemed to be absolutely no way to predict where any single electron would strike the screen.

Heisenberg proposed the Uncertainty Principle as being the reason for the uncertainty of where any particular electron would hit the screen. He reasoned that the momentum (mass x velocity in kg-m/sec) and the distance from the center of the screen directly behind the slit—the point at which one would assume the electron should always go, was a distance which could be measured in meters. Heisenberg called the distance (from the theoretical mid-point at which the electron logically should strike the screen to where it actually hit the screen), as being its 'inaccurate position.'

Multiplying the readily measurable momentum by the widely varying position gave no meaningful answer and Heisenberg chose the recently discovered Reduced Planck's Constant ħ (j-sec = kg-m^2-sec) as his excuse for the unpredictability of where a given electron would hit. The units of ħ are fine (mv x l), and would match Heisenberg's equation, so his explanation looked to be logical, BUT….

The problem is, **ħ should NOT be used in measuring linear momentum (mv)— ħ** governs the absolutely fixed, **rotation** of subatomic particles. In **linear motion**, momentum is a vector quantity which has its action in the **same direction** as the movement of the velocity. In linear movement, the momentum is always conserved in THAT direction. If you see a particle change in direction, it will always be accompanied by another particle moving away from that same point in a slightly different direction, so the combined momentums are always conserved. Experimentalists know that and even if they cannot detect objects (such as neutrinos), they always know they are there and can often predict the direction and velocity changes that have taken place. **Thus, it is not appropriate to use ħ with linear motion to tell us 'why' we cannot tell where an electron will hit a fluorescent screen**.

The problem is in **ħ (possessing the same physical units), itself— ħ relates to unchanging rotating systems so is not applicable to linear momentum at all**—the use of **ħ** should be restricted to the unchanging **rotational** movement of subatomic particles.

In angular rotation, we have **angular momentum**, which, while it is a vector quantity, has its **direction of action always pointing to the center of rotation, perpendicular** to the direction of its instantaneous (with its predictable, but always changing of direction), velocity. **The distance element in rotational systems, is the radius of the rotating system and is NOT the position where an electron strikes a fluorescent screen.**

In TOPS we always indicate the rotational velocity by **u** rather than **v** to avoid such a conflict in thought processes.

Thus, in double-slit experiments, ħ is being MISUSED with linear momentum (a fixed mass with variable velocity) times a variable 'place'—the variable range of deflection of where the electron hits the screen. That is being misunderstood as relating to a fixed mass rotating at a fixed rate at a fixed distance that we have in ħ.

Reason 2

If the Heisenberg Uncertainty concept WERE to be essentially correct in principle, the structure of ħ needs to be considered. Calculate the angular momentum (L_e) of an electron of mass m_e rotating around orbit n=1 of a hydrogen atom as shown in Chapter 2. $L_e = m_e r_{o1}^2 2\pi f_{o1}$ = $\mathbf{m_e u_{o1} r_{o1} = \hbar}$, because $u_{o1}=2\pi r_{o1} f_{o1}$.

> In Heisenberg's misuse of the equation $p_e=m_e u_e$ and $x = r_e$. Notice that p_e includes u_e and u_e includes r_e. Thus, **if we know the value of u_e, we HAVE to know the value of r_e to the same degree of precision (because u_e INCLUDES r_e)!**

This means that if we know the momentum precisely, we will have to know the value of BOTH p_e AND r_e! And thus, ħ is more a measure of CERTAINTY of measurement (of rotation at distance r), than uncertainty! The more precisely we know the value of the rotational momentum, the more precisely we HAVE to know the value of r because ħ does NOT change in value and we know that value with great precision! AND, that r is NOT the position away from a theoretical central spot on a fluorescent screen, but is the radius of the rotating particle itself!

Thus, if there really IS something to the Uncertainty Principle, it is certainly NOT related to **ħ**. We must look elsewhere for some other constant that is free to fluctuate to demonstrate that uncertainty.

Let us thoroughly reexamine the Uncertainty Principle.

If there IS, indeed such a principle, it is NOT to be based on ħ which should be limited to only those particles that are spinning at a fixed velocity.

All the Uncertainty Principle has done for us in the last 100 years, is give us an excuse **not** to try to understand those things that puzzle us about the double-slit experiments in particular, and provide an excuse for never looking for ANY answers to puzzling effects because of the supposed, 'Uncertainty Principle.'

Science has made awesome strides in applied physics over the last 100 years—and all of it has been done **in spite of** rigid adherence of physicists to this useless 'Principle.' Imagine where we might be now if we had not been hogtied by Heisenberg;s false legacy.

Let us freely ASK, 'WHY?' And work until we find out WHY?

The Road to Understanding Double-Slit Interference Patterns

Now, let us try to **understand** what we don't know about the interference patterns from double-slit experiments. I DO NOT have the answers. I submit the following possibilities be considered in the study of the TRUE reasons why we have the interference patterns in double slit studies.

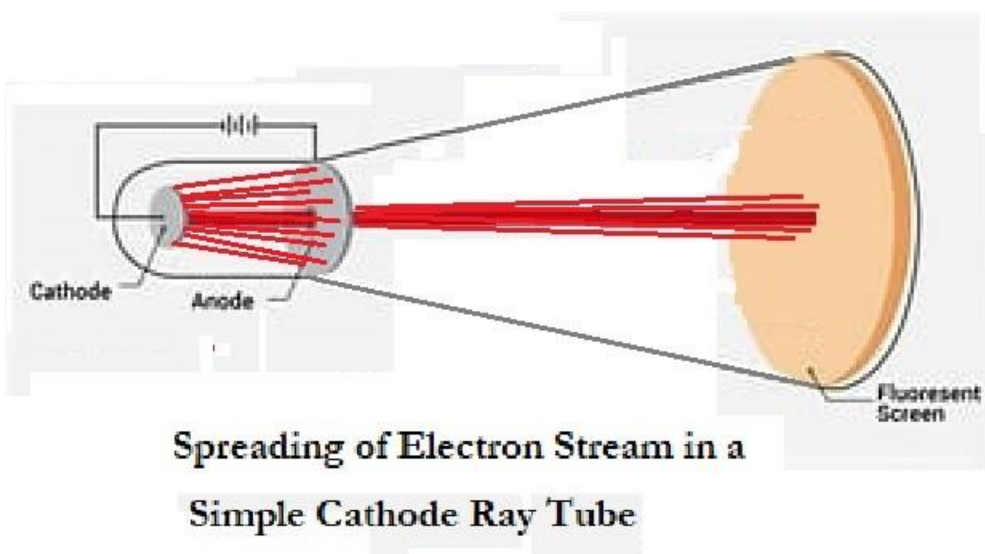

Figure 13-1 The Spreading of the Electron Stream in a CRT

Figure 13-1 illustrates how the electron stream across a CRT is not normally a pencil-thin beam of electrons. There are at least three major reasons for this divergence of the electron beam.

First, all electrons have a negative charge and therefore will repel each other. Thus, even if they started out together, they would diverge from each other as they continue across the CRT.

Second, the distances between the opposite sides of the anode aperature will be different for each electron as it passes through the slit. The electron which is exactly AT the center of the aperature will be evenly affected by the attraction to both sides and will pass straight through the slit to hit the center of the fluorescent screen. An electron that is at a position of ½ the distance between the center of the beam and the side will be deviated somewhat toward the closest side and one that barely misses one side of the aperature will be diverted by a maximum amount. The result of these different positions off-center from the slit gives a bell-shaped curve with most electrons striking close to the center of the fluorescent screen, but tapering off to both sides.

Third, the source of the original electrons in the gas within the CRT is the collisions with the rarified gas molecules. Although all electrons will be subjected to the same voltage once they are freed from their gas atoms, those electrons are originally moving in random directions. Those which were already headed in the direction of the voltage will have a bit more energy (velocity) and those that were headed in the opposition direction will be depleted in energy because they are now traveling at slightly lower velocities. The different velocities will affect how long it takes for the electron to pass through the aperature in the anode, with those going more slowly, being more diverted from their original paths.

Modern CRTs are more highly evacuated than those of the early days of physics as shown in Figure 12-1. The source of the electrons in modern CRTs is no longer the gases within the tube but comes from a hot filament which 'boils off' electrons by way of the thermionic emission process discovered by Edison while he was developing the first electric light bulbs. Specially shaped cathodes form a more compact stream of electrons, so there is less diversion of the electron beams. Anodes may be arranged 'downstream' from the electrically neutral aperture (or slit) that defines the shape of the beam. These factors can help reduce the scattering of the beam, but the beam-scattering effect problems are always going to be there to some degree.

It is easy to demonstrate that scattering occurs at a SINGLE slit. It is only when we have TWO slits that we find the interference patterns. I suspect that the uneven spreading out of the particles as they pass through the (microscopically ragged) edges of the slit are partially caused by an edge-scattering effect like the beam scattering within a CRT.

I will use the concept of a continuous stream of electrons as the focus for the following comments: I envision the edges of the slit to appear like the ragged, cutting edge of a rip saw to the very tiny passing electron. The degree of scattering depends on how close that particular electron comes to the jagged edge.

The electron in a CRT will either pass through the slit or will be stopped by a collision with the jagged edge of the slit. Those that are stopped contribute to the current flowing through the battery in Figure 12-1 and have no effect on the diversion of electrons passing through the slit. Only those that pass through the slit unimpeded, will contribute to any interference patterns.

The slit will be positively charged and have an attraction at the jagged edge of the slit. I suggest that the observed interference patterns may be produced by the inherent rotation (spin) of the electrons that pass through the two slits and scatter due to the slits' edge-effects. The diversion of the electrons passing through the slits, will cause interference with each one another, but TOPS provides no 'explanation' for the observed interference except for the natural repulsion between two electrons traveling in slightly different and interfering paths. Perhaps a further complication is that the electrons may be going through the slits in many orientations—not just up or down. Random spin directions would mean different magnetic moment directions with resulting unpredictable results.

QUO VADIS?

Chapter 14 - Where TO From Here?

I have very little knowledge of the experimental side of physics. Most of my study of particle physics has been based on the 'What IF?…' question that I started with in the Prologue of this book and most of my work has been done with pencil and paper to guide my concepts.

Nevertheless, the CONCEPTS of TOPS are so different from those of conventional physics, that I think some of the implications of TOPS can be evaluated by challenging conventional thought. Following are a few topics that I think might bear fruit for experimental physicists.

I may add to the following topics as new concepts occur to me, so this will be an open chapter, subject to continual changes. Because of that, I may find it necessary to change some of what has been posted earlier. If, for example, my further studies of TOPS on the subject of monopoles is contrary to what you can find in the first subject below, please allow me to make changes as appropriate without criticizing me for changing my mind. I am still asking 'What IF?' and I still do not KNOW whether I am right or wrong.

Magnetic Monopoles

The following article was written on August 23, 2020, when I had another experience which has enlarged my understanding of TOPS. I will tell you about it, for I believe it is another example of how God slowly reveals the wonders of His creation through the mind of man and how He has led me in my study of TOPS.

First, a quotation from Isaiah 28 (KJV—'he' of verse 9 is identified as 'The LORD of hosts' in verse 5):

> 9 *Whom shall he teach knowledge? and whom shall he make to understand doctrine?*
> …
> 10 *For precept must be upon precept, precept upon precept; line upon line, line upon line; here a little, and there a little:*

Two days earlier, just as I thought I had 'completed' Chapter 3, I was preparing to move on to Chapter 4, much of which was already written, but felt it needed some editing and updating. It was not yet time to go to bed and instead of shutting down my computer, I went to the web. I do not remember why I did that, but it is not unusual for me to occasionally search for some scientific term or concept to expand my understandings. On the side of my monitor, I saw an ad for a YouTube video entitled, 'Magnetic Monopoles.' My first reaction was 'Yeah, sure.' But for some reason, I started the video and watched the whole thing—it was nearly an hour long.[81] It featured a Dr. Felix Flicker of Oxford University, a theoretical physicist who seemed to really believe that one should be able to find evidence of particles that had only one magnetic pole, either a North pole without a South or a South pole without a North. Dr. Flicker ended his presentation, still not having found a monopole.

I watched the video with much skepticism, for 'everyone knows' if you break a magnet in half, you end up with two smaller magnets, each of which has a North pole and a South pole. And that goes clear down to the atomic level. The earnestness and logic of Dr. Flicker's presentation impressed me and for some reason, I could NOT let it go when I went to bed. As has been true many times during my TOPS journey, I simply could not get to sleep. Something in my head kept churning over my initial rejection of the concept of magnetic monopoles. During the perhaps, three hours that I did get to sleep that night, those magnetic monopoles bothered me in my dreams. Until that time, all my analysis of the TOPS nn2 neutito had been with the neutito's **interior** magnetic fields.

Thus, the following morning I got up, resolved to see how the monopole concept would fit into what I had been studying in TOPS. Now magnetic monopoles looked possible, and I resolved to check into it that night. I finally sat down and looked at the (1,1) neutito and its **exterior** magnetic field, and suddenly, **I could see the magnetic monopoles; BOTH kinds**, and here they are!

TOPS Magnetic Monopoles

In my work to this time, I had been focusing on the internal fields in the neutito and had illustrated them (Figure 14-1, as shown on the next page) to

[81] www.youtube.com/watch?v=S3xH975u-KY
OR
https://www2.physics.ox.ac.uk/events/2020/02/04/iop-oxford-presents-dr-felix-flicker-magnetic-monopoles-in-spin-ice. Another video is at: https://www.youtube.com/watch?v=S3xH97Su-KY recorded on May 20, 2020.

convey the opposition of the two sets of magnetic fields within the Neutito. Only when I drew a diagram of the **external** portion of the fields, similar to the figure on the right, could I see that what I had been describing regarding the neutito, would **naturally produce a magnetic MONOPOLE**!

The South monopole of the neutito as shown at the top-left of Figure 14-1, would have a North monopole isomorph (bottom-left) if the structure had been the zork at the top and the york at the bottom (but still spinning clockwise). Furthermore, it seems obvious that a South monopole would seek out and attract a North monopole and produce a DIPOLE magnet as shown on the right.

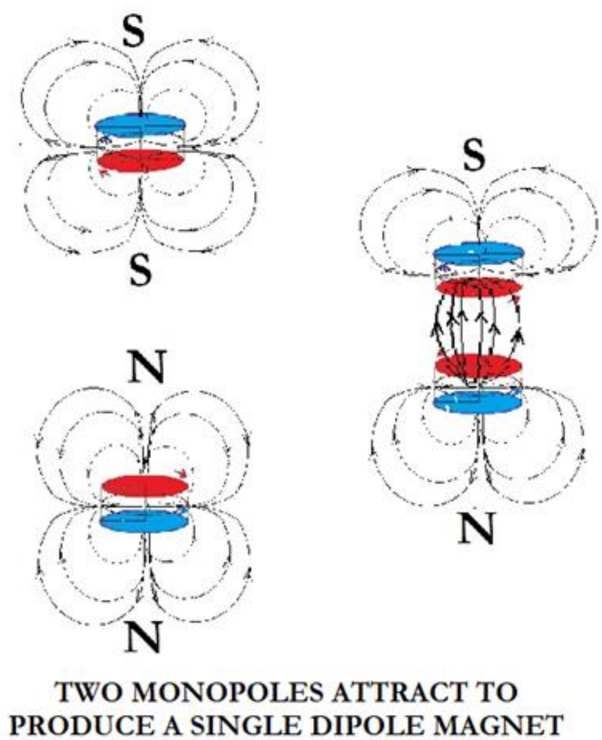

Figure 14-1 Two Monopoles Attract to Produce a Single Dipole Magnet

Both monopoles would have the same (1,1) makeup with equal spacing between the york and the zork—both would have the same magnitude of forces that are balanced within each monopole, and both would have the same mass. **They would differ only in their magnetic polarities.**

In the dipole combination, however, the forces **between** the two monopoles would be much weaker than those **within** the monopole. I will not attempt to do the math here, but it is obvious that the Coulomb repulsion between the york of the South monopole and the york of the North monopole is going to be much less than that between the two zorks which are much closer together. On the other hand, the Coulomb forces between the york in the South monopole and the zork in the North monopole are going to be the same as that between the york and zork of the opposite monopole. It appears obvious that the combination of opposing forces in the dipole format would have some neutral point so that the distance between the two monopoles will be fixed. While the distance will be fixed, it should be a much weaker bond, a bond that would be vulnerable to breakage so the two neutitos could exist as separated monopole entities. The bond within the neutito, however, is so strong that I expect that NO amount of energy could break that n2 particle into separate Sparqs. Even a black hole would only pull them more tightly together.

One consequence of this is that energy states would be different in the monopole state than in the dipole state. At this time, I have no idea of how those different energy states would be expressed or changed during energy transfer.

One result of this concept (new to me) is that I believe I have discovered a basic exclusion feature that limits how these particles can interact. Note that in the depiction of the dipole magnet, I have purposely shown both the york and the zork rotating in the same, clockwise direction. Apparently, nature requires a particle structure such that two spinning particles MUST be arranged so that the direction of the **Coulomb and magnetic forces are always in opposition to each other. Otherwise, the system would collapse and produce a black hole (SEE Science Fiction, below).**

While the spin direction has no effect on the force or energy of the Coulomb forces in the axial direction, it is essential to have the two, oppositely charged particles of the neutito spin in the same direction so the magnetism that is induced by the rotating charges opposes the Coulomb force of attraction. If you could change the current direction of only one component, the magnetism direction would be reversed, repulsion would become attraction and the particle would collapse into itself with both Coulomb and magnetic forces being in 'attraction-mode.'[82] This would result in an UNPERMITTED structure and, thus, at present, TOPS assumes this would prohibit this kind of structure.

[82] Perhaps this CAN happen! The presumed result would be a tiny black hole. See 'Black Hole' later in this chapter.

[I feel that I was 'led' to view Dr. Flicker's video. When I saw the video's title, I just wanted to skip it as being wishful thinking, but something inside me told me to 'give it a chance--be open-minded.' I thought I would just watch enough to 'know' that it was a baseless theory. Even when the video ended, I thought the possibility of magnetic monopoles was quite questionable. But SOMETHING, kept my mind going and led me back to my present work on the neutito where I found the natural presence of monopoles in my hypothetical neutitos. Again, from Isaiah 28:

> 9 *Whom shall he teach knowledge? and whom shall he make to understand doctrine?* …
> 10 *For precept must be upon precept, precept upon precept; line upon line, line upon line; here a little, and there a little:*

I still have no validation that there actually ARE yorks, zorks, or monopoles. My entire work on TOPS over 21 years, has been based on 'WHAT IF? As for me, at this time, I have decided not to pursue monopoles any further. It is possible that the actual existence of magnetic monopoles COULD be critically important in the evolution of TOPS, but I do not see that at this time. At my age, I need to focus on what I DO think is important in this book. Thus, I will leave further studies on monopoles to others—unless, of course, 'The LORD of hosts' gives me another push, another '*here a little, and there a little.*' I never want to 'close the door' to HIS guidance just because of MY personal biases. I want to follow the principle, '*TRUTH is where you find it.*' BBB 10/05/2020]

CERN

I have little knowledge of the LHC and other particle accelerators. Nevertheless, my study of TOPS leads to certain conclusions that would appear to run counter to generally accepted physical principles. For example, I recently read in the newspaper that there was a movement to upgrade an area of the LHC for the purpose of increasing the energy of electron/positron collisions. The assumption seemed to be, if we could only accelerate these particles to even higher velocities, their collision energies would be high enough to create even larger particles than the Third-Generation particles of the Top and Bottom quarks (I would call the Fourth-Generations: the Sol (15,13) and the Terra (15,16), respectively).

From a TOPS perspective this makes NO sense. The LHC drives its proton/proton collision beams well above 99% the speed of light. There is little room for pushing that limit another decimal or two especially when you consider that the kinetic energy of a proton going that velocity is almost 2000 times as much as an electron going the same speed. TOPS holds that specific numbers of Sparqs (yorks and zorks) are required to form all structures and that electrons (2,5) and positrons (5,2) only have 14 Sparqs (7 yorks and 7 zorks) between them.

For TOPS, only if beam densities were high enough for THREE electron/positron collisions within the confines of limited time and space to form a near-instantaneous conglomerate of [21,21] would there be enough matter to decay into permitted structures of ANY size. The following decay is provided as an illustration.

3 e- 3 e+ up down strange

$$3(2,5) + 3(5,2) \rightarrow [21,21] \rightarrow (6,4)^{+2e/3} + (6,7)^{-e/3} + (9,10)^{-e/3}$$

The strange quark would temporarily recombine with the up and down to produce a strange neutron (uds), and then decay into a normal neutron (udu), for NO particles of any size above the up and down-quarks can exist alone for long, in nature—they decay into First-Generation particles. The statistical collision signature for that reaction would be unique and unquestionable but making even larger than Fourth-Generation particles would seem to be impossible without increasing the matter content (i.e., number of available Sparqs) within the colliding particles.

From a TOPS perspective, I strongly doubt that any intensity of electron/positron beams can produce fourth Generation particles.

The following section was added on June 30, 2022. It was inserted at this position because of its CERN content.

[Last night, I was editing the end of Chapter 4, cleaning up wording, misspellings, etc., in preparation for posting the final book on my web site. I noted it was just at midnight, about half an hour earlier than I usually quit, and thought I would spend a few minutes surfing the web for something interesting. The subject of Chapter 4 is the Photon and, with that on my mind, I typed in two key words, 'photon' and 'structure' and immediately got the following URL: Photon structure function - Wikipedia. I clicked on that link and found something that sounded quite bizarre to me at the time.

"While the photon is a massless boson, through certain processes its energy can be converted into the mass of massive fermions."

The article continued with descriptions of what was presumably happening: "by scattering electrons off the photons." Reportedly, this phenomenon had been observed at electron/positron collision facilities around the world, to include LEP and CERN.

The article was talking about very high energy photons that were interacting with a single electron (or positron) and that is NOT what I had envisioned happening in the LEP or CERN from a TOPS perspective. They even had a Feynman Diagram depicting the proposed events. With the following description: "The incoming target photon splits into a nearly collinear quark–antiquark pair. The impinging electron is scattered off the quark to large angles, the scatter pattern revealing the internal quark structure of the photon. Quark and antiquark finally transform to hadrons."

