Ball of Light Particle Model

by John Thomas Nordberg

$$\text{Time} \equiv c \equiv 1$$

$$\vec{E} \times \vec{B} \cong \vec{G}\textit{ravitational Field} \quad \text{Equation 1a}$$

$$n \oint \frac{\vec{E} \times \vec{B}}{v^2} r_{\min} ds \cong -m \rightarrow n = 1, 2, 3, \ldots \quad \text{Equation 1b}$$

$$n \frac{1}{c} \oint \frac{\vec{E} \times \vec{B}}{v^2} r_e ds = -m \rightarrow n = 1, 2, 3, \ldots \quad \text{Equation 1c}$$

The Ball-of-Light Particle Model is a Grand Unification Theory.

particles can be described as standing waves of electromagnetic radiation by mapping the electromagnetic fields over the surface of a sphere. These standing waves create the gravitational field. I call these spheres “Balls of Light.” Photons, neutrinos, electrons, protons, neutrons, alpha particles, all stable nuclei, and possibly even solar cores and black holes are specific resonant harmonic combinations of spherical standing waves of electromagnetic and gravitational forces. Particles that are not stable at rest are not resonant harmonics.

Introduction

I believe there are no preferred reference frames, nor geometries, nor human formulations of equivalent Grand Unified Theories. In other words, there may be alternate forms of Grand Unification Theories just as there are alternate forms of geometries. This GUT uses: 3 dimensional space, a Cartesian coordinate system, referenced with respect to the universe—or, equivalently, any expanding sphere of light (since it can’t have a motion with respect to the universe)—and Euclidean geometry. I do not believe that high energies are needed to unify the physical forces. I treat space as if it has no physical properties. However, if these 3 fundamental force fields—Electric, Magnetic, Gravitational—do act at right angles to each other as the triad described here, then it may be why energy & matter in space appears 3-dimensional. My basic concepts are: constant length, constant motion—also called “time”—charge, and mass. However, mass or charge could be dropped from this set of basic units since mass is defined in terms of charge in equations 1b and 1c.

I define “time” as a constant quantity of motion. Time ≡ c ≡ 1. Therefore, one second ≡ 299,792,458 meters. Therefore, “speeds” and “velocities” are the dimensionless ratios of two lengths. Since length measurements are also dimensionless ratios of two lengths, I recommend that we retain the separate notation of “x” and “t” while understanding that they can be converted.

Therefore:

let $\frac{\Delta x}{\Delta x}$ continue to represent a measurement of constant length, and

let $\frac{\Delta x}{\Delta t}$ continue to represent a measurement of constant motion.

Velocities can be directly added if they are fractions of c. The critical velocity “v” in:

Equation 1b $$n\oint \frac{\vec{E}\times\vec{B}}{v^2} r_{\min} ds = -m \rightarrow n = 1, 2, 3, \ldots$$

is expressly defined as a fraction of the speed of light.

Let me especially stress this point, I treat “time” as a basic unit—never as a derived concept. Defined this way, time can not “speed up” nor “slow down”—time is never a function of velocity in this GUT. I state that it is illogical for time to be both a basic unit and a derived unit in the same GUT—as it has been treated ever since Einstein’s theories of relativity. This refutes the ad hoc relativistic time dilation, mass dilation and length contraction by definition. The observed mass dilation and length contraction effects are inherent in equation 1.

Since a unit of time can be equated to a unit of length, events can be described in three dimensions instead of four. A “one-dimensional” time axis is actually 3-dimensional in 3-dimensional space—visualized as an expanding sphere of light—and can be reduced to the traditional 3 dimensions of space.

I believe a sphere is the most symmetrical Euclidean geometrical form. I hypothesize electromagnetic “radiation” can “collide” or, “wrap around itself” to create spherical standing waves of electromagnetic “non radiation” which I call “Balls of Light.” The first harmonic resonant frequency of these balls is the photon.

I hypothesize photons can add to other balls of light to create “larger” or more energetic balls of light—and all other particles—in a quantum-like fashion. “Larger” here does not necessarily mean “greater in diameter”—it only means greater in mass, or energy. On the other-hand, two particles with the same mass or energy could have different sizes—the smaller particle would necessarily be faster moving—and, I hypothesize, this process occurs in a smooth, non-quantum-like fashion.

I hypothesize the second harmonic resonant frequency is the rest neutrino—the standing waves exactly cancel to create a perfectly neutral particle with mass.

I hypothesize the third harmonic resonant frequency is the electron—the electron is essentially a combination of a neutrino and photon. Note, the traditional "rest electron" refers to a specific energy level for the electron while it is at rest on the planet earth.

I hypothesize further permutations can be created by adding together these balls of light, creating all other particles in the universe, including: more energetic neutrinos such as the muon neutrino and tau neutrino, more energetic electrons such as the muon and tau, protons and neutrons, higher nuclei—even the cores of suns and black holes.

I hypothesize that when larger permutations are created, which are not harmonic, the balls of light decay into photons, neutrinos, and other balls of light until stable harmonics are reached. For example, a star could be a non harmonic resonant frequency that is giving off energy in an attempt to reach a harmonic resonant frequency. It is radiating balls of light in an attempt to be stable. The same argument may even describe such unique and previously indescribable phenomena as "ball lightning."

I state the "right-hand" rule is completely arbitrary. I hypothesize it applies to what we now call "matter." I state the "left-hand" rule is equally valid. I hypothesize it applies to what we now call "anti-matter." These balls of light—including matter and anti-matter—form perfect symmetries in all directions, and reflections using either the right-hand rule or the left-hand rule. (These symmetries are detailed in Table A.)

I hypothesize the components of these standing waves—the counter-rotating fields of E and B—spin around the center of the ball at the speed of light. You might say this spin is in essence where gravity comes from.

A big question is, "Are the gravitational forces which we observe and measure the result of the *total* E & B fields in every particle—even if the E & B fields combine to form a neutral particle like a neutrino—or, are they simply the *net* gravitational force from the *net* E & B fields of "non-neutral" particles such as, the electron, the proton, and even higher nuclei that "contain" protons and neutrons?" At this point, I hypothesize that the gravitational field is a result of the *total* E & B fields, *not* the *net* E & B fields. One reason I believe this is because neutrinos are assumed to have no net electromagnetic fields, therefore, they must have a gravitational field, or they would have no measurable properties! What theory requires any particle with no traits? Furthermore, I hypothesize the mass of a particle is induced electromagnetic mass from acceleration.

This particle model assumes that the currently used convention that nuclei "contain" separate particles of neutrons and protons is an incorrect but useful convention, and that nuclei are actually higher harmonics of these balls of light. For example, I hypothesize an alpha particle—a Helium nucleus—is not 4 *separate* balls of 2 protons and 2 neutrons clinging to each other as a result of the strong nuclear force, but rather *one* very stable harmonic of electromagnetic and gravitational fields in the shape of one sphere. When an alpha particle decays, it prefers to decay into protons and neutrons because they are smaller harmonic frequencies. However, the alpha particle can decay into other particles, most of which are not stable, causing a further cascade of decays until harmonic frequencies are reached. If this assumption is correct, then the strong and weak forces are also simply conventions that help to explain how these balls of light may combine and decay.

The mathematical derivation of known particles beyond an electron using the spherical harmonics of electromagnetic fields is beyond the scope of this paper and the author's mathematical capability. An educated guess of the fourth harmonic helps to outline some difficulties.

According to this model, the gravitational force law is dynamic, not static. A particle with a constant velocity in a straight line will continue in a straight line with the same velocity unless it is compelled to change its motion by forces impressed on it, *because* a change in velocity—an acceleration—will immediately induce electromagnetic forces in the particle which resist the acceleration or deceleration of the particle. This resistance is a result of the induced mass created by the acceleration. In other words, mass is the physical property of particles that appears as a resistance to change in its motion as a result of an induced gravitational field. No matter which direction one of these balls of light is accelerated there will be induced E and B fields, increasing the ball's gravitational field—and its mass. This is effectively the why to $F = ma$. Stated equivalently, a particle—whether at rest, or with a constant velocity, with respect to the speed of light—has a gravitational force field, and when it is accelerated, it has a greater gravitational force field, induced by acceleration, that can be thought of as mass when integrated over the surface of the ball of light.

Therefore, the current static geocentric gravitational force law works only for objects moving through the universe at approximately the rate earth is hurling through the universe. In other words, the traditional gravitational constant—G—is not a constant. Instead, it is a function of velocity.

I assume that the current geocentric "rest" electron is not truly at rest. I believe the earth has a complex motion that, at the minimum, is a factor of its: axial spin, solar orbital velocity, galactic orbital velocity, and galactic motion with respect to the center of the universe. While we may never be certain of all of these known variables, and potentially other unknown variables, the speed of the earth with respect to an expanding ball of light can still be estimated using equation 1c. Using

current constants for the "rest electron" and this theory, the motion of the earth with respect to the universe—or, an expanding sphere of light—is approximately 40.6 kilometers per second. This value is greater than the earth's orbital velocity with respect to the sun—29.8 km/sec—but much less than the estimated value of the galactic orbital velocity—250 km/sec—which suggests that the current direction of the earth's motion in its galactic orbit is roughly towards the center of the big bang. If this is correct, it has significant cosmological implications, as well as implications for how earth's geological structure has developed.

This theory does not require ether. No medium is required for this theory. This ball of light theory is based only on whether there is a maximum speed in the universe. If a higher speed than the speed of light is obtainable, then all that is needed is to redefine time using the higher speed. If "infinite speed" is possible in the universe, then this model is invalid.

One question I can not answer is, "Are these balls hollow, or solid?" At present—for numerous reasons—I assume these balls are hollow. This point may be irrelevant.

This theory derives the critical electron radius, and Planck's constant. The radius of the traditional rest electron—at rest on earth—is determined by c, π, m_e and h/2. (The derivation will be shown later.)

Equation 2 $$r_e = \frac{3h}{4\pi m_e c}$$

This may be the "why" to the quantum. Note: all constants are set, h can be derived. Note: both equations 1 and 2 imply that the "rest" electron's radius and mass are not constants. However, they are effectively constants for humans traveling on earth at this point in history in earth's galactic orbit.

In order for a particle—other than a photon—to reach c, a particular ball of light would have to have a zero radius—which is impossible since the key equations in grand unified theories "blow up" at zero radius. However, there is a minimum radius that a particle must have just before the ball decays into its component radiations instead of getting smaller.

Equation 3 $$r_{\min} = \frac{r_e}{c}$$ (This is for SI units. If $c \equiv 1$, then this equation is an identity.)

Combining equations 2 and 3, Plank's constant can be derived as:

Equation 4 $$h = \frac{4\pi r_{\min} m_e c^2}{3} \rightarrow \frac{h}{2} = \frac{2\pi r_{\min} m_e c^2}{3} \rightarrow \frac{h}{2} = 2\pi r_{\min} \frac{m_e}{3} c^2$$

This is a critical equation in the overthrow of Einstein's relativity—specifically for the portion of relativity on length contraction and mass dilation. It is immediately evident from equation 4 that for any of these balls of light, as r approaches r minimum, mass approaches a maximum.

Balls of light may or may not have a net angular momentum depending on the particular combination of waves.

Equation 5 $$l = s\frac{h}{2\pi} = s(\frac{2r_e m_e c}{3}) = s(2r_{\min}\frac{m_e}{3}c^2) \rightarrow s = 0, 1/2, n, n+1/2$$

I assume some combinations of balls of light would be odd, figuratively—the resulting instability leading to decay. For example, a helium nucleus—a stable resonant harmonic frequency—is one ball of light that decays into 4 stable balls of light (2 neutrons and 2 protons—each also a stable resonant harmonic frequency) plus photons, and possibly neutrinos, as needed depending on the original energy level of the helium nucleus. However, the proton is a resonant harmonic frequency that appears to have no *stable* resonant frequencies—between it and an electron—that it can *directly* decay into. The theorized quarks that compose the proton are apparently not resonant harmonic frequencies. When particles decay, they must decay into stable resonant harmonic frequencies, or further decays will occur until stable resonant harmonic frequencies are reached. If the proton is the first important resonant harmonic frequency after the electron, with a charge that is opposite that of the electron's, then, this may be why the universe appears as it does.

Note: when high velocities are plugged into equation 1 it implies forces are generated that would tend to keep non resonant harmonic frequencies of balls of light together longer. In other words, particles do not simply "live" longer because time dilates.

The weak and strong forces are simply the traditional forces used to describe how these balls of light combine and break apart. While not derived in this paper, examples will be shown that may point to their solution.

I hypothesize electromagnetic waves that satisfy certain conditions of wavelength and polarization can create a gravitational field using the idea of superposition—even if the electromagnetic fields forming the waves come from different "sources" so-to-speak. Thus, I believe the photon is the carrier for gravity. This explains how electromagnetic waves can pass through two slits and still combine to create the particle-like photon. This explains why electromagnetic fields can behave both as waves *and* particles. Photons and particles of matter are spherical electromagnetic waves with a mass quality. However, because these balls of light are "standing waves", they are much more than "wave packets" and do not dissipate as they travel.

I believe photons can "wrap" around other balls of light—including a certain "correct kind" of photon with the correct wavelength and polarization. The details of this "wrap" are determined by:

the radii of the balls—or equivalently, to the relative wavelengths, or, the circumferences of the balls—and the different permutations of the E & B fields when they collide—in other words the polarizations. This corresponds to the "shrink" and "turn" in QED. This wrapping of the photons around electrons explains QED phenomena such as: partial reflection of light in glass; and other optical effects, such as the bending of light waves or the splitting of white light in a prism. Different wavelengths of light "wrap" around same size electrons a different number of times. If the wavelength is just right, then there is nothing left over, and the photon "combines" with the electron and a new harmonic frequency of the electron is created—it has a new energy level. If the wavelength is not an integral of the electron, then the wave is "emitted" from the electron—it "unwraps" from the electron so-to-speak.

This may explain why the speed of light "appears" to slow through mediums versus through a vacuum. I hypothesize that the speed of light does *not* actually "slow" at all. All that happens is the path of the photon is increased as it automatically wraps around every ball of light it comes across. In most cases the photons wrap around electrons because the wavelengths and polarizations are more likely to be correct. In rare cases—when the photon has a small enough wavelength—it might be possible for the photon to interact with the nucleus. The photons can change direction as a result of interaction with another ball of light. (I have decided to be more bold and state that the speed of light never changes—ever. All phenomena where the speed of light seems to slow must be reevaluated based on this. For example the index of refraction of a material would be an indication of exactly how much the travel distance of photons is increased in a particular substance.)

The, so called, "missing mass" of the universe would be explained by both: the hard to observe neutrinos; and equation 1. This new dynamic gravitational force law implies "induced gravitational forces"—or, in other words "induced electromagnetic mass."

Time

The key to this theory is understanding time. The traditional technique for adding velocities is:

Equation 6 $v_1 + v_2 = v_3.$

This technique allows v_3 to be greater than c. The Lorentz transformation for time prevents this by slowing time in a reference frame moving with respect to an earth-bound reference frame—but it does so illogically. In SI basic units "time" is defined to be a basic unit. In the SI system "velocity" is a derived unit—deriving its meaning from the basic units of length and time—not a basic unit. The Lorentz transformation for time treats time as a function of velocity. Therefore, time derives its meaning from velocity. This circular definition is the inherently illogical. Cased closed, Einstein's theories of relativity are illogical. A better solution is possible anyhow.

