PART 2
IMPLICATIONS & CONSEQUENCES OF THE EQUATIONS DISCOVERED
&
SUGGESTIONS FOR BUILDING A PERIODIC TABLE OF THE ELEMENTS OF PHYSICS
&
DISCUSSIONS OF POSSIBLE FUTURE WORK

Scope

In Part 1 the core findings of the mathematical physics research work about which this book is composed are presented. There descriptive equations are presented which described many of the measured physical properties of the elementary electromagnetic waveforms, the leptons and the photons. The equations which had been found matched their objective physical properties to many decimals of accuracy.

In this Part 2 the results of the specific mathematical physics research work are extended into topics of a more speculative nature. That is the material presented in this Part 2 is not backed by the accuracy of mathematical decimals. In this part there are mainly verbal discussions of ideas and concepts related to the material presented in Part 1. These discussions tend not to be technical in nature and do not require any knowledge of what has been written by persons in the academic hypothetical physics community. The discussions in the next several reports are simply presented, without any proofs or derivations, as food for thought for persons interested in the subatomic physics realm.

General Notes - Definitions

There are some general notes which apply to all the chapters / reports in this Part of the book. Further, these notes apply to and should be remembered for all Parts of this book. In this work the following definitions or meanings are used:

1 Lepton(s) -- Means the the electron family; the electron, the muon, and the tau, or their charge reversed counterparts of the positron family.

It does NOT mean the electron family plus the neutrinos in this work.

2 Unit(s) -- Means measurements units, either; the relative SI units, the absolute Squigs units, or generic, meta, place-holder, universal, or as yet unspecified parametric units. These are always static quantities, "blobs" of something, and not quantities plus motion to make dynamics.

It does NOT mean the number of decimal places in a number. The author gets tired of having to repeat the word measurement before the word units.

3 Dimension(s) -- Means spatial and temporal dimensions.

It does NOT mean variables, parameters, measurement units, or the number of arguments for a mathematical function or expression. It does not mean the parameters which are often grouped together in engineering, scientific, and technical work under the heading of "Dimensional Analysis" or to make "Dimensionless Numbers". The author gets tired of having to repeat the word spatial before the word dimensions.

A general reminder is needed that the world size realm of George Johnstone Stoney and the particles, the electron family, is at a scale 36 orders of magnitude smaller in distance than humans and 44 orders of magnitude smaller than the human invented second. The electron is 33 orders of magnitude smaller in mass than a human and the quarks appear to inhabit a world of 4 spatial dimensions. Futher the little critters of investigation are really only just wave forms or energy bodies and do not really have any "solid" form. Assuming or trying to impose laws and physical property inter-relations upon them based upon the human world experience and mechanics is a seriously dubious proposition.

These Reports Cover Material as Follows:

Chapter 2.1 Implications And Consequences Of The Lepton, Photon, And Quark Equations

This report covers some of the implications and consequences of the equations discovered which describe the leptons and the photons. There are also implications reported arising from the discovery that the quarks appear to be true 4 dimensional particles inhabiting a realm of 4 spatial dimensions. The

implications discussed cover consequences; for the elementary electromagnetic particles themselves, for the others elementary subatomic waveforms (particles), and for cosmology in general.

Chapter 2.2 Towards A Periodic Table Of The Elements Of Physics (PTEP)
This report gives discussions concerning a suggested arrangement for constructing a Periodic Table of the Elements of Physics (PTEP).

Chapter 2.3 An Approach Towards A Mathematical Description For The Masses Of The Quarks
This report extends the work of Part 2 by outlining suggested ways to begin discovering equations which would describe the masses and other measured physical properties of the quarks.

Chapter 2.4 Future Work
This report outlines many avenues of possible future work which could stem from the research work presented in this book.

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CHAPTER 2.1 IMPLICATIONS AND CONSEQUENCES OF THE LEPTON, PHOTON, AND QUARK EQUATIONS

1 Introduction

This report investigates several of the implications of the equations found for the structures of the elementary electromagnetic waveforms, both the leptons and photons alike. Aside from their differences of mass-masslessness, charge-chargelessness, and difference intrinsic spins, the two species photons and leptons have many things in common, as least mathematically. In the reports describing the mathematical structural models for these particles some of the implications of the models were discussed. There though the discussions stayed with aspects which directly could be supported by the mathematics which was presented there.

Here in this report discussions move further afield. This is done by primarily examining patterns which were set by the mathematical descriptions of the waveform structures for both the leptons and photons. Examining these patterns questions can be asked, what if a particular pattern is extended to other particles or to cosmology in a particular fashion? Discussions here touch on topics peripheral to the core mathematics of the lepton and photon reports and which cannot directly support by actual decimal places. A person could call the discussions in this report speculation. Never-the-less the discussions here do raise some interesting ideas for consideration by the broader scientific community.

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2 Particle Physics Geometric Consequences

One of many interesting aspects of both the leptons and the photons was discussed in Section 5.2 of the photon report. There the temporal radial functions of these waveforms were found to be immediately describable in terms of planar or circular areas, $\text{Area}(t_1) = 2\pi t_1^{\,2}/\sqrt{k_l}$ for the leptons and $\text{Area}(t_1) = \pi t_1^{\,1}/\sqrt{k_p}$ for the photons. This area was posed as a "behind-the-scenes" or underlying mathematical form which is embedded in or operated upon by the distance function in the expansive radial functions $R_e(t_r)$, $R_{eL}(t_r)$ for the leptons and $R_{eP}(t_r)$ for the photons. In effect this radial temporal variable is double embedded as a function within a function of the temporal variable. Also their spatial radial functions are planar or two dimensional, with one radial parameter and one angular parameter. Both of these particles relate to the binary force set electromagnetic which, with its usual description of having perpendicular force vectors, can be thought of as a planar, squared, or a second power phenomenon.

Although not provable from the mathematics in this work, an analogy would suggest that the neutrinos and gravitons which only respond to the unary force set gravity, have linear mathematical descriptions for these same functional forms.

Likewise the quarks and gluons responding to the ternary force set, blue-green-red, may have cubic, $4/3\pi r^3$, or 3-dimensional volumetric descriptions. The spatial description of the quarks would be expected to include one three dimensional radial parameter and two independent angular parameters, and that their internal radial temporal descriptions to be cubic, third order, or three dimensional as well. Their ultimate radial temporal variable would also be expected to be triply embedded or implicit.

This is only one choice for the quarks based upon the mathematics of the leptons. Another choice, as found in the add-on research work discussed in the quark report, Section 4, is that of simultaneous interlinked planar forms which move, rotate, pass thru each other…

Rationales are offered for these spatial choices or assumptions in the Report 2.2 Towards A Periodic Table Of The Elements Of Physics. Likewise in the discussions there, references are made to the concepts of physically multi-tiered, mathematically multi-embedded, or multi-implicit time as the temporal equivalence to n-dimensional space. These concepts are explored in the Appendix 2, Time & Space

3 Particle Physics Calculational Consequences

Referencing Tables 1 & 2 in the photon report some interesting mathematical consequences are found to arise. The equations for both the leptons and photons are found to have scaling or correlation constants. These factors or constants are directly related to their objective derivations. These scaling constants cannot be assumed to be portable or generally applicable to other particles or other subatomic physics calculations.

The importance of this statement is that neither quantity may be downwardly compatible or applicable for calculations involving the neutrinos which only respond to gravity. The particular importance of this being that the derivation for the photon includes or involves all the widely used quantities of α, $(\mu_o / \varepsilon_o)^{1/2}$, and *h*. Limiting the use of these quantities to the leptons, photons, quarks, and gluons, all of which respond to, encapsulate, or stabilize electromagnetic energy, may be objectionable. Prohibiting their use with the neutrinos may appear unreasonable. That is until the following analogy is considered. Suppose sometime in the future that the values of the ternary forces $Blue_o$, $Green_o$, and Red_o are accurately measured. Further suppose that then these values are combined appropriately unit-wise to produce a quantity for the radial meter, similar to the quantity, absolute or universal meters = $e\mu_o(G\varepsilon_o)^{1/2}$ = 4.893,752,96 x 10^{-36} already used with the lepton mass density equations. Then obviously this new color derived quantity would not be appropriate to apply to the leptons. Seeing this then, there may be a willingness to conclude that some favorite constants such as, Planck's *h* and the fine structure α, which are related to ε_o and μ_o may not be applicable to the neutrinos.

Likewise how can the assumption be made that just because the Heisenberg Uncertainty Principle applies to the elementary electromagnetic waveforms, "particles", that it also applies to the neutrinos? Here of course there is an assumption that the neutrinos are not electrically neutral analogies to the neutrons. The assumption here is that they do not have intrinsic charge or internally charged subcomponents that have been balanced or canceled out. Instead, they do not have charge because they just do not have a mathematical relationship with the binary force pair electromagnetic. Further this is because they are linear, longitudinal, or compressonal waves which mathematically do not have a curvature. As seen in both the Lepton report and the quark report a vector curve having a fixed curvature was the necessary criteria to describe the charge of these species.

Without entering the realm of speculation to far, this last idea can be generalized one step further. There are obvious reasons to assume that the neutrinos, the encapsulated version of gravity, do not have the same mathematical-geometric descriptions as the leptons, the encapsulated versions of gravity plus electromagnetism. Why should the assumption be made that gravity itself or that the quantity of gravitational energy in transition, the graviton, has the same mathematical description as that found in this work for the photons? Further if gravitational energy in transition does not have the same mathematics as that of the photon, then why should it be required to travel at the same speed, c? Such a path of reasoning may help provide relief for the problem of information transfer in super luminal experiments. That is, if such super luminal information transfer is definitively proven to the consensus of the physics community.

These particular trains of thought could ultimately lead to three *h*'s, and c's. There would be one quantum and velocity of "energy" transfer for gravitational force alone. There is the already well established *h* and c of the electromagnetic photons. Of course the photons involve a gravitational component since they respond to or are bent by gravity. Finally there would be an *h* and c for colored

particles or the color force in transition. Would such particles be limited to or have to abide by the *h* and c of the electromagnetic forces becomes an interesting question, since such particles are already known to respond to these and the gravitational forces.

This whole concept of particle speed limits was discussed in more detail in the quark report, Section 5.3. This is now especially relevant since the charge of the quarks have now been shown to be modeled by vector curves in 4 spatial dimensions.

3 High Energy, Excited States, Amplitude, And Wavelength Consequences

Another interesting question, that of excited states and amplitude, may be answerable by comparing the mathematical structures of these two waveform groupings, photons and leptons. The radial and angular patterns described for the gravitational structure of the photons are independent of their wavelength. This is exactly as was known to be required from the outset of the project. By analogy the length around or across the toroidal coil of the leptons is immediately known to be independent from and not defined by their mass density equations. A conclusion can be made that it is this analogy to the wave length for the photons, the coil length for the leptons, that is the best place for the extra energy of an excited state of the leptons to reside.

In fact a short examination of the radial planar expressions for both particles reveals that the extra energy of an excited state is probably prohibited from residing in the mass density radius of these particles as an amplitude parameter. Looking at the inner most level of time the radial temporal expression $R(t_1)$, from which $Area(t_1)$ above is derived, is found to have the form of a monomial, kt_1^p. Again, this concept was first found in Section 5.3 of the photon report. Nothing numerically prohibits there from being other constant factors in these monomials, which ultimately would produce more or less diameter, amplitude, in the radial structures or these particles. In fact, numerically, such extra factors would not even need to be step jumps, but could take on continuous values. What does prohibit such extra numerical factors is parametrics. What would be the parametric basis for such additional constants? All the applicable parameters or variables of multi-tiered time (doubly implicit) and n-dimensional space (2d in this case) have already been consumed, used, or taken into account. An extra factor, constant or variable, cannot be inserted into the radial planar equations to create more amplitude to store more energy of an excited state, because there is no extra or spare physical parameter upon which such a factor can be based.

If the planar radii of these particles then are fixed, this leads to consequences just as profound as some of those already cited. In the next section ideas are discussed about the consequences created by the fact that they have radial planar structures at all. Here though there is a distint slightly different focus. As is well known, higher energy photons have shorter wave lengths than lower energy ones. What if the process of shortening the wavelength of the photon to reach higher and higher energies is taken to the extreme? Mechanical energy analogies are typically borrowed from human musical instruments, to describe energy storage in the photon. The analogy typically given is that of shortening the length of a string on stringed instrument or the length of the air column on a wood wind to produce a higher pitched sound. So at some very high energy, the wavelength of the musical instrument photon is reduced to a size range similar to that of its radial diameter. Continuing to shorten the wavelength would move the photon entirely out of the orchestra sections for stringed instruments and wood winds. It would no longer have a linear columnar appearance, but instead would appear like a flat drum head, albeit a very tiny one. Obviously drum heads have very different vibrational patterns than those of linear columnar instruments.

In terms of high energy physics, three energy regions are found. First is the only known region at this time, that where the wavelength of the photon is significantly longer than its diameter. Here the Heisenberg Uncertainty Principle applies as an absolute law. Next is a transitional region where the wavelength has a size comparable with that of the radial diameter. Here the vibrational patterns probably

have very complicated mathematics and produce weird hybrid particles, if stable energy patterns are producible at all. This transition region could possibly explain the region known as the "energy desert". In this transition region and in the next one, all bets are off as to the applicability of the uncertainty principle. Finally where the wavelength is almost nonexistent in relation to the planar radius, effectively there is a drum head, a screen for a Fraunhofer diffraction pattern, or some other such analogy. Here the photon would appear as a spinning drum head and the lepton as both a spinning and revolving drum head. It is this region which might produce supersymmetric vibrational partners for the photon and leptons. Additionally, if the forwards propagation of the particle, lepton or photon, has effectively gone to zero, the radial plane has almost no wave length, but at the same time the particle has an almost infinitely high stored energy, how does this concept relate to those of relativity? How does this picture mess-up with the idea that the length of all material forms goes to zero when traveling at the speed of ligth, c?

4 Cosmological Spatial Consequences

The idea and discussion here is referenced to Tables 1 & 2 in the photon report. As seen in these tables both species, the leptons and the photons, have radial planar structures. Although the radius of their respective wave patterns is unknown at this time and further probably will never be measurable, the fact that they both have some describable radius has profound consequences.

Since the Big Bang is conceived as starting as a mathematical point in both time and space, then neither of these species with a describable diameter could have existed in the incipient fireball. In fact, anything else with a structure, form, or measurable dimension, could not have existed there. This concept extends not only to the particles or waveforms themselves but also to all the known properties of basic matter. The particle or waveform properties of mass and charge are easily seen to be eliminated since these have been found to have or to be related to structures.

Physicists already concede that the colored bodies, the quarks and gluons, could not, did not exist in the pre Big Bang soup. Using logic a conclusion can be made that, since neither the quarks nor the leptons existed there, then neither did the neutrinos. This implication can be confirmed as soon as the masses of the neutrinos are actually measured and then structural mathematical descriptions are found for them. A conclusion is forced that the incipient fireball contained nothing, that is nothing with a describable form. That is, it was empty or empty of form, while it itself was a formless and timeless mathematical point.

4.1 The Big Bizarre

In fact if this last idea is extended further, then the whole concept of the Big Bang is found to be bizarre. Again the fact that it is conceived as a mathematical point with no dimensions in either time or space causes total and unavoidable self contradictions or paradoxes. Further this mathematical point is also conceived has having no location neither in time nor space, since exterior time and space are thought to have only come into existence after they had something to form around. With the lack of an environment or external references and no internal content or references there is a total breakdown of all scientific concepts. Under these assumptions, the incipient fireball could not contain, nor could itself have been, anything which meets the human scientific definitions of force or energy, since both of these require senses of both time and space. The particle or waveform properties of mass and charge have just been eliminated since these have been found to have structures. Now the human constructs of time and space are eliminated. Without matter and energy how can any scientist with a straight face ascribe the words; mass, massive, temperature, hot, fireball, etc to such a conceptual object?

Further the human concepts of unity and uniformity can be eliminated as applying to the Big Bizarre. If in fact it represented perfect unity and uniformity then it never could have exploded. Under

the assumptions of unity and uniformity the Big Bizarre would have had neither a driving force to cause an explosion nor any subdivisions to permit one.

To ascribe the properties of unity and uniformity in both time and space to the Big Bizarre automatically requires it to have been a mathematical point. Otherwise no matter how small of an object, even as small as 10^{-80} meters in diameter, there would have been some non-uniformity. The endpoints of a line/curve, perimeter of an area, surface of a 3D object, or an (n-1)D surface of an nD object would sense two realms. On one side there would be the emptiness of space and on the other there would be something like itself. A point in the interior, at the center, or at a focus would only sense that it is surrounded by likeness of itself. The very concepts of focus, center, end, surface, interior, exterior, boundary, limits, etc require the concept of division in space. Likewise the concepts of a state of time; past, current, future, initial, final, forever, etc require the concepts of impermanence and change or divisions in time.

Again a final paradox is reached. To have represented perfect unity and uniformity the Big Bizarre is not only required to be a mathematical point, further it is again required to have been empty. How can this Big Bizarre be distinguished from the surrounding space? And where did all this matter and energy stuff come from?

5 Cosmological Temporal Consequences

Another common mathematical form for both the photons and leptons is their initial conditions, both radial and angular. These point toward the all pervasive concept of impermanence. Obviously if either particle collides with another particle under suitable conditions they cease to exist. In such incidents the photon is absorbed to lose its identity and the lepton is destroyed. Both can also be ejected, come into being, from the temporary composites formed from colliding particles, disintegrating unstable particles, excited states of wave patterns which drop back to some lower or ground states, etc. The concept of impermanence is not new. What is new or emphasized here is that all photons and all leptons are alike in the aspect that all begin at some moment in time and some point in space. Since mathematically they all have initial conditions, none are primordial or somehow magically existed forever or pre-existed the Big Bang.

Initial conditions also mean that these basic particles do not magically spring forth in their full glory. They start and develop over time just like all other entities in the physical universe. This gives the strong implication that since they arise, develop, and exist for a period, then they also probably "grow old and die" like all other physical entities. In fact using scale of size as a measure of life expectancy, then the conclusion is reached that these particles with un-measurably small radial diameters probably also have un-measurably short life spans.

