Relation of the Internal Structure of the Photon with Field and Charge

By

Mark Anthony Tierno

(drstrange@gmx.us)

Abstract: This paper provides an analysis of the internal structure of a photon and how that relates to the apparent differences in each of the observed forces, as well as to the formation of electrons and protons. A connection will also be shown between the movement of a photon and its internal structure as well as the Energy Density of this universe, as measured by Planck's Constant. Key to determining this photonic structure is the splitting of the Gravitational Constant into two separate constants: c^2 and a new Field Density, the latter of which is what varies for Gravity versus Strong Force according to the photon's internal structure. An association is then mathematically shown to exist between the Field Density of gravity and the value of c^2, and as well between that and Planck's Constant. The final analysis yields an equation that predicts the mass values for protons and electrons based only on geometrical considerations and the sinusoidally varying nature of the Field Density. A relationship between Charge and entangled photonic fields is then demonstrated. Finally, the difference between matter and antimatter is explained within the context of these theories. Wherever possible, calculated values are compared to known measured ones and shown to agree to within 0.4% – 0.005% for most values.

Introduction

At first measure, this paper would seem to cover a wide range of subjects, when in actuality the core of my single subject simply reaches far into several intertwined topics. This is to be expected, however, given the nature of the topic at hand, and necessitates the breadth of what I intend to cover and in the order in which I will do so.

You will find that much of what is uncovered is done so by equal measures of logic and detective work, and it may be because of this that the math ends up being relatively simple.

I should also like to state that it is not my intention to replace but to enhance. I seek not to build on top of what already exists but rather to put something *beneath* what we know; to show why certain mysterious things are the way they are, to fill in the gaps that have long made certain elements of Physics seem as voodoo to most people. In short, I seek to show the simple beneath the complex, for at their core all complex systems must invariably have the very simple as their foundation.

In this case, the very simple is represented by the photon.

This paper is a thorough examination of the photon, showing its internal structure and properties, and how that structure gives rise to literally everything else in our universe. It thus has a connection to gravity, strong force, charge, particle formation, and more.

At this point I will state that I do not view any type of force as being mediated by an exchange particle. That makes for a nice mathematical convenience but unrealistic as that implies that either a given particle would have to be emitting an unending stream of such exchange particles in all directions, or the given particle would have to be intelligent so it can know when something is passing by so as to release an exchange particle to interact with the other; neither option is at all logical. Instead, force is not mediated by anything, but rather is a constant static field surrounding a given particle, linked to and sourced from that particle. This field then acts as a sort of springboard, such that anytime anything passes through it, then the field reacts much like an actual springboard.

Let us now begin with a summary of some basic definitions we all know quite well, then some initial suppositions that will direct the course of the derivations to follow.

Definitions

Before we begin, let us start off with some basic definitions simply as a reminder of what we already know.

- A photon is a unit of energy.
- Matter is comprised of a dense concentration of energy, as explained by $E=mc^2$.
- Gravity is an all-attractive force.
- The Energy of a photon is equal to Planck's Constant times its frequency divided by 2π.
- The Strong Force is approximately 10^{38} times as strong as the gravitational force.
- The speed of Spin (that is, how fast a particle spins around on its axis) is known to be equal to the speed of light.
- Planck's Constant, h, is equal to 6.67176×10^{-34} Joule-sec
- The Gravitational Constant, G, is equal to 6.673×10^{-11} N m^2/Kg^2
- PI is 3.141592654
- Natural log base, 'e', is 2.718281828
- Gamma = $\sqrt{[1 - (v/c)^2]}$
- $M = m_0/\{\sqrt{[1 - (v/c)^2]}\}$.
- Mass of proton, m_p, is $1.672621923 \times 10^{-27}$ Kg*
- Mass of electron, m_e, is $9.1093837 \times 10^{-27}$ Kg*
- The speed of light, c, is 299,792,458 m/s*
- Elementary electric charge, e^-, is 1.602176×10^{-19} Coulombs*

*According to the National Institute of Standards and Technology, Physical Measurement Laboratory; www.physics.nist.gov

I also wish to define what is meant by a "Universal Constant." A Universal Constant is that which is invariant within a given Universe but may vary with other Universes.

A "Geometric Constant" arises solely from geometrical considerations and is invariant from universe to universe. The mathematical constant of PI is an example of such.

With this out of the way, let us move onto some initial suppositions that are key to what follows.

Initial Suppositions

This section lists a number of initial suppositions key to the theories that follow. Each such supposition will be discussed in detail later on, and logically and mathematically proven. Right now we're just giving the theoretical seeds that lead to the rest.

- **Question 1: What is Energy?**

Before anything else, we must posit the nature of energy itself. A photon is a unit of energy, but what exactly is energy itself? That is the first question that we must ask ourselves.

It is said that energy makes up matter; Einstein's famous $E=mc^2$ shows that. A visualization is first in order. Picture a given particle of matter as being a dense concentration of energy, like a bell curve (or some other appropriate, perhaps Gaussian, distribution), with the most dense distribution at the center, and decreasing exponentially after a certain radius. This would then give matter more an appearance of a wave-like nature at very close ranges (which is what quantum mechanics says anyway), but more as discrete lumps of matter at any distance greater than the range of a few atomic radii.

***** Supposition 1: Energy is comprised of Force.**

Suppose now that force makes up energy; that each photon of energy is a distribution of lines of force concentrated into a similar bell curve type distribution. Again, at close enough range this would look like a standing wave, while at greater ranges it would appear more discrete; thus the particle-wave duality of a photon. Energy then is contained-force just like matter is contained-energy. Since this is a distribution, then the edge of the distribution would gradually disperse into a standard field of force surrounding the unit of energy. Such a surrounding field then gives rise to the observable standard magnetic and gravitational fields that all particles have, eliminating the need for exchange particles.

Essentially, it would be like pinching a blanket, where the pinched-up part is the unit of energy erupting out from the middle of the field.

Now perhaps we should look into exactly how energy makes up matter. What is the physicality that causes this transition? For a clue to this, we simply have to ask one question: *What happens when a photon chases its tail?*

That is, if a photon is made to spin in a circle, chasing itself around in a continual circle. It's still moving at the speed of light, except in a circle, but if taken as a whole unit it is actually stationary, spinning in place. Give it some outside force, then the whole unit can then be made to move off to the side, at a given velocity, while the photon is still spinning in place within its own coordinate frame. Thus it looks like a single discrete unit being made to move off to the side.

Basically, a particle.

***** Supposition 2: All particles are comprised of spinning photons.**

That is the basis of these theories, that all particles are comprised of a number of photons spinning around their common center of attraction. This, then, explains a trap that many fall into when they say that a particle is comprised of a number of smaller particles. If all a particle is, is some odd number of photons chasing themselves around in circles, then if you break that distribution in half you get two particles, break into several more different pieces and you get several more collections of contained photons each of which can be called a particle, but none of which previously existed as discrete particles. The search for fundamental quantum particles that make up the only stable three particles in our universe is then a wild goose chase: divide up a particle however which way you wish and you get any desired numbers and sizes of particles, all of which have the same combined mass as the original particle, but are now in several separate clumps of contained photons. This leads the bulk of particle physics to a dead end.

It would not be a coincidence, then, that the computed speed of a particle's spin has always been found to be the speed of light; after all, particles are made up of light.

Energy has mass. Since matter is composed of energy, then energy too must have a mass or ultimately be its source. Furthermore, if a photon has mass, however small, then it must therefore also have a gravitational field, however small. The famous Einstein theory of photon lensing and bending of light around gravitational fields can then be explained, and computed, using normal mechanics, without the need for some sort of curved space. Treating it as a normal particle of matter in a standard two-body mechanics problem would result in the same deviation of light around a gravitational body *if* you take into account the full and correct geometrical considerations. To serve as an example, a brief mathematical analysis for the specific famous case of the deflection of a photon passing by our Sun is included in the next section; one that does not require *space* to be curved in order to supply the correct answer.

Thus far then we have these two suppositions:

-Energy is comprised of Force.

-Particles are entirely comprised of photons spinning in place around one another.

The first point should almost seem obvious, so it is the second point that raises more questions. How many photons are in a given particle, what are their given frequencies, and what keeps them locked together in the first place? We will see the answer to each of these in time, but first there is another supposition that must be covered.

- **Question 2: Why does light have one given speed?**

The answering of this innocent little question actually unveils a lot more than you might think.

Why does light all move at the same velocity, never mind why any particular number for that speed? Energy is motion. Since a photon is the basic unit of energy, then it must therefore move.

***** Supposition 3: The speed of energy then must be dependent on the type of energy that comprises it.**

Since energy is made up of force, as mentioned previously, then energy must have a given density of this force. It is this density of force that determines the energy's speed (its own light speed). This force density thus results in a matter frequency (for lack of a current better term) that is unique for a given universe; only in a universe of its own matter frequency will energy of that given speed be observable. Since a given universe all has the same matter frequency, and hence the same force density for its energy, then all energy in a given universe must have the same speed of light.

This explains why all light in a given universe has the same speed, and why normal matter for that universe cannot (normally) exceed that speed, but as to why it has a given number? This is derived from the above; each universe would have its own speed of light. Our theory of creation would then imply that a universe exists for every possible value of the speed of light, each universe with its own unique value, no two values being repeated between universes. Thus our universe has one given value just as other universes have theirs (and God therefore does *not* play dice with the universe… on a large enough scale).

As to what keeps these universes separated, well nothing really. They all coexist but only matter and energy of the same given force-density can see one another, the rest passing through it unnoticed. This is akin to electricity of one given frequency being able to harm a human being while other frequencies can arc over a man relatively harmlessly.

**

A given "universe" is simply the density state at which all matter and energy of that same force-density can be seen.

**

Brief Sidebar: Between all these universes of differing densities then would be a sort of central nexus from which the rest spring. This is where things connect up to my theory on the origin and structure of the universe, which is the subject of a different paper. To briefly complete the thought here, though, let us say this in brief: This central dimensional realm (some would be tempted to call 'hyperspace' but I would hesitate to) would also have a constant speed. Since it is the source of all energy and universes, it is at one extreme end of creation; its speed would therefore be at one of two extreme values for the speed of light (i.e.: if you could graph out speed vs. universe, this would have to be at one extreme end of the graph):

either zero or infinite– no other values would be possible. Well, zero speed implies zero energy potential, which is impossible, not to mention that a field moving at zero speed could not have interacted to produce energy in the first place. Therefore, the natural speed of that central dimension must be infinite! (Some might have other terms to wrap around this concept.) If one could shift a specially shielded vehicle to that dimension, then one could go anywhere instantly (big understatement), not to mention to any universe.

Back to the main subject then, the point then is that for a given universe– such as our own– there is a given constant; an Energy Density that maintains the exact same value throughout all of that universe. This Energy Density would be the only truly 'Universal Constant', and even that is a variable if you look at the large enough picture, dimensionally speaking. The big question would then be for how one would obtain this measure of the universe. As it turns out, we already have, and we have known about it for quite some time

- **Question 3: What is the Energy Density of the Universe?**

Planck's Constant is key to all of quantum mechanics and the bulk of the rest of physics, with units of Joules-seconds. But take a look at that carefully for a moment. In my view, all units for something must make some sort of physical sense (this is a point that comes up again later when dealing with something else). So is a Joule-second something we can see in the real world? Not as stated in that form, no. But there is an inverse relationship between Time and Frequency; that's Year-One physics. So we can easily restate this value instead as 'Joules per unit frequency', or 'J/v'. Now *this* not only sounds like something 'real world' but like a density. In fact, this is our required Energy Density of this universe and a key factor in what is to come.

Our next supposition is then:

***** Supposition 4: Planck's Constant represents the Energy Density of our universe.**

It is then Planck's Constant that determines everything about matter and energy, and even what the value of the speed of light is to be. The answer to the latter turns out to be staring everyone in the face in another connection that shall be examined later in this paper.

So, change Planck's Constant and you change the speed of light, but also everything that rises from the value of this Energy Density, including what may constitute a stable value for elementary particles. If you could alter Planck's Constant for a given sample of matter, for example, all matter in that sample would suddenly and rather violently reorganize itself to correspond to the new stable field value.

***** Supposition 5: The nature of force is all-attractive.**

Gravity is an all-attractive force, and derives like all forces do from this basic type of force that comprises energy. Gravity, Strong Force, electromagnetism, and the rest are simply this same force under different conditions. The Electromagnetic force arises because of the nature of charge (which we'll get to later). Gravity is more of a 'far-field' effect while the Strong force is more of a 'near-field' effect. How this can be is best illustrated with a visual.

Picture a tidal wave going across the ocean. It has a lot of energy far out at sea, but as it gets closer to shore a good deal of that energy can be sapped. Between shallow shoals, wide reefs, and little islets that it has to pass through along the wave, by the time it reaches the beach of the mainland there is little of it left, and we see only the soft lapping of water at our feet.

On the subatomic scale that amounts to this: Your average particle is emanating a strong field of force derived from the photons spinning around within it; like a larger globe expanding out from its core. But part of that spherical volume gets caught up interacting with the other particles around it, such as other protons, neutrons, and the clouds of electrons. All these obstacles take away from how much of this field of force gets past, until by the time you reach the macro-world the force of Gravity is a very faint force indeed.

Since starting on this paper, by the time I finished it I had discovered that this analogy is not 100% accurate. There is something else going on, a final connection between gravity and the rest, but this visual will do for now.

Okay then, how do we explain the fact that like particles repel if the nature of force is all-attractive? Simple. While we will go into the detailed math later, in essence a proton and electron are each but one half of the total force component; like a sine wave being split (it turns out that it's a little bit more than that, although far more elegant, but this will do for now). Each particle has one half of this component, which is why they're attracted to the opposite half, so as to form a complete whole waveform.

What about the Neutron then? Even easier. The Neutron is the result of a Proton and Electron finally joining together, so it has *both* components of the original photonic waveform and is thus *all-attractive,* attracting both protons and electrons as well as other neutrons. This is why you will *never* see an atom with more than one proton without a neutron there to mediate. No Strong force needed, just stop assuming that a chargeless Neutron has no attractive force.

***** Supposition 6: The Neutron, while electrically "neutral" is equally attracted to *both* positive and negative particles, as well as other Neutrons, and is what keeps the nucleus together.**

The details that give rise to all this will be covered later on.

The difficulty of penning in a neutron in a particle accelerator with magnetic fields is well known, the thought being that is because of their neutrality. But if a neutron is equally attracted to both charges then would not that have the same effect as no charge? Since everything coming at it would simply balance out as far as the neutron is concerned.

***** Supposition 7: Light has mass.**

Einstein *defined* light as being massless, the simple reason being that if you've ever seen the gamma term for increasing mass with higher speeds, then you know that the equation blows up if something going the speed of light has any mass. But his term was based on an old Lorentz equation detailing the *observed* size increase– i.e., what we can see and measure– as opposed to what the particle itself may be experiencing.

On the other hand, if you continue to assume a massless photon (which is the only way that Einstein could make that function work without blowing up at the speed of light), it still blows up. You can apply the Lorentz contraction to length as originally used (and not extend to mass and energy), in which case you can use it with a photon as this calculation has no consideration for mass. For the photon's original length, then, just use its wavelength. Then according to Lorentz contraction, at its natural speed of the speed of light, it will have a total length of zero, which defies the fact that it has a defined wavelength greater than zero. Even if you just take that key term "observed" length as being the real fact instead of giving its "actual" length, in this case a photon's "observed" length would be its visible wavelength, but that cannot go to zero since all photons have a defined wavelength greater than zero which can be observed.

Since energy is mass, and photons have energy, then they *must* have mass. But what does this say about the gamma term in Lorentz contraction? The answer is to simply say that Lorentz Contraction does not apply at the speed of light. In fact, the nature of this 'mass increase' on higher-speed objects falls out of the final derivations coming up later.

The biggest objection to this supposition would obviously be, how would a photon having mass be possible without violating a number of theories, equations, and gauge invariance. To which the answer is simply that a photon is still energy; any equation in which the energy of a photon is required can still be expressed that way, it's just that now you can also treat it as having mass for other circumstances to simplify things. In the derivation given in the next section with regards to a photon passing by the Sun, you will see that the mass of the photon actually drops out completely, leaving us with nothing to object to.

Once we assume that photons have mass, however, then a number of things pop up as a result:

1) Since a photon's energy depends on its frequency, then so will its mass. The difference may sometimes be minute, but it is there.

2) Curved space is no longer needed to explain gravity and the behavior of photons whizzing by a star. You can use basic mechanics but just have to remember that stars are *spherical;* remember to think three-dimensionally (a more detailed analysis follows in the next section).

3) The particle-wave duality: A photon is simply a standing wave of fixed length propagating through space. The dimensions of this wave take up a finite size and it is this set of dimensions that moves along as the wave travels. The physical dimensions defining the limits of the wave give rise to its particle nature while the fact that it's actually an energy wave reveals its wave nature. Then the fact that photons comprise particles explains everything else.

Here are also some obvious properties that you should already know just to have them on hand.

1) When two photons of different energies hit into one another, they combine to form a new photon of the combined total energy and a new appropriate frequency.

2) You can split a photon into two or more photons, of lesser frequencies, whose total energies are the same as the one original.

3) The reason why an electron attracted to a proton in the core of an atom simply doesn't slam into it and combine into a neutron is simply because it has reached an equilibrium in the same way that a moon circles its planet instead of crashing in. The proton and electron are each of vastly different masses, so at high speeds an electron will orbit indefinitely according to basic mechanics. The electron has found a stable point between its speed versus the force of attraction. And thus is matter able to form. Now if electrons and protons were each of the same exact mass, then they would immediately slam into one another.

Finally:

***** Supposition 8: The Photon is the ultimate source of all force, including gravity and the perception of what has been termed the "Strong" force.**

The simple fact of light having mass eliminates the need for curved space. That and the fact that gravitational force does not simply radiate from the exact center of a stellar mass but from every point within and about it, including its rather large *curved* surface. As for where the observed Strong force comes from, that is something we will cover later in this paper.

- **Summary of Suppositions**

These then are my initial suppositions for this subject upon which the rest is built. For convenience, here is a complete listing of my suppositions to reference before moving on.

Supposition 1: Energy is comprised of Force.

Supposition 2: All particles are comprised of spinning photons.

Supposition 3: The speed of energy then must be dependent on the type of energy that comprises it.

Supposition 4: Planck's Constant represents the Energy Density of our universe.

Supposition 5: The nature of force is all-attractive.

Supposition 6: The Neutron, while electrically "neutral" is equally attracted to *both* positive and negative particles, as well as other Neutrons, and is what keeps the nucleus together.

Supposition 7: Light has mass.

Supposition 8: The Photon is the ultimate source of all force, including gravity and the perception of what has been termed the "Strong" force.