The SI unit for time is a second. A "second" is a constant motion that is approximately 86,400 times the apparent motion of the sun crossing the sky for an earth-bound observer. For every time the sun appears to circle the earth once for an earth-bound observer, the second hand circles the dial-face of a clock 1440 times. If there was a fourth hand on the dial-face of a clock, which circled the dial-face once in one second, then this fourth hand would spin around the dial-face 86,400 times in a day. Of course, physicists no longer use the "solar" second but instead use the "atomic clock" second. While the atomic clock's second defines this sublight definition for motion in a very precise manner, it still approximates a multiple of the sun's apparent motion for an earth-bound observer. Most importantly, the atomic clock's "second" is still *a sublight definition for time.* Let me repeat this to be absolutely clear: both the traditional "solar second" and the "atomic clock second" are sublight definitions for time. The problem with this is, if a "second" is said to have a motion of v_2 then a clock moving at a velocity of v_1 potentially could lead to motions faster than c. The better solution is, instead of slowing all moving clocks to the geocentric definition of a second, I propose speeding them up. Take the fastest known motion in the universe—presently the speed of light in free space—and redefine time to travel at that motion. All motions would be defined as fractions of this speed. If a faster speed is discovered, then redefine time to travel at that faster speed.

Note: this is not a theory for time. It is a definition for time. While theories can be wrong, a definition is something people agree on. If people treat time as *a constant quantity of motion,* and use this constant quantity of motion to *measure all other motions,* then we are compelled to adopt this new definition for time. There is no possible compromise here.

The error in the traditional technique for adding velocities using equation 6 was in the denominators of v_1 and v_2. The denominators in each fraction were not equal. Using the speed of light to define time, all motion measurements will have equivalent denominators in all reference frames.

Therefore: Time ≡ c which should be ≡ 1

Therefore: Since c ≡ 299,792,458 meters per second in SI units:

One second ≡ 299,792,458 meters in SI units.

(Note: the author rarely uses c ≡ 1 in this paper. Most equations are treated in SI units. However, there are places where this transformation between length and time are needed. One example is equation 3 where a distance is divided by 299,792,458. This is logical, with the correct units, c could be equal to 1 and equation 3 would become an identity. Another example is in the section on space—two paragraphs down.)

Measuring motions

To correctly measure a motion divide the distance an object travels by the distance light travels. If added correctly, then all instances of: $v_1 + v_2 + v_3 + v_{\ldots} + v_n \leq c$ by definition.

Space

Traditional 4-dimensional space-time treats the axis of time as mutually independent from the 3 dimensions of space. If one second is ≡ 299,792,458 meters, then 4-dimensional space-time reduces to 3 dimensional space.

Current doctrine treats space as having curvature. I do not treat space as having curvature or straight-line properties. I believe space is inherently unobservable, and that we should not assign *any* attributes to space other than to say the universe exists in space. If one theory has a property assigned to space, there is another equally valid parallel theory that assigns that property to something other than space. (Note: a similar argument was given earlier with the example of the neutrino. It must have measurable properties, otherwise, why need it?)

The factor $\sqrt{1-\frac{v^2}{c^2}}$

This factor from the Lorentz transformations appears in every relativity equation. Why? What does it physically represent? I believe it can be explained with some simple analytical geometry.

The general equation for a sphere is:

Equation 7 $$\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=r^2$$

If the sphere is centered at the origin, then its equation is:

Equation 8 $$x^2+y^2+z^2=r^2$$

If the shell of the sphere is expanding at constant velocity, then:

Equation 9 $$\frac{x^2}{t^2}+\frac{y^2}{t^2}+\frac{z^2}{t^2}=\frac{r^2}{t^2}=v_x^2+v_y^2+v_z^2$$

Next, imagine two spheres positioned so they are concentric, the outer one expanding at the speed of light, the inner one at a sublight velocity v. The difference between the two spheres' expansion rates would be:

Equation 10 $$\Delta V_{(x,y,z)}=\sqrt{\left(c_x^2+c_y^2+c_z^2\right)-\left(v_x^2+v_y^2+v_z^2\right)}$$

The difference between the two spheres' expansion rates—in just the x direction would be:

Equation 11 $$\Delta V_{(x)} = \sqrt{c_x^2 - v_x^2}$$

Now at this point, I should remind the reader that the unit for time in the denominators in equations 9, 10 & 11, for both the c's and the v's, are the traditional "seconds." Equation 11 contains the difference between two velocities—both of which are fractions. In order to add or subtract fractions they must have identical denominators. The denominators in equation 11 are not identical for every reference frame. They can not be subtracted in this case. To eliminate this error, these denominators can be "eliminated" so-to-speak, by dividing by c. In other words, if you divide a traditional velocity V by c, then:

Equation 12 $$\frac{\frac{\Delta x}{\Delta t}}{c} = \frac{\frac{\Delta x_{measured\ length}}{\Delta t_{traditional\ second}}}{\frac{\Delta x_{measuring\ length}}{\Delta t_{traditional\ second}}} = \frac{\Delta x_{measured\ length}}{\Delta x_{measuring\ length}}$$

This eliminates the traditional seconds in the denominators and creates a true measure of motion. Thus, the distance an object travels is measured, and is divided by the distance light travels—"in the same time." This results in a dimensionless ratio without the error of the traditional geocentric definition of a second.

Therefore, to eliminate the error in equation 11, divide by c squared:

Equation 13 $$\frac{\Delta V_{(x)}}{c} = \sqrt{\frac{c_x^2 - v_x^2}{c^2}} = \sqrt{1 - \frac{v_x^2}{c^2}}$$

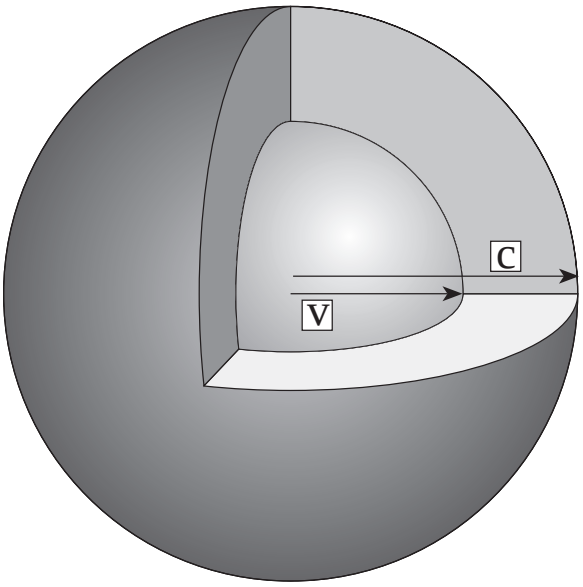

Figure 1

This is "where," so to speak, the Lorentz factor comes from.

Equation 14 $\Delta V = \sqrt{1 - \frac{v^2}{c^2}}$

The delta V—a ration of two distances—is simply the difference in velocities in one direction between the inner and outer expanding spheres. Geometrically, this factor is a one dimensional transformation between the geocentric sublight definition for time—the second—and best known universal definition for time—the speed of light in free space. If a geocentric clock is in motion, it develops an error proportional to this amount. This transformation is not needed if time is defined to travel at the speed of light in free space instead of at the speed of a "second."

I believe, understanding time is the key that unlocks everything else.

Symmetry of the sphere

In my study of time I came to appreciate the beauty of the symmetry of the sphere. In a 3-dimensional space, I believe that it is the most symmetrical form. While pondering spheres, I asked, "What if electromagnetic radiation can collide to create standing waves in a spherical form? How would they act and react?" These questions led me to a seemingly inexhaustible number of other questions. One of the first to come up was the statics of the forces. In other words, if the electromagnetic forces spinning around the center of the sphere could create a standing wave—**on their own**—then what is to be made of the "left over" central acceleration around the center of the sphere? Is this gravity? In this particle model I hypothesize that this central acceleration is gravity.

The Poynting vector

The inspiration that led to think of mapping the electromagnetic forces over a sphere occurred back in 1985 while working with spheres and time. Another significant event that inspired me to keep working on this particle model occurred when I was reviewing basic physics theory and reviewed a section on the Poynting vector. It contained the critical cross product of E cross B, and explained a light-wave phenomenon that had mass-like qualities like momentum. Understanding this cross product seemed to be critical.

The Poynting vector is a measure of energy flow per unit area. It will be shown that the basic cross product of E cross B on a sphere is a central pointing force, and is similar to the Poynting vector. They differ by only a constant. All that is needed really is a new constant.

Equation 15 $\vec{E} \times \vec{B} \cong \vec{G}ravity$

Equation 16 $\vec{S} = \frac{1}{\mu_0} \vec{E} \times \vec{B}$

Note, equations 15 and 16 both contain the concept of mass. The units of E cross B are kilograms per cubic second. Noting that seconds represent motion, but can be equated to lengths, it can be argued that this is like saying that E cross B is proportional to mass per unit volume. This is not quite correct though because time represents motion not length. Again, remember, mass is a quality of particles that only appears when it is induced by acceleration.

If equations 1b and 1c are not presented in a mathematically correct form, then I'm sure that someone else can still extract the mass from the relation 1a.

Another guiding concept for me was Gauss's law of gravitation. His version describes that gravitational force law as:

Equation 17 $$\frac{1}{4\pi G}\oint \vec{g} \bullet d\vec{s} = -m$$

It an easy leap from this equation to: first, suspect the old gravitational force constant G; second, hypothesize a new gravitational force constant will be needed—G_N; third, plug in E cross B and hypothesize:

Equation 18 $$\frac{1}{4\pi G_N}\oint \left(\vec{E} \times \vec{B}\right) \bullet d\vec{s} = -m$$

The mathematics of this integral is beyond my skills. However, I should note that the general form of the mathematical relation:

Equation 19 $$(a \times b) \bullet c$$

is sometimes used to calculate volume.

I will not try to develop equation 18 further—I wasted years trying it. However, the equations I eventually obtained—1b and 1c—resemble equation 18.

Building a Ball of Light

To prepare the reader to visualize these spheres as I do, I will walk through the steps of building a ball of light.

Again, the equation of a sphere centered at the origin is:

Equation 20 $$x^2 + y^2 + z^2 = r^2$$

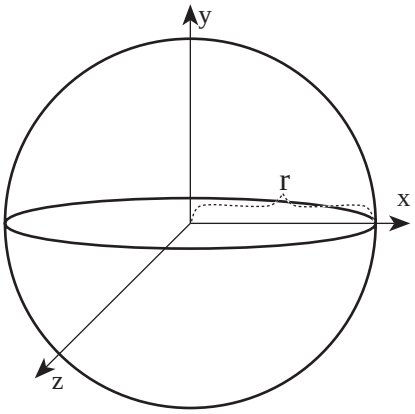

Figure 2

I spent quite a bit of time struggling with notation—trying to come up with the best way to describe my signage. I had quite a few pluses and minuses. The best technique that I've devised so far is to use one nappe of a double circular cone. The equation for a circular cone with the x-axis through its center is:

Equation 21 $x^2 = y^2 + z^2$

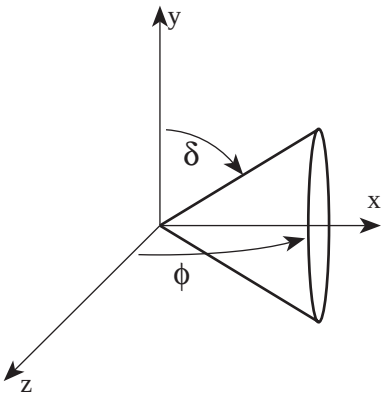

Figure 3

The biggest advantage of using this cone to describe what is happening is that the two angles δ and ϕ are identical. This is like eliminating a variable that really isn't a variable. If r is constant, then the only variable is the central angle of the cone. As will be shown later, the radius "r" will be both a constant and a variable—depending upon at what point in the theory you use it. Even the central angle of the cone is a constant in one sense—when it is expressed in terms of angular velocity—as will be shown later. At this point you can already start to see why nature acts in a quantum-like fashion since the variables are dropping like flies. If the cone is combined parametrically with the sphere, we have, geometrically:

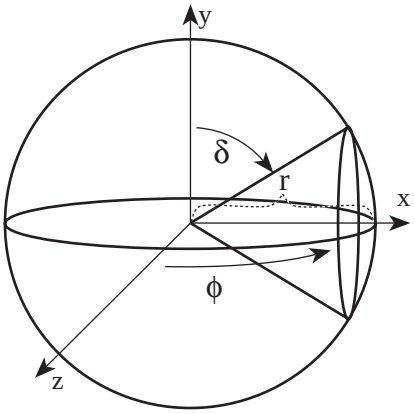

Figure 4

I will no longer use the two angles δ and ϕ. The central angle of the cone is what is important. The central angle of the cone can vary from 0 to 2π. As will become more evident later, this is critical—this range represents *one* wavelength. This wavelength is equivalent to the circumference of the sphere.

The key feature of this parametric combination of cone and sphere is their intersection, which forms either a circle or a point. The intersection of the circle sweeps across the sphere as the central angle of the cone varies from 0 to 2π. (Note: when describing how a photon propagates or how a photon combines with another ball of light such as an electron, angles higher than 2π are needed.)

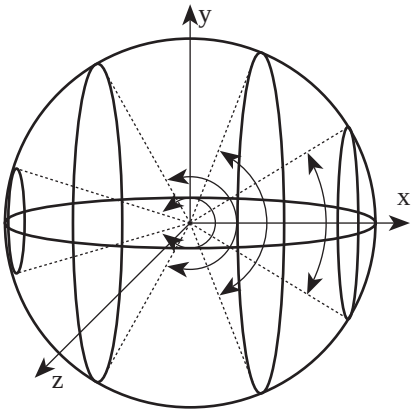

Figure 5

The description of what happens at the nodes—0, π and 2π—is very important. Let me remind the reader of the important equation:

Equation 22 $E = cB$

If units are chosen so that, Time ≡ c ≡ 1, then:

Equation 23 $E = B \rightarrow \frac{E}{B} = 1$

This relation shows the magnetic field is simply the inverse of the electrical field. Further, while the mathematics that I know of can't handle the description of the nodes, the fields don't seem to necessarily vanish to zero at them.

Now here is where I make an important analogy in order to visualize the strengths of the electric and magnetic fields over the surface of the sphere. I pretend that this circle—the intersection of the cone and sphere—is like a wire that contains a constant electrical charge—that creates an electrical field. This electrical charge is constant around the circumference of the wire circle—but its electrical field varies in strength as the circular wire sweeps across the sphere. (Note: we are only concerned here with the strength of this electrical field at the radius r.)

As the wire sweeps between the angles of 0 and π, the constant electrical charge is being spread out—thus, the electrical field diminishes in strength. Between the angles of π and 2π the constant electrical charge is being concentrated—thus, the electrical field increases in strength.

