

**L. Stephen Young**

**G-DIMENSIONAL THEORY  
&  
THE SMARANDACHE QUANTUM PARADOXES:  
*Comparative Logic and Modern Quantum Theory***

<b>Table 1A. Elliptic Parameters of <math>S'</math>. <math>\{\theta = \arcsin(v)\}</math></b>						
$S'$	$a$	$b$	$f_1$	$v$	$a/b$	$\sigma_e$
$a_1$	$\cos(\theta)$ (4)	$\cos^2(\theta)$ (4)	$\sin(\theta)\cos(\theta)$ (5.1)	$\sin(\theta)$ (2)	$\sec(\theta)$ (3.1)	$\sec(\theta) [1 - v \cos(\Phi)]$ (9.5)
$a_2$	$\sec(\theta)$ (4)	$1$ (4)	$\tan(\theta)$ (5.1)			

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**Abstract**

The *Smarandache Quantum Paradoxes* ["Nature", Vol. 413, No. 6854] and *Smarandache Hypothesis (FTL)* are defined as a formal set of (anti-logic) statements inclusive in modern quantum theory. To determine whether they constitute theoretical artifacts or can be considered true physical paradoxes, *G Dimensional Theory*, a unique, logical and physically congruent system of physics, at significant variance with modern and classical theory, is presented in Sections 3-4. A comparative analysis of the Smarandache quantum paradoxes within context of the two theories follows in Section 5.

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**Keywords:** G-dimensional theory, mathematical physics, relativity, Smarandache hypothesis, gravity, quantum theory, Smarandache quantum paradoxes, physical chemistry, particle-fields.

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**1. Introduction**

The author's motivating interest the past few years has been the development and dissemination of G-dimensional theory (GDT). K. Toshihara, from Japan, proposed the concept of a paper defining G-Dimensional theory in relation to the Smarandache quantum paradoxes. After reviewing a draft, Dr. M. L. Perez, Editor of the SNJ, suggested the inclusion of the *Smarandache (FTL) Hypothesis* as well. So it is hoped that a determination of parametric relationships between the quantum paradoxes and GDT proves helpful in advancing interest and research in both areas.

It became apparent from preliminary research that, although described in several forums and papers, e.g., [29] [32] the Smarandache quantum paradoxes have not been analyzed in depth or in terms of their relevance to modern science theory; so that, for example, "ask the expert" type online forums offer little in the way of explanatory relevance of these paradoxes. [7] [20]

Undoubtedly, at least part of the reason for this is that they are multi-disciplinary, having both physical and logical components. To consider these paradoxes, one needs be as much logician as physicist.

The *American Heritage Dictionary* defines the paradox as: "1. A seemingly contradictory statement that may nonetheless be true, 2. A statement exhibiting inexplicable or contradictory aspects. 3. An assertion that is self-contradictory though based on a valid deduction from acceptable premises. 4. A statement contrary to received opinion." [1]

We see that none of these definitions indicate that labeling a statement as paradoxical, or containing a paradox, specifically defines the statement as being false. Nevertheless it is common practice in both scientific and pure logic systems to measure the comparative validity of conflicting statements in terms of their paradoxical elements. In fact, given the above broad definitions, it appears the scientific method has comparative resolution of paradoxes as the only available recourse in determining the relative value of competing theoretical systems. Thus, the scientific paradox is a valuable source of information in comparing physical theories or in demonstrating the need for revising or refining a given theory.

The scientific method works because recurring patterns are found everywhere in the natural world—thus enabling the successful prediction of events in physical systems. The recurring patterns indicate *logical causality*, i.e.: it is assumed there is a rational, causal, explanation for any given event, and *aesthetics*, i.e.: the simpler, less energetic, more elegant, explanation tends to be the correct one, (all other factors being equal).

Comparative resolution in scientific logic systems is based on the assumption that the above traits are characteristic in physical systems. The subjective traits of aesthetics are important but are nonetheless secondary considerations in a scientific value system—the primary consideration being logical causality in predictive outcome of behavioral phenomena. Yet, regardless of criteria, the comparative decision is based on a subjective value system, so that comparative methodology has inherent elements of uncertainty, i.e. characteristics of *neutrosophy*. [31] [36] Objectivity is then the often-difficult goal in effective systems comparison. For this discussion we propose the following classification of paradoxes in physical systems and physical theory. These can then be considered a decision tree, providing at least one applicable category for any given scientific paradox.

- a.) unresolved paradox: further classification not yet determined.
- b.) resolved paradox: seemingly paradoxical behavior in physical systems which is resolved in a fuller understanding of the process or process theory.
- c.) axiomatic paradox: contradictory, illogical or non-causal behavior is predicted or inferred from axiom-determined conditions in the physical model.
- d.) predictive paradox: theory-based behavioral expectations in a physical system are contradicted by well-defined physical evidence.
- e.) comparative paradox: a paradoxical component in a theoretical model is noted in comparison with a second, less-paradoxical, model.
- f.) physical paradox: seemingly contradictory, illogical or non-causal behavior is assumed to accurately define a physical system.

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## 2. *The Smarandache Quantum Paradoxes*

We consider the Smarandache Quantum Paradoxes, together with the Smarandache (FTL) Hypothesis, [38] as a physical logic test, the "SQP Set". The set members are restated here with the intention of enabling examination of specific paradoxical behaviors:

1. **Invisible Paradox (Sorites Paradox):** macroscopic visible particles are formed of invisible atomic and subatomic particles.
2. **Uncertainty Paradox:** macroscopic matter, which is under the 'determinist principle', is formed of subatomic particles, which are under Heisenberg's uncertainty principle.
3. **Stability Paradox:** Stable matter is formed of particles that are unstable in distinct form.
4. **Lifetime Paradox:** Long-lived matter particles are formed of short-lived elementary particles.
5. **FTL Hypothesis:** Quantum behavior implies instantaneous or faster-than-light connection between physically separate loci.

We see the SQP focus on ill-defined and paradoxical boundary conditions in the axioms of quantum mechanics and the standard particle model. The boundaries define behavioral limits between the visible, determinative, macroscopic, universe, and the invisible, quantum, indeterminate world of particle physics in *Modern Theory* (MT): defined generally, as inclusive of *general* and *special relativity*, *quantum theory*, *the standard model*, and any of the standard variations thereof.

SQP-1 has been denoted as the *Sorites Paradox*. [32] In general, *sorites* refers to a class of paradoxical arguments, which arise as a result of indeterminacy or *vagueness* concerning the predicates involved. *Sorites* is from the Greek word for "heap", referring to the original sorites puzzle, attributed to Eubulides of Miletus:

*If a single grain of wheat does not make a heap, and nor does two, or three grains of wheat . . . then if 9,999 grains of wheat do not make a heap, 10,000 grains of wheat do not make a heap.*

This type of chaining argument proceeds in the reverse direction as well:

*If 10,000 grains of wheat make a heap, then so do 9,999 grains ... as do 3 grains, as do 2 grains: so that one grain of wheat makes a heap.*

The paradox might seem due solely to semantic vagueness in defining the maximum or minimum number of wheat grains constituting a "heap", however, as noted in the Stanford Dictionary of Philosophy,

*"The (sorites) argument certainly seems to be valid, employing only modus ponens and cut (enabling the chaining together of each sub-argument which results from a single application of modus ponens). These rules of inference are endorsed by both Stoic logic and modern classical logic...[Yet,] we arrive at an apparently false conclusion." [40]*

We compare this with the explanatory definition of SQP-1:

Our visible world is composed of a totality of invisible particles.

- a) An invisible particle does not form a visible object, nor do two invisible particles, three invisible particles, etc. However, at some point, the collection of invisible particles becomes large enough to form a visible object, but there is apparently no definite point where this occurs.
- b) A similar paradox is developed in an opposite direction. It is always possible to remove an atom from an object in such a way that what is left is still a visible object. However, repeating

and repeating this process, at some point, the visible object is decomposed so that the left part becomes invisible, but there is no definite point where this occurs. [23]

The above definition is structured in the sorites form; i.e. it proceeds through additive or subtractive chaining arguments and leads to an apparently paradoxical conclusion. The contradiction arises in resolving visible objects composed of invisible parts, with syntactic *vagueness* arising in the definitions of 'visible' and 'invisible' We note however, that this is an apparent *physical* contradiction, as well as a logical one—a characteristic absent from the general sorites paradox form. Until this apparent physical paradox is resolved, (i.e., visible objects composed of invisible parts), the invisible paradox (SQP-1) *cannot* be reduced to an argument of syntactic vagueness or structural logic.