I thought that this description in no way, was like what I was working with in TOPS. I decided to see what the TOPS findings would be using the same information. With the 3-electron/3-positron collision described above in mind, I knew the Wikipedia description would need even more pairs of electrons and positrons for the required energy. As a first stab, I took 5 electrons and 5 positrons, but there was no way I was getting possible decay routes—there were always unpermitted particles made, so those decays could not occur. My next stab was 5 electrons and 4 positrons which I will now diagram to show how TOPS describes such a decay. (By 1 am, June 30, I had an answer from the TOPS perspective! Following are only TWO of multiple possible routes, but the results are consistent with the same type of hadrons (particles) predicted by the Feynman diagram. BBB]

From a TOPS perspective, the photon could come FROM the multiple e+e- collisions and be the triggering energy to form that high energy photon but would not originate the decay on a single electron, as implied in the text, no matter what their velocities might be.

Case 1

SOURCES | **PRODUCTS**

e- +4e-+4e+ | **neutron+e- + ϱ⁰ meson**

5(2,5)+4(5,2) →[30,33]

↳ [24,29] + (6,4)**up |**

↳ [18,22] + (6,7)**dn |neutron |**

↳ [12,15] + (6,7)**dn |**

↳ [10,10] + (2,5)**e-**

↳ (6,4)**up** +(4,6)**antiup** = **ϱ⁰ meson**

Case 2

SOURCES | **PRODUCTS**

e- +4e-+4e+ | **proton+e- + tau neutrino**

5(2,5)+4(5,2) →[30,33] | (**hydrogen atom**)+ **tau neutrino**

↳ [24,29] + (6,4)up |
↳ [18,22] + (6,7)dn | **Proton** |
↳ [12,18] + (6,4)up | | **H atom**
↳ [10,13] + (2,5)**e-** |
↳ (8,8) **tau neutrino**

In Case 1, the products are a neutron, an electron and a ϱ^0 meson. Of course, the meson would continue the decay process into smaller particles of matter as shown in Chapter 8. In Case 2, the products are a hydrogen atom and a tau neutrino which would also decay into a couple of electron neutrinos and n2 neutitos.

The decay processes required to produce second and third-Generation particles would require even more electron/positron couplets to join in a single massive collision particle.

Now let us consider Case 2 from yet, a different aspect. The original, high-energy photon is converted to a hydrogen atom and a tau neutrino. We know the radius of a hydrogen atom in orbit n=1 is 5.29×10^{-11} m (Chapter 2). The mass of the hydrogen atom is also approximately 1837 times the mass of an electron, about 16.7×10^{-27} kg. (Note this does NOT include the tau neutrino!). The energy of that hydrogen atom is $m_H c^2 = hf_\varphi$. Solve for $f_\varphi = 2.27 \times 10^{23}$ Hz!!! This corresponds to a maximum wavelength of $\lambda_\varphi = 1.32 \times 10^{-15}$ m and for one cycle, the volume of the photon would be the cube of that, or 2.30×10^{-45} m^3 as the instantaneous volume of that photon. That wavelength is about **4 orders of magnitude smaller** than the hydrogen atom that evolved from that single photon of wavelength λ_φ. If we included the tau neutrino's required mass, the wavelength and volume differences would be even more drastic! I find it absolutely AMAZING how that much mass is packed into that tiny quantum of energy if current theories are correct! Perhaps, however, the TOPS approach is more correct, and we do NOT have all that energy packed into our initiating photon. Perhaps, I am also prominently displaying the fact that I do not know much about mesons or photons! But I am still trying!

Nevertheless, it appears that the current quantum theory and TOPS give results that are similar, but I would suggest that, perhaps the TOPS approach would be more precise in predicting the specific particles that we should find in LHC collisions.

I recently heard, the LHC was studying proton/proton collisions but wanted to increase the energy to produce even larger particles by using higher energy electron/positron collisions. From a TOPS perspective, the Sparq content of a single proton is (18,15), so such a head-on collision of two protons can produce a momentary conglomerate of [36,30] and this limits the size of particles that can be produced. Nevertheless, proton/proton collisions are much more efficient than electron/positron collisions which can only produce [7,7] conglomerates which can decay only into AR photons and neutrinos as we saw in Chapter 6. If, however, it is possible that more pairs of electrons and positrons may be fused within the same conglomerate, larger hadrons could be produced like the three-pair electron/electron example shown above.

I would, however, suggest that if CERN wants to increase the energy content to make higher energy particles, that a better approach to upgrade the LHC, would be to use deuteron/deuteron collisions. Since a deuteron consists of one proton (18,15) and one neutron (18,18), we would have Sparq matter content of (36,33) for each colliding particle, for a total Sparq matter content of [72,66] for each head-on collision! From a TOPS perspective, with all that Sparq content, we could use much lower particle velocities and theoretically, still produce more massive particles. [BBB 02/24/2021]

Science Fiction

[This section is being written starting on July 15, 2022. The following is background information.]

In the early 1990s I wrote a science fiction novel that never got published. It featured the Fermilab facility at Batavia, Illinois. In the summer of 1992, I took a trip to Fermilab so I could relatively accurately portray the milieu of the facility. The CERN project was under way in Europe, but was far from being operational. I wrote the story as taking place in 1998, still about six years into the future at that time.

The story centered on a group of physicists who traveled to Fermilab to conduct their proton/antiproton collision experiments. On one of their routine runs, the collision caused such a violent reaction that a rho meson was collapsed into a miniature black hole that they called a Rho hole. One particular Rho hole penetrated all physical barriers of the underground facility as it left the Fermilab detection center. The Rho hole entered the floor of the Fermilab control room and exited the ceiling in an instant, but the team found the points of entry and exit to verify its source and path.

A race was on to find what had happened and figure out any hazards it might pose to the population. Later investigation discovered that Rho holes were always produced in pairs and in the Fermilab event, the first one shot off into outer space, never to be encountered by humans, but the other had penetrated the earth's surface and was in an elliptical orbit that carried it partially within the earth's surface with each orbit. It was quickly picking up other material and becoming more massive without becoming measurably larger. It was obvious that leaving it alone was not an option—it would slowly absorb the entire earth with utter annihilation of all life.

That was the heart of the plot. Scientists later found that CERN and another facility had unknowingly also created a pair of Rho holes. —How does one get rid of black holes? Scientists from around the world joined to study the problem.

I will give no more of the plot of my science fiction, for my reason for bringing it up lies in the black hole concept and not the story. It was perhaps seven years after I failed to get my novel published (ca 1993), that I started my study that I now call TOPS. My attempt at Science fiction had been inspired by Hawking's book, 'A Brief History of Time" and has been far from my mind as I worked on TOPS, but it was only this week when I am editing this work in its final stages, that I began to consider the Rho hole problem from my present TOPS perspective. Could a TOPS Rho hole really be created by high energy collision research at CERN today?

Thus, I decided to consider what COULD happen with my present TOPS concepts. Following is a summary of my recent reviews of the Rho hole problem over the past few days.

I will start with the assumption that the energy available in today's CERN proton/proton collisions actually COULD cause an up-quark/antiup-quark Rho meson to collapse to the thickness of one Planck Length $=1.6\text{x}10^{-35}$ meters for each Sparq within the particle. I will then give an example of a proton/proton collision that theoretically COULD produce that TOPS $\boldsymbol{\varrho^0}$ **meson** and will call it CASE 3. Finally, I will calculate the volume ($V_{n2}=2\pi r_y^3$) of an n2 neutito collapsed with no space between the Sparqs to find the spatial collapse of the hypothetical Rho hole that has assimilated that tiny volume of matter.

Black Hole Discussion

Case 3

Proton/Proton Collision

SOURCES **HYPOTHETICAL PRODUCTS**

(up+dn+up) + (up+dn+up) → ϱ⁰ meson +3(e+) +muon +2n4 +2n2

[(6,4)+(6,7)+(6,4)]+[(6,4)+(6,7)+(6,4)] →[36,30]

↳[26,20]+**[(6,4)+(4,6)] =ϱ⁰ meson**

↳[11,14] +**3(5,2)** = **3e+ positrons**

↳ [6,6]+**(5,8)** = **muon**

↳ **2(2,2) + 2(1,1) neutrinos**

Earlier in this chapter I discussed magnetic monopoles and made a statement that just **might** give a hint as to HOW black holes COULD BE made in the first place. I said,

"Apparently, nature requires a particle structure such that two spinning particles MUST be arranged so that the direction of the **Coulomb and magnetic forces are always in opposition to each other."**

That opposition of magnetic and Coulomb forces was at the heart of the TOPS theories starting in Chapter 3. It is a natural consequence when the york and zork spin in the SAME direction—if Coulomb forces are attractive, the accompanying magnetic forces are repulsive or vice versa. For TOPS this balance of forces is what maintains the structure of all particles. But suppose that a black hole is produced when the yorks and zorks are forced to spin in OPPOSITE directions. In such a case, the attractive Coulomb forces between the york and zork would be reinforced by the magnetic fields which would also produce attractive forces—both forces acting in the same direction. ALL forces in a Rho hole would be in a state of attraction. See Figure 14-1.

From a TOPS perspective, all other outside particles would be attracted to that doubly powerful attraction of a collapsed, single n2 neutito, the smallest of all Standard Model particles. Thus, for this exercise, **I am going to assume** that the way any black hole is formed is to cram a TOPS particle into a very small volume so hard, as to force **the yorks and zorks to stack into an arrangement of +-+-+- such that the yorks and zorks always spin in**

opposite directions so there is NO space between them. The remainder of this discussion will rely on this concept.

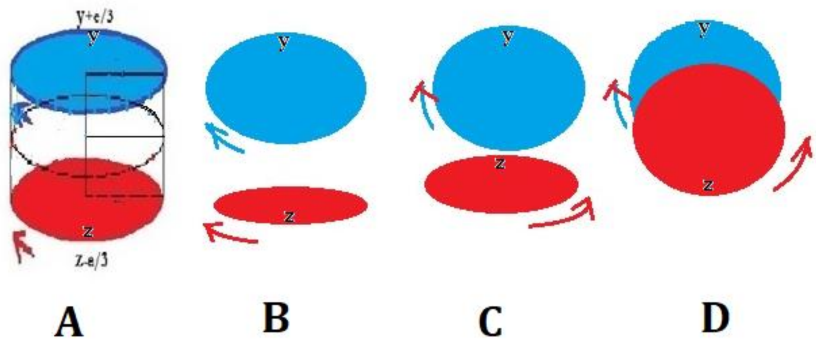

Figure 14-2 An n2 Neutito Collapsing into a Black Hole

In Figure 14-1 the n2 at the left at **A** is the starting point. Envision the front edge of the york as being forced downward, rotating 180^o to its Black Hole position at **D**. At the same time the front edge of the zork is being forced upward by 180^o to lie flat on top of the york. Between **B** and **C,** the zork has been flipped over and is now rotating in the opposite direction from that of the zork. The former space between the york and zork is gone and the two Sparqs are now spinning in opposite directions. Electrostatic forces are attractive, and the magnetic fields are attractive and anything touching the Black Hole is attracted, assimilated, and absorbed. The Black hole will only grow, every time it meets and unites with another particle.

From Chapters 3 and 12, we know the following about the n2 in our natural (non-black hole) world:

Mass: $m_{n2} = 2.60x10^{-31}$ kg

Radius: $r_{n2}=r_y = r_z = 6.76x10^{-13}$ m

Thickness: $2d_y = 2r_y = 13.5x10^{-13}$ m

Area: $A_{n2} = \pi r_y^2 = 143x10^{-26} = 1.43x10^{-24}$ m^2

Volume: $V_{n2} = 2r_y A_{n2} = 19.3x10^{-37} = 1.93x10^{-36}$ m^3

Now let us assume that the n2 DID collapse into an n2 black hole. What would now be true?

The mass would remain unchanged—it is just packed into a smaller volume.

The radius of the york and zork would be unchanged—it would be the empty space between them that would be eliminated.

The surface area of the york and zork would be unchanged because the radius would be unchanged.

What WOULD change is the thickness of the n2 because that volume will be reduced. I will now assume that in the n2 black hole is shrunk to the point that there is NO space between adjacent yorks and zorks, and that the thickness of both the york and zork is the smallest possible thickness that can be—a single Planck Length, $1.6x10^{-35}$ m. Thus, the thickness of a single Sparq in an n2 black hole would be $1.6x10^{-35}$ m. The thickness of both Sparqs in the n2 would be twice that, at $3.2x10^{-35}$ m with absolutely no space between them.

Thus, the volume of the n2 black hole (V_{n2BH}) is reduced to:

$$V_{n2BH} = A_{n2}(2x1.6x10^{-35}) = 1.43x10^{-24}(3.2x10^{-35}) = 4.58x10^{-59}\ m^3.$$

And the ratio of the n2 volume to that of the n2 black hole is an astounding,

$$\mathbf{V_{n2}/V_{n2BH} = 19.4x10^{-37}/4.58x10^{-59} = 4.22x10^{22}}$$

Is it possible that black holes CAN be produced in large accelerators? Is it possible that Fermilab and CERN have ALREADY produced black holes without knowing they have done so? If so, how long does the world have before the presently unrecognized swarm of those tiny black holes accumulates enough mass to coalesce to consume the entire planet?

Now, I do not know whether there is an actual measurement as small as one Planck Length. TOPS would suggest that the smallest possible non-black hole particle is the n2 and that particle has a volume of $1.94x10^{-37}\ m^3$ (if I have not made errors in my calculations). But if the thickness of a york or zork were ten Planck Lengths, that would knock off only **one** of those 22 exponents in the volume ratio.

Even if the ratio of $\mathbf{V_{n2}/V_{n2BH}}$ were to be more in the region of 10^{12} (TEN orders of magnitude less than using one Planck Length) it would seem prudent that **accelerator facilities around the world should cut back on operations until we can find a way to see if we have been unwittingly creating the means of our inevitable planetary destruction.**

Increasing the energy per collision by increasing particle size rather than velocity (using deuterons as suggested under the topic 'CERN,' above) might well be an 'environmentally safer' and more productive way of conducting our experiments at our accelerators.

A couple more observations: A Rho hole (Case 3, above) would consist of a collapsed up-quark and an antiup-quark which form a Rho meson. This involves 20 Sparqs, half of them yorks and half zorks. That is a tenfold increase of particles that would be crammed into a Rho hole as opposed to an n2 black hole. The mass of a Rho hole would then be tenfold larger and ten times thicker with ten times the volume as compared to the n2 black hole. A Rho meson is the smallest of the mesons that are produced in our accelerators. Any black hole produced by larger quarks and antiquark mesons, would be correspondingly larger, leading to the possibility of forming even larger black holes. Note also, that Case 3 produces THREE positrons. Those positrons would soon contact extraneous electrons and produce Annihilation Radiation (AR) in accordance with decay patterns shown in Chapters 9 and 10—n2 neutitos, the bottom of the energy pit and the ash of the universe. The net result of a Case 3 Rho hole collision is two high-velocity, insatiable black holes which can only grow in mass over time, plus a few high-energy AR photons and a few neutrinos which have such low masses that they will never show us evidence of their existence. But IF they exist, **the Rho holes have been shot out and can only grow at the expense of whatever they meet**. If a Rho hole dips into a sub-earth orbit, how do you get rid of the Rho hole?

2024 Solar Eclipse Experiments

Einstein's General Relativity predicted that presumed 'massless' photons would be deviated by a warped gravitation field as they grazed the sun's surface during a solar eclipse. Observation of such deviations during an eclipse in 1919 were taken to be confirmation of Einstein's theory of General Relativity.

TOPS, however, would predict a similar deviation of paths because TOPS would predict that photons DO possess a mass so they WOULD be attracted by the sun's mass. (See Chapter 4.) The magnitude of the photon mass would depend upon the inherent mass of the Sparqs (m_y+m_z) of which the photon is made PLUS the mass equivalence of the triggering photon energy, hf_φ. For most photons, the TOPS inherent mass is much larger than the triggering energy so, for lower energy (longer wavelength) photons the measurable deviations should be almost all the same. Thus, any sensors of this presumed mass-effect, must be in the shorter wavelength regions. Thus, present optical and infrared-based telescopes (such as the new Webb and old Hubble) would not be effective in observing any such deviations. If, however, we could find a star which emits high-enough energy photons (i.e., characteristic ultraviolet, X-rays, or gamma rays) to increase the proposed deviations, and which is close enough to the sun during the upcoming 2024 solar eclipse, perhaps we could verify that higher energy photons are deviated differently from lower energy photons. This kind of a finding might support the TOPS Theory. Lack of significant differences among different energy photons would support General Relativity which assumes photons to be massless and that deviations of photon paths are due to warping of space itself.

Interferometer Experiments with Coherent Light

(Testing the Concept of TOPS Coherent Light)

TOPS predicts that coherent light consists of packets of photons of the same energy but packaged with the photons spaced ¼th of a wavelength apart. An experiment is proposed to use an interferometer similar in design to that used by Michelson and Morley to see if we can separate packets of coherent light by adjusting one arm of the interferometer to lengthen the path by $1/4^{th}$ of a wavelength and RECOMBINE them so they are ½ or full wavelength apart. (Is there a way to separate the coherent light packet? Can we experimentally distinguish between the 2 photons of coherent light separated by these values? Could we generate coherence of longer-wavelength microwaves, so the wavelength distances are easier to fine-tune?)

With Two-Photon Simultaneous-Production

(Testing that Characteristic Radiation Results in
Two-photon Emission in Opposite directions.)

Using the interferometer equipment of A, place a photon generator at the center so as to project photons, one at a time, down the arms of the interferometer. Tune the device so the predicted two-at-a-time photons would go in opposite directions and, in the end, be combined to travel in the SAME direction and be in phase and arrive at a detector at the same time.

The Source of Gravity??

Any charged particle that rotates is producing a magnetic field. Because all TOPS particles are made of charged yorks and zorks, there is always an associated magnetic field which extends far beyond the structure of the particle itself. Thus, every TOPS particle is a small magnet that tends to line up with external magnetic fields that extend endlessly through space.

Might it be possible to equate the tiny magnetic tug from a single york or zork to the phenomenon we call 'gravity?' At this point, that is beyond my mental grasp, but it seems it should be possible.

Suppose Yorks and Zorks are NOT Disks

What if I am correct in principle that the smallest particles (Sparqs) have a charge of + or – e/3 but am wrong about their shapes being disks? That is a good possibility. I chose the disk shape because it had a moment of inertia of ½ mr^2 because we know that all such particles have a spin of ½ and that was the simplest model I could find. But that moment of inertia value was also possible using the shape of a rotating cylinder, or a thin rod of length 2r revolving about its center point.

The thin rod model ends up being exactly the same as the disk because in just half of a revolution, the 2r rod has swept out the shape of a disk, so that has no effect on the numbers we derived in this book. That leaves only the possibility of the sphere which has a moment of inertia of 2/5 mr^2.

Thus, the spherical model would produce less current than the disk. I do not know how much current it would be—that would require use of calculus, which, I am unfortunately unable to do. Thus, I must leave it up to somebody else to do that kind of calculation.

Nevertheless, the currents produced in the magnetic energy equation portion would need to change, while those of the electric portion would not (for that force depends only on the distance between the charges and not on their shapes). This would change the r_y/d_y ratio in the n2 because the forces MUST be equal along the n2 axis. I predict that would also increase the value of the gamma boost factor (γ) for the n2.

My impression is that the rotational velocity u_{n2} will still be =c and that would mean that α~=1. Thus, γ would NOT change from 615, and the shape of the n2 MUST be a disk or 2r rod.

I think this book shows the way to solving for those values, but I must leave the work of finding the model which is most likely to be correct to more talented physicists and mathematicians. [BBB 09/10/2022]

WHERE TO FROM HERE? 'QUO VADIS?'

Chapter 15 - FAITH

1 We limit not the truth of God
To our poor reach of mind,
By notions of our day and sect,
Crude, partial and confined.
Now let a new and better hope
Within our hearts be stirred:
The Lord hath yet more light and truth
To break forth from His Word.

2 Who dares to bind by his dull sense
The oracles of heaven,
For all the nations, tongues and climes
And all the ages given!
The universe how much unknown!
That ocean unexplored!
The Lord hath yet more light and truth
To break forth from His Word.

3 Darkling our great forefathers went
The first steps of the way;
'Twas but the dawning yet to grow
Into the perfect day;
And grow it shall, our glorious Sun
More fervid rays afford:
The Lord hath yet more light and truth
To break forth from His Word.

4 The valleys past, ascending still,
Our souls would higher climb,
And look down from supernal heights,
On all the bygone times;
Upward we press, the air is clear,
And the sphere-music heard!
The Lord hath yet more light and truth
To break forth from His Word.

5 O Father, Son and Spirit, send
Us increase from above;
Enlarge, expand all Christian hearts
To comprehend Thy love;
And make us all go on to know
With nobler powers conferred:
The Lord hath yet more light and truth
To break forth from His Word.

*

George Rawson wrote the words to this hymn based on a 1620 farewell speech spoken by John Robinson to the pilgrims who were about to set sail to the New World on the Mayflower. Here is a portion of that speech:

> "I charge you before God and His blessed angels that you follow me no further than you have seen me follow Christ. If God reveal anything to you by any other instrument of His, be as ready to receive it as you were to receive any truth from my ministry, for I am verily persuaded the Lord hath more truth and light yet to break forth from His Holy Word."

It is precisely that philosophy that led me to TOPS and the writing of this book. It has been my journey of FAITH.

"The Lord hath yet more light and truth
To break forth from His Word."

Now faith is the assurance of things hoped for, the evidence of things not seen. (Hebrews 11:1, IV[83])

Thus begins the famous chapter on Faith in Hebrews 11. The entire chapter is devoted to examples of how Biblical characters demonstrated their faith through their actions. It goes all the way back to the righteous sacrifice of Abel and ends in the first century AD martyrdom days of persecution of early Christians.