Before continuing, I would like to reflect figure 5 along the y-axis. The reason is, as the angle increases it gives the impression of a motion from right to left. I simply prefer to convey this motion from left to right. Therefore, when reflected over the y-axis, figure 5 would appear like:

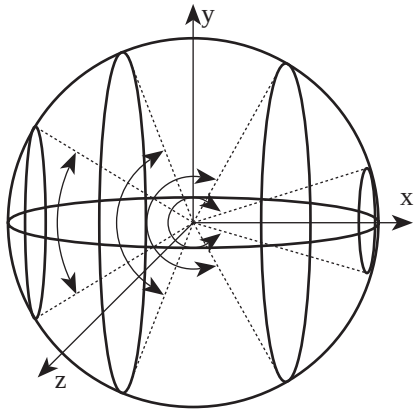

Figure 6

To summarize, we have a sphere, combined parametrically with a cone, which has a central angle, which varies from 0 to 2π, the intersection of which represents a fictitious wire circle, which moves from left to right, conveying a motion. The wire contains an electrical charge that is constant around the wire but creates an electrical field that varies as it sweeps across the sphere. Between the angles of 0 and π, the strength of the electrical field is decreasing, between the angles of π and 2π, the strength of the electrical field is increasing.

Since the central angle can be equated to sines and cosines, I assume: that as the central angle spreads from an angle of 0 radians, the electrical field decreases from a value of 1 and reaches a value of 0 at π, then increases to 1 again as it approaches 2π. Note: earlier I stated that the wire has a

constant charge, but now say the electrical field varies from 1 to 0 and then back to 1. This is not a contradiction but has to do with how the energy in the electrical field converts into the energy in the magnetic field as the fictitious charged wire sweeps across the surface of the sphere. Therefore, what I am saying is that the total electrical and magnetic field strength over the sphere is constant.

What is the speed at which the circle sweeps over the sphere? I add another parametric equation and define it to be the speed of light. Thus, while this angle can vary, the angular velocity can not.

Equation 24 $$\omega = \underbrace{\lim_{\Delta t \to 0}} \frac{\Delta\theta}{\Delta t} = \frac{d\theta}{dt} \equiv c$$

The speed of light is our clock here—as always. (By the way, I believe this constant angular velocity is the real "clock" in QED.)

This constraint is very important. Because of this constraint, when a ball of light is "at rest" and has a particular radius r_0, this radius must shrink when the particle is accelerated to a higher velocity. Otherwise, some point on the surface of the sphere will have a motion greater than the speed of light.

One other minor point, at this stage I treat the balls of light as being at rest, setting the radius equal to one for simplicity.

Equation 25 $r = 1$

Applying E and B fields

In this section I will continue to build a ball of light. It covers the most important idea, applying the electric and magnetic fields to the surface of the sphere. Two of the most important physical observations in physics are: if you change the strength of an electrical field, it induces a magnetic field; and if you change the strength in a magnetic field it induces an electrical field.

Using:

Equation 26 $$\oint \vec{E} \bullet d\vec{s} = -\frac{d\Phi_B}{dt}$$

and the approximation:

Equation 27 $$\oint \vec{B} \bullet d\vec{s} \cong \frac{d\Phi_E}{dt}$$

while ignoring the constants—which we may wish to change—we see that: as the fictitious wire circle sweeps across the sphere with a constant angular velocity c, the changing electrical field on the wire would induce a magnetic field around the sphere at right angles to the direction of travel of the electrical field.

Figure 7 shows the direction of rotation of the magnetic field (in magenta) for one location on the left side of the sphere as the electric field (in blue) sweeps from left to right over the surface of the sphere.

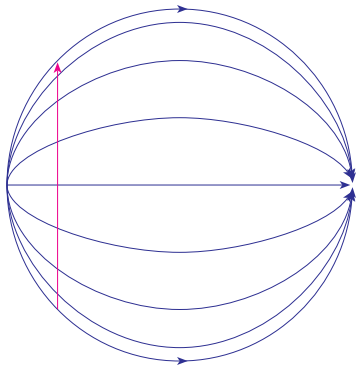

Figure 7

Note: I could, and later will, sweep a magnetic field across the sphere. I describe the field that is being "swept" across the sphere from pole to pole as the primary field. I describe the "induced" field as the secondary field.

I follow the right-hand rule at this point, but note that the left-hand rule is completed acceptable, complimentary, and symmetrical.

Referring to figure 7, apply the right-hand rule. Here the direction of travel—left to right—is arbitrarily chosen to be positive, but the flux of the electrical field is negative—it is spreading out—so the direction of the magnetic field is opposite of the right-hand rule. The circle for E gets bigger on the left side of the sphere and smaller on the right side. Specifically, field strength E is decreasing between 0 to π and increasing between π to 2π.

Therefore, the flux of the electric field is negative on the left, positive on the right. Therefore, the electric field obeys the negative of the right-hand rule (i.e., the left-hand rule) on the left side of the sphere.

The electric field obeys the right-hand rule on the right side of the sphere because the flux of the electric field is positive—and the direction is still positive. This is explicitly displayed in figure 8.

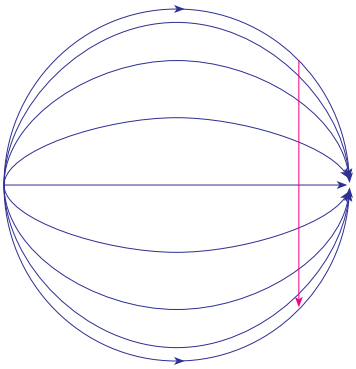

Figure 8

The reverse direction is explicitly displayed in figure 9. Here, because the circle sweeps from right to left, an extra negative sign is added for this reverse direction.

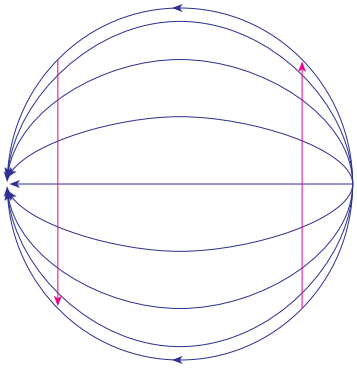

Figure 9

Two sample points are shown in figure 9, one for each side.

Note how the magnetic field must change direction at the vertical equator. Note how the electrical field changes direction at the end nodes.

I treated the Electric field as the primary field for this example while using the right-hand rule. Alternatively, the magnetic field could be treated as the primary field, inducing electrical fields. Furthermore, either field could be treated as the primary field while using the left-hand rule. See Table A for a complete representation of each of these symmetries.

I stressed that this circular wire is fictitious. These balls actually represent whole waves, where one wavelength is represented by the cones central angle sweeping from 0 to 2π. There is no need to have a wire "move" across the sphere because the sphere is a 3-dimensional snapshot of the wave. However, the fields are moving over the "surface of the sphere" at the speed of light. You can't break the wave up, so-to-speak, into smaller chunks. I used this wire technique simply to allow me to visualize and measure the field strengths at each point on the sphere. Furthermore, there

is no real underlying conducting sphere that these fields move across. No conductor, no medium, no ether is involved. The standing waves create the sphere.

To summarize, the parametric equations for an "at rest" ball of light are:

Equation 28 $x^2 + y^2 + z^2 = r^2$

Equation 29 $x^2 = y^2 + z^2$

Equation 30 $\omega = \underbrace{\lim}_{\Delta t \to 0} \frac{\Delta\theta}{\Delta t} = \frac{d\theta}{dt} \equiv c$

Equation 31 $\oint \vec{E} \bullet d\vec{s} = -\frac{d\Phi_B}{dt}$

Equation 32 $\oint \vec{B} \bullet d\vec{s} \cong \frac{d\Phi_E}{dt}$

Equation 33 r = 1

Is it gravity?

Note that, if two of these spheres traveling in opposite directions are superimposed, then their electric and magnetic fields would exactly cancel each other, but analyzed individually, each field is still accelerating around the center of the sphere. Note: the relationship of E cross B can be expressed, and that the cross product always points to the center of the sphere. Note: while the E and B fields of 2 opposite traveling spherical waves would cancel, their central pointing cross products would still exist and add together. In other words, there would be a standing field of something around the center of the sphere. I hypothesize that this something is the gravitational force field.

Equation 34 $\vec{E} \times \vec{B} \cong \vec{G}ravitational\ Field$

To obtain the correct signs for the fields, the simplest technique is to worry only about the direction—to the right is positive, to the left is negative—and the changing strength of the primary field. If E is the primary field, and if:

Equation 35 $\frac{d\Phi_E}{dt}$ is increasing then, the sign is positive.

Or, if:

Equation 36 $\frac{d\Phi_E}{dt}$ is decreasing then, the sign is negative.

The Balls of Light—Table A

All possible combinations of E & B fields—treating each as the primary field—and using both the right-hand and left hand rules are shown in Table A. Table A uses blue to represent the Electrical field, magenta to represent the Magnetic field, and green to represent the gravitational field. The right-hand rule is represented by red. The left-hand rule is represented by orange. The primary field changes direction at the poles. The secondary field changes direction at the equators. Each ball of light has two sample points analyzed to indicate the direction of the gravitational field. Carefully inspect this table, note the symmetries.

The small boxes contain the notation: if the primary field is moving left to right, then x is positive; if the primary field is moving from right to left, then x is negative; if the primary field is spreading out, its density is decreasing; if the primary field is contracting, its density is increasing. The net result of this notation is: as the electrical field becomes weaker, the magnetic field becomes stronger; and as the magnetic field strength becomes weaker, the electrical field strength becomes stronger.

The first harmonic

In the simplest case take an electric field and sweep it across the surface of a sphere from left to right. It would look like this.

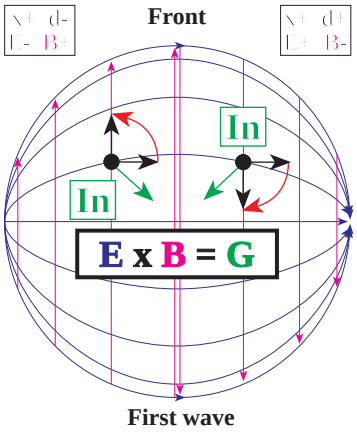

Figure 10

Examine this particle to see if the E & B fields are described according to classical electromagnetic theory. Notice that when you use the right-hand rule the gravitational field points to the center at the two sample points. This is the first harmonic. In essence, I hypothesize this is a photon moving from left to right.

Next, what if the electric field “rebounds” so-to-speak at the right node? Normally, it wouldn’t of course—but what if it did? Then the wave would sweep back to the right like this.

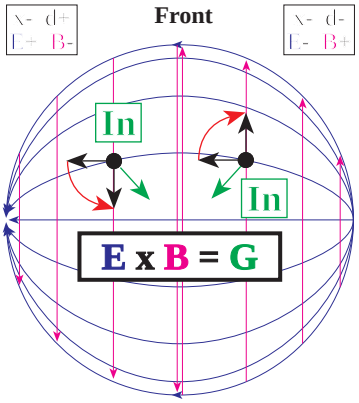

Figure 11

Note how it is exactly symmetrical in every way. This is another example of the first harmonic. Now, where does this wave come from? It doesn’t really simply “rebound” on its own. It is another photon, simply moving from right to left. However—this is very important—this photon is not simply the “back” view of the first photon in figure 10. It is a photon that is polarized 180° out of sync with the first photon. Compare in Table A the differences between the ball in 1b and its back in 1d, versus the second ball in 1f and its back in 1h. The ball in 1d does not have the same field directions as the ball in 1f. They are two opposite polarizations. Therefore Table A shows 2 polarizations each for: electric matter and anti-matter, and for magnetic matter and anti-matter. Eight possible polarizations—the “Eight fold Way”!

The second harmonic

Next, I asked, “What would happen if two opposite polarized first harmonics were combined?” What if the first photon met the second photon—see figures 10 and 11, or Table 1b and 1f—in a head-on collision? I believe, they would create a standing wave of electromagnetic radiation—and, the E and B fields could hold the ball of light together “by themselves” so-to-speak.

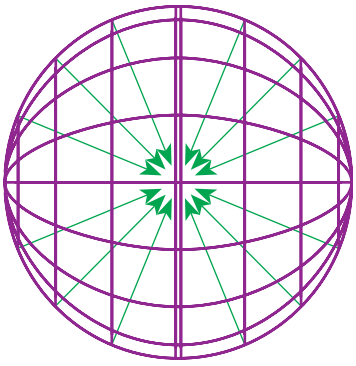

Figure 12

Figure 12 contains green central vectors. They are assumed to exist for every point on the sphere—except perhaps at the end nodes and at the equator—and always pointing to the center of the particle. (I do not attempt to mathematically describe the nodes and the equators in this paper but note that as the limit approaches π or 2π or any multiple of π, the limit never "vanishes" since π is a number that can never be calculated to total precision! In other words, this theory could have no zeros except at the moment of creation!)

What is to be made of this net vector towards the center? I believe, it is the gravitational field—or, when integrated over the surface of an accelerated or decelerated particle, it is mass.

This combined particle would have: neutral E and B fields; a small gravitational force; a mass when accelerated or decelerated; spinning E and B fields with angular momentum; and the total energy equal to the energy of two photons—sounds like a neutrino to me. This is the second harmonic. (This harmonic might also be called by an equivalent name, the "graviton," but I prefer "neutrino" because gravitons were predicted to be the "carrier" for gravity, and as already stated, I believe photons are the main carriers of gravity. I will show later that E & B fields can superimpose. Thus, plain electric fields and plain magnetic fields could combine in unusual circumstances to also create the gravitational field.)

Balanced cones

Pick any 2 equal and opposite central angles for the cones for the second harmonic, such as at π/2 and 3π/2. Note that the cones of gravitational forces for those angles are equal and opposite.

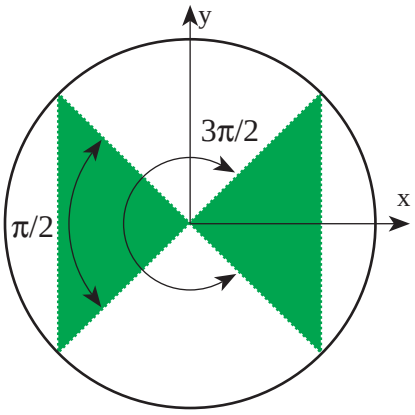

Figure 13

This is part of the reason why the two photons "want" to combine so-to-speak. The gravitational forces of the two photons pull them together. Is this the strong nuclear force? No, I

believe the strong nuclear force is the *combination* of the electromagnetic and gravitational forces that hold the particle together.

Unbalanced cones (i.e., The propagation of light)

The first harmonic—the photon—does not have equal *and* opposite cones. For example, at the angle 0, the cone for the first harmonic is spreading, while the cone at 2π is coming together. While the two cones have an equal force, they are not opposite. Rather they are both conveying a motion of left to right. Therefore, they add.

You might think of the photon as having one cone that is not balanced. When it reaches π, it sweeps around the "corner" so-to-speak, and heads for 2π. However, when it reaches 2π, there is nothing there to "hold it back." Instead of reversing direction—turning tail and moving back to the left—it moves on to the right. This gravitational cone is like the pivot point that the electromagnetic fields of a photon continuously sweep around. I try to give a feel for this in figure 14.