It is then seen that SQP-2 may also be structured in the sorites form; however, the boundary conditions in SQP-3 and SQP-4 are well defined in specific particle identities, so they are not in sorites form. A proposed general definition of SQP statements (1-4) is expressed as,

A given object  $\{S\}$ , having physical characteristics in set  $\{A\} \ni \{a_1, a_2, a_3, \dots, a_n\}$ , is composed of elements,  $\{S\} \ni \{s_1 + s_2 + s_3 + \dots + s_n\}$ , having physical characteristics in set  $\{B\} \ni \{b_1, b_2, b_3, \dots, b_n\}$ ; so that,

$$B \rightarrow S. \quad (1)$$

SQP (1-4) are considered formal statements of non-logical conditions in the physical world, as interpreted by modern theory. They indicate modern quantum theory lacks a component of logical causality: the absence of shared compositional traits: (invisibility, uncertainty, instability, half-life), in the physical projection of subatomic particles into macro-group systems. Complete absence of *structural projection* in a physical system is non-rational—like using stone blocks to construct a wooden pyramid.

Their antithesis would be, *a rational expectation of compositional projection in a physical system*. The problem then is to determine what constitutes a rational expectation of compositional or structural projection.

The computer is an example of quantum behavior in structural projection. Each bit in the computer's logic system has two possible quantum states (on/off); yet the computer as a whole has a near-infinite number of possible states. This then serves an example of apparent non-projection of quantum behavior of system subcomponents, similar to the premise in quantum theory that gives rise to the uncertainty paradox. However, in the computer analogy, non-projection of quantum behavior is ruled out when we consider the on/off switch. The computer's near-infinite number of states can be logically reduced to two states: on and off. thus indicated, then, is evidence of *structural projection* rather than its inverse.

We can infer from this example that while the many different states of the finely differentiated macro system can mask elemental behavior, there is nonetheless the potential for structural projection to manifest at any time. This calls to mind the expression, 'if something *can* happen, it *will*.' Thus the quantum paradoxes appear to be genuinely valid expressions of paradoxical behavior in physical systems, as interpreted by modern quantum theory.

Quantum theorists use statistical probability in the case for non-structural projection and would assume that the quantum paradoxes are true physical paradoxes. Resolution of the dilemma thus appears (fuzzy). [31] However, even without attempting a definitive answer, an alternative solution method is to use comparative paradox analysis, i.e.:

*Given two otherwise equivalent physical system theories, each describing an area of physical behavior where non-projection of structural traits is a limit to logical causality, the theory having the greater degree of structural projection is the more logical, hence preferred, physical system theory.*

Or, using terminology of identity (1):

*Given physical object S, the greater the similarity between set B and set A, the more logical is their relationship.*

We see then, (somewhat obviously), that these statements are congruent with our previous premise—that logical causality is a desired trait in a scientific value system, and that comparative analysis offers a possible solution to the Smarandache quantum paradoxes.

Florentin Smarandache proposed the *Smarandache Hypothesis* : *There is no speed barrier in the universe*, (1972), [38] in regards to the EPR-Bell (Einstein, Podolsky, Rosen, Bell) paradoxical condition of causality in entangled particles. [41] Leonardo F. D. da Motta in a recent paper, [33] proposes the Smarandache Hypothesis, supported by recent theoretical and experimental findings, as a general axiom or prediction of the faster-than-light, (FTL) connection, The FTL connection is, however, a violation of the second principle of relativity; and as modern theory is based on special and general relativity, (SRT/GRT), a paradoxical situation arises. Here we define the determination of causality in the FTL connection as resolution of its paradoxical components and thus justify grouping the Smarandache (FTL) Hypothesis with the Smarandache quantum paradoxes as the *Smarandache quantum paradox set*.

Assuming the SQP members are found to be valid, a next consideration is to determine if the physical component of each member is an artifact of modern theory, (axiomatic paradox) or an actual physical paradox. However, given only one system theory, it appears impossible to effectively distinguish between axiomatic and physical paradoxes. Hence, we again see the need for comparative physical models in generating data concerning the nature of scientific enigmas. Accordingly, a second system of physics, G-Dimensional Theory (GDT), becomes especially relevant to this analysis.

The physical models of GDT are shown to have significant variance with modern theory—particularly in regard to the SQP paradoxical elements. Thus, the Smarandache quantum paradox set should provides an effective comparison of these differing physical models. While parameters of GDT have previously appeared in a book, (1999) [46] and on the Internet, (2000), [47] [48] [49] and (2001), [50] this constitutes its first appearance in a peer-review journal.

The relativistic parameters (Section 3) and particle-fields model (Section 4) have been refined considerably since the earlier versions referenced above. In no small part is this due to the logical demands of confronting solutions for the quantum paradoxes. The result is a more incisive and formal expression of G-dimensional theory, which hopefully is also coherent and accessible. It is asked of the expert in a field, through which this pan-disciplinary theory may perhaps clumsily tread, inclined to dismiss or take difference, to nonetheless bear in mind that posterity is able to distinguish between the trivial and fatal objection.

---

### 3. GDT Relativity

#### 3.1 Elliptic and 4d Space

We begin the parametric definition of G-dimensional theory (GDT), by modeling space-time as a 2d surface with local angle of inclination in projective dimension ( $G$ ), as determined by kinetic vector  $v$ : ( $v \equiv v/c$ ) The matter-containing body is modeled as a closed circle in the non-vector 2d plane and so in non-vector 3d frame ( $k$ ), as closed sphere ( $S$ ).

The vector determinant projection of  $S$  in  $G$  is defined as a congruent right conic solid with conic axis perpendicular to the model  $k$  plane. [Fig. 1a.]

In kinetic reference frame  $k'$ , the translated parameters of the body,  $S'$ , are determined from the angle  $\theta$ , between the 2d  $k$  and  $k'$  planes, where  $\theta$  is determined from the scalar of  $v$  projected at right angle to  $k'$ . [Fig. 1c.] We see that  $S$  translates in  $k'$  as an ellipse of eccentricity  $e$ , (ellipsoid in 3d manifold), with the major axis congruent with  $v$  and identity,

$$v \equiv e \equiv \sin(\theta). \quad (2)$$

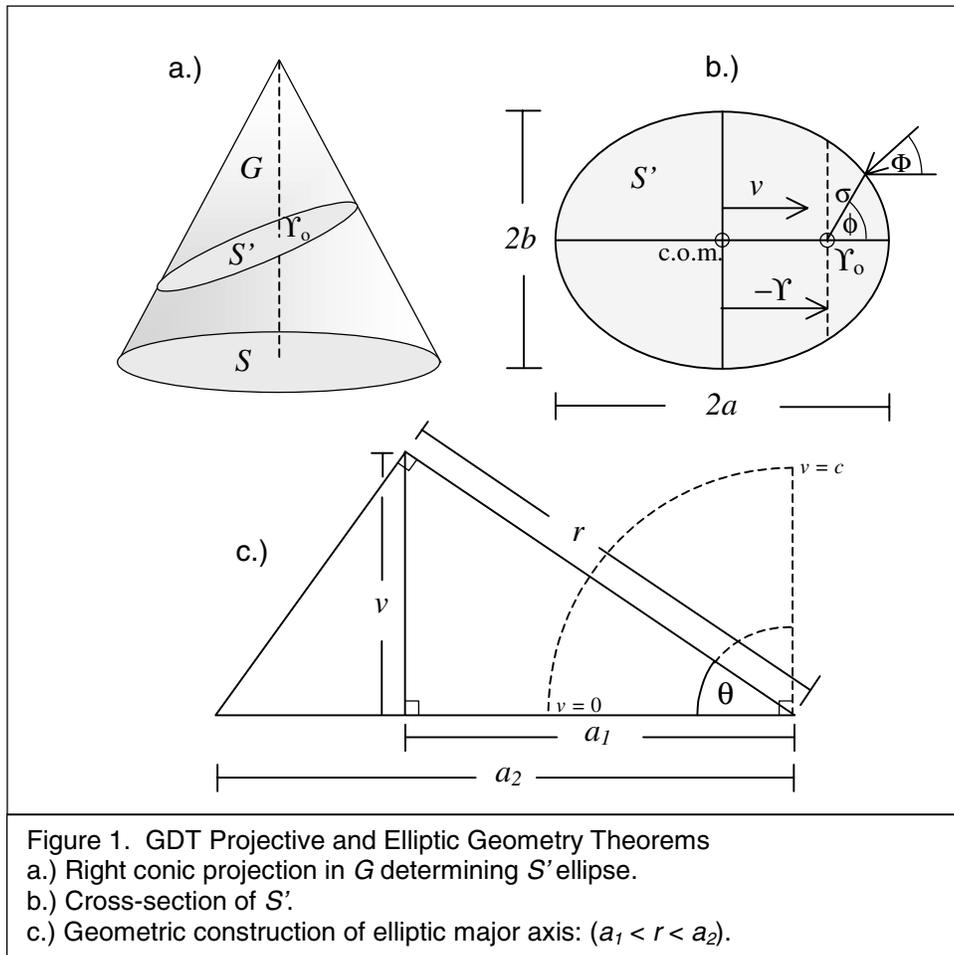
Range:  $[\theta: \{0, \pi/2\}], [v, e: \{0, 1\}]$ .