From these suppositions we can proceed with the derivation of the field and charge theories, ending with an equation that is key to understanding what is going on, and another equation demonstrating where charge comes from. As it turns out that latter explanation is the big one, explaining the nature of everything that came before. But for now let us start with something relatively simple. We have now all but set the stage for an overarching connecting theory that needs no exotic parameters. It just needs to be pulled together, which is what we are going to do next.

But first, I mentioned an alternative analysis for the famous problem of a photon passing by the Sun but without assuming that space has curvature as in Einstein's solution. I offer this as a proof by way of counter-example to curved space before moving onto the real meat of this paper.

An Alternative Solution For Einstein's Photon Deflection Proof Of Curved Space

First off, let me begin by saying that it is not my intent to re-explain all of Einstein's theories and calculations in light of my own theories (that would take a book), merely to prove by way of counter-example that there is another simpler way; to suggest that his complex equations can be reduced to simpler ones once you assume that energy is equivalent to mass, and that all stars have curved surfaces. From that you can derive the rest of his predictions; you simply substitute the curvature of a star in place that of space. Then, for example, 'frame dragging' has been described as equivalent to torque if photons had mass, but by assuming that photons *do* have mass then frame dragging simply becomes normal torque.

Einstein has said that gravity comes from the curvature of space and that a photon has no mass, but that doesn't make sense. Einstein's own famous equation says that matter and energy are two aspects of the same thing, that energy makes up matter. But a photon is the base unit of energy, therefore it has mass. From this one can easily postulate that gravity is a force emanating from matter/energy itself, from the photon to the stars. And yet, he says that gravity is a matter of the curvature of space. The big example proving this comes in the prediction of the total angle of deflection of a photon skimming by the surface of a star. The standard equations predict half the angle as measured, but Einstein's method correctly predicted the full angle. So, how can curved space be wrong and yet his equations still work?

Standard pre-Einstein calculations compare the energy of the photon's forward motion ($E= ½ mv^2$ with $v=c$ for this case) to the gravitational energy between the star and photon (gravitational energy between any two bodies = GmM/R) to arrive at the angle of deflection. This comes up with an angle (θ_1) of

$\theta_1 = 2GM/c^2R$,

as measured in radians. Here R is actually the distance between the two bodies. But this is still half the actual value, and half what Einstein predicted.

This author finally made that calculation and came to the same error but realized there was one troubling part of the problem. The fact that the distance between the two stellar bodies was, in this case, the radius of the star. Was this distance supposed to be measured from the two bodies' centers or their surfaces? The problem is that the equation for gravitational force between two stellar bodies assumes that 1) they're pretty far apart, and 2) they are basically treated as point sources. As it turns out, this is the key to it all, but more as we come to it.

Back to the main question. Why does Einstein's equation work? Simple. First, the only reason why Einstein was able to assume that photons have no mass is because in the standard derivation for the angle of deflection by a star, the photon's mass just drops out completely; it appears on both sides of the equation and cancels out. But this is not the same as having no mass. Even for his curved-space calculations the same would be true.

But, the real reason why his equations work is because there *is* something with curvature involved, it just is not space. A *star* has a large curved surface; furthermore, every particle within it exerts its own gravitational force upon its neighbors, creating a continual field of force whose contours match the overall shape of the star, then radiating out into space from there. Thus, from a photon's point of view, when it travels close to a star it does not see a point source of gravity but rather a very large surface of gravitational force. So when a photon is deflected close to its surface, it would not simply be suddenly deflected, but rather would travel around the curve of its outer surface for a while before finally breaking free of the star's gravity. This total angle can be broken down into two components– the part independent of the curve ($\theta_1 = 2GM/c^2R$), and which would be the classically predicted angle, and the additional component which results from the arc-length (S) that the photon turns through before releasing– producing the second component of the total angle (θ_2). See the drawing below (Fig.1) for details.

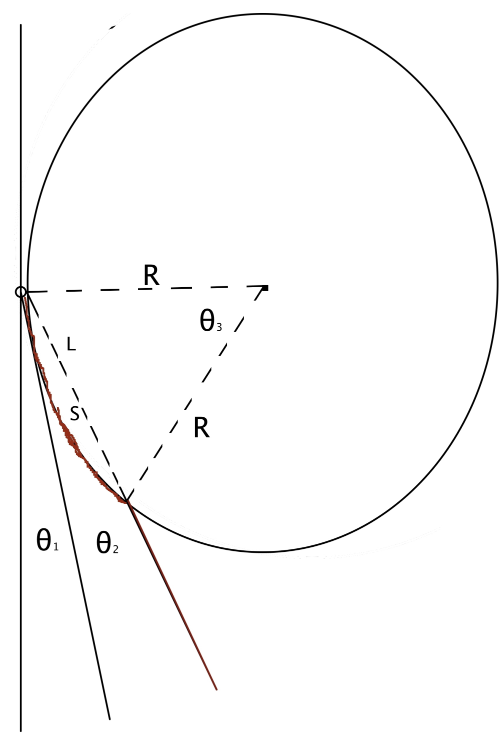

Fig. 1

With the star, and not space, being curved, the same derivation as for Einstein's equations can be used and get the same answer, but let's continue on with our own methods and see where it leads us anyway.

θ_3 is the angle swept out across the star during the period when the photon is grazing around the surface of the star (the angle corresponding to the arc-length, S, the photon follows; given in red), while 'L' is the straight line that runs from one end of the arc to the other, and 'R' is the radius of the star, which here is also equal to 'D', the distance between the two bodies. θ_2 sweeps out at the same rate as θ_3; they are the same angle. Both angles depend entirely upon the curvature of the star the photon is curving around.

θ_3 sweeps out at the angle predicted by standard non-Einstein calculations and is unaffected by the curvature of the star (or rather, the component of the total angle of deflection that remains completely independent of the star's curvature). θ_1 and θ_3, though, are similar triangles, and at the surface of the star (when D=R) their heights are both equal to R, so both angles sweep out at the same rate, which means that here $\theta_2 = \theta_1$. Thus we have the Einstein default for this special condition. (See below diagram– Fig. 2.)

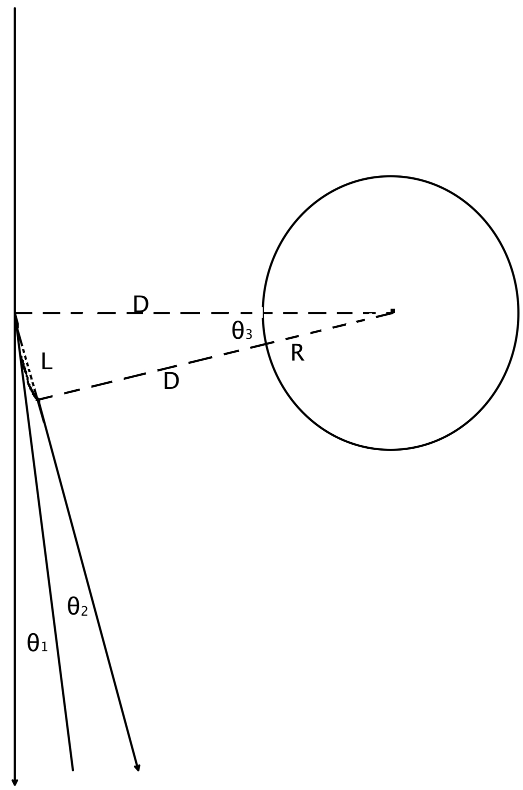

Fig. 2

But as the distance increases (i.e.: D>R), then the height for the θ_3 triangle gets larger (now being = D) and so the angle θ_3 (as compared to what its size would be at height=R for this given θ_1) decreases– and hence so does θ_2 (since they are both still the same angle and still sweep out at the same angle). θ_1 remains unaffected by the star's curvature and so is the angle that θ_3 would be if it was still measured at the surface of the star (though now θ_1 is, of course, smaller than it was for a shorter D). So the decrease in θ_3's angle due to increasing D can be compared to what it would be at the surface of the star (D=R), for that given value of θ_1, by comparing the heights of the two triangles as: R/D. Since θ_3 is proportional to θ_1 by this amount, then $\theta_3 = (R/D) * \theta_1$. But θ_2 is still equal to θ_1, so we have the generalized formula of:

Total angle = $\theta_1 + (R/D)* \theta_1$,

where for the far-field case (where D is equal to several light-years) it reduces to the more classical assumptions.

This accounts for the curvature of the star, but something else in this interaction also has a curvature due to its physical geometry and that is the photon itself, small though it may be. The photon is a ball of energy and would technically be deflecting the star by a minuscule amount, but since that star is too massive to move then it is the photon that ends up moving this small amount, adding into the final angle. With the radius, r, of the photon, we reason the same as to the second term and have θ_4 (not drawn, as it's too small on this scale) = $(r/D)* \theta_1$.

But we can make a reasonable approximation of the photon's radius by assuming it is equal to half its wavelength, so our final full equation is:

$$\text{Total angle} = \theta_1 + (R/D)* \theta_1 + [(\text{wavelength}/2)/D] * \theta_1.$$

Usually this last term can be completely ignored, and for D greater than R certainly dropped, but if there is a strong enough gravity field, and if the light passing by the star has a wide enough spectrum and is of strong enough intensity for us to still observe, then that wavelength dependency can manifest as a spread of frequencies exactly like a prism. Thus we could have a 'Gravity Prism' producing a spectrum spread coming off the edge of the star (assuming it is at the right distance for us to observe it as a spectrum instead of just one of the color components).

Another possibility on that third term added by the photon's radius is that, small though it is, besides the possibility of producing a Gravity Spectrum under the right conditions, if the added angle from that term is smaller than the wavelength of that photon, then it may internalize in the form of inducing a small vibration into that photon, having the effect of actually changing the wavelength of that photon as it passes around the star. This would be a very small, but detectable effect (at least more detectable than a possible gravity prism).

This small example shows that space need not be curved, but rather it is the surface of the stellar bodies in question that is. A similar derivation could no doubt be arrived at for the problem with Mercury's orbit, but is unnecessary at this point and leads us too far astray from the main topic at hand.

Since all stars are spherical it can perhaps be easy to assume it might be space that is curved, but if you ever discover an oddly shaped star (perhaps affected by other forces) or a square star, then curved space will not hold. More significant, however, is that by thus demonstrating that gravity is not due to spatial geometry, we are now open to gravity instead being an actual force, which makes it possible to be united with the other forces.

That, of course, leads us back into the main topic of this paper.

Statement of the Theory in General Terms

The Initial Suppositions all but provide the framework for a theory uniting each of the disparate forces, all we have to do is tie it all together. No need for Strong or Weak as separate forces, only the one force arising from the simple photon and its variations imposed by the photon's structure.

The second Supposition proposes that particles are comprised of balls of photons all spinning around in place. Force makes up energy and hence emanates from the photons, but these interact with the fields of force emanating from the other photons in a particle, twisting around one another to create the final field of force emanating from the particle of which they comprise. Since the force at its core is all-attractive, that would be the gravitational component. The bulk of the force emanating from Protons and Electrons, however, is charged so their gravitational contribution should be less than that of the Neutron which has only the pure all-attractive force and no charged force. Gravity then emanates from all particles, though more strongly from Neutrons because of this.

Einstein's Curved Space then becomes a simple tool of dealing with gravitational fields, though perhaps not the simplest. You just need to consider the fact that the surface of a star is curved and the rest falls out.

The Electromagnetic force is a result of the different charges between protons and electrons, which itself is a result of the way in which the photons within them are twisting about one another. Because of the way that charged force arises, it often overwhelms the gravitational component of a particle's field of force. Look at it this way for now: A given particle has a certain amount, 'X', of force, but a certain fraction of it, 'Y' is twisted into charged force while the rest, 'Z', remains pure. Y is the amount considered as charged force, Z is now the gravitational force, but the total field between them still amounts to 'X'. This is, of course, a crude and inaccurate picture that will be improved upon later. The details for how charge arises from these spinning twisting photons will be covered towards the end of this paper.

What we call the Strong force comes from the same thing as that of Gravity, just Gravity is more macroscopic and Strong is more subatomic, though there is another aspect to this though that falls out of our derivation, as we shall see. The Neutron, being all-attractive, is what overcomes the mutual repulsions of protons to keep them glued together into an atomic nucleus. It also helps keep the electrons sticking to the nucleus as well.

It may also be possible that, because of the presence of the Neutron within the nucleus, that protons can covalently share photons between one another, thus strengthening the shared connections and apparent Strong force.

Now, if an atom has too many neutrons, or too many protons, then it becomes unstable; the charges aren't balanced vs. the geometry of the atom and it starts to break apart. Thus we have the case of heavy molecules breaking down by spontaneous radiation; they have too many neutrons that keep bumping into each other more than they do the protons they're attracting and some go spinning off. This is the cause of radioactive decay– simple geometry. It gets too crowded in there. Toss in the possibility of photon exchanges between particles in the nucleus, and the Weak Force becomes less a force and more a mathematical convenience.

Thus are all types of force not so much united as shown to have never been distinct individuals in the first place. After you have read the section on charge then come back and reread this for some better insights.

Photons Within A Particle

** *The net field of a given type of particle is determined by the photons that make up the particle.* **

But the frequencies of all photons within a given type of particle *must* be of the same exact frequency in order for them to hold together into the shape of a particle. Why is this so? Simple. Because the photons must be in phase with one another; they are locked together as their fields overlap, twisting together inseparably. In this one statement you will find two major and well-known aspects of physics:

1) The photons within a given particle must all be of the same frequency because they are linked together in the same way as Einstein's laser effect.
2) All such photons are *entangled*, so that they are as one within the particle– just as quantum mechanics states.

So essentially we have little lasers spinning around in circles, entangled within one another to form the particles. Entanglement then is real, but not over large distances but within these particles.

From all this and what has been given previously, we can make a simple intuitive leap, and ask about the specific number of photons in each of an electron, proton, and neutron. The number of photons in a proton, electron, and a neutron are each *exactly the same,* only their energies and frequencies are different, each equal to the resonant frequency of the particle in question. A higher frequency gives a higher energy which results in a physically larger particle (energy and matter being the same thing) and also a higher gravitational force; such a force is needed to overcome the energy resulting from a photon's velocity which would otherwise pull the particle apart. Thus the vastly different sizes of electrons and protons are due to vastly different frequencies of energy.

**** All particles have exactly the same number of photons in their base state, only the frequencies within each type of particle differ. ****

The frequencies of these particles directly determine their size; an electron has the lowest frequency, a proton much higher, while a neutron has the superposition of the two. Since all electrons are the same size, due to the nature of the photons within them, this explains why quantum mechanics works, but also like Einstein said God does not play dice with the universe. Go to a universe with a different value for Planck's Constant and things change accordingly.

Our next step then, and it's the big one, is to fill in some numbers here.

1) What is the number of photons in a particle?
2) What are the frequencies of photons within their respective particles… and why?
3) Despite their different sizes and energies, why do a proton and electron each have the same force of electric charge?

The next section will get into the meat of it all. Everything up until this point has all been setup.

Computation Of Number Of Photons In A Stable Particle

The problem of computing the number of photons in a given particle turns out to not be as difficult as one might think. In fact, there is a fairly simple method: if you just simply think about what forces are involved with these photons orbiting around one another, then it comes down to two: the gravitational force of a photon vs. the force from its velocity. The gravitational force would keep them together as long as the force of motion from the particles does not exceed it. Therefore the number of photons in a particle would be the ratio:

(Force of motion for a photon due to its velocity of c)/(Gravitational force of a photon)

Remember that the energy of a given photon is equal to the photon's Frequency times Planck's Constant divided by 2π. It stands to reason then that the energy of a particle is equal to the total energy of all the photons which comprise it, and thus:

Energy of particle = (number of photons)(Frequency)(Planck's constant)

But we already know the value for each particle (proton and electrons), so we can simply input that into this equation to generate the frequencies for the photons in a proton and that of the photons in an electron. Any frequencies above this value will escape the particle; any frequencies below this will probably combine with other photons to yield photons of the common frequency of that particle.

With the required photon energies and frequencies known for both protons and electrons, it is then possible to see what base equation of what required constants would yield these values on their own (and thus have a general equation for calculating the two stable particle sizes for other parallel universes).

Now, given that photons of the same frequency will initially attract gravitationally to one another, fall into phase like for a laser to form a particle, what will finally stop them from simply accumulating endlessly into an increasingly massive particle? The answer, of course, must be that too many concentrating together causes them to finally physically jostle one against another rather than interacting further away via their extended fields.

As the assemblage of photons increases, the mass of that forming particle likewise increases, drawing the photons closer together in their orbits, shrinking the average width of the particle until it gets to the point where the photons are physically bumping into one another instead of interacting by remote via their attractive fields. That's when it gets too crowded inside the particle.

The act of physically bumping into one another would then result in two possibilities: First, they would combine into a single photon of higher energy and frequency which, since it *is* then of a different frequency, would then no longer be in phase with the rest and then be immediately ejected from the particle. Second, in phase or not, being that crowded one photon would be physically knocked out of the particle by the other photons. Thus the stable particle size occurs when the number of photons being absorbed by the particle equals the number being expelled from this "jostling". This provides our limit for the size of a particle when in its rest state.

The question then becomes, "How close is too close?" Well, given the physical geometry of things and assuming a photon roughly symmetrical and a diameter equal to its wavelength, "too close" would be when the distance from their cores is about half that; *half the wavelength of the stable photon frequency* for that given type of particle. With this in mind we can now proceed by setting:

(Kinetic energy of the photon) = (the summed gravitational energy of all other photons in that particle),

or the equivalent comparison of forces (either comparing energy or force would yield the same results, but I simply choose energy for simplicity).

One caveat about this computation, though. Obviously the gravitational energy will involve the Gravitational Constant, 'G'. As stated earlier, 'G' is more of a macro value, but for this case we have the force at its full measure. This is the realm in which that same "purer" measure of force is labeled (mistakenly) as the "Strong force". As such, what we really need is a different gravitational constant scaled for this inter-photon scale.

Unfortunately, apparently there is no constant for the "Strong" force. All that we know is that the Strong force is 10^{38} times as strong as the gravitational force. So as an initial approximation we shall be using G_s as our strong force constant, and setting it equal to 10^{38} times G.

- **The Computation:**

First to set a few variables:

ν = Resonant frequency for all photons in that particle (protons, here), given in Hz.

λ = corresponding wavelength of the photons of the given frequency, given in meters, and remembering that $c = \lambda\nu$.

M = Mass of the particle in question. In this case we're using the Proton. So here M = 1.6726219 X 10^{-27} Kg.