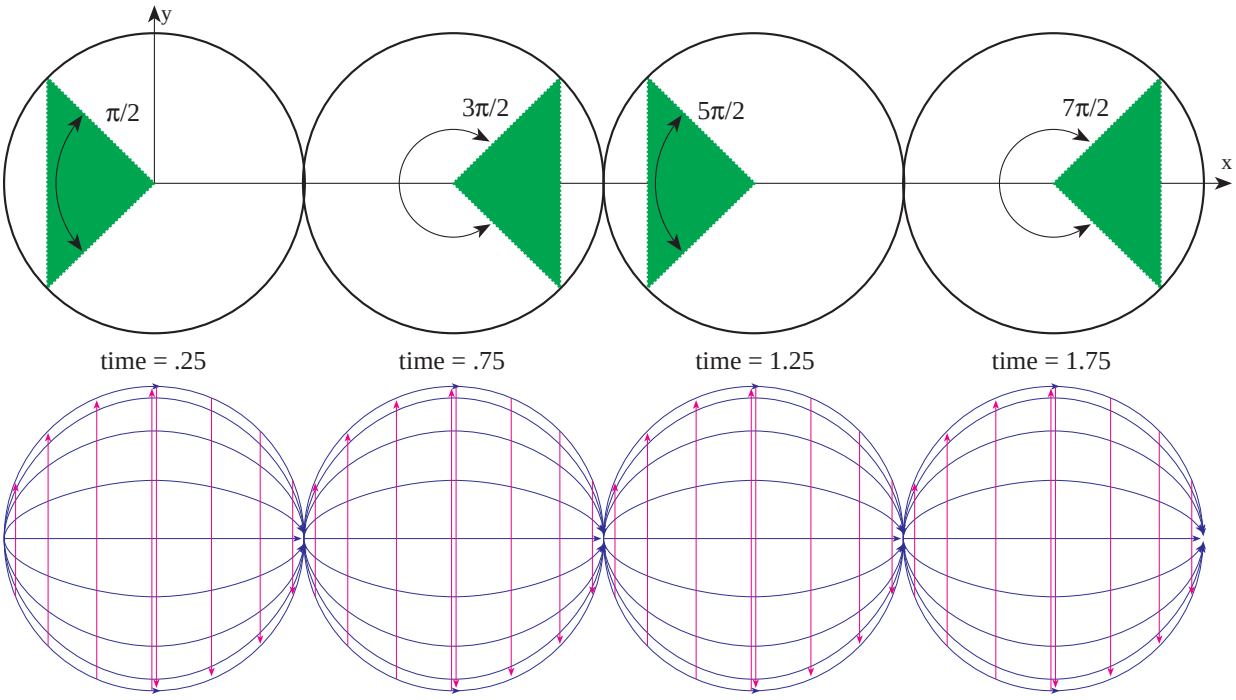

Figure 14

At the central angles of: 0, π, 2π, …, the value of E cross B may be zero—I'm not certain how a mathematician will view these points when analyzing E cross B. My guess at what happens is this. When the central angle has a value slightly less than 0, π, 2π, …, the primary field strength is changing the most rapidly. My intuition tells me that this is sort-of-like momentum, and the momentum carries the fields "through" the nodes. For example, at time = .75 in the figure above, notice how the gravitational cone points to the left. This is as if someone is holding a rope from the

center of the second sphere—while someone swings around it. Then at 2π, it is as if the person lets go of the rope, and another person—at the center of the third sphere—starts pulling on the rope to change the momentum at 2π so that the primary field swings around the center of the third sphere.

I look at these drawings and—in the same thoughts—visualize the photon moving from left to right across the page—feeling it is correct—and wonder if this is really how nature works? Is this how photons propagate? Can this be proved? The part that makes me uncomfortable here is, with the photons I often find myself visualizing them moving in one half wavelength increments, but with balls of light for the second harmonic and up, I visualize in only full wavelength increments. This is one place where I feel uncertain. Maybe, instead of visualizing full spheres, I should be using half spheres for the smallest increments—using half wavelength increments instead of full wavelength increments.

Maybe, all that is needed is a different perspective for the photon. For example, the portion of the wave train from 0 to π, induces the portion from π to 2π, then the portion from π to 2π, induces the portion from 2π to 3π, then the portion from 2π to 3π induces the portion from 3π to 4π, and so on. This is shown in figure 15.

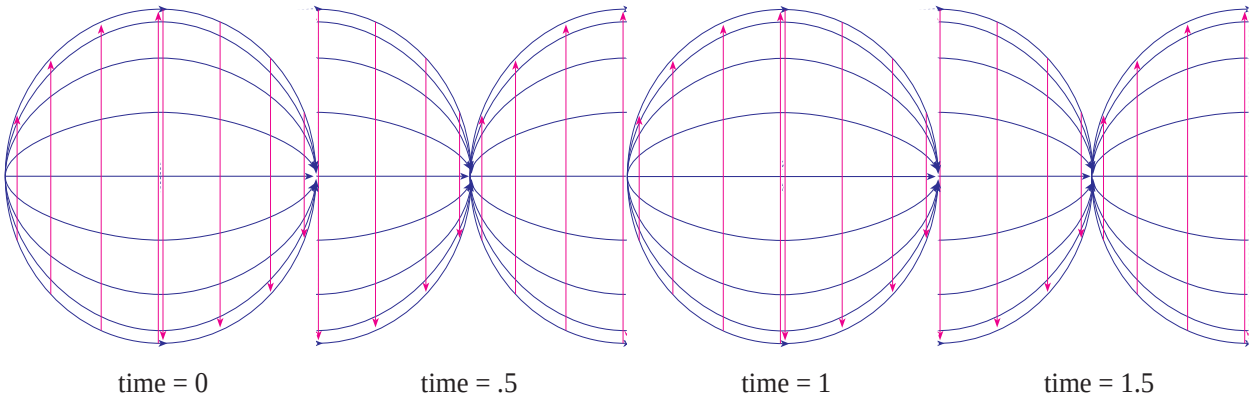

Figure 15

The third harmonic

Now what is to stop us from mapping the first harmonic onto the second harmonic? It would be like mapping another photon onto the rest neutrino? I can't see any reason to stop. The first harmonic can combine with the second harmonic, and "stick" to it so-to-speak, because the balls of light have a gravitational force to pull them together. This next harmonic would resemble the first harmonic, except the photon does not continue moving to the right—with respect to the neutrino—because it is not free of the neutrino's gravity. Instead when it reaches the right node it induces itself to change direction and move back to the left.

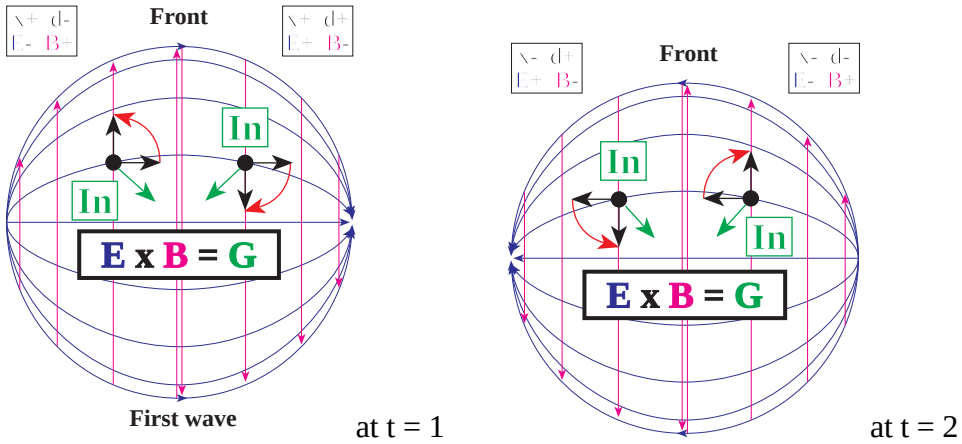

Figure 16

This is the third harmonic. It has a net electrical field that quickly circulates around the particle—effectively radiating outward from the particle in all directions. It also has a magnetic moment. One half of the magnetic field is spinning one way, the other half of the magnetic field is spinning the other way—the total *net* spin is zero. The direction of spin for each half of the magnetic field reverses direction each time the primary field passes a node. I believe this is an electron.

One of the biggest assumptions I could make is that this third harmonic is equivalent to the "rest electron" used classically, as in, "at rest with respect to the earth's reference frame" rather than at rest to the universe's reference frame.

Earlier I suggested that maybe I should be working with half wavelength increments rather than full wavelength increments. If so, it would be like using 1/4 of Planck's constant rather than 1/2 of it. Alternatively, instead of assuming that the first harmonic is proportional to h/2—one half of Planck's constant—it could be proportional to h instead. In essence then, an electron might require 6 multiples of photons. This can be visualized easier in figure 17.

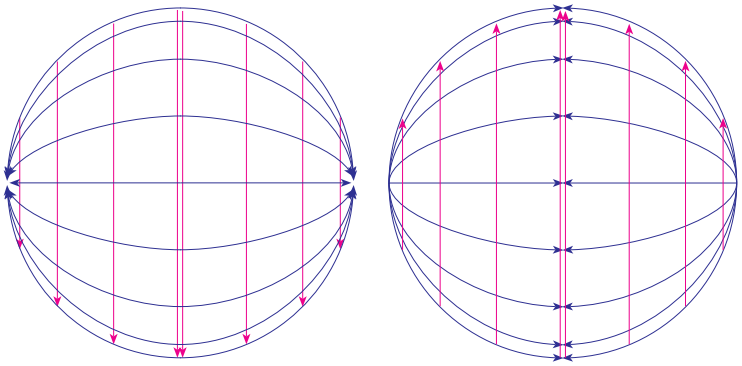

Figure 17

The first 4 photons would combine to make a neutrino as in figure 17—2 diverging, 2 converging—and the last 2 could be 1/2 of a wavelength out of phase, creating the electrical charge over the surface of the sphere. In other words, think of the last 2 waves as being mapped onto a neutrino but are moving away from each other after passing the vertical equator, then towards each when approaching the equator.

I think it is more likely that this figure represents the fourth harmonic, and should be thought of as having a larger rest mass diameter, as will be discussed later.

The possibility that the sphere grows and shrinks is distinct. When the particle is moving faster it would be smaller. When it is moving slower, or, when it is at rest, it would be bigger.

Before continuing further with the general analytical geometry, some specific formulas are needed.

Equating a photon to an electron

At this point we can derive Plank's constant and some other features of these balls of light. One of the critical questions is, should we use h, h/2, or h/4 as our smallest quantum increment and should it represent a full wavelength or a half wavelength? On the basis of standard theory, I will use h/2 and it equate it to a full wavelength.

- What if photons can make electrons?
- First, assume the wavelength of a photon would be equal to one "trip" around a "ball of light"—one wavelength.
- The energy of a photon is:

  Equation 37 $E_{photon} = \left(n + \frac{1}{2}\right)h\nu \rightarrow n = 0, 1, 2, 3, \ldots$

- However:

  Equation 38 $c = \lambda\nu$ or, $\nu = \frac{c}{\lambda}$

- Therefore, for n = 0:

  Equation 39 $E_{photon\,\min} = \frac{hc}{2\lambda}$

- If photons can make electrons, then their energies can be equated. The energy for a rest electron is:

  Equation 40 $E_{rest\ electron\,\min} = m_e c^2$

- Therefore, since I'm guessing the electron is the third harmonic:

  Equation 41 $E_{rest\ electron\ \min} = 3E_{photon\ \min}$ or, $m_e c^2 = 3\left(\frac{hc}{2\lambda}\right)$

- All values are constants except for the wavelength. Solving for the wavelength:

  Equation 42 $\lambda = \frac{3h}{2m_e c}$

- This wavelength refers to the circumference of the rest electron:

  Equation 43 $\lambda = 2\pi r_e$

- Solving for the radius of the rest electron:

  Equation 44 $r_e = \frac{3h}{4\pi m_e c}$

- Therefore:

  Equation 45 $h = \frac{4\pi r_e m_e c}{3}$

  (Note the similarity of equation 45 to the equation for the volume of a sphere.) and,

  Equation 46 $\frac{h}{2} = \frac{2\pi r_e m_e c}{3} \rightarrow \left[\frac{kg\ m^2}{s}\right]$

  which are the units for angular momentum. (Similar to half of a sphere)

- Angular momentum of an electron is quantisized:

  Equation 47 $l = s\frac{h}{2\pi} = s(\frac{2r_e m_e c}{3}) \rightarrow s = 0, 1/2, n, n+1/2$

- As stated earlier, there is a minimum radius that a ball of light could have just before a ball of light would have to come apart. The actual radius of the ball of light when it does come apart determines the wavelengths of the emitted photons. Examples of this type of total decay occur in nuclear fission or fusion when mass is converted into energy. This is not an example of an electron emitting a photon—a situation where a non harmonic frequency is attempting to reach a resonant state.

  The electromagnetic radiation circles around the sphere at the speed of light for a specific rest mass radius. If the particle is accelerated, then the electromagnetic fields induce greater gravitational forces, pulling the sphere in so it has a tighter radius. The radius shrinks as the particle's speed is increased. Compared to the rest mass radius, a moving ball of light's radius would shrink by a factor of c as it reaches the speed of light.

Equation 48 $$r_{\min} \cong \frac{r_e}{c} \rightarrow c \cong \frac{r_e}{r_{\min}}$$

Note: this is an approximation because of the difference between the geocentric rest mass electron and rest mass electron. If equation 1c is correct, then the error is a result of the motion of the earth with respect to an expanding sphere of light = 40,600 / 299,792,458.

Note: in essence, this is saying that a particle's radius is a function of velocity. This is similar to the Lorentz transformation for length contraction—but it's not ad hoc. (Remember: all speeds are dimensionless ratios. If c is defined to be 1, then this would be an identity.)

- Therefore:

Equation 49 $$\frac{h}{2} \cong \frac{2\pi r_{\min} m_e c^2}{3}$$

Note, half of Planck's constant represents the smallest increment in these balls of light. This equation contains the energy of the particle: mc^2. The mass is divided by 3 because this equation uses an electron which is the third harmonic. The $2\pi r$ is simply the circumference of the sphere—or, alternatively, its wavelength.

- Reevaluating the angular momentum using the minimum radius for an electron:

Equation 50 $$l \cong s(\frac{2r_{\min} m_e c^2}{3}) \rightarrow s = 0, 1/2, n, n + 1/2$$

- Note the similarity of this last equation to the traditional equation for the angular momentum of a thin spherical shell:

Equation 51 $$l = I\omega = \frac{2}{3} m r^2 \omega$$

This is the main reason why I suspect that the balls of light are hollow. Another reason is the primary fields on the surface of the sphere would be repelling each other through the center of the sphere—while the secondary fields attract each other through the centers of the balls of light (This is an important consideration when theorizing about the strong force.).

- Every physics book on quantum physics I have read, always points out something to the affect, that while electrons have an angular momentum, they don't actually spin. Well, I think they do. One half of the electron spins one way. The other side spins in the opposite direction.