In terms of the general kinetic vector, the major and minor axial radial lengths have the defined ratio:

$$a/b = (1 - v^2)^{-1/2}, \quad (3)$$

$$a/b = \sec(\theta). \quad (3.1)$$

Where:  $a$  is the major axis radius;  $b$  the minor axis radius; and,  $\theta = \arcsin(v)$ . [Figure 1b.]



We see in equation (3) the scalar  $a/b$  is equivalent to the *gamma* ( $\gamma$ ), factor in SRT. [Originally denoted as *beta* ( $\beta$ ), by Einstein, i.e.,  $\beta = (1-(v/c)^2)^{-1/2}$ , [14]  $\gamma$  is now the common symbol for this factor.] With (3.1), we see that the secant of angle *theta* ( $\theta$ ), yields this factor as well, with its inverse as cosine of *theta*. In Fig.1c the length of the major axis radius,  $\{a_1, a_2\}$  of the vector equivalent elliptic bodies defined by  $v$  are determined from the Pythagorean theorem so that,

$$\begin{aligned} a_1 &= \cos(\theta) ; & b_1 &= \cos^2(\theta) ; \\ a_2 &= \sec(\theta) ; & b_2 &= 1 . \end{aligned} \quad (4)$$

Where:  $\{b_1, b_2\}$  are the corresponding minor axial radii as determined from elliptic geometry. We only require reference to one of the ellipse's two focal points, this the one positive with the vector and defined by the intersection of the elliptic major axis with the projective cone's centerline axis, ( $\Upsilon_o$ ). The "vector-proportional focal length" ( $f$ ), defines the general kinetic vector geometric relationship with elliptic eccentricity established in terms of ( $a/b$ );

$$f = va/b . \quad (5)$$

This, ( $f$ ) is simply the geometric focal length,

$$f_1 = va , \quad (5.1)$$

as proportional to  $e$ . As defined below, the vector-proportional focal length (5) determines the equivalent force acting in inertial and gravitational vectors, i.e., we seek validity in the postulate that  $v$  is a general kinetic vector defining the moment sum of inertial and gravitational vectors acting on body  $S'$ . Note from (4) that (5) and (5.1) have equivalent values in the  $S'$  body where, ( $b_2 = 1$ ).

### 3.2 Elliptic Transformations

The analog to Lorentz transformations is inferred from the geometric relation to the vector. The elliptic focus positive with the vector intersects the conic axis and is therefore aligned perpendicular to the central origin of plane  $S$ , (Fig.1a). Light rays with perpendicular incidence to the surface of  $S$  will thus intersect the conic axis and therefore the positive elliptic focus in  $S'$ , (Fig.1b). The length of space-time translated into  $k'$  is then proportional to angle ( $\Phi$ ), with respect to the vector, by a factor to be determined: the *elliptic length* ( $\sigma_e$ ) defined as: *the length of the line from any point P on the elliptic surface to the positive focus*.

The velocity of light ( $V = dl/t$ ), in any direction in  $k'$  is then,

$$V = V_o(\sigma_e / \tau_e) = 1 = c . \quad (6)$$

Where  $\tau_e$  is the elliptic time factor corresponding to  $\sigma_e$ . The indicated condition of constancy in the speed of light is therefore in agreement with the second principle of relativity and experimental evidence. [15] [34] Equation (6) indicates the e-m Doppler wavelength  $\lambda$ , is proportional to the elliptic length (as inverse of  $\tau_e$ ),

$$\lambda = \lambda_o \sigma_e . \quad (7)$$

The quantitative determination of the elliptic length factor is derived in an  $xyz$  coordinate system

with origin at the elliptic center and vector parallel with the  $x$ -axis. The equation of the ellipsoid defining the surface of  $S'$  is then,

$$(y + z)/b = (1 - (x/a)^2)^{1/2} . \quad (8)$$

The *elliptic length* is obtained from the Pythagorean theorem,

$$\sigma_e = b^{-1}[(y + z)^2 + (x - f_1)^2]^{1/2} . \quad (9)$$

Substituting the right side of equation (8) for  $(y + z)$ , multiplying the terms out, and using the relationships:  $[a = (1 - v^2)^{-1/2}]$ ,  $[f_1 = va]$ , we have,

$$\sigma_e = b^{-1}(1 - x^2 + v^2x^2 + x^2 - 2vax + v^2a^2)^{1/2} . \quad (9.1)$$

The  $(x^2)$  terms cancel; and through algebraic substitution the equation is simplified;

$$\sigma_e = b^{-1}(1 + v^2a^2 - 2vax + v^2x^2)^{1/2} , \quad (9.2)$$

$$\sigma_e = b^{-1}(a^2 - 2vax + v^2x^2)^{1/2} , \quad (9.3)$$

$$\sigma_e = (a - vx) / b . \quad (9.4)$$

The elliptic length in  $k'$  is determined in relation to the angle of incidence  $\Phi$ , from parallel to the major axis, (Fig.1b), and computed from the point of tangency on the elliptic surface perpendicular to angle  $\Phi$ . The slope  $m$ , of the elliptic equation at that point is then,  $m = -\cot(\Phi)$ . The chain rule obtains the derivative of (8):

$$d(y+z) = (b/2)(1 - x^2/a^2)^{-1/2}(-2x/a^2) dx . \quad (10)$$

Similar terms then cancel and substituting the slope relationship for  $d(y+z)/dx$ ,

$$-\cot(\Phi) = b(-x)(a^2 - x^2)^{-1/2} . \quad (10.1)$$

Through simple algebraic and trigonometric identities we find  $x$ ,

$$x = b \sec(\theta) \cos(\Phi) . \quad (10.2)$$

The right side of (10.2) is then substituted for  $x$  in (9.4), reducing to,

$$\begin{aligned} \sigma_e &= \sec(\theta) [1 - v \cos(\Phi)] \\ \sigma_e &= \sec(\theta) - \tan(\theta) \cos(\Phi) . \end{aligned} \quad (9.5)$$

Thus the electromagnetic radiation (e-m) Doppler factor of wavelength is equal to the length from point  $P$  at tangent perpendicular to the angle of incidence, to the positive vector-equivalent focal point, *upsilon zero*, ( $\Upsilon_0$ ). (Fig.1b.),

$$\lambda = \lambda_0 \sigma_e \sec(\theta) [1 - v \cos(\Phi)] . \quad (7.1)$$

We see from (7.1) that the two opposing Doppler shifts longitudinal with the vector in  $k'$  translate in congruence with SRT/GRT [14] i.e. for,  $\Phi = \{0\}, \{\pi\}$  ;

$$\lambda = \lambda_0 \sec(\theta) [\{1 - v\}, \{1 + v\}] . \quad (7.1.1)$$

These are the only angles of congruence required of a theory to have experimental congruence with GRT/SRT regarding gravitational and motion e-m Doppler shift. [34] (At other angles, Heisenberg uncertainty plays a role.) It is noted that frame invariance of  $c$  in this theory does not require the Lorentzian inference of length contraction in the moving body  $S'$ ; so that the assignment of the two vector-proportional longitudinal lengths  $\{a_1, a_2\}$ , as in accordance with the *principle of equivalence*, Einstein (1907), are as yet undetermined. That is, we have not had to determine whether relative motion will have length expansion, ( $a_1$ ) with gravitational length contraction, ( $a_2$ ), or the reverse case. As will become apparent in Section 4, this flexibility allows a new paradigm in particle-fields theory.