E_p = Energy of the particle in question. Again, since we're using the Proton then here E_p = 1.503277484 X 10^{-10} J.

m_p = mass of the photon. Since the mass of a photon is equal to its energy which is frequency dependent, then this would be that of a photon at the internal resonant frequency for the particle– a proton in this case. Units will be in Kg.

c = speed of light = 299,792,458 m/s

$G_s = G \text{ X } 10^{38} = (6.673 \text{ X } 10^{-11} \text{ N m}^2/\text{Kg}^2) \text{ X } 10^{38} = 6.673 \text{ X } 10^{27} \text{ N m}^2/\text{Kg}^2$

h = Planck's Constant = 6.67176 X 10^{-34} Joule/Hz

Thus to begin, the gravitational force here is G_sMm_p/R^2, but R is our "too-close" distance which is equal to (λ/2). So:

$$F = G_sMm_p/R^2 = G_sMm_p/(\lambda/2)^2 = 4\ G_sMm_p/\lambda^2$$

Now for the force of the photon in motion we start with the kinetic energy of a moving photon, which is really easy:

$$KE = ½m_pv^2 = ½\ m_pc^2$$

But we need this stated as a force over a given distance, R. With R= λ/2 as already stated, then:

$$\text{Kinetic Force} = KE/R = KE/(\lambda/2) = ½\ m_pc^2/(\lambda/2) = 2(½m_pc^2/(\lambda)) = m_pc^2/\lambda.$$

Equating the two then yields our starting point for computation:

$$m_pc^2/\lambda = 4\ G_sMm_p/\lambda^2$$

Now we could substitute M = (number of photons in a proton)(mass of a photon at that particle's frequency), but that would then give us two variables to work with, and since we happen to know the mass of a proton, we'll use that. After that everything else slips right into place. Proceeding:

$$m_p c^2 = 4\ G_s M m_p/\lambda$$

$$c^2 = 4\ G_s M/\lambda$$

$$\lambda = 4\ G_s M/c^2$$

And thus, for $\lambda = c/\nu$:

$$c/\nu = 4\ G_s M/c^2$$

1) $$\boldsymbol{\nu = c/[4G_s M/c^2] = c\ [c^2/4G_s M] = c^3/(4G_s M)}$$

Since this is linear, it is worth noting that for a proton vs. an electron their respective frequencies scale up directly according to their masses as well, thus preserving our supposition that the number of photons in both the proton and electron are *exactly* the same, just their respective frequencies differing.

Let us hold off calculating the frequencies for a bit until we have N. For the rest of this we use:

$$E_p = N\ (h/2\pi)\nu_+$$

2) $$N = E_p/\ [(h/2\pi)\nu]$$

We can now substitute the value for the frequency from 1) into 2) and get our final equation for the number of photons in a proton:

3) $$N = E_p\ 2\pi\ (4G_s M)\ /(h\ c^3)$$

$N = (1.503277484 \text{ X } 10^{-10} \text{ Joules})2\pi(4)(6.673\text{X}10^{27} \text{ Nm}^2/\text{Kg}^2)\ (1.6726219 \text{ X } 10^{-27} \text{ Kg.})\ /[(6.67176 \text{ X } 10^{-34} \text{ Joule/Hz})\ ((299{,}792{,}458 \text{ m/s})^3)]$

$$N = 2.36 \text{ photons.}$$

But we can't have a fraction of a photon, since they're all in phase at the same frequency, so we must round up to 3 photons (so much for being concerned for the approximate value of our G_s; it just self-corrected). Thus:

4) $$\mathbf{N = 3.}$$

Since we used an estimated G_s for the proton based on the Strong force, and since there is no measured value for the Strong force for an Electron, then we cannot complete a computation like this for electrons. However, as we shall see later there is a solution for this when we break apart the Gravitational Constant (you read that right). For now, however, this number is all we need. Looking at this, it occurs to me that the number of photons in a proton– or *any* given particle for that matter– has absolutely nothing to do with universal constants but simple geometry.

Analysis of the Solution: A single photon has no impetus to suddenly start chasing its own tail. If two photons are approaching head on, they might spin around each other for a short time but will quickly slam into each other and combine into a single photon of higher energy, whether in resonance or not. But for at least three photons, each photon will be conflicted between one and then the other of the other two photons, and as a result none will spiral into the other, especially if they're of the same frequency and in resonance. They will keep orbiting one another indefinitely. Thus the reason for three photons is pure geometry and will remain the same answer for any particle in any Universe.

***** All particles at their base energy state are comprised of exactly THREE photons. *****

Now that we have N, computing those frequencies is elementary school math, but oh the implications…

Computation Of The Resonant Frequencies For Proton And Electron Photons

Now that we know that the number of particles in a base-sized particle is Three, we can go back to find the values for the Proton and Electron frequencies by simply using:

$$E_p = N (h/2\pi) \nu_+$$

Solving for the frequency now we have:

5) $$\nu = E_p / N (h/2\pi)$$

Let's start with the proton:

$\nu_+ = (1.503277484 \text{ X } 10^{-10} \text{ Joules})/ [3 * ((6.67176 \text{ X } 10^{-34} \text{ Joule/Hz})/2\pi)] =$

$\mathbf{4.719 \text{ X} 10^{23} \text{ Hz}}$

and

$\boldsymbol{\lambda_+ = 6.353 \text{ X } 10^{-16} \text{ m.}}$

Then for the electron, with $E_p = 8.187 \text{ X } 10^{-14}$ Joules, we get:

$\nu_- = (8.187 \text{ X } 10^{-14} \text{ Joules})/ [3 * ((6.67176 \text{ X } 10^{-34} \text{ Joule/Hz})/2\pi)] =$

$\mathbf{2.57 \text{ X} 10^{20} \text{ Hz}}$

and

$\boldsymbol{\lambda_- = 1.1665\ 10^{-12} \text{ m}}$

These are the two stable resonant frequencies that result in the two elementary particles. The Neutron we will get to later, and with it touch once again upon the Weak Force, but for the Neutron there are two possibilities: Either the photons from a proton and electron all combine into three higher-energy photons of a new frequency, or all six photons remain intact, three at the one frequency and three at the other. The answer to this will fall out when we get to the final explanation for Charge.

*** The eagle-eyed person may note a similarity here, in that the derivation of these values looks very close to that of the Compton Wavelength. There is, however, a notable difference, in that whereas the Compton Wavelength simply lumps the entire energy of a particle into its equivalent photon energy (while ignoring the fact that this is yet another proof for photons having mass) as a matter of convenience, here we have followed the postulate of a particle *actually* being *comprised* of a number of photons while making no initial assumption as to what that number is, then dividing up the particle's energy into that number. This is also different, in that while the Compton Wavelength will change depending on the total energy of a given particle, these wavelengths will remain fixed; a proton can be energized up to double its normal energy-mass but the wavelengths of the photons within it will remain unchanged (it will simply have more of those same photons). There is, though, more to these wavelengths than simply being a fraction of the Compton Wavelength, as will be shown in a later derivation.

A little note: These frequencies for the photon and electron values mark approximately either end of the gamma ray frequency range. So, maybe a particle speeding down into a gravity well like a black hole, when they get accelerated to gamma ray ranges then are at the right frequencies to form particles on their way out, thus the black hole particle radiation predicted by others. This also means that if someone were to create a gamma-ray laser that emits at one of these two frequencies then they would see particles spitting out the end.

First a reminder: *Energy is force condensed, like matter is energy condensed.* Each photon is a compressed unit of force, dense enough at the center to be energy, then sharply declining after its borders into the force from which it sprang. This results in a field of force surrounding the photon which can interact with other nearby forces. So this is the source of perceived forces like gravity, E/M, etc..

Another little note. Apparently the diameter of the electron is bigger than that of a proton, even though the proton is more massive; a fact which has people puzzled. However, since we know that an electron is comprised of photons of a lower frequency, that means their wavelengths will be a lot larger than that of a proton. Longer wavelengths means that the orbits of the photons about each other will, naturally, also be larger. And thus is the physical diameter of an electron more than that of a proton.

The frequency of all photons within a Proton is 4.719 X10^{23} Hz

The frequency of all photons within an Electron is 2.57 X10^{20} Hz

Discussion.

- **Photon Resonance:**

Regards that resonance. We briefly used a laser as a comparison, but what we are looking at is *exactly* like a laser! The inside of a particle should be acting exactly like a laser cavity, and it may be that Einstein's laser physics should be applicable to conditions within any given particle (just add in the twist of the particles spinning around one another). And just like a laser, photons of those same frequencies get in sync with one another, only instead of straight lines, they revolve around their common point of attraction, resulting in spinning around in circles.

You have photons of the same frequency orbiting each other, the force fields around each overlapping with the others will merge and make them effectively a single whole unit. In essence, kind of like a single large photon, and operating like a whole. I.E., a particle. This collective field will ensure that the photons within it stay at that same frequency, as well as any new ones entering.

But the observant may now be starting to have a sneaking suspicion that he's seen this sort of description elsewhere before. Spinning photons, their fields all twisting about one another until they operate as a single whole, what happens to one happens to them all? That's *Entanglement* from Quantum Mechanics! Yes, it is the property of a very physical entanglement of force fields that keeps photons together into a particle, and laser physics that allows them to join in the first place.

Einstein just met Quantum Mechanics.

- **Interactions:**

Now, when another photon enters the particle, or near enough to be pulled in, one of a few things can happen depending on if it is of the same frequency as those of the particle:

** If the new photon is of a lesser energy that is required to join the resonance, then it will be deflected out since dividing its energy amongst the existing photons would raise their frequencies and break resonance.

** If the new photon is of the same frequency then it will join the rest in resonance.

** If the new photon is of a greater frequency, then the new photon will be pulled apart, with the one part of it having enough energy to match the frequency of the others and join in with the resonance, and the left over energy forming a new photon that then gets deflected out.

It is this behavior, stemming from either the frequencies of proton photons or electron photons, that ultimately gives rise to the discrete energy levels that define all of quantum mechanics.

Also, in case it wasn't obvious from before, quarks are simply smaller clumps of photons that haven't yet formed into full particles but are on their way to doing so, or are just another handful of photons that you can rip out of a particle and call its own thing. That is why they're both so transitory and so glued into the particle: because they're really just momentary formations within the particle that result from the motions and interactions of the photons.

All this implies that you should be able to form particles from any frequency at which you can get a bunch of photons to fall into resonance at. And indeed, the bulk of particles being generated are cases of exactly that. However, since there are only two stable frequencies for particle formation in this universe, any others will simply decay immediately. The question then is why only these two frequencies? What makes them special?

There is an answer to that too, as well as a final formal derivation of the formula for the stable frequencies that involves the addition of one little bit of geometry to make everything complete. Before we can do this, though, there is something else that must be tackled, and as it turns out this is not only key to the final answer but probably opens up a whole new consideration in physics.

We are going to take apart and analyze the components of the Gravitational Constant.

Splitting The Gravitational Constant

While deriving the previous elements, every time I had to use the Gravitational Constant I kept looking at those units. They seem like such a jumble and more like *two* constants multiplied together. With units of "N m^2 kg^{-2}" there is no visible connection to a real-world phenomena otherwise. It would make far more sense if it was actually two parameters detailing different aspects of what's going on. So, I went about analyzing the units for some clues.

First off, just by looking at the normal "N m^2 kg^{-2}" a better way of arranging the units would be to combine one "N m" into Joules and rewrite it as:

"J m/kg^2"

Okay that's better, but why should we split G in the first place? Well, for one we might gain some more insight, and for another at the time I was looking for any better ways to help me figure out the number of photons in a particle and those other mysteries already discussed. As it turns out, though, this splitting of G is key to everything, so bear with me.

Looking at our new arrangement for any sort of a pattern, one thing falls immediately out as something one can measure in the real world, and that is "J/Kg". So rearranging just a little bit we get:

$$G = (J/Kg)\ (m/Kg)$$

Putting aside the second half of that for a minute, "J/Kg" is starting to look like something. In fact, it looks like a sort of energy density, and being as it comes from such a universal constant as G, then it would have to be a universal energy density. What could this equate to, though? As it turns out, we already have a constant of that value, we just didn't recognize it because of its perceived units.

Consider: what equation out there can give us Energy/Mass? I kept bumping into the answer before realizing what it was. Recall $E=Mc^2$, but now try solving for c^2– *not* simply c. We get $c^2=E/M$… units of energy per unit mass. But this gets overshadowed by the fact that c has units of speed so we think in terms of velocity squared. Now, while the result can be *simplified* to velocity squared, the proper interpretation is Energy/Mass. This is key, because it means that we have a "new" universal constant, the numerical value of which happens to be equal to c^2 but whose units are J/Kg. We have here the energy density that we've been looking for to help solve our problem– not to mention quite a few others.

To avoid confusion of units then, simply define it with a new symbol, say E_D, to denote this as our energy density.

6) Energy per unit mass constant = $E_D = c^2 = (299{,}792{,}458)^2$ J/Kg = 8.987551787368176 X 10^{16} J/Kg.

We now have a truly universal constant from which we can derive the value for 'c' for a given universe. Thus:

$$c = \sqrt{(E_D)} = 299{,}792{,}458 \text{ m/s.}$$

But, this new constant also has another connection. The universe (or *A* universe) can only have one energy density, and yet we already have another in the form of Planck's constant, h, and its value of Energy per Unit Frequency. The conclusion? E_D must be directly related to h; it would have to simply be the exact same thing as Planck's Constant only scaled up to macroscopic levels. This leads to another connection that I've always considered but could never see a way to get it to match up, and that is that c must be derived from h, since logically the more energy a photon has per unit frequency the faster it would move. We see here that c falls directly out of our new E_D, which is itself derived from h.

** c^2 is the macroscopic version of h; both measure the Energy Density of the Universe, just on different scales.

While the logic of this connection is inescapable, providing a mathematical connection is always preferable; something to show directly the connection between h and c^2. As it turns out, deriving a mathematical derivation showing this relationship is not all that difficult once everything is set up. We will save such a derivation, however, for later on in this paper.

Back to the Gravitational Constant now, seeing as how our new E_D is the only constant with the required units, we can conclude that from unit analysis it must be what we want for one of our 'real-world' constants comprising G. So substituting into G:

7) $$G = 6.67384X10^{-11}\ N\ m^2/kg^2 = (6.67384X10^{-11}\ N\ m^2/kg^2) = 6.67384X10^{-11}\ (J/Kg)(m/Kg) = E_D\ X.$$

'X' here represents the second half of G, which when multiplied by our new E_D gives us what we know of as G; in essence, it is our leftovers for now. Solving then for X to see what we get:

8) $$X = G/E_D = [6.67384X10^{-11}\ (J/Kg)(m/Kg)] / (8.987551787368176\ X10^{16}\ J/Kg) = 7.42564845\ X\ 10^{-28}\ m/kg.$$

This is the value of our second half of G, a new universal constant. But this X can vary for the different parameters involving such as the Strong force, which implies this constant may be geometrical in origin. Our next step is in figuring out what that 'X' is and what it means. Also it should be noted at this point that the 'G' we are using is for gravity and not including the adjustments for the Strong Force that we used earlier. That generalization comes up in a bit.

With units of 'm/Kg' it makes sense that 'm' is some leftover after the cancellation of other units, in the same way that the Kg term canceled out of c^2 to hide the fact of its real units. Now, the only types of units that would reduce to meters would be J/N. But then there's that Kg at the bottom as well, and "J/NKg" makes no sense… unless we shift the parenthesis around and regroup a couple of things. Then it all falls into place.

9) $$m/Kg = (J/N)/Kg = J/(NKg) = (J/Kg)/N$$

Now we have something that's starting to look very familiar indeed. If (J/Kg) is in reference to our Energy Density, then this whole looks like some sort of Energy Density per unit Force. Recalling back to when we discussed that Energy comes from force, suddenly this mysterious second parameter of G makes a whole lot of sense and is even something that we can give a name to. For this is our *Field Density!* Labeling our 'X' as F_D, we now have the complete breakdown of G:

10) $$G = E_D\ F_D$$

Where for the case of gravity, $F_{Dg} = 7.42564845\ X\ 10^{-28}\ (J/Kg)/N$.

The Gravitational Constant has now been split into two different universal constants that make a bit more physical sense.

Our Energy Density, E_D, is a derivative of the one truly universal constant and hence does not change for any conditions. Our Field Density F_D, though, will change for whichever given conditions that one is measuring this force over.

In the case of gravity, which is measured on a macroscopic scale, this represents the amount of the field's energy that makes it past interacting with other particles, past the electron clouds, to yield the trickle that's left macroscopically for the gravitational force. But closer up, for subatomic particles not yet shielded by the electron clouds, it is much stronger and we get what has been measured to be the "strong force". This may also in part explain why the Strong Force has no set constant that anyone can figure out and why it varies depending on how it's measured and where; because this Field Density constant is dependent on circumstances. On the macroscopic level, the localized changes in microscopic circumstances wash out to give us a very consistent gravitational constant.

Our next step then is to figure out the value of this Field Density for the level of the photon; that should give us a far better look into what's going on. As it turns out, at this point that is very easy. Let us handle the Proton first, since our previous computations for the frequency of photons within a proton have already been done. We can now use those values to work backwards and figure out exactly what F_{Dg} is for a proton.

First let us generalize the Gravitational Constant, G, into a Force Constant, G_x, where our 'x' subscript will depend on what type of force we're calculating this for. Thus:

11) $$G_x = E_D F_{Dx}$$

For that of the proton frequency $F_{Dx} = F_{D+}$, and for electrons $F_{Dx} = F_{D-}$.

Then from equation (1):

$$\nu = c^3/(4G_sM)$$

We know now that $M = 3m_p$, but to get m_p we can now use

$$E = mc^2 = (h/2\pi)\nu,$$

then solving for m,

$$m = (h/2\pi)\nu/c^2$$

and substituting:

$$\boldsymbol{\nu = c^3/(4G_sM) = c^3/\{4G_s3\ [(h/2\pi)\nu/c^2]\}.}$$

Or

12) $$\boldsymbol{\nu^2 = c^5/\{4G_s3\ [(h/2\pi)]\}.}$$

Solving for G_x:

13) $$G_x = c^5\pi/\{6h\nu^2\}$$

But $G_x = c^2F_{Dx}$, and so

$$c^2F_{Dx} = c^5\pi/\{6h\nu^2\}$$

14) $$F_{Dx} = c^3\pi/\{6h\nu^2\}$$

Where the frequencies will be as previously calculated:

$$\nu_+ = 4.719\ X10^{23}\ Hz$$

$$\nu_- = 2.57\ X10^{20}\ Hz$$

At this point it's just a matter of plugging in the appropriate values to get first the Field Density for a proton, F_{D+}. For the electron now, let us compute F_{D-} as well; it won't be the Strong force but it will be whatever value it needs to be to give us our frequencies for whatever's going on inside the electron. Thus:

15) $$\boldsymbol{F_{D+} = 9.560878722\ X10^{10}\ (J/Kg)/N}$$

16) $$\boldsymbol{F_{D-} = 3.223528522X10^{17}\ (J/Kg)/N}$$

From these we can now simply multiply by c^2 to get our generalized Force Constants for each of the proton and electron:

17) $$\mathbf{G_+ = c^2\, F_{D+} = 8.592889264 \times 10^{27}\ (J/Kg)^2/N}$$

18) $$\mathbf{G_- = c^2\, F_{D-} = 2.897162953 \times 10^{34}\ (J/Kg)^2/N}$$

G_+, as expected, is in the neighborhood of what one would expect for the Strong force, while G_- is… well that would be the big question of the day. Before we answer that, however, let me go over a couple of curiosities.