These particles probably wink in and out of consensus space-time at rates many many orders of magnitude to fast for physicists to have even dreamed that they were not permanent. To beings of the human scale of existence or to modern machine extensions of the human senses at their best level to discern, these particles would appear as a blur that are then assumed to be a permanent or continuously existing "object". While this conclusion is not definitively proven by the mathematics in this work there is a high probability that this is the case and further that physicists will never be able to measure the rate of their coming and going. Of course after an unknown number of cycles the muon and the tau explode or permanently self destruct. This is to say their wave patterns are so unstable that they cannot reproduce themselves appropriately for the particles to re-emerge.

Possible support for this view comes from the Dirac theory concerning the polarization of the vacuum. In this view attempts to make exact measurements of the electron’s charge at very close range would be hindered by a shielding cloud of secondary positive and negative charge pairs surrounding the exact location of the electron. These charge pairs would appear from the vacuum and dissolve back into it again at a very rapid rate. Then a question can be posed in this manner. Could these charge pairs be a

form of turbulence, eddies, vortices created in space-time by the coming and going of the electron itself? The cosmological question then becomes where do these particles, or the energy of their wave patterns, go when they are "out"?

Combining this concept of the particles' impermanence or blinking effect with that of the Big Bizarre, yet another speculation arises. This time though there arises an idea which is plausible and has high appeal. Start with the assumption that the leptons and all other elementary particles do have infinitesimally short life times and even much shorter "out" times before their patterns re-form. Further upon re-forming the patterns appear an infinitesimally short distance away from where they left. Since the universe is not a now you see it, now you don't affair, a guess can be made that all this blinking is random, now. What if, though, at higher densities of matter and energy, such as going backwards towards the Big Bizarre the blinking was more synchronous or in unison. Ultimately the Big Bizarre is reached which was a Big Blink.

6 Radius Of The Leptons?

On agreeing that the mass density equations presented in this work appear to be valid and that the leptons have definable structures, one immediate question which can be asked is what is the radius of these structures? By radius, the radial distance outward from the center of the radial planar form is meant, and does not refer to distance around or across the toroidal coil which is completely independent and undefined in the mass density equations. Unfortunately at this time there is no answer to this question. Further there may never be an answer that is verifiable, since this diameter appears likely to be many orders of magnitude too small for scientists to ever be able to measure. Equally unfortunately jumping to an answer is very easy, but one which involves performing mathematical or logical fallacies getting there. The most obvious calculation or manipulation can be shown not to be valid.

The ultimate mass density equation of the leptons is presented as $m_p = C_g C_p D_p$

m_p mass of the particle = (C_g, l_{Sgs}) x (D_p, the integrated radial x integrated angular geometric equations, kg/l_{Sgs})

This is temporarily ignoring the individual unitless scale factors, C_p. One immediate impulse or desire of the over eager is to attempt to rearrange this as follows.

m_p mass of the particle / (radial x angular geometric equation, kg/l_{Sgs}) = some specific distance R for the specific lepton.

For the electron of course this operation just reproduces the value of the human absolute physics distance l_{Sgs}, derived from $C_g = e\mu_o(G\varepsilon_o)^{1/2} = 4.893{,}752{,}96 \times 10^{-36} m/l_{Sgs}$. This operation of shifting the geometric factor across the equal sign is not valid. This is seen by the two following suggestive analogies.

Suppose at the onset of this project a decision had been made that *h* was an a-priori, and then as is done with the human physics Planck Units had created the perfectly valid mathematical equation

$$1.0\ length\_{Pl} = (\hbar G/c^3)^{1/2} = 1.616{,}05 \times 10^{-35}\ m \qquad (01)$$

or equally had created the mathematically valid equation

$$distance\ absolute\ based\ on\ h\ of,\ he(\mu_o/G)^{1/2} = 1.456{,}882{,}996 \times 10^{-50} m\ /\ L\_absolute \qquad (02)$$

While mathematically valid, this equation would have yielded a non-meaningful result in terms of the physics particles, and the project would not have been competed. This is because these second derivations or attempts at defining a universal or absolute unit of length are not based upon the four interlocked absolute physics Squigs scales. Likewise suppose that the decision had been made that the quantity, (Q^1 relative/L absolute), was the correct quantity to seek to try to find a mathematical-geometric expression modeling the charge of the leptons. This is rather than the quantity, (C^2/l_{Sgs}) which was used. Again a perfectly valid mathematical expression, but physically meaningless, could have been developed. And again the project and science would have continued to suffer along in ignorance. In short a valid mathematical operation does not necessarily yield a useful scientific result.

Specifically why may a proposed R-electron = 4.893,752,96 x 10^{-36}m not be valid? First, the final form of the mass density equation is, radial equation x angular equation. This is two independent integrals multiplied times each other. This is not a classical double integral, in which the measurement units of the result are clearly fixed by the units of the values used for the upper and lower limits of the outside integral. Secondly, the radial and angular integrals used here are in effect double integrals themselves, with the implicit variable of time embedded within them. They are not just integrals of space, where there is a possibility of calculating a radius, but instead are integrals of both space and time. Thirdly, these integrals, especially the radial equation, are not those of linear functions.

At best, an average R would need to be discussed. The question then becomes what average and how is it weighted? For example, there are at least two average radii commonly used in engineering and scientific calculations, as follows

$$(\int F(r) \times R^1 \, dr / \int F(r) \, dr)^1 = \text{average radius} \quad (03)$$

$$(\int F(r) \times R^2 \, dr / \int F(r) \, dr)^{1/2} = \text{radius of gyration} \quad (04)$$

What prohibits an expression?

$$(\int F(r) \times R^3 \, dr / \int F(r) \, dr)^{1/3} = \text{radius yet to be named} \quad (05)$$

In the lepton report, the strong case was made that the results of the mass density equations, and their sub or internal parts or factors, applied to the real consensus world. Never-the-less without the consensus buy-in of the greater scientific community, there is no assurance yet as to exactly what is the meaning of these equations. Are they equations in consensus space, probability space, momentum space, energy space, et cetera? If these equations are those of energy space than clearly an R in consensus space cannot be produced from them.

As stated from the outset of the project in Chapter 4.1, Methodology, was that the result or answer of any proposed model, any equations, needed to match real world physical data. This has been demonstrated in this work. But this does not guarantee that the underlying model is itself a map or model of consensus physical reality. Using this model, these equations, for anything other than their intended purposes could lead to false or invalid conclusions. That is the masses of the three leptons were correlated. Their radii were not correlated nor their temporal durations.

There is one argument in favor of lepton particle sizes actually being in the neighborhood of this 4.893,752,96 x 10^{-36}m value. Physics hypotheses seeking to unify the basic forces discuss a distance in the range 10^{-35} to 10^{-36} m at which gravity becomes of equal strength with electromagnetism. At this scale gravity becomes a player on an equal footing with the electromagnetic forces, and potentially could counter balance these forces and help hold together a wave structure of pure energy. This is hinted at in the report of the ternary force interaction constant.

A primary argument by some hypothetical physicists against particles existing in this size range is that such structures would have to be built from subparticles which would have extremely massive

kinetic energies. Somehow through their interactions these subparticles would shed or cancel out a vast majority of this energy. A person does have to agree with this argument. First, this argument assumes the subparticles are of such a nature that they still have some intrinsic or internal mass from which this kinetic energy can develop. A counter argument is that such subparticles could be massless or pure energy. Secondly, to stipulate the necessity of this high kinetic energy, such arguments base off of the uncertainty principle. There is no guarantee that the uncertainty principle is valid at this size scale of phenomena. Another likely scenario is that phenomena of this very scale size are responsible for the rise of the uncertainty principle, the Planck constant h, and other such basic principles. Does the uncertainty principle apply to multiple dimensions in time? Further such arguments and counter arguments could continue indefinitely, but all are speculation and beyond the scope of this work.

Probably the best measure of whether a proposed radius for the electron, of 4.893,752,96 x 10^{-36}m, is or is not valid lies with the astrophysicists. Those people studying the origins of this three dimensional universe, the big bang, have found what appears to be a non-linearity in its expansion rate at a very early time and a very small diameter. A question can be posed in this manner. How does this size of the early universe at this discontinuity compare with the universal or Squigs length used in this work? Could this period of non-linear expansion be where the expanding fireball had reached a size large enough such that leptons of the size R proposed could then start condensing out?

7 Calculation Of A Photon Series?

Looking at the form of the radial expressions for the leptons, these were found to involve even members of the Laguerre orthogonal polynomial series, with the first lepton, the electron, being associated with the first polynomial or L_0. Since the L_0 polynomial is = $1r^0$ and its normalizing factor is 1, its presence cannot be detected with the electron nor with the photon, even if its presence is a valid factor for the photon. For this immediate discussion let's assume that the photon does involve the factor L_0. Then a question can be asked what numerical value would the second member of a photon series have? A tentative answer can be reached by making the following assumptions about a proposed series for the photon and some higher member partners.

1. Assume the proposed second member of the photon or Planck constant series has a primary wave pattern and a secondary wave pattern, as was the case for the muon.
2. Assume the primary radial planar pattern relates to L_2, and the primary angular pattern relates to T_3, again the same as for the muon.
3. Assume the secondary radial pattern relates to the second derivative of L_2, and the secondary angular pattern relates to 1/3 times T_1, again the same as for the muon.
4. Assume a final product expression of initial constants, the integral of the radial pattern, and the integral of the angular pattern. The initial constants being the integrals of the initial conditions times their respective radial and angular patterns.

Going through the calculus and algebra, an exact tit-for-tat photon analogy or equivalent to the muon is found to give a numerical value of 9.264,377 before any scaling or individualizing factors. This is as compared to the 68.517,994... of the photon. This conceptual approach does not appear to be a fruitful means to search for any higher "symmetric" partners for the photon, if they exist.

At the same time such a potential waveform could represent a low energy "dark matter" version of the photons. Such hypothetical second member waveforms would not be detectable by any standard human instrumentation because these are constructed from matter and based upon the excitation caused by photons of the standard electromagnetic spectrum falling upon their detection devices. Further since these hypothetical second member photon series waveforms contain, carry, or encapsulate less energy than the photons, then they would effectively act as energy sinks or elementary black holes. Should any

matter particle (fermion) or other open ended waveform (bosons) somehow decay into such a particle, then there would be no escape. This is because the counterpart to the Planck constant for these waveforms would carry less (ML)(L/T). There is nothing, no other energy waveform, available from which these particles can upgrade themselves to become normal photons.

To do an experimental search for such open ended moving waveforms or bosons would require that any individualizing factors be specified for this series member. This would be difficult since the only bases there is available from which to work is a mathematical analogy to the muon. There is no guarantee that other series members of the photon series, should they exist, would have analogous individuation factors with the lepton series.

8 Consequences of a 4th Spatial Dimension

In Chapter 3.3, the quark report, it was demonstrated that the charge of the quarks could be modeled or described by certain vector curves propagating in 4 spatial dimensions. The existence of truly 4 dimensional particles living in the 4th spatial dimension opens up a whole plethora of possible consequences and speculations. Since the quark report was not too long already, many of these un-proven ruminations were listed there at the end in Section 5.

These is at least one major implication of this quark study of applicability to the leptons. In Chapter 1.1, the Lepton Report, Section 4.1, the charge of the leptons was found to be related to the fixed curvature or the fixed torsion of a specific cylindrical spiral in 3 dimensional space. This is of course with several front end numerical scaling constants and a parameter connector or conversion constant with the units of L_absolute / Q_relative. The quantity for the charge was shown to be mathematically related to ρ^2. There ρ was found to be $= 6/(6^2 +1^2)$ which has the generic form of $a / (a^2 +b^2)$ or equally $b / (a^2 +b^2)$ according to whether a or b was chosen to be 6 and the other to be 1. In Section 3 of that report the form $a / (a^2 +b^2)$ was shown to relate to the curvature of of a 3D spiral and the quantity $b / (a^2 +b^2)$ was shown to relate to the torsion.

Since there was no other information available at the time, there was some wishy-washy-ness, vagueness, or back and forth as to which, the curvature or the torsion, that this ρ_{lepton} was actually related. Since then the add-on quark portion of the project has demonstrated that the equivalent ρ_{quarks} for the charge of the quarks was related to the constant curvature of certain vector curves in 4D space. This then should settle the matter. The charge of both the leptons and the quarks relates to curvature of their formulations as vector curves. Specifically in the case of the leptons, this would be the $a / (a^2 +b^2)$ choice, given a = 6 and b =1.

This now opens up or frees the other possibility, the torsion = $b / (a^2 +b^2)$. The obvious question is since this is a constant or fixed mathematical quantity how does it relate to the physical properties of the leptons or the quarks. There is one other property of the leptons and presumably the quarks which has not been discussed, their magnetic aspects. In Chapter 3.1, the Lepton Report, the magnetic property of the leptons was totally ignored and not mentioned. This was primarily because the mathematical research had gone on long enough, as also had the writeup. Additionally it appeared that no particle physicist was the slighted interested in reading about what the author had already found.

Now the question or obvious connection has raised its head begging for an answer. Does the magnetic physical property of the leptons relate to their torsion or maybe their torsion^2 or torsion$^{1/2}$? After various front end numerical and unit scaling constants had been tacked on, the charge of the leptons was demonstrated to be correlate-able as;

$\text{curvature}^2 = (\rho_{chg})^2 = (a / (a^2 +b^2))^2 = (6/(6^2 +1^2))^2 = (0.162,162,162\ldots)^2 = 0.026,296,567\ldots$ numerically.

Is the magnetic quantity of the leptons correlate-able to the

torsion = $\rho_{mag} = b / (a^2 + b^2) = 1/(6^2 + 1^2) = 0.027,027,027\ldots$?

Or to torsion^2 = $(\rho_{mag})^2 = (b / (a^2 + b^2))^2 = (1/(6^2 + 1^2))^2 = (0.027,027,027\ldots)^2 = 7.304,601,899 \times 10^{-4}$?

Or to torsion$^{1/2}$ = $(\rho_{mag})^2 = (0.027,027,027\ldots)^{1/2} = 0.164,398,987\ldots$?

Further the vector description giving rise to the lepton's charge was found to be

$\mathbf{R}(t) = a \cos[F(t)]\ \mathbf{i} + a \sin[F(t)]\ \mathbf{j} + bF(t)\ \mathbf{k}$

Here the the cos() **i** and sin() **j** vectors are orthogonal to each other as is observed for macro scale magnetic and electrical phenomena. Additionally the cos() and sin() functions are every repeating derivatives of each other as also found mathematically for macro scale magnetic and electrical phenomena. This seems almost like a perfect fit. One outstanding physical property, the magnetic. And one un-consumed constant mathematical feature, the torsion.

There are several difficulties in checking out this idea. The first is there is no physics unit for a blob of magnetism. In this work only static quantities were used, blobs, such as; meters (a blob of distance), seconds (a blob of time), kilograms (a blob of mass), and Coulombs (a blob of charge). This fell under the heading Keep It Simple Stupid. No human assumed dynamics were to be permitted in basic scale definitions used in this work. None of the dynamic compounded groupings such as; Newtons, Joules, Watts… were permitted in this work.

As discussed in Chapter 3.3, Measurement Systems Bases, Section 5.2 the definition of the unit Ampere appears to just have been a back handed and very complicated way to subordinate the static unit Coulombs. As discussed in Chapter 3.3, Measurement Systems Bases, Section 5.4 there appears to be no static equivalent or analogous magnetic equivalent for the Coulomb. There are several defined quantities related to magnetism; the Gauss or Tesla, the Maxwell or Weber, the Oersted, etc. All of these defined units are dynamic compounded quantities clearly involving all the problems for dynamic based measurement systems, discussed in Chapter 3.3, Section 6. And in these cases, just like with the definition of the Ampere, most of these "basic" units involve behind the scenes integrals and other such upper level mathematics putting the them out of reach of the common person or a 6th grader. Why can't there be a simple non-dynamic unit of magnetism assigned to lodestone rocks laying on a table?

Further and probably far worse for this or future work investigating the magnetic properties of the leptons all the definitions for magnetic "quantities" and not really definitions for magnetism at all. They all appear to be masquerading as magnetic definitions, when none of them have a have, use, or involve a basic definition of a "blob" of magnetism. All the definitions for magnetic quantities just defer or refer to the Coulomb or Ampere behind the scenes. So in addition to subordinating statics to dynamics in magnetic definitions, these definitions further subordinate magnetics to electrical measurement units. In short, magnetism is treated as a step child of electricity. This will not hack it.

As just seen above the constant curvature of certain vector curves in 3D space were clearly distinct from their constant torsion. This is required by the very mathematical definitions and concepts of curvature and torsion. As seen in Chapter 1.3, the Charge Of The Quarks, Tables 1, 2, and 3, the 4th dimensional k_1, k_2, and k_3 of the vector curves discussed there are related, but this is not a constant relationship. This is even though the constant $(k_1)^2$ always ultimately related the ±2/3 and ±1/3 charge of the quarks back to the lepton formula and to the real physical world as required.

Yes, at the human size world realm magnetism and electricity are related. Their interactions have long been understood and well defined with Maxwell's Equations 157 years ago. But in this work the discussions are about individual particles and their properties and not about the collective interaction

effects between swarms of particles, or even between 2 particles. Further in this work the world scale realm is that of George Johnstone Stoney. Yes in this far removed world realm there is a relation between magnetism and electricity as applying to the individual particle. But to automatically make the assumption that the two relations or interactions, macro scale and infinitesimal, are the same relation or have the same interaction is sheer folly. Finally as found repeatedly in Chapters 3.4-3.6 attempting to impose human geometric, dynamic, definitional, hypothesis first, or other such stories upon the particles and their mathematics doesn't hack it. Frequently this leads to nonsense, often measurement system dependent nonsense, etc., because the particles were not consulted and did not vote upon the human ideas.

Relating a magnetic property of the leptons to the torsion of their vector formulation appears like an excellent idea and would make a good trial and error challenge. But what magnetic property and how is it to be defined, according what measurement scale? It appears that physicists need to do some definitional homework first before taking up this open challenge.

9 Some Warnings

This body of work has found that the leptons and photons alike have spinning radial planar structures. These structures then propagate forwards with consensus time. Of course the photons' flight path is known to be a straight line. That of the leptons' was found to be that of a circle or of flower petaled affairs. The leptons, specifically the electron, make the outline of very miniature donuts. Some warnings are made concerning the use of any data from collider experiments, other than the masses of these or other elementary particles such as the quarks.