Planck's Constant

I've derived Planck's constant 3 different ways:

Equation 52 $$h = \frac{4\pi r_e m_e c}{3}$$

Equation 53 $$\frac{h}{2} = \frac{2\pi r_e m_e c}{3} \rightarrow \left[\frac{kg\ m^2}{s}\right]$$

Equation 54 $$\frac{h}{2} \cong \frac{2\pi r_{\min} m_e c^2}{3}$$

I prefer the second two. I feel h/2 is a more meaningful constant. Each of these equations divides by 3 because they were calculated for the third harmonic, the electron. Thus h/2 is a good constant because it is not based just upon the electron, but is the key constant for all of these balls of light.

As previously mentioned, the second two equations have the 2πr group, which can be interpreted two ways. This group can be thought of as representing either the circumference of the sphere or as the wavelength of the particle.

Variable width radii

The derivations of Planck's constant contain the value of the mass of a rest electron. The first two contain the radius of the rest mass electron. The third contains the smallest radius for an electron. In essence, the radius is inversely proportional to the speed of the particle

Equation 55 $$r_e m_e c \cong r_{\min} m_e c^2 \rightarrow r_e\left(m_e c\right) \cong r_{\min} c\left(m_e c\right) \rightarrow r_e = \frac{r_e}{c} c \rightarrow r = \frac{r_e}{v} c$$

This approaches an identity as the velocity of the particle approaches the speed of light. Thus, each stable resonant frequency of a standing wave of electromagnetic radiation has a variable radius that varies from its maximum to its minimum as its velocity—with respect to an expanding sphere of light—is increased from rest to the speed of light. The geocentric rest electron has almost the same radius as a rest electron.

Graphically, this could be represented with a chart something like:

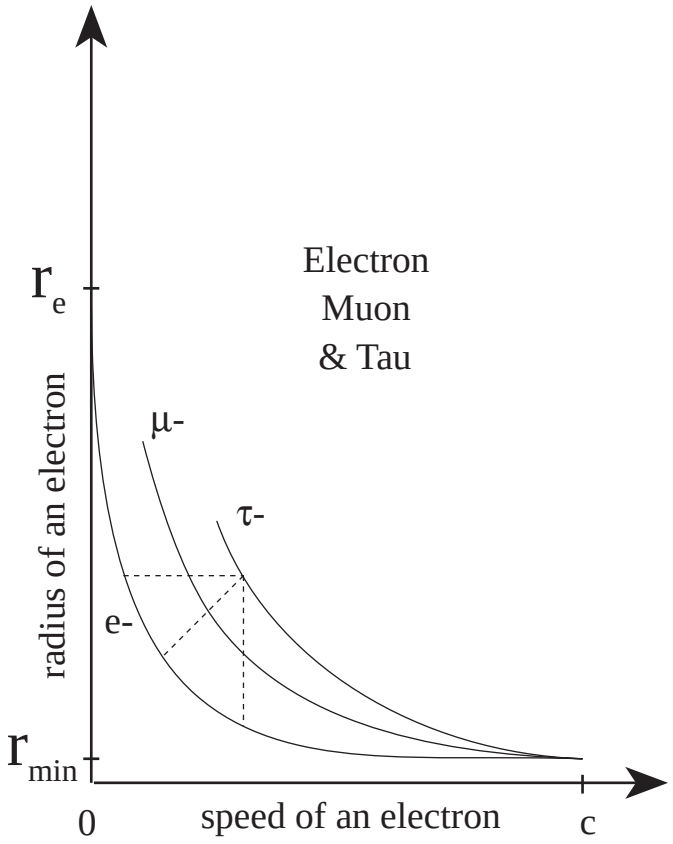

Figure 18

These three electrons—electron, muon & tau—each has a different mass for a specific velocity. If they were accelerated purely by electromagnetic fields in an accelerator, or by the gravitational forces close to a black hole, then they would induce greater magnetic fields and gravitational fields. Thus, the particle's radius would shrink to the minimum radius.

This chart is simply meant to give an idea about what I am conceiving. The chart could be wrong in a couple of ways. For example, it is quite likely that the three electrons have different minimum sizes for their radii—this chart has them converging to the same minimum radius. Another error could be the height of the endpoints for the Tau and Muon lines. I do not believe these particles are stable at rest. They are harmonic only with higher induced electromagnetic and gravitational fields.

Note the dotted lines. The vertical line represents a Tau electron decaying at roughly one speed by emitting photons (or neutrinos), in essence dropping its mass, first to a Muon, then to an electron. The horizontal line represents an electron being accelerated, and gaining mass, from absorbing electromagnetic fields (e.g., from an accelerator), or gravitational fields (e.g., from a black hole). The diagonal line could represent an electron being accelerated and gaining mass by both absorbing photons (or neutrinos) and by electromagnetic or gravitational fields.

A key distinction between these ideas and QED is that the forces can be conveyed by both photons and fields. I think, limiting the transmission of force by only using photons—and trying to avoid force fields as QED does—is incorrect. I would like to remind the reader that I am explicitly stating the photon is simply a ball of electromagnetic and gravitational fields.

The fourth harmonic

The fourth harmonic could have a surface area twice as big as the second harmonic—when at rest or at the same velocity. Or, it could have a volume twice as big as the second harmonic—again, when it is at rest at the same velocity. Either way, it seems it would be simply a heavier—or more energetic—form of the neutrino. How does one progress with further harmonics?

The formula $\vec{E} \times \vec{B} \cong \vec{G}ravitational\ Field$ is much too broad of a generalization to make predictive physics. I tried to research the mathematics and improve my skills in this area but have resorted to analytical geometry because I am more comfortable with the visualizations than the math.

Whether the fourth harmonic has twice the relative surface area or twice the volume as the second harmonic seems to be a question of charge versus mass. Electrical "charge" is simply the electrical field strength per surface area, while the "mass" is simply the energy per unit volume. The derivative of the volume of a sphere is its surface area. Therefore, it seems these parallel ideas of "volume versus surface area of a sphere," and "mass versus charge of a sphere" are not at odds with each other but are related. The math might depend on whether a first order derivative to the formula $\vec{E} \times \vec{B} \cong \vec{G}ravitational\ Field$ is used to obtain the charge, or a second order derivative to the formula $\vec{E} \times \vec{B} \cong \vec{G}ravitational\ Field$ is used to obtain the mass. Or, maybe what is needed is a double integral of $\vec{E} \times \vec{B} \cong \vec{G}ravitational\ Field$ over the surface area to obtain charge, and a triple integral of $\vec{E} \times \vec{B} \cong \vec{G}ravitational\ Field$ over the surface area to obtain the mass.

I feel something very close to Green's Theorem might work here. Green's Theorem states:

Equation 56 $$\int_C f(x,y)\,dx + g(x,y)dy = \iint_R \left(\frac{\partial g}{\partial x} - \frac{\partial f}{\partial x} \right) dA$$

If the left hand functions of *f* and *g* can be expressed in terms of the cross product of E and B—multiplied instead of added—maybe where E and B were expressed like:

Equation 57 $$\oint \vec{E} \bullet d\vec{s} = -\frac{d\Phi_B}{dt} \text{ and } \oint \vec{B} \bullet d\vec{s} \cong \frac{d\Phi_E}{dt}$$

and the appropriate variables were used for *x* & *y* to express these fields over spheres, then maybe it would finish this theory.

One of the biggest questions is, “Would the right hand side of this equality break down to Maxwell’s equations when gravity is ignored?” For example, would the mathematics of the equation:

Equation 58 $$\iint \left(E(\theta, x) \times B(\theta, x) \right) = ?$$

reduce to Maxwell’s equations?

Another line of reasoning goes like this:

- We know F = ma, or, m = F / a
- We know—for angular motion—acceleration is equal to v^2 / r
- Combining: mass = Force * radius / v^2
- Or, if the force is E x B:

  Equation 59 $$m \cong r \oint \frac{\vec{E} \times \vec{B}}{v^2} ds$$ (when the radius is a constant)

- Or, better yet:

  Equation 60 $$n r_{\min} \oint \frac{\vec{E} \times \vec{B}}{v^2} ds = -m \rightarrow n = 1, 2, 3, \ldots$$ (again, when the radius is a constant)

- Or, alternatively, when the radius is not a constant:

  Equation 61 $$\frac{n}{c} \oint \frac{\vec{E} \times \vec{B}}{v^2} r_e ds = -m \rightarrow n = 1, 2, 3, \ldots$$ for SI units

I must admit equations 59–60 are guesses using mathematics I’ve had no training in. If I could, I would try to derive Maxwell’s equations from equation 61.

Earlier, I hypothesized that the two balls of light for the fourth harmonic—in figure 17—were the same relative size as the earlier harmonics. Another possibility is the fourth harmonic would necessarily be relatively larger.

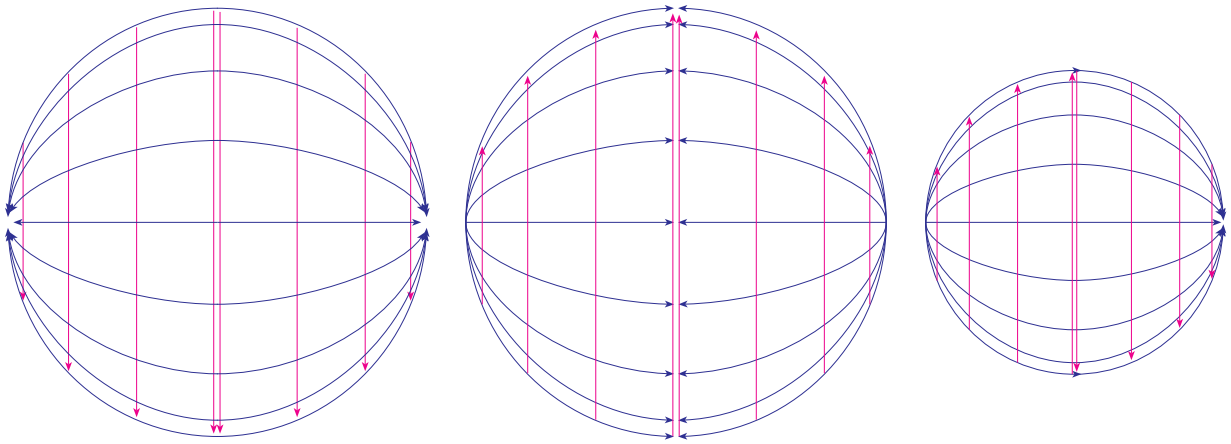

Figure 19

The two spheres on the left of figure 19 each represents half of the fourth harmonic—a heavier neutrino—and are compared to the relative size of the first harmonic—the third sphere. When I conceived of the fourth harmonic being larger, I asked, "Will it be larger based on its surface area, or volume?" I guessed it would be twice the surface area—at the same velocity of the second harmonic—which implies the radius is 141% larger.

Equation 62 $$Area_1 = 4\pi r_1^2 \rightarrow Area_2 = 2Area_1 = 4\pi r_2^2 \rightarrow 8\pi r_1^2 = 4\pi r_2^2$$

Solving for the second radius:

Equation 63 $$r_2 = \sqrt{\frac{8\pi r_1^2}{4\pi}} = \sqrt{2} r_1$$

The term "larger" here can be misleading. To be more explicit, any specific ball of light could vary through a range of diameters as it varies through a range of velocities. If this was not the case, then it would be like saying that photons can have only specific wavelengths, rather than a continuous range of wavelengths. A continuous range of diameters for the electron, for example, must be possible if photons of light can combine to form electrons—again, since photons have a continuous range of wavelengths. Thus, the term "larger" could mean: larger diameter; larger in mass; larger in energy; or a combination of these.

Maybe there is no "fourth" harmonic at all. Maybe there are only harmonics for each prime number: 1, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, …? Or, a step further, are there only "charged" harmonics for the prime numbers that are odd? Where the one even prime represents the neutrino?

Further harmonics

I believe that further permutations add together to create all other particles including: more energetic neutrinos such as the muon neutrino and tau neutrino, more energetic electrons such as the muon and tau, protons, neutrons, the nuclei of all atoms, maybe even the cores of suns and black holes. For example, the spherical harmonics for the electromagnetic fields of more energetic (or larger) particles might resemble these two particles.

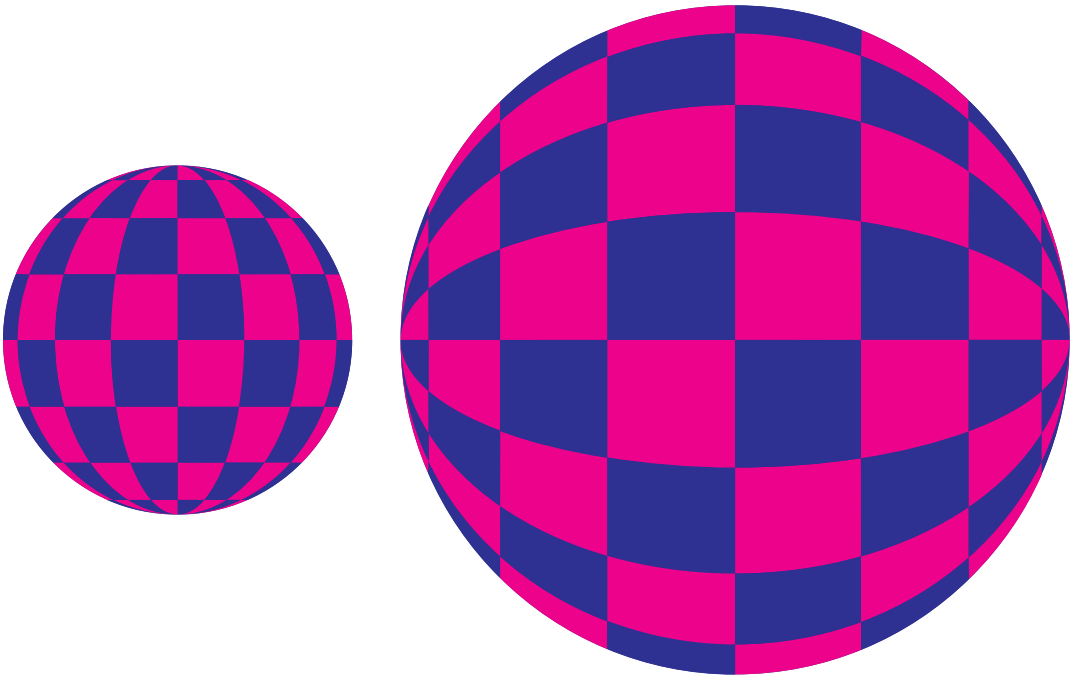

Figure 20

Or, maybe instead of having “square like” regions of E & B fields, the further harmonics have “circular” regions—where the electric and magnetic fields circulate in opposite directions. These regions would have spin. In order for the spins to be integrals of h/2 over the entire particle, there could only be certain numbers of regions in order to have stable harmonics.