Frequency Ratios and the Planck Length

- **Frequency Ratios:**

First off something I discovered while messing around with the ratio of proton to electron masses, (M_+/M_-). Taking that value I kept dividing by π just to see what I'd get. As it turned out, after dividing by π five times I got an unexpected whole number of '6'. Putting in a few more digits for π resolved the result down to 5.99… essentially '6' after accounting for experimental error of particle mass measurements. This means that the ratio of proton over electron mass is exactly $(6\pi^5)$– using the electron mass as a base, then multiplying it by this factor, gives a result that is within 0.00488% of the currently measured value for the proton mass.

19) $$(M_+/M_-) = 6\pi^5$$

It should also be noted that since the Force Constant goes by the square of the resultant frequencies, that the ratio of the Force Constants must therefore be squared as well (as verified by calculation).

$$(G_+/G_-) = 36\pi^{10}$$

What does this mean? If nothing else it points to a pattern that we may be able to use later on.

- **Planck Length:**

For our next little curiosity, refer to equation (13):

$$G_x = c^5\pi/\{6hv^2\}$$

First rearrange for the frequency:

$$v^2 = c^5\pi/\{6hG_x\}$$

Recall that $c = v\lambda$ and substitute.

$$(c/\lambda)^2 = c^5\pi/\{6hG_x\}$$

$$\lambda^2/c^2 = \{6hG_x\}/c^5\pi$$

$$\lambda^2 = \{6hG_x\}/c^3\pi$$

Solving for λ gives us:

$$\lambda = \sqrt{\{6hG_x/(c^3\pi)\}}$$

Rearranging a little bit (sorry, but I don't have a symbol for h-bar to use):

20) $$\boldsymbol{\lambda = \sqrt{\{12(h/2\pi)G_x/c^3\}}}$$

For those unfamiliar with what they're now looking at, let me refresh your memories by giving the Planck Length:

21) $$L = \sqrt{\{(h/2\pi)G/c^3\}}$$

Planck derived this purely by unit analysis and for years people have wondered what it means. With our more complete derivation, however, it becomes clear that Planck was missing a couple of elements. Throw in the numerical constant and allow G to vary (I don't think anyone was even considering the existence of a Strong force back when he came up with this), and suddenly we can see the Planck Length as being my exact same formula for calculating the frequencies of those photons (or rather, wavelengths in this case). We can see now that as applied to the standard value for the Gravitational Constant that the value for the Planck Length is pretty much meaningless (with one caveat to be discussed in more detail in a later paper on black holes), but with the correct values we have another confirmation of our new approach and an explanation of the Planck Length.

Photon Induction and Increasing Mass

One problem I'd been mulling over, is if Photons are the source of energy, and energy is motion, then how does that relate to some bulk matter moving? Is it a different type of energy or what? And when they accelerate particles in a particle accelerator, how does that work regards affecting the photons within the particle?

First, while the photons within the particle are constantly spinning around at the speed of light, the net motion of the particle they constitute results from a sort of Brownian motion. That is, a fraction of their motion knocks the net assembly in one direction or another. Remember, their overlapping fields now have them operating as a whole, so they will now move as one. And so:

*** The energy of the particle's motion is a fraction of the total energy of the photons within.**

*** Thus the more photons that build up within the particle, the greater will be the particle's net energy.**

Also, to restate: since the fields of the photons have all merged in resonance, they become the field perceived of the whole particle.

Since energy equates to mass, this also explains where all that extra particle mass comes from as it is accelerated closer to the speed of light.

Now, a particle being accelerated in a particle accelerator is done so by use of strong magnetic fields to move against those of the particle. But a particle can only be made to move faster by increasing the number of photons within it. BUT, we have one field– that of the particle– moving through another field– that of the accelerator; so two fields rubbing up against one another. This is how an induction coil in an electric motor works to create energy, or rather to convert magnetic force into electrical energy. What the accelerator is thus doing is *creating new energy* by the exact same method, and since energy is photons, the accelerator creates new photons at the same resonant/entanglement frequency of the particle that then naturally get drawn into the particle, thus increasing its net energy and hence its net velocity. The particle gains energy, and hence mass, so that when it is slammed against a target, it spits out its newly created photons in the form of a scattering of new particles that the scientists then assume were in there all along as components of the original particle. But they never were, the scientists generated them themselves in their experiment. That explains how they can find other component particles within a proton whose net mass exceeds that of the proton itself and why such attempts will never find the final answer that they seek.

This same this line of thought can also be applied to the problem of electrons: they emit photons whenever they change energy level orbitals in an atom, leading some to ask how the electron doesn't run out of extra photons, or perhaps simply disintegrate into a blast of photons once it gets down to its base of three. Well, first given these discussions, an electron is never going to completely disintegrate into a blast of photons as those photons are completely entangled to make the electron. If an electron gets down to its minimum of three electrons then it will not emit any photons; only when it has excess photons can it emit anything and then only when it encounters an exterior force or compulsion to rip one lose (like your average chemical or atomic reaction). Then as an electron gains energy, it gains photons, which gives it greater speed and hence the reason why it moves into higher orbital levels. But as for where an electron keeps getting these extra photons from in the first place, keep in mind that an electron is constantly moving in circular motions around the atom's nucleus, which means that its fields are twisting around opposing fields like those of the atom's protons and neutrons, or even other nearby electrons. Fields cross, lines of force twist about one another, and according to what we have been seeing, this is how we create energy from force. It's very movement within the atom is responsible for its constant supply of new photons as they are created from the very fields that radiate out from all photons (and hence particles) in the first place.

With all this in mind, there is now something else that can be corrected and explained: the relativistic Gamma term that calculates the increase of mass with increasing speed. First:

Gamma = $\sqrt{[1 - (v/c)^2]}$

So, for a velocity v, and a particle of original mass m_0, the adjusted increased mass, M will be equal to:

$M = m_0/\{\sqrt{[1 - (v/c)^2]}\}$.

That much is well known, but now that we know the relation between a particle's resonant frequency and its mass, we can make a couple of substitutions:

$m_o = 3(h/2\pi)\nu$

$M = N(h/2\pi)\nu$

Where N is the number of photons (N at least 3), of the same given frequency ν, currently in the particle as a result of acceleration and increased energy-mass. (the frequency in both cases will remain the same since we know now that is the only way a given particle will take in new photons for energy). Combining we get:

$N(h/2\pi)\nu = 3(h/2\pi)\nu/\{\sqrt{[1 - (v/c)^2]}\}$.

- **$N = 3/\sqrt{[1 - (v/c)^2]}$.**

This shows how the number of photons increases with increased speed of the particle; an increase in the value of Gamma means that there is an increase in the number of photons within the particle in question, which of course increases the mass of the particle as well as its inherent gravitational force and all that comes with it. We can also rearrange this and state it in terms of the particle speed as a fraction of the speed of light:

$3/N = \sqrt{[1 - (v/c)^2]}$

$1 - (9/N^2) = (v/c)^2$

- **$v/c = \sqrt{[1 - (9/N^2)]}$**

This version shows how the velocity of a particle increases with the increased number of photons bound within the particle. Note that the frequency, and hence mass, of the photons has dropped out; the particle velocity depends only on the number of photons, though different particles of different photon frequencies will have appropriately different masses for the same number of photons.

Another fallout of this, is the ability to calculate the resonant frequency of a given particle knowing only its velocity and the increased mass, M, due to that velocity.

$M = m_o/\sqrt{[1 - (v/c)^2]}$

$M = 3(h/2\pi)\ \nu/\sqrt{[1 - (v/c)^2]}$

- **$\nu = M\{\sqrt{[1 - (v/c)^2]}\}/[3(h/2\pi)]$.**

We now have a proper view of what the Lorentz factor really represents in light of this.

Of course, a particle can still be moved by other external applications of force, such as physically bumping into something– just like for any normal macroscopic object. But for any case that involves particles exchanging energy (i.e.: photons), or being accelerated by magnetic or gravitational fields, we're talking about the creation or addition of photons for that "Brownian" motion, and the implication that Einstein's Gamma only really applies to individual particles. Particles cannot move faster than light simply because they are comprised of light.

Particle Frequencies– The Geometric Derivation

We are now ready to re-derive the particle frequencies without reference to a particle's mass and obtain a geometrical interpretation of what exactly is going on. As it turns out, though, we won't have to change much.

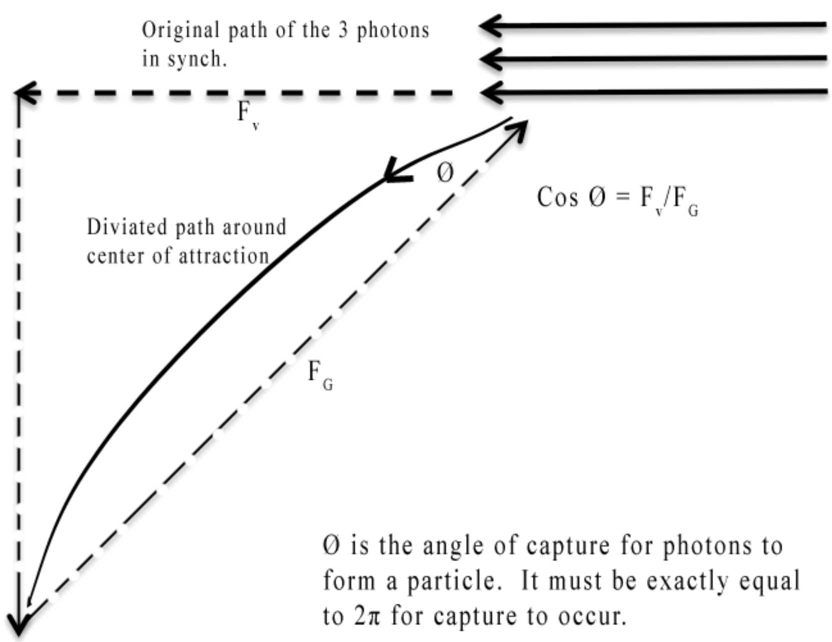

Fig. 3

For forward moving photons in synch at the same frequency to be mutually captured into a particle, they must move through an angle of exactly 2π to form a complete circle and loop back. Any less and the photons escape, any more and they overshoot. From the diagram above, this angle is formed between the force of the forward velocity as vs. the mutual gravitational force pointing inwards towards the common center. With the angle between them being Ø it is then Ø that must be equal to 2π. The Cosine of this angle is then the force of the forward motion divided by the gravitational force, or:

22) $$\mathrm{Cos}(2\pi) = \{m_pc^2\}/\{4GMm_p/\lambda\}$$

Since $\mathrm{Cos}(2\pi) = 1$, then this becomes

23) $$m_pc^2 = 4G_xMm_p/\lambda$$

With $M=3m_p$ for three photons, and using

$$E = mc^2 = (h/2\pi)\nu,$$

As before to solve for m,

$$m = (h/2\pi)\nu/c^2$$

then substituting and using $\lambda=c/\nu$, we get

$$\nu^2 = c^5/\{4G_x 3\ [(h/2\pi)]\}.$$

Just as for equation (12). NOTE: A careful eye will note that you can pull out Einstein's Gravitational Constant of $8\pi G/c^4$ from this.

Then finally:

24) $$\nu = \sqrt{\{c^5/(12G_x\ [(h/2\pi)])}.$$

If we want to reduce it even further then we just need to substitute in $G_x = c^2\ F_{Dx}$

25) $$\nu = \sqrt{\{c^5/(12c^2 F_{Dx}\ [(h/2\pi)])} = \sqrt{\{c^3\pi/(6F_{Dx}h)\}}$$

Using the appropriate Field Density, F_{Dx}, that we'd used before, we get the exact same frequencies for both proton and electron photons as before. The same frequencies as before but now derived without dependence on knowing the particle mass ahead of time. However, this still leaves one major question of the day: Why is the Field Density different for protons and electrons?

Well, for the two parts of our new generalized Force Constant, G_x, we know that the E_D component will never change, and that the F_D component changes from macroscopic to microscopic depending on the circumstance, but why would it change from one particle to the next? How would this work?

One word: two different polarizations.

The standard picture of a photon is a rather one-dimensional line wiggling its way through space. But the structure of a photon is not a homogenous blob waving its way along. Rather, it has a cross-section with two perpendicular components, where one component is much greater than the other. Assigning one as "horizontal" and the other as "vertical", the 'horizontal' for instance would be the component with a Field Density corresponding to that which will form protons given the correct photon frequency, while the 'vertical' component has the far greater Field Density for which the lower frequency for electron photons can be generated.

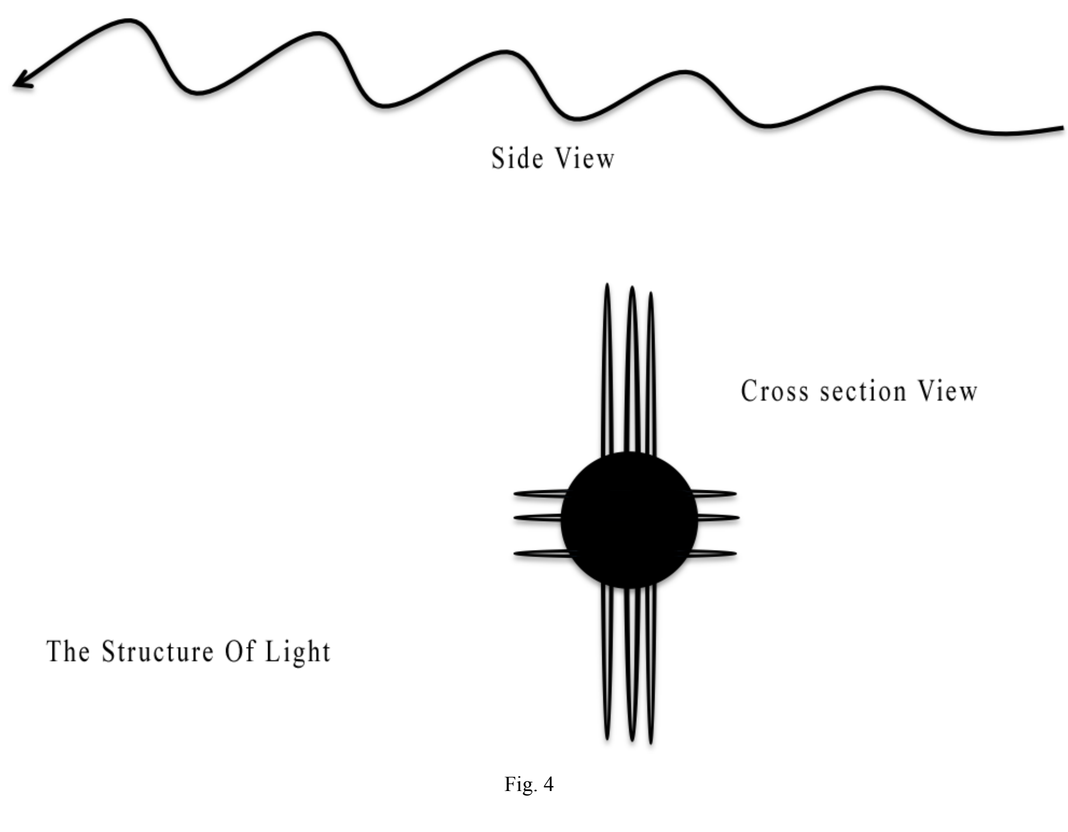

Fig. 4

Photons have structure! It is this structure, and its unbalanced energy/force distribution, that is responsible for the two different resonant frequencies that generate two different stable particle sizes and hence charges.

- **The Neutron:**

With all the above it is now easy to explain the structure of the Neutron.

Originally there were two possibilities. The first would be when a proton and electron combine then their component photons combine into 3 photons of a new resonant frequency. However, we now know this to be ruled out, as whatever frequency the new three would achieve would not be one of the two stable entanglement frequencies that the photon's shape allows; the neutron would just go flying apart.

The second possibility is if the two sets of three photons maintain their integrity as well as their separate frequencies, the proton and electron now entangled with each other but now via their opposing polarities instead of frequencies. This would also explain how the neutron could have both polarity waveforms requiring the two different frequencies activated at the same time, because the photons of the two constituent particles are both inside operating at their original frequencies and energies simultaneously. The resultant whole thus has both components of a photon's waveform so as to attract both types of particles as well as other neutrons.

**** Thus, the Neutron has six photons; three at the proton's frequency and three at the electron's frequency. ****

It is, essentially, a superposition of the proton and electron and hence able to attract them both… again, exactly my initial supposition.

Another way of viewing the Neutron and its function within the atom, is as a sort of ground in an electric circuit.

- **The Weak Force:**

Now that we have determined what a Neutron is, it is time to more formally state my stance on the Weak Force. It is said that the Weak Force is responsible for how a neutron "changes" into a proton and electron, and governs much of the radiation in the universe. But if a neutron actually *is* a proton and electron spinning around one another in excessively close proximity, then its decay becomes an inevitable consequence of the momentum of those particles held within a neutron getting the better of their electromagnetic attractions. A neutron is like a balance point that can be disrupted by any unbalancing force from the outside, such as other neutrons in an overly-crowded atom bumping close enough for, say, the protons within one to repel the protons within the other (before the attraction of the electrons also bound within the neutrons can act upon them) and cause both neutrons to break apart. No over-sized force-carrier particles are needed (and would indeed make no sense, since energy being mass, how does a single proton produce a carrier-particle 90 times its own mass that then seems to know which direction to fly out to for it to interact with the other particle?). Two neutrons need only get close enough, and be propelled at one another hard enough, for the fields around their individual component particles to briefly overcome the collective all-attractive neutrality the neutron normally exhibits: exactly the sort of range over which the Weak Force is said to operate. I leave it to others better versed in the mathematical complexities of the Weak Force to more formally solidify the connection between it and this theory presented herein.

Another type of decay that the Weak Force may be said to govern would be that of the zoo of short-lived particles outside our base primary ones, but these need no new force to explain. Particles are stable only at those two frequencies at which photons can entangle to form long-lasting particles such as the Proton and Electron. While there are transitional frequencies between these two stable extremes, photons entangling at any of these transitional frequencies would be a bit like balancing on the head of a pin; no long-term entanglement would be possible and so the decay of such a "particle" would be an inevitable result of the momentum of a photon's motion overcoming any type of attraction. Any frequencies outside of this range would last even shorter as there would be no cross-sectional frequency built within the structure of photons with which they can resonant, however briefly, and so the lifetime of such a particle would be entirely dependent on how long a purely gravitational force could overcome the photons' momentum.