Faith is an **assurance**, a strong conviction of a truth that cannot be seen or proven, and when acted upon, that conviction is an act of faith. But faith is not limited to things of religion.

We ALL have Faith

When you got out of bed this morning, you were expressing your faith in….almost EVERYTHING in your daily life. For most of us, we live a life of faith in things we cannot see or measure, but we are still confident that they exist, and…. we TRUST them.

When you got out of bed, you were confident that this new day, was the day after yesterday and that tomorrow would NOT be yesterday's 'Ground Hog Day' all over again. You trusted that time always moved forward. You check your calendar. You plan your entire life around that immutable truth that you cannot prove.

You wakened and were hungry--most likely anticipating breakfast, or the smell of coffee in the kitchen. You trusted that your visits to the supermarket had stocked your pantry and refrigerator. Perhaps it was your spouse who did the shopping, but you trusted that it had been done. If you did the shopping, you KNEW what you had bought, and THAT is NOT faith--it is knowledge. If you KNEW you bought that jar of pickles, but it did NOT make it into the house, you KNOW it ether is still at the store in a bag you did not grab, or is still in the car. You were not uncertain, fearing that your feet might not reach the floor by the bedside, or that you would suddenly fall to the ceiling. You placed your trust in the fact that gravity always pulls things downward--that is, unless you happen to be an astronaut in the International Space

83 New Testament of the Christian Bible, Inspired Version

Station. THEN, if you suddenly 'fell' to the ceiling, you would **know** from your studies in physics--and you would feel very confident--that you are undergoing some form of unexpected deceleration such as when you fire your retrorocket to escape earth orbit. And if that happened, you would be betting your life (having faith in them) on the thousands of people around the world that would be working together to guide your space capsule to a safe landing on earth. You have chosen to TRUST them, for you have faith in them.

On earth, most of us may not have liked the temperature outside but would be confident that our HVAC system would keep us comfortable if we adjusted the thermostat. Of course, if your electricity were to go off, you would not question that the heating system is off, but you would trust--indeed you would EXPECT--that the power company would soon have the problem repaired and that the temperature would soon get back to normal.

Faith always requires trust. Although faith and belief are related, Faith is not really *quite* the same as Belief. We can claim a belief, but until we are willing to trust that belief and act upon it as if we really KNEW it was true—only then have we expressed our faith in that belief.

In my youth, I once read a Readers Digest story that is a good example of the difference between faith and belief. I will try to give the gist of the story here, as best I can remember it.

> Every day, a man walked his dog through a neighborhood where an off-season circus high-wire walker practiced over ten feet above the ground, day after day. Watching the effort over a period of months the man observed the wire walker as he got better and better and finally, he had progressed to trying to push an empty wheelbarrow across the wire. Over and over the wire walker lost his footing and dropped the wheelbarrow to the ground below. Occasionally, the observer reassuringly called up to the wire walker, "Keep it up. You can do it. I believe in you!' Then, one day, the observer saw the wire walker push the wheelbarrow all the way across the high wire! The observer, shouted for joy, "I told you I believed in you!" Then, the wire walker looked down at the observer and said, "If you REALLY believed in me, YOU would come up here and get in the wheelbarrow."

I like to think of Faith as being Belief-in-action. You may profess a belief, but the depth of your belief is really shown by what you DO in expressing your faith in that belief.

Faith in Science vs Faith in Religion

I really do not like that caption because it seems to imply that there is a difference between faith in science and religion. Personally, I see no 'versus' in there. Faith is faith, wherever it is found. Nevertheless, I will keep talking about faith, since that is what eventually led me to completion of this book on TOPS. I am going to start with the word, 'REVELATION.' According to my Webster's Unabridged Dictionary:

> '**reveal**' *v.t.* to: 1. make known; disclose' divulge. 2. lay open to view, display, exhibit.
>
> '**revelation**' *n* 1. The act of revealing or disclosing. 2. Something revealed or disclosed, esp. a striking disclosure, as of something not before revealed.

I use these terms in a general way, to mean that something that has long been hidden to mankind, is now being disclosed for all to see. Thus, to me, any new finding of something that is being demonstrated as being true, is a revelation. I treat it as being something that has been known to God but is just now being recognized by man. In my religion, we believe in Continuing Revelation, the belief that God is continuing to unveil things that man has not before known—and I believe that is not limited to what God has revealed in the scriptures.

That is a core belief, and I have no problem applying it to both religion and science. Thus, I EXPECT to find new understandings if I rely, in FAITH, that God will continue the unveiling of the secrets of His realm as man opens his eyes and ears to that realm.

As a minister, I have faith in God. As a scientist, I have faith in science. But there are problems in both areas. First, subjects of faith and belief are not capable of being measured whether from the scientific or religious viewpoints. Let us start with 'science.'

We CAN measure the force of gravity on a body on earth for we know the formulas well. We have faith in those formulas. But there are things about gravity that contemporary science does not understand. What is the source of mass? How does the attraction between two masses work across the (sometimes VAST) distance between them? The contemporary scientific theories cannot adequately answer those questions. We know how to measure that mass, not only on earth, but we can apply the equations across the universe--but where does all that mass COME from and how does a galaxy 100 million light years away from us, exert a pull on us, here on our earth?

A child doesn't need science at all to tell us that things will fall DOWN to the earth. A very significant part of the child's life is the experience of resisting that downward pull of gravity as it learns to crawl and walk. That comes quite naturally to a child. The child learns to trust the very nature and truth of gravity and doesn't have to think about mass at all.

Good science is the process of studying natural phenomena and measuring their effects. Science develops rules of how things behave and can quantify parts of those behaviors and predict things that will happen under controlled conditions. Sometimes, science finds that there seem to be exceptions to the rules, so it eventually concludes that the assumed rule is not quite on the mark and needs to be revised to better describe what is observed to happen. Good minds review the observations and attempt to make a new set of rules that seem to better explain what happened. When new observations give unexpected results, science needs to reevaluate the old rules to explain the WHY and then, we continue the cycle. Our rules are becoming better and better, but they are ALWAYS subject to being changed when we come upon a new set of disturbing and unexpected measurements. It seems that every time we come up with a new answer, we just find more new questions.

As viewed over the several thousands of years of recorded history, the flexibility of the rules of science has been enormous. 'Follow the science' is a great slogan, and that principle is much better than trusting unsupportable superstition, but it often carries the presumption that science has all the answers--and that is far from true today, and that will always be so. Those who totally trust today's science just because a respected scientist calls it 'science' have a slippery slope to face, for those rules are frequently changing in every area of science.

Late in the 19th century, most scientists believed in the existence of the 'Luminiferous ether' which was presumed to exist to explain the existence of electromagnetic waves—the logic was, there would HAVE to be *something that kind of splashes around,* that carried the waves! A detailed and precise, historic experiment by Michelson and Morley over a century ago, could find absolutely no evidence of the necessary drag of the presumed ether. They concluded that there was no such thing as the 'Luminiferous ether.'

It appears to me that 'Luminiferous ether' of the 19th century has not really died but has been replaced by 'field theories' of today and frankly, I am not at all sure that those theoretical fields exist anymore than the ether did. As I understand the state of science today, the field theories seem to fit the ultra-large aspects of the universe where billions of light-years are used as a measure of distance between galaxies, but those same theories also seem to be incompatible with the ultra-small aspects in the quantum realm where the diameter of the first orbit of a hydrogen atom may be measured as about a millionth of a millionth of a meter.

I cannot prove that such fields do not exist. Are they real, or are they 'false science,' figments of human imagination, from super-smart people that are stretching their intellects to try to answer those kinds of sticky questions? I am in much the same state regarding field theories, as I was in high school physics where I was told that double-slit experiments demonstrated that electrons are both particles and waves at the same time. I still have the strong impression that there is some 'false science' involved with that assumed duality. Thus, I do the same thing that I did in high school—I learn what the teacher teaches (so I can pass the test), and reserve judgement on the truth of such a statement until I gain more information. Usually, I eventually learn enough that things that are taught really begin to make sense and I come to trust them. But I am also confident that I will die with many of those possibly, 'false-science' assertions unanswered. Perhaps my suggestions of the existence of Sparqs-making quarks in TOPS is a new 'false-science.' Even the best of us makes mistakes, as we stretch our minds to answer the hard questions.

My faith in science is based on the concept that, the laws that govern the universe should move seamlessly through all levels of the universe. By that I mean those laws should apply to the far-off nebula billions of light years from the earth. They should also apply to our daily existence on earth and down to the tiniest particles that make up an atom of hydrogen. I question the collective wisdom of a theory that does NOT apply across all aspects of the universe. There must be something wrong with such theories.

I have heard physicists say that one cannot use Planck's Constant at the quantum level. They say that because they place their faith in, what I believe is, the 'false science' of the 'Uncertainty Principle.' (See CHAPTER 13.) On the other hand, it was my strong faith in Newtonian science that allowed me to get to the point that I could apply Planck's Constant **down to** the quantum level. That kind of faith has been applied throughout this book. I discovered that YES, Newtonian physics is consistent with Planck's Constant, if you subject those tiniest of particles to the Laws of Special Relativity, as demonstrated in Chapters 2 through 9.

Some of my TOPS Study Examples of Faith in Science through Religion

EXAMPLE 1:

On Saturday, August 29, 2020, I thought I had completed Chapter 3 and went to bed. During the night I was awakened with another bit of inspiration. I suddenly realized that Sommerfeld's alpha could be used as a Planck's Coefficient and could be used in determining a particle's intrinsic spin. I might be able to use the known value of spin (**ħ** or ħ/2) in the same way. I suddenly understood that alpha might also help to determine the relativistic mass of a particle. I laid awake about two hours pondering the problem and thought that I now had the tools to calculate the dimensions of all particles! I knew I needed to do lots of work to get there, but now I thought I had the last key to finding those dimensions. That same afternoon, I sat down and rethought the problem of the figures of the proto photon. I THINK I have the approach right now. Again, I feel that I have been led to those understandings during the night. [BBB 08/31/2020]

The material written at the beginning of Chapter 1 has now been revised to reflect this new understanding. It was several months later that I finally figured out that the gamma boost of Chapter 6 was also a Planck Coefficient. Of course, that had to be true, because gamma is a function of alpha, but the importance of such connections often takes a bit longer to come to one's awareness. [BBB 10/05/2020]

EXAMPLE 2:

September 12, 2020 6:15 am. This is as far as I had got on Chapter 6 last night. I had just completed my day's work and it was just 12:00 midnight at the turn of the date of infamy, from September 11 to the 12th. I realized that my next subject to cover was the calculation of the mass of the york. I had written a bit of introduction about using ħ to calculate that mass but had delayed a detailed description of that process. It was now time to go to bed, I thought, so I shut down my computer. Well, it WAS a bit earlier than I usually retire, so I picked up my spiral notebook where I do my actual calculations and started writing out an outline of a method for finding the value of m_y.

When I started outlining this method, I was recalling that earlier in this chapter I said,

$$E_{\mu y} = 2\,[(e^2/36) \text{ x } Ћ/r_{yi}]\, u_y^2\, (m^2\text{-sec}^{-2})$$

Note that the expression in brackets IS in **kilograms x meters = mass x length**; and the result of the final expression is kg-m^2-sec^{-2}, or joules = **energy**!"

My problem was that I had never sat down to make this calculation because I had not yet recognized the full implication of using γ for determining the relativistic mass. I had known for a couple of months that I needed to include relativity in some way but had not yet done so. Thus, I had approached the problem with the presumption that each of the 7 Sparqs in an electron contributed 1/7 of the entire electron mass so, the n2's inherent mass would be at or very close to $2m_e/7$.

All along my real hope was that I could come up with a logic that would give me the mass when I took out the radius—but how do I find the value of the radius when I can figure out only the product of the mass and radius?

So that is where I was when I decided to figure out the radius when the mass = $2\ m_e/7$. I concluded that the radius was about $1.35x10^{-12}$ m. I liked that figure, but still did not know whether it is correct. So, I went to bed about 12:30 in the morning. I had no problem falling to sleep. At about 3:15 I wakened with a need to visit the bathroom but when I got back in bed and rolled into my sleeping position, my mind suddenly jumped into gear. "All I need to do is treat $[2(e^2/36)x10^{-7}$ (kg)] as being the inherent mass times γ (to give relativity mass) TIMES r_y and use $u_y = c$ to get the value of γ."

I thanked the Lord for that insight and tried to get back to sleep. But sleep would not come. I HAD to get this written down as a testimony of how God can inspire us if we have faith in what He has given us and move out as if we knew what we were doing. Thus, here I sit at 7:50 am, completing this note. The following discussion of mass will include all this insight when I finish editing it. Now, I am going back to bed. BBB

In the previous paragraphs, I was working on Chapter 6 on September 22, ten days after what I felt was a revelation about how to use gamma. **It was NOT that easy.** I had worked on this for ten days, and still could not mathematically separate the mass from the radius in Thud. As a result of this further study, however, I have gained considerably more insight but, I firmly believe that what I concluded about gamma ten days earlier, is still right. For a while, I thought I could perhaps use the physical constants which we encountered in Chapter 3.

$$\mu_o = 4\pi\ \text{Ћ}$$

$$\varepsilon_o = 1/(4\pi\ c^2\ \text{Ћ})$$

I solved for $\hbar$ from both equations, set them equal, and then solved for μ_o **and ε_o,** but all I could get out of that was something we already knew:

$$\varepsilon_o \mu_o = 1/c^2$$

That told me that I had done my math correctly and that the equations I was using were correct.

EXAMPLE 3:

Many might think that my 'revelation' on September 12 was flawed because I did not get the answer I thought I had. I do not see it that way. As a result of my turning that over and over in my mind, and making multiple scribbles on paper, I became aware that the energy of the system involved results in multiplying ħ by the relativistic $2\pi f_{rel} = 2\pi \gamma f_i$ **because of relativistic Time Dilation.** Now, I should have known that, but sometimes it takes a lot of work to see something you **think** you 'know' become truly apparent and applicable. While all instances of γ cancel out WITHIN ħ (through mass boost, time dilation and length contraction), γ remains OUTSIDE of ħ where it determines the relativity ENERGY of the entire system through time dilation. That greatly improved my understanding of that energy relationship and was quite worth the effort I needed to expend to get there! I feel like I was being told to hold up my writing and get things straight in my mind. It DID do that for me, but it turned out that I did not advance as far as I thought I had. Thus, I will continue with later chapters as if there is no other way to separate the mass from the radius. Bbb

EXAMPLE 4:

I was working on Chapter 6 on September 22, 2020, some 10 days after what I felt was a revelation about how to use gamma. It was NOT as easy as I thought it would be. I had worked on this problem for ten days, and still could not mathematically separate the mass from the radius in Thud. As a result of this further study, however, I have gained considerably more insight but, **I firmly believe** that what I concluded about gamma ten days earlier, is still right—There IS a way to separate m_y from r_y. I just don't see it yet.[84]

Many might think that my 'revelation' on September 12 was flawed because I did not get the answer as I thought I had. I do not see it that way. As a result of my turning that over and over in my mind, and making multiple scribbles on paper, I became aware that the energy of the system involved

[84] You will find that in Chapter 11.

results in multiplying ħ by the relativistic $2\pi r f_{rel} = 2\pi \gamma f_i$. Now, I should have known that, but sometimes it takes a lot of work to see something you 'know' become truly apparent and applicable. While all instances of γ cancel out WITHIN ħ, it remains in f_{rel} OUTSIDE of ħ where it determines the RELATIVITY ENERGY of the system.

That greatly improved my understanding of that energy relationship, and that was quite worth the effort I needed to expend to get there! I feel like I was being told to hold up my writing and get things straight in my mind. It DID do that for me, but it turned out that I did not advance as far as I thought I had. Some eight months later I did discover a way to independently calculate the mass (See Chapter 10). [Bbb 05/07/2021]

EXAMPLE 5:

I am writing this portion of my 'Faith Chapter' on June 25, 2021. On June 20, 2021, I posted the first three chapters of this book on the website www.abookunsealed.com. I felt reasonably confident that the material that I posted was essentially accurate, but I knew that some of the numbered Figures had values of mass, radii, etc., that were NOT correct. I planned to start getting people to look at TOPS concepts and correct those wrong numbers when I could finally confirm what they should be. In a way, I was stepping out, in the faith that this information WOULD come to me.

Many concepts needed to be brought together to find the correct values and those concepts were to be presented in following chapters. A person reading this book can probably sense my stutter-start-stop-recalculate-leap forward-fall back approach in writing the book. I was trying to integrate all concepts in my mind while I was still working the sequence of presenting the TOPS concepts in successive chapters. Occasionally, I needed to change direction and I found it necessary to split a chapter or slightly rearrange the sequence of chapters.

For example, I needed to start with the Reduced Planck's Constant because everything seemed to revolve around that concept (pun intended).

The content of that subject is in Chapter 2, however, that happened to be some of the most recent of my work when I started on this book, just as the COVID-19 shut-down began. I felt the need to work from the simple to the complex, so I followed with Chapter 3 on the structure of the n2 neutito. I

could find no equation that gave the energy bound in a magnetic field, so I had to derive one. As I learned more and more during my studies over the following months, I found that I sometimes had to return to rework the formulas because of minor errors—for example, the axial forces of magnetism and electric charge separation HAD to be equal. My objective was to calculate the mass of the tiny TOPS Sparqs. Once, I knew the mass, I knew I could calculate the radius and spacing of the charged Sparqs, and calculate velocities, frequencies, etc. I was looking forward, in FAITH.

The reader can probably sense the many points at which I seemed to be struggling of ways to reach that mass, but I always found only the product of mass and the radius. I never attempted to substitute known values of constants into my equations. I would stop working on the area only because I realized, over and over, that I was only going to find that product. The equations told me that without me having to do the math.

Each time I reached a point of thinking 'I am almost there' I would run into that problem. I would drop the specific mass issue and go to another topic, leaving the missing mass as something that would eventually be solved.

So, I went to Chapter 4, where I wanted to introduce a new concept of the photon, a near-relative of the n2 neutito. I knew that I needed Chapter 5 on Sommerfeld's Fine Structure constant, alpha (α), for that was going to be essential in understanding the rotational velocity, u. That, in turn was a lead-in to Lorentz' Gamma factor (Chapter 6) which boosts the mass to a relativity level. Lo, and behold! I found I could actually calculate gamma (=615) from my equations! When I had accomplished that, it finally hit me that Chapter 3's product of mass and radius was (Equation A):

<u>A $\quad\hbar/c$</u> $= \alpha_x m_{relx}\, r_{relx} = 3.50\text{x}10^{-43}$ kg-m. [85]

But even Equation A involves the product of mass and distance—even when one knows the value of α.

Each time I got a chapter 'finished', I had discovered something new and needed to go back and redo Chapter 3. Each of my discoveries affected my understanding of that n2 neutito in Chapter 3. I am confident that anyone who has gone through my accounts of the many attempts to find a way of

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[85] The correct answer is $1.75\text{x}10^{-43}$ as per Chapter 12.

separating that mass and distance will see that struggle as they move from chapter to chapter.

I have not finished Chapter 7 where I try to give the reader an insight into the more complex structures of the electron, quarks, etc. I very likely will not finish that chapter at all, for my intent is to encourage others to take my proposed structures and analyze energy contents, etc. rather than try to do that by myself—I simply do not have the mathematical skills that will be needed for vector analysis. I simply want to point the way for further exploration in TOPS.

Chapter 9 is on Particle Decay, and I started on that subject many years ago. I think I have pretty well resolved most possible decay paths of the Standard Model structures. But in reworking that chapter after initial writing, I encountered Annihilation Radiation (AR) which struck me as being a key in finding the mass of the individual Sparqs. So, I incorporated AR into that chapter—maybe that was going to separate mass from the radius. At that point, however, it just seemed like another possibility.

Then, last Sunday (June 20, 2021), when I posted Chapter 3 with my latest revisions on my abookunsealed.com website, I felt I was ready to revise Chapter 4, so I spent the next couple of days trying to do that, but I always got to the point of needing to KNOW what that mass WAS! I had inserted those incorrect numbers at the very beginning of the book (before the Table of Contents). They were based on an incorrect assumption that each Sparq carried 1/7 of the mass on an electron. Now, knowing that is incorrect, I ran into the same difficulty (separating mass and distance) in Chapter 4. It had become very apparent that I wasn't going to get much more done on the book until I could make that mass calculation.

During these critical three or four days, I struggled with what decay path could be producing Annihilation Radiation (AR) and how it might help me to calculate the mass of a york or zork. I made a few revisions in Chapter 9 and came up with the following relationship:

TOPS TOPS
Electron Positron

$$e^- + e^+ \rightarrow$$

$$(2,5) + (5,2) \rightarrow [7,7]$$

$$\hookrightarrow 6(1,1) + (1,1)\varphi$$

$$9.11 + 9.11 \quad = \quad 6\ m_{n2} \quad + \quad 9.11 \qquad [\text{All } x10^{-31}\text{ kg}]$$

$$\cancel{9.11 +} 9.11 \quad = \quad 6\ m_{n2} \quad + \quad \cancel{9.11} \qquad [\text{Subtract from both sides.}]$$

$$9.11 \quad = \quad 6\ m_{n2} \qquad (\text{Equation B})$$

$$\text{B} \qquad 9.11/6 = 1.82 = m_{n2} \qquad (x10^{-31})\text{ kg}$$ [86]

Equation B appeared to be telling me that if all the mass of the positron was transferred to the photon, that all of the mass of the electron/positron pair was divided among SIX n2 neutitos. That would mean that the mass of a single neutito was $1.82x10^{-31}$ kg! While that mass INCLUDED one york and one zork, there was still an unknown amount of structural (binding) energy/mass in that $1.82x10^{-31}$ kg. The same problem was in the mass of the electron and positron—AND in the photon. Struggle as I might, I could not find a way of solving four unknowns with three equations. SOMEHOW, there had to be a way of calculating the constant mass of every york and zork from Annihilation.

The night of June 23, I laid the problem before the Lord. I prayed that I had exhausted every avenue I could think of. If I was going to be able to publish this book as a testimony of Him, I was going to need His help to get there. I confidently placed the problem in HIS hands, and dropped off to sleep--I had a good night's sleep.