### 3.3 Time Dilation

The time dilation factor in  $k'$  is defined as equal to the average  $\tau_e$  factor over  $2\pi$  radians i.e.,

$$\tau = t (\tau_{(\Phi=0)} + \tau_{(\Phi=\pi)}) / 2 , \quad (11)$$

$$\tau = t (a/b) = t \sec (\theta) . \quad (11.1)$$

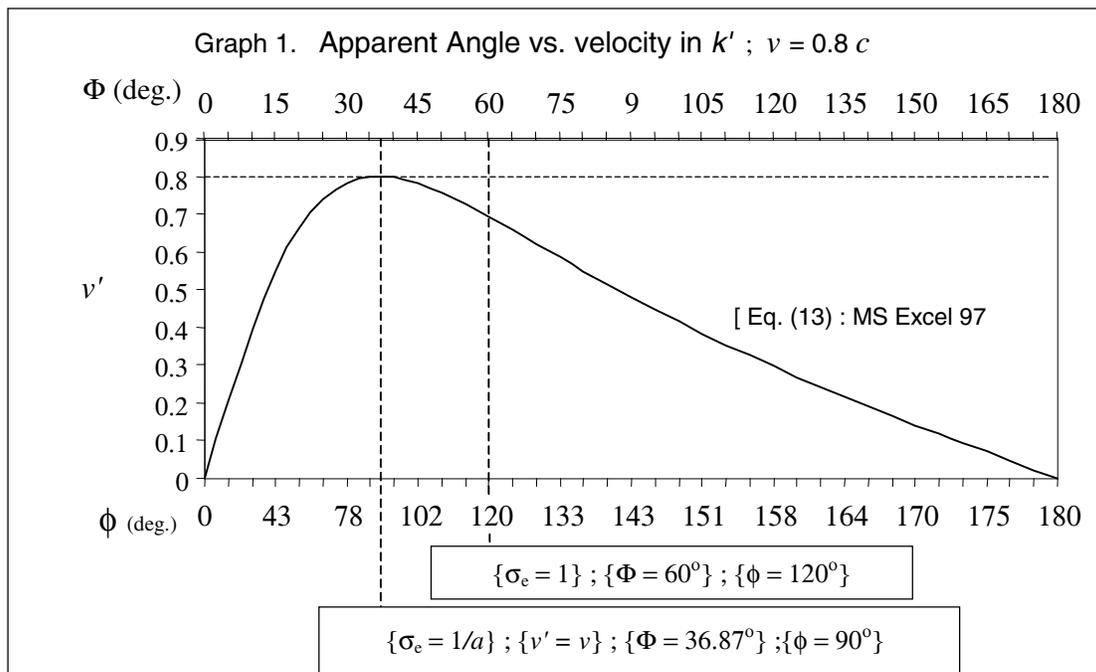
Thus, although the method of determination differs, time dilation in the GDT model is in agreement with SRT/GRT, and therefore in accord with experimental evidence. [34]

### 3.4 Transformation of Angle & Velocity

The displacement of the vector center ( $Y_0$ ), in  $S'$ , results in apparent angle of incidence ( $\phi$ ), in the energy transformation from frame  $k$  to  $k'$ . ( $\phi$  is determined from the positive major axis with origin at  $Y_0$ .) The angles  $\{\Phi, \phi\}$ , (Fig.1b) are related in the expression,

$$\phi = \arctan [y / (x - f)] , \quad (12)$$

$$\tan(\phi) = \sin(\Phi) / [\sec(\theta)\cos(\Phi) - v] . \quad (12.1)$$



The transformation of apparent velocity  $v'$ , in frame  $k'$ , of a distant body,  $S''$  stationary in frame  $k$ , is related to its apparent angle  $\phi$ , through inverse proportionality with the elliptic length,

$$v' = v \sin(\Phi) / \sigma_e. \quad (13)$$

The maxima of  $v'$  in (13) is found at angle:

$$\sin(\Phi) = \sigma_e = \cos(\theta); \quad (13.0.1)$$

where ( $v' = v$ ) and ( $\phi = \pi/2$ ), as expected. A second angle of interest is found where ( $\sigma_e = b$ ):

$$\cos(\Phi) = \csc(\theta) - \cot(\theta). \quad (13.0.2)$$

This angle defines the point between blue and red-shifted energies where ( $\lambda = \lambda_0$ ). The angle dichotomy between  $k$  and  $k'$  is evident;  $\sigma_e = b : |\{\Phi < \pi/2\}, \{\Phi > \pi/2\}|$ . (Graph 1.)

Velocity addition ( $v, u$ ) proceeds in the classic manner [14] with the similar result, except for difference in apparent angle, determined as in (13),

$$v' = (v + u) \sin(\Phi) / \sigma_e (1 + vu). \quad (14)$$

### 3.5 Inertial Causality & Gravitational Equivalence

We find a simple premise reveals causality of inertial motion. As determined in establishing the parameters of the elliptic transformation, the positive focus ( $Y_0$ ), is vertically coincident with the center of  $S$ . Thus, there is geometric justification in setting  $Y_0$  as the locus of zero potential energy for the mass of  $S'$ . Assuming a uniform mass density, the body's center of mass (c.o.m.) is thus located at the elliptic center and a kinetic condition is thereby established. The geometric displacement of the potential well from the c.o.m. in  $S'$  indicates a force of attraction ( $-Y$ ), compels the mass to the site of the potential well, ( $Y_0$ ).  $-Y$  is thus proportionally equivalent to the length of displacement  $f$ , (5). Note that the potential well locus is defined by the architecture of  $S'$ , and thus has conjunctive motion with the body.

We now suspend Newton's first law of motion, *Principia*, (1687), as a given principle and treat it instead as an hypothesis to be tested within these parameters. In isolated system  $S'$ , the mass  $m$ , has an internal attractive force acting upon it's c.o.m. locus at time  $t_0 = 0$ :

$$-Y = mv \sec(\theta) / t^2. \quad (15)$$

From Newton's second law of motion, the resultant acceleration ( $A$ ), of the body is then,

$$A = -Y / mv \tau = 0. \quad (16)$$

Note the system has time dilation relative to the rest frame; therefore from (11.1),  $\tau$  cancels  $\sec(\theta)$ . The body's kinetic motion resulting from  $-Y$  is then  $v$ . It is evident the absence of kinetic acceleration due to the motive force  $-Y$ , is only achieved at the defined displacement length ( $va/b$ ). Note also that due to our suspension of inertia and in spite of having  $v$  at time  $t_0$ , the body will have no compulsion for motion in the following time quanta  $t_1$ , other than that imposed by the motive force  $-Y$ , acting upon its mass in that quanta. This definition is in complete accord with Newton's first law of motion and moreover provides a causal definition for inertial motion:

*Relative inertial motion occurs because of positive displacement of a body's gravitational center from its mass-center. The motion is non-accelerative due to displacement length*

determination from relative vector angle ( $\theta$ ).

### 3.6 Momentum

The defined attractive force compels the mass to the site of the potential well with force proportional to the displacement length. The momentum of the particle is then proportional to  $\Upsilon$ , so that,

$$p = m\Upsilon = mva/b = m\tan(\theta) . \quad (17)$$

Where:  $p$  is the momentum and  $m$  the mass. Note the  $p$  value set is equivalent to that in SRT, (and thus in accord with experimental evidence), but without the descriptive complication of covariant "relativistic mass". In this system, mass is simply invariant, while momentum is covariant.

### 3.7 Gravitational Acceleration

Given the definition of  $v$  as a general kinetic vector, we see this displacement as a causal condition applying to the gravity vector as well, resulting from the internal displacement of a body's center of gravity ( $\Upsilon_o$ ), from its center of mass. Let  $S'$  describe a mass body at rest in a uniform gravitational field; the induced vector is then,

$$g = v_g = -\Upsilon/m\tau . \quad (18)$$

This indicates acceleration of a free-falling body in a gravitational field is caused by the moment sum of its inertial and gravitational vectors increasing over time. The result of uniform gravitational acceleration is achieved through the following postulates: that the  $\Upsilon$  vector signal propagates at less than infinite velocity; and that space-time is quantized. Letting  $S'$  be isolated in a uniform gravity field, the vector summation at time  $n$  is the moment velocity,

$$v_n = v_{(n-1)} + g_{\{n\}} . \quad (19)$$

Equation (19) results in a uniform acceleration proportional to the gravity vector, i.e. in freefall of length  $s$ , where:  $\{|A = g\}; \{dg \ll ds\}$ ;

$$v_n = v_o + At . \quad [8]$$

### 3.8 Electrodynamics

In GDT, frame translation of electrodynamics produces equivalent value sets to SRT. For example, let electromagnetic (e-m) field:  $\{E = X, Y, Z\}$ ;  $\{H = L, M, N\}$ , be at rest relative to stationary frame  $k$  and let electrically charged particle  $S'$ , be at rest relative to moving frame  $k'$ , with  $v$  parallel to the  $x$  axis and the  $x$  axes of the two coordinate frames parallel and congruent. The transformation of the electrodynamic equations in  $k'$  coordinates for the charged body are,

$$\begin{aligned} X' &= X , \\ Y' &= (a/b) (Y - vN), \\ Z' &= (a/b) (Z + vM), \end{aligned} \quad (20)$$

where:  $\{E' = X', Y', Z'\}$ .