The collider experiments while they may be controlled very accurately and have produced billions or trillions of data points, may have also produced a hugh body of very bias data or extremely limited pictures of the true nature of the elementary particles. This is due to the inherent nature of the equipment and the experiments. Suppose that all the donut electrons or positrons in a collider line up chocolate side facing forwards as they fly down the tube. In all likelihood this in fact must be the case. As they run into the beam coming at them several possible interaction or reaction mechanisms can be identified.

If two interacting donut particles are viewed as they crash together, then several possible reaction schemes can be immediately identified. Two donuts can be line up, coming at each other with their holes on a common center. They could slam into each other in a side-by-side manner, like donuts lying in a grocery store box with their rims touching. Remembering that the electron is a circulating energy pattern, two sub-modes or cases for each of these layouts can be identified. The two interacting electrons can be circulating in the same direction or opposite directions. For the center-on-center donut wreck there can be chocolate tops colliding, cake bottoms colliding, or chocolate tops running into cake bottoms. Opposite rotations in a side-by-side donut wreck would be like having one donut lying chocolate side up and the other chocolate side down. Finally a third interaction scheme can be identified, that where one donut is standing on its rim and the other is lying on its side. Here the rim of the one donut electron is going to crash into the hole of the other.

After having identified these possible interaction mechanisms, then if all the donut particles line up chocolate side facing forwards as they come into their collisions, would the result of a reaction where these donut particles ran into each other in a side-by-side manner ever be seen? Could these rare events be what humans call violations?

Secondly since the donut particle electrons fly down the collider tubes at near the velocity of light, the whole experimental set up, although incredible accurate, at the same time could show a very limited, distorted, or bias picture of their geometric nature. The donuts may appear compressed, more as flying disks, or inversely may appear as stretched out hoola hoops. This body of work does not address these concepts nor the issue of relativity at all.

Now if this very simple experimental picture of leptons colliding is put on steroids to that become that of hadrons colliding some very complex issues arise. First although not demonstrated in this work at all, the quarks masses could be found to have true three dimensional geometries, and maybe even 4 dimensional ones, which then propagate forwards in time in their home world. The logic for this is discussed in the report about possible mathematical descriptions for the quarks. Now if three quarks are bonded together to make protons, there is already a plethora of geometric possibilities. Further since they are bonded, then they may have made the geometric outlines of hybrid molecular energy shells analogous to say what happens when hydrogen and carbon bond to make methane. There is hardly any need to analyze any further.

To add further confusion as now has been found in the add-on portion of this work, the quarks have been shown to probably be related to vector curve structures living in 4 spatial dimensions.

Without a Periodic Table of the Elements of Physics (PTEP) based upon mathematical-geometric structural forms there is essentially no way to predict the outcome of such hadron collisions. On the other hand, with a knowledge of geometric appearances, bond strengths, etc, an advanced organic chemist can predict the intricacies of organic reactions made under controlled conditions, the number of byproducts, percent of each expected to be made, et cetera. For physicists though, even after correlation efforts have revealed the rest nature of the quark structures, there still will be an uphill battle to predict S-matrices resulting from high speed hadrons colliding. This would be the physicists' equivalency to say a chemist predicting the equilibrium product mix expected from an uncontrolled high temperature organic chemistry reaction, which involved several large molecule starting materials.

What needs to be remembered here, regardless of whether discussing lepton collisions or hadron collisions, is that neither class of particles is spherical nor are they mathematical points with no form what-so-ever. Even if these these waveform bodies are moving at 99.9999% the speed of light, they still probably have irregular body shapes of forms in the size range of 10^{-34} to 10^{-36} meters in diameter. The scattering of the collision products might reflect the geometries of the interacting waveforms, in addition to the masses, charges, etc of both the reactants and products.

CHAPTER 2.2 TOWARDS A PERIODIC TABLE OF THE ELEMENTS OF PHYSICS (PTEP)

1 Introduction

This report stresses the dire need for simplicity, returning to the basics of particle physics, and the organizing of a Periodic Table of the Elements of Physics (PTEP). The perpetual chase for a unification of the basic forces and the elementary particles has lead physics further and further away from the questions which actually need to be asked and the information which is already available. Just what is a "basic" force? Just what are the basic particle properties mass, charge, or color? How do these relate to mathematical-geometric structures of the particles themselves? How do the gravitational force and the electromagnetic force pair relate to each other or to the particles which respond to them?

Based upon the mathematics of this overall body of work several Periodic Tables of the Elements of Physics are proposed. These include the elemental fermions, bosons, and basic forces. These tables are based upon a Building Block Model of Subatomic Physics (BBMOSP) in which the big, complex, or high energy composites are built up from the elementals. This is the opposite of all the top down models which assume that the elementary particles are lessor derivatives of some super massive originating unity and uniformity. Based upon mathematics of this work a PTEP can probably be constructed by a mathematical analysis of the masses of the elemental particles alone! This analysis should be particle centric.

How particles and forces can be transmuted into one another or where they come from should be or soon will become unnecessary and very expensive experimental spurious side issues. With a Periodic Table of the Elements of Physics (PTEP) based upon a Building Block Model of Subatomic Physics (BBMOSP) particle physics, both hypothetical and experimental, should become very much simpler, more direct, and many orders of magnitude cheaper.

2 Historical Background

Back during the 60ies when the world was young and so were we, the number of subatomic particles began to grow like a mushroom cloud. Even so, subatomic physics appeared as if there would be just a few short years before the physicists had everything all figured out and tied up in a pretty pink bow-tie. Much to the amazement of anyone with the slightest familiarity with college level science, now fifty years later there still is no periodic table of the elementary particles.

Murry Gell-Mann and independently George Zweig did an excellent job of showing that the hundreds of hadrons could be explained as compounds of the more elementary quarks. The mesons are now accepted to be binary composites and the baryons as ternary composites, analogous to the di and tri atomic molecules of the elements of chemistry. For example the $\pi^0 = (uu^-$ or $dd^-)$ can be thought of as analogous to H_2 or N_2. The $\pi^+ = ud^-$ or $\pi^- = du^-$ could be considered as analogous to HCl or NaCl. Likewise the stable proton can now be understood to be composed of u_2d analogous to H_2O. Whereas the somewhat unstable neutron is composed of ud_2 and is analogous to HO_2, which is so unstable as to be nonexistent.

From this incredible start though the rest of the periodic table of elementary particles has not yet been filled in. This is because there has not yet been an agreed upon mathematical basis for any of the elementary fermion families. Even though the hadrons have now been known for several decades to be binary and ternary composites of quarks, scientists still don't know what a quark is, nor a lepton, nor a neutrino.

Instead of wrapping particle physics in a pretty pink bow-tie, Gell-Mann and George Zweig proposed that the quarks wear blue, green, or red dresses. Those whom have followed, though, have never explained why humans only see white dresses or no dresses at all. Experimental high energy physicists can count particles by the billions and accurately find a single event that they want to see out

billions of collisions. They can make sure that the total masses, momentums, energies, etc coming out of a high speed collision is equal to those going into the collision. But what are the "things" which are colliding?

To be fair, particle physicists have assembled a Standard Model. But this is just a dictionary or encyclopedia of numbers, masses, charges, spins, lives, decay modes, and the likes. The Standard Model has not and due to its inherent nature can never explain the masses of the elementary particles such as the neutrinos, leptons, and quarks [1,2]. Likewise, the Standard Model cannot explain the occurrence of multiple generations of particles, whether this number is 2, 3, 4, or anything greater than one [1].

This is a really sad state of affairs. For 20, 30, or even 40 something years now particle physicists have had within their ranks tens of thousands of some of the brightest minds in science, salaries to make anyone green, blue, or red with envy, access to the latest and greatest computers in the world. Hypothetical and experimental programs in high energy physics have had the almost unfettered financial support of most of the wealthier countries of the world, second only to maybe the Russian and American space programs or the US military. This is one time in history that a basic science has not been held back by religious fanatics, arrogant kings or dictators, or a general lack of infrastructure from the supporting societies. To state the obvious, something is radically wrong here. This community of scientists needs to look at itself. What has occurred here?

To those persons on the outside, hypothetical physics appears to have completely lost its way in flights of intellectual fancy. The physics hypotheticans are busy creating mental projections about strings and membranes with bizarre numbers of dimensions, 9, 10, 11, 26... Stories are made up about imaginary angle-like super symmetric partners guiding the affairs of the mere mortal particles. Other such unprovable mental constructions seem to abound. These hypotheticans appear to always want more data and higher energy. The answer is just around the corner, if only some government would just build them yet a bigger collider. The original data on the basic low energy particles has been lying around fallow for a long time now. This data appears to have been either completely inefficiently or else ineffectively examined. For example, the mass of the electron has been known since the late 1890s. Again to put it bluntly, something is radically wrong here. The fault does not lie with the particles. They just are what they are and do what they do.

2.1 Something Must Change, A Building Block Model Of Subatomic Physics Is Needed

To again state the obvious, something has to change. This state of affairs of particle physics cannot continue indefinitely, or realistically even for a very short time to come. The wealthy nations of the world can no longer support the very expensive enterprises of running colliders. This is particularly true when there is nothing to show their tax payers for their money, except an occasional news headline of another exotic particle having been discovered. Further these exotic particles and bizarrely expensive data have no practical uses and are not even being used by those who discovered them. That is, except of course to make a bigger and bigger catalogue of the Standard Model. Finally, the wealthiest nation of them all supporting this research the USA has bankrupt itself in the usual most costly and least productive human enterprise of them all, continually fighting unnecessary wars.

So what is to be done? Particle physics must turn back the clock and start all over. The definitive particle data which already exists needs to be examined, analyzed, correlated, something, anything other than to be perpetually hypothesized about. The time has come for a Periodic Table of the Elements of Physics (PTEP).

This PTEP should provide or be constructed as a Building Block Model of Subatomic Physics (BBMOSP). This would be unique today amongst the plethora of current proposals, hypotheses, and models about the construction of subatomic physics particles. The BBMOSP would begin with the small, the basic elementary particles, and would view all the other higher energy particles as larger complexes or temporary very high energy inherently unstable reaction intermediaries.

All the other particle physics models might be called Top Down Models (TDM). Such TDM view the basic elementary particles as being of low energy and somehow lessor, or "incomplete" derivatives resulting from the disintegration, symmetry breaking, or other such degradation of some other more massive originating bodies. Further somehow by convoluted logic these massive bodies are conceived of as being the more elemental or simpler forms.

To an outsider, this Top Down world view of the elementary particles appears to be a subconscious and not-so-subtle long outdated hold over from the Yahwistic, Judeo, Christian, Islamic, Morman (YJCIM) mythology of a creator, now turned into a Big Bang. All of this insistence of bigger, more massive is better, and its ultimate expression as a "Big Bang" appear to be throw backs, stuborm clinging to the at least 3500 year old Yahwistic-Judeo-Christian mythology of a creation and a creator. Even the very idea of calling the Higgs boson, The God Particle, reveals this bias or still yet stucked-ness in the thinking of modern scientists. The god particle goes around sprinkling mass and its blessings on those lessor elementary particles. No! What if the universe is a continuum, a self substaining, self creating or self reproducing movie which needs no creator or guiding director general? What if the small particles just appear and disappear in and out of the space-time vacuum as Dirac proposed? These ideas were touched upon in Report 2.1 Implications & Consequences, specifically in Section 4.1 The Big Bizarre and Section 5 concerning the Dirac theory.

A useful analogy is from chemistry. A building block model would view carbon, hydrogen, and oxygen (C, H, O) as elemental sources which come together to form the sugar molecule, $C_{12}H_{22}O_{11}$. Whereas a top down model would view the sugar molecule as the god father source of carbon, hydrogen, and oxygen. A chemist might be able to take sugar down into his lab and determine that it is made of C, H, and O. But it would be totally incorrect for him to then run up and down the street proclaiming that he had found the origins of C, H, and O. This appears to be exactly what both the experimental and hypothetical physicists want to do, run up and down the street carrying banners and waving flags proclaiming that they have just found the god particles, source of all other particles. Just like the mythical designer of intelligent design, such a proclamation begs the question, where did these god particles come from. The answer is obvious in particle physics. These god particles had been created from smaller building block particles which had just been smashed together in insanely high speed particle wrecks, head-on collisions at that.

2.2 Return To The Basics

If the complete immersion in the current world view held by particle physicists is briefly shaken off, something might be learned from the historical path followed in another subject of science. The analogy here is to the importance of and necessity for the Periodic Table of the Elements of Chemistry (PTEC). The early-on chemists worked with water, salts, solid minerals, organic compounds, and various gases for several decades. A clear understanding of what these substances were, though, and how they interacted was only possible after the periodic table of the elements had been developed. This required a foundational understanding of the basic elements and their electron shells. The nature of the chemical bonds of H_2 and H_2O only make sense once one is familiar with the electron shells of hydrogen and oxygen. Only when a person is familiar with the concept of the electron shells, can they then understand why the very stable molecule H_2O exists but that HO_2 is so untenable as to be essentially nonexistent. The ionic bonds of salts, the gregarious metallic bonds, and the covalent bonds of organic compounds only make sense once one is familiar with the concept and details of the electron shells. High school students are taught how the repeating patterns that they create come about. These then form the basis of the PTEC. Stepping further away from the basic elemental shells to the hybrid covalent molecular shells of organic compounds, one can then understand the nature of the benzene ring and what toluene is. Finally then one can grasp the instability of the bastard isomer of TNT. A chemist who wants to describe

the DNA molecule must first understand the basics of organic chemistry, and before that the basic electron shell foundation of the periodic table.

In Chapter 4.1 Methodology, the basic premise of this overall work was that the elementary particles, both bosons and fermions, have structures, are energy patterns describable by wave equations. The correct mathematical descriptions of these wave patterns should explain all the observed and measured physical properties of these particles; such as their masses, charge, color, intrinsic angular spin, magnetic moments, discreteness or open ended moving unbounbedness, et cetera. Further once the exact nature of these elementary particles are understood, then the thinking of how they combine in twos to make mesons, in threes to make baryons, and so on, should be greatly simplified. This idea of beginning with the elementary particles needs to be stressed. The elementary particles; neutrinos and gravitons, leptons and photons, quarks and gluons, need to be understood first, before the higher energy composites and their various collision behaviors will make any sense.

A chemist may be able to determine the mass of a water molecule, 2H's and an O, but cannot explain it before he first knows what an H and an O are. Likewise a physicist may be able to determine the mass of a proton, 2U's and one D, but before much further progress can be made an intimate knowledge of the U's and D's is needed. A physicist needs to know what an Up, Down, Charm, Strange, et cetera, are first, their mathematical-geometric wave structures. Then a physicist stands a chance of discussing CPT, chirality, parity, violations, symmetry, conservation, non-conservation, et cetera.

There already is, and has been for several decades, plenty of data available on the basic elementary particles. The charges of the elementary particles come in; 0 for the neutrinos, ± 1 for the leptons, and ± 1/3 and ± 2/3 for the quarks. Admittedly there is not much a person can do with this information. The quarks come in three colors; blue, green, and red. Again a person cannot do much with this. But with the masses of these elementary forms, a wonderful array of information is found. The numerical size spread of this property ranges from the very tiny to the bizarrely big no matter what measurement scale it is placed upon. This information alone should give any inquisitive and mathematically oriented person hours of joy placing it on plots, attempting to correlate it, and working late into the night. Computer geeks should have great fun developing code trying to fit integrals to this information.

This is exactly what was done to discover the equations describing the masses of the three known leptons. These results, along with the additional mathematical-geometric description for the (ML)(L/T) of the photons, forms the core of the body of these collected reports. Now physicists, mathematicians, and computer coders, need to go after the two columns of quark masses to finish building a Periodic Table of the Elements of Physics (PTEP).

2.3 What Is Not Needed

There are many things, dozens of conceptual tools, which are not needed in these future efforts to find correlations and mathematical-geometric waveforms for the two columns of quarks in a PTEP. This information is listed in much tedious detail in Chapter 4.2, so only few general pointers need to be made here.

First and foremost, more hypotheses, of any sort, are not needed. Hypotheses building has not served an efficient or even an effective purpose. In fact what is needed is the opposite, a clear wide open mind space free from intellectual and conceptual clutter. All hypotheses and everything and anything to do with them needs to be dropped.

The search for mathematical-geometric structures for the two quark columns should be particle centric. The necessary data is available. More data is not needed. Whether these particles have uncles, aunts, cousins, great grandparents, or grand children should be of no relevance. These specific particles are to be examined here and now. More experiments are not needed and certainly more mighty particle smashing machines are not needed.

3 Preliminary Periodic Tables For The Fermions Of Physics

Table 1 Simplified Periodic Table Of The Elements Of Physics

Elementary Particles - Fermions					
		Neutrinos	Leptons	Quarks	
Charge →		0	± 1	± 2/3	± 1/3
Increasing Mass with Row →	5*		---		
	4*		shipa σ		
	3	υ_τ	tau τ	top (t)	bottom (b)
	2	υ_μ	muon μ	charm (c)	strange (s)
	1	υ_e	electron e	up (u)	down (d)
* Mass (energy) increases for first 3 rows, then rolls over and rapidly goes negative or does not produce viable particles.					