The next morning when I awoke, my mind went to two other relationships that I felt very confident in, and I felt a calm assurance that taking these equations together, I could solve this.

These are the other two equations:

From Chapter 3:

$$\text{A} \qquad \underline{\hbar/c} = \alpha_x m_{relx}\, r_{relx} = 3.50x10^{-43}\text{ kg-m} \quad (\text{As shown above.})$$ [87]

$$E_{\mu n2} = \quad \frac{\gamma[\underline{\hbar\, e^2}]\, u_y^2}{36(r_y)}\text{ joule} \qquad (\text{but, } u{=}c)$$

There were a few more essential things I needed to understand:

First, $\quad r_y = r_z = r_{n2}$ **and,**

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86 That number is wrong. It does not include the york and zork jn the photon. But that was where I was when I wrote it.

87 The correct answer is $1.75x10^{-43}$ as per Chapter 12.

Second, the photon had a york and a zork that carried the photon energy. That means that their sum, m_y+m_z, needed to be added to the triggering energy, so there was actually more energy in there than the hf_φ. Thus, the total mass of the AR photon was $m_y+m_z+(hf_\varphi/c^2)$,

Third, that the total mass involved in an electron/positron annihilation was distributed among 14 Sparqs, not 12, and,

Fourth, the total mass had to have an 'excess' of energy to be transferred to the six n2 neutitos as 'recoil' momentum and mass in order to conserve those fundamental attributes.

Thus, $9.11\text{x}10^{-31}$ kg in each particle was evenly distributed among all 14 of those Sparqs and, between them, $\mathbf{7m_y+7m_z = 2x}9.11\text{x}10^{-31}$ kg. Consequently, s**ome of those things were already in my equations, but until that morning, I had been unable to connect them properly. When I sat down to work that evening, it only took about half an hour for me to solve this problem. Equation A has only two variables, m and r. Equation C has only ONE variable, r. Equation B provided the value for m (shown as (m_{relx}) in Equation A, above.**

Thus, I could calculate the Sparq mass of the york $m_{ys}= m_{zs} = 0.65$ $\text{x}10^{-31}$ kg, and the total mass of the photon's Sparqs was $1.30\text{x}10^{-31}$ kg

$$m_{ys} = m_{zs} = 0.65\text{x}10^{-31}\ \text{kg, so,}$$

$$m_{n2s} = 1.30\text{x}10^{-31}\ \text{kg}$$

For months, I felt I was ALMOST there, but had serious problems with circular reasoning. "Am I thinking about this wrong? Is there something I have been overlooking?" I knew there are other energies in the electron and thought I understood them pretty thoroughly but was having trouble bringing them all together to end with the consistent values of mass for the n2, n4, and n10 neutrinos. I kept getting confirmation that $m_y = m_z = 0.65\text{x}10^{-31}$ kg but was trying to calculate the binding electric and magnetic energies that held the particles together. I knew the gamma boost ($\gamma_{n2} = 615$) was already in the m_y and m_z. I also knew the relationship between γ_{n2} and α_{n2} but how did they relate to the associated γ_e **and α_e for the electron's structure and the need to balance energy and momentum? After all, the electron itself would not be spinning at $u_{n2} = c$ and so,** $\alpha_e < 1$.

I knew the sum of all 14 of the Sparqs' masses = 4.55**x10^{-31} kg, exactly half of the total mass of the electron and I knew the mass left over from the original 2x9.11x10^{-31} kg (the sum of the masses of electron and positron) after removing the AR mass (**10.4x10^{-31} kg) from the resulting photon) was 7.81x10^{-31} but how do I break out the binding energy and determine the velocity of rotation to find the values of γ_e **and** α_e?

I had to leave my work on the problem to address another commitment to prepare a presentation on the **Caractors Transcript** also on my web site with the previously posted chapters of the TOPS book. I didn't do much on TOPS while my mind was focused on that other commitment, but TOPS was never far from my thoughts. When I finished that other project, I returned to TOPS, but found I was still trying to sort out the binding energy, the gamma boost, and the lower velocity with $\alpha_e < 1$.

I had published on my web site that I would not be changing Chapter 3 and posting subsequent chapters until I got the full connections from Chapter 12. Finally, I laid it out before the Lord once, again. I **prayed, "I think I have all of the concepts down, but Why am I not getting the correct answers?"**

It was just after Christmas (2021) that I finally realized that I did not NEED to know all that detailed information to determine the masses of those neutrinos. All I needed to know was how much mass of the combined electron and positron was NOT accounted for after I knew the Sparq masses of m_y and m_z. I called that the mass of **all other energy, δm_O**. The remainder of the other mass was divided among the six n2s to for its total mass which, by then, I felt confident, was m_{n2}=1.30x10^{-31} kg and I needed some left-over mass for the energy and momentum to be applied to the product particles, the six n2 neutitos, as the single AR photon shot away in the opposite direction.

Now, for a very long time, my best efforts had not been working. Nevertheless, my mind was being led from one new concept to another, one step at a time. But, God gave me help only when I acknowledged I could not do it on my own and asked for His help, i.e., when I laid the problem before the Lord and prayed for wisdom and knowledge. At those times, I TRUSTED that He would give me the answer, and HE SLOWLY, GAVE ME THE WAY TO FIGURE IT OUT. There was just too much that needed to be considered for my mind to do it alone.

I believe that GOD had ME do the math work and it was within my mathematical abilities, but HE gently showed me the way to do it! That's all I had asked for. THANK YOU, LORD! Amen.

EXAMPLE 6:

Update: March 1, 2022.

I have now been working on this book over two years. I completed Chapter 2 early on—soon after discovering the existence of a unique number that I call a Planck's Coefficient which allowed me to calculate the properties of the radiation produced when an excited hydrogen atom emits a photon as its electron returns to a lower orbit. I thought I was done with Planck's Coefficient and moved to other chapters.

As I said earlier, in Chapter 3, I ran into problems trying to calculate the mass of the n2 neutito. Several times I discovered new concepts which would lead to better understanding, but HOW to separate the mass from the radius was a continuing problem. Although I managed to arrive at the mass of the n2 from Annihilation Radiation, a general method that applied to higher order particles, STILL escaped me. That problem dogged me through Chapter 11.

The process of discovering the new concepts always was incremental—when I needed to understand a new concept, it seems I always got to a point of getting impossible results in my math and I repeatedly got to the point of 'explaining' to the Lord that I had reached the end of what I could understand, and finally I would ask for further guidance. I felt a continual assurance that I was on the right track, but just didn't know how to continue at that point.

In some way, during the night, fully awake, or partially asleep, I usually came to an assurance that I was going the right direction. Usually, it was the next morning when I awoke with some new sense of direction in mind. Sometimes the inspiration came, not the following day, but a few days later. But ALWAYS, when I asked for Divine help, it came. But sometimes it put me 'on hold' until I was mentally able to continue.

When I finally got to Chapter 12, where I fully expected all to become clear, I thought I could breeze through the final calculations to find the properties of the electron.

I felt confident that the ratio of the hydrogen atom, orbit n=1 could be used to determine the electron radius (r_e) through the Divine Law of Spin using the Reduced Planck's Constant, ħ.

Doing so, however resulted in circular reasoning, a mishmash of conflicting math results, and a return to extreme mental frustration due to my limited human understanding. I recognized one problem: that I was making minor errors in my calculations and exponents. Another error I noted, was occasional incorrect entries of the values for the known factors.

I decided to let a spreadsheet to do the math for me. That way, I could be sure I could check all entries and formulas without worrying about the math. I entered all the constants, such as the speed of light, Reduced Planck's Constant, the mass of the electron, and known values of the first orbit of the hydrogen atom (r_{o1}, f_{o1}, u_{o1}, α_{o1} from Chapter 2). Now, how could I calculate the values of α_e and r_e for the electron from all that known information?

I played with the spreadsheet, rearranging cells and inserting known formulas from the fundamental characteristics of orbit n=1. I set up a row of sample values of α with their corresponding velocities with the objective gaining some insight as to what the value of α_e might be.

I tried to determine the ratio of Binding Energy to Kinetic Energy at each value of α_e but since I did not know whether my formulas for each were correct, I had no faith in the results. I did find that the BE/KE ratio had an asymptotic-appearing beginning at very low values of α and that it leveled out, but never came to zero--clear up to the value of α=1.0 (anything higher would indicate a velocity greater than c). I could find nothing to provide a distinct value of α_e, but I did conclude that it must be Somewhere between those two curves, in the range of $.075<\alpha_e<.40$. That didn't help much because there are STILL an infinite number of combinations of m_e, r_e, f_e, and u_e in that range, but I felt confident that the alpha component of the velocity of the electron spin was below α=.30.

[It turns out that the actual velocity $u_e = .459 \times 10^8$ m/sec with an α_e =.153. I take some satisfaction knowing that the true answer was within my range of guesstimation.]

The spreadsheet was great at reducing the math, but I still faced a Reduced Planck's Constant, as having three unknown values. On the night of February 26, 2022, I was puzzled when I went to bed. I turned those three unknowns around in my head and prayed for enlightenment, for I felt certain that the answer was almost there—I just needed a bit more help to understand so I could find it.

I slept soundly, not remembering dreaming at all. But I awoke at something like 5 am and quickly my mind returned to the problem of all those unknowns, and I had somehow developed a sense that the answer lay in ħ and the frequency f_e. hf_e is Energy! THAT frequency is what I need to find!

I immediately got up from bed and grabbed my notebook and wrote:

$E_e = m_e c^2 = \hbar f_e$ and I solved for f_e.

$f_e = m_e c^2/\hbar = 1.237\text{x}10^{20}$ Hz. [WRONG!!]

Of course, THAT later turned out to be wrong too, but it eventually led me to a better answer when I realized that the frequency in $E = \hbar f$ is NOT the frequency of the electron's rotation, but **is** the frequency of THE PHOTON produced from a specific AR—i.e., Radiation resulting from a positron annihilating an electron! I later came to understand that energy as being the triggering energy of the AR photon. In spectroscopy involving the hydrogen atom, the energy released was between the energy levels of the different orbits and that was also not affected by the fixed, intrinsic mass/energy of the electron itself.

But I was still learning!

EXAMPLE 7:

This is May 5, 2022. A couple of days ago, I was feeling seriously uneasy. My quest was to identify the properties of the electron—I knew the mass, but what was its radius, rotational velocity, and frequency of rotation? Regardless of my approach, I seemed to be unable to nail down the details of any particle other than the n2 neutito.

The logic seemed to be there but when I applied the values I was getting to the Reduced Planck's Constant formula of Chapter 2, they did not come out with the right value of $1.05\text{x}10^{-34}$ j-sec as they simply HAD to. It just DID NOT work. I was obviously NOT using the right values somewhere! I was frustrated and confused.

So, again, I finally put it in the hand of the Lord. "Where am I wrong, Lord? Guide me! There HAS to be some relationship between the mass of a particle and its radius."

That night, I slept fitfully, the equations swirling around in my head. I mentally redid the logic of the night before and awakened in the morning with the realization that the 'mass index' concept I was working on was a Planck's Coefficient and that from THAT Chapter 2 concept, I should be able to readily calculate the radius, frequency, velocity, etc. for EVERY particle, not just for the electron!

When I tried to apply that in a spreadsheet, it suddenly became apparent that I was using some incorrect logic. Much of the math of the previous 11 chapters was just flat wrong. Somewhere, I was starting with a wrong assumption and had been working on that wrong assumption for over a year!

In Chapter 3, I had come to the conclusion that there was a Sparq mass of $.65x10^{-31}$ kg and that was exactly half of the mass of any particle. I had assumed that the other half was due to Binding (Potential) Energy and Kinetic Energy of Spin. It took me a very long time to realize that the Kinetic Energy was THE factor that gave the gamma boost in Chapter 6 and I did not need to consider that any further as part of the 'Other Energy.'

Only then did I realize that the Sparq mass of $.65x10^{-31}$ kg did NOT INCLUDE my expected other forms of energy and **the actual mass of the particle is TWICE the sum of all Sparq masses within the particle.** Thus, the electron consists of seven particles, each of which possesses an accumulated mass of $1.30x10^{-31}$ kg for a total of 9.11 $x10^{-31}$ kg. That affected the values of the n2 I posted just prior to the Table of Contents and all material after chapter 2.

I did not want to go back and change EVERYTHING in the book just because I was correcting an incorrect assumption. After all, I was using this book as an outline of my thought processes in arriving at the conclusions I sought in Chapter 12. To make those changes would destroy the reasoning process that I wanted to document. Thus, I found it prudent to acknowledge my earlier errors, but LEAVE them in place so others could see how my understanding changed. See Chapter 12 to find the errors in my logic and how to use a Planck's Coefficient to find those previously unknown features of my TOPS model.

The discovery that I was dealing with a **process that was predictable**, allowed me to run a spreadsheet that calculated all the parameters of every particle in the Standard Model! Thus, I have not only identified the values of the radius of the electron (and this was my goal), but also, the masses, velocities, and frequencies of their rotations for ALL Standard Model particles. A copy of this spreadsheet is provided in Table 12-1, and it is the culmination of the two plus years of faith that I have put into this project as I have been writing this book! Yes, there IS a way to separate the mass from the radius!

Jeremiah's Potter Prophecy

Jeremiah 18 (King James)
1 The word which came to Jeremiah from the LORD, saying, 2 Arise, and go down
to the potter's house, and there I will cause thee to hear my words. 3 Then I went
down to the potter's house, and, behold, he wrought a work on the wheels. 4 And the
vessel that he made of clay was marred in the hand of the potter: so he made it
again another vessel, as seemed good to the potter to make it.
5 Then the word of the LORD came to me, saying, 6 O house of Israel, cannot I do
with you as this potter? saith the LORD. Behold, as the clay is in the potter's hand,
so are ye in mine hand, O house of Israel.

The imagery of this prophecy rings deep within me. It reminds me of my efforts to bring my original intent for TOPS into fruition as my potter's wheel. Time and again, I wrestled with the concepts, knowing what I wanted in general, but running into flaws in my work at the potter's wheel--only to find it still marred with a need to be pressed down and reshaped.

For Jeremiah, the Potter was a flawed human potter, struggling to produce a simple dish, but the diligent potter recognized the flaws and started over again until he got it right. Jeremiah's prophecy went on for six entire chapters, chastising the leaders of his religion of the day for not being faithful to its God of creation. Jeremiah was telling the Kingdom of Judah that they were going to be sent into a long captivity to be molded into a different people. Not until Jeremiah 24 does God reveal the reason for remolding his people through Jeremiah.

Jeremiah 24 (King James)
6 For I will set mine eyes upon them for good, and I will bring them again to this
land: and I will build them, and not pull them down; and I will plant them, and not
pluck them up.
7 And I will give them an heart to know me, that I am the LORD: and they shall be
my people, and I will be their God: for they shall return unto me with their whole
heart.

A change was coming and it weas for the people's own good. God would first humble them and THEN build them back up--they would learn to KNOW God and worship him.

The timing of this prophecy was around 600 BCE and the religion of the Jews of **that** day, was based on routine temple animal sacrifices by priests all of whom were descended from the tribe of Levi. The average Jew visited the Jerusalem temple for several annual feasts and bringing the sacrifices, all as prescribed by the Law. The Law, however, was written in a common Semitic alphabet known as proto-Hebrew or paleo-Hebrew. There was no recognized body of scriptures which we would correspond to the Bible.

When the Babylonian King Nebuchadnezzar sacked and burned Jerusalem, totally destroying the temple, those Jews who survived the siege, became slaves and were carried off to serve their Babylon masters. There was no more temple, no place to offer sacrifices to God, no more scriptures, and their religion went 'underground.' Teachers would discuss the Law and reason out their daily affairs and those teachers became rabbis who scrambled to pull together recollections from the old scrolls. They adopted the writing system of the Aramaeans who ruled them and began the process of gathering the scrolls, maintaining them within small buildings they called synagogues. There, they could learn to read and study the writings. They developed rules for carefully copying the scrolls, to protect them from natural copying errors. The synagogues became the social center for learning and studying the things of God.

Roughly three generations later, the first contingencies of Jews returned to Jerusalem under Ezra and Nehemiah, with the objective of rebuilding the temple, fortifying the walls of the destroyed city and building homes. But they returned with a new writing system with a growing number of religious writings on scrolls, a new 'priesthood' in the rabbis, and a new social-centered local congregation where religious study of the scrolls was prized. All this was mixed with the 'Old Fashioned' religion of temple worship and sacrifices. Oh, what a change!

And it had all been prophesied by Jeremiah, inspired by the appearance of a potter's mistake of a broken lump of clay.

But things change. By the time Jesus arrived, another 500 years later, the Sadducees were the temple sacrifice ruling class, the Pharisees were the local rabbis, the scribes were copying and recopying the scriptures but none of those groups agreed with each other in what to believe and what was important in their 'Jewish' religion.

Faith and Belief in Religion

It is easy to find fault with religion. Even though a given faith group (such as Judaism, Christianity, Islam) has some basic core agreements, there is also a wide range of disagreement among different sects in each of those faith groups.

I am a Christian because I believe that Jesus is the Christ who died for me and for all my fellow mankind. My hope and trust are in Him and Him alone, for He created me. He loves me the way I am, yet He calls me to be better than I am. But He is not a respecter of persons, and He loves and values us all, no matter how broken we may be. I believe that long ago, God revealed Himself to those of our ancestors who were wise enough to listen. Those ancient wise men were prophets, and they recorded their understandings of the truths they could see while in an enlightened state. Those writings became the source of the scriptures we hold dear today.

The words we read are different from one religion to another, and from one era to another, for the eras when they lived were different and God's prophets were different. But when you get to the basic truths those prophets perceived, there is a growth in depth of understanding and basic teachings that is awesomely consistent.

An 80year old Moses led a multitude of Israelites on a 40-year trek in the wilderness by finding 'I AM' in a burning bush.[88] A young lad heard his name called out in the temple darkness in the middle of the night—"Samuel, Samuel." Samuel answered, "Speak; for thy servant heareth."[89] And, to Jeremiah was revealed a reforming of the House of Israel in a misshaped lump of clay.[90]

So also did the Lord speak to other prophets of old, and they wrote it in their sacred texts. Their records were all different, for each wrote what **he** could comprehend in the days of **his** stewardship, but the heart of the message was basically the same, **to serve God, you must serve your fellow man.** But no two prophets received their prophetic words in the same way!

But religions are different. I hold that these differences are not of God, for **God's message does not tell us what to believe**—it tells us to serve. The differences in religions have been forged by man, not by God.

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[88] Exodus 3:14.
[89] I Samuel 3:10.
[90] Jeremiah 18:4-6.

Each time a devout man 'discovered' a great 'truth' in the scriptures, he proclaimed that truth as being essential for 'salvation,' he started a new religion based on that 'truth.'

"Here is the Truth!" the first would proclaim, as if there were just one 'truth.'

"No, HERE is the Truth!" the second would counter,

"Oh, NO, that's not right, HERE is the Truth!" Came from the third.

Each such leader developed extensive lists of things that one must believe to be 'saved.' And often, those lists were at odds with each other based on the logic of a single set of 'truths.' Each taught that particular 'truth' MUST be followed to be 'orthodox.'

The scriptures are full of wonderful TRUTHS that people dispute because each group has its choice set of beliefs based on man's wisdom about what must be believed. How about admitting that scriptures must be telling more than one truth and searching for ways of making all the truths meaningfully and consistently related to one another?

Furthermore, no matter how devout its adherents might be, the belief systems of all religions undergo cultural changes over time. Some of those changes reflect the broader society of the believers—as society accepts previous taboos, adherents are swayed by larger society beliefs and religious acceptance changes. Other changes occur as the earlier leaders die off and other viewpoints shift among their successors. Disagreements separate those who hold to old teachings and those who feel a need for freedom due to some 'new enlightenment.' Schisms result in factions, each of which feels a justification for holding to its 'ONE truth' positions. This process is natural and inevitable. But it leads to further fractures in belief systems, an increase of denominationalism and decrease in effectiveness in spreading the 'Good News' of believing in God and serving your fellow mankind.

In my faith tradition, Christianity, that was even true among the first 12 Disciples of Jesus. The famous 'Doubting Thomas' was not the only doubter among Jesus' closest followers.

Mark 16:

14 Afterward he appeared unto the eleven as they sat at meat, and upbraided them with their unbelief and hardness of heart, because they **believed not** them which had seen him after he was risen.

It seems that there is always some passionate leader who finds some element of truth and decides THAT is the way things should be, and that EVERYONE should believe what HE believes. Those who believe in X are accepted into the fellowship but those who do not believe in X, tend to be shunned if not driven out.

However, it is my experience that even within any given denomination, **no two people are really in TOTAL agreement in all things. It is a matter of belief and THAT is very personal but is also subject to human error.**

But **what does the Christian New Testament say we should BELIEVE? Here are the principal quotes. Note that we are told only that we must believe in Jesus who is the 'Good News' or 'the gospel.'**

Mark 1 (King James)
15 And saying, The time is fulfilled, and the kingdom of God is at hand: repent ye, and **believe** the gospel.

Luke 8 (King James)
12 Those by the way side are they that hear; then cometh the devil, and taketh away the word out of their hearts, lest they should **believe** and be saved.
13 They on the rock are they, which, when they hear, receive the word with joy; and these have no root, which for a while **believe**, and in time of temptation fall away.

John 1 (King James)
7 The same came for a witness, to bear witness of the Light, that all men through him might **believe**
12 But as many as received him, to them gave he power to become the sons of God, even to them that **believe** on his name:

John 6 (King James)
29 Jesus answered and said unto them, This is the work of God, that ye **believe** on him whom he hath sent.
69 And we **believe** and are sure that thou art that Christ, the Son of the living God.

John 14 (King James)
1 Let not your heart be troubled: ye **believe** in God, **believe** also in me.
11 **Believe** me that I am in the Father, and the Father in me: or else **believe** me for the very works' sake.
29 And now I have told you before it come to pass, that, when it is come to pass, ye might **believe**

John 17 (King James)
[20] Neither pray I for these alone, but for them also which shall **believe** on me through their word;
[21] That they all may be one; as thou, Father, art in me, and I in thee, that they also may be one in us: that the world may **believe** that thou hast sent me.