We see this transformation is equivalent to that derived in SRT [17] and that the transformed momentum (17) produces equivalent values; therefore, the kinetic energy derived from this relationship is likewise equivalent to the derivation in SRT, [18] i.e. the minimum work (K.E.), required to accelerate a charged body is,

$$\text{K.E.} = mc^2[(a/b) - 1] . \quad (21)$$

### 3.9 Mass-Energy

Let body  $S$  have energy  $E_0$ . Let  $S$  emit plane light waves of energy  $(E^*/2)$ , in opposing directions parallel to the  $x$ -axis. Let this energy be measured by two observers. The first observer is located on the  $x$  axis and at rest relative to coordinate frame  $k$ . The second observer is located on the  $x'$  axis and at rest relative to the motion frame  $k'$ : Axes  $x$  and  $x'$  are parallel and coincident;  $v$  longitudinal with  $x'$ . Letting  $(E_o, E'_o)$  and  $(E_l, E'_l)$  denote the energy of the body prior to and following the emission of energy, as measured in the respective frames; then,

$$E_o = E_l + [E^*/2 + E^*/2] , \quad (22)$$

$$E_o = E_l + E^* . \quad (22.1)$$

Inverting (7.1), the relationship of relative frequency ( $\mathbf{v}$ ), to angle of incidence ( $\Phi$ ), in  $k'$  is,

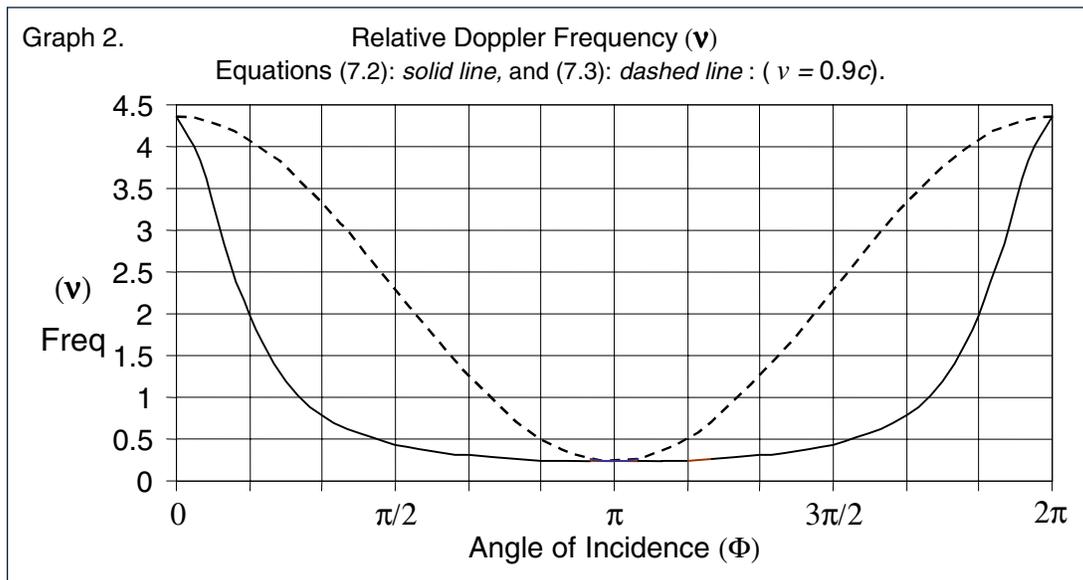
$$\mathbf{v} = \mathbf{v}_o \cos(\theta) / [1 - \sin(\theta) \cos(\Phi)] . \quad (7.2)$$

So that, where:  $\sin(\theta) = v$ ,  $\cos(\theta) = (1-v^2)^{1/2}$ , and  $\cos(\Phi) = [\{1\}, \{-1\}]$ , the energy as determined by the  $k'$  observer is then,

$$E'_o = E'_l + (E^*/2)[(1 - v^2)^{1/2}/(1 + v) + (1 - v^2)^{1/2}/(1 - v)] . \quad (22.3)$$

This reduces to,

$$E'_o = E'_l + E^* \sec(\theta) . \quad (22.4)$$



The difference in energy emission by the body in the two coordinate systems is proportionally equivalent to the difference in the kinetic energy of the body in the two coordinate systems, so that from (21),

$$\begin{aligned}\Delta E^* &= E^*[\sec(\theta) - 1] = \Delta \text{K.E.} = mc^2 [\sec(\theta) - 1] , \\ \Delta E^* &= \Delta mc^2 .\end{aligned}\tag{23}$$

The mass-energy relationship is equivalent to that derived in SRT. [19] However, the above result is the special case where the energy emission recorded in  $k'$  is longitudinal with motion. The equivalent equation to (7.2) in SRT (using like terms) is,

$$\mathbf{v} = \mathbf{v}_o \sec(\theta) [1 + v \cos(\Phi)] .\tag{7.3}$$

As realized by Einstein, (7.3) indicates the conditions of (22) results in (23), for any two opposing angles ( $\Phi$ ). From (7.2), the defined energy of emission in GDT for *any* angle  $\Phi$ , and its opposing angle, as determined in  $k'$  is,

$$E'_o = E'_l + E^* \cos(\theta) / [1 - v^2 \cos^2(\Phi)] .\tag{24}$$

As plotted in Graph 2., equations (7.2) and (7.3) clearly indicate that at angles other than longitudinal with motion, the energy of emission predicted in GDT differs from SRT. However, the inferred mass-energy relationship (23), is critically dependent on kinetic energy only at angle longitudinal with the kinetic vector, and thus is not contradicted by (24).

### 3.10 Particle Gravity Identity & Equivalence

It is proposed that matter particles are extrinsic and intrusive to the  $3d$  "spatial field". This identity allows a logical premise for causality in gravitational intrinsic curvature.

- 1.) The matter particle is defined in terms of volume.
- 2.) Spatial curvature is defined as resulting from volume displacement by particle volume.
- 3.) Volume displacement indicates relativistic compression of the spatial field.

As noted in Sec.3.2, the GDT elliptic transformation does not require (Lorentz transformation) longitudinal length contraction, and therefore does not determine relative equivalence. Given the "intrusion principle" (gravity identities 1-3) above, we must infer "reverse equivalence" i.e. longitudinal length contraction in the gravitational vector body, and therefore longitudinal length expansion in the motion vector body. In accordance with the inverse square law then, longitudinal length in the gravity vector  $S'$  body is defined by  $a_1$  (4), The *principle of equivalence* then indicates the major axis radius of the motion vector ellipsoid corresponds to length expansion ( $a_2$ ). It follows from the intrusion principle that curvature at the spatial/particle interface is absolute, i.e., the *Swartzchilde radius* of the nucleus is by definition the nuclear surface, ( $s_\eta$ ),

$$s_\eta : | r \equiv 1, (\theta \equiv \pi/2), (g \equiv c) |.$$

While SRT/GRT allows the Kaluza-Klein 4d space, [25] it does not require it. Given the *intrusion principle*, we see a fourth spatial dimension in GDT has evolved from a mathematical convenience to a logical necessity. Let Universal Space be denoted as open  $U$ , and the spatial field as open  $K$ ; let  $G_{xyzg}$  represent Space containing dimension ( $g$ ) orthogonal to  $K_{xyz}$  so that,

$$U \perp (K + G) .$$

$$G_g \perp K_{xyz} .$$

Implied in this theory is that covariant length in  $K$  is invariant in  $G$ . This condition allows an absolute solution to the gravity equation. Letting gravity act upon two otherwise isolated nuclear bodies in accordance with the inverse square law and equation (12), with reference to an observer in  $G$ , the gravitational moment vector acting on the bodies is then,

$$G : -g = c[(r_1 + r_2) / R]^2 \quad (25)$$

Where:  $r_1$  and  $r_2$  are the respective nuclear radii ;  $c$  is the speed of light ; and  $R$  is the invariant length between the nuclear surfaces. Note the particle mass is expressed in terms of radial length. Given this relationship, the newtonian equation is only conditionally approximate,

$$-g \cong \mathbf{G}(m_1 + m_2)/D^2 , \quad (26)$$

where:  $\mathbf{G}$  is the gravitational constant;  $D$  is the distance between mass centers; and given conditional premise:  $D \gg r_1 + r_2$  .