The appearance of a Weak Force then is simply due to momentum and the constant internal jostling around of the photons which comprise all particles.

- **Predicting particle lifetimes:**

From all the above we now know that for a particle to be stable its photons have to complete that full 2π angle; the more of that angle it can complete before the photons go shooting off means the longer the "particle" has survived. A particle's lifetime could then be predicted by comparing its frequency to either one of the two stable frequencies then computing (using the previously derived formulas) how far from that 2π angle it will get (i.e.: how much of the pseudo-particle's circumference it can complete at the speed of light), or possibly how many orbits of increasing radius it will make (in an ever-widening spiraling orbit) before escape is achieved. Since the formula involves a cosine function then the predicted lifetimes of a range of particles of different internal frequencies will likewise follow a cosine distribution but as compared against the two stable entanglement frequencies for protons and electrons. The graph of the lifetime of such unstable particles might then end up looking sort of like two overlapping cosine waves. I leave it others to perform such calculations, but warn that there will be difficulties since you'll have to include the frequencies of the photons within the given particle as well as the speed the particle has been accelerated up to at the time of such measurements, not to mention the confusion of if a "new" particle is not simply a proton or electron with a vastly different number of photons to yield a greater mass. Additionally, increased speed or energy means increased mass (in the form of an increase in the number of photons within the particle as given by Gamma) which brings increased attractive force which would then keep an unstable particle together longer than expected (something which has otherwise been attributed to "time dilation" effects); the use of Gamma for this case would be correct but its interpretation is wrong which could affect other observations.

Simply put, the data taken on the zoo of "particles" is insufficient and a bit too sloppy in places to be of use in truly defining the nature of a given "particle". It should also be noted that anything with a lifetime approaching or below a millionth of a second is not really a "particle", and in the cases of those with even shorter lifetimes is more of a chance occurrence of very briefly attracted photons that just happen to be crossing paths at the moment of hitting the detector. This includes the Higgs Boson.

Derivation of the Field Densities and the final Shape of Light

We have F_{D+} and F_{D-}, but the problem is why or how these two parameters can vary on a photon, or more specifically, when we have just the one variable Planck's Constant and its macroscopic derivative, c^2, then how can we get *two* such results with just the one variable to work with? What manner of equation can generate them both? It can't be any sort of normal second order equation because we still can't generate two roots with just Planck's Constant. But then it occurred to me what form of equation can do the trick, and given the circumstances it seems rather obvious in retrospect.

Everything about a photon is a wave. It's a sine wave traveling through space, so it just makes sense that its cross-section distribution would follow one as well. A sinusoidal distribution wherein the two "roots" would simply be the minimum and maximum of the function, these then corresponding to our F_{Dx}'s. F_{D+} would be the valley of the curve while F_{D-} would be the peak. Basing the function around the cosine function with minimum at 90 degrees and maximum at 0 or π degrees, we want F_{Dx} to be F_{D-} when the angle Ø is zero degrees and equal to F_{D+} when Ø is 90 degrees. So what about every angle in between? Well, that really doesn't matter as our stable frequencies that generate protons and electrons arise from these extrema alone. We also want our function to be squared in some fashion, or when the cosine goes negative then so will our Field Density which is not what we want. Then together with our previous observation of a proton-photon's frequency being $6\pi^5$ times the electron-photon's and what that means for our Field Densities, that leaves us with two possibilities:

1) $F_{Dx} = F_{D+} [(6\pi^5 \cos Ø)^2 + 1]$
2) $F_{Dx} = F_{D+} [(6\pi^5 \cos Ø + 1)^2]$

So which one is the best fit? Simple. For Ø = π/2 we want $F_{Dx} = F_D+$ and for Ø = 0 we want $F_{Dx} = F_{D-}$, so we simply compute these two sets of numbers for each of the two equations then divide F_{D-}/F_{D+} to see which comes closest to the measured value of the proton mass divided by the electron mass squared. The winner here then is the first equation, with an error of 0.004899% as compared to .04958%.

And so:

26) $$F_{Dx} = F_{D+} [(6\pi^5 \cos Ø)^2 + 1]$$

For 0 degrees, this generates $F_{Dx} = F_{D+}$ while for 90 degrees this gives us $F_{Dx} = F_{D-}$, which is what we want. The cross-sectional shape of the photon then is not a simple case of greater Field Density in one direction as compared to the other, but a series of pits and valleys that follows a trigonometric distribution, though because of the $6\pi^5$ term these pits and valleys would be so sharply defined as to seem like very closely packed spike functions.

The final question then is, where does F_{D+} itself come from? Is it derived from Planck's constant and/or c^2? Is there something else involved? Or is this simply another measure of that same density of energy vs. force for this universe of which Planck's Constant is one side of? As it turns out, there is an answer, which will be discussed in a bit.

The shape of the photon, then, is described by both Planck's Constant and the Field Density parameters, F_{D+} and F_{D-}, as shown below. Of course the shape should be more in the way of a smoother sine wave between the two extremes (I'm not an artist), but this drawing should give you a good visual as to how the Field Density varies around the cross-sectional axis of the photon.

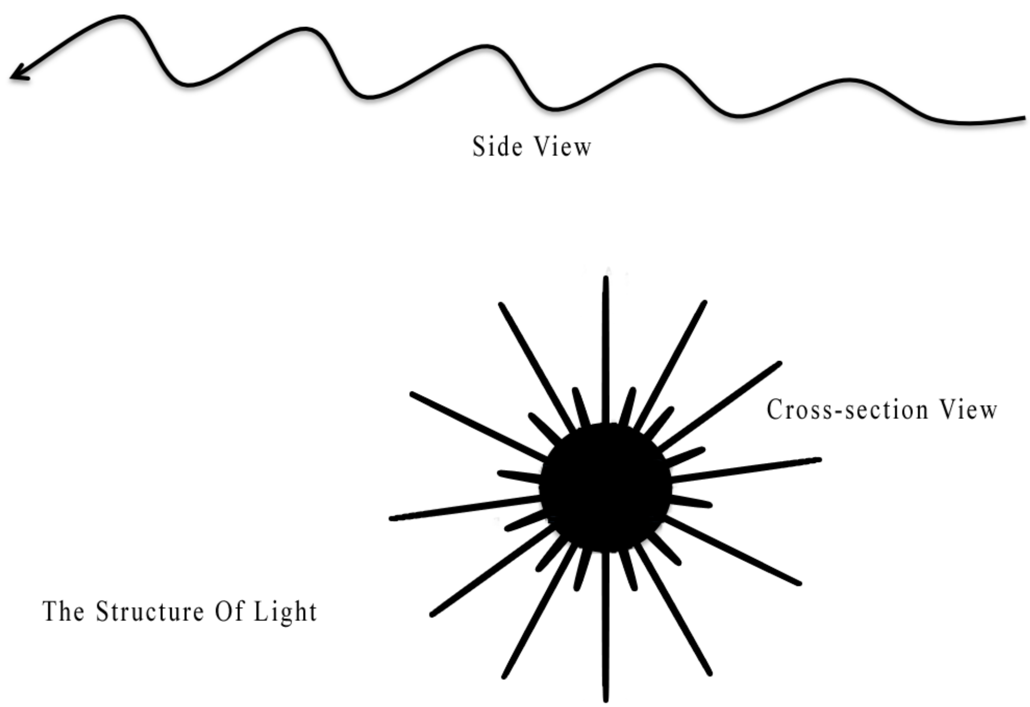

Fig. 5

This, then, is the shape of light.

We can now even say *how* the photon moves. The differential in force between FD+ and FD- causes the photon to twist, moving forward in a sort of corkscrew trajectory.

- **Final Formalization Of The Field Density Equation**

Equation 26 is still incomplete as it puts things in terms of one of the Field Densities instead of our previously recognized universal constant, but we can still rearrange it a bit if we recognize a couple of things. We're looking for any sort of pattern to give us a clue as to where the two Field Densities originate from. First remember that:

$$F_{D-} = F_{D+}\,(6\pi^5)^2,$$

which means that one is dependent on the other, leaving us to find which of the two is the original from which the other is derived. We begin by looking for a pattern to give us a clue, and in that one pops right out in front of us. F_{D-} is of the order of magnitude is closest to c^2, our Energy Density, so we'll examine that first. Dividing F_{D-} by c^2 we get:

$$F_{D-}/c^2 = 3.586659191,$$

which is complete nonsense at first glance, but it *is* rather close to PI, so let's divide by PI to see what's left.

$$F_{D-}/(\pi c^2) = 1.141669079.$$

This is *almost* nonsense until we realize that some of those digits look *very* familiar. In fact, add 2 to this and you get to within 0.00764% of π! This means that we can rewrite F_{D-} as

27) $$F_{D-} = c^2\,(\pi)(\pi - 2).$$

Of course this does not tell us where all the PI values come from, nor does this give us all the units required for our Field Density, but when the numerical value is within 0.0067% of our F_{D-} then we kinda go with it and figure out the rest later. But using this we can give a better representation of our equation that depends solely on our known universal constant and a little geometry.

Substituting $F_{D+} = F_{D-}/(6\pi^5)^2$ and $F_{D-} = c^2(\pi)(\pi - 2)$ into our equation we finally get:

28) $$\mathbf{F_{Dx} = c^2(\pi)(\pi - 2)\,[(\cos Ø)^2 + 1/(6\pi^5)^2].}$$

When the cosine of the angle is equal to 1 then $F_{Dx}= F_{D-}$; when it is equal to 0 then $F_{Dx} = F_{D+}$. Of course now we have that extra $(1+1/(6\pi^5)^2)$ term multiplying in for FD- but that still brings us within 0.006665% of our previous value for FD-, as compared to 0.00669% percent for using just $c^2(\pi)(\pi -2)$ without the extra fraction, which as we can see is actually a little bit more accurate.

This looks like a good final value for our equation save in one respect: We still need units of (J/Kg)/N, and this only gives us (J/Kg) from the c^2. Somehow either the addition of the $(\pi)(\pi -2)$ term or the c^2 must include the "per Newton" that we require to convert the Energy Density into the Field Density, not to mention where do all these powers of PI come from in the first place, nor the reason behind a couple of the terms.

Let's start by noting that Equation 28 is actually missing one little term before we can put it in its final form.

29) $$\mathbf{F_{Dx} = c^2(\pi)(\pi -2) [(\cos(n\text{Ø}))^2 + 1/(6\pi^5)^2].}$$

As it turns out, that 'n' together with the square of the cosine determines the actual shape of the photon's cross section and the number of density 'loops', or petals on a rose for a normal graph.

Now, the reason for the 'square' of the cosine function, other than to avoid a negative Field Density, is simple. Picture a balloon and squeeze it once in the middle; you now get two balloons for the price of one; that is sort of what is going on with the varying sections of higher field density; each opposing pair is actually just one but "pinched" in the middle by the core of the photon. If you graph it out, you will see that squaring the cosine doubles the number of petals represented by 'n'.

Which brings us to 'n'. The number of 'petals'– or in our specific case the number of higher density patches, then again the number of lesser density patches– is equal to '2n', or more generally:

$$F_{Dx} = c^2 (\pi)(\pi -2) [(\cos(n\text{Ø}))^m + 1/(6\pi^5)^2]$$

Where 'nm' equals the number of 'petals'. The question then is what determines 'n'. The answer, after a lot of deep thinking, is really pretty basic. Basic geometry, that is. Each ray or petal radiating out from the center has two parametric components, analogous to 'x' and 'y', or more accurately the cosine and sine of the angle between any two rays or petals.

First, remember that the force behind a photon is all-attractive, and in fact the reason why a photon moves at all is because each 'petal' is attracted to its neighbors, causing the photon to spin and move along as it is attracted to itself. Now for a given ray, if the angle is closer to one neighboring ray than its other neighbor, the two rays will either combine together, reducing their number to something stable, or be counteracted by another such pair being attracted in a counter direction resulting in the photon seizing up and staying in place. The only way that the photon can move at all, is *not* if the angle between all rays is the same, but if their *component vectors* are the same– the component of a given 'petal's' force directed to either side in the direction of its neighbors. That is, if both the cosine and sine of the angle between any two 'petals' is exactly the same. There is only one angle for which this occurs: 45 degrees.

This means there must be eight 'petals' (360/45 = 8), or "nm=8". Since m=2, then 'n' must equal to 4. This gives us the final form of our Energy Field Density Equation.

30) $$\mathbf{F_{Dx} = c^2 (\pi)(\pi -2) [(\cos(4\text{Ø}))^2 + 1/(6\pi^5)^2]}$$

- **How a Photon moves:** We thus have a situation in which each given 'petal', or section of higher field density, is 45 degrees away from each of its two other neighboring higher density regions, as are the sections of lower field density away from one another. This creates a stable configuration, but also sets up the reason behind the photon's movement and shape. If the photon starts as a straight line, in a near instant the self-attraction of similar density field areas will twist the photon about in a given direction, causing it to deform into a corkscrew spiral. But it will keep twisting, causing it to spin about as it moves forward. This is the reason behind a photon's movement and shape, with the wavelength being the distance between loops of this corkscrew.

The last piece to analyze is the '$1/(6\pi^5)^2$' term. That, as it turns out, involves a bit more work, so rather than detract from the subject immediately at hand, its derivation is left for a later section in this paper. Suffice it for now to say that this term is somewhat sinusoidal in its origin.

This then is the complete form of the equation and the physical reasons behind its components. But we are still missing the "per Newton" part of our units. c^2 gives us units of (J/Kg) but F_{Dx} requires units of (J/Kg)/N. This little puzzle is answered after tackling one last derivation which we will see a little bit later. Until then realize that Equation 30 describes the exact shape and number of density regions of the cross section of a photon. But not just for our one universe, but for *any* universe. PI is a mathematical constant that will remain the same in any given universe, while c^2 (and its relative Planck's Constant) is the one multiversal variable that will change from one universe to the next and thus define everything for that given universe. This is truly a generalized equation!

As far as the appearance of what these Field Densities would look like, the previous graphic is still basic at best, because the Field Densities varying like a sine wave would actually be perceived as sharply varying *intensities* of force around the photon's cross section in place of the spikes I put in my crude drawing. As such I now present a more accurate cross-sectional drawing of the photon, including the exact number of 'petals' we have just calculated, where the varying Field Densities are given by lighter and darker shades of gray. The relative intensities are not to scale, and I can't really draw a corkscrew spiral (the line indicates the direction of motion and I labeled what one wavelength would be) so I did that alongside the old side-view drawing to give you two views of that, but this should give you an idea.

Basically, the shape of a photon is that of a spiral corkscrewing along through space (or picture it like a spring, if that helps), whose cross-section has 8 regions of high field density alternating with 8 regions of low field density.

One question here would be to ask if the photon's shape would thus corkscrew left or right, to which we can say that there is no preference; you can have both "left-handed" and "right-handed" photons. It should not, though, make any difference in interactions and the creation of particles. It's all really a matter of perspective; say if a clockwise corkscrew causes the photon to go "forward" while corkscrewing counter-clockwise makes it move "backwards", if you flip one around 180 degrees then we now see them as both corkscrewing in the same direction anyway.

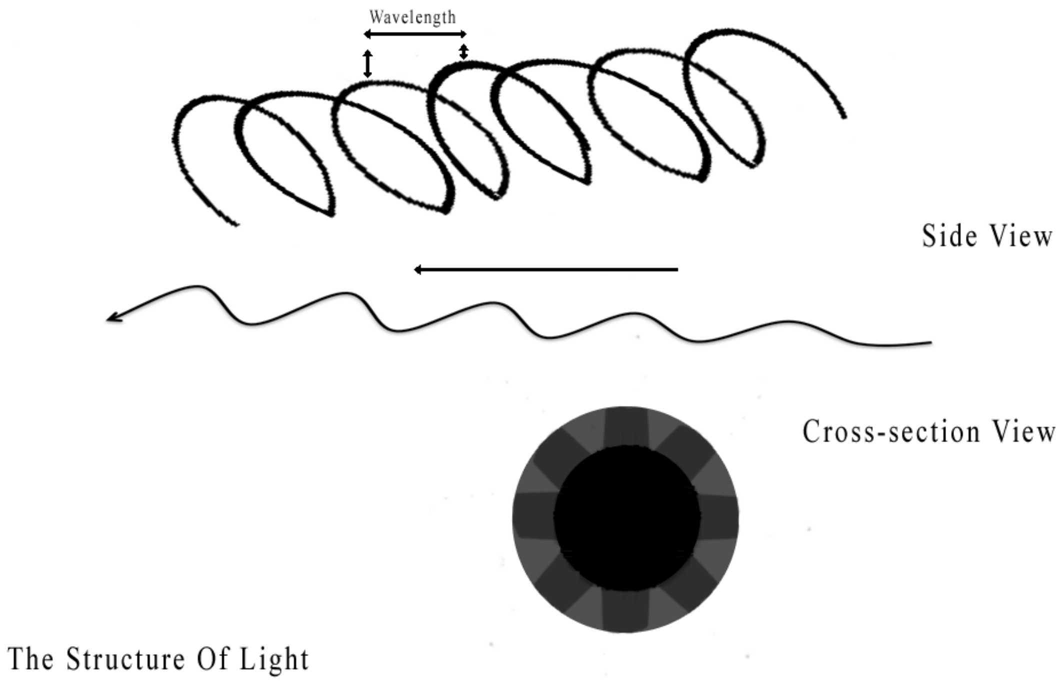

Fig. 6

The final step will now be to use Equation 30 to work backward and calculate our new more accurate values for the Field Densities and resonant frequencies for the proton and electron photons. Using Equation 30 to first calculate the Field Densities with more reliable precision, then plugging that into Equation 25 to get the adjusted frequencies to similar precision, our final values are then as follows:

31) **New F_{D+} = 9.560953724 X10^{10} (J/Kg)/N Percent change: -0.0007845%**

32) **New F_{D-} = 3.22331369X10^{17} (J/Kg)/N Percent change: 0.0066645%**

33) **New ν_+ = 4.718981491X10^{23} Hz Percent change: -0.00039%**

34) **New ν_- = 2.570085643X10^{20} Hz Percent Change: 0.00333%**

Admittedly the difference between the old and new values is pretty small, but the point was to arrive at these final values from a derivation involving only universal constants and geometry to provide exact values against which the errors of measurements can then be judged.

Planck's Constant and c^2 Equivalence- Mathematical Derivation

Earlier it was stated that Planck's Constant and the square of the speed of light both measure the same universal Energy Density just at different scales; Planck's Constant does so at the level of the photon while c^2 does so on a more macroscopic scale. My argument was the simple logic that the universe can have only one energy density so they both must be the same. This, now, is a mathematical derivation to show that fact.