John 20 (King James)
[31] But these are written, that ye might **believe** that Jesus is the Christ, the Son of God; and that believing ye might have life through his name.

*

And because a typical Christian often believes that Jesus IS the same I AM God of the Old Testament, (I certainly do!) the following gives the Christian Old Testament guidance as to how to live his life based on that belief.

Deuteronomy 10 (King James)
[12] And now, Israel, what doth the **LORD** thy God **require** of thee, but to fear the **LORD** thy God, to walk in all his ways, and to love him, and to serve the **LORD** thy God with all thy heart and with all thy soul,

II Chronicles 20 (King James)

20 Hear me oh Judah, and inhabitants of Jerusalem; **believe** in the **LORD** your God, so ye shall be established, **believe** his prophets, so shall ye prosper.

Isaiah 43 (King James)
[10] Ye are my witnesses, saith the LORD, and my servant whom I have chosen: that ye may know and **believe** me, and understand that I am he: before me there was no God formed, neither shall there be after me.

Micah 6 (King James)
[8] He hath shewed thee, O man, what is good; and what doth the **LORD require** of thee, but to **do justly**, and to **love mercy**, and to walk humbly with thy God?

Here, **doing justly** does not mean to dispense strong judgement upon another, but to be fair in treating him. Doing justly, to love mercy and walking humbly with God involve our human interactions that emphasize mercy, leniency and forgiveness, and reject haughty snobbery that leads to harsh and retributive judgement.

In short, Micah is calling people to live the kind of life that Jesus of Nazareth would model hundreds of years later.

I am confident that God knows that His human leaders are struggling to find TRUTH. I believe those leaders are honest in their religious convictions about truth as they see it. **But comprehending the fullness of God is far beyond the capacity of the mind of any man or woman, no matter how pious and dedicated he or she may be.**

Thus, how we humbly and trustingly follow the Lord and treat our fellow man is what we will be judged by—NOT by what any particular leader, no matter how well intended, has decided is what we must believe.

Trust in the LORD

From the Old Testament
Isaiah 28: [9] *Whom shall he teach knowledge? and whom shall he make to understand doctrine?* …[10] *For precept must be upon precept, precept upon precept; line upon line, line upon line; here a little, and there a little:*
Psalm 27: [14] *Wait on the LORD: be of good courage, and he shall strengthen thine heart: wait, I say, on the LORD.*

From the New Testament
Matthew 7: [7] *Ask, and it shall be given you; seek, and ye shall find; knock, and it shall be opened unto you.*
From latter day revelation: Doctrine and Covenants (Community of Christ)
D&C 90: [6a] *The glory of God is intelligence.*
D&C 149:[5] *For have I not told you that my glory is intelligence and he that seeketh learning by study and by faith will be rewarded in this life and the life to come?*

From the Book of Mormon (Community of Christ):

Alma 16:[151] *But behold, if ye will awake and arouse your faculties, even to an experiment upon my words, and exercise a particle of faith; yea, even if ye can no more than desire to believe, let this desire work in you, even until ye believe in a manner that ye can give place for a portion of my words.*
[152] *Now we will compare the word unto a seed.*
[153] *Now if ye give place, that a seed may be planted in your heart, behold, if it be a true seed, or a good seed, if ye do not cast it out by your unbelief, that ye will resist the Spirit of the Lord, behold, it will begin to swell within your breasts;*
[154] *And when you feel these swelling motions, ye will begin to say within yourselves, It must needs be that this is a good seed, or that the word is good, for it beginneth to enlarge my soul; yea, it beginneth to enlighten my understanding; yea, and it beginneth to be delicious to me.*
[155] *Now behold, would not this increase your faith? I say unto you, Yea; nevertheless it hath not grown up to a perfect knowledge.*

Appendix A - Calculation for Magnetic Energy

In Chapter 3, we have suggested that the **magnetic** energy within the n2 neutito may be expressed by the relationship,

$$\mathbf{E_{\mu n2} = 2\ [\mu_o\ i_y\ \mu_y/r_y]}\ \pi r_y^2$$

This is because,

$$\mathbf{E_{\mu n2y} = [\mu_o\ i_y\ \mu_y/r_y]}\ \pi r_y^2 \qquad \textbf{and,}$$

$$\mathbf{E_{\mu n2z} = [\mu_o\ i_z\ \mu_z/r_z]}\ \pi r_z^2$$

Because $r_y = r_z$ and $i_y = i_z$, these two values are equal and the total magnetic energy in the neutito would be:

$$\mathbf{E_{\mu n2} = E_{\mu n2y} + E_{\mu n2z} = 2[\mu_o\ i_y\ \mu_y/r_y]}\ \pi r_y^2$$

Going through the processes shown in Chapter 3, we find that the total energy of the n2 neutito is going to be twice the value that of the york only, or:

$$E_{\mu n2} = \mathbf{2\ [4\pi Ћ\ i_y (i_y \pi r_y^2)/r_y]}$$

Rearranging terms, we obtain: (Also recall that $2\pi r_y f_y = u_y$)

$$E_{\mu n2} = \mathbf{2\ [Ћ\ (e^2/36)/r_y]\ u_y^2}$$

$$E_{\mu n2} = \frac{\mathbf{2[Ћ\ e^2]\ u_y^2}}{\mathbf{36(r_y)}} \text{ joule} \qquad \textbf{or,}$$

$$E_{\mu n2} = \frac{\mathbf{[Ћ\ e^2]\ u_y^2}}{\mathbf{18(r_y)}} \text{ joule}$$

(Again, this is only the energy due to the <u>magnetic moments</u> of the york and zork of the n2—it does not include the Coulomb potential energy (E_{qn2}) between them and does not address $2d_y$ the distances between the york and the zork as compared to the radii ($r_y = r_z$) of these particles.)

Again, we need to balance the electric and magnetic forces. Knowing that E=Fd we can calculate that balancing, electrical force.

$$E_{\mu n2} = \frac{[\hbar e^2]\, u_Y^2}{18(r)} \text{ joule}$$

And the magnetic force that produces this energy with a radius of r_y for **an axial distance** of $(2d_y)$ is $F_{\mu n2} = E_{\mu n2}/(2d_y)$, so,

$$F_{\mu n2} = \frac{[\hbar e^2]\, u_y^2}{18(r_y)(2d_y)} \text{ N}$$

(The r_y in the denominator refers to the radius of the york that is in the u^2 in the numerator, where, the larger the radius, the greater is the magnetic energy. The $(2d_y)$ in the denominator is the **axial distance** that the magnetic field acts through in the magnetic force. The greater the distance in the denominator, the less is the magnetic force.)

And that axial magnetic force MUST equal the balancing, Coulomb force (F_{qn2}) which is:

$$F_{qn2} = \frac{k\,(q_1 x q_2)}{d^2}$$

where q_1 is $+e/3$, q_2 is $-e/3$ (Coul), and the distance is $(d_y+d_y) = 2d_y$.

For formula simplification, to use the electric constant we will replace Coulomb's constant, **k** with its equivalent value of $\mathbf{1/4\pi\varepsilon_o = c^2 \hbar}$. Thus,

$$F_{qn2} = c^2 \hbar \frac{(+e/3)(-e/3)}{(2d_y)^2} = \frac{-c^2 \hbar e^2}{9(2d_y)^2}$$

(The negative value indicates it is an attractive force.)

Adding the two opposing forces yields:

$$F_{qn2} + F_{\mu n2} = 0$$

$$\frac{-c^2 \hbar e^2}{9(2d_y)^2} + \frac{[\hbar e^2]\, u_y^2}{18(r_y)(2d_y)} = 0 \text{ N}$$

After adding the negative term to both sides, rearranging terms and cancelling out common factors, we find:

$$\frac{[\cancel{\hbar e^2}]\, u_y^2}{18(r_y)(\cancel{2d_y})} = \frac{c^2 \cancel{\hbar e^2}}{9(2d_y)^{\cancel{2}}}$$

$$\frac{u_y^2}{2r_y} = \frac{c^2}{(2d_y)}$$

But, What does THAT mean?

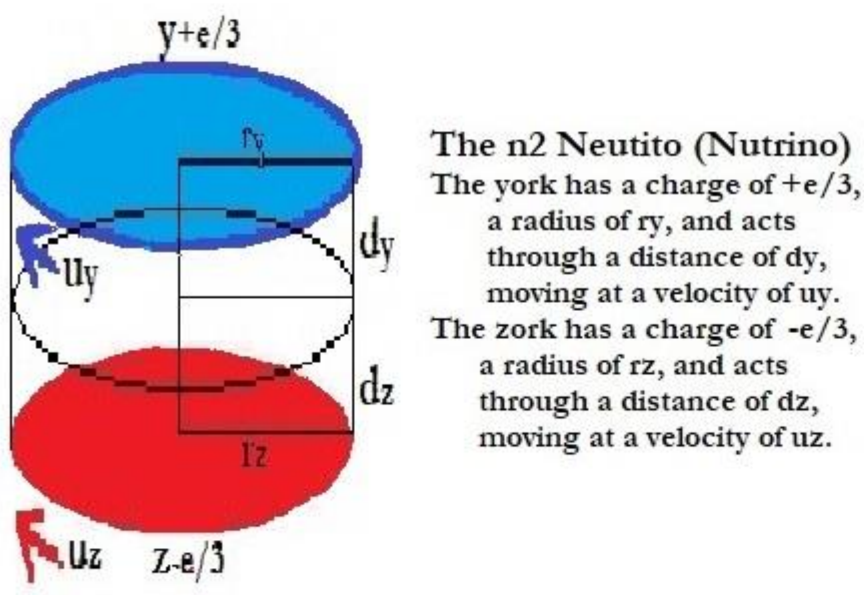
Again, rearranging terms and realizing that u = c:

$$\frac{2r_y}{(2d_y)} = \frac{u_y^2}{c^2} = 1$$

Thus,

$2d_y = 2r_y$

And we realize that $d_y\ r_y = r_z = r_{n2}$!



Appendix B - Summary of Planck's Coefficients for Different Conditions

A. Planck's Coefficient (γ) for RELATIVITY

[$_{rel}$ = relativity; $_i$ = inherent]

$m_{rel} = \mathbf{Þ_{rel}}\, m_i = \gamma\, m_i$

$r_{rel} = r_i / \mathbf{Þ_{rel}} = r_i / \gamma$

$u_{rel} = u_i$ **~= c (CONSTANT velocity)**

$f_{rel} = \mathbf{Þ_{rel}}\, f_i = \gamma\, f_i$

B. Planck's Coefficient for Orbital Shifts in the Hydrogen Atom Electron[91]

[$Þ_{if}$ = initial to final orbit]

$\mathbf{m_{eoi} \sim= m_{eof}}$ **(CONSTANT mass i.e., γ boost insignificant)**

$\mathbf{r_{oi} = r_{of}\, Þ_{if}}$

$\mathbf{u_{oi} = u_{of} / Þ_{if}}$

$\mathbf{f_{oi} = f_{of} / Þ_{if}^2}$

C. **Planck's Coefficient (m_p/m_e = 1836 = $Þ_{ep}{}^2$) for Orbital Shifts in Hydrogen Proton vs Electron**

[$Þ_p$ = proton orbit; $Þ_e$ = electron orbit]

$m_p = \mathbf{Þ_{ep}}^2 (m_e)$

$r_{p1} = r_{e1} / \mathbf{Þ_{ep}}$

$u_{p1} = u_{e1} / \mathbf{Þ_{ep}}$

$f_p = f_e$ **(CONSTANT frequency— electron/proton the same)**

---

91 While a particular value of Planck's Coefficient applies to the hydrogen atom, the actual value for **Þ** will vary for different kinds of atoms.

D. Planck's Coefficient for Identifying Characteristics of All Standard Model Particles

[To determine the characteristics of ANY particle of known mass, m_x from the known characteristics of the n2 neutito]

$\mathbf{Þ}_{xn2} = (m_x/m_{n2})^{.5}$ so,

$m_x = m_{n2} * \mathbf{Þ}_{xn2}^{2}$

$r_x = r_{n2} * \mathbf{Þ}_{xn2}$

$f_x = f_{n2} * \mathbf{Þ}_{xn2}^{-4}$

$u_x = u_{n2} * \mathbf{Þ}_{xn2}^{-3}$

$\alpha_x = u_x/c$

E. Planck's Coefficient for The Photon

There is no Planck's Coefficient for the photon. The closest thing we have is Planck's Constant, itself. When multiplied by $2\pi f_\varphi$ Planck's Constant gives us the triggering energy ($\Delta E = hf_\varphi$) of the photon produced, but it does not apply to other factors within ħ, for those Planck Coefficients cancel each other so ħ remains a constant.

TOPS Characteristics of the Photon

$\mathbf{m_\varphi = 2m_y + \hbar\, 2\pi f_\varphi/c^2 \sim= 2m_y}$ [92]

$\mathbf{r_\varphi = c/2\pi f_\varphi}$

$\mathbf{u_\varphi \equiv c = \lambda_\varphi f_\varphi}$ **(CONSTANT velocity)**

$\mathbf{f_\varphi =}$ **INFINITELY VARIABLE**

$\mathbf{E_{\varphi TOT} = 2m_y c^2 + \hbar\, 2\pi f_\varphi}$

$\mathbf{\Delta E = \hbar\, 2\pi f_\varphi = hf_\varphi}$

[92] This is true for most photons for the hf component is very small as compared to the my component until we get to an energy of around 100 KeV.

Appendix C - False Starts and Stops in Pursuing the Binding Energy

All material in this appendix is incorrect from SOME standpoint. I do not make the corrections here, but I am retaining the material in the hope that someone will be able to find some thoughts that trigger connections that have not occurred to me.

FEEL FREE TO USE OR DISREGARD THIS INCORRECT INFORMATION.

THE FOLLOWING WAS ORIGINALLY IN CHAPTER 4

ENERGY EXCHANGE DURING PHOTON EMISSION

The proto-photon remains relatively unchanged (except for minor translational KE), until activated by a source of external energy (e.g., $\mathbf{E_{\varphi 21} = \hbar_{\varphi 21}\, 2\pi f_{\varphi 21} = hf_{\varphi 21}}$ from Chapter 2) which sends them into the **photon-mode, at which time they are redirected according to the energy ($\mathbf{hf_\varphi}$)** input to become photons traveling in a straight line, at the speed of light. When the photon is eventually stopped by some target atom, the energy (hf_φ) is released in one of three possible forms. It may be exhibited as translational (kinetic) energy in the absorbing target atom by making it move more rapidly; it may be converted to potential energy of the target atom by boosting an orbital electron of the atom to a higher orbit; or it may give up only part of its energy in either of the above ways and continue as a new photon of lower energy and longer wavelength. In the first two cases the two Sparqs of the photon return to the proto-photon state (of a spinning sphere?), which again, is available for energy transfer into a new photon whose energy is dependent upon the new **($\mathbf{hf_\varphi}$)** energy being released to the proto-photon.

In producing a photon, the transferred energy (E_φ=hf_φ) immediately tilts the proto-photon's york and zork so the torque of each is directed at an angle (depending on the input energy), in the same direction. The degree of tilt is determined by the amount of energy being transferred, with a higher energy producing a photon of smaller radius, going through more cycles in a shorter time. This converts it to a photon, but STILL traveling at the speed of light (c). The energy of the electron shift determines the degree of the york's tilt and thus the wavelength (λ_φ) of the resulting photon with the higher energy producing a shorter wavelength. The york and zork now orbit each other at a fixed (but new) distance ($d_\varphi = 2r_\varphi$) and travel in matching helical paths, moving forward at the velocity of light (c) for one wavelength (λ_φ) during a time of $T_\varphi = 1/2\pi f_\varphi$ sec and they possess a **translational energy of hf_φ.** Thus, $c = \lambda_\varphi f_\varphi$. This would seem to mean that the relationship between the photon's helical radius (r_φ) and the wavelength is: $\lambda_\varphi = 2\pi r_\varphi$.

We have already mentioned that conservation of energy and momentum requirements dictate that photons that are produced by orbital electron energy shifts are usually made in identical pairs that move in diametrically opposite directions at the speed of light.[93] For these cases, TWO proto-photons must be available for photon

THE FOLLOWING WAS ORIGINALLY IN CHAPTER 6

Total[94] = γxINHERENT + SPIN = RELATIVITY

Energy=Magnetic+Electric+ Kinetic= Magnetic+Electric+ Kinetic = Total

$$\Sigma E_{n2rel} = \gamma(E_{\mu n2i} + E_{qn2i}) + \tfrac{1}{2}hf_{yrel} = \gamma\left(\frac{2\mu_o\, i_z\, \mu_y}{r_y} + \frac{kq^2}{(2d_y)}\right) + \tfrac{1}{2}m_{n2rel}u_{n2rel}^2 = m_{n2rel}c^2$$

D C B A

Note that the last kinetic energy equation (**B**) is the kinetic energy of the particle's spin and is exactly HALF of the Total energy (**A**) because $u_{n2} = u_{n2(c)} = c$. That means that **C+D** is ALSO half of the total energy. But note also that the magnetic energy (**D**) and electric energy (**C**) have to be equal, so, we can make the following conclusions: **The kinetic energy is half of the total energy; the electric energy is ¼ the total energy, the magnetic energy of the york and zork interaction is ¼ of the total energy of the n2 neutito.**

The simplest and most unambiguous of those equations is at **C**, the electric energy and we now know that is ¼ the total energy of the n2 system. From Chapter 3, we also know that $2d_y = 2r_y$. After all, we are trying to determine the mass and radius of the n2, so, perhaps we can work with just the electric energy formula to calculate those values from the value of the γ boost.

$$\frac{\gamma k q^2}{2d_{yi}} = \frac{\gamma k q^2}{2r_{yi}} = \tfrac{1}{4} m_{n2rel} c^2$$

$$\frac{\gamma k q^2}{2r_{yi}} = \tfrac{1}{4} m_{n2rel} c^2$$

Knowing that $q = e/3$ Coul, $k = c^2Ћ$, $Ћ = 10^{-7}$ kg-m/Coul^2, $\hbar = mur = mcr$ (keeping in mind that u=c here), **and solving for γ, we have:**

$$\gamma = \frac{(\tfrac{1}{4} m_{n2rel} c^2)(2r_{yi})}{k(e/3)^2}$$

$$\gamma = \frac{(\tfrac{1}{4} m_{n2rel} c^2)(2r_{yi})(9)}{ke^2} = \frac{(\tfrac{1}{4})(2x9)\ (m_{n2rel} c r_{yi})c}{c^2 Ћ\, e^2} = \frac{(4.50)\ \hbar c}{c^2 Ћ\, e^2} = \mathbf{\frac{(4.50)\ \hbar}{c\, Ћ\, e^2}}$$

After we cancel c, we find that the last expression is ALL composed of CONSTANTS! Thus, when we substitute the values for all of those constants, **we can solve for γ directly. Furthermore, all units cancel and $\gamma_{\underline{n2}}$ is therefore a dimensionless constant which is unique to the n2 neutito, so, we shall call it $\gamma_{\underline{n2}}$.**

$$\gamma_{n2} = = \frac{(4.50)\ \hbar}{c\, Ћ\, e^2} = 4.50 \frac{(1.05x10^{-34}\ \text{kg-m}^2/\text{sec})}{(3.00x10^8\ \text{m/sec})(10^{-7}\ \text{kg-m/Coul}^2)(1.60x10^{-19}\ \text{Coul})^2}$$

$\gamma_{n2} = 615$ (using 3 significant figures for our constants)

$\gamma_{n2} = 617$ $\alpha_{n2} = 0.99999(87)\ u_{n2} = c = 2.9979\ x10^8$ m/sec

(using 5 significant figures for our constants)

:

THE FOLLOWING MATERIAL WAS TAKEN FROM CHAPTER 10

THE ANNIHILATION PHOTON

The Annihilation Radiation by **Direct AR Production** equivalent mass value of .51 MeV has been confirmed many times, so TOPS takes that as a given. There is, however, a flip-side to this value, because TOPS sees this value as being the equivalent of only FIVE of the seven Sparqs in the electron/positron. The other two Sparqs are **WITHIN that $9.1x10^{-31}$ kg equivalent photon! Thus, the TOPS photon energy must include NOT ONLY the hf_φ** photon-triggering energy from structural energy, but must also include the m_yc^2 and m_zc^2 energy values as well.

From this, we readily see that the Annihilation Radiation ($_{AR}$) photon mass-equivalent must add the masses of the york and zork TO the photon-triggering energy ($\Sigma E_{Q\mu s}/c^2 = hf_{AR}/c^2$).

Classical physics says the photon's energy is, $\mathbf{E_{\varphi AR} = hf_{\varphi AR}}$, but TOPS carries that further and says,

$$\mathbf{E_{\varphi AR} =(m_y+m_z)+ hf_{\varphi AR} = m_{\varphi AR}\, c^2 = (m_y+m_z+\delta m_\varphi)c^2}$$

Where **δm_φ is the** mass attributed to the photon's triggering energy (= $9.11x10^{-31}$ kg). We now know that the mass of $m_y = m_z = .65x10^{-31}$ kg, and we know the values of the physical constants h and c, so we can readily calculate the energy of the AR photon and its total mass, and frequency!

$\mathbf{E_{\varphi AR} = m_{\varphi AR}\, c^2 = (m_y + m_z +(\delta m_\varphi))c^2}$

$E_{\varphi AR} =$ $(.65 + .65 + 9.11)x10^{-31} \text{ x } 9.00x10^{16}$

$\mathbf{E_{\varphi AR} = 9.37\ x10^{-14}}$ joule

$\mathbf{m_{\varphi AR} = m_y + m_z + \delta m_\varphi = 10.41\ x10^{-30}}$ kg

$\mathbf{hf_{\varphi AR} = \delta m_{\varphi AR}\, c^2 = 8.20\ x10^{-14}}$ joule (Triggering Energy)

$$f_{\varphi AR} = \frac{\delta m_{\varphi AR} c^2}{h} = \frac{8.20\ \mathrm{x}10^{-14}}{6.63\ \mathrm{x}10^{-34}} = 1.24\ \mathrm{x}10^{20}\ \mathrm{Hz}$$

Thus, the TOPS total energy equivalence of the AR photon is $9.37\mathrm{x}10^{-14}$ j; its equivalent mass is $10.41\mathrm{x}10^{-30}$ kg; and the frequency of that photon is $1.24\mathrm{x}10^{-20}$ Hz. [It seems the actual energy of the AR photon is LESS than that of the positron, so momentum of other recoil particles takes away some of the energy.]