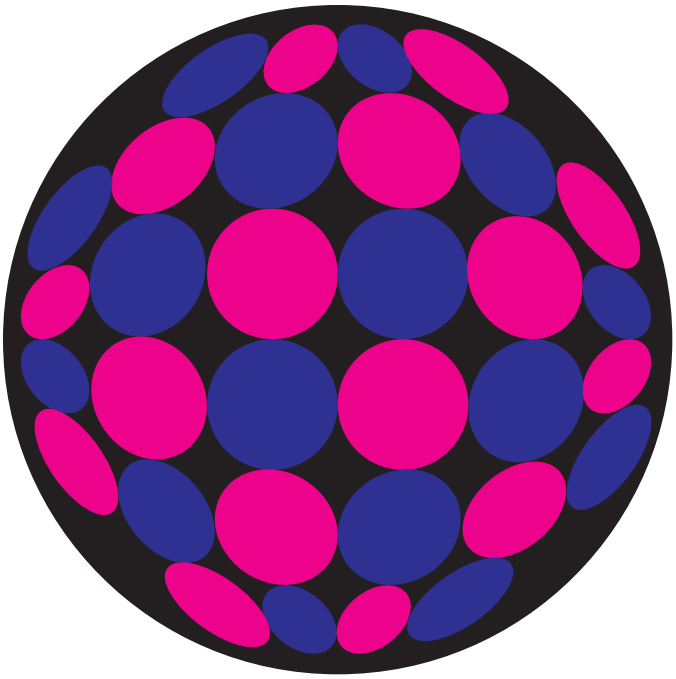

Figure 21

This figure gives a feel for what I mean. Here the black area simply represents where the approximations were not carried out to a finer degree. If protons and neutrons are roughly 1860 times as massive as an electron, and a “rest” electron is the third harmonic, then there could be close to 6,000 subdivisions like these on the surfaces of protons and neutrons—not to mention heavier particles!

Is there a prime number that matches?

Could a mathematical proof show that: if the regions of electric and magnetic spin in opposite directions, then there must always be an odd number of regions?

Again, the mathematics for describing higher harmonics is beyond the author’s skills—these particles are presented simply to give a feel for what the higher harmonics might look like. Note: this makes quite a bit of sense though. For example, a proton’s charge of +1 is actually the missing charge of an electron—a lack of its electrical field. (If it was up to me the charge of a proton would be -1, and the electron would be +1.) If the proton’s charge is thought of being spread equally over the entire surface of a the proton, then why doesn’t the electron spiral into the proton? It doesn’t of course. However, if the charge wasn’t spread evenly, but in chunks like in figures 20 and 21, then, while the electron would be attracted to the proton on the whole, it would be repelled from any localized area on the surface. The combination of overall attraction and localized repulsion would determine the electron distance from the nucleus. Also, the shapes of the E & B harmonics, mapped

over the surface of the balls of light, could determine the unusual orbits of electrons in the clouds of atoms.

Recently, I saw a short news clip where the patterns of the sun's electromagnetic fields where described. The computer enhanced graphic reminded me of the two figures above. I haven't been able to track down the source of the report to research it further, but it is possible that balls of light can keep growing to star sizes. If so, the mechanics of solar thermonuclear burning and black holes could be in question. Wouldn't it be amazing if the core of the sun is actually "hollow"—containing simply a large ball of electromagnetic energy. Maybe a supernova occurs in a star simply because a large instability is suddenly created, like from the collision of another star, and the rather ordered radiation of balls of light of the star suddenly becomes a violent radiation. A parallel to this might be seen in "Ball Lightning."

Recently, when I was describing my theory to a relative, it reminded her of an incident from her childhood where she saw "ball lightning." Ball lightning is controversial because there has been no physics to explain its existence. Ball lightning has been seen in sizes ranging up to feet in diameter. It can take on a range of colors, but at any one time each ball seems to have a uniform color. These balls appear to be spinning. They have an electrical charge since they can be attracted to wires and surfaces. They appear to be hollow since they act light rather than heavy—for example: landing on an arm, or bouncing off the ground. They are not stable harmonics since they are obviously giving off photons of light. Sometimes, they decay slowly into apparent nothingness. Sometimes, they suddenly decay with a violent explosion. It is well known that as a normal stroke of cloud to ground lightning approaches the ground, a second stroke of ground lightning often leaves the ground—moving upwards—to meet the cloud lightning. It seems likely to me that these strokes can sometimes meet in such a way as to act like two large streams of photons—even thought they are electrons—meeting each other—with a probability of creating standing waves of electromagnetic energy. Maybe ball lightning is simply an example of larger forms of these standing waves of electromagnetic and gravitational energy. It certainly seems likely that scientists should be able to create artificial ball lightning.

The original mind-experiment that led me to guess that particles are balls of light had to do with black-holes. When reading about the density of mass in black holes, I asked myself, "How could all of that mass really be in such a small spot?" Then I asked, "How could all the mass of the universe be in one small spot when the Big Bang occurred?" It was hard to imagine. If mass can be transformed into energy though, it made more sense to me that such large structures were really balls of energy. This left the question of how energy can form gravity? That is what started me thinking about balls of light.

Induced Mass

Now, take any of these particles—except the photon—and imagine that the ball is accelerated—with respect to an expanding sphere of light. (At this point we will skip how it is accelerated other than to say it could come from a field or a photon.) Notice that there are circular lines of both electric and magnetic fields—in all directions—around the sphere. It doesn't matter which direction these imaginary circular "wires" containing charge are accelerated—the shell of a sphere looks like a circular wire from any direction. Therefore, fields of E, B & Gravity will be generated that resists the motion of the acceleration. F = ma is a direct result. Remember, mass is the property of matter that exhibits itself only when the particle is accelerated or decelerated.

The absorption of a photon by a ball of light

These balls of light can be accelerated simply by having a photon impact it. The resulting ball would have a quantum more of energy. Figure 22 represents a photon colliding with an electron. If the frequencies are not specific multiples of rational numbers, then the interaction between the photon and the ball of light may simply result in a change in the directions and energies of the two particles—the photon will not be absorbed. The photon's wavelength could be altered, however.

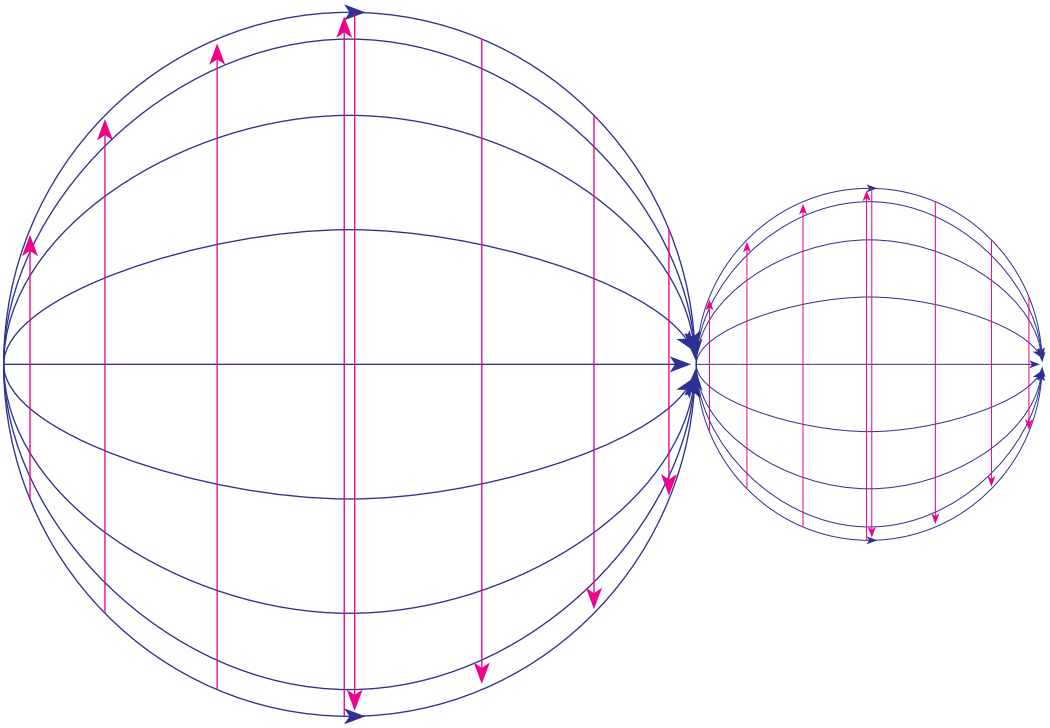

Figure 22

Here the frequency of the photon on the left is twice that of the electron on the right. If the photon is a resonant frequency of the electron, then the photon is absorbed—its energy is

transmitted to the photon. If it is not, then the photon is cast off and emitted. There is another important consideration beyond the proper wavelength. It is the polarization of the two balls of light.

Polarization—a condition for combination

In addition that the photon must be of a proper wavelength for it to combine with another ball of light, another specific criterion must be met in order for the electromagnetic fields to "mesh" with each other. For example, the two balls of light in figure 22 can combine because their electromagnetic fields are circularly polarized—just like a traveling photon. Whereas, the two balls of light in figure 23 can not combine because their electromagnetic fields are not polarized in the correct orientation:

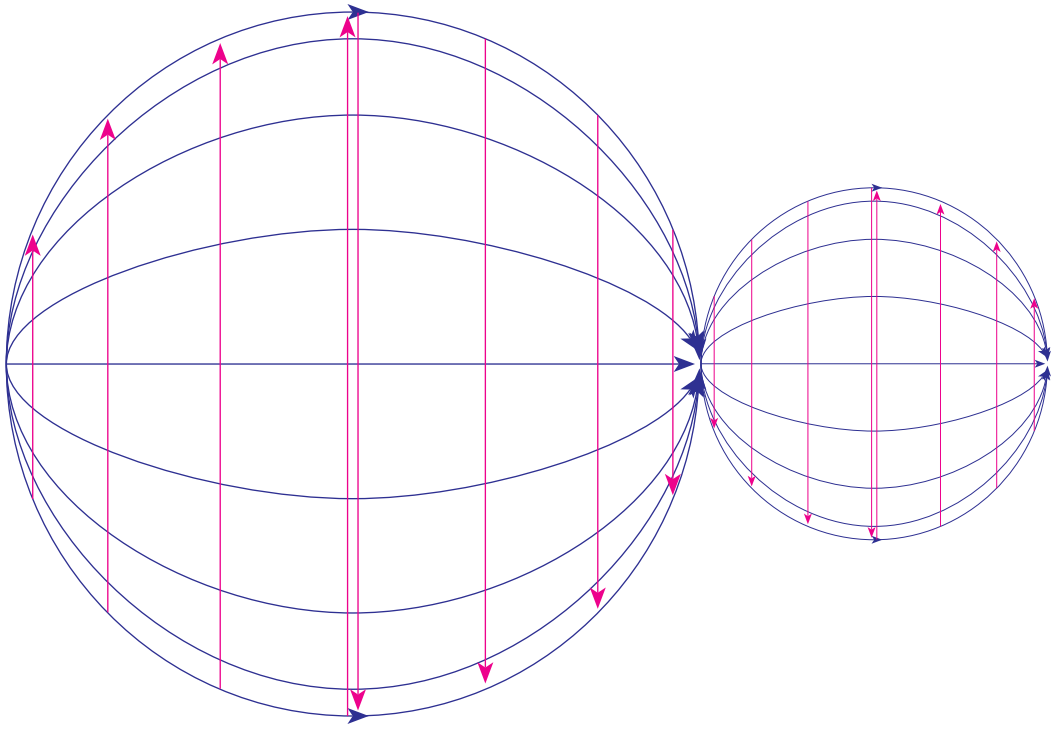

Figure 23

In figure 23, the photon is on the left, an electron is on the right. The photon has a correct wavelength to combine with this electron—just like in figure 22—but it can not because the magnetic fields repel each other like two magnets with identical poles pointing towards each other. The momentum of the photon might be transferred to the electron through the repulsion of their fields, but they can not combine.

From this it seems likely a particular photon will "see" some electrons in the shell of an atom, while it will not see others, depending on the polarization of the electron. That is why some

materials can polarize light. Half of the light is stopped—"absorbed"—while the other half of the light passes through. The polarized light will be stopped by another sheet of polarized material turned at a 90° angle because the electrons in the second sheet are oriented to absorb the remaining light.

It is also interesting that the electron shells always try to contain electrons in multiples of two—one for each polarization.

Transmission of photons through glass

In QED, one phenomenon that is commonly used as an example is the partial reflection of light with glass. One question that is asked is, "How does a particular photon decide whether it should pass through the glass or reflect?" I believe that every photon attempts to combine with every electron it comes across. The decision isn't made until all of the photon has made the attempt to wrap around the electron. If the wrap is exact, the answer is the light is absorbed, which normally doesn't happen in clear glass for the wavelengths of humanly visible light. Light can be absorbed by glass containing impurities, as in colored glass. This absorption is like a computer's "yes."

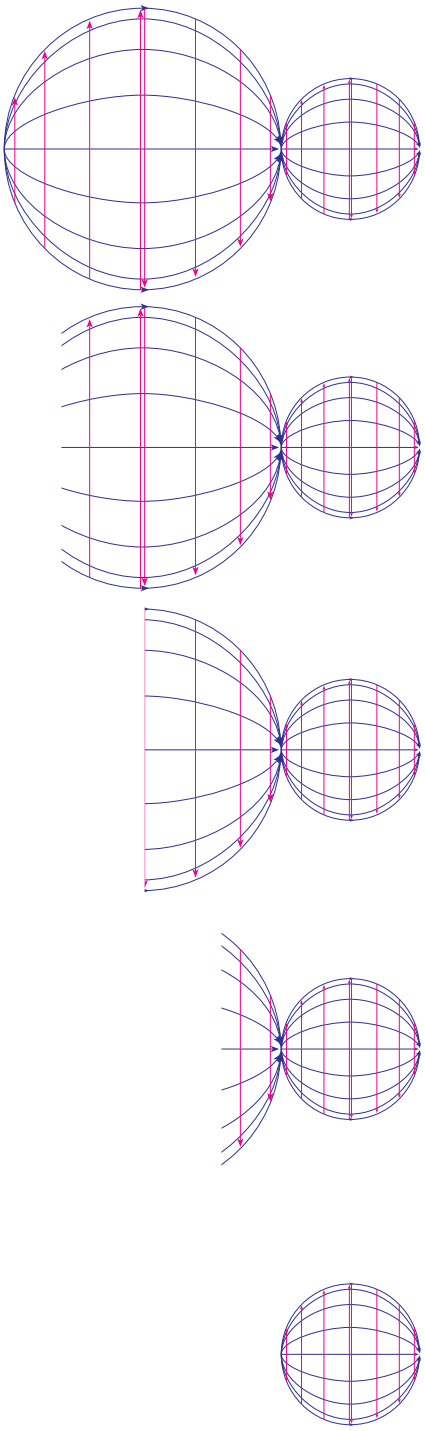

Figure 24

If the wavelength is not exact, then the electron will have a “tail” left over. It is like a computer’s “no.” This tail may then determine which direction the photon will be emitted as it unwraps. The tail of the photon would have electromagnetic fields. The electron would, of course, also have electromagnetic fields. Since they are not harmonic to begin with, I suspect the electromagnetic

fields of the tail of the photon and the electron would repel each other, determining the direction of emission. (Note: when describing how a photon propagates or how a photon combines with a ball of light—like an electron—angles higher than 2π are needed.)

Figure 25 provides an example of correctly polarized light colliding with, and being absorbed by, an electron. However, the wavelengths are not correct—a tail is left over—so, the photon is emitted.