The idea is to show a conversion from Plank's Constant directly to c^2. This means that we have to go from units of Js– or rather, J/ν– into units of J/Kg; a task that initially intimidated me until I had an epiphany that simplified things to a one-line calculation.

With h = $6.62607015 \times 10^{-34}$ J/ν, our goal is to convert that into $c^2 = 8.987551787368 \times 10^{16}$ J/Kg.

The basic strategy is to use h to calculate the energy of a single photon, then knowing now that there are 3 photons in a particle, then from there count up how many particles we have in a kilogram. That last bit was the part that intimidated me until I hit the obvious solution (which I am sure you've already seen). As it turns out, there already is a well-known constant that counts particles. Avogrado's Number states the number of particles per mole of a given substance, then from there we can look up how much one mole of a given element weighs.

We will use Avogrado's Number = $N_A = 6.02214076 \times 10^{23}$ particles/mol

With this in mind, the base format would be thus:

$(h\nu/(2\pi))$ * (3 photons/particle) * N_A * (1/(number of grams/mol)) * (1000grams/Kg)

This converts Planck's J/ν into J/Kg. The $(1/2\pi)$, of course, comes from $E=h\nu/(2\pi)$.

As far as which element to use for the calculation, the obvious is to use Hydrogen; it has just one proton and a single electron and no neutrons, which makes it as simple as possible. This means that the photon frequency we'll be using is that of those found within a proton. But we're talking about a mole of hydrogen *atoms,* which also includes its electron. So for greater accuracy, we must also include the electron, which effectively means setting $\nu = \nu_+ + \nu_-$, since $(h\nu_+ + h\nu_-) = h(\nu_+ + \nu_-)$. Thus:

$\nu_+ = 4.718981491 \mathrm{X} 10^{23}$ Hz

$\nu_- = 2.570085643 \mathrm{X} 10^{20}$ Hz

Looking up the number of grams/mol for hydrogen, we get 1.00794 grams/mol. (For this, the assumption is simply single-atom atomic hydrogen, not molecular H_2).

Inserting all this, we get:

$(6.62607015 \times 10^{-34}$ Js) * $(4.718981491 \mathrm{X} 10^{23}/\mathrm{s} + 2.570085643 \mathrm{X} 10^{20}/\mathrm{s})$ * $(1/(2\pi))$ * (3 photons/particle) * $(6.02214076 \times 10^{23}$ particles/mol) * (1 mol/1.00794grams) * (1000 grams/Kg) = $8.92479760078 \mathrm{X} 10^{16}$ J/Kg.

Comparing this to the known value of c^2 we get an error of 0.6982%.

This is enough accuracy to say definitively that Planck's Constant, h, and the square of the speed of light, c^2, are indeed one and the same thing, just at different scales; h for the microscopic and c^2 for the macroscopic. As far as the source of what little error there is, that most likely comes from any limits on the accuracy of the measurement of the grams/mol of hydrogen as well as the accuracy of Avogadro's Number, and possibly my calculator.

A side effect of this connection, is that since this calculation uses two values derived exclusively in this paper– the number of photons/particle being 3 and the resonant frequencies used– the accuracy of the result serves to also prove the validity of both of those values, since the odds would be beyond astronomical if it was just a coincidence.

Further Analysis– Angular Velocity

There is one part of Equation 30 that does admittedly look like it could do with a bit of analysis, and that is the '$\mathbf{c^2 (\pi)(\pi - 2)}$' part. To see what's going on, however, we need to make a quick calculation.

- **Angular velocity of a photon**

We now know that a photon has structure, and that it is corkscrewing along the length of its axis as it travels along. We know its forward speed, but what about its *angular* speed? Just how fast is it spinning around in circles? The speed of light would be the forward velocity of the photon as it moves forward, while v_a would be the rate at which it is spinning around in loops as the helix shape twists its way forward.

One full loop of the helix would be a circle of circumference 'πD', where $r = D/2$. D is also the linear distance the photon as a whole has moved forward in the same time period.

Now, in general for angular velocity:

$\omega = 2\pi/T$

and so with $r=D/2$,

$v_a = \omega r = \pi D/T$.

From the forward velocity, since the time for one revolution of πD would be equal to the time for the photon to travel the linear distance 'D' forward at speed 'c':

$T=D/v_a = D/c$

Substituting for v_a, we get

35) $v_a = \pi D/(D/c) = \pi c$.

A photon spins around with an angular velocity of πc, though a side note is to see that for *any* helix moving forward at a given linear velocity of 'v', its angular component would be equal to πv.

- **Equation 30 rewritten**

This itself is an interesting little tidbit, and while we might be curious about the angular acceleration of a photon, that is not our goal here. Note now how that segment of Equation 30 looks in light of this.

36) $c^2 (\pi)(\pi -2) = c^2 (\pi^2 - 2\pi) = (c\pi)^2 - 2\pi c^2$.

Now that mysterious string of PIs can be seen in a different light: the difference of the square of the angular velocity minus 2π radians times the square of the forward linear velocity. A more representational way of writing Equation 30 would then be:

37) $$\mathbf{F_{Dx} = \{(c\pi)^2 - 2\pi c^2\}[(\cos(4\O))^2 + 1/(6\pi^5)^2].}$$

This may perhaps be a more comfortable way of viewing the equation of a photon. As far as the pesky '$6\pi^5$' term, that is the next topic of discussion.

Photon Compression Factor- $6\pi^5$ Derivation

By now you have realized that '$6\pi^5$' is a pesky little number. It fits into a number of things, gives a lot of evidence that it is a real thing, and yet what is it? What does it represent and how is it actually derived? To get the answer, we must reason our way back to the very beginning and ask a question that no one has ever asked before.

How does a photon form in the first place?

We've seen that energy is compressed force, that a photon forms from a concentration of force. But let's now take a look at the details of how that happens. After all, we would not expect a photon to form full-blown with all its bumps, valleys, differing field densities, and internal geometries; there has to be a reason why all of its structure forms so consistently.

We start with two things: Force compresses into energy, and this force is self-attractive– which is what causes force to collect into pools of energy in the first place.

Force spins around itself and forms into energy in the form of a proto-photon. In appearance, this would basically be a plain uniform cylinder. No differing field densities yet, no wave-patterns, no features whatsoever. Just a plain bar of energy. Note that it could also begin life as a sphere, but the processes to be describe would eventually lead to it assuming a more cylindrical shape once it gets to spinning about and shooting off. But, to continue.

As far as variables, we have only the one: our Energy Density, which we can take in one of two forms; either Planck's Constant or c^2. However, we can't yet use Planck's Constant because that is in units of energy per unit frequency and we are not yet in a place where the sinusoidal waves in a photon have even formed. This leaves us with using c^2 as our only known variable.

The first thing that happens should, at least in retrospect, be obvious: the energy, being comprised from this self-attractive force, begins attracting to itself. That is, the ends of our cylinder start pulling inward towards one another. But not simply the ends, but rather all along the length of our proto-photon. Picture it as being done in slices, where each slice is simultaneously being pulled in both directions along the axis of the cylinder to its next neighboring slices.

Our proto-photon would then begin resembling an aluminum can being crushed from the ends. What happens when you do that? You create ripples, like unto a sinusoidal pattern as our can compresses. In the case of the proto-photon, these ripples take the form of the highs and lows of the Field Densities discussed throughout this paper. But like for a spring, there is a limit to this compressibility as the substance of the energy itself gets in the way. The energy will continue to be attracted to itself, continue to compress, but only down to a certain minimum point as its own substance gets in the way of any further compression.

Again, like crushing an aluminum can, you can crush it down only so far before the material of the can stops you from going any further. The bulk of the photon itself pushes back to resist any further compression.

During the act of compression, especially as its own substance starts to get in the way, our proto-photon cylinder will start to twist as it compresses; like wringing out a wet rag. It is here that the sinusoidal pattern of its wavelengths forms and we obtain the final spiral corkscrew shape described earlier.

The following is a quick sketch of what has just been discussed of how a photon forms:

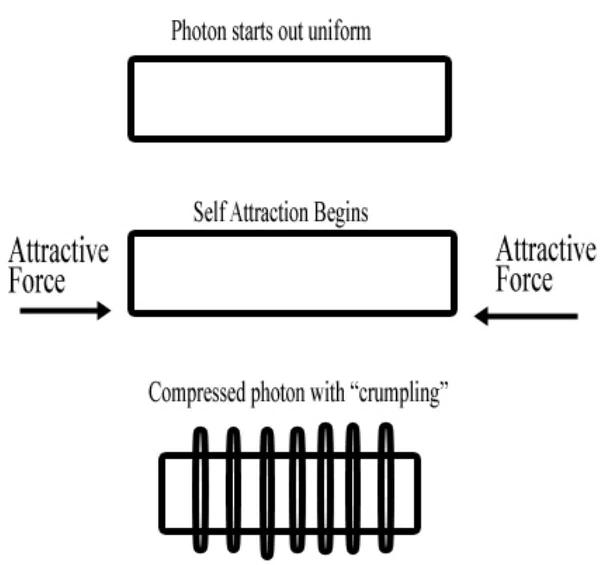

Fig. 7

The next step is to figure out how to measure this compression. To start, you have two basic vectors. The first is our self-attractive force, which we'll label as F_g, since it is sort of akin to a gravitational-like force. The other is our resistive compression force which we'll label as F_p, since it is basically the force of building pressure. F_g is going inward, while F_p is aimed outward, but additionally while F_g can be viewed as a straight horizontal vector, F_p will be angling upwards from the horizontal as its 'crumble zone' forms until such time as maximum compression has been reached. At this point a small angle will be formed between the two forces. This will be happening at each 'slice' or crumple of our photon, as illustrated below in a sketch of one random such slice.

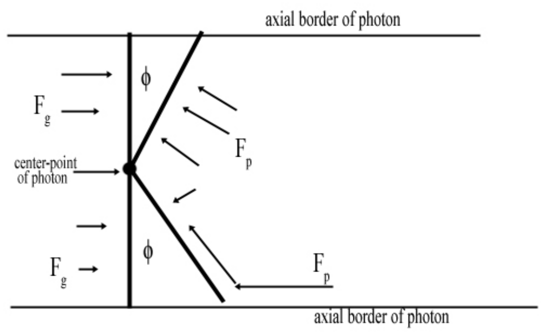

Fig. 8

Of course this is only a crude first approximation drawing of what's coming, but it's enough to show that the only real way we have of measuring or even defining how much a photon crumples in upon itself to become a photon is by the measure of that tiny angle, φ. This angle is our *'Photon Compression Factor'*. Computing this angle will involve taking its sine and, as we shall see (if you haven't already guessed), this angle is small enough that we can use the small-angle approximation to yield sine (φ) = φ.

The first step in computing this angle is to clean up our diagram with a couple of detailed observations. One obvious observation is that those lines of force slamming together would not be straight, but more like a curved wave front, more so because as the two ends of our slice of the photon get closer together, they are actually twisting into a spiral. Thus there is a forward vector as well as an angular vector.

The next thing to realize is that a photon is three-dimensional. Not only the ends will be attracting towards one another, but the outer skin of the photon will be attracting inward, shrinking the photon. Then in a cross-sectional view, any given cross-sectional slice will also be attracting in a radial direction in towards their neighbors. That's three different directions, with three different force vectors. The following illustrations should make things clear.

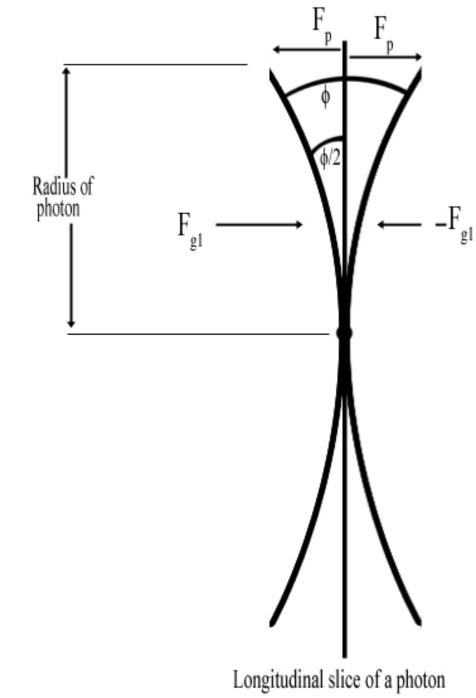

Fig. 9

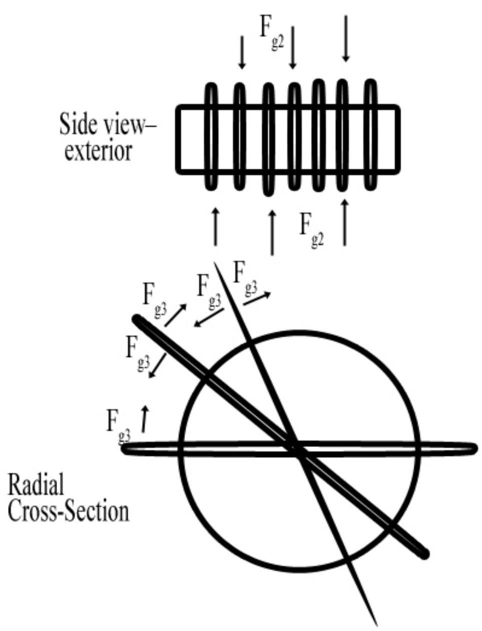

Fig. 10

So, how do we compute this mess? By making a couple of simple observations. First, that the nature of all three force vectors stems from the exact same source, that is derived from c^2. Each of these three forces are of exactly the same magnitude. Thus, we can add them together and treat them as a single vector coming from just one chosen direction.

The second observation is that to solve this problem we're actually dealing with a half angle, so we need to arrange our equation in terms of φ/2, then double our final solution to get the full compression angle. Also note that we're dealing with curved surfaces moving at a given velocity, not to mention twisting as they move.

First then, for F_g:

38) $$F_g = F_{g1} + F_{g2} + F_{g3} = 3F_{g1}$$

Then our base equation is:

39) $$\text{Sin}\ (\varphi/2) = F_p/F_g.$$

First we tackle F_g.

We begin by noting that everything about this component concerns angular velocity, which means the acceleration component of any force is going to be a function of 'v^2/R' (for whatever 'R' will be). But also note that we're talking surfaces twisting around and not simply lines; this implies that there will be an area component in there somewhere, our only concern being that since we're talking curved surfaces then that area will involve a 'π' at some point. Thus, the attractive force in this case is going to be a function of π times the square of the incoming angular velocity. Thus we have:

$F_{g1} = f(\pi v^2)$

But the velocity is the angular velocity of a photon, which we saw earlier as being 'πc', so we have

40) $$F_{g1} = f(\pi(\pi c)^2) = f(\pi^3 c^2) = \pi^3 f(c^2),$$

since we know that PI is a straight constant and not the object of our function. At this point, we know nothing about the function itself, just that it will be in terms of c^2 as our variable and involve other geometrical aspects of the photon. Let's leave it that way for now. That leaves us with the final result for F_g:

41) $$F_g = 3\pi^3 f(c^2).$$

Now for F_p.

Our resistive pressure can be treated as a force counter to the force compressing the photon, just opposite in sign, that at the final angle we're interested in is in balance. This means that:

$F_g = -F_p$.

We just need to make some adjustments. Since this counter force also comes from the same substance as its opposite, it will also be a function of c^2, but it's not moving as is F_g. Rather it is acting more in the way of a standing wave; an oscillator or spring. This suggests:

$F_p = f((v/(2\pi))^2)$

The velocity here is not spiraling around like for F_g, so we can simply use 'c' for 'v' and get

42) $$F_p = f((v/(2\pi))^2) = f((c/(2\pi))^2) = f(c^2/(4\pi^2)) = (1/(4\pi^2))\ f(c^2).$$

Where $f(c^2)$, being derived from the exact same origin and forces as that of F_g, with the same geometries (any differences having been taken out in the various 'π' terms), will likewise be the exact same function.

Let's now put it all together.

43) $$\sin(\varphi/2) = F_p/F_g = (1/(4\pi^2))\ f(c^2)/(3\pi^3 f(c^2)).$$

We haven't computed $f(c^2)$, and in fact have no idea what it might be comprised of or what additional terms will be in it (no doubt a lot of rather messy trigonometric and other terms). As it turns out, however, there is no need to know, since that function is the same on top and bottom and cancels out, leaving us with:

$\sin(\varphi/2) = 1/(12\pi^5)$.

This is an obviously small enough angle that, since it's a sine function, we can use the small angle approximation, yielding

$\varphi/2 = 1/(12\pi^5)$.

But remember that this is a half-angle, so our final answer becomes:

44) $$\varphi = 2/(12\pi^5) = 1/(6\pi^5)!$$

Thus, the measure of how much a proto-photon compresses to become the wrinkly little worm we know it to be, is given by the Photon's Compression Factor in the form of a diminutive angle, or rather its sine which on this scale of things amounts to being the exact same thing.

Photon Compression Factor = $1/6\pi^5$

And so, the more proper way of stating our little Field Density Equation is now seen to be as,

45) $$\mathbf{F_{Dx} = \{(c\pi)^2 - 2\pi c^2\}[(\cos(4\text{Ø}))^2 + \sin(\varphi)^2],}$$

where $\varphi = 1/6\pi^5$.

$1/6\pi^5$ represents the ratio of the original force to the energy field it compresses into, and the reason behind the differing sizes of protons vs. electrons and everything else that this factor appears in. It is also worthy of noting that this number is entirely geometrical in origin and not dependent on any constants or variables. This means that this factor, and hence the Field Density equation that it is attached to, holds for *any* given Universe in which you might find yourself. Only 'c^2' (and hence Planck's Constant) changes and that changes everything.

As noted at the beginning of this section, even if you have to assume that the proto-photon starts out more spherical in shape, its compression and evolution of the differing Field Densities would cause it to take on directionality for it to move and that would quickly evolve its shape to one more cylindrical… or much like a length of spiral pasta.

The Nature and Origin of Charge

Finally we come to charge. What is it, where does it come from, and why does it have a given specific value no matter the size or energy of the particle in question? That is what this section will answer in full.

From my base theory of the make-up of particles in general and the structure of a photon, we can now work out where the two different charges come from and what is the nature of charge itself. Since each particle is in synch at a frequency corresponding to one of the two values of Field Densities present within a photon, then it is basically an incomplete field, being half a field naturally attracted to particles of the opposite polarization; like half of a photon trying to connect with its other half. Basically the same sort of theory as initially postulated, of partial waveforms being naturally attracted to one another, only now we know that it's particles of only one polarization generated from its photons. Particles of the same type both have the same polarization and would thus repel.