THE FOLLOWING WAS TAKEN FROM CHAPTER 11.

CALCULATING THE MASS OF THE n2 NEUTITO

We will start with calculating the mass of the n2 Neutito which we began in Chapter 3. At that point, we did not have enough information (e.g., the gamma boost of Chapter 6) to calculate the mass of the n2.

Let us examine the TOPS energy of the n2 for each, and every, energy-contributing aspect of the particle. We will exclude only the final kinetic energy that will be related to the low velocity of each separate particle.

ENERGY COMPONENTS OF THE n2 NEUTITO

Total[95] = γxINHERENT = RELATIVITY

Energy=Magnetic+Electric+ Kinetic= Magnetic+Electric+ Kinetic = Total

$$\Sigma E_{n2i} = \gamma(E_{\mu yzi}) + \gamma(E_{qn2i}) + \tfrac{1}{2}hf_{yi} = \underbrace{\gamma\frac{2\mu_o\, i_y\, \mu_y}{2r_y}}_{D} + \underbrace{\gamma\frac{kq^2}{(2d_y)}}_{C} + \underbrace{\tfrac{1}{2}m_{n2rel}u_{n2rel}^{\ 2}}_{B} = \underbrace{m_{n2rel}c^2}_{A}$$

Magnetic Energy (D)

$$E_{\mu yzi} = \frac{2[\hbar\, e^2]\, u_y^{\ 2}}{36r_{yi}} = \frac{[\hbar\, e^2]\, u_y^{\ 2}}{18r_{yi}}\ \text{joule} \qquad \text{Chapter 3}$$

Electric Energy (C)

$$E_{Qi} = c^2 \frac{[\hbar e^2]}{18(2d_{yi})} \text{ joule}$$ Chapter 3

Kinetic Energy of Spin (S= ħ/2)(D)

$E_s = \frac{1}{2} m_{n2i} u_{n2i}^{\ 2} = \frac{1}{2} h f_{n2rel}$ Chapter 2

Other Pertinent Factors:

$q = \pm e/3$ Chapter 1

$u_y = 2\pi\, r_y f_y = c$ Chapter 2

$\hbar = m_y\, u_y\, r_y = m_y\, 2\pi r_y^2 f_y$ Chapter 2

$2d_y = 2r_y$ Chapter 3

$m_{n2} r_{n2} = \hbar/c = 3.50\text{x}10^{-43}$ kg-m Chapter 6 [96]

$\gamma = \gamma_{\underline{n2}} = 615$ Chapter 6

$m_y = m_z = m_{n2}/2 = .65\text{x}10^{-31}$ kg Chapter 10

spin energy $= \frac{1}{2} m_e u_e^2 = \frac{1}{2} h f_e = m_e c^2$. Chapter 10

In Chapter 6 we used the following statement which we will now apply:

> **"The kinetic energy is half of the total energy; the electric energy is ¼ the total energy, the magnetic energy of the york and zork interaction is ¼ of the total energy of the n2 neutito."**

[96] The correct answer is $1.75\text{x}10^{-43}$ as per Chapter 12.

THE FOLLOWING WAS ORIGINALLY IN CHAPTER 11

THE MATHEMATICS OF THE MAGNETIC ENERGY EQUATION

In Chapter 3 we said we could calculate the magnetic energy within the n2 neutito from the following equation:

$E_{\mu n2} = 2\ \boldsymbol{\mu_o}\, i_y\, \boldsymbol{\mu}_y/\mathbf{2d_y}$ (SI units for energy: joule= kg-m^2-sec^{-2})

Since it is not likely that the reader has encountered this approach before, we need to thoroughly explain the rationale for this proposed formula for magnetic energy. This equation is derived from the magnetic moments of the proposed york which has a charge of +e/3, and its counterpart, the zork with a charge of -e/3.

If all of the charge on a york or zork were concentrated at **the rim** of the disk, the total current that produces the repulsive magnetic fields in the neutito would be the sum of the two currents caused by rotation of the york and the zork. This, however, is not true because the positive current of the york is rotating in the same direction as the negative current of the zork. This means that the magnetic moments of the york and the zork are in opposition to each other, i.e., $i_y = (+e/3)f_y$, and, $i_z = (-e/3)f_z$, and the sum of the two currents appears to be ZERO (equal opposite charges traveling in the same direction at the same time)! Actually, however, both currents exist, and both are producing magnetic fields which oppose each other. When, however, the charge is uniformly distributed over the **surface** of the disk (as we assume in TOPS), the true currents are just a quarter of those rim values because a nonconducting spinning charged disk produces only **¼** of the current we would have if all charge were concentrated at the rim of the disk. Also, note that $f_y=f_z$. Thus, for our TOPS n2 neutito:

$i_y = ¼\ f_y(+e/3) = f_y(+e/12)$ and,

$i_z = ¼\ f_z(-e/3) = f_z(-e/12)$ (SI units for current: Amperes = Coul-sec^{-1})

The magnetic moment ($\boldsymbol{\mu_{n2}}$) of the neutito is also NOT the sum of the two magnetic moments, for, while they are equal, their forces also act opposite in directions. (If two magnetic fields are directed in the SAME direction, they reinforce each other with an attractive force, rather than oppose each other.) Thus, we will treat the magnetic moments separately as $\boldsymbol{\mu_y}$ and $\boldsymbol{\mu_z}$, but will also recognize that they are always in a mode of magnetic attraction or repulsion against each other. (Note, however, that while the york and zork electric and magnetic FORCES are equal and opposite, and the net current is zero, their magnetic fields and ENERGIES are not cancelled, but are summative.) As with all measures of magnetic moment,

$\boldsymbol{\mu}_y = i_y A_y$ [97]Where A_y is the surface area of the york-disk = πr_y^2, SO,

$\boldsymbol{\mu}_y = i_y \pi r_y^2$ and, $\boldsymbol{\mu}_z = i_z \pi r_z^2$ (SI units for magnetic moment: Coul-m^2-sec^{-1} OR, Amp-m^2)

Now let us return to the proposed formula for the energy of the magnetic field in the n2 neutito. The total magnetic energy of the neutito is:

$E_{\mu n2} = E_{\mu y} + E_{\mu z} = 2E_{\mu y} = 2E_{\mu z}$ But, is the sum of the magnetic energies of the york and zork. Thus,

$E_{\mu y} = \mu_o \quad i_y \quad \mu_y \quad /2d_y$

$E_{\mu z} = \mu_o \quad i_z \quad \mu_z \quad /2d_z$

$E_{\mu y} = E_{\mu z} = (4\pi Ћ)\, (f_y(-e/12))\, ((f_y(+e/12)(\pi r_y^2))/2d_y$ [98]

$E_{\mu y} = 4\pi\, Ћ \quad (e^2 f_y^2/36) \quad \pi r_y^2/2d_y$ (i_y times μ_y)

$E_{\mu y} = Ћ \quad (e^2/36) \;\; 4\pi^2 r_y^2 f_y^2/2d_y$ (rearrange terms)

$E_{\mu y} = (e^2/36)\;\; Ћ\, (4\pi^2 r_y^2 f_y^2)/2d_y$ (rearrange terms)

$\mathbf{E_{\mu y} = (e^2/36)\;\; x10^{-7}\, u_y^2/2d_y}$ ($Ћ = 10^{-7}$ kg-m-Coul^{-2}

$\mathbf{E_{\mu y} = [(e^2/36)\;\; x10^{-7}/2d_y]\; u_y^2}$ and, $2\pi r_y f_y = u_y$)

At this point it is reasonable to question why the $2d_y$ factor appears in the denominator. The distance involved here is not the radius of the york and zork, but the distance ($=2d_y$) between them. The magnetic force is directed along the axis of the rotating structure. The radius determines the electric current produced by the rotating pair of particles, and thus, the magnitude of the magnetism which is produced normal to the plane of the current flow. Thus, the magnetic force is a function of the radius but the distance between the york and zork centers $(d_y+d_z)= 2d_y$ is the appropriate distance aligned with the axial magnetic force.

But, why do we need this $2d_y$ measurement in the denominator at all?

The reason for this lies in THUD ($\hbar = 10^{-7}$ kg-m/Coul^2) which we first encountered in Chapter 3. If you do not recall the reason for taking the length unit (m) from the numerator, I suggest you return to Chapter 3 and study THUD. The simple reason is that the results of the magnetic energy equation does NOT give us **energy** when we convert charge to mass—it gives us **joule-meters**, so we must remove that measurement of length, by dividing the result by $2d_y$ to obtain energy in **joules**.

As we said, because these two magnetic energies (i.e., those of the york and zork) are quantitatively the same, and the TOTAL magnetic energy of the n2 ($\Sigma E_{\mu n2}$) is the sum of energies of the york and zork together. Thus,

$$\mathbf{\Sigma E_{\mu n2} = E_{\mu y} + E_{\mu z} = 2\ (e^2/36)\ x10^{-7}\, u_y^2/2d_y} \qquad (\hbar = 10^{-7}\ \text{kg-m-Coul}^{-2})$$

$$\mathbf{\Sigma E_{\mu n2} = E_{\mu y} + E_{\mu z} = (e^2/18)\ x10^{-7}\, u_y^2/2d_y}$$

And another equivalent expression is:

$$E_{\mu n2} = 2\ (\mathbf{4\pi\ \hbar})\ (\mathbf{f_y(-e/12)})\ (\mathbf{f_y(+e/12)(\pi r_y^2})/2d_y$$

$$E_{\mu n2} = \mathbf{4\pi\ \hbar} \quad \mathbf{(e^2\ f_y^2/18)} \quad \mathbf{\pi r_y^2}/2d_y \qquad (i_y \text{ times } \boldsymbol{\mu_y})$$

$$E_{\mu n2} = \mathbf{\hbar} \quad \mathbf{(e^2/18)\ \ 4\pi^2 r_y^2\ f_y^2}/2d_y \qquad \text{(rearrange terms)}$$

$$E_{\mu n2} = \mathbf{(e^2/18)\ \ \hbar\ (4\pi^2 r_y^2 f_y^2})/2d_y \qquad \text{(rearrange terms)}$$

$$E_{\mu n2} = \mathbf{(e^2/18)\ \ x10^{-7}\, u_y^2}/2d_y \qquad (\mathbf{\hbar = 10^{-7}}\ \text{kg-m-Coul}^{-2}$$

$$E_{\mu n2} = \mathbf{[(e^2/18)\ \ x10^{-7}/2d_y]\ u_y^2} \qquad \text{and, } \mathbf{2\pi r_y f_y = u_y)}$$

Note that the last expression is in the form of E = mv^2 which is ENERGY, so, $\mathbf{m_{\mu n2} = (e^2/18)\ \ x10^{-7}/2d_y}$**.** Note that $m_{\mu n2}$ is **NOT** the total mass of the n2 neutito but is only the *mass attributable* to the **magnetic** energy of the neutito. There is a similar *mass attributable* to the attractive **electrical** bond between the york and zork. See Chapter 6 for determination of the values of the n2 neutito.

[INSERT EQUIV VALUE OF 2dy=8^.5 ry from Chap 3.]

There is no other known source of energy in the n2's inherent state, so we might be rather confident that this equation constitutes the total energy within the inherent state of our hypothesized neutito.

The fact that the above equations represent energy, is not in question. The units are right. The values of the constants are well known. What IS in question is whether that equation represents ALL of the energy that is really in there. But, on the other hand, perhaps, it should really be HALF of the actual energies of the york and zork.

Following is the reason for that doubt.

The equation KE = ½ mv^2 ($kg\text{-}m\text{-}sec^{-2}$) is well known in classical physics. Anytime a physicist finds those units, he knows he is dealing with energy. The factor ½, however, is important in knowing HOW MUCH energy there really is. We have the same problem in our calculation of energy of the n2 neutito. The correct units are there, but perhaps we have to look further to determine the correct coefficient to quantify the 'true' energy of this particular particle. We will now look to the spin of the particle to see if we can make this determination. We will start by analyzing the relativistic value of particle energy in terms of its angular momentum, $\hbar_{n2rel} = m_{n2rel}\, u_{n2rel}\, r_{n2rel} = \hbar$.[99] We will then compare that to the inherent energy formula we derived above.

We are told that neutrinos possess a spin of $\hbar/2 = ½(m_{n2rel}\, u_{n2rel}\, r_{n2rel}) = \hbar_{n2rel}/2$. Which of those ħ factors (i.e., m, u, or r) is flexible so it can change to accommodate that fraction of ½? That question may be easier to answer when we observe that $u=2\pi rf$.

The mass is not going to change except for our gamma boost,[100] but, similarly, the radius will be foreshortened (the mass and radius are inversely related) by the same gamma (γ) factor, so the mass and radius cannot otherwise change. Obviously, the 2π factor is geometric, relating to the circular rotation of the n2, and THAT cannot change. This leaves us only a frequency shift—how often the particle rotates per second. I would maintain that the particle's frequency of rotation is free to adjust to whatever the other combinations of fixed factors may be, in order to satisfy the fundamental physical law that all subatomic particles have a spin of either ħ or ħ/2.

On this basis, I am going to assert that it is the **frequency of rotation** that is cut into half to produce its ħ/2 factor. The mass and radius do change by a factor of γ, but do so inversely, so their effects offset each other in ħ, but the frequency does change to whatever value is necessary to produce either ħ or ħ/2! We have already concluded that $u_{n2rel} = u_{(c)} = c$. Thus, if it is frequency which carries the energy change, $f_{rel} = 2f_i$, $r_{rel} = r_i/2$, and because $u = 2\pi rf$, $u_{(c)}$ STILL = c!!

Recall from Chapter 2 where we said the energy of a photon was quantized according to the frequency of the photon, i.e., $E = \hbar 2\pi f$. Since ħ is a constant, it MUST be the frequency that determines the particle's energy. Thus, if we double the frequency, we get double the energy content of a photon which is always quantized so it possesses a spin $S=\hbar$ and has an energy of $E = \hbar 2\pi f$. The n2 neutrino has a spin $S=\hbar/2$ with an energy of $E = \hbar 2\pi f/2$. This is a general rule that applies not just to the photon and n2, but to all rotating subatomic structures which possess a spin of $S=\hbar/2$. Thus, if we have an angular momentum (spin) of ħ/2, the product of the mass and radius is not changing, but the frequency in $S=\hbar/2$ particles will be cut in half of that in $S=1\hbar$ particles. This will NOT affect the velocity, u, because $u=2\pi rf$ and the gamma factor effects on the radius and frequency offset. Thus, the equation, $\underline{\boldsymbol{\hbar/c}}\ \mathbf{= m_{rel}\ r_{rel}}$ holds for all particles with a spin, $S=1\hbar$ OR, $S=\hbar/2$. The kinetic ENERGY, however, is dependent upon the magnitude of f_{rel} and IS affected by a change in that factor.

I am now going to continue by following the same logic plus the assumption that it is the frequency that absorbs that factor of ½ in ħ/2. For clarity, I will include three equivalent forms of ħ for each line, the last few of which include the gamma (γ) boost to incorporate the relationships between the inherent and relativistic states.```

$\hbar_{n2rel}/2 = ½(m_{n2rel}\ u_{n2rel}\ r_{n2rel}) = ½(m_{n2rel}\ \alpha_{n2}c\ r_{n2rel}) = ½(m_{n2rel}\ r_{n2rel})\ \alpha_{n2}c = \hbar/2$, AND,

$\hbar_{n2i}/2 = ½(m_{n2i}\ u_{n2i}\ r_{n2i}) = ½(m_{n2i}\ \alpha_{n2}c\ r_{n2i}) = ½(m_{n2i}\ r_{n2i})\ \alpha_{n2}c = \hbar/2$,
(For n2, $u_{n2i} = u_{n2rel} = c$; $\alpha_{n2} \approx 1$), AND,

In Chapter 6?? we learned that $\mathbf{E_{n2rel}/E_{n2i}} =$ γ the Lorentz gamma boost. We also learned that [Before we reject this, go back to Chap 6 **and reevaluate it.]```**

Keep the following. Edit above to agree with this portion! BUT VALUE IS NOT 3.5, BUT HALF OF THAT = 1.75!]```

$\hbar_{n2i} = (m_{n2i}\ c\ r_{n2i}) = (m_{n2i}\ c\ r_{n2i}) = (m_{n2i}\ r_{n2i})(c) = \hbar$

$\hbar/c = (m_{n2i}\, r_{n2i}) = 3.50\text{x}10^{-43}$ **kg-m** [101]

This relationship holds for the n2 neutito ONLY because $\alpha_{n2} = 1$. For generic purposes, for any other particle, x, $0<\alpha_x<1$, $\gamma_x=(1/(1-a_x^2))^{1/2}$, AND, THUS,

$\hbar_{xrel}/2 = \frac{1}{2}(m_{xrel}\, u_{xrel}\, r_{xrel}) = \frac{1}{2}(m_{xrel}\, \alpha_x c\, r_{xrel}) = \frac{1}{2}(m_{xrel}\, r_{xrel})\, \alpha_x c = \hbar/2$, AND,

$\hbar_{xi}/2 = \frac{1}{2}(m_{xi}\, u_{xi}\, r_{xi}) = \frac{1}{2}(m_{xi}\, \alpha_x c\, r_{xi}) = \frac{1}{2}(m_{xi}\, r_{xi})\alpha_x c = \hbar/2$

$\hbar_{xrel}/2 = \gamma\hbar_{xi}/2 = \gamma_x\frac{1}{2}(m_{xi}\, u_{xi}\, r_{xi}) = \gamma_x\frac{1}{2}(m_{xi}\, \alpha_x c\, r_{xi}) = \gamma_x\frac{1}{2}(m_{xi}\, r_{xi})(\alpha_x c) = \hbar/2$Thus, the following relationship still holds for ħ, but when we are dealing with particles of spin ½ we must include that fraction when figuring the actual energy. $\hbar_{xi} = (m_{xi}\, u_{xi}\, r_{xi}) = (m_{xi}\, \alpha_x c\, r_{xi}) = (m_{xi}\, r_{xi})(\alpha_x c) = \hbar$

$\hbar/c = (m_{xi}\, r_{xi})\, \alpha_x = \alpha_x \mathbf{3.50x10^{-43}}$ **kg-m**

TOTAL ENERGY OF THE NEUTITO

Now let us consider the TOTAL ENERGY of the rotating neutito. This equation must include the inherent energy due to magnetism (μ) and that due to the separation of the two charges (**q, i.e.,** the york and the zork). It must also include the gamma boost (γ) of the inherent state to the relativity state, and the kinetic energy of that final, rotating, relativistic mass. Thus, I propose the following relationship holds for the total energy:

Total Energy = [Magnetic + Electric] + Kinetic

$$E_{n2rel} = \gamma[E_{\mu yi} + E_{\mu zi}) + (E_{qn2i})] + \tfrac{1}{2}\hbar 2\pi f_{n2rel}$$
$$= \frac{2\,\mu_o\, i_y\, \mu_y}{r_y} + \frac{k\,q^2}{2d_y} + \tfrac{1}{2} m_{n2rel} u_{n2}^2$$

Total Energy + (Magnetic + Electric) + Kinetic = mc²

$$E_{n2rel} = \left[2\,\gamma\frac{\mu_o\, i_y\, \mu_y}{r_y} + \gamma\frac{k\,q^2}{2d_y}\right] + \tfrac{1}{2} m u_{n2rel}^2 = m_{n2rel} c^2$$

Note that the total energy (mc²) is the relativistic energy with the inherent energy having been boosted by the Lorentz factor. Note also, that the kinetic energy of ($\frac{1}{2}mu_{n2rel}^2$) is exactly HALF of the total energy (mc²) because u_{n2rel} = c! Again, this is true only of the n2 neutito because all larger

Standard Model particles are rotating at much slower speeds and the appropriate α <1, as concluded in the previous section. Xxx```

[Is the following correct? Do we need to add an alpha factor?]```

$\gamma\hbar_{n2i}/2 = \gamma\frac{1}{2}(m_{n2i}\ c\ r_{n2i}) = \gamma\frac{1}{2}(m_{n2i}\ c\ r_{n2i}) = \gamma\frac{1}{2}(m_{n2i}\ r_{n2i})©= \hbar_{n2rel}/2 = \hbar/2$

$\gamma\hbar_{n2©}(c) = \gamma\frac{1}{2}\ (m_{n2i}\ r_{n2i}) = \frac{1}{2}\ (m_{n2rel}\ r_{n2rel}) = \hbar_{n2rel}/2c$ And, thus,

$\boldsymbol{\gamma\hbar_{n2i}/c = \gamma(m_{n2i}\ r_{n2i}) = (m_{n2rel}\ r_{n2rel}) = \hbar_{n2rel}/c = 3.50\text{x}10^{-43}\ \text{kg-m}}$ **102**

Thus, [RETHINK ALL OF THIS. WHERE IS IT GOING? Do we need to include an alpha factor?]```

$\hbar_{n2rel}/2 = \frac{1}{2}(m_{n2rel}\ u_{n2rel}\ r_{n2rel}) = \frac{1}{2}(m_{n2rel}\ c\ r_{n2rel}) = \frac{1}{2}(m_{n2rel}\ r_{n2rel})c= \hbar/2,$ AND,

$\hbar_{n2i}/2 = \frac{1}{2}(m_{n2i}\ u_{n2i}\ r_{n2i}) = \frac{1}{2}(m_{n2i}\ c\ r_{n2i}) = \frac{1}{2}(m_{n2i}\ r_{n2i})c= \hbar/2,$

$\hbar_{n2i} = (m_{n2i}\ c\ r_{n2i}) = (m_{n2i}\ c\ r_{n2i}) = (m_{n2i}\ r_{n2i})(c)= \hbar$

$\gamma\hbar_{n2i}/2 = \gamma\frac{1}{2}\ (m_{n2i}\ c\ r_{n2i}) = \gamma\frac{1}{2}\ (m_{n2i}\ c\ r_{n2i}) = \gamma\frac{1}{2}\ (m_{n2i}\ r_{n2i})(c)= \hbar_{n2rel}/2 = \hbar/2$

$\gamma\hbar_{n2i}/2(c) = \gamma\frac{1}{2}\ (m_{n2i}\ r_{n2i}) = \frac{1}{2}\ (m_{n2rel}\ r_{n2rel}) = \hbar_{n2rel}/2c$ And, thus,

$\boldsymbol{\gamma\hbar_{n2i}/c = \gamma(m_{n2i}\ r_{n2i}) = (m_{n2rel}\ r_{n2rel}) = \hbar_{n2rel}/c = 3.50\text{x}10^{-43}\ \text{kg-m}}$

Now, we know that the product, $(m_{n2rel}\ r_{n2rel},)$ will be a constant in the ħ equation because all other factors are constants, but we do NOT know how to determine the value of either of those factors at this point. **Note that this is also a generalized formula for ALL subatomic particles. The product of the mass and the radius of ANY subatomic particle is a constant = $3.50\text{x}10^{-43}$ kg-m!**

$$\boldsymbol{\gamma\hbar_{xi}/c = \gamma(m_{xi}\ r_{xi}) = (m_{xrel}\ r_{xrel}) = \hbar_{xrel}/c = 3.50\text{x}10^{-43}\ \text{kg-m}}$$

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[PROBABLY NEED TO SHOW BALANCE IN FORCES TO COMPARE WITH WHAT HAPPENS WITH ENERGY.]```X

]For all particles of S= ½ħ, this must be modified to:

$\underline{\hbar/c}$ = m_{rel} r_{rel} hold this for probable deletion.'