The *intrusion principle* indicates spatial curvature results from particle volume displacement. This produces differing spatial volume parameters dependent on reference frame. For example, locate an observer at reference coordinates in  $G : \{x, y, z\} = 0 ; g = l$  ; let nucleus of volume  $V_\eta$  be inserted into the spatial field at locus  $K : \{x, y, z, g\} = 0$  at time ( $t_n$ ). To the observer, the total volume parallel with  $K$  remains constant, i.e.,

$$V_K \{t_{n-1}\} = (V_K + V_\eta) \{t_n\} . \quad (27)$$

However, in reference to an observer at coordinates in  $K : \{x, y\} = 0 ; z = l$  , the spatial field curves around—not through—the nucleus, with apparent volume decrease in the spatial field:

$$V_K \{t_n\} = (V_K - V_\eta) \{t_{n-1}\} . \quad (27.1)$$

This indicates to the  $K$  observer that length,  $R'$ , to the gravitational center is contracted: ( $R' = R - r_1$ ); thus, gravitational effect decreases with distance at a rate greater than the inverse square. Then, letting  $r = (r_1 + r_2)$ , these relations are inserted into (25) so that,

$$K : -g = c[r / (R+r)]^2 \quad (25.1)$$

Table 1A. Elliptic Parameters of $S'$ . $\{\theta = \arcsin(v)\}$						
$S'$	$a$	$b$	$f_1$	$v$	$a/b$	$\sigma_e$
$a_1$	$\cos(\theta)$ (4)	$\cos^2(\theta)$ (4)	$\sin(\theta)\cos(\theta)$ (5.1)	$\sin(\theta)$ (2)	$\sec(\theta)$ (3.1)	$\sec(\theta) [1 - v \cos(\Phi)]$ (9.5)
$a_2$	$\sec(\theta)$ (4)	1 (4)	$\tan(\theta)$ (5.1)			

Table 1B. Kinematic Relations of $S'$								
$v = -Y/\tau$	$a$	$b$	$f$	$\tau$	$\lambda$	$p$	$E$	$g$
$v_g = \sin(\theta)$	$a_1$	$b_1$	$\tan\theta$	$t \sec\theta$	$\lambda_0\sigma_e$	$m\tan\theta$	$mc^2\sec\theta$	$cr^2/R^2$
$v_{n-1} = \sin(\theta)$	$a_2$	$b_2$	(5)	(11.1)	(7)	(17)	(23)	(25)

### 3.11 Three Logical Proofs of GDT Relativity

Three recently developed statements define intrinsic logical proofs in GD relativity. [50]

#### 3.11.A Relativistic Volume Causality

Assuming the hypothesis that physical massed particles having volume is a logically valued characteristic in a physical theory, then a relativity system which allows this condition at boundary limits can be assumed logically superior to one which doesn't, (all other conditions being equal). In SRT, longitudinal length goes to zero as velocity approaches the speed of light. This condition clearly doesn't allow volume potential for the photon.

GDT proposes 'inverted' vector equivalency, with longitudinal length expansion in relative motion and length contraction proportional to the gravity vector, thus clearly indicating volume potential at  $c$ . At the contracted, gravitational limit, nuclear volume induces spatial contraction through displacement. Thus, physical volume is not only potential but also gravitationally causal at the boundary condition of the nuclear surface.

We see particle volume is a necessary corollary to the intrusion principle. Furthermore, the relativistic properties of the kinetic vector body are defined from projective geometric conditions (focal length displacement), requiring the precondition of physical volume for the relativistic particle. Thus, particle volume in GDT is not only defined in all space-time conditions, but also causal and axiomatic. In context of particle volume then, GDT has clear logical superiority and raises a comparative paradox in SRT/GRT.

#### 3.11.B Relativistic Length Expansion Proof

Albert Einstein's special relativity proposed relative length contraction in accordance with Lorentzian transformations. [16] However, this is considered an aspect of SRT which cannot be experimentally verified, except as a thought-experiment with unrealistically ideal conditions: (requirement that at test-instant, the arriving light-signal is from only one time-instant of the test-object.) [43].

The reason for SRT's non-accord with experimental measurement is that any actual measurement of longitudinal length of an object in motion relative to an observer requires a test-window having time-length greater than zero, with signals arriving from different time-loci of the object within the test-window. Thus, in any valid, realistic, experiment, "position-smearing" is certain to occur in measurement, resulting in apparent *length expansion*, longitudinal with velocity.

As GDT relativity derives longitudinal length expansion in relative motion, any valid test-measurement for relative longitudinal length will record a positive test result for the GDT inference, particularly as ( $v \rightarrow c$ ). While it can be argued the positive result is solely from "position-smearing", the certainty of a positive test result indicates congruity between the physical and the theory; which is logically favorable, to one (classical relativity), where incongruity between theory and physical measurement, (test failure), is the certain result. In context of relative motion length then, GDT has clear logical superiority and raises a comparative paradox in SRT/GRT.

### 3.11.C Very Strong Equivalence

In *Gravitation and Inertia*, Ciufolini and Wheeler define Very Strong Equivalence, (VSE):

*For every pointlike event of spacetime there exist a sufficiently small neighborhood such that in every local freely falling frame in that neighborhood all the laws of physics obey the laws of special relativity.* [44]

VSE was seen to be a dividing line separating general relativity (GRT) from gravitational models, which violate VSE, such as Jordan - Brans-Dicke. Thus, when analysis of Lunar Laser Ranging measurements of the *Nordtvedt effect* correlated closely to VSE, [45] those theories which lacked very strong equivalence appeared less convincing.

"However" they note, *"the content of the VSE has been criticized even 'locally' .."* [44]

The essential reasoning of the argument is that in any Riemann, smooth, gravitationally curved, ( $dg/ds$ ) space-time, (e.g. GRT), the local region will possess curvature, so that there is no local region where:  $| dg/ds = 0$  ; and  $ds > 0$  |, This condition then disallows the principles of special relativity in the local region, (neighborhood). This objection can only be satisfied by a quantum (non-smooth) space-time, (e.g. GDT). There is a second aspect to the VSE argument.

*"The Riemann curvature tensor represents at each point the intrinsic curvature of the manifold, and, since it is a tensor, one cannot translate it to zero in one coordinate system if it is non-zero in another."* [44]

Again, GRT fails to meet the criteria of the mathematically non-trivial "*strict VSE*".

In Section four the local region of the nucleus ( $\eta$ ) in GDT is simply characterized in form relevant to this statement, as a *quantum volume*. In Sec.4.(I.2) we find  $g \notin \eta$ . Thus, for local region  $\eta$ :  $| g = 0$  ;  $dg/ds = 0$  ; and  $ds > 0$  |. As  $g$  always equals zero in the nucleus, it can be translated from one coordinate system to another, thus satisfying the criteria for "*strict VSE*".

To summarize then, Einstein relativity meets the criteria of Very Strong Equivalence—but only if you ignore the fact that the defined local region has zero width. Only a GRT equivalent, quantum-space relativity, can have a local region which meets this requirement. Only a theory with a GRT equivalent, quantum-space relativity, with local quantum having zero gravity, can be logically translated in any vector conditions, under the defined conditions for "*strict VSE*". G-dimensional theory is the *only* relativity theory having intrinsic properties which satisfy the conditions for *strict* Very Strong Equivalence. In this context, GDT has clear mathematical superiority and raises a comparative paradox in SRT/GRT.

## 3.12 Simplicity vs. Complexity: A Summary of Section 3.

Simplicity, as noted in the introduction, is a recurring pattern in nature. Sometimes however, one must consider introducing initial complexity in order to find the elegant pattern. As Michio

Kaku notes, '*hyperdimensions simplify physics*'. [24] Thus, by introducing initial complexity in the form of the  $G$  hyperdimension, the end result is an inherent simplicity in GDT relativity equations, (as determined by angle  $\theta$ ).

Somewhat similarly, by assuming elliptic elongation of the  $S'$  vector body, we introduce initial complexity, in that relative length-time in the vector body is not equal in all directions, (as in SRT). However, elliptic transformations have a unique simplicity—all parameters, (time, space, mass, volume, energy) reduce to length measurements.

Using this methodology, predictive equivalence is found with classical relativity, i.e. equivalent congruity in predicted values with experimental measurements, in regards to time dilation, gravitational and relative motion e-m Doppler effect, relativistic momentum, orbital precession, and e-m curvature in the gravity field. Other variances appear to be "experimentally subtle".

As further indication GDT is the correct solution, with Sec. 3.10, we find spatial curvature energy is concentrated precisely where the mass-energy in the universe is concentrated—at the particle level. Only by using inverse equivalence is this possible—to assume likewise with GRT requires infinite spatial length in the atomic field. Moreover, the principle of intrusion-exclusion is only logical in a relativity theory where space is gravitationally contracted—it lacks logical causality using equivalence with the Lorentz transformation.

#### 4. GDT Particle - Field Identities

The properties of the nucleus and subcomponents, inferred from GD relativity and physical phenomena, are defined as reference to their affects: atomic and molecular structures. The goal is a logical system of hypotheses, which provide causality to the physical world. While the intrusion principle and equation (25) indicate nuclear singularities, a necessary property variance with the classically derived singularity is immediately obvious—atoms are not black holes. The electric field of the nucleus must be, in some way, projected outside its Swartzchilde radius. Thus, the energy effect of the nucleus is more analogous to a 'white hole'. This is considered an axiom, Identity (I.8), as yet unproven but used as a basis for following corollary theorems and hypotheses, some of which are logically and mathematically proven.