Table 2 Detailed Periodic Table Of The Elements Of Physics

Elementary Particles - Fermions				
Particle Group	Neutrinos	**Leptons**	Quarks	
Charge	0	± 1	± 2/3	± 1/3
Forces "Held"	Gravity	G + E/M	G + E/M + Color	
Spatial Dim.[1]	probably 1 radial	1 radial + 1 angle	4 Dim composed of 2 linked circles 2 radii and 2 anglular descriptions	
Lives In[2]	2nd Spatial Dim?	3rd Spatial Dim	4th Spatial Dimension	
Laguerre Poly. $L_6(r(t))$		**shipa σ^- ?**		
Laguerre Poly. $L_4(r(t))$	υ_τ or υ_H m < 2.76 x 10^{-29} kg	**tau τ^-** 3.167,88 x 10^{-27} kg	top (t) or truth 170,900 ± 1,800 MeV/c^2	bottom (b) or beauty 4,100-4,400 MeV/c^2
Laguerre Poly. $L_2(r(t))$	υ_μ or υ_M mass < 3.0 x 10^{-31} kg	**muon μ^-** 1.883,532,7 x 10^{-28} kg	charm (c) 1,150-1,350 MeV/c^2	strange (s) 80-130 MeV/c^2
Laguerre Poly. $L_0(r(t))$	υ_e or υ_L mass < 3.9 x 10^{-36} kg	**electron e^-** 9.109,389,7 x 10^{-31} kg	up (u) 1.5-4 MeV/c^2	down (d) 4-8 MeV/c^2
Fermions are "stationary" particles, originators & receivers of forces, Spin = 1/2 Have closed form wave patterns, are mathematically bounded in all spatial dimensions				
Examples Of Composites				
Compounds (Hadrons) of Colored Elementaries (Quarks)				
Binary Compounds (Mesons) – Homogenous; $\pi^0 = (uu^- + dd^-)$ or ss^-				
Binary Compounds – Heterogeneous; $\pi^\pm = du^-$ or d^-u, $K^0 = ds^-$ or d^-s, $K^\pm = us^-$ or u^-s				
Ternary Compounds (Baryons) – Stable; proton = u_2d, analogous to H_2O				
Ternary Compounds – Metastable, Unstable; neutron = ud_2, analogous to HO_2				
Notes: 1 Number of spatial dimensions of basic gravitational (mass) structure.				
2 Movement of the basic structural body as a "unit" which creates charge, color, etc.				

Having discussed several preliminaries, seeing what a Periodic Table of the Elements of Physics (PTEP) might look like is in order. Table 1 shows a bare bones or simplified such table. Table 2 shows a slightly more detailed version

A few notes are in order here. The neutrino masses listed are still somewhat speculative. Those listed are according to Wikipedia. These masses according to Particle Adventure are; mass $\upsilon_e < 2.3 \times 10^{-37}$ kg, $1.6 \times 10^{-38} < m\ \upsilon_\mu < 2.3 \times 10^{-37}$ kg, $7.1 \times 10^{-38} < m\ \upsilon_\tau < 2.5 \times 10^{-37}$ kg.

This overall body of work has clearly demonstrated that the increasing mass of the lepton series members is directly mathematically linked with members of the Laguerre orthogonal polynomial series. This is in the same manner that the increasing atomic weights with each row of the Periodic Table of the Elements of Chemistry (PTEC) can be mathematically linked to the Laguerre polynomial series as it applies to the base number of S electron shells for each row. For each row upwards in Table 2 there is at least one added radial-angular mass density or "energy" shell.

The Periodic Table of the Elements of Chemistry (PTEC) has a historically based appearance which is slightly illogical. In it the heavier, more massive, or elements higher in the numerical scheme of weights are filled in at the bottom of the table. A Periodic Table of the Elements of Physics (PTEP) might be more becoming of physics if the larger, more massive, or higher energy elements are placed higher up in any table. For these reasons Tables 1 & 2 are set up as shown.

Other features of these tables are:

1 The neutrinos would occupy the first column of the periodic table of the elementary particles. These particles only have mass and only respond to the gravitational force. This is the only force which they probably encapsulate or stabilize. They probably have a linear or one dimensional standing wave, longitudinal or compressional vibrational pattern of the gravitational force, which is somehow self balancing. These waveforms them incidentally tumble around in n-dimensional space with time. These could be thought of as strings in the various super string-membrane conjectures.

There is support for this 1 dimensional spatial proposal which is given by the nature of the charge correlations found for the leptons and the quarks. The charge of the leptons (electron, muon, and tau) was found to be directly related or linked to the curvature of certain 3 dimensional vector curves in 3 spatial dimensions. In a similar manner, the charge of the quarks was found to be correlated with the curvature of certain 4 dimensional vector curves in 4 spatial dimensions. Curvature is defined mathematically to mean the devation of a curve away from its traveling in a straight line. If the flight path or form of the neutrinos is that of a linear compressional wave, then its curvature would be zero or it would have no curvature, and no charge.

2 The leptons would occupy the second column of the PTEP. These particles have mass or encapsulate the gravitational force and additionally have charge or stabilize the electromagnetic force pair. They have radial mass density wave patterns in two dimensions, one radial plus one angular aspect. These planar forms can be thought of as membranes in the various super string-membrane conjectures. Additionally their mass density structures move in 3 dimensional space with time. In fact their charge is really only represented by the outline of a vector curve living in 3 spatial dimensions

3 The quarks would occupy the next two columns of the PTEP. These particles respond to and encapsulate or stabilize all three of the basic forces; the unary gravitational force, the binary pair electromagnetic, and the ternary set blue-green-red. Again, in the quark report, the charge of the quarks was found to be correlated with the curvature of certain vector curves in 4 spatial dimensions. Also as seen in the quark report, the two quark columns were found to be represented by two vector patterns in radius and frequency/wave length. That is, they represent two differernt vector curve structures and

would have two different analogous shell and or interior mass-energy structures. Never-the-less the possibly that they have a single shell which can accept one or two members should not be totally overlooked or discarded.

A very important note is in order here. Care needs to be taken when thinking of and discussing the mass density patterns of the particles and the origins of their charge. There are very distinctive and crucial differences between the two actual mathematical applications. The particle's mass density patterns may be referred to as being linear compressional waves, 2D radial-angular planes moving into the 3rd dimension, 3D "solid" fills moving into the 4th dimension, etc. But the patterns which give rise to their charge are really only vector curves traveling in the higher of the referenced number of dimensions. These vector curves just make the pencil point outlines in empty space. They do not represent anything "solid" or objects. They may outline a figure, form, or structure, but there is nothing "solid" there.

This is an important distinction even though the mass and the charge being discussed are both from the same "objects" or waveforms. A person could think of looking down a conference room table one way, that of vector mathematics in rectilinear coordinates, and seeing the charge of the particles as features in their higher number of dimensions. Then they could look down the same conference room table the other way, that of regular or scalar mathematics in polar coordinates, and see the mass structures of the particles in the lessor number of dimensions but with these structures moving thru the higher number.

3.1 Further Spatial-Geometric Reasoning / Verification

In Report 2.1 Implications & Consequences, Section 2, the neutrinos were briefly ascribed as having one dimensional mass-energy wave patterns and quarks as having three dimensional ones. There little reasoning was offered there for these attributions and their accompanying verbal descriptions. Such rationale is now needed.

First obviously, now there are three entire reports, those concerning the leptons, the photons, and the quarks detailing the matching of the charges and/or masses of these particles with various mathematical-geometric structures in 3 and 4 spatial dimensions. Never-the-less, aside from all the decimal precision a person could still ask how-why is this so. Is there a philosophical or intellectual basis for why these particles and their corresponding geometries turned out as they were found to be?

Some inductive logic or reasoning can be used as a starting point towards verifying the general geometric nature of the neutrinos, leptons, and quarks as listed in Table 2 above. To start this reasoning, the four assumptions which are used as underlying guidelines for this entire work need to be reviewed. These are listed in Chapter 4.1 Methodology, Section 6.

A restatement or refinement these four assumptions underlying the correlative approach used in this work might be; physical properties are the result of real physical structural features in the energy waveforms of the particles. There must be real physical reasons as to why different physical properties arise. That is, physical properties cannot be arbitrarily attached to the particles as if they were just listings in a dictionary, an encyclopedia, a Standard Model table, or signs on a street sign post.

In short, the basic particles responding to the different forces have different structures. Just as a bunch of measurable properties, such as mass and charge, cannot be tacked on a featureless mathematical point, likewise more measurable properties cannot be tacked on a particle than there are mathematical features to hold those properties. As the number of forces goes up to which a particle responds or equally the number of physical properties related to those forces that a particle displays, then there must be increasing complexity of the mathematical structures which embody these forces or hold these properties.

Therefore, since neutrinos only have mass or only respond to gravity, then they must have at least one corresponding structural feature. This feature can be assumed or assigned to be one dimensional, such as only being a radial energy density pattern.

As discovered in this work, the leptons which respond to gravity and electromagnetism, or equally which contain or encapsulate mass and charge, were found to have two dimensional planar mass density structures. Mathematically these mass structures had a radial description or equation and one angular distribution or equation. Since both the leptons and the photons move into a third spatial dimension with time, they could be thought of as being pseudo three dimensional. Intrinsically, though, their mass structures are not truly three dimensional but instead are only two dimensional radial-planar structures which move. As also found, the two physical properties, mass and charge, consumed or accounted for essentially all the useful mathematical features of the radial-planar structures of these particles.

If color is truly an independent measureable physical property, then there needs to be some physical structural feature to embody it. Rather than attempting to needlessly complicate the radial-planar structures of the leptons to accommodate yet another physical property, the simplest straight forwards choice is to assign at least a third or fourth spatial dimension to the quarks. This is according to whether the mass density pattern or the charge related vector are being discussed. A wave pattern which is intrinsically three or four dimensional in nature would obviously have features which are not possible for two or pseuo three dimensional structures. By inverting the assumptions of this work, a three dimensional mass density wave pattern could give rise to physical properties which are not possible for such two dimensional patterns.

4 A Second Periodic Table For The Bosons Of Physics

A second PTEP could be constructed for the bosons in an analogous fashion. This is seen in Table 3. This would include various wave patterns which are unbounded in at least one spatial dimension. These would include the boson partners for the various fermions; the gravitons (yet to be demonstrated), the photons, and the 8 gluons. This table would follow the pattern of Table 2.

Table 3 Boson Periodic Table Of The Elements of Physics

Elementary Particles – Bosons			
Particle Group	Gravitons?	Photons (1)	Gluons (8)
Force "Carried"	Gravity	Electromagnetism	Color
Comments	Do not have mass spin = 2?	Do not have mass Do not display charge	Do not have mass Have or display color
Bosons are "moving " particles, "carriers" of forces , Spin = 1 Have open form wave patterns, are unbounded in at least 1 spatial dimension			
Examples Of Composites			
Complex Form, temporary high energy reaction intermediary; "weak force" carriers W^+, W^-, Z^0			

Here the yet to be demonstrated gravitons would fill the first column and like the neutrinos would be 1 dimensional wave patterns. The photons in the second column like their counterpart fermions the leptons have been shown in this work to have 2 dimensional radial planar structures oriented at right angles to their 3 dimensional flight paths. Finally logic indicates that the unbounded gluons probably have 4 dimensional structures similar to those to be discovered for the charge of the quarks.

What would not be in this second PTEP are the various high energy temporary reaction intermediaries, "radicals", or physics "molecules". The "weak force" bosons clearly are not elementary waveforms and do not belong in a table of basic forms, no more than sugar molecules belongs in the

Periodic Table of the Elements of Chemistry (PTEC). Likewise the Higgs boson could be compared to an extremely short lived DNA molecule, interesting and important but clearly not elementary.

Historically the members of the higher rows of the PTEP have all been created by humans by smashing together members of the first or bottom row of the table. These high speed collision reactions produce all manner of flying particulate shrapnel. Most of these sprays of particulate junk, both the fermionic and bosonic forms, have extremely short lives or durations of "stable" existence before themselves disintegrating into further clouds of secondary and tertiary particulate forms. The lives of the upper members of the PTEP are no exception and decrease markedly with each upwards row. The distinction between "stable" particles as either elementaries or as composite compounds, and the temporary high energy reaction intermediaries has seriously blurred. Likewise what might be considered to be an originating/receiving particle structure or stable encapsulation of the forces, fermions, as opposed to a moving or open ended mathematical structure "merely" carrying these forces, bosons, has also seriously blurred. A person can ask what is the difference between an extremely short lived but "stable" or distinct particle and an equally short lived but "unstable" high energy temporary complex? These Tables 2 & 3 or others analogous to them should help address this issue.

5 Consequences Of A Building Block Model

As is seen these Tables 2 & 3 of the elementary particles are not just yet more pictorial regurgitations of the Standard Model. From the view of a BBMOSP the weak force carriers W^+, W^-, Z^0 would be considered to be composite entities, analogous to various sugar molecules, burning ones at that. They would be thought of as merely temporary composite waveforms, high energy reaction intermediaries, or inherently unstable activated states having very complex geometries.

If found at the world distance and reaction time scales of chemistry, the "weak force" particles would be viewed as some not very useful nor important temporary reaction intermediaries. Analogies could be made to the unstable molecular radical CH_3O^- or some short lived combustion intermediaries found in the burning of sugar $C_xH_yO_z$ to produce carbon dioxide x CO_2 and water y/2 H_2O. Obviously the radical CH_3O^-, sugar $C_xH_yO_z$, carbon dioxide CO_2, and water H_2O are not the source of carbon C, hydrogen H, and oxygen O. Rather C, H, and O combine in stable configurations to produce these larger molecular entities.

Again from the view of a BBMOSP the Higgs bosons would not be considered as elementary or a-priori. These entities would not rate a specific listing in any periodic table that might be constructed for the bosons. That is, should such a table be built after one is first constructed for the fermions.

Continuing in a building block model view, other simplifications of the subatomic physics semantics would be in order. There would be no more ascribing to the universe that there is yet another new or elementary force every time yet another new boson is predicted or verified. While although maybe shocking to some, the "weak forces" would not be considered to be one of the basic forces of the universe. In fact these supposed forces would not be considered to be forces at all. That is at least not in the same sense that mass, encapsulated gravitational force, charge, stabilized electromagnetic force, and the color phenomenon appear to be intrinsic properties of matter associated with some mathematical-geometric structural features of the fermions. A table of the elementary or basic forces of the universe or that particles experience would appear like Table 4 following. This Table 4 concludes the picture of the elements of subatomic physics with a tabulation of the basic forces. These are placed in columns which match those of Table 3.

As is seen here, the focus of a building block model of subatomic physics (BBMOSP) is upon the small, the most essential, "indivisible" units of matter. There are several implications here which are briefly worth noting. Since these implications are closely tied to the presentations here, they were not put in the Report 2.1 Implications & Consequences with the other more speculative ideas which flow from this body of work.

Table 4 The Fundamental Forces

Force	Gravity	Electromagnetism	Color
Force Nature	Unary; G	Binary; E & M	Ternary; Blue, Green, Red
Encapsulated or Stabilized Form	mass Kilograms	charge Coulombs	color Whites (neutral, clear)
Spatial Strength	Inverse Square Decay w Distance	Both Have Inverse Square Decay	Non-Inverse Square Decay with 3D Distance
Temporal Strength	Unknown Decay Modality with Time	Unknown Decay Modality with Time	Unknown Decay Modality with Time
Nature of Spatial Dimensions of Waves	1 Dim – radial	2 Dim - planar for pair. Electrical – radial Magnetism - angular	4 Dim, 2 radial and 2 angular
Waves Lives In n-Dim	n = 1?	n = 3	n = 4

First is the concept that the elementary particles of physics as shown in the tables are not in fact indivisible. The fact that the leptons have been shown to have mass structures and shells based upon the Laguerre orthogonal polynomials begs for the obvious question. What creates these shells or causes them to come into being? Likewise, since all the leptons and quarks can come into being and can be destroyed, then logically this implies that they are themselves composites or in tern have subconstituents. This is similar to the atoms listed on the PTEC. There the atomic elements are listed as if they are indivisible structural units, which serves a useful purpose for chemistry. This does not negate what is already known though, that atoms although they form very tight knit units, they do never-the-less have internal structures and subcomponents.

Science appears to have fallen into yet another regression of size; from planets to molecules to atoms to the nucleus of atoms to hadrons to quarks and now to yet some smaller entities. In short, as long as there is a multiplicity of forms at any size and duration scale, then there probably is be an infinite regression of smaller subconstituents.

Returning to the basics, a particle centric examination of the elementary particles of physics should eliminate a tremendous amount of overhead baggage. There should be no need for yet more collider experiments, or yet bigger particle wrecking machines. Physicists should see that trying to find a particle entity which unifies "everything", provided that this is physically possible for humans and their machines, is like a chemist who wants to find a hypothetical molecule that contains every element on the periodic chart. The fascination with transmuting one elementary particle into another by finding yet more exotic bosons should dwindle away. Instead of insisting on finding some god particle that goes around sprinkling mass into other particles, the important questions and focus should return to the basics. Just what is mass? Can a simple yet general definition be proposed for charge or color? This work has shown that mass and charge, at least for the leptons, are very precisely related to proposed mathematical-geometric structures. Additionally the quark report linked the charge of the quarks to definitive differerntial geometric structures in 4 spatial dimensions. Can the leptons' mass approach be extended to the neutrinos and the quarks?

5.1 Intrinsic Features Of The Particles And Forces Versus Human Definitional Stories

A brief aside is needed at this point. In Part 4, Report 4.3, Measurement Systems Bases, Section 8, almost all of the material developed in that entire report was summarized as to its implications for development of and discussions about universal absolute physics measurement systems. A point of

concern needs to be brought forwards to the discussions here. This is that concerning human stories or narratives which have been imposed upon the physical world though the use of mathematical-geometric definitions for the words describing the forces and their enclosed, entrapped, or stabilized quantities.

Specifically the early chemists tied the quantity for mass, the kilogram or equally the gram, to the quantity for distance, the meter or equally the centimeter, on a 1 unit of mass $\propto$ 1 unit of distance cubed bases. This was to make calculations involving aqueous chemistry easy and has served that function admirably. But when moving to discussions of the masses of the neutrinos, defining what appears to be inherently a one dimensional phenomenon for the neutrinos, related to the first spatial dimension of discussion, the radius, by a human imposed definitional story of mass being a cubic phenomenon clearly creates difficulties. Likewise for the 2 spatial dimensions describing the masses of the leptons and 3 to 4 spatial dimensions to be demonstrated for the masses of the quarks.

Worse yet, the physicists have imposed a highly convoluted mathematical-geometric dynamic definition involving integral calculus upon the flowing ampere. This definition of the dynamic ampere and through it the currently dependent definition of the static coulomb has effectively made understanding of electromagnetic phenomena beyond the reach of the common person. It has also resulted in the permanent enshrinement of contrary to physical fact descriptions of the electromagnetic forces. The result of the setup of the mathematical-geometric calculus integrals behind the definition of the ampere has been such that the electromagnetic forces have been forced to be $\propto 1/\text{distance}^1$. This is directly contrary to the common person having been taught that all of the gravitational, electrical, and magnetic forces decay spatially in a manner which is $\propto 1/\text{distance}^2$.