At this point, we can see that the above derivation yields a modified value for the n2's inherent energy, and, the correct equation for the inherent energy of the n2 should be:

$$E_{\mu n2i} = (e^2/36)\ \text{Ћ}\ (4\pi^2 r_{n2i}^2 f_{yn2}^2)/2d_{n2i} =$$

$$E_{\mu n2i} = (e^2/36)\ \text{Ћ}\ (u_{yn2}^2)/2d_{n2i} =$$

$$E_{n2i} = [(e^2/18)\ x10^{-7}/2d_{n2i}]\ (c/2)^2??? = ½\,\hbar\ (2\pi f_{n2i})```x$$

I am now going to take a side trip to this relationship, but we will come back to the energy relationship in a few moments. I want to make a few points about the consequences of the last derivation. Take the two sides of the energy equation and set them equal and solve for the velocity $u_{n2i} = 2\pi\ r_{n2i}\ f_{n2i} = c/2$.

$$[(e^2/18)\ x10^{-7}/r_{n2i}]\ (c/2)^2 = ½\,\hbar\ (2\pi f_{n2i})$$

$$[(e^2/18)\ x10^{-7}]\ (c/2)^2 = ½\,\hbar\ (2\pi f_{n2i})\ r_{n2i} = ½\,\hbar\ (2\pi\ r_{n2i}\ f_{n2i})$$

$$[(e^2/18)\ x10^{-7}]\ (c/2)^2 = ½\,\hbar\ (u_{n2i}) = ½\,\hbar\ (c/2)$$

$$[(e^2/18)\ x10^{-7}]\ (c/2) = ½\,\hbar$$

$$2[(e^2/18)\ x10^{-7}]\ (c/2) = \hbar = [m_{n2i}\ u_{n2i}\ r_{n2i}] = [m_{n2i}\ (c/2)\ r_{n2i}]$$

$$[(e^2/36)\ x10^{-7}]\ (c/2) = [m_{n2i}\ (c/2)\ r_{n2i}]$$

$$[(e^2/36)\ x10^{-7}] = [m_{n2i}\ r_{n2i}] = 7.1x10^{-47}\ \text{kg-m}$$

BUT,

$$[(e^2/36)\ x10^{-7}] = 7.1x10^{-47}$$

While $[m_{n2i}\ r_{n2i}]$ = $[m_{n2rel}\ r_{n2rel}]$ = $3.50x10^{-47}$ kg-m 104

mn_{2rel} = 2/7 me = 2.6x10-31 kg, SO,

rn2 = 3.50x10-47/2.6x10-31 = 1.3x10-18 m?? check out.

THE FOLLOWING WAS ORIGINALLY IN CHAPTER 12:

ESTIMATING m_{Be} FROM VELOCITY u_e CONSIDERATIONS

For a TOPS structure of the electron (2,5), we have TWO different sources of energy. First is the mass from the Binding and Kinetic Energy m_{BKE} which is what we want to find. Part of this energy is the Potential Energy bound in the separated Sparqs within the electron structure. Referring to Figure 12-3, note that there are multiple repulsive bonds (AB, BC, CD, etc. for 5 total); and (AC, AD, BD, BE, etc. for a total of 10 repulsive bonds among the 5 zorks); and multiple attractive bonds (AF, BF, AG, BG, etc. for 10 total). The energies between those respective points are all summative, but need to be calculated via vector analysis to establish the total energy involved. (The single repulsive bond, FG is very strong, with a correspondingly high energy, but has nothing to do with the KE because it lies on the axis of rotation and contributes nothing to the KE.) This energy is spread throughout the volume of the electron, so the $KE_{Be} = ½m_Bu_e^2$.

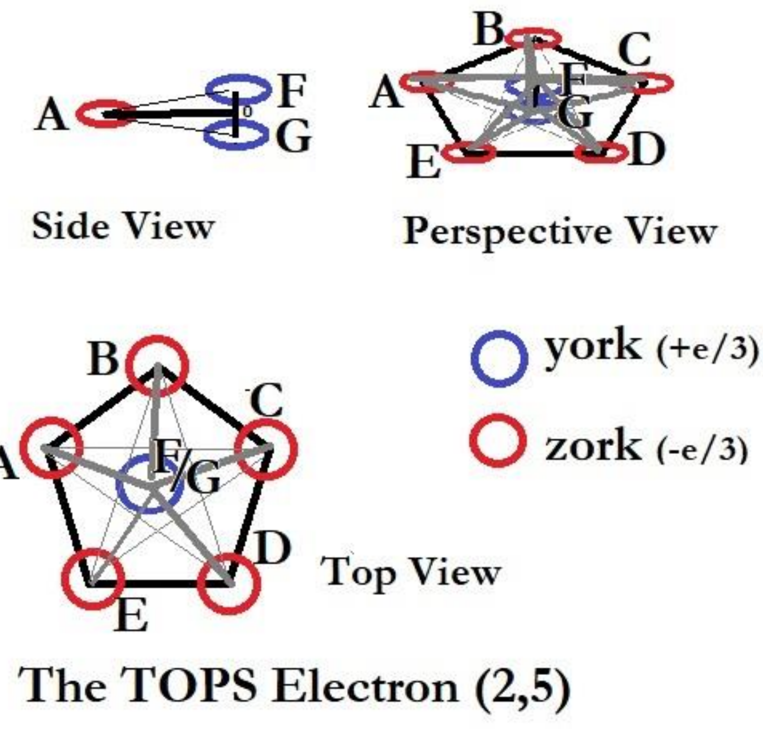


Figure 12-3: The Structure of the TOPS Electron

There is also a KE associated with the five zorks (A, B, C, D, E), all of which are orbiting the central FG axis at a distance of r_e. We know the energy of THAT system is $KE_{es} = 5m_s u_e^2$. The velocity (u_e) is the same for both kinds of KE. From Chapter 11, we found:

$E_{es} = (2m_{ys}+5m_{zs})c^2 = 7m_{ys}c^2 = 7x0.65x10^{-31}xc^2 = 41.0x10^{-15}$ j, exactly half of the total energy of the electron.

Thus, we also know that half of the energy of the electron will be the Binding Energy PLUS the total KE=41.0 j.

The total energy of the electron may be expressed as:

$E_e = \Sigma(E_{es} + E_{Be} + KE_{Be} + KE_{Bs}) = m_e c^2 = 9.11x10^{-31}$ kg x $c^2 =$ j

A B C D

Where Equation element A is the Sparq-charge energy; B is the Binding Energy (which is what we are trying to find; C is the kinetic energy of the Binding Energy; D is the kinetic energy of the five zorks spinning about the two-york electron axis (the yorks are ON the axis and do not contribute to the KE). The considerable electrical and magnetic energy between the two yorks is included within the Binding energy.

$$E_e = (7m_{ys}c^2 + E_{Be} + \tfrac{1}{2}m_{Be}u_e^2 + 5m_{ys}u_e^2) = m_ec^2 = 82.0\text{x}10^{-15}\ \text{j}$$

A B C D

From Chapter 11, we know the value of element A is $7\text{x}0.65\text{x}10^{-31}\text{x}c^2 = 4.55\text{x}10^{-31}\text{x}c^2 = 41.0\text{x}10^{-15}$ j, or half of the entire electron relativity energy. We also know the value of the kinetic energy in D is $5\text{x}0.65\text{x}10^{-31}$ kg $\text{x}u_e^2 = 3.25\text{x}10^{-31}\text{x}\ u_e^2$.

$E_{Be} = m_{Be}c^2$ but, equation element B is what we want to calculate.

So, we put those values into the equation and solve for the other half of the electron's energy.

$$E_e = (41.0\text{x}10^{-15} + E_{Be} + \tfrac{1}{2}m_{Be}u_e^2 + 3.25\text{x}10^{-31}\ \text{kg}\ \text{x}u_e^2) = m_ec^2 = 82.0\text{x}10^{-15}\ \text{j}$$

A B C D

Subtract A from both sides of the equation:

$$\tfrac{1}{2}E_e = (E_{Be} + \tfrac{1}{2}m_{Be}u_e^2 + 3.25\text{x}10^{-31}\ \text{kg}\ \text{x}u_e^2) = \tfrac{1}{2}m_ec^2 = 41.0\text{x}10^{-15}\ \text{j}$$

B C D

Divide through by c^2 to obtain the corresponding *attributable* masses.

$$(E_{Be}/c^2 + \tfrac{1}{2}m_{Be}u_e^2/c^2 + 3.25\text{x}10^{-31}\ \text{kg}\ \text{x}u_e^2/c^2) = \tfrac{1}{2}m_e = 4.55\text{x}10^{-31}\ \text{kg}$$

B C D

The problem with this equation is that it includes two unknowns, **m_{Be} and α.** While there are some obvious results that result in negative values of energy and a requirement that $\alpha \leq 1$, there are still an infinite number of combinations of those two quantities that can exist to satisfy that equation. Using this approach, it still appears that we will not be able to identify the precise value until the vector analysis of the electron is done as outlined in Chapter 7.

ESTIMATING m_{Be} FROM RADIUS CONSIDERATIONS

Of course, if we knew the radius of the electron, we would be able to calculate the m_{Be} directly. But again, we will not be able to determine that value until the electron's vector analysis is completed, as outlined in Chapter 7. Still, we know the calculated radius of the n2 neutito ($r_{n2}=1.35\times10^{-12}$ m) and we know the electron is larger than that value. We also know the radius of the hydrogen atom at n=1 ($n_{o1}=5.29\times10^{-11}$ m) and the electron must be smaller than that value. Thus, $r_{n2}=1.35E\text{-}12<r_e<r_{o1}=5.29E\text{-}11$.

I am now going to take a **radius** approach to the problem.

We know the mass of the electron, we know the value of r_{o1} and r_{n2}, so we will now try to use those values to obtain the radius.

We do NOT know the value of r_{o1}/r_e or r_e/r_{n2}, but it is obvious that $(r_{o1}/r_e)(r_e/r_{n2})= r_{o1}/r_{n2}$, for the r_e values will cancel. Thus,

$r_{o1}/r_{n2} = 5.29E\text{-}11/1.35E\text{-}12 = 39.2$

I now propose that we take a test value of r_e such that it is about the middle of that range. Let us take an easy test case such that the ratio $r_{o1}/r_e=10$. That would make $r_e = 5.29\times10^{-12}$ m. It would also make $r_e/r_{n2}= 3.92$ because the product of $(r_{o1}/r_e)(r_e/r_{n2}) = r_{o1}/r_{n2}$ and we know that value must be 39.2. Thus, we see that the ratio $r_{o1}/r_e=10$ is too high.

We need a r_{o1}/r_e test value that is smaller than 10, and adjust it until the two ratios are almost equal in value. Ideally, the two values WILL be exactly equal, for then, and then only, will we have arrived at the sole solution to the problem.

My first attempt at the solution from the aspect of particle radii, was to multiply the r_{n2} (=1.35E-12) by whole numbers from 1 to 10 on a spreadsheet and that produced a straight line when I crudely graphed it.

I conceived of a series of positive whole number that I identified as **n**,[105] with the following relationships:

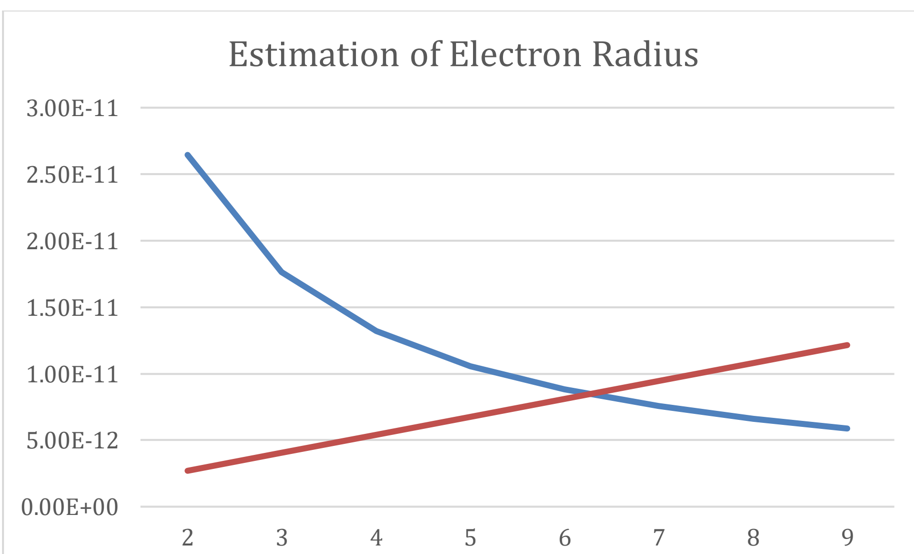
$r_e = n*r_{n2}$ and $r_e = r_{o1}/n$

This relationship will always give us possible values of r_e that are between r_{n2} and r_{o1}.

My initial attempt at graphing this relationship assumed that I would obtain a continuous curve over that possible range, and I hoped for an abrupt kink in the curve to tell me the approximate value of r_e. I incorrectly expected that plotting the r_{o1} value divided by 1 to 10 would also produce another straight line that could extend to the previous line. [I should have known better, but I really am NOT a good mathematician!]

It very quickly became apparent that some of my expected results were wrong. I was soon plotting TWO separate lines that were obviously going to intersect and it was at that point that I thought that the point of intersection should identify the specific value of r_e!

Figure 12-4 shows the intersection of the two lines, and it was obvious that the point of intersection was at the n=6 region, but just a shade larger than 6. I was awed that both of them showed up at the same n level. Then it hit me that they HAD to be the same at the true value of r_e.



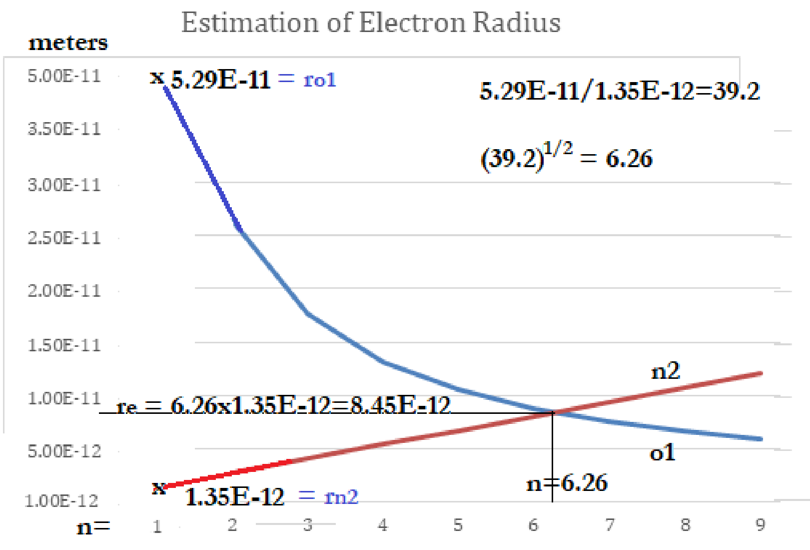


FIGURE 12-4 Pinpointing the Electron Radius

[Clearly, n=6.26 **is a solution** to these equations. But what does it mean???? I am not a mathematician and can't figure it out. It doesn't seem to be related to the dimensions of the electron.]

Here is the math:

$r_{o1}/r_{n2}= (52.9 \text{ x}10^{-12}/1.35\text{x}10^{-12}) = 39.2$
$r_{o1} = n\ r_e$ and so, $r_{o1}/r_e= n$
$r_e/r_{n2}= n$
$(r_e/r_{n2}= n)(r_{o1}/r_e= n) = r_{o1}/r_{n2}= n^2 = 39.2$
$n = (39.2)^{½} = 6.26$

Thus,
re= ro1/n = $52.9\text{x}10^{-12}/6.26 = 8.45\text{x}10^{-12}$ And,
$r_e = n\ r_{n2}= 6.26\text{x}1.35\text{x}10^{-12} = 8.45\text{x}10^{-12}$

We have just demonstrated that the value of re= $8.45\text{x}10^{-12}$ m, at least to the level of accuracy of three significant figures and that is as accurate as we can get when we have limited our level of precision by using all factors at three significant figures.

Although it seems obvious NOW that the way to find that value of r_e was simple—we needed only to take the square root of that 39.2 value—I had to analyze that to prove it to myself. Originally, I was just playing with the numbers to see if I could find a pattern.

Taking the root = 6.26 and from information given in Chapter 2, we can now calculate the velocity of rotation of the electron u_e:

$\hbar = m_e u_e r_e$, so, rearrange the terms, to solve for u_e.

$u_e = \hbar/(m_e r_e)$, and we know the values of everything on the right side of the = sign! Make those calculations:

u_e = 1.05E-34 j-sec/(9.11E-31 kg*8.45E-12 m), or,

u_e = 1.36E6 m/sec, from which we may calculate the value of α_e.

α_e = u_e/c = (1.36E6 m/sec)/3.00E8 m/sec) = 0.00453, and of f_e.

$f_e = u_e/2\pi r_e$ = (**1.36E6 m/sec)/(2π*8.45E-12 m**) = 2.56E15 Hz

We now know all the parameters of the rotating electron!

We can do the same with any subatomic particle for which we know its mass. I will now do the same calculations for the n4 electron neutrino, assuming that the total mass of the n4 is double that of the sum of the 4-Sparq masses, i.e., m_{n4} = 5.20E-32 kg. First, calculate the radius r_{n4}.

[**How is electron different from the n4?? In mass. Must include that first. STILL a problem. How distinguish between r_{n4} and r_{n2}?]**

$u_{n4} = \hbar/(m_{n4} r_{n4})$ = 1.05E-34 j-sec/(9.11E-31 kg*5.20E-12 m)

THE FOLLOWING WAS ORIGINALLY IN CHAPTER 12

'[T]he particle's frequency of rotation is free to adjust to whatever the other combinations of fixed factors may be, in order to satisfy the fundamental physical law that all subatomic particles have a spin of either ħ or ħ/2.'

This means that the frequency of a particle with a spin of ħ/2 is just half of the frequency it would possess if its spin had been ħ. Note, however, that the velocity $u = 2\pi rf$, and, because we said that r would not change, any change in frequency will affect the velocity by the same amount. Note also, that the energy depends on the velocity **squared**, and this means that halving the frequency results in reducing the energy to the FOURTH power. Let us calculate the velocity (u_{s1}) we would have if we had if the electron had a spin of 1 where S= ħ; $\hbar = m_e\, u_{es1}\, r_{e;}$ and we know the product of the mass and radius ($m_e r_e$) is fixed at $1.75x10^{-43}$ kg-m.

$$\hbar = m_e\, u_{es1}\, r_e = (m_e\, r_e)\, u_{es1} = 1.75x10^{-43}\, (u_{es1}) = 1.05x10^{-34} \text{ j-sec}$$

$$u_{es1} =$$

$$u_{es1} = 2\pi r e f_{\ es1}$$

We also know that

$$E_{s.5} = ½\, hf_e = ½\, m_e\, u_{es.5}\, r_e\, 2\pi f_{es.5} = ½\, m_e u_{es.5}{}^2 = m_{BE} c^2 = 4.10x10^{-14} \text{ j}$$

For this, let us again consider the equation shown in the paragraph above this section.

$$m_{n2rel} = \frac{\gamma_{n2i}\, \hbar\, e^2}{9 r_{\mathbf{n2}}} =$$

Note that this equation is the relativistic energy. Divide that by the gamma factor ($\underline{\gamma_{n2i} = 615}$ from Chapter 6) and we have the inherent mass.

Note that, for TOPS, the relativity spin of the electron is NOT determined by the masses of all particles within the electron—only by those five peripheral zorks which surround the two axial yorks (See Figure 12-3.)