Basically, groups of photons resonating at the frequency corresponding to the Field Density that gives rise to protons we call "positive", while groups of photons resonating at the frequency corresponding to the Field Density that gives rise to electrons we call "negative". The "sign" of our charge is directly connected to which frequency a particle is entangled at.

This hints at the greater picture.

The concept of 'Charge' originates from the structure of the photon itself and its two different Field Densities, as do the relative sizes of the Proton and Electron.

But why then do the electron and proton have the same charge even if vastly different masses? And what about when one of them is accelerated up to greater energies, and hence greater numbers of photons, and still have the same value of their charge? That is the question that will be answered, as well as doing something that no one else has performed before (to my knowledge): we will calculate the predicted value of the unit electron charge based purely on the theories we have been herein discussing. Up until now, the value of charge has been considered an intrinsic value that can only be measured, never calculated.

First let us be clear on the goal. The Unit Charge is measured in Coulombs, at 1.602176×10^{-19} C, but the 2019 redefinition of SI units set the numerical values of 1 electron-volt and the elementary charge in Coulombs exactly equal to one another, differing only in their units. It thus seems reasonable, for now, to equate one with the other and express the elementary charge in Joules as well (this will change). Thus the target is: $e^- = 1.602176x10^{-19}$ J. While I have seen this given to more decimal places, I have also seen different values for those extra digits; thus, this is as far as I can reliably go.

- $e^- = 1.602176x10^{-19}$ J.

The value of the elementary charge comes, at its basis, from the difference in the two opposing Field Densities of a photon as it interacts with other photons with which it is entangled within the confines of being a particle as they spin around each other. Thus, the numerical value of the elementary charge originates from the interaction of their forces, the centrifugal force as they orbit around, and the moving geometry of the situation.

These interactions involve a lot of moving and twisting about; photons– comprised of energy that is itself derived from the force that emanates from them– moving and spinning, which twists the field lines through which they are entangled; like balls with lengths of string attached to them that get entangled with those of other photons. The amount of such twisting of these field lines is independent of the number of photons present, only relying on the speed the photons are moving at and the courses they take. These "twists" in the field lines are what defines charge.

What then are these twists? How do we measure or define them? Picture the photons speeding about a common center as masses at the end of a stick moving with a constant velocity around in circles, constantly pulling against what it is attached to. It would have a tangential component due to its velocity but also an attractive one luring it back in. Two components of the same type of phenomena that are described in a single word.

Torque.

Charge is a measure of the Torque upon a particle's field by the motion of the photons within it.

Specifically, charge is the torque that the moving photons within a particle put upon the fields of force emanating from each of them, constructed by a combination of their movements and entangled attractions. It thus doesn't matter how many photons after the first three that there are, the numerical value will always be the same. This is because, just as the value of 'positive' or 'negative' is a function of which frequency the photon is entangled at from which of the two stable Field Densities, so is charge a function of the *difference* between those two Field Densities. We're basically measuring the force resulting from the span of those two measures (which occur in all photons) as the photons' fields are being torqued around one another by their constant motions.

If the nature of charge is indeed torque, however, then noting that the units of torque are Newton-meters, we can express the base unit charge more correctly thus:

- $e^- = 1.602176E^{-19}$ N-m.

This, then, is our true goal; to calculate this value for electron (and hence proton) charge in terms of torque.

So where do we start? Well, to begin, it takes at least 3 photons to create a particle, but a particle can have more than three photons. How then do we handle this? Simple. We can always group any number of photons into subgroups of three at a time; even if the number of photons involved is not divisible by three, that just means that one or more photons are getting shared, like overlapping triangles. The result is the same.

So for a given particle comprised of any number of photons, we can always break it down into groups of three photons at a time, knowing that the result will still apply for 3 or 300 photons in a particle. This calculation at first appears to be your classic three-body problem, however luck is with us: all three bodies involved are of the same mass (entangled at the same frequencies), and we do not seek to find their equations of motion, but merely a scalar value.

Some assumptions to start:

With three photons spinning around one another, the angle, Θ, between them that we'll need for these calculations would be (360/3=) 120 degrees, or $2\pi/3$. It should be noted that for a sine of this angle, that 120 degrees and 60 degrees ($\pi/3$) give exactly the same value (a fact which initially tripped me up a bit).

- $\Theta = 2\pi/3$

This is the only angle that we will need. Now for the rest.

- Frequency (photon or electron) = $\nu_x = \{c^3\pi/(6hF_{DX})\}^{1/2}$
- F_{DX} = Field Density; F_{D+} for proton, F_{D-} for electron.
- Photon mass = $m = (h/2\pi)\nu/c^2 = [(h/2\pi)/c^2] * \{c^3\pi/(6hF_{DX})\}^{1/2} = hc/(2\pi c^2) * \{c\pi/(6hF_{DX})\}^{1/2} = (h/2\pi c) * \{c\pi/(6hF_{DX})\}^{1/2}$
- $m^2 = \{ch\pi/(6F_{DX})\} / (2\pi c)^2 = h/(24cF_{DX}\pi)$
- $G = c^2F_{DX}$
- Wavelength = $\lambda_x = c/\nu = c[(6F_{DX}h)/(c^3\pi)]^{1/2} = [(6F_{DX}h)/(c\pi)]^{1/2}$

At any given instant, in our groups of three photons, we have a circle prescribed by their orbits with a maximum circumference, C, equal to their three combined lengths. Naturally we would require the radius, r, of that circle. Nothing could be easier:

- $C = 3\lambda = 2\pi r$, which gives us: $r = 3\lambda/2\pi$

The base equation for torque is $\tau = Fr\sin\Theta$, while also noting that torques from multiple sources are cumulative.

$\tau_t = \tau_1 + \tau_2 + \ldots$

For our case, there appear to be two sources of torque; the first from the attractive force (τ_f) and the second from centrifugal force (τ_c).

However, this is a torque in *three* dimensions brought about by *three* moving photons, each running around at three different angles. So our torque becomes $\tau = Fr\sin\Theta_1\sin\Theta_2\sin\Theta_3$. The angles, though, will all be the same (120 degrees), so our torque formula reduces to:

46) $$\tau_t = \tau_f + \tau_c + \ldots = F_fr_f\sin^3\Theta + F_cr_c\sin^3\Theta$$

Before we delve into these, however, there is one last thing to account for, and that is the fact that as each of these photons are corkscrewing along their trajectories, the '$1/(6\pi^5)$' term in the Field Density equation will come into play. We know now that it is actually the sine of the Photon Compression Angle and a measure of how tightly wound the energy of a photon is, which also reflects in how tightly wound the resulting torque between our photons is. But while for the Field Density equation that was for a purely linear direction, here the movement is in three dimensions by three interacting particles. Not simply three particles moving forward in straight lines, but three particles *corkscrewing* forward along their lines of motion, the actions of their twists being reflected upon the motions of the other two particles. As such, we get to cube it, just like for the sine term. Since this would apply for both of our torque terms, we finally have:

- $\tau_t = \{F_fr\sin^3\Theta + F_cr\sin^3\Theta\}(\sin(\varphi)^3) = \{F_fr\sin^3\Theta + F_cr\sin^3\Theta\}/(6\pi^5)^3$

Now let's start to break it down.

First to note is the 'r' term. This term represents the line that a photon is drawing, but remember that we're talking about a sphere, so the line is not straight but rather an *arc length.* An arc length moving about in three dimensions through three angles under the influence of two other particles. For either component of our torque, then, this extended arc length would become:

$r = r\,\Theta_1\,\Theta_2\,\Theta_3 = r\,\Theta^3$

where 'Θ', of course, is in radians and is equal to the only angle that we have to work with for this situation; $2\pi/3$. Rather than leave it in there next to the 'r's, though, let's pull it out front and leave fewer symbols to worry about in our coming calculations. This results in our final main equation:

47) $$\tau_t = (2\pi/3)^3 \{F_f r_f \sin^3\Theta + F_c r_c \sin^3\Theta\} / (6\pi^5)^3$$

This gives us two terms to calculate, so let's do those one at a time. First the centrifugal component, τ_c.

Calculation of the centrifugal component of photonic torque:

$\tau_c = r_c \sin^3\Theta \; F_c$

F_c would be simply centrifugal force, or

$F_c = mv^2/r$

Where 'm' is the mass of one photon, and our velocity of course is equal to 'c' the speed of light. But our centrifugal force component is comprised of three photons entangled, so:

$F_c = 3mc^2/r$

Which leads to:

$\tau_c = r_c \sin^3\Theta * 3\{mc^2/r\}$

Now, at first, one might be tempted to equate $r_c = r$ and cancel them out, but we cannot make that assumption. So for now let's leave them in. Recalling then, that for our photon mass, $m=(h/2\pi)\nu/c^2$ and substituting in the value for frequency then collecting a few terms, we get:

48) $$\tau_c = (r_c/r)\, 3 \sin^3\Theta\, c^2\, m = (r_c/r)\, 3 \sin^3\Theta\, c^2 \{(h/2\pi c) *[c\pi/(6hF_{DX})]^{1/2}\} = (r_c/r)\,(3/2\pi) \sin^3\Theta\, hc *[c\pi/(6hF_{DX})]^{1/2}$$

However, there are *two* frequencies involved– or more correctly two Field Densities. Since no matter which frequency a given photon is entangled at, it still bears both Field Densities, we must account for them both by calculating this equation for both values of F_{DX} and taking the difference; this represents the *range* of frequencies and hence Field Densities within any given photon. Thus expanding, we get:

49) $$\tau_c = (r_c/r)\,(3/2\pi) \sin^3\Theta\, hc *[c\pi/(6hF_{DX})]^{1/2} = (r_c/r)\,(hc)(3/2\pi) \sin^3\Theta\, [c\pi/(6h)]^{1/2} * [(1/F_+)^{1/2} - (1/F_-)^{1/2}]$$

This just leaves us with (r_c/r) to account for. While r_c would point along the direction of torque, the other 'r' would point towards the common center of the circle. Let's put in a quick change in nomenclature then at this point:

$(r_c/r) = (r_1/r_2)$.

We're doing it this way because this term will also pop up in the other torque component. As such, we'll save the final calculation of this term for later and next work on the second torque component.

Calculation of the attractive force component of photonic torque:

Let's now focus on the attractive force term:

50) $$\tau_f = (GmM/R^2)\, r_f \sin^3\Theta$$

For M, since we're calculating for a group of three, then m is the mass of any single photon, while M is the mass of the other two in the system, and so M = 2m, while G is our more generalized value of c^2F_{DX}. This gives us:

51) $$\tau_f = [(c^2F_{DX}2m^2)/R^2]r_f \sin^3\Theta = 2c^2F_{DX}\,(r_f/R^2) \sin^3\Theta\, [h/(24cF_{DX}\,\pi)]$$

Once again, before we start canceling out r's let us think for a moment. r_f would be our moment arm running along the direction of the photon's course– just as for the previous torque component– while R points towards the common center. But the system is also constantly on the move, so our 'R' can actually be broken down a bit. For now, let's represent this as:

$r_f/R^2 = (r_1/r_2)/R$.

'R' is now the radius of the orbit prescribed by our three photons, which we gave before as $3\lambda/2\pi$. The equation now becomes:

52) $$\tau_f = (r_1/r_2)\, 2c^2F_{DX}\, (1/R) \sin^3\Theta\, (h/(24cF_{DX}\,\pi)) = (r_1/r_2) \sin^3\Theta\, [ch/(12\pi)] /(3\lambda/2\pi)$$

53) $$= (r_1/r_2)\, ch \sin^3\Theta\, (2\pi/(3\lambda))*(1/12\pi)$$

54) $$= (r_1/r_2)\, (1/18)ch \sin^3\Theta /\lambda$$

For the wavelength, we substitute in the wavelength formula earlier established and get:

55) $$(r_1/r_2)\, (1/18)ch \sin^3\Theta / [(6F_{DX}h)/(c\pi)]^{1/2} = (r_1/r_2)\, (1/18)ch \sin^3\Theta\, [c\pi/(6F_{DX}h)]^{1/2}$$

Once again, this is now computed for both values of the Field Density and for the same reasons as we did so for the first torque component. This leaves us with the final result for the second component.

56) $$\tau_f = (r_1/r_2)\, (1/18)ch \sin^3\Theta\, [c\pi/(6h)]^{1/2} * [(1/F_+)^{1/2} - (1/F_-)^{1/2}]$$

Assembling the final equation:

Assembling both components, then gets us:

57) $$\tau_c + \tau_c = (r_1/r_2)\ \{(1/18)ch \sin^3\Theta\, [c\pi/(6h)]^{1/2} * [(1/F_+)^{1/2} - (1/F_-)^{1/2}\,]\} + (r_1/r_2)\ \{(ch)(3/2\pi) \sin^3\Theta\ [c\pi/(6h)]^{1/2} * [(1/F_+)^{1/2} - (1/F_-)^{1/2}\,]\}$$

Gathering together the common terms, then putting back in the $(2\pi/3)^3$ and $(6\pi^5)^3$ components, we get the final form for the total torque experienced in the system.

58) $$\tau_t = (r_1/r_2)\, [(2\pi/3)^3]*\{ch \sin^3\Theta\, [c\pi/(6h)]^{1/2} * [(1/F_+)^{1/2} - (1/F_-)^{1/2}\,] * [(1/18) + 3/(2\pi)]\}/[(6\pi^5)^3]$$

This is the specific form, but if we want to put it in general symbology form, you can write it as:

59) $$\tau_t = (r_1/r_2)\, [(\Theta_r \sin\Theta)/6\pi^5]^3\, ch\, [1/\lambda_+ - 1/\lambda_-] * [(1/18) + 1/\Theta_r]$$

But we have one last component to account for, and that is the (r_1/r_2) term. Up until now if you run the numbers you'll get a near miss on the charge value. This is because r_1 and r_2 are *almost* equal to each other. r_1 runs the length of a given photon– from one end to the other– which if you represent it in terms of the range of values for possible wavelengths generated by its two Field Densities, would equate to

$r_1 = \lambda_+ - \lambda_-$

r_2 on the other hand runs from the moving photon down towards the common center, all of which are dependent on the range of frequencies and Field Densities, so

$r_2 = \lambda_+ + \lambda_-$

As a first approximation you would then get:

$(r_1/r_2) = (\lambda_+ - \lambda_-)/(\lambda_+ + \lambda_-)$

If you substitute this in, however, you will still be off by 0.1%. We can do better if you realize one more small detail.

While the cross section of a photon is comprised of a varying distribution of our two calculated Field Densities, it *does* have those very tiny transitional values between them. That is, every single possible frequency *between* λ_+ and λ_- must be included in our calculation, as each offers another tiny nudge. Thus:

$(r_1/r_2) = [1+2+3+\ldots+(\lambda_+ - \lambda_-)]/[1+2+3+\ldots+(\lambda_+ + \lambda_-)]$

We will here note the obvious mathematical sequence and its summation:

$1+2+3+\ldots+N = N(N+1)/2 = (N^2 + N)/2$

(There is also a personal anecdote regarding this and why the author of this paper nearly slapped himself when he realized this connection, but that's another story.)

Before we perform that calculation, though, let's make a quick substitution. Since $\lambda_x = \{(6F_{DX}h)/(c\pi)\}^{1/2}$ we can cancel out all the common unchanging terms and get the following in terms of our Field Densities.

60) $\mathbf{(r_1/r_2) = [1 + 2 + 3 + \ldots (F_-^{1/2} - F_+^{1/2})]/[1+2+3+\ldots+(F_-^{1/2} + F_+^{1/2})] = [(F_-^{1/2} - F_+^{1/2})^2 + (F_-^{1/2} - F_+^{1/2})]/[(F_-^{1/2} + F_+^{1/2})^2 + (F_-^{1/2} + F_+^{1/2})]}$,

since the '/2' part of the summations would cancel out.

We now have the final form of our full torque equation:

61) $\mathbf{\tau_t = \{[(F_-^{1/2} - F_+^{1/2})^2 + (F_-^{1/2} - F_+^{1/2})]/[(F_-^{1/2} + F_+^{1/2})^2 + (F_-^{1/2} + F_+^{1/2})]\}*[(2\pi/3)^3]*\{ch\ \sin^3\Theta\ [c\pi/(6h)]^{1/2} * [(1/F_+)^{1/2} - (1/F_-)^{1/2}] * [(1/18) + 3/(2\pi)]\}/[(6\pi^5)^3]}$

Plugging in all our variables, we get a final number for our photonic torque:

$\tau_t = 1.6022 \times 10^{-19}$ N-m

(Note: I came up with more digits than this, but experimentation between the spreadsheet and calculator programs at my disposal yielded inconsistent results between the two, so I elected to simply truncate it at the fourth digit.)

This, then is our charge, since Newton-meters can be mistaken for Joules if you aren't aware of what's going on. Expressing the classic measured value for e^- in the more correct units of N-m, we have a comparison:

e^- measured = 1.602176×10^{-19} N-m

e^- calculated = 1.6022×10^{-19} N-m

This yields an error of 0.00565%

Charge thus results from the resultant torque within a given particle produced by its constituent photons. Separate particles are not entangled, so their internal photons exert no torque upon those of the neighboring particle; each is a separate entity and separate charge. Thus a proton with 6 photons will have the same charge value as one with three photons, whereas 2 protons with 3 photons each will add up to the force of two charges.

The sign of the charge, positive or negative, then depends on *which* of the two Field Density frequencies that the photons in the given particle are entangled at. It's like an arrow that points in one direction if the photons are entangle at the Field Density frequency for electrons while the other Field Density then acts as a sort of anchor, or pointing in the other direction for the reverse situation.

To restate, Charge is the torque of fields at one of two resonant frequencies inherent in the photon, as derived from the photon's two complementary Field Densities. However, we can go further and say that one should be able to produce a field (either artificially or as a result of the collective action of multiple macro fields) at a given Field Density other than these two main ones, and with a resultant corresponding resonant frequency that would then cause passing photons (and their fields) of that frequency to interact with it in the same way as photons entangled within a particle, and thus produce a charge and current flow. This charge, however, would be neither positive nor negative (and hence undetectable by standard electrical equipment designed for normal charges), but a charge at that frequency; it would also not be stable under normal circumstances since it would not involve either of the two main fields within a photon (a bit like balancing on the head of a pin), and may or may not have a corresponding complementary frequency in the way of our standard Positive versus Negative.

A last note here, in that one might ask if given this set-up, if we can scale things to ask if electrons orbiting around a nucleus of protons and neutrons would produce some atomic torque of their own. The answer is that it is possible (and may even be known as a force by a different name), but since the electrons would be moving at a minute fraction of the speed of light, the resultant torque-charge would be far beneath our ability to measure.