From the *intrusion principle*, spatial curvature results from particle volume displacement. As gravity is defined as a property resulting from spatial field curvature, let nuclear space be defined as closed  $\eta$ . This indicates that although the nuclear vector is connected to the external gravity field via  $\Upsilon_{xyz}$  nucleons within the nucleus are not gravitationally attracted to each other, yielding the following identities:

1.  $\eta \subset G \not\subset K$ .
2.  $g \in K \notin \eta$ .

As defined, the nuclear surface contains the nucleus but is a subset of the spatial field;

3.  $s_\eta \subset K$ .

Let the *upsilon* force ( $\Upsilon$ ), be the force of spatial field curvature tension in opposition to the intrusive force of the nucleus. Let  $\Upsilon$  influence the geometric and  $g$  vector parameters of  $\eta$ , as a force of exclusion and compression acting through the nuclear surface;

4.  $\Upsilon \in K$ .

Let nucleons have degrees of independence in regards to intranuclear loci, with intranuclear manifestation of the electric field, ( $\epsilon$ ) so that;

5.  $\epsilon \in U$ .

6. The significance of isotope stabilities indicates nuclear stability is dependent on neutron/proton ratios and thus the nuclear  $m/\epsilon$  ratio. We assume in the above particle-field identities that mutual charge repulsion and nuclear boundary containment determine proton intranuclear loci. As forces that determine stability in the  $\eta$  configuration then,  $-\Upsilon$  is counteracted by particle intrusion/exclusion and particle  $\epsilon$  field.

It should be clear that the *upsilon*  $\Upsilon$  factor is the proposed GDT strong force analog—the causal force holding the multi-nucleon nucleus together—this in response to question: "*How do protons on lattice corners maintain their equilibrium and not Coulomb explode?*" [51] The  $\Upsilon$  containment energy is external to the nucleus, stored in curvature in the surrounding spatial field lattice—a geometric solution rather than the MT *virtual particle* premise.

7. From the particle volume corollary to the intrusion principle, (Sec.4.11.A), we assume as a necessary general condition, physically coexistent particle-waves. [49] The premise of *physical particle-waves* appears congruent with the available evidence, (e.g. dual-slit diffraction as source wave self-interference with particle path.) The physical particle-wave is disallowed in modern quantum theory, however, (see Sec.5.2) and so an alternate physical model which allows this condition is developed.

8. We assume proton charge fields are projected from the nucleus: in effect, the electrical and gravitational inverse square laws begin at different distances from the nucleus. Adopting the principle of *charge projection* results in electron potential wells non-coincident with the nucleus. This indicates atomic stability for the physical electron particle is not dependent on orbital momentum and thus allows the logical premise of the physical electron.

9. The *octet rule* analysis, typified by Periodic Table elemental behavior patterns and rules of molecular bonding, suggests a regular symmetrical arrangement of electrons in the atom. In developing a causal theory for the octet rule, for proton number, ( $Z > 1$ ), let the projected nuclear charge map be heterogeneous with electron well loci determined by intranuclear proton geometry. It is obvious that proton charge repulsion, interior to a spherical nuclear volume, will not result in a distribution of electron potential wells in accordance with the octet rule and heterogeneous charge projection—without imposing further conditions on proton loci. The simple geometric solution to this problem is thus proposed.

10. For isolated nuclei with  $Z > 2$ , let the nuclear surface be defined as a six-sided, (cubic) surface. Coupled with proton repulsion, the logical result of this geometry is eight proton potential wells, (*octet sites*) with lowest potential at maximum distance—the corners of the nuclear cube.

11. This indicates the noble elements, (Column 8A, Periodic Table), should possess perfect nuclear cubic symmetry, i.e. have a common characteristic of completely filled  $\eta$  potential shells. Analysis of the noble group  $Z$  progression does in fact reveal a cubic-based series, indicating that in addition to octet-sites, there is an inner locus proton site (nucleo); and for  $Z > {}_{10}\text{Ne}$ , six face-center outer sites. [46][50]

Nucleo " $\alpha$ -particle" series, ( $\alpha = 2Z$ ).

He :  $\alpha = 1$  ,

Ne :  $\alpha = \alpha_{(n-1)} + 0$  ,

Outer proton group number ( $P$ ):

He :  $P = 0$  ,

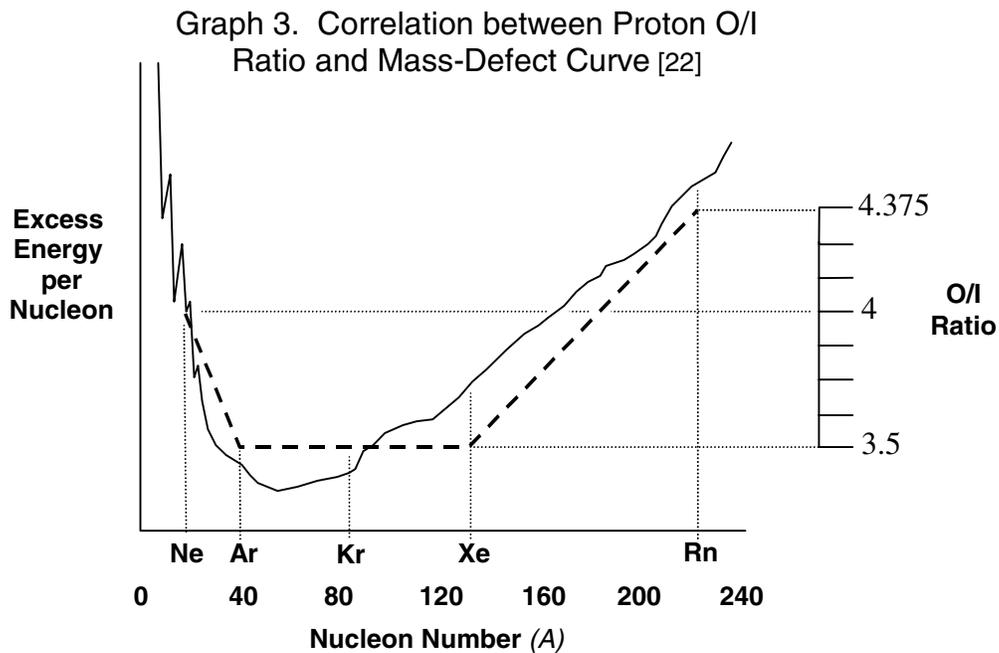
Ne :  $P = 1$  ,

$$\begin{aligned}
 \text{Ar} : \alpha &= \alpha_{(n-1)} + 1 , & \text{Ar-Ra} : P &= P_{(n-1)} + P_{(n-2)} . \\
 \text{Kr-Ra} : \alpha &= \alpha_{(n-1)} + 2 . & & 
 \end{aligned}
 \tag{28}$$

Eq.(28) proves the 8A noble proton number progression equates to an (elegant) cubic-based series: an even-number ( $\alpha$ -particle) progression in *nucleo* protons and *Fibonacci* sequence in the outer proton, (*octet* and *face*) sites. The projection of the series infers very high mass *hypothetical* noble elements in Table 2.

Table 2. NOBLE GAS PROTON CONFIGURATION						
Element	Nucleo (Inner) Proton No.	Outer Proton Group No.	Octet Total	Face Total	Z	O/I
helium	2	-	-	-	2	-
neon	2	1	8	-	10	4
argon	4	1	8	6	18	3.5
krypton	8	2	16	12	36	3.5
xenon	12	3	24	18	54	3.5
Radon	16	5	40	30	86	4.375
<i>Hypothetical</i>	<u>20</u>	<u>8</u>	<u>64</u>	<u>48</u>	<u>132</u>	<u>5.6</u>
<i>Hypothetical</i>	<u>24</u>	<u>13</u>	<u>104</u>	<u>78</u>	<u>206</u>	<u>7.583</u>

The functional relationships listed in Table 2 define the number of octet, face and nucleo protons in a given noble nucleus. This finding of a simple and elegant mathematical relationship provides causal evidence of cubic symmetry in the noble element Z progression.



12. The outer/inner (O/I) proton ratios for noble elements, (last column of Table 2), have a modal cluster at (3.5), with neon O/I at (4.0) and radon having the highest ratio (4.375). Highly

increased O/I ratios of hypothetical high-Z elements may be indicative of greatly decreased stability. In Graph 3, we find the plotted noble proton O/I ratio has notable correspondence to the mass defect curve—approximating its pattern of 'middleweight' nuclear stability. [50]

13. If we were to assume the *nucleon* O/I ratio to be equivalent to the proton O/I ratio, simple geometry would indicate as nucleon, or atomic number (*A*), increases, the ratio of the exterior to interior nucleon density must decrease. This assumption appears non-logical, given the nuclear model of minimal volume, (compression by  $-\gamma$ ), so that one would assume nucleon density to be approximately uniform.