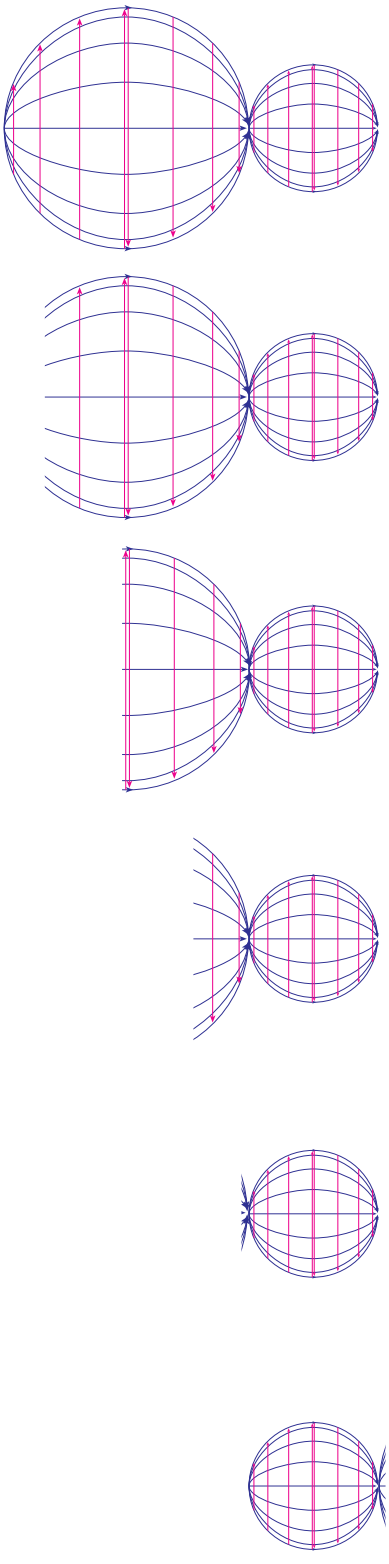

Figure 25

Figure 25 is important for understanding the partial reflection of glass. Glass is a crystalline matrix of atoms each containing the same number of electrons arranged in a uniform pattern. Photons of light simply combine with, then emit from, electrons in a number of set patterns. The patterns are different on a surface of the glass as compared with the normal pattern within the matrix of the glass.

If the matrix is just one atom thick, while the photons will all change direction upon interacting with the electrons of the glass, they will all pass through the matrix. However, with ever increasing thickness, the photons in one of the patterns gradually have their directions changed enough to have the combination of electrons they pass through emit the photons back in the direction of the incident light.

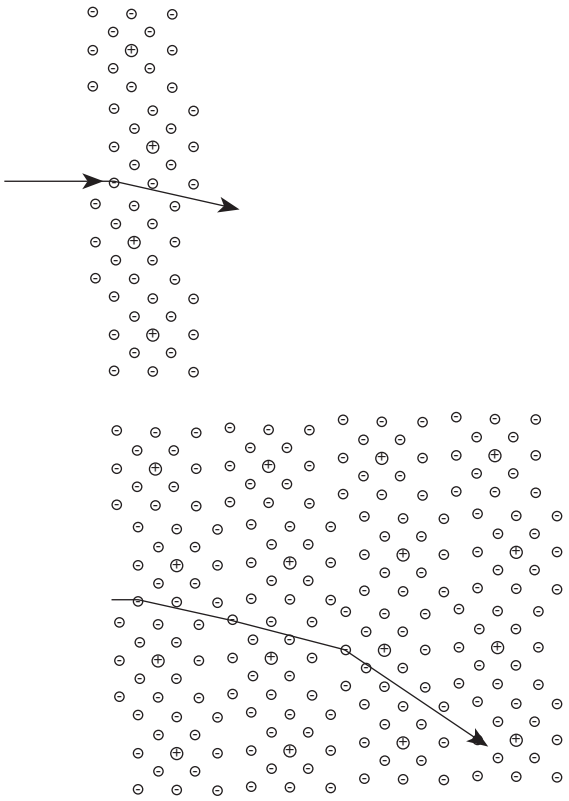

Figure 26

Figure 26 represents a photon being slightly deflected through one atom of glass, and deflected further through 4 atoms of glass. By no means does this simple figure actually represent the correct number of electrons, or, correct pattern of electrons that photons actually encounter in real glass. It is only intended to give a feeling for what I am implying.

If there are extra atoms of a different type mixed in with the regular glass, then they could completely absorb photons of a certain wavelength. Certain wavelengths will not be transmitted, changing the white light into a color (e.g., red glass, brown glass, and so on).

If the matrix is not exactly the same width over the panel of glass, then some photons will be shifted at an angle—with respect to their entry angle—when they are emitted from the opposite side of the glass. Thus explaining traditional optical effects almost exactly as QED does. The only difference this theory really has with QED is that the objects involved are balls of light—standing waves of electromagnetic and gravitational fields.

The destruction of two balls of light

If two balls of light meet, then:

- they can combine with each other (This was addressed in the sections on harmonics.)
- they can repel each other (This was discussed in the section on polarization.)
- they can pass through each other—like the waves in the ocean (This is discussed in the next section on superposition.)
- they can pass each other close enough to induce one or both of them to decay—not counting the photon (This is discussed in the section on induced decay.)
- or they can destroy each other. (This will be discussed in the section on matter/antimatter destruction.)

Superposition

I believe balls of light can be accelerated by E, B, and gravitational fields. This does not agree with QED where forces are transmitted only by photons rather than by fields. I agree that long-range transmission of force requires particles like photons or higher harmonics because field strength drops too quickly otherwise. However, just because in most situations forces seem to be transmitted by photons, this does not mean that larger particles can not transmit forces, or that fields can not transmit forces.

However, how can pure E, B, and gravitational fields be created? Of course, it is relatively easy to create an electrical field by aligning many atoms or molecules with a net electrical charge. The electrons in the matrix can add up creating an electrical field. In a similar fashion, it is quite easy to create a magnetic field with many electrons aligned so their magnetic moments are aligned in the same direction. As already shown, pure gravitational fields would emanate from the second, third, fourth, and seemingly all higher harmonics.

It would also be possible to align photons in such a way that their fields combine by superposition to create pure fields. Creating a large electrical field with normal photons (i.e., where the electrical field is primary) would probably not be as difficult as creating large magnetic fields with normal photons—where the magnetic field quickly changes direction at a very small scale.

For the following discussion of E and B fields, refer to Table A. For example, imagine a stream of photons of the same type is traveling to the right. Imagine that they are of the type in figure 1b. Next, imagine that another stream of photons—like in figure 1h—with close to the same frequency—but with opposite polarization—is also traveling to the right but is out of phase or alignment enough so that they don't combine. The magnetic fields would roughly cancel, but there would be double the electrical field. An example might look like:

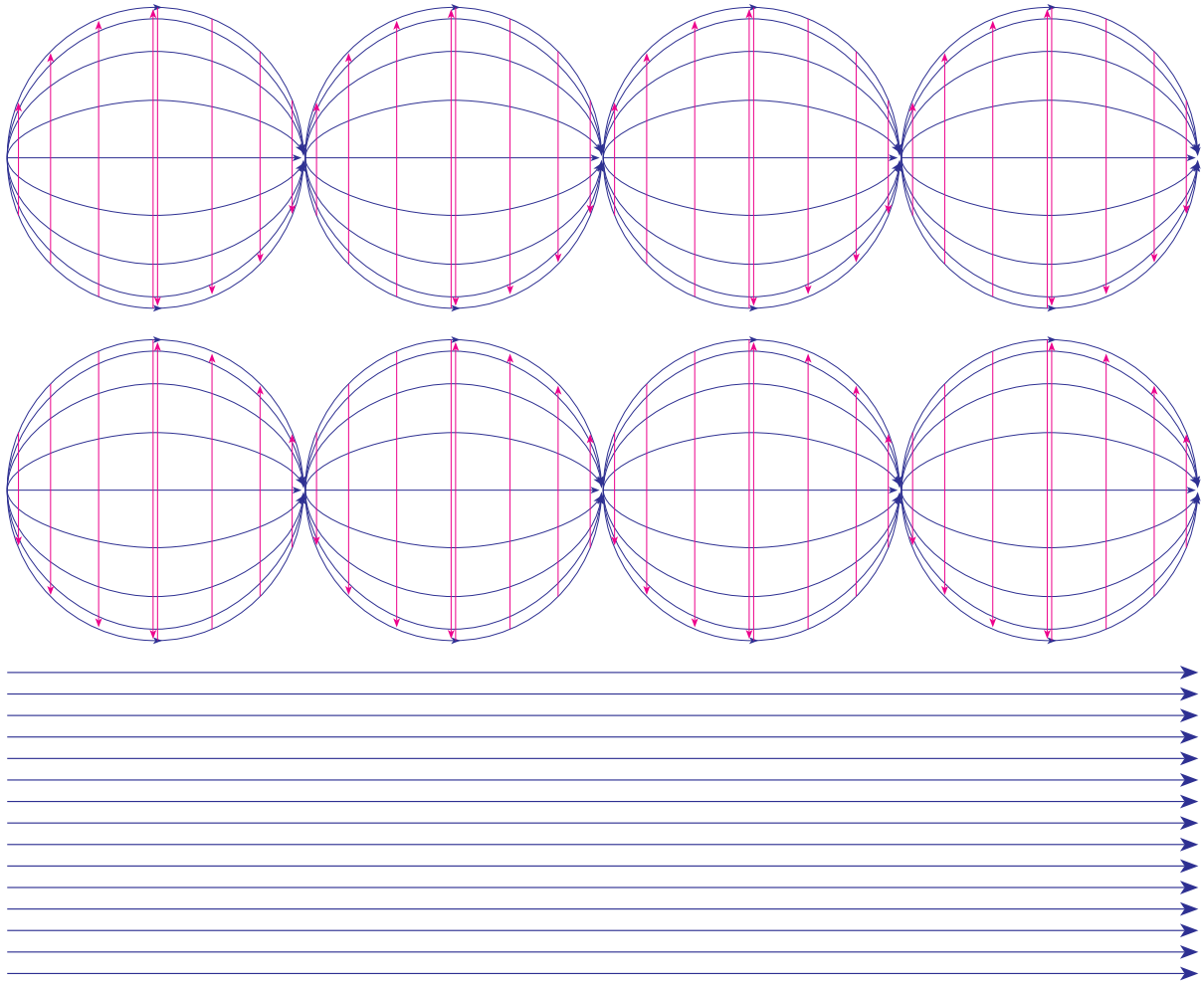

Figure 27

The same argument could be made with electrons instead of photons. A similar argument could be made using the magnetic field as the primary field. Or, as in the next figure, the same argument could be made for magnetic fields using photons.

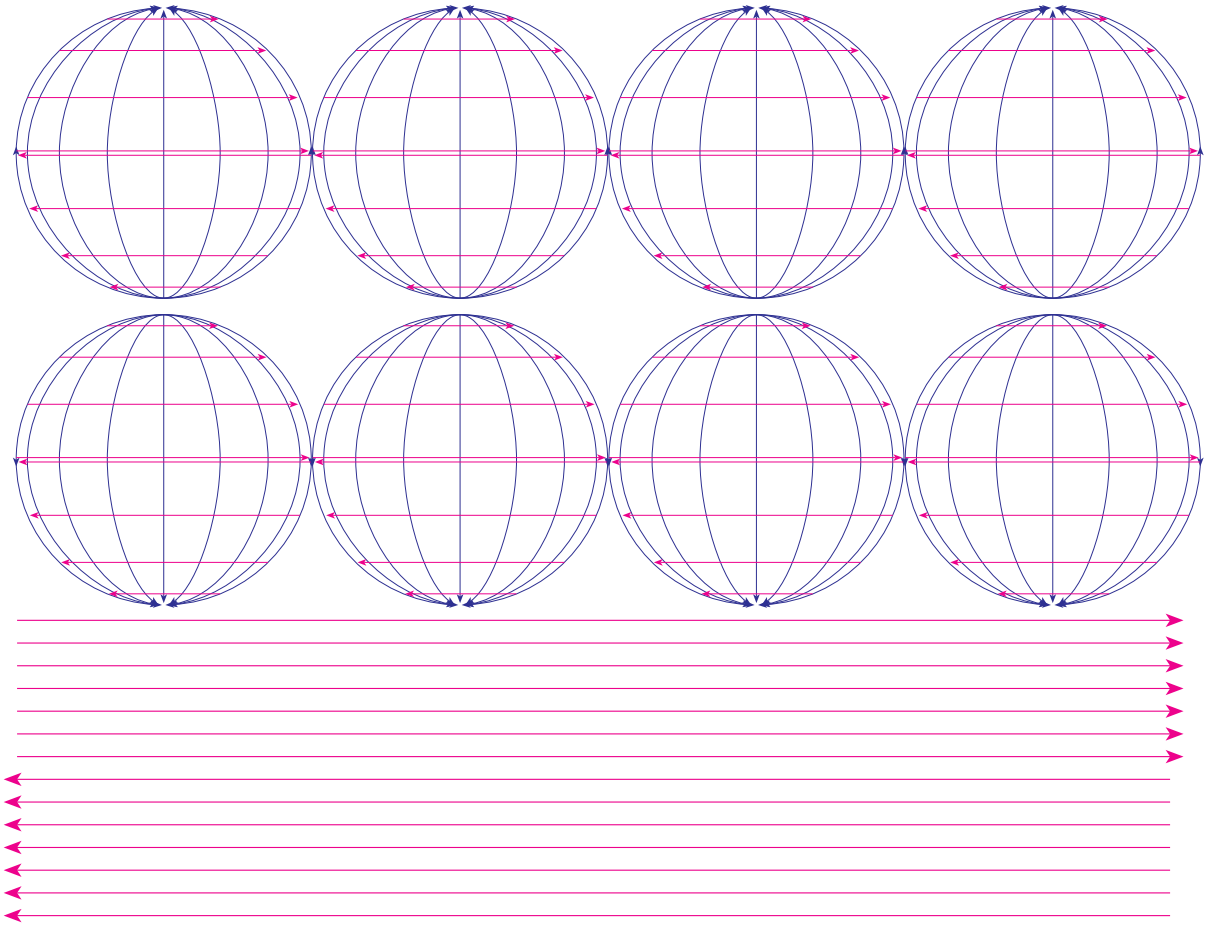

Figure 27

In this figure 4 streams of photons are moving up, 4 are moving down, their electrical fields cancel, creating alternating magnetic fields, that on a macro-level would appear to cancel—or, at least, would be very hard to measure.

Thus it seems possible to create E, B, and Gravitational fields from these balls of light using the principles of superposition. It is understandable that these fields were easy for early physicists to discern. If this theory is correct, then in hindsight, it is also easy to see why it has been so difficult for physicists to work from the specific case—superposition—to the general case—balls of light.

Induced Decay

This section describes how particles—other than photons—could interact with each other, causing a decay while using no photons. It is possible that two particles could pass each other without touching so to speak and still have an effect on each other. It is well known that some decay processes apparently occur with the “colliding” particle passing well outside the nucleus of the “hit” particle. I hypothesize that their fields do the damage by induction.