Several distinctions and warnings are needed here. Mass, electrical charge, magnetic "charge", blue color, green color, and red color are all physical properties intrinsically related to or created by features of the energy structures of the particles. Definitions for the words used to describe these static quantities cannot be imposed arbitrarily by humans inventing some mathematical-geometric narrative as to how these quantities are supposed to exist or behave. This warning or prohibition particularly applies to if and when physicists decide to quantize the particle properties of the three colors. That is if the particle and hypothetical physicists do not like the descriptions given in the quark report.

Equally the difference between a physical property being ascribed to a particular particle needs to be kept clearly distinct from the result of this property appearing as a force between several such particles. Describing, quantizing, and naming the quantity for such a force need not get itself tangled with the name for the quantity of the physical property that the particle contains. For example, the physical property of an individual particle or body is mass whereas the force between two or more particles or bodies is called gravitational, derived from the word gravity. Again this distinction between intrinsic quantities and forces appears to have been blurred with the naming and quantizing electromagnetic quantities and forces. The continuation of such blurring is not advisable when the time comes to mathematically describe or quantize the color forces.

6 Why Are The Periodic Tables Of The Elements Of Physics So Small?

Why are the Periodic Tables of the Elements of Physics (PTEPs) so small? Why don't these tables have sizes something similar to or in proportion to the Periodic Table of the Elements of Chemistry (PTEC)? There are multiple answers to such questions.

First at an obvious and practical level, the scientists of physics have not discovered or even proposed any more basic or elementary particles. The issue of the non-elementary or composite bosons was briefly addressed in Section 4 and was further expanded upon in Section 5.

At a philosophical level everything physical must terminate. Only conceptual mathematic sequences, bad feelings, and grudges can go on forever, if they want to.

From mathematical and physical viewpoints the answers to such questions become very interesting. Referencing the Periodic Table of the Elements of Chemistry (PTEC) again, some useful insights might

be gained. How or why does the PTEC terminate? In very simplistic layman's' words, the nucleuses of the elements get heavier and heavier until they fall apart under their own good looks. This terminates the number of rows. Why would a proposed PTEP terminate? As discussed in the report on the leptons, the mathematics of the mass density radial structure stops increasing, rolls over, and rapidly goes negative. This and assumed analogous mathematics for the neutrinos and quarks would terminate the number of rows in the PTEP.

Mathematically why are there no more columns for a PTEP? This question can also lead to some interesting considerations. Viewing Table 2 an increasing number of total spatial dimensions is found with the columns for each class of particles; neutrinos, leptons, quarks. The number of temporal dimensions was discussed in the lepton and photon reports, was briefly alluded to in the Report 3.1 Implications & Consequences and is more fully explored in the Appendix 2 Time & Space. In Section 3.1 above a strong case was made that as each force set is added to the elementary particles, then correspondingly additional spatial dimensions are also needed or added. One answer to this question of why no more columns may be spatial energy efficiency. This is discussed in detail in Section 6.1.

Starting with the leptons, these particles respond to or encapsulate the unary force set, gravity, plus the binary force set, electromagnetic. This electromagnetic pair sets up a 2-dimensional transverse disk. Gravity then is probably what drives this structure into the third spatial dimension with time. The same occurs for the photons. The only difference is the photons fly unimpeded in a straight line, while the leptons go in a circle like a dog chasing its tail. With quarks there is a third force set, comprising the three colors; blue, green, and red. These probably control the radial vibrational pattern of a three dimensional "ball". Electromagnetism and gravity possibly then drive this vibrating ball into an unknown number of extra spatial dimensions with an unknown number of temporal trails. Regardless though of the exact number, the possibility of a quaternary force set being added to these pre-existing structures does not appear likely to occur.

To see the reasoning for such a statement, the spatial dimensional pattern set in Table 2 for a PTEP should be taken to an extreme. That is of course, assuming that there is in fact a spatial dimensional pattern. Only the leptons and quarks have been mathematically demonstrated to have the number of spatial dimensions attributed to them. The number of spatial dimensions of the neutrino are of course just speculative. While there may be some logical rationale behind this assignment, it never-the-less is still speculative.

The PTEP as set up in Table 2 has the pattern that for each new column, or set of columns as with the quarks, there is an increasing number of spatial dimensions. In radial-angular coordinates this would amount to adding additional angular parameters to describe these new mass-energy dimensions. For n spatial dimensions, n even, there can be n-fold symmetry, both physically and mathematically-geometrically. Also it appears that for n spatial dimensions there is a corresponding set of n forces and n physical properties associated with the particles which encapsulate or stabilize there new forces. Additionally the the forces and physical properties associated with the pre-existing lower number of spatial dimensions do not go away.

Consider the following, particles with 26 spatial dimensions, as has been proposed in the past at the onset of the era of string-membrane hypotheses, would then logically have associated with them a set of 26 forces and 26 physical properties. Underlying these there would be other energy waveforms or particles with an additional set of 25 forces and 25 physical properties. Underlying these there would be 24, and so fourth. This would continue on down to the known energy waveforms, the quarks with a ternary force set of three colors, then the leptons and photons having the binary force set of electromagnetism, and finally the neutrinos having or responding to the unary set of gravity. Totaling all these sets and their distinct members there would be 351 distinct forces and 351 unique physical properties associated with a 26 dimensional column in the PTEP. Likewise particles with 9, 10, and 11 spatial dimensions would have respectively 45, 55, and 66 forces and physical properties associated with

them. This is of course including the 6 known basic or elementary forces and the corresponding physical properties of mass, electrical charge, magnetic "charge", and quantities of blue, green, and red. The idea of a particle with 26 spatial dimensions is so bizarre that there is not even an intelligent much less scientific way to say anything further about it. Even with 9, 10, or 11 spatial dimensions, any reasonable person would think that should such particles exist then the experimental physicists would have noticed something by now.

6.1 The N-Spheres

To see and understand yet more difficulties of any hypothesis which proposes to add an ever increasing number of spatial dimensions to the subatomic particles, whether or not elementary basics or complex composites, the geometric properties of the n-spheres needs to be examined. Table 5 lists the numerical values for the two geometric characteristics of the n-spheres, with unit radii.

The first item to note is the n-sphere series is not in fact a single series, but instead is composed of an interlocked pattern of two distinct and independent series. These are described as follows;

volume of n-sphere, n_odd = $2(2\pi)^{(n-1)/2}\ r^n / (1x3x5x7x...\ n)$

volume of n-sphere, n_even = $\pi^{n/2}\ r^n\ /\ (n/2)!$

Figures 1 & 2 illustrate the results of these formulas. Although technically these n-sphere volumetric and surface numerical values should be shown as two intertwined curves, for the purpose of the discussion here depicting them as having one smooth curve suffices. Likewise these numerical formulas only produce meaningful values for integer n, but again a smooth flowing curve gives better clarity than just a series of integer step jump points.

By volume what is meant is the interior fill of the geometric figure. Surface means just that, the surface or the exterior skin which encloses the interior volume and bounds it, making it distinguishable from the surrounding space. Mathematically the surface is obviously just the derivative in r of the volumetric formulas. For example; for 4 spatial dimensions or n = 4, the 4_volume = $1/2\ \pi^2\ r^4$ and the 4_surface = $2\ \pi^2\ r^3$, with numerical values of 4.93... and 19.73... for the volume and surface respectively of a one unit radius 4-sphere.

What is found for the characteristic geometries of the n-spheres is not at all intuitive and can only be grasped when viewing curves such as those plotted in Figures 1 & 2. Initially the volume of the n-spheres grows with the increasing number of spatial dimensions. Then at about 5.27 dimensions, the volume curve reaches an inflection point, rolls over and starts to decrease in size indefinitely as the number of dimensions continues to grow. This is of course pretending that there can be a fractional number of dimensions. The surface curve follows this same pattern of ever decreasing in size or numerical value starting somewhere between 7 and 8 spatial dimensions.

Several other mathematical and physical facts need to be added to this discovery to fully grasp its significance for any proposed physically real particles. First, the n-spheres are the most efficient geometric forms in terms of enclosing a maximum interior volume with a minimum exterior surface. This is regardless of the value of n.

Second in science, the physical property associated with the gravitational force, mass, has so far been viewed as an interior phenomenon. This has been the historical view when discussing macro scale objects such as; the earth and the sun, metal cylinders, and so on. This is also synonymous with the conceptual view of mass even at the micro quantum mechanical scale. There the kinetic energy factor is described in terms of a concentrated or localized point source mass with a uniform interior or volume and which is dynamic or moving.

Whereas the physical properties associated with the electromagnetic forces, electrical charge and magnetic "charge" have always been conceived as being surface phenomena. At the quantum mechanical scale, the potential energy factor is described in terms of a diffuse, distributed, or delocalized charge appearing as a shell, surface, or boundary quantity which is static or not moving.

Mathematically mass has been summarized by using equations that involve interior integrals and in these reports charge by using equations that describe the curvature of vector curves forming the "surface" of the figures. Since in the broadest conceptually terms there can only be interiors and surfaces as descriptions of general geometric forms, such views of mass and charge raise a very interesting philosophical question for subatomic physics. Mathematically how should the ternary force set, the color forces blue, green, and red, and their quantized, encapsulated, or stabilized versions color be described. Concentrated interiors and diffuse surfaces have already been consumed or allocated. The answer is, that as is found in the quark report, there can be three different representations of the vector curves which correctly describe or correspond to match the measured-theorized charge of the quarks.

Third there can be no escape from this dilemma by conceiving of temporal dimensions. Repeating what was discovered concerning this dimensional issue for the leptons offers no help. What was found is that for every spatial dimension there was a corresponding temporal dimension. All the temporal dimensions or their mathematical variables, three in the case of the leptons, were independent from each other. More importantly all the temporal dimensions were the originating, implicit, or independent variables in the equations with the spatial descriptions being the dependent variables. In short there was no spatial description of the particles without an underlying temporal description. The number of spatial and temporal dimensions were irrevocably linked.

These three discussion points and the two plots of the n-spheres raise some serious food for thought when considering blithely adding spatial dimensions to subatomic particles to attempt to satisfy some hypothesis-first geometric description for them. A simple question can be posed which brings all these ideas together. Why would, how could, nature create a real physical "object" or energy wave form with a high number of spatial dimensions, such as 26, when its energy would be packed into a very tiny volume while at the same time having a proportionally very large surface which would permit this energy to dwindle away? In short all the n-dimensional spheres past about 5 to 6 dimensions would be volumetrically inefficient at containing energy.

Concluding the overall discussions of Sections 6 and 6.1, for all these reasons it appears highly unlikely that physicists will find any particles with 5 spatial dimensions or any additional columns in the Periodic Tables of the Elements of Physics (PTEP) to which they might belong.

Table 5 Geometric Properties Of N-Spheres

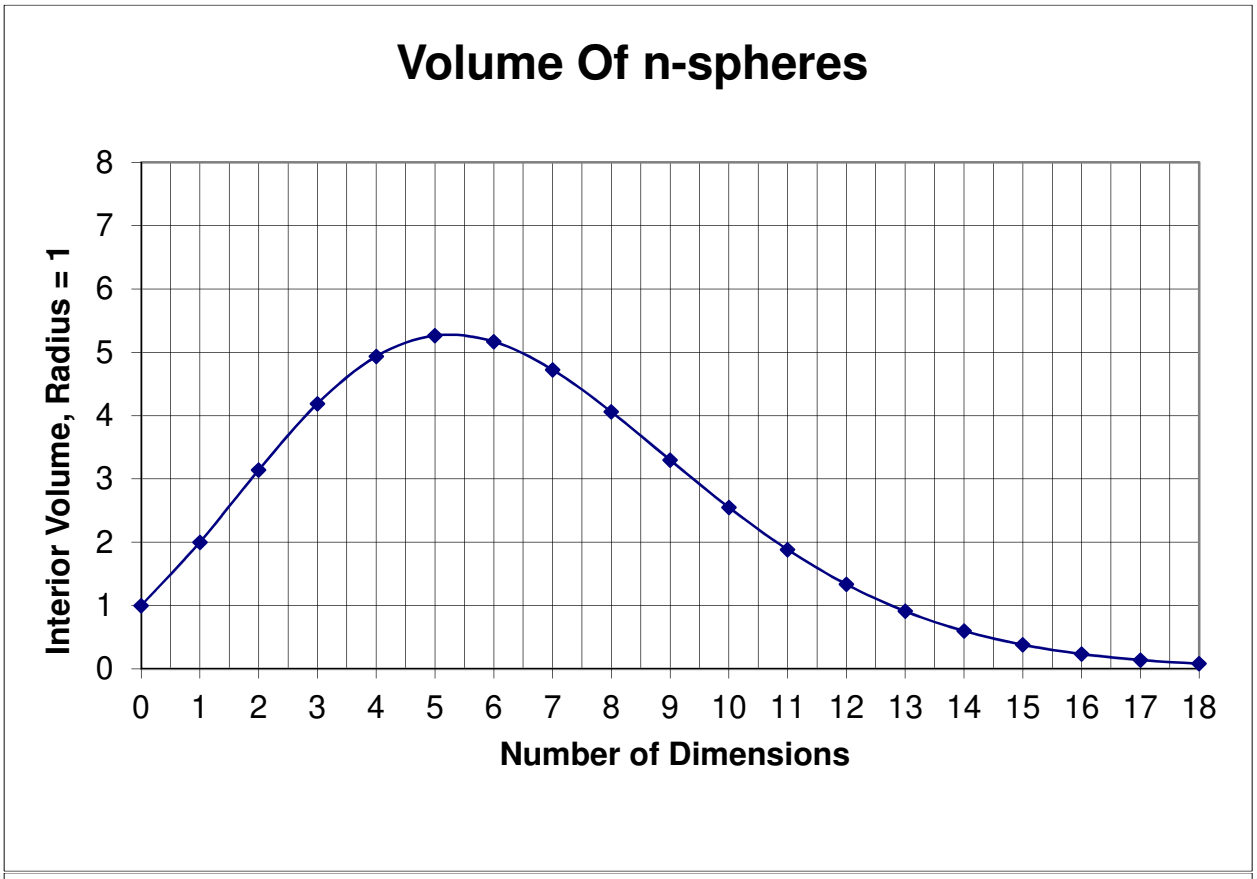
n	n odd				n even			
	volume		surface	s/v	volume		surface	s/v
	symbolic	numeric			symbolic	numeric		
1	$2/1\ \pi^0$	2.00000	2.00	1				
2					$1/1\ \pi^1$	3.14159	6.28	2
3	$4/3\ \pi^1$	4.18879	12.56	3				
4					$1/2\ \pi^2$	4.93480	19.73	4
5	$8/15\ \pi^2$	5.26378	26.31	5				
6					$1/6\ \pi^3$	5.16771	31.00	6
7	$16/105\ \pi^3$	4.72476	33.07	7				
8					$1/24\ \pi^4$	4.05871	32.46	8
9	$32/945\ \pi^4$	3.29860	29.68	9				
10					$1/120\ \pi^5$	2.55015	25.50	10
11	$64/10395\ \pi^5$	1.88410	20.72	11				
12					$1/720\ \pi^6$	1.33526	16.02	12
16					$1/40320\ \pi^8$	0.23533	3.765	16
26					$1/13!\ \pi^{13}$	4.663×10^{-4}	1.212×10^{-2}	26
32					$1/16!\ \pi^{16}$	4.303×10^{-6}		
64					$1/32!\ \pi^{32}$	3.080×10^{-20}		
128					$1/64!\ \pi^{64}$	5.178×10^{-58}		
256					$1/128!\ \pi^{128}$	1.119×10^{-152}		

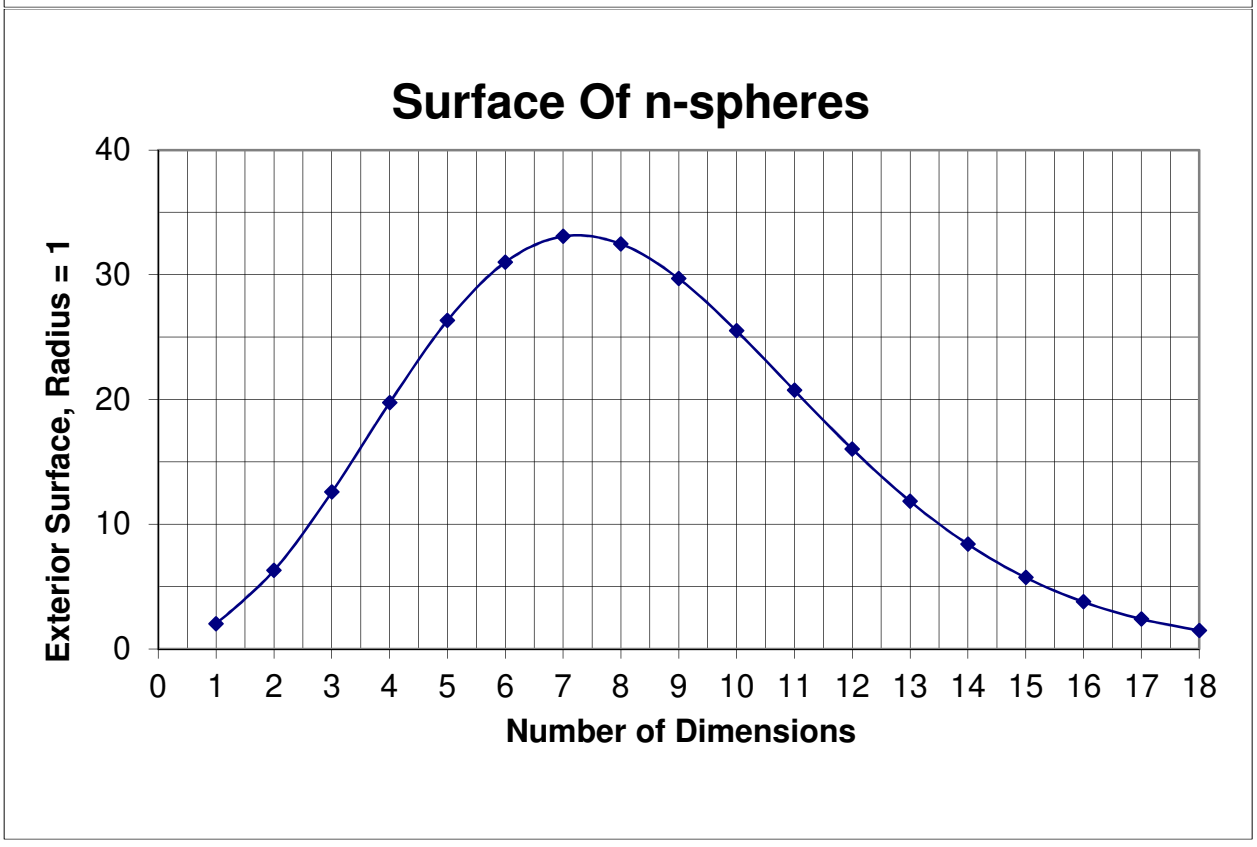
Notes: The powers of r (radius) have been suppressed or r = 1 in all cases.