Correlating the Gravitational Field Density

We are now ready to tackle one final problem, and that is how the Gravitational Field Density, denoted by F_{Dg}, derived way back around Equation 10 connects up with our other two Field Densities, F_{D+} and F_{D-}. Initially I had assumed that F_{Dg} was the trickle-charge macroscopically leftover from the other two, but as it turns out I had the situation a little backwards.

We know that the Gravitational Field Density is rather small and somehow derives from the two Field Densities connected up with the photon… or rather the reverse is true. In the act of Force attracting into itself to compress into the energy of a photon, the Gravitational Field Density likewise greatly compresses. The task here now is to equate F_{Dg} with F_{D+} and F_{D-}. So which one do we equate F_{Dg} to?

The answer is neither.

Recall the equation for F_{Dx} and how it is dependent on c^2. What we really need to do is derive c^2 from F_{Dg}. We begin with a few assumptions. First, to go from one to the other is a difference of around 45 orders of magnitude. Clearly this can only be achieved by figuring an exponential progression, and when we speak of exponential in Nature, we invariably default to 'e'. Our second assumption is that this derivation must somehow obviously involve our new Photon Compression Factor. As such, our first guess at a general form of our equation is the following:

$c^2 = F_{Dg} A \exp(6\pi^5/B)$,

where $F_{Dg} = 7.4256485 \times 10^{-28}$ (J/Kg)/N as given previously from Equation 10, and A and B are constants yet to be determined.

The 'B' in the denominator is because we know that taking 'e' to the power of $6\pi^5$ will result in a final number far too high for our needs, therefore we can assume that the Compression Factor will be divided by something.

The first thing we notice is something that will answer another puzzle and that is the missing "per Newton" part of the units from Equation 30. While the value we seek here for 'c^2' may have the numerical value of c^2, the units will be the same as from F_{Dg}: (J/Kg)/N. This, then, is where our missing "per Newtons" for our main equation comes from! Thus, once we have achieved this step we can comfortably re-label our main equation with the correct units. To denote this difference in units, then, we shall alter the notation for c^2 as follows:

$c_N^2 = F_{Dg} A \exp(6\pi^5/B)$.

The second thing to notice is the form of this equation. We are basically looking at a point on a logarithmic spiral, specifically a Golden Mean Spiral. The general equation for a Golden Spiral is given in a couple of ways, but we're going to use this one because it works out a lot simpler:

$r = \exp(B\Theta/(2\Phi))$,

where Φ is the Golden Mean with a value of '1.6180339887', and Θ is the angle around which the spiral winds.

However, this is the equation for an *expanding* spiral, while we are looking for something that gives us the value at a point at the end of what amounts to a *decreasing* spiral. We need to invert this equation by inserting a minus sign in the exponent, thusly:

$r' = \exp(-B\Theta/(2\Phi)) = \exp(2\Phi/(B\Theta))$.

Equating this with our search for c_N^2 then gives us a generalized equation of:

$c_N^2 = F_{Dg} A \exp(2\Phi/(B\Theta))$.

Let's start with Θ. First, recall that our Photon Compression Factor is actually a really small angle, such that $\sin(1/6\pi^5) = 1/(6\pi^5)$. But, we must realize that this angle is actually the angle formed between the compressing layers and not quite the winding angle of the spiral itself. We must make some adjustments first before we can use it. $1/(6\pi^5)$ derives from the forces coming at a point from all directions; however, here our Θ measures an angle in a plane in only one direction.

Recall in our derivation of the Photon Compression Factor that there was a Resistive Force figured in that contributed a factor of '$2\pi^2$' (to be precise, it was actually '$1/(4\pi^2)$' multiplied by '2' to convert the half-angle into a full angle), and further that for the compressing force we took it from three directions to get the term '$3\pi^3$'. For the attractive force we only need it from the one direction and not all three, so we can divide out the '3'. As for the Resistive Force component, it would not be acting like a spring or oscillator here so we can drop the '$2\pi^2$' part as well (so, instead of having '$2*f((c/(2\pi))^2)$' we would have '$2*f(c^2)$'). This results in:

$(2\pi^2 * 3)/6\pi^5 = 1/\pi^3$

for our BΘ term. Plugging in, we now have:

$c_N^2 = F_{Dg} A \exp(2\Phi/(1/\pi^3)) = F_{Dg} A \exp(2\Phi\pi^3)$.

This just leaves us to find 'A'. Well, there are two ways to go about this. First, we can figure that instead of 'r' what we really need is the rate of change of r as given by $(dr/d\Theta)(\exp(A\Theta)) = A\exp(A\Theta)$. Or we can cheat a little and simply solve for 'A'. Some might question this approach, pointing out how we could end up simply getting random number garbage with nothing to prove its worth, except for the particular number we *do* get for 'A' when we do so.

$A = (c_N^2 / F_{Dg})/ \exp(2\Phi\pi^3) = 2\Phi$

Thus, our equation becomes;

62) $c_N^2 = F_{Dg}\, 2\Phi \exp(2\Phi\pi^3)$.

This is the sort of format we would expect to get from taking that derivative instead and is a nice and clean answer.

Plugging in the various values yields:

63) $c_N^2 = (7.4256485 \times 10^{-28}$ (J/Kg)/N) * 2 * 1.6180339887 * exp (2 *1.6180339887 *(π^3)) = 9.0609502752 x 10^{16} (J/Kg)/N.

Taking the square root of this to equate it numerically to 'c' as an error check yields a difference of 0.4075%.

Thus we have our correlation; the connection that shows how the Field Density of Gravity compresses enough to lead to a value for the square of the speed of light and from there to the two Field Densities on a photon, F_{D+} and F_{D-}. Full circle.

Pulling It All Together

This last derivation has given us more than a direct mathematical and logical connection between the Field Density of Gravity and the square of the speed of light, but also solved the puzzle of the missing units from Equation 30. We can now rewrite our main equation one last time with the proper units of (J/Kg)/N, as follows:

64) $F_{Dx} = \{(c_N\pi)^2 - 2\pi c_N^2\}[(\cos(4\text{Ø}))^2 + \sin(\varphi)^2]$ (J/Kg)/N

Where $c_N^2 = F_{Dg}\, 2\Phi \exp(2\Phi\pi^3)$, Φ is the Golden Mean, and $\varphi = 1/(6\pi^5)$.

Or combining terms, into its final presentation:

65) $F_{Dx} = (\pi^2 - 2\pi)^*\{ F_{Dg}\, 2\Phi \exp(2\Phi\pi^3)\}[(\cos(4Ø))^2 + \sin(\varphi)^2]$ (J/Kg)/N

This is the final form of the Photon Field Density Equation, now with all parameters accounted for. It describes all aspects of the photon, Planck's Constant, the square of the speed of light and hence the speed of light itself, and what evolves from there to be seen as Gravity, the Strong Force, stable particle sizes, and everything else that has been thus far discussed.

It is worth noting once again that all constants of this equation are entirely geometrical in origin and would hence apply to any universe in which we find ourselves. The only thing that ever changes is F_{Dg} , which we now determine to be the one multiversal variable there ever was. To each universe there is a different Gravitational Field Density from which arises our Energy Density in both its microscopic and macroscopic forms of 'h' and c^2, as well as the two Field Densities that describe the makeup and shape of the photon that in turn define Protons and Electrons.

We know the geometry of light, how it moves, and how its design in turn gives rise to what we perceive as the other forces. Equation 65, then, is the equation of our Universe… of any Universe.

Regards Antimatter

Finally we are left with the topic of antimatter, specifically the anti-proton and positron.

For the anti-proton there are two possibilities. One way to make an anti-proton is to take a normal electron, run up its mass with a few thousand frequency-matched additional photons until it's the size of a proton, and you have an anti-proton. Needless to say this is not something that will occur often in nature, and getting over 5000 photons to remain entangled into a single particle would be rather unstable and prone to breaking apart.

But this method cannot explain the existence of a positron, since to have a positive charge you would still need photons of a proton's frequency, which would imply the same mass. No, for the positron, and any sort of stable anti-proton, another explanation is required. At first this problem would appear to be a bit tricky, but all we have to do is remember that all particles are comprised of photons entangled with one another at a given frequency of stability, and what happens to one happens to all so entangled. They are waves, with all the properties of waves.

Including that of *phase.*

To paint a simplified picture, imagine two electrons represented as simple Sine waves. The crests of the waveform of one match up with the crests of the other, thus pushing each other away. This is why electrons repel electrons but attract protons. But, if the photons of one electron are all shifted in phase by 180 degrees, then its crests would instead match up with the troughs of the other electron, and they would thus attract one another instead of repel. This would not, however, be the same sort of positive charge attraction as a proton would exert upon an electron due to its complementary frequency, but rather one of equal and opposite waveforms. The positron is not really "positive" like a proton, though it is attracted to electrons like protons are. Indeed, the concept of "charge" as being one of only two opposite on or off binary possibilities is now seen as being a bit simplified from the reality.

To illustrate, consider the following little graphics. First, as a reference, consider the standard attraction of an electron to a proton:

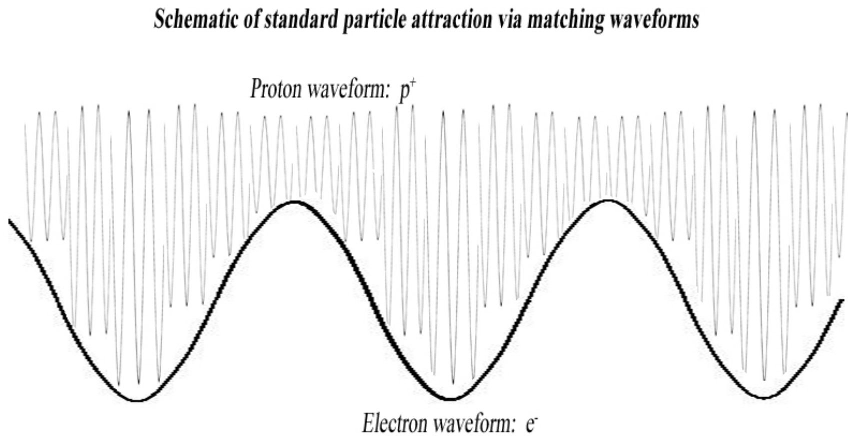

Fig. 11

This represents your standard attraction due to opposing charges, or as we now more properly see it to be, complementary frequencies as derived from their complementary Field Densities. This is your standard charge attraction.

Now, two normal electrons facing one another would be like the following:

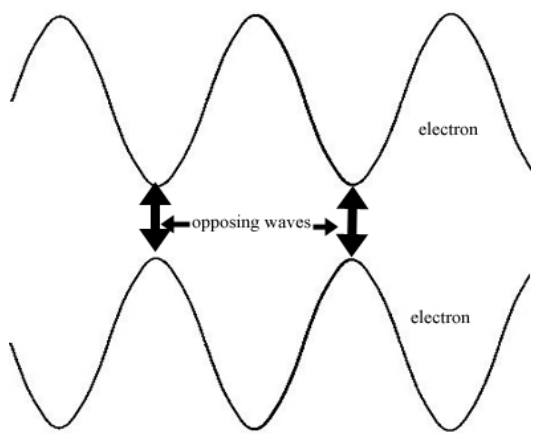

Fig. 12

Their waveforms are not complementary, and so they repel.

An electron facing a phase-shifted electron– i.e., a positron– on the other hand, would be more like this drawing:

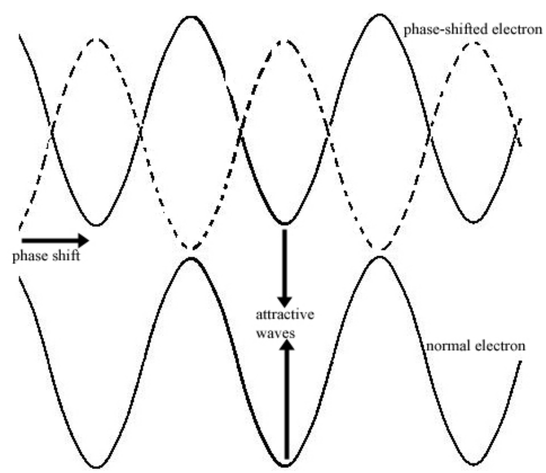

Fig. 13

Furthermore, since the positron is the exact same mass as a normal electron, one would not orbit the other; orbits happen because one particle or body is so much massive than the other that simple angular momentum prevents head-on collisions unless their trajectories and incoming velocities are just right– in which case a proton and electron form into a neutron. For two equally massed bodies in mutual attraction, they would run straight into one another, and their exactly opposing waveforms annihilate into a blast of photons as the particles disintegrate– Gamma Rays, for the most part, since as noted earlier the frequencies of these photons span the Gamma Ray part of the spectrum.

Thus, a positron is an electron whose constituent photons are 180 degrees out of phase of that of normal electrons.

Similarly for the anti-proton. An anti-proton is a proton whose constituent photons are 180 degrees out phase of that of normal protons.

"Anti" particles are not really anti-matter at all but normal matter that has been phase-shifted.

The reason why particles and their phase-shifted cousins annihilate one another is simple. An electron orbits a proton for the simple reason of their differences is masses; the proton is over a thousand times bigger and so the electron becomes its moon from simple mechanics and angular momentum. But give two particles of exactly the same mass *and* a mutual attraction, and there is no difference in angular momentum to keep them spinning around one another; they'll just slam straight into one another, their photons combine, and explode into a burst of energy.

A quick addendum now regards "anti-neutrons". For me there would seem to be two possibilities. First, if a positron gets together with an anti-proton, the result is the same size as a Neutron; same properties, just 180 degrees out of phase when compared to a normal Neutron (or rather, its constituent particles). Another possibility is if an electron combines with a positron *and* their masses are sufficiently different from one another due to one's greater speed for there to be a notable difference in angular momentums, then instead of mutual annihilation they could orbit and combine into another form of "anti-neutron", though one a lot smaller than a standard neutron; I would not imagine it, however, to be all that stable. Similarly for a proton combining with an anti-proton of sufficiently different mass combining into another form of "anti-neutron".

*** This would also explain why there is not an equal amount of antimatter versus matter observed in the universe. Normal matter is the regular default state, while its "anti", or out of phase, form is more of a highly uncommon variation; an aberration created by specific circumstances that cause normal matter to shift 180 degrees out of phase. All matter is created in its normal "in-phase" form and has to be shifted into anti-matter. ***

This explanation of anti-particles being out of phase regular particles does open some other possibilities. If an out of phase electron will instead be attracted to electrons and repel protons, then imagine this: Using the value of the Field Density required to obtain the gravitational constant, compute what then the average frequency for gravity would be, then generate a field of that frequency and shift its phase by 180 degrees. Or, since that frequency might be a bit too high, solve vs. the collective Field Density frequency for whatever common bulk matter happens to be beneath you– say, the ground– then phase shift it by 180 degrees. Either way, the implication is the same:

A theoretical foundation for *antigravity* (give or take a few technological hurdles).

Summary

We now have the two frequencies of photons in protons and electrons, derived from purely universal constants and variables, the physical structure of the photon that is responsible for different sized particles and their charges, the two different Field Densities of the different polarizations (or rather cross-section outline, if you prefer) of a photon, and from that how our generalized Force Constant (formerly the Gravitational Constant) varies for what was called the 'strong force' for protons and its equivalent for electrons, why Neutrons attract both Protons and Electrons, and finally the nature of Charge itself. The Strong Force is no longer needed, nor is the Weak Force since we have now seen that particle decay is a result of the structure and interactions of the photons comprising particles of all types (and how close they are to mutually stable entanglement frequencies). Gravity is merely the pre-compressed version of the same force as is bound up within the photon itself.

The sum total of all these parameters suggests the outline of an effective and complete unified-field theory.

A couple last little observations of note:

- If the range of the supposed Strong Force is so short, then would not the Electromagnetic Force with its far-greater range have an effect long before the Strong Force could come into play? That is, protons would repel one another long before they'd get close enough for the Strong Force to overcome it, which would make it excessively difficult for atoms to form on a regular basis.
- It may be obvious by now that the whole concept of "carrier" particles such as the Gluon, may be a nice mathematical convenience, but is utter nonsense when it comes to reality, because either the interacting particles would have to know when the other's around in order to send out the carrier particle, or each particle is constantly sending out an infinite number of such carrier particles. Rather, all we have is the *field* of force which surrounds each carrier of energy, the photon, acting like springboards waiting for anything to touch upon it.
- The solution to another little mystery also falls out of what has been presented: Why does an electron have a larger radius than a proton even though it's so much smaller? Because being of a lower resonant frequency, the photons within an electron have a longer wavelength, which would in turn define the diameter of a particle. It should thus be possible to calculate a given particle's diameter if the frequency of its photons is known. Be careful though, for when in other than its ground energy state of 3 photons, as more photons crowd together that could alter the particle's diameter by a small degree, making agreement of measurements difficult at best. *NOTE:* A small spinoff paper of mine will later derive a formula with which to compute the radius of a given particle based on these facts.
- The Neutrino: I have not made specific mention of the Neutrino but there is a reason for that. Looking into the subject, I found that a neutrino's mass is usually given in the range of 0.2 to 2ev, which is a pretty wide spread, but also there are references to neutrinos being anywhere in the range of 10^{-6}ev to 10^{8}ev. Combined with the fact that neither a neutrino's speed nor lifetime seems to be known, leads me to believe that no one really knows what it is, which makes it difficult to fit into any theory. I will, however, note a couple of things. A neutrino is said to interact weakly with gravity, which makes sense. For, if we take the 0.2ev to 2.0ev range as a viable standard, then use my formula to compute the frequency of its constituent photons, they would actually be in the UV part of the spectrum; well out of the range bounded by protons and electrons and their defined Field Densities. This means that they cannot be formed by entangled photons, cannot have charge as a result, and are only held together by weaker gravitational force. This itself implies that their lifetimes will necessarily be rather short. In fact, I would venture to say that, if you could put a neutrino detector up into space, you would find them forming in Earth's upper atmosphere as a result of heavier particles slamming in from exterior sources, for they would not have the stability to hold together as particles for any sort of long-distance travel. Essentially, neutrinos are basically "scrap"; excess photons that spin around each other just long enough to be

picked up by a detector.

In this paper we have seen an explanation for a significant portion of particle physics, along with giving a workable premise for a unifying theory covering each of the known basic forces. We have also seen that there is only one real "universal constant", and that is Planck's Constant, AKA c^2, AKA the Gravitational Field Density, and even that varies with a given universe.

The majority of my other theories deal with cosmology, specifically the origin of the Universe (that do *not* involve the need for dark energy, dark matter, or inflation theory) and other related subjects, though there is a need to understand what has been discussed in this paper first, since the two are somewhat related. You cannot figure out Infinity until you know the Infinitesimal.

That, however, is a matter for a different paper, and on that note I leave you for now.

(with special thanks to Anna Louise Mastro for assistance in proof-reading, feedback, and formatting of this paper.)