Element	Z	A	Proton			'Excess' Neutrons	Nucleon O/I
			O	I	O/I	E	O/(I+E/2)
helium	2	4	-	2	-	0	-
neon	10	20	8	2	4	0	4
argon	18	40	14	4	3.5	4	2.33
krypton	36	84	28	8	3.5	12	2
xenon	54	131	42	12	3.5	23	1.79
radon	86	222	70	16	4.375	50	1.71
<i>hypothetical</i>	<u>132</u>	<u>364</u>	<u>112</u>	<u>20</u>	<u>5.6</u>	<u>100*</u>	<u>1.6*</u>
<i>hypothetical</i>	<u>206</u>	<u>612</u>	<u>182</u>	<u>24</u>	<u>7.583</u>	<u>200*</u>	<u>1.47*</u>

\*From krypton to radon the excess neutron number was approximately doubling with each noble element—this was used as a rough approximation for the *hypothetical E* number.

However, note that as *Z* increases, *A* increases at a greater rate. Assuming general isotope stability with 1:1 '*n/p* pairing', then, following neon we see leftover, or 'excess' neutrons (*E*), with number increasing with increasing *Z*. This indicates the logical premise that the excess neutrons serve as 'space-fillers' in the nucleo, as in accord with a premise of approximately uniform nuclear density. This then allows the calculation of the nucleon O/I ratio, as,

$$\text{Noble Nucleon: } O/I = 2O / (2I + E). \quad (29)$$

The noble functional relationship (29), corresponding to atomic number and listed in the last column of Table 3, indicates decreasing O/I ratio with increasing atomic number *A*, which is as would be expected, given the prior assumptions of proportionally increasing nuclear volume, uniform nucleon density and cubic symmetry. Thus there is a reasonable basis to assume the proton and nucleon O/I ratios, as determined in (28) and (29) are correct and play key roles in nuclear energy and stability.

Roger C. Jones in *Physics for the Rest of Us*, non-formally describes the nucleus as a, "*bunch of nucleons in a ball, like marbles in a round bowl.*" He notes that,

*"... A large sphere has proportionately less surface than a small one ... In a small nucleus, as compared with a large one, there is a greater chance of losing nucleons through surface 'evaporation,' which makes lightweight nuclei relatively less stable.*

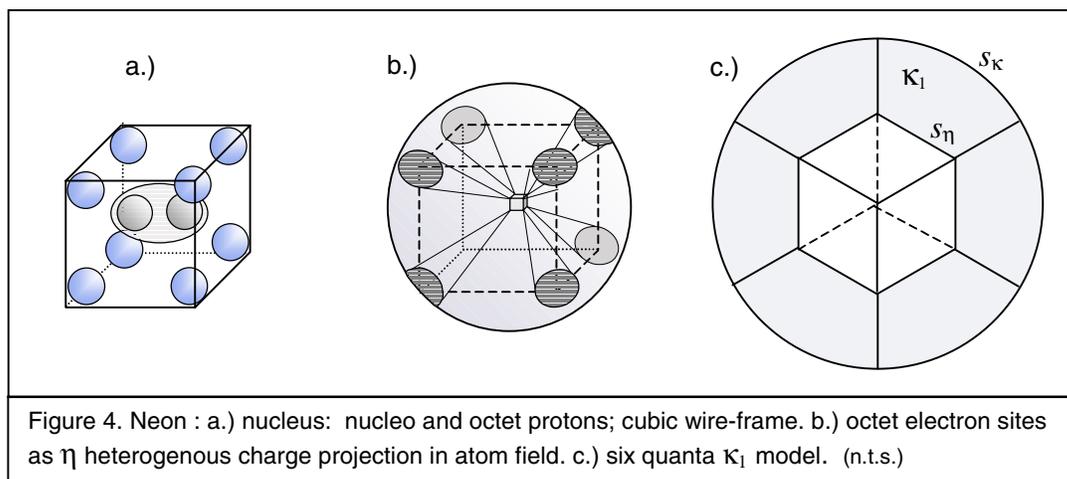
*"In summary, electrical repulsion tends to make heavy-weight nuclei unstable, and surface "evaporation" tends to make lightweight nuclei unstable. Thus the most stable nuclei are the middleweights, which are neither too large nor too small." [21]*

The deduced nuclear correlation to cubic symmetry appears stronger, and less arbitrary, as compared to the spherical, "marbles in a bag" geometry assumed in modern theory, which has little information to offer on intranuclear nucleon structure.

14. Assuming this theory accurately defines nuclear structural characteristics, then, logical resolution of the nuclear structure of non-noble elements should be available as well—as deduced from the physical properties of common isotopes and their tendencies for noble-like structures—within the geometry of cubic symmetry.

Helium and hydrogen isotopes appear to define the limits of a quantum space smaller than the octet structure. Helium-4 clearly represents the most efficient packing of this space, and also describes the neon nucleo (Fig.4a). Helium-5 doesn't exist, indicating it is too large to fit in the "helium quantum".

Following helium, the first octet sites began to fill. Lithium,  ${}^3\text{Li}$  and beryllium,  ${}^4\text{Be}$  then, have an outer octet space that is mostly vacant. We would expect them to be highly reactive—and they are. In the modern theory grouping, beryllium has filled (1s) and (2s) shells. One might expect then, that the isotope,  ${}^4\text{Be-8}$ , having symmetry, filled shells, and perfect neutron-proton ( $n-p$ ) pairing would be stable. In fact it is highly unstable, existing for only a "billionth of a trillionth of a second". [4]



Continuing between helium and neon, with boron, carbon, nitrogen, oxygen and fluorine, we find exact  $n-p$  pairing with  ${}^6\text{C-12}$ ,  ${}^7\text{N-14}$ , and  ${}^8\text{O-16}$ , but the common isotopes of boron,  ${}^5\text{B-11}$  and fluorine,  ${}^9\text{F-19}$  have an additional neutron. As their outer octets are odd-numbered, it appears safe to assume the extra neutron is in the octet site opposite to, and thus counterbalancing the odd-numbered octet  $n-p$  pair. In the case of the odd-numbered nitrogen, it is proposed that formation of the nucleus occurs in a "near-molecular" energy state, where the counter-balancing neutron of N-15 is a liability to the extremely stable nitrogen  $\text{N}_2$  molecule. If so this would indicate the N-15 isotopic molecule to be significantly less stable.

Between neon and argon, the first octet  $n-p$  sites have been previously filled; thus there are two possibilities for the added  $n-p$  pairs—either locating at the six open face-sites or in the nucleo. Of the first six elements after neon, the odd numbered ones have an extra neutron: e.g.  ${}_{11}\text{Na-23}$ , while the even numbered have perfect  $n-p$  pairing e.g.,  ${}_{16}\text{S-32}$ . It appears safe to conclude the face-sites are filling up, with the extra neutrons functioning as mass counterbalances to the odd-numbered face-sites. Then, chlorine,  ${}_{17}\text{Cl}$  has two common isotopes Cl-35 and Cl-37 (~3:1 ratio). It appears safe to assume the extra neutron in Cl-35 is at the

opposing face, with the two remaining in Cl-37 located in the nucleo. (This because there is the jump to four extra nucleo neutrons in  $_{18}\text{Ar-40}$ .)

Now, with argon, every octet and face-site is filled with an  $n-p$  pair. We might assume the added proton in the next element, potassium, could locate in the nucleo, but how to determine this? Recalling argon's four extra nucleo neutrons—suppose the next proton were to replace one of them. The mass number would stay the same, while  $Z$  increased. Close, but in fact the atomic number actually decreases,  $_{19}\text{K-39}$ . Moreover, the following element, calcium,  $_{20}\text{Ca-40}$  has identical mass number to argon and perfect  $n-p$  pairing. It appears we have sufficient correlation to conclude their added protons are in the nucleo, replacing extra neutrons.

There are still fifteen more elements before we get to krypton,  $_{36}\text{Kr-84}$ . Following calcium, are the transition metals (B subgroups). We note with scandium,  $_{21}\text{Sc-45}$  (3) there is a jump from zero to three in the extra neutron number ( $E$ ). This likely indicates two  $E$  in the nucleo, with one to balance the odd outer site. Should we assume, in following calcium, it also has six  $n-p$  pairs in its nucleo? No, it is more likely to revert to argon's nucleo, with the three added  $n-p$  pairs at outer sites, as in accordance with its +3 ion state. Except, why does it only have only two extra nucleo neutrons? Perhaps it has one extra  $n-p$  pair in the nucleo, with the remaining two providing outer symmetry.

The remaining transition metals are easier:  $_{22}\text{Ti-48}$  (4) ;  $