Overall, non-photon interactions seem to fall into four categories:

- One of the particles is induced to split.
- Both particles are induced to split.
- The particles are almost split, but do not, and return to equilibrium. In this case they could still be deflected, or have their energies changed.
- Or, both particles could combine with each other—often emitting balls of light in order to reach harmonic frequencies.

Imagine that a small ball of light with very high energy is passing close to a larger ball of light with low energy. Use figure 29 as an example. The particles could induce electromagnetic fields in each other. The strongest localized points of the induced fields would normally be along the "equators" created by line drawn from their centers. (Of course it easy picture situations where the strongest forces would be slightly off center.) Since the smaller particle—which is moving faster in this example—is inducing a greater gravitational force for its size than the larger particle, I hypothesize that it is less likely to decay.

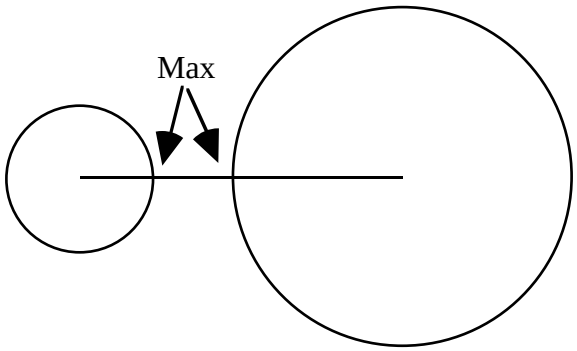

Figure 29

If the induced field is strong enough, then one or both of the particles will have "pinching-like" forces propagating around the centers—effectively splitting the particles. If the split particles are not harmonic, then the individual particles would spontaneously split again, or, alternatively, give off photons until a stable harmonic is reached. (The further spontaneous decays would depend upon how long it would take for the instabilities to spread across the remaining particles at the speed of light. This would explain the extremely short lives of some particles.)

The following figure suggests how I visualize this process.

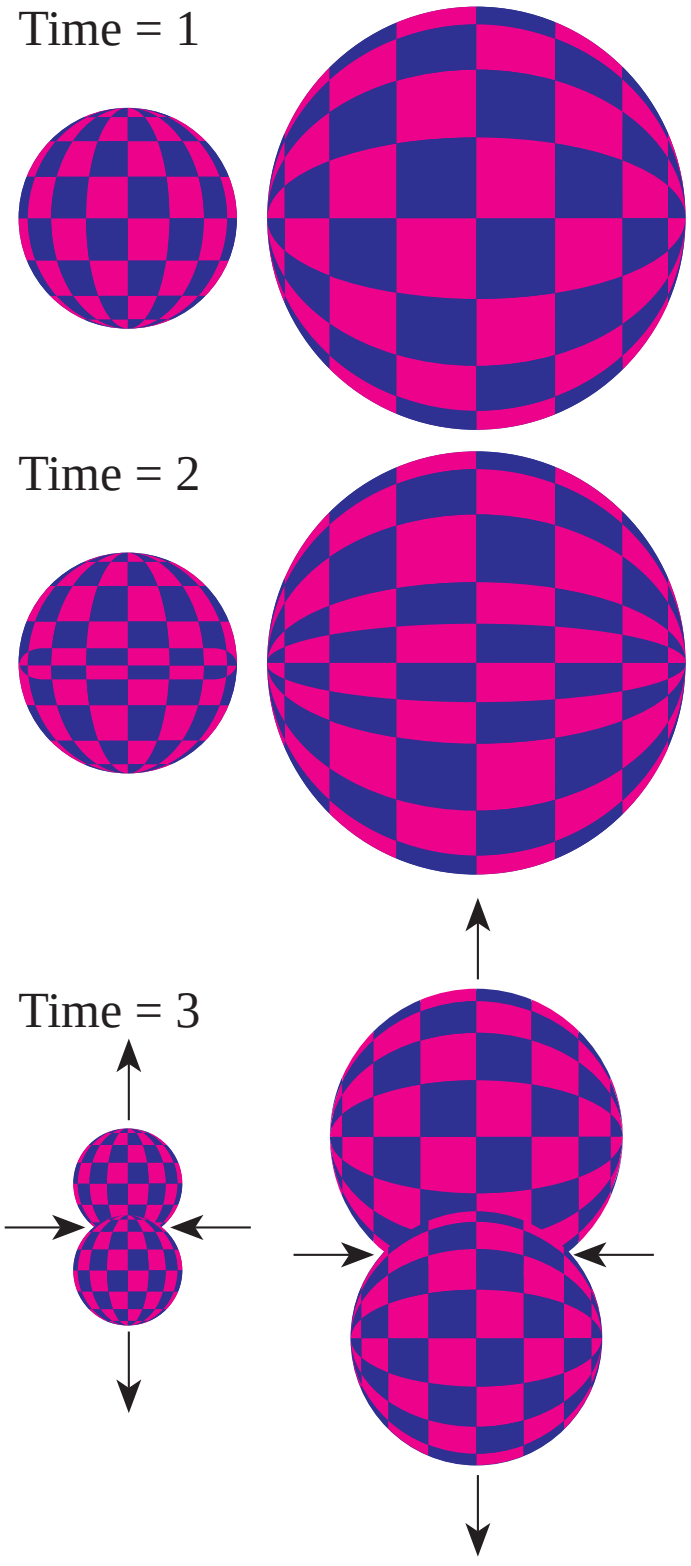

Figure 30

At time t = 1, the two particles are approaching. At time t = 2, their fields have interacted with each other inducing stronger localized fields along their relative equators. At time t = 3, the induced fields have effectively split each other. After this point, the mutual repulsion of the small localized E and B fields would take over and fling the decayed particles apart at high velocities. If the decayed particles are not harmonic, then the asymmetric forces on the surface of the particle would induce further pinching fields, and the particles would continue with their individual series of decays until resonant harmonic frequencies are reached. The asymmetric forces in this situation—that could cause the particle to decay further—would take a certain amount of time to propagate around the particle at the speed of light.

Obviously, the faster the particle is moving, the higher the internal electromagnetic and gravitational forces would be, and the particle would hold together longer. I am not implying though that only gravitational forces hold the particle together. Again, these balls of light are standing waves of electromagnetic radiation. They fit together like a lock and key. Pulling them apart—or pushing them together—fights not only their gravitational forces, but also their electromagnetic forces.

Note that: as the particles approach each other, their energy levels could be described like traditional energy craters as shown in figure 31a. The heights of the sides of the craters represent their mutual electromagnetic repulsion minus their mutual gravitational attraction.

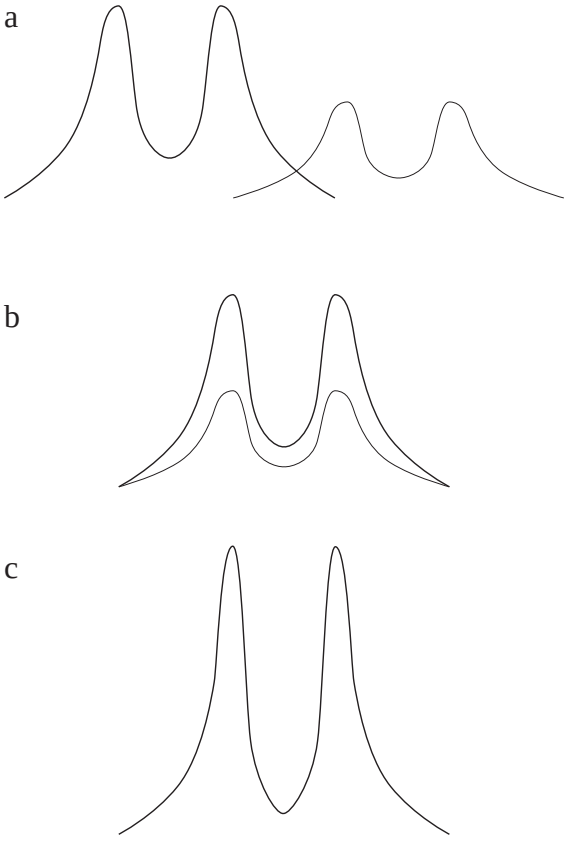

Figure 31

In figure 31a, the two craters could easily repel each other enough to prevent each other from combining. This could describe time = 1 in figure 30. Alternatively, figure 31a could describe time = 3 in figure 30 for each of the decaying particles. Here the fields would be pushing each other apart. However, if the particles could get past the rampart of their craters to reach the situation in figure 30b, then the electromagnetic repulsion becomes an electromagnetic gravitational attraction—creating a more stable energy crater than just the combination of electromagnetic attraction shown in figure 31c.

The smaller in diameter that one of the particles is, in relation to the pattern of E and B fields on the larger particle, the more likely it would be for the smaller particle to meet with less electromagnetic resistance as it approaches the larger particle. It other words, the smaller particle would more likely penetrate the holes in the larger particle. (Especially if the smaller particle is polarized to a group of E and B fields on the larger particle.)

Matter/Anti-Matter Destruction

There are too many combinations in Table A of matter and anti-matter interactions to go through all of the possibilities in this paper. The primary consideration in every combination is that matter follows the right-hand rule, and that anti-matter follows the left-hand rule. When working on the signage of these balls of light, care was needed to insure that the gravitational force fields always pointed inward in order to hold the particles together. I hypothesize without proof, that the reason matter and anti-matter annihilate each other, in general, is they eliminate each other's gravitational fields, allowing the photons that combine to make the balls of light to be "free" of each other and go their separate ways.

I see nothing in this theory that requires equal amounts of matter and anti-matter in the universe. Maybe only matter was created in the Big Bang, and anti-matter is only a rare, but possible alternative that is statistically created on occasion by correct combinations of fields, only to be quickly destroyed by the predominance of matter.

Another theory that I enjoyed at one time but now dislike is that matter and anti-matter have gravitational forces that are opposites to each other. In other words, they repel each other like similar poles on a magnet or in the same manner similar electrical charges repel. This symmetry appealed to me at first. The cosmological significance would seem to be: all matter in the universe is exploding away from a central core of anti-matter, or visa versa. In other words there are two concentric shells in the universe of opposite kinds of matter. For this to work, I would have to wrong about the right and left-hand rules being equally valid. Thus, anti-matter would also follow

the right-hand rule. The main reason this is disagreeable to me is I can't visualize what would hold anti-matter together in the same way gravity seems to hold matter together. Maybe the tremendous forces of an expanding shell of matter could compress an inner shell of anti-matter? If antimatter also follows the right hand rule, then all of the gravitational fields in the anti-matter half of Table A would point out instead of in. (Another reason I don't like this theory is because anti-matter can be stable in accelerators when it is contain in electromagnetic fields.)

Another reason I now dislike this idea is because I like the idea that the universe is going through a series of Big Bangs and Big Crunches. I independently arrived at the idea of a series of Big Bangs and Big Crunches before I ever read anything about it. The chill I experienced run up my back the day I read others had already arrived at this same conclusion provided motivation to continue my theories when I had no other motivation. Furthermore, if the center of the universe repels the shell of the universe, I can't visualize how the universe could be more than a one-shot deal, which is kind of disappointing theologically.

The Zeeman effect?

I had pondered how one of these balls of light would act in a magnetic field. When the particle has a primary electrical field, like in Table A 1b and 1f, then the magnetic fields would appear circularly polarized in opposite directions. However, placed in a magnetic field, the ball of light would react oppositely for one half of the ball versus the other—an electron would tip on its side. Then I came across a subject new to me called the Zeeman effect. I still don't understand all of the mathematics involved, but these balls of light appear to explain both the "normal" and "anomalous" Zeeman effects.

Electron/Positron pair-production

The last topic I wish to cover is electron/positron pair-production. Electrons and positrons can be produced from photons. According to classical theory, when an electron collides with a positron, they decay into two gamma rays. This makes sense to me. However, also according to classical theory, only one gamma ray is needed to suddenly transform itself into an electron positron pair! I don't not think this is correct. I hypothesize the analysis of bubble chamber pair-production tracks is flawed.

The traditional interpretation of bubble chamber pictures showing electron/positron pair-production looks something like:

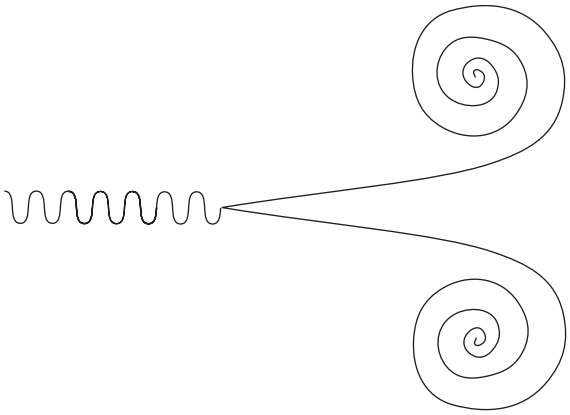

Figure 32

Instead, of one gamma ray producing the electron/positron pair, I hypothesize, the gamma ray that is known to enter the bubble chamber from one side collides with a second unknown gamma ray entering the bubble chamber from the other side. It must be polarized correctly and have an appropriate wavelength to combine with the known gamma ray.

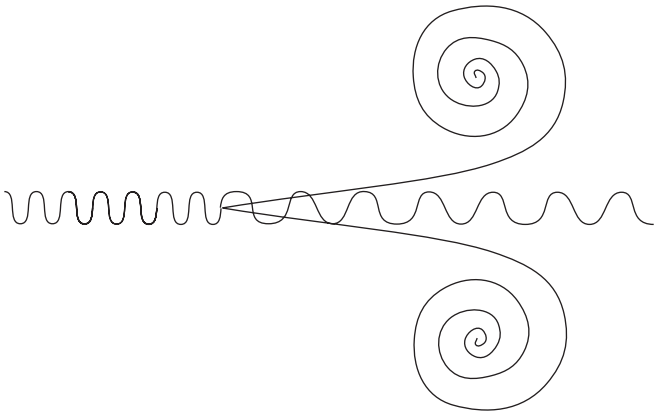

Figure 33

This brings me back to a final problem. Can two photons combine to form just an electron, or just a positron? Or, must they always be produced in pairs in order to conserve charge? Or, could a neutrino combine with a photon to create an electron? Or, could 3 photons combine to form an electron directly? I don't know, but there are experiments that could decide these questions.

Summary

This paper has proposed a definition for time and theorized a unique particle model: define time to travel at the speed of light instead of at the speed of a second; and all subatomic particles are standing spherical waves of electromagnetic and gravitational fields—balls of light.

I believe the current illogical circular definition of time leaves no alternative but to adopt this new definition of time. This would completely overthrow relativity, which might leave a gap without an alternative to pick up the slack.

The alternative is a particle model that attempts to integrate all major facets of physics including gravity. While equations 1b and 1c may not be in the correct form, I believe they point in the direction of the correct solution.

While people may wish to retain relativity as a separate GUT by fixing the circular definition, it would be a GUT in 6 or more dimensions—3 for space plus 3 for time. Certainly the 3 dimensions of this GUT should be attractive—not to mention the symmetries in the spheres.

The question remains, does this ball of light particle model correspond to nature?

However, I can't see any way this definition of time can not be adopted. If time is a constant quantity of motion, and we use it to measure all other motions, then it must be defined to travel at the fastest known motion—currently the speed of light.