Vol n odd = $2(2\pi)^{(n-1)/2}\ r^n / (1x3x5x7x...\ n)$; Vol n even = $\pi^{n/2}\ r^n / (n/2)!$

The maximum n-sphere volume occurs at n approximately 5.2599 to 5.2600 with a volume of 5.2777

FIGURES 1 & 2


Volume Of n-spheres
Interior Volume, Radius = 1
0
1
2
3
4
5
6
7
8
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Number of Dimensions


Surface Of n-spheres
Exterior Surface, Radius = 1
0
10
20
30
40
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Number of Dimensions

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CHAPTER 2.3 AN APPROACH TOWARDS A MATHEMATICAL DESCRIPTION FOR THE MASSES OF THE QUARKS

1 Introduction

This report extends the work of Part 1 by outlining suggested ways to begin discovering equations which would describe the masses and other measured physical properties of the quarks. The mathematical-geometric model found for the charge of the quarks as corresponding to the curvature of certain vector curves in four spatial dimensions is presented in Chapter 1.3 and is not repeated here.

Part1, Chapter 3 has shown that the charge of the quarks, and presumably their masses, could be modeled by vector curves occupying 4 spatial dimensions in the form of a pair of linked circles. The idea was shown to be valid that the information discovered for the leptons and photons can be used as a starting basis for modeling the quarks has been. There are logical expectations that wave structures for the neutrinos and quarks form some general pattern with those discovered in this work for the leptons. But just what is this pattern? Such general logical expectations are not much help is formulating mathematical equations which must bear out many mathematical decimal places. Suggestions are made here as to how to do this.

1.1 Overview Of The Challenge

In Reports 1.1 and 1.2 mathematical descriptions were given which can explain most of the primary physical properties of the leptons and photons. The organization and interlinkages of these descriptions offered much valuable information about the geometric structures of these waveforms. Never-the-less these mathematical descriptions for the leptons and photons should be thought of as applying only to these specific waveforms occupying the second columns of periodic tables for the fermions and bosons. While there might be hope that these mathematical-geometric descriptions could somehow be expanded or modified so as to also apply to the quarks, there is no guarantee that the particles agree with such a human imposition. The best help that can be expected from the knowledge discovered by this work and presented in the core chapters of Part 1, is that maybe this information gives some general pointers as how to proceed when considering the quarks, but nothing specific what-so-ever.

Reviewing the Periodic Table of the Elements of Physics (PTEP), in Report 2.2, Table 2, the fourth row listing spatial dimensions of the particles shows the nature of the challenge here in finding mathematical-geometric descriptions for the quarks. Humans appear to have never even thought of the constituents of physical matter as possibly having 4 spatial dimensions. Additionall when considering the neutrinos these are no physical bases for their row in this table of one dimensional spatial geometries. The information listed there is strictly conceptual assumptions.

The search for mathematical-geometric waveforms for the quarks will be much like that which began this overall work, trial and error to match the masses of these physical forms. Such a search this time should not need to be as utterly wide open as the previous search for equations to describe the masses of the leptons, in that this time much has already been learned. The exhaustive and initially somewhat random search for mathematics to match the lepton masses has already shown, at least in general, what logically would be good starting trial forms. This pervious material has shown what mathematical forms may be useful and even more importantly the details of the past efforts have shown what mathematical forms will never prove to be beneficial and should be rejected from the start.

2 Thoughts On Mathematical Features That May Give Rise To The Masses Of The Quarks

2.1 Parallel Pathways

In Chapter 4.1 Methodology the first action that was taken for this overall work was to plot the data, the masses of the three known leptons. Likewise here this would be a good and necessary first choice towards discovering mathematical-geometric equations which model structures for the quarks.

Matching the numerical value of the quark masses is not the only task which needs to be done though. A correct model of their geometric forms also needs to be discovered. As found with the leptons, this geometric shape and its motion directly related to their fixed invariant charge and also had bearings upon the nature of their angular mass density equations. Here when considering the quarks at least three tasks need to be done.

First a vector geometric model of the quark's basic spatial form and their motion needs to be conceptualized. This then needs to be verified by calculations to see if the concept produces the correct invariant ± 2/3 and ± 1/3 charges as related to either the curvature κ or torsion τ of the moving figure. This has now been done and reported in Report 1.3.

Then discovering their radial mass density equations and also discovering their angular mass density equations needs to be done. These two mass related tasks can be done almost completely in parallel or simultaneously. Ultimately of course these two parallel tracks must come together to produce the the exact values of their masses. As found with the leptons, though, the bulk of their mass densities were contributed by their radial equations and their angular distributions generally contributed less than an order of magnitude to their final unscaled masses. If the same trend continues with the quarks, then the primary shaping of the mass curves resulting from their radial equations can be done almost independently, at least initially, from efforts to match their charges and discovering their related angular equations.

The number crunching part of the research necessary to discover the mathematical-geometric nature of the quarks has not changed. Unlike the analytical efforts necessary to verify a fixed invariant charge for the quarks, efforts to match the empirical many decimal mass values requires tools beyond the capability of paper, pencil, and the human brain. Just as with the past research to model the mass structures of the leptons, the efforts to do the same for mass structures of the quarks requires brute force trial and error computer searches.

These search efforts can be greatly simplified this time, if the mathematics of the quark masses are assumed to follow a pattern or be an extension of the mathematical forms found for the leptons. The specific features of the mass equations for the leptons can be examined one at a time and logical first guesses made as to how each item should be modified to initiate the trial and error process for the quarks.

The general features or structural layout of the mathematical expressions which were found to describe the masses of the leptons were discussed in Part 1, Chapter 1.1 A Model For Determining Physical Properties I: Properties Of Leptons, Subsection 4.2.1. These is good reason to feel that these same general features or structural layout apply to the quarks, just maybe expanded or modified to now accommodate three spatial dimensions which the quarks are reasoned to have.

An example would be that now there now needs to be a second angular equation, instead of just one as was needed for the 2-dimensional leptons and photons. Since no research has as yet been done to attempt to match the numerical values of the masses of the quarks, then it is somewhat premature to start making a specific detailed listing of each such feature as might be expected to appear in the final form of any mathematical expression for the quark masses.

2.2 Correlation Constant

Never-the-less, there is one general feature which known to be absolutely required. This is a general scale factor or correlation constant. Just as with the mathematical-geometric descriptions of the leptons and photons, a factor is needed which scales from the arbitrarily sized world of black board mathematics to the size of the consensus world scale of humans and physicists. This factor is needed to turn what could be a correlation for the quark masses into actual equations. No matter how well mannered such an initial correlation may be, what patterns it shows, or how many decimals it may be good to, an unscaled

correlation is just that. An unscaled correlation is not and can never substitute for a series of equations which produce real world numerical values with their appropriate measurement units.

This factor could present an insurmountable block to ever generating final mass equations for the quarks. The reason for this potential problem is simple. The general or universal scale factor for the leptons required the use of the universal constants for all three of the forces to which the leptons respond; G, ε_o, and μ_o. These then were used to create a value for the absolute unit of distance as $e\mu_o(G\varepsilon_o)^{1/2} = 1\ l_{Sgs} = 4.893{,}752{,}96 \times 10^{-36}$meter. If the quarks require a new or distinct absolute unit of distance applicable to themselves, then it will probably likewise require the numerical values of all of the six forces to which the quarks respond; G, ε_o, μ_o, B_o, G_o, and R_o. The obvious problem is that the values of the three color forces Blue, Green, and Red have never been quantified.

This difficulty should not stop any research to find a correlation for the quark masses, but should be kept in mind in that it ultimately could stop the final desired equations from ever being generated. More precisely, mathematical-geometric equations calculating to the quark masses may be achievable, including with an exact scaling factor, but the physical property origins of this constant may still be an unknown. There could and probably will be a major gaping unknown in any equations for the quark masses which bridge from the world of conceptual mathematics to the real physical world. This is even though the required numerical value with its measurement units for such a scaling constant may be obvious.

3 Ideas On The Radial Features For Mass Equations For The Quarks

The mass density equations for the leptons were found to have two major parts; an integrated radial equation factor and an integrated angular equation factor. Considering the radial equation first, it in tern was found to have several subfactors. These can be found by reviewing Chapter 1.1 Subsection 4.2.2 which describes the mathematical features of the radial equation for the leptons. These same mathematical features should apply to the quarks even though they may need to be expanded or modified. Section 6.2 of the lepton report discusses the physical reasoning for these features. Again there is reason to feel that the same or analogous physical relationships and drivers would apply to the quarks. All these same mathematical features and physical embodiments were also found to apply to the photons. In Chapter 1.2, Subsections 2.1 and Subsection 4.2 the factors of the radial mass equations for both these two classes of elementary electromagnetic forms were again listed and discussed in detail.

These several factors of the radial mass equations for the leptons and the photons do need to be listed here so they can be examined one at a time and decisions made as how to apply them in planning work for the quarks. The objective here is to plan the trial and error searches for the mass equation descriptions of the quarks in a broad enough manner that permits them to start from a wide base. Hopefully the chosen base mathematical form will include the actual descriptions of the quarks somewhere within itself as a specific subset.

For both the leptons and the photons the radial equation, D(r), is composed of an initial constant C_r, a contractive spatial factor R_{csf}, and an expansive spatial factor R_{esf}. The radial equations for the two species of electromagnetic particles, em_p, are:

$$D_{em\_p}(r) = C_{r\_em\_p} \int_0^{\infty} R_{csf} R_{esf\_em\_p} dt_r = C_{r\_em\_p} \int_0^{\infty} e^{(R_c(t_r))} e^{(R_{e\_em\_p}(t_r))} dt_r \qquad (01)$$

Specifically for the leptons;

$$I(r) = FHDif[F(r)] = \left[\frac{2J_1[F(r)]}{F(r)}\right]^2 \qquad (02)$$

$$k_L = 1.697,525,53... = \int_0^{\infty} \mathrm{FHDif}\,(1.000,000, ... r^1)dr \quad (03)$$

$$I_{rL}(t_r) = \mathrm{FHDif}[k_L t_r^{\,1}] = \mathrm{FHDif}[1.697,525,53\ldots t_r^{\,1}] \quad (04)$$

$$C_{rL} = \int_0^{\infty} I_{rL}(t_r)\, e^{(R_c(t_r))} e^{(R_{eL}(t_r))} dt_r \quad (05)$$

$$R_{csf} = F(R_c(t_r)) = e^{(R_c(t_r))} = e^{(-6t_r^2)} \quad (06)$$

$$R_{esfL} = e^{(R_{eL}(t_r))} L_n^d(R_{eL}(t_r)) \quad (07)$$

$$R_{eL}(t_r) = \left(\frac{\pi}{2}\right)^{\frac{1}{2}} ds\left(\frac{2\pi t_r^2}{k_L^{1/2}}\right) = \left(\frac{\pi}{2}\right)^{\frac{1}{2}} \left[1 + \left(\frac{4\pi t_r^1}{k_L^{1/2}}\right)^2\right]^{\frac{1}{2}} dt_r \quad (08)$$

In the context of the quarks, first the Fraunhofer Diffraction Function FHDif[F(r)] needs to be modified. This function for use with the elementary electromagnetic waveforms, the leptons and photons, was derived from a planar Fraunhofer diffraction pattern. If this function is going to be used for the quarks, then it probably needs to be upgraded to model a 3-dimensional pattern, at least. The constant k_q would have a different numerical value.

Next the contractive spatial function R_{csf} needs to be reviewed in conjunction with the expansive spatial factor R_{esf}. Specifically within R_{esf} the expression for $R_{eL}(t_r)$ contains a distance function application, $ds\left(\frac{2\pi t_r^2}{k_L^{1/2}}\right)$. This instantaeous distance function as applied is a weighted expanding area of a circle. If applied to the quarks the expression may appear as $ds\left(\frac{4/3n\pi t_r^3}{k_Q^{1/2}}\right)$ as being applied to a weighted expanding volume of a sphere. Continuing with this derivation directly leads to how one problem can arise. The expression $\left[1 + \left(\frac{4\pi t_r^1}{k_L^{1/2}}\right)^2\right]^{\frac{1}{2}}$ now becomes $\left[1 + \left(\frac{4n\pi t_r^2}{k_Q^{1/2}}\right)^2\right]^{\frac{1}{2}}$. The contractive spatial function R_{csf} with the form $e^{(-6t_r^2)}$ will probably need to be modified to accommodate this new R_{esf}. While not absolutely prohibited at this stage, there is a high likelihood that the $e^{(-at_r^2)}$ with a = 6 may not be able to overcome the distance function operating on a 3-dimensional or cubic form. The contractive spatial factor may not be able to force the overall D(r) to converge. This then leads to at least two choices. The value of a = 6 = 3! could be increased to a = 24 = 4! or the power of t_r^2 could be increased from 2 to some value such as 4 or 6. At this point then computer code needs to be run for the necessary integrals for D(r). These will provide feedback as to which choice would better match the shape of the mass curves for the two columns of quarks in the PTEP.

Without having run such computer code, though, information can still be gained by analytically examining the nature of the function $R_p(t) = e^{(-at^p)}$. Much information is given about this negative exponential form in Sections 3.1 and 5.1 following and in Appendix 6. When P = 2 or $R_2(t) = e^{(-at^2)}$, what is found is quite amazing.

3.1 Special Features Of The Contractive Spatial Function $R_2(t) = e^{(-at^2)}$

To introduce several of the special features of the Radial Contractive Spatial Factor, R_{csf}, a few examples of general engineering mathematical concepts should be reviewed.

First a general expression of a simple radial position as a function of time needs to be chosen, such as F(r) = R(t). Applying mass (m) to the first two derivatives of R(t), the resulting expressions are viewed as relating to or modeling several important physical phenomena. The typical engineering assignments are as follows.

Velocity = $(D^1)R(t)$ or $d^1R(t)/dt^1$ (09)

Momentum = $m[d^1R(t)/dt^1]$ (10)

Velocity squared = $[(D^1)R(t)]^2$ or $[d^1R(t)/dt^1]^2$ (11)

Kinetic energy = $m(D^2)R(t)$ or $m[d^2R(t)/dt^2]$ (12)

Force = $m[d^2R(t)/dt^2]$ (13)

Potential Energy = $mR(t)[d^2R(t)/dt^2]$ (14)

Currently for real world practical physical engineering applications the third derivative expression is basically ignored as not being relevant. As discussed in the report for the charge of the quarks, Section 5.2 this continuing to ignore the higher derivatives of time with distance, such as mass x jerk, $M(L/T^3)$ for the quarks is clearly not advisable. In fact the concept of Senergy presented there as $\mathbf{S = mV_g^3}$ may lead to major breakthrus for particle physics working with the quarks.

Both of the concepts of kinetic and potential energy can be rolled into the second derivative if a quadratic starting form is used, such as $F(r) = 1/2mr^2 = 1/2mR^2(t)$, where t is implicit within r = R(t). Besides representing a quadratic form, such a variable could also be thought as modeling the properties of a binary system or dualistic force scenario. With this form the following are found.

$F(r) = 1/2mR^2(t)$ (15)
$F'(r) = mR(t)x\, d^1R(t)/dt^1$ (16)
$F''(r) = mR(t)x\, d^2R(t)/dt^2 + m(d^1R(t)/dt^1)^2$ (17)
$F'''(r) = mR(t)x\, d^3R(t)/dt^3 + 3md^1R(t)/dt^1x\, d^2R(t)/dt^2$ (18)

Within the second derivative of this general starting expression obviously there are two terms. What is significant with this form is that the first term has the appearance of the above conceptual definition of potential energy and the second term matches that for kinetic energy. For any stable system with no outside energy input and with no output of energy to the exterior environment, or with no accumulation or depletion of internal energy, these two terms of the F" expression must balance to zero.

Another general mathematical expression can also lead to this same result of the second derivative containing two terms which could be said to represent kinetic energy, the first derivative squared, and a second term to balance it.

$F(r) = at^p$ (19)
$F'(r) = +pat^{(p-1)}$ (20)
$F''(r) = (-p+p^2)at^{(p-2)}$ (21)
$F'''(r) = (+2p-2p^2+p^3)at^{(p-3)}$ (22)
Kinetic Energy / m = $(F'(t))^2 = +p^2a^2t^{(2p-2)}$ (23)
Potential Energy / m = F(r) x F''(r) = $(-p+p^2)a^2t^{(2p-2)}$ (24)

The expression for potential energy contains embedded within it the expression for kinetic energy. Obviously here neither the sum or the difference of these two energy expressions balances to zero.