Traditionally, the Spin energy E_s for an electron is ½ $\hbar f_e$. Traditional physics has no way of measuring the frequency or4 rotational velocity of the electron. But with TOPS is: (Get BE into * in equations below))

$$E_s = ½\, \hbar f_e = ½\, m_e\, u_e\, r_e = *\ 5 m_z\, u_e{}^2 = *\ (5/7)\, m_e\, u_e{}^2 = m_e\, c^2$$

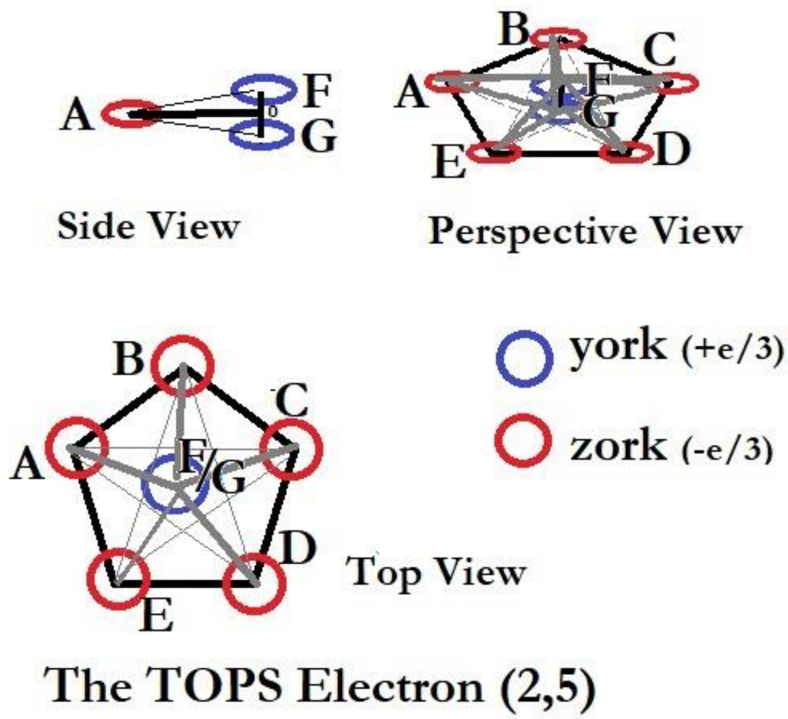


Figure 15-1 - The TOPS Electron

Taking the last two expressions, we can find the value of u_e!

$E_s = (5/14)\ \cancel{m_e}\ u_e^2 = \ \cancel{m_e}\ c^2$

[SOMETHING WRONG. THIS SHOWS u_e>c!

$E_s = ½\ m_e\ u_e\ r_e = \ 5m_z\ u_e^2 = (5/14)\ m_e\ u_e^2 = \ m_e\ c^2$

Thus, the spin energy = $½(5m_z\ u_z^2)$ for the five peripheral zorks which are rotating at a distance r_e from the axis of rotation. (The two yorks are ON the axis and the radius here is effectively zero so the yorks do NOT contribute to the energy of the electron above that of $.65x10^{-31}$ kg each, which is due to the Sparq mass.)

Calculation of estimated relationship between mB and mKE in an electron.

(Max mB=4.55E-31 kg)

(Area in bold print is most likely area)

$$m_{Be} = \frac{(9.11\text{x}10^{-31} - 6.50\text{x}10^{-31}\,\alpha^2)}{(\alpha^2 + 2)} \text{ kg}$$

						~c=
alpha=ue/c	0.03	0.05	**0.1**	**0.3**	0.4	0.99999
ue = (m/sec)	8993700	14989500	**29979000**	**89937000**	119916000	299787002
gamma	1.0004503	1.00125235	**1.0050378**	**1.0482848**	1.0910895	223.60736
	too large	~max mB				
mB = (kg)	4.55E-31	4.54E-31	**4.50E-31**	**4.08E-31**	3.74E-31	8.70E-32
mKE = (kg)	-2.749E-36	8.8015E-34	**5E-33**	**4.711E-32**	8.139E-32	3.68E-31
total E/c^2 = (kg)	4.55E-31	4.55E-31	**4.55E-31**	**4.55E-31**	4.55E-31	4.55E-31

Resulting current is $i_y = ½*e/3*f_y$

And magnetic moment is $mu_y = i_y*pi*r_y^2$.

$$E_{\mu y} = ½\ (e^2/36)\ \hbar\ (4\pi^2 r_y{}^2 f_y{}^2)/r_y$$

$$E_{\mu y} = ½\ (e^2/36)\ \hbar\ (2\pi r_y\ f_y)/r_y\ ]\ r_y\ \ 2\pi\ f_y$$

$$E_{\mu y} = ½\ \left[(e^2/36)\ \frac{\hbar}{r_y} (u_y)\ r_y \right] 2\pi\ f_y$$

$$E_{\mu y} = ½\ \left[\frac{(e^2\ \hbar)}{36\ r_y} u_y\ \ r_y \right] 2\pi f_y$$

$$E_{\mu y} = ½\ \left[\frac{(e^2\ \hbar)}{36\ r_y} u_y\ \ r_y \right] 2\pi f_y$$

Now the portion in parentheses is the mass; and everything in the brackets is ħ. (Recall: $\hbar_x = \hbar = m_x\ u_x\ r_x$.)

$E_{\mu y} = \frac{1}{2} \, \underline{[(m_y\ )} \, u_y \ \ r_y\ ] \, 2\pi f_y \qquad \frac{(e^2\ \text{Ћ}) = m_{y\ i}}{36\ r_y}$

$E_{\mu y} = \frac{1}{2}\,\hbar\,\mathbf{2\pi f_y} = \frac{1}{2}\,h\mathbf{f_y}$

Now, let us consider this from a relativity perspective. Recall that $\hbar_{yi} = \hbar_{yf}$ because the Planck's Coefficients within the ħ structure, cancel out, numerator-to-denominator. Thus, the value of ħ does not change whether it is the inherent condition $\hbar_{yi}$ or the $\hbar_{yrel}$ condition. The $\mathbf{2\pi f_y}$ **in our Energy formula, however, is in the relativity position in our macro-world! Since $\mathbf{f_{yrel} = Þ_{rel}\, f_{yi}}$,** and THIS is the Planck's Coefficient that provides the relativity boost to our inherent m_{yi}.

TOPS TOPS

Electron Positron

$e^- + e^+ \rightarrow$

$(2,5) + (5,2) \rightarrow [7,7]$

↳ $7(1,1)\varphi$	**POSSIBILITY 0**
↳ $(5,5) + 2(1,1)\varphi$	**POSSIBILITY A**
↳ $5(1,1) + 2(1,1)\varphi$	**POSSIBILITY B**
↳ $6(1,1) + (1,1)\varphi$	**POSSIBILITY C**

TOPS TOPS
Electron Positron

$e^- + e^+ \rightarrow$

$(2,5) + (5,2) \rightarrow [7,7]$

↳ $6(1,1) + (1,1)\varphi$ **POSSIBILITY C**

$$L + M = N + O$$

$$9.11 + 9.11 = 6\, m_{n2} + 9.11 \qquad \text{[All x}10^{-31}\text{ kg]}$$

$$\cancel{9.11 +} 9.11 = 6\, m_{n2} + \cancel{9.11} \qquad \text{[Subtract from both sides.]}$$

$$9.11 = 6\, m_{n2}$$

$$9.11/6 = 1.82 = m_{n2} \qquad (\text{x}10^{-31})\text{ kg}$$

Part of each m_{n2} is the Sparq/mass of (m_y+m_z); the remainder is structural (or 'Binding') energy ($m_\triangle$). The (m_y+m_z) in the PHOTON (at O) is included within the $9.11\text{x}10^{-31}$ kg photon, but there are 7 (m_y+m_z) pairs in the original electron (at L) and positron (at M). Thus, the total Sparq/masses of the electron and positron (a total mass of $18.22\text{x}10^{-31}$ kg) is one-fourteenth of the combined masses.

$$2\text{x}9.11/14 = 1.82 = m_y = m_z \qquad (\text{x}10^{-31}\text{ kg})$$

Thus, each of 6 neutitos possesses a Sparq mass (m_y+m_z), of $1.82\text{ x}10^{-31}$ kg and the structural mass ($m_\triangle$) in each n2 is the difference between the mass of the n2 and the Sparq mass of the n2 (m_y+m_z), or,

[RETHINK. THIS IS GIVING A NEGATIVE NUMBER!]

Following extracted from Chap 12.

From Figure 12-3 we see that the heart of an electron is a pair of yorks, identified as F and G. The axial forces between F and G are very much like those of the york and zork in an n2 neutito. The significant difference is that the n2 neutito has opposite charges while the electron heart possesses two, like-charged particles. Thus, the electric charges between the two particles in the n2, are attractive while those in the electron are repulsive. This is not important, for the magnetic forces in the two particles are in a balance to completely neutralize the electric forces in the axial direction. Mathematically, they would yield ALMOST the same forces and energies between them. The only difference is the minor influence of the sin θ forces where θ is the angle at FAO, FBO, GCO, etc. (ten, small force vectors, all together). Those sin θ forces are attractive, thus, slightly reducing the repulsion between F and G. This would lead to a slightly greater distance between the F and G yorks than between the york and zork in an n2—essentially estimating that θ=0.. For purposes of our estimation, we shall ignore this small difference until mathematicians can give more precise calculations of the axial forces and energies between the respective particles. Nevertheless, this estimation will result in a slightly lower energy that is present in the TOPS electron structure.

The five zorks at the periphery of the electron possess repulsive forces among them. As we saw in Chapter 7, there are five AB types of bonds which will not be affected by our estimation that θ=0. There are ten AC type of repulsive bonds, which also are not affected by our assumption. There are, however, ten ATTRACTIVE bonds of the AF type, which, when we estimate θ=0, result in assuming AF=AO which is actually decreasing the actual distance, but INCREASES the energy, somewhat off-setting our estimate along the axis. Thus, we believe an estimate using this approach would be close to the true value that we will find with rigid vector analysis.

Thus, we will assume (or know) the following:

$r_{ys} = r_{ys}$	**$= 1.35 \times 10^{-12}$ m**	**(exact)**
$r_{es} = r_{es}$	**$= 6.75 \times 10^{-12}$ m**	**(estimate)**
$2dy_e = 2dy$	**$= 2.70 \times 10^{-12}$ m**	**(estimate)**
$my_s = my_s$	**$= 0.65 \times 10^{-31}$ kg**	**(exact)**
$E_{axe} = E_{n2}$	**$= m_{n2} = 2.60 \times 10^{-31}$ kg**	**(estimate)**
$E_{pe} =$?		**(estimate to be calculated)**

E_{axe} is the Binding energy along the FG axis. It is a PART of the Binding Energy of the electron. We therefore assume, that the remaining Binding Energy (E_{ep}) is that among the peripheral zorks, resulting in repulsive forces and energy and the attractive forces and energy between the peripheral zorks and axial yorks, i.e., we assign (estimate) the same relativity value as the $m_{n2} = 2.60 \times 10^{-31}$ kg. **Both E_{axe} and E_{pe} include both electric and magnetic energy as per Chapter 3.**

$$m_e = (\tfrac{1}{2} m_{Be}\,\alpha^2 + 5 m_{ys}\,\alpha^2 + m_{Be} + 2 m_{ys} = 9.11 \times 10^{-31} \text{ kg}$$

Since, from Chapter 10, we know $m_{ys} = 0.65 \times 10^{-31}$ kg,

$$m_e = (\tfrac{1}{2} m_{Be}\,\alpha^2 + 5 \times 0.65 \times 10^{-31}\,\alpha^2 + m_{Be} + 2 \times 0.65 \times 10^{-31} \text{ kg}) = 9.11 \times 10^{-31} \text{ kg}$$

$$m_e = (\tfrac{1}{2} m_{Be}\,\alpha^2 + 3.25 \times 10^{-31}\,\alpha^2 + m_{Be} + 1.30 \times 10^{-31} \text{ kg}) = 9.11 \times 10^{-31} \text{ kg}$$

Subtract 1.30×10^{-31} kg from both sides to obtain:

$$\tfrac{1}{2} m_{Be}\,\alpha^2 + 3.25 \times 10^{-31}\,\alpha^2 + m_{Be} = 7.81 \times 10^{-31} \text{ kg}$$

Collect m_{Be} terms and solve in terms of α^2.

$$\tfrac{1}{2} m_{Be}\,\alpha^2 + m_{Be} = 7.81 \times 10^{-31} - 3.25 \times 10^{-31}\,\alpha^2 \text{ kg}$$

$$m_{Be}\,(\tfrac{1}{2}\alpha^2 + 1) = 7.81 \times 10^{-31} - 3.25 \times 10^{-31}\,\alpha^2 \text{ kg}$$

$$m_{Be} = \frac{7.81^{-31} - 3.25 \times 10^{-31}\,\alpha^2}{(\tfrac{1}{2}\alpha^2 + 1)} \text{ kg}$$

$$m_{Be} = \frac{2(7.81 \times 10^{-31} - 3.25 \times 10^{-31}\,\alpha^2)}{2(\tfrac{1}{2}\alpha^2 + 1)} \text{ kg}$$

$$\mathbf{m_{Be} = \frac{(15.62 \times 10^{-31} - 6.50 \times 10^{-31}\,\alpha^2)}{(\alpha^2 + 2)} \text{ kg}}$$

Now, let us calculate the kinetic energy values in terms of **α**.

Repeating, from the above derivation,

$\frac{1}{2}E_e = (KE_{Be} + KE_{Bs} + E_{Be}) = \frac{1}{2}m_e c^2 = 4.55 x 10^{-31}$ kg x $c^2 =$ j

$\frac{1}{2}E_e = (\frac{1}{2}m_{Be}u_e^2 + 5m_{ys}u_e^2 + E_{Be}) = \frac{1}{2}m_e c^2 = 41.0 x 10^{-15}$ j ????????

$\frac{1}{2}E_e - 5m_{ys}u_e^2 = (\frac{1}{2}m_{Be}u_e^2 + E_{Be}) = \frac{1}{2}m_e c^2 - 5m_{ys}u_e^2 = 41.0 x 10^{-15} - 5m_{ys}u_e^2$ j

Appendix D – The Origin of My FAITH in TOPS

The following account is an experience that I had in early 1952. I alluded to that experience in this book's Prologue, but would like to expand on it here.

It was in the introductory lecture of my Integral Calculus class at the beginning of the second semester of my Sophomore year. Before the class started, the professor had drawn a diagram of a helix on the blackboard. I realized that the professor was going to use that diagram as a part of his introduction to integral calculus. As I sat down, that diagram seemed to draw me in, and I studied it in awe. I soon noted that a perpendicular projection of that helix would produce a sine wave and somehow, that clicked with a puzzlement that had followed me from my high school physics class. I had been told that an electromagnetic wave could be represented by a sine wave, and I had no concept of how or why that could be so.

But, seeing that helix projection-sine wave link on the blackboard was like a brilliant flash of light blazing in the darkness! Somehow, that connection was accompanied by an assurance that this helix could represent a particle path and THAT was how the sine wave came about!

I have no idea why those concepts came together and clicked in my mind. I can only say that it did so with an awesome power of assurance of the connection. The feeling was so intense, and I was so caught up by the impression, that I heard very little of what the professor was saying on how the helix applied to the principles of integral calculus. During that lecture, my entire being was caught up in a sense of awe. I somehow sensed that had been illuminated as to something very deep and important.

I had not yet taken a college course in physics at that point. I had only my 1949 high school physics background and I could not understand how that helix could relate to a photon as I understood it at that time.

In my high school physics class, I had pondered the duality of the wave/particle theory as it was being taught. I had read of the double-slit experiments in which interference patterns were produced and that this was the reason that light was considered to be in the form of waves, for, 'only waves can produce such interference.'

On the other hand, in a later course, I had studied the results of Michelson and Morley's interferometer experiments in which they convincingly (to me) demonstrated that there was no such thing as the 'luminiferous ether' as being taught by the learned professors in the late 19th century—their conclusion was that there WAS no medium (ether) in space to CARRY a wave! The concept of some substance kind of 'splashing around' and causing wave-effects observed in double-slit interference seemed quite contrary to the Michelson and Morley experiments, and I was very uncomfortable with the scientific attempts to explain away the 'ether' and, at the same time, to hold to the wave aspects of double-slit experimental results. It was all very puzzling, and I personally felt more comfortable envisioning Einstein's quantized photon as being more like a particle than a wave. I had also absorbed the concept of the attraction between negative and positive charges. Somehow, they all had to fit together.

In my earlier calculus class, I felt an assurance that the helix SOMEHOW, held the answer, but I had a nagging sense that I had seen only a glimpse of something that was VERY important. During the professor's introduction, I spent the time looking for a connection. Following is a sample of what was going on in my head during that hour.

If a photon traveled in a helical path, what kept it in that path? It couldn't be a normal particle for something had to keep it locked into that path—something had to attract it to keep it from flying off the helix tangentially—something had to balance it. What if it were a charged particle? A similar particle of opposite charge would balance it. But what kind of particle would that be? An electron? (I didn't know anything about anti-matter at that point, so I never considered the anti-electron as a serious candidate for the companion particle). Certainly, it could not be a proton—that was far too massive to consider. And, if that were two, oppositely charged particles, there would not be just ONE helix—it would require TWO, intertwined helical paths!

With the end of the lecture, I had no answers—just more questions. I had only an assurance that I had seen a glimpse of something important, but I had absolutely no idea of what it was. I later described my sense of awe as being like going to a tall, board fence at a huge construction site and looking through a tiny knot-hole—I couldn't see much, but could see enough to know that it was a vast, new realm with lots of activity going on. I saw only a glimpse, but in my very bones, I KNEW that it was important. I trusted that feeling.

In my junior year, I took an Introductory Physics course, and during my senior year, I took a course in Physical Chemistry, but that was the end of my undergraduate work in the field. I found myself involved with the subject of education and science took a back seat. Over the subsequent years, I occasionally thought of my experience with the helix, pondered what it meant, drew diagrams of double helixes, and, each time, over and over, I left it, AGAIN, for I could make no sense of it. But, I never lost that sense of it being important—SOMEHOW!

Then, in 1999, I had my open-heart surgery, and the recovery was agonizingly slow. By then, I was a retired educator and no longer in the field of science. There had been many advances in science over the years and the popular press dwelt on many new discoveries, among them, the scientific consensus that the up- and down-quarks actually existed; there had been the development of lasers with coherent light—whatever THAT meant; and so on.

During my slow recovery, I did a lot of thinking about the science that I thought I knew. In retrospect, I believe my thoughts started with the subject of 'coherent light.' I asked myself, how multiple photons could be packed together. Suddenly, the helix raised its head again. Was it possible that my two, helically rotating, oppositely charged particles could make a single photon and that a laser pulse of coherent light could consist of two such connected photons, just ¼ wavelength apart? If so, that 4-particle combination would make a coherent pulse of light. Those FOUR charged particles would form a neutral tetrahedron! But that was just a hypothesis and I had nothing to go on from that point. Nevertheless, I tucked the four-particle packet into the back of my head for future reference. For some reason, I trusted the feeling of its importance, too.

During my convalescence, another area somehow entered my conscience—atomic physics. I had taken my last physics course in 1967 and late in that course the professor had been talking of the possibility of the existence of 'new' particles, called 'quarks.' If these things really existed, he said, they would have fractional charges of plus or minus 1/3 or 2/3 the charge of an electron! Here I was, in 1999, over 30 years later, and quarks were in the science news. For SOME reason, I yearned to know what quarks really were. I resolved I would study them as soon as I could get to the library to do some research. Although I had a computer I used as a word processor, I didn't know how to 'surf the web' at that time.

Finally, came the day the doctor said I could start driving, as long as it was only for short distances. The next day was a Saturday, and I drove to the library where I found Richard Feynman's little book, 'The Third Lecture' as I described in the Prologue.

I will not discuss further about my thought processes at that time. The only reason I bring this up is that I wanted to give more background of how I started on my TOPS journey in 1999.

The 'helix' experience was foundational in leading to my discovery of the quarks. But, the only connection of the helix was my hypothetical tetrahedron consisting of four charged particles. Two positive and two negative particles would be neutral. Perhaps that was not only a two-photon coherent light pulse, but it was also a neutrino. Now, I do not recall that being a connection that I made at the time, but on that Saturday night in 1999, I first formulated the 'What IF?' question, **'Suppose all Standard Model particles are made of four of these charged particles, at least one of which is a neutrino and at least one of which is one of my two charged particles?'**

The next question then, was, 'What would be the structure of the up-quark; the down-quark; etc., for all of the Standard Model particles?'

I don't know how I came to identify those particles that night, but I soon settled on the following designations: The positively-charged particle I called y; the negatively-charged particle, I called z; and the neutrino, hypothetically made of two photons, I identified by the Greek letter nu (ν).

PARTICLE	SYMBOL	CHARGE
York	y	+e/3
Zork	z	-e/3
Neutrino	ν	0

STANDARD MODEL STRUCTURES

	As of 1st night		TOPS Designation
Up-quark	(yyνν)	+2e/3	(6y,4z) = (6,4)
Down-quark	(νννz)	-e/3	(6y,7z) = (6,7)
Neutrino(ν)	(yzyz)	0	(2y,2z) = (2,2)
Photon	(yz)	0	(1y,1z) = (1,1)φ

I quickly compared the results with Feynman's Standard Model, and they all seemed to fit the First-Generation particles. I had a heady, euphoric feeling that I was on to something and resolved to study it more thoroughly, but it was late at night, and I needed to get to bed.

Over the next couple of weeks, I had named the y-particle the YORK, the z-particle the ZORK, and the neutrino **n4** (indicating the total number of charged particles it contains). I abandoned the use of ν and settled on reducing all particles to the total number of yorks and zorks they contained (always placing the number of yorks first). Thus, the up-quark became (6y,4z) which I now further abbreviate to (6,4).

I soon discovered the pattern that separated the First-Generation particles from the Second and Third-Generations and settled on particles that were PERMITTED as opposed to hypothetical groupings of yorks and zorks that are PROHIBITED. Take any permitted structure and add 3 to both particles to advance to the next generation. Thus, the up-quark is (6,4), the Charm is (9,7) and the Top is (12,10).

I now use the parentheses to specify PERMITTED structures only, for there are multiple PROHIBITED structures that cannot exist in nature—for example, a four-particle structure of [3y,z] would have the theoretical charge of +2e/3, the same as on an up-quark, but this is NOT a permitted structure. See Chapters 1 and 7.