Now returning to Radial Contractive Spatial Factor, R_{csf}, $R_2(t) = e^{(-at^2)}$ which was found to apply identically to both the leptons and the photons.

$$R_2(t) = e^{(-at^2)} \quad (25)$$
$$d^1R_2(t)/dt^1 = e^{(-at^2)}\{-2a^1t^1\} \quad (26)$$
$$d^2R_2(t)/dt^2 = e^{(-at^2)}\{-2a^1t^0 + 4a^2t^2\} \quad (27)$$
$$d^3R_2(t)/dt^3 = e^{(-at^2)}\{+12a^2t^1 - 8a^3t^3\} \quad (28)$$
$$d^4R_2(t)/dt^4 = e^{(-at^2)}\{+12a^2t^0 - 48a^3t^2 + 16a^4t^4\} \quad (29)$$
$$d^5R_2(t)/dt^5 = e^{(-at^2)}\{-120a^3t^1 + 160a^4t^3 - 32a^5t^5\} \quad (30)$$
$$d^6R_2(t)/dt^6 = e^{(-at^2)}\{-120a^3t^0 + 720a^4t^2 - 480a^5t^4 + 64a^6t^6\} \quad (31)$$

Multiplying $R_2(t) = e^{(-at^2)}$ or its derivatives by mass (m) when appropriate gives the following.

$$\text{Velocity}^2 \text{ or Kinetic Energy of } R_2(t) = m^1e^{(-2at^2)}\{+4a^2t^2\} \quad (32)$$
$$\text{Potential Energy of } R_2(t) = m^1e^{(-2at^2)}\{-2at^0 + 4a^2t^2\} \quad (33)$$
$$\text{PE + KE} = m^1e^{(-2at^2)}\{-2at^0 + 8a^2t^2\} \quad (34)$$

As with the two preceding demonstrations, the expression for potential energy has contained within it that for kinetic energy. Taking the definite integrals of several of these expressions highlight some of the amazing mathematical properties of the radial contractive spatial factor for the leptons $R_p(t) = e^{(-at^p)}$ when P = 2.

Table 1 Values Related To $R_2(t) = e^{(-at^2)}$

$d^nR_2(t)/dt^n$	$\int_0^\infty\{d^nR_2(t)/dt^n\}\ dt$
n = 2	= 0
n = 4	= 0
n = 6	= 0
Σ (PE, KE)	= 0
The appearance of mass (m) is suppressed	

If as with the quadratic starting form used above, the second derivative is construed to be the starting form, then this negative exponential form passes the test of having the balanced energies necessary for a stable system or structure. Further more, if any even derivative of this negative exponential starting form is conceived as the original description of an energy body or system, then in tern its second derivative also passes this same test.

Likewise the usual conceptual definitions can be used, kinetic energy = $m[d^1R_2(t)/dt^1]^2$ and potential energy = $mR_2(t)[d^2R_2(t)/dt^2]$. Using these longer and more rigorously correct definitions, this negative exponential starting form still passes the balanced energy test for a stable structure. Furthermore what is found for all other expressions $R_p(t) = e^{(-at^p)}$ where P = 1, 3, 4, ... any value ≠ 2, is that for none of these does the definite integrals of their second derivatives equal zero. Likewise nor does the definite

integrals of the sum of the conceptual quantities as described here for potential and kinetic energy. All these results and many more are detailed in listed in Appendix 6.

The $R_{csf} = e^{(-at^2)}$ is found to be unique in terms of many of its derivative properties. This is of course when it is free standing and not embedded in a longer expression such as those for the radial equations of the leptons and photons. For these reasons for first trial and error computer runs to match the masses of the quarks preserving this valuable form with P = 2 would be a better choice than moving up to negative exponential forms with P > 2.

3.2 Consideration Of The Application Of The Laguerre Orthogonal Polynomial Form $L_n^d(R_{eL}(t_r))$

Before leaving the topic of possible mathematical descriptions for the radial mass equations for the quarks the issue of how to step thru the mass series from the up to the charm to the top, or likewise from the down to the strange to the bottom needs to be addressed. For the leptons the use of the even Laguerre orthogonal polynomials served this purpose. Without having done any mathematical trial and error searches at this time there is no reason to believe that the same mechanism would not also serve for the quarks, of course with some appropriate modifications.

There is a severe physical difficulty with such a mathematical approach though. The quarks have two columns of members. Further although the two columns start out with the reasonably mathematically close mass vlaues for the up and down, as the particles rise thru their respective series then their masses diverge wildly. Using the values given in Chapter 2.2, Section 3, Table 2 the following ratios are found between the masses in the two columns.

Table 2 Ratios Of The Quark Masses

	Reported Masses			Reported Masses		Ratios	
	MeV/C^2			MeV/C^2		± 2/3 / ±1/3	
± 2/3 Quarks	Low	High	± 1/3 Quarks	Low	High	Low	High
Top	169,100	172,700	Bottom	4,100	4,400	41.243	39.250
Charm	1,150	1,350	Strange	80	130	14.375	10.385
Up	1.5	4	Down	4	8	0.375	0.500

Looking at how the masses of the corresponding members of the two columns diverge obviously there needs to be additions mechanisms to track the masses of the upper members of the two series. New conceptual ideas are needed to explain both for the physical mechanisms and the mathematical models of these diverging masses.

Briefly reviewing the contributions to the masses of the leptons by their angular equations shows that angular contributions alone probably do not bridge this widening mass ratio gap. This is even considering, as is done shortly, that there are probably two angular mass equations to be applied to model the quark masses. Some conceptual challenges are still wide open here.

Finally although measurement unit conversions do not affect the ratios shown, as was found with the leptons these masses need to be put in terms of the elementary or basic unit of kilograms. As is found in Chapters 3.4-3.6 Analyses of Measurement Systems I – III the kilogram can directly be related to absolute physics measurement unit systems. Whereas the mass units of MeV/c^2 are completely worthless for this work because of the involvement of the c^2 which only contains two of the four necessary unit basis to create an absolute physics measurement system.

The fact that Table 2 even contains the word "ratio" also can lead the investigatory efforts required here off into bad territory. A strong reminder is needed that the objective of the work to be done here is to explain the quark masses, NOT their mass ratios. Each column of quarks contains three particles and three masses and three numerical values. If the false objective of simply modeling the mass ratios of the

first members to the second members and the mass ratios of the second members to the third members is set, then nothing will be accomplished except many years of wasted time, intellectual effort, and money. Explaining two mass ratios in each column, if that is even possible, simply throws away one of the valuable three pieces of information available. Again reviewing the mass density equations for the leptons shows the uselessness and ultimate impossibility of attempting to explain the mass ratios of the members of a particle series, without first modeling their individual masses.

This distinction between modeling several quantities and modeling the ratios between several quantities should be abundantly obvious anyhow. These are clearly two different conceptual operations with two different objectives. Further there is absolutely no guarantee that the model of several ratios can ever lead backwards to a model of the individual quantities from which the ratios came. Further these general statements not only apply to the physical sciences, they apply even more so in those realms than they would in other endeavors such as the social science realms.

4 Ideas On The Angular Features For Mass Equations For The Quarks

The angular features of the mass density equations for the leptons, Report 1.1, and those for the descriptive equations for the (ML)(L/T) of the photons, Report 1.2, should be reviewed for features which might also apply to the mass density equations for the quarks. These pervious energy waveforms, particles, of course only had one angular equation or description. The following general features were found for their angular mathematical-geometric descriptions.

1 These angular equations $D_L(\theta)$ had an Outer or exterior Angular Spatial Functional appearance A_{osfL} for the leptons and A_{osfP} for the photons. These two had the identical generic appearance or form A_{osf}. This function was based on the Chebyshev $T^{\dagger}$orthogonal polynomials.
2 The angular equation $D_L(\theta)$ had an Inner or implicit angular functional appearance $A_{iL}(t_\theta)$ and $A_{iP}(t_\theta)$ as the argument of the Outer Spatial Function. These were again identical in generic appearance or form $A_i(t_\theta)$ of the angular implicit variable t_θ. Although these angular inner or implicit functions had identical generic functional forms, within them the use of the ultimate implicit variables t_θ, their arguments, were distinct. This distinction between the two species was critically important and became the subject of much discussion.
3 There was an initial angular condition $I(\theta)$ which lead to a premultiplying factor C_θ. This initial condition was $I(\theta) = \cos(\theta)$.

The outside or primary spatial function within the angular equation $D(\theta)$ of both the leptons and photons had the form:

$$A_{osf} = T_n^{\dagger}(\sin[\pi/2\ A_i(t_\theta)]) \tag{35}$$

The inner or implicit angular function $A_i(t_\theta)$ for both species had the same generic or meta-form;

$$A_i(t_\theta) = [1 - f^2(t_\theta)]^{1/2} \tag{36}$$

Specifically for the leptons this inner function was,

$$A_{iL}(t_\theta) = T_n^{\dagger}[1 - \sin^2(n^{-1}t_\theta)]^{1/2} = T_n^{\dagger}(\cos[n^{-1}t_\theta]) \tag{37}$$

or equally

$$A_{iL}(t_\theta) = T_n^{\dagger}[1 - \cos^2(n^{-1}t_\theta)]^{1/2} = T_n^{\dagger}(\sin[n^{-1}t_\theta]) \tag{38}$$

Giving the curious appearance of

$$A_{osf} = T_n^{\dagger}(\sin[\pi/2\ T_n^{\dagger}(\sin[n^{-1}t_\theta])]) \quad (39)$$

The importance of this expression is that it had the same trigonometric appearance as was found for their electrical vector descriptions of;

$$\mathbf{R}(t) = a\ T_n^{\dagger}(\cos[F(t_1)])\ \mathbf{i} + a\ T_n^{\dagger}(\sin[F(t_1)])\ \mathbf{j} + bG(t_2)\ \mathbf{k}$$

Where $G(t_2) = F(t_1) = T_n^{\dagger}(\sin[n^{-1}t_\theta])$ or $T_n^{\dagger}(\cos[n^{-1}t_\theta])$

Where the **i** and **j** vectors described the inherent 2-dimensional energetic form of the particle and the **k** vector described its motion into the third dimension. A close linkage was found between the geometric appearances of the electrical charge descriptions and the angular mass density descriptions for the leptons. Note, in reality this vector curve for the charge correlation describes a continuous vector curve in 3 spatial dimensions, not a 2D figure at all.

At the initiation of the investigative research of the mass of the quarks there was expected to be a similar angular mass density linkage. If the same pattern or trend of the leptons held for the quarks, then the initial guess for the angular mass density or charge vectors might have been

$$\begin{aligned} R(t) = +\ r_1\ \{&+ \cos(F(t_1))\cos(G(t_2))\ \mathbf{i} \\ &+ \sin(F(t_1)\cos(G(t_2))\ \mathbf{j} \\ &+ \sin(G(t_2))\ \mathbf{k}\ \} \\ &+ r_2\ H(t_3)\ \mathbf{l} \end{aligned} \quad (40)$$

for a moving 3 dimensional analogue. This would have been expected to ultimately resulted in this same trig(trig) appearance for the two 3-dimensional angular expressions of,

$$X = R \cos(\text{angle1}) \cos(\text{angle2}) \quad (41)$$
$$Y = R \sin(\text{angle1}) \cos(\text{angle2}) \quad (42)$$
$$Z = R \sin(\text{angle2}) \quad (43)$$

where again these definitions are based upon an expansion coordinate system for naming angles.

Obviously as with the leptons $G(t_2)$ must necessarily equal $F(t_1)$ to produce a spherical shell or energy form for the structure of the particle. $H(t_3)$ would then describes this 3-dimensional form's flight path thru the fourth spatial dimension. It was hoped that thru the analyses proposed $H(t_3)$ would also be found to equal $F(t_1)$.

Further a reminder is needed of the distinction between the mathematical descriptions for the charge and for the masses of the leptons. The charge of the leptons related to a true 3 dimensional vector curve, but the the masses were related to a 2 dimensional radial-planer feature which moved into the 3rd spatial dimension with time. Or the masses were "pseudo" 3 dimensional.

4.1 Oops, What Was Actually Found For the Geometric Structure Describing the Charge Of The Quarks

These last several 3 dimensional preliminary ideas just suggested for the angular nature of the quarks need to be laid aside. What was found in the report on the charge of the quarks, these starting forms (40) thru (43) are not valid. Instead what was found for the charge of the quarks was that it correlated with a

true 4 dimensional figure living and moving in 4 spatial dimensions. This was found to be a vector curve which was composed of two linked circles.

In the original setup to produce fixed curvatures k_1, k_2, k_3, for the quarks the space curves were required to be as in Equations (44) and (45), as follow.

$$\gamma(s) = (r_1 \cos(as); r_1 \sin(as); r_2 \cos(bs); r_2 \sin(bs)) \quad (44)$$

$$\gamma(t) = (r_1 \cos(At); r_1 \sin(At); r_2 \cos(Bt); r_2 \sin(Bt)) \quad (45)$$

Where s was the parameter curve length.

What was found for the model correlating the charge of the quarks there was several features, 2 radii, 2 frequencies f or cycle lengths λ and an angle α between the two curves or circles having r_1 and r_2.

This new information from the charge formulation of the quarks gives serious pause for any ideas concerning mass equations for the quarks which base off extending the 2 dimensional lepton ideas into a third spatial dimension. This is for both for any angular expressions and even as well for any radial expressions. Instead of a 3D like mathematical geometric structure modeling the masses of the quarks, there may be just 2 linked planar structures residing in 4 spatial dimensions.

4.2 Angular Features Of Equations For A Second Or Spherical Angle (If There Is One)

A few conjectures can be made about the second angle which will appear for a 3-dimensional mass body for the quarks can be proposed. That is, if indeed they have 3D mass bodies which is now doubtful. These proposals-speculations are left here and not deleted because what will be found for the actual nature of the angular mass expressions of the quarks remains to be seen.

As seen in Report 2.1, Section 6.3, Table 7 the Legendre P_n polynomials typically used with 3-dimensional quantum mechanics are found technically to be the Jacobi $P_n[0,0,\cos(\theta_2)]$ polynomials. Their ODE description is of a Jacobi $P_n(a,b,x)$, a=b=0, and the first term of their differential equation formulations is $(1-x^2)d^2F/dx^2 - 1x\ dF/dx$.

Assuming that there are multiple or higher energy shells for the upper members of the quark series as there was for the upper members of the lepton series, then this second angular appearance can probably be described as is done for the higher hydrogenic electron shells. That is, the derivatives of the $P_n(\theta_2)$ polynomials are used and are multiplied by $(1-x^2)^{\text{derivative order / 2}}$ to force them to comply with the defining differential equations for the original functions and to simultaneously still maintain their orthogonality. In other words the definition of the weight factor for the original Legendre polynomials, numerically 1, was redefined to this expression containing the variable x for the Legendre derivatives.

In terms of the second angular mass density equations the appearance of $P_n^{\dagger}$ might have been be found. This is instead of the appearance of $T_n^{\dagger}$ proposed for the first angular mass density equations just above. This second angular appearance might be found to still have the form of an inner circular trigonometric embedded with another outer circular trigonometric function or

$$A_{2\text{-osf}} = P_n^{\dagger}(\sin[\pi/2\ P_n^{\dagger}(\sin[n^{-1}t_{\theta 2}])]) \quad (46)$$

Finally since the quarks were initally conceived here as 3-dimensional "bodies" which traverse thru the fourth dimension, or now may be true 4 dimensional bodies, the use of a generalizable coordinate system is advised. That is to say the second angle of discussion should be stated in terms of an expansion or ascension angle, not as a typical dead end declination coordinate as has been taught in schools and as was used by the now obsolete sailing ships of old.

This extendable concept of expansion coordinates in discussed in Appendix 3 and only a summary is given here.

Beginning at the beginning, for two dimensions the first and only angle of discussion is referenced to the first axis of discussion, the X axis. This angle is erected away from this axis or equally away from the polar line for polar coordinates.

For three dimensions the definition of the first angle of discussion, typically called θ, continues on unchanged. But for some illogical reason known only to sailors of old the second angle of discussion, typically called φ, is referenced to or dropped down (declined) from the third coordinate axis introduced into a discussion, the Z axis. The second axis of discussion, the Y axis, gets left out as a reference. This inclusion or use of the Z axis as a reference caps off and terminates the discussion. What is to be done next?

The possibility of the appearance of a form traversing in 4 spatial dimensions causes obvious problems for the use of a declination coordinate for the second angle of discussion. How are the coordinates to be set up and angles to be defined when the number of dimensions, d = 4, 5, 6, ...? Is the second axis of discussion, the Y axis, always to be left out as a reference for the d-1 angles? Is the next-to-last axis of discussion always to be left out as a reference? As the number of dimensions grows the illogic started by the use of a declination angle grows.

A far better system is that the last axis to be introduced into a discussion, the d^{th} axis, is the one which gets left out as a reference for the d-1 angles. This pattern allows more dimensions to be added later without destroying the naming systems and definitions for the already pre-existing angles. The naming system is left open ended and the discussion never capped off.

5 The Embedding Or Layering Of Time

In the report Time & Space, Appendix2, the concept is presented that time is not only an internal or implicit variable, but that multiple dimensions of time are embedded within one another. That is to say multiple dimensions of time should be represented as dimensions within dimensions within dimensions, and so on. This is very different from the typical human concepts of spatial dimensions as being external to one another. That is to say multiple dimensions of space are represented as dimensions outside of dimensions outside of dimensions, and so on.

For the leptons three temporal variables were used. An unsubscripted t was found in the vector description which lead to their charge. This use of time modeled the flight path of the basic 2-dimensional structure on its excursion thru 3-dimensional space. There were two subscripted variables of time t_r and t_θ which referred to the inherent 2-dimensional structure of the energy form or mass pattern of the leptons. For the leptons the issue or problem of multiple embedding of time did not arise. The unsubscripted t referring to the particle's motion thru space could be considered as also representing the outer most layer of time or the usual consensus concept of external time.

What was found in the Photon report is that the distance functions within the expansive radial functions, $R_e(t_r)$ of both the leptons and the photons could be conceived as operating on an original, hidden, or precursor function. It was this original or effectively doubly embedded function of time which ultimately lead to the leptons having mass and the photons having none. To keep the presentations of the vast bodies of new material in both the lepton and photon reports from becoming any further overwhelming this concept or viewpoint of the variable t_r as being doubly embedded was purposely not included. Additionally from a strictly mathematical view, who is to say where one function of an ultimate variable leaves off and the next function encompassing an inner one as an argument begins.

Returning to the quarks, these wave form or energy-mass patterns were initially conceived as having inherently 3-dimensional spatial structures. If this still holds or if the mass patterns of the quarks are truly 4 dimensional in space, then there is the possibility that any implicit temporal variables within

mathematical-geometric descriptions or equations for their masses may need to be triply embedded or layered. While ultimately mathematically such fine distinctions in concepts may not affect the numerical values generated during trial and error searches, such concepts may be critical in helping set up the correct mathematical forms for computer programs to evaluate.

5.1 Mathematical And Engineering Repercussions Of 3-Dimensional Bodies In Layered Time

Finally there is a warning that the potential triple embedding of time may add a new and surprising twist to the common thinking of almost all engineering and science. Commonly engineering and science stop their endeavors oriented towards atomic and chemical energies and those towards the energies described by movements of gross macro bodies at the second derivatives of the starting mathematical-geometric descriptions of the systems. The third derivatives of such expressions are basically not even considered as relevant.

If the mass density patterns of the quarks are in fact shown to be 3-dimensional forms moving thru the fourth dimension and if the concept of temporal dimensions being internally layered phenomena is valid, then new mathematical foci and tools may be required. For example, in Section 3.1 Equations (18), (22), and (28) several starting mathematical forms were carried to their third derivative. Such third derivatives could be necessary to correctly model the color forces. This is a very real possibility as is discusses in the report concerning the charge of the quarks, Section 5.2.

As discussed in Section 3.1, typically second derivatives result in two terms which are related to the human concepts of potential and kinetic energies. Third derivatives tend to offer more mathematical terms and choices as to what could be called energies or some other new concept. For examples;

The starting form $G(r_2) = [R(t)]^2$ (46)
results in $d^2G(r_2)/dr_2^2 = 2\{R(t)\ x\ d^2R(t)/dt^2 + [d^1R(t)/dt^1]^2\}$ (47)
and $d^3G(r_2)/dr_2^3 = 2\{R(t)\ x\ d^3R(t)/dt^3 + 3d^1R(t)/dt^1\ x\ d^2R(t)/dt^2\}$ (48)

Whereas the starting form $H(r_3) = [R(t)]^3$ (49)
results in $d^2H(r_3)/dr_3^2 = 3\{R(t)^2\ x\ d^2R(t)/dt^2 + 2R(t)[d^1R(t)/dt^1]^2\}$ (50)
and $d^3H(r_3)/dr_3^3 = 3\{R(t)^2\ x\ d^3R(t)/dt^3 + 6R(t)\ x\ d^1R(t)/dt^1\ x\ d^2R(t)/dt^2 + 2[d^1R(t)/dt^1]^3\}$ (51)

The starting form $R_2(t) = e^{(-at^2)}$ (52)
results in $d^2R_2(t)/dt^2 = e^{(-at^2)}\{-2a^1t^0 + 4a^2t^2\}$ (53)
and $d^3R_2(t)/dt^3 = e^{(-at^2)}\{+12a^2t^1 - 8a^3t^3\}$ (54)

Whereas the starting form $R_3(t) = e^{(-at^3)}$ (55)
results in $d^2R_3(t)/dt^2 = e^{(-at^3)}\{-6a^1t^1 + 9a^2t^4\}$ (56)
and $d^3R_3(t)/dt^3 = e^{(-at^3)}\{-6a^2t^0 + 54a^3t^3 - 27a^4t^6\}$ (57)

These mathematical forms are also listed in much more detail in Section 3.1 above Appendix 6
What is seen here is that the third derivatives of "2nd order" mathematical expressions tend to be uniformly limited to two terms. Whereas if the starting forms are "3rd order" then the third derivatives take on an "extra" term. Assuming that such a "3rd order" form is the correct model of some system, then these extra mathematical terms should take on some physical significance or relevance.

6 Warnings – Surprises

All of the discussions and analyses in this report so far have involved an overriding assumption. This is that the mathematics for the leptons and photons have in fact set a pattern for the particle waveforms of the other columns of the Periodic Table of the Elements of Physics, PTEP. Although such an assumption is reasonable, there is no assurance that the quarks agree with such a human imposition upon them. Historically humans have shown themselves to be very good, even excellent, at making up stories and narratives, projecting them upon the external world, and then seeing and believing their own projections. As already seen here, there is a significant chance that the mathematical-geometric structures for the masses of the quarks are totally different from what has been discussed so far in this report.

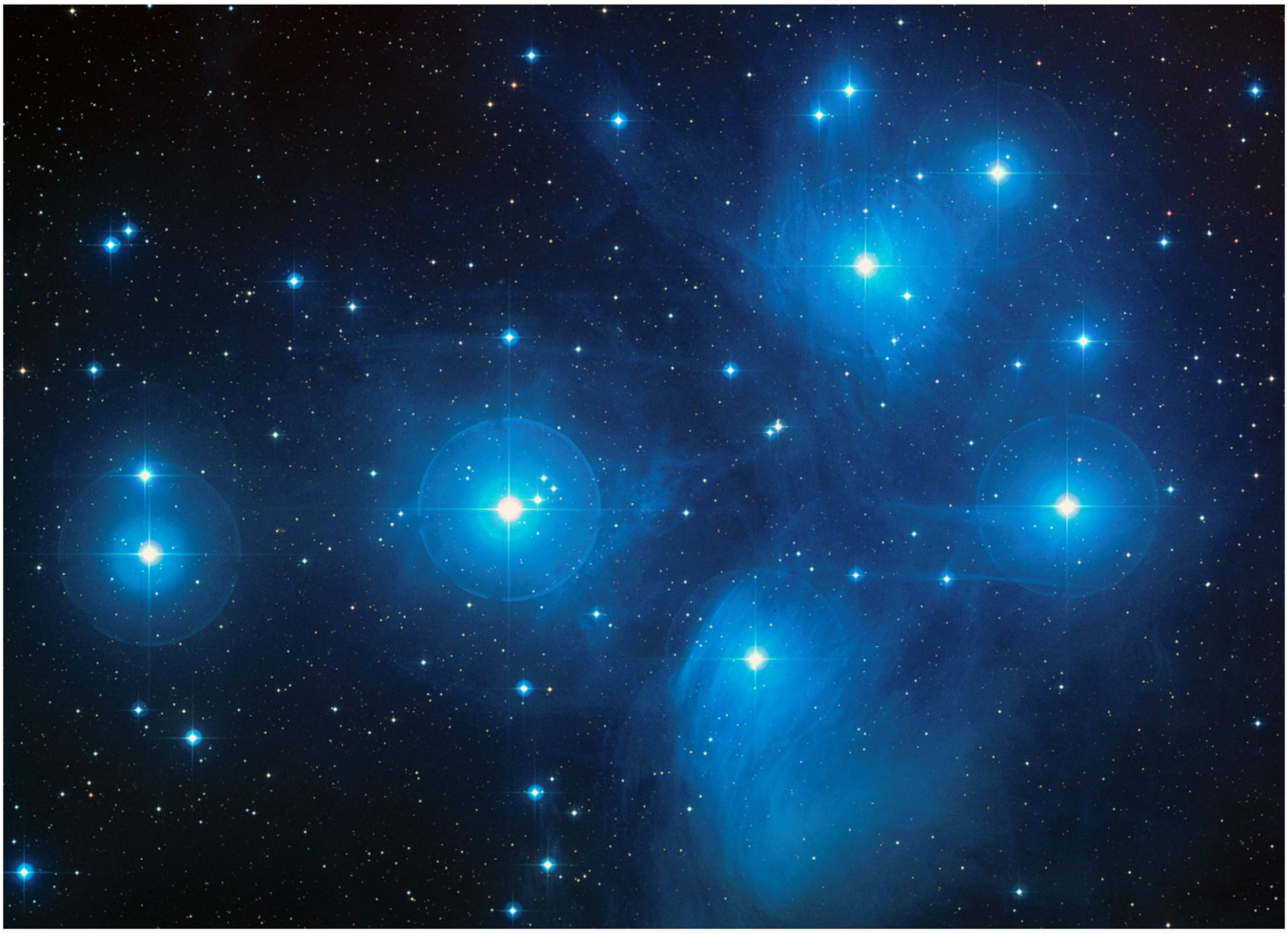
Here now with the findings concerning the charge of the quarks, a person needs to question not only the validity of Equations (40) thru (43) as starting forms for their masses, but also the entire concept of attempting to describe the mass or anything else of the quarks as spherical or 3 dimensional moving into the 4th dimension. That is, the concept of the masses of the quarks as being "pseudo" 4 dimensional might and probably should be tossed out. Looking at the masses of the quarks as relating this time to 2 radial-planar features somehow linked and living in the 4th dimension would be the better starting concept. That is both for their radial and angular mass features.

There are several or even many other possibilities of the masses of the quarks as being or relating to various true 4 dimensional structures. As just one example, the masses of the quarks could be modeled by intrinsically 3-dimensional waveforms, but instead of traversing thru 4-dimensional space, they could be the skins or surfaces that close or cover the interiors of true 4-dimensional structures which live in 4 spatial dimensions.

Trial and error attempts to match to the mass curves for the two columns of quarks hopefully will indicate what new mathematical approach should be tried. The efforts to find mathematical descriptions for masses of the quarks will be very much like those initial efforts to find the equations describing the leptons, truly brute force trial and error.

A lessor but equally obvious warning is also in order. A researcher looking for mathematical-geometric descriptions of the masses of the quarks, for either or both columns in the PTEP, should avoid the trap of thinking that just reproducing the mathematics and/or geometry for the leptons in a 3 or 4 dimensional version will produce the desired results. The warning is that new creativity will be required and that unexpected surprises are almost guaranteed. As an example of a new and different possible mathematical feature the quark masses might require, triply embedding or layering of the ultimate implicit temporal variables may be necessary for the model to correctly reflect the physical reality of the quarks.

Finally as was already pointed out in Section 3.2 is the fact that the quarks have two columns of members and that the diverging masses between these two series will probably not be explainable by geometry alone. Researchers attempting to explain the quark masses should expect to and be prepared to have much creative fun.



CHAPTER 2.4 FUTURE WORK

1 Introduction

This report lists many of the possible research or calculational efforts which have been promulgated by the core research of this body of work. The correlative trial and error mathematical physics research of this overall body of work has set a basis for many areas of future endeavors. These include other calculational efforts, possible future physical research experimentation, pure mathematical studies, and many more such endeavors in diverse mathematical-scientific arenas. These possible future efforts are listed in a short catalogue like form and are not listed in any particular order of importance. There may be many items which have not yet been thought about, but which persons with other academic backgrounds might find interesting or exciting.

2 Calculational Research – Prediction Of Properties

1While this work has offered a solid mathematical description or explanation for most of the physical properties of the leptons and photons, it is not yet totally comprehensive. The following need to be or possibly can be calculated;

1.1 Magnetic moments

1.2 Decay modes, products, & energies for muon & tau

1.3 Half lives for muon & tau

1.4 Could a muon or tau missing one of their upper energy shells be found?

1.5 Mixing angles resulting from lepton collision reactions

1.6 The qualitative spin angular momentum correlations already found need to be made into actual equations

Of course for the first three of these items any calculated values need to be squared with known experimental data.

2 While this work has shown clear mathematical patterns as to how the lepton series arises, these patterns need to be extended or used as trail heads to investigate how the quarks and their two subclasses arise mathematically. For such investigative work probably only correlations of the masses can be developed. Quantification of the values of the three color forces; blue, green, and red, would probably be needed to produce the scaling factors necessary to make actual equations.

3 Conceptual - Organizational

1 Once a sense of understanding has been brought to the masses of quarks and added to that of the leptons, then maybe a Periodic Table of the Elements of Physics (PTEP) can be developed. This is discussed in detail in Towards a Periodic Table of the Elements of Physics.

2 Likewise the open ended or "moving" energy waveforms, the Bosons, need their own Periodic Table.

3 There needs clear mathematical-geometric based definitions developed for the words and scientific concepts of mass, charge, and color.

4 Conceptual – Calculational & Speculative

1 This work has found that both the leptons and photons have definitive structural appearances. Other areas of investigation might include the many calculational implications of this, such as:

1.1What is the effective radius of the radial energy patterns found for both the leptons and photons? What is the effect of this fixed radial diameter for other broader physics models?

1.2 What is the diameter of the circular donut shape found for the resting state electron? Does this and how would it vary, expand, or shrink upon ingestion of energy by the electron as it might go to an

excited or activated state? The higher energy photons are known to have shorter cycle lengths than the lower energy ones. What is the correspondence for the high energy electrons in their circular loops?

1.3 Since the leptons appear to fall into a well understood mathematical orthogonal polynomial series pattern, can there be correspondingly higher order photons?

1.4 The mathematical-geometric equations for the leptons, specifically the electron, have shown then to be or to follow donut like toroidal coil patterns. A question can be asked, if a coil like pattern is wound around a vacuum core and itself has no material substance, then why would it not set up an infinitely self sustaining electromagnetic phenomenon? Would there necessarily have to be some maximum or minimum size for this to occur, as least from a mathematical calculational view?

1.5 Does and how would gross spatial velocity of moving leptons interact with their mathematical structures? Is there an exact way to describe how relativity interacts with the leptons' structures?

Thoughts on these first three items are discussed in Implications & Consequences.

2 Investigate other such more speculative implications of the framework for the leptons and photons, for the particles themselves, such as:

2.1 Can the donut shape of the leptons be used to help explain anomalies or "violations" found in the results of various collider experiments? For example if all the electrons, or the muons or the taus, line up "chocolate side" facing forwards as they fly down collider tubes, would they ever smash into their anti-particle partners coming at them in a side-to-side manner? Could these rare events be what humans are calling violations?

2.2 Do the electrons actually have an infinite life, or do all the lepton energy wave patterns terminate and reform at rates so fast that humans have never even been suspicious that the particles might be coming and going at infinitesimally short rates of existence and dissolution (the blinking effect)?

3 Investigate other such more speculative implications of the framework for the leptons and photons, for other particles and cosmology, such as:

3.1 How do leptons and photons with definitive radial structures fit into the concept of a mathematical point source "Big Bang"? Can they even have mathematically existed in the "pre-bang" soup?

3.2 This work may give clues as to how to answer even more vague and speculative physics questions, such as: The unary force gravity, the binary force set or couple electromagnetism, and the ternary force set blue, green, and red are known to exist. Can a quaternary force set mathematically be shown not to exist or why it has not yet been found? This work involving the ternary force interaction constant showed that neither the forces nor the particles exist in isolation by themselves, but that both are totally interdependent upon the existence of the other. Can this knowledge and the demonstrated concept of definitive energy density structures for the particles be used to show why the Periodic Table of the Elementary Particles terminates after only a mere 4 columns? Would a mathematically-geometrically prohibited appearance of either the particles or of the forces exclude the both from coming into existence for a quaternary force set?

5 Older Data Mining & Physical Experimentation

1 Perhaps the most definitive and provocative question as a result of this work is; Were the detectors on the older low energy colliders capable of making a fine enough scattering grid to indicate that some of the collision products went thru a low energy intermediate, the calculated 4th member particle? Particularly if that particle has a half life 1-2 or even 10-20 orders of magnitude shorter than that of the tau?

1.1 If the answer to 1 is Yes, then was data actually collected in the energy range found for the 4th member particle? Is this data still available?

1.2 If the answer to 1.1 is Yes, then what would be the cost to obtain the rights to this data, and then to review and analyze it for evidence of the 4th member of the lepton series?

1.3 Can this work be used to predict a completely new property or other such feature to be discovered as proof of equations?

1.4 Actually experimentally prove the existence or find the 4th member or elsewise prove its non-existence.

2 Can experiments in astrophysics be conceived and constructed to search for the potential second member of the photon series should it exist. This open ended moving wave form or boson would be a low energy "dark matter" version of the photons, an analogous counterpart to the muon of the lepton series.

3 Design, setup an experiment to examine spin/rotate vs oscillation/alternate issue.

4 At the gross physical scale of humans and their machines, is it possible to design an experiment to examine "blinking" effect?

6 Mathematical Investigations, Derivations & Proofs

1 Investigate the origin of the Fraunhofer Diffraction Function as the initial conditions for both the lepton and photon waveforms.

2 Derive the original differential equations (2nd order) for both the radial and angular solutions already found.

3 Study dynamics of radial wave, 1st and 2nd derivatives, and required initial or boundary conditions.

4 Proof of uniqueness of both lepton and photon equations, as solutions to differential equations.

5 Study of convergence of various mathematical forms found in the equations.

6 Investigate further matters of parity and hand based on the equations found.

7 Calculate the average charge of photon for 1/2 cycle.

8 Investigate origin, meaning, and implications of the individual particle scaling factors, both mathematically and as real phenomena.

8.1 Series member factor

8.2 Shielding factor

8.3 Shell factors

7 Mathematical Investigations, Free Standing But Arising Due To Project

1 In depth study of Fraunhofer diffraction functions.

2 Determine formulas which give exact, many decimal, values for the Bessel functions at high and very high values of the argument.

3 Integral tables of transcendental functions (exp, sin, cos, …) of variables in the second power, multiple and mixed integrals.

If a system of absolute physics scales is created using the four measured quantities G, ε_o, μ_o, and e which are combined so as to produce the four practical measurement units for L distance-length, T duration-time , M mass, Q charge, then develop proofs that:

4 The use of any combination of 3 of these 4 bases is a necessary and sufficient requirement so that any parameter combination of L, T, M, and Q using such bases and which refers to absolute physics scale sizes, durations, "objects", and events, then this parameter set is numerically measurement system independent. That is regardless of the relative measurement system underlying the measurement of the 4 bases, provided that the relative scales are SI analogous.

5 The use of any combination of 3 of these 4 bases is necessary and sufficient to properly constrain an absolute physics size structure, event, or system under investigation, and does not over constrain nor under constrain the system under discussion.

6 Arisal of Measurement Units? The questions need to be asked, how does a technical person know that the mathematical-geometric quantities found in these reports have the units as ascribed to them? Details need to be presented which make specific the concept of how units, (relative, absolute, universal, etc) arise, can apply or come along with equations, particularly those equations describing initial and boundary conditions.

8 Conceptual Investigations Related To Time

1 As implicit driver of both radial and angular forms.
2 Multiple dimensionality or t_1, t_2, t_3, …, implicit within one another.
3 Possible varying speeds of time.
4 Possible varying levels, layers, or dimensions of time.
5 Directions of time in both radial and angular equations.
6 Could the implicit temporal parameters underlying the spatial equations for the lepton masses and the photon (ML)(L/T) represent the invisible, rolled up dimensions of membrane hypotheses?

9 Implications Of The Mathematics Correlating The Charge Of The Quarks

In the quark report the charge of the quarks was definitively shown to correspond to the curvature of certain vector curves in 4 spatial dimensions. In Section 5 of this report much ovbious speculation arising from this discovers was listed / discussed.
1 Can any of these items be verified experimentally, mathematically, of in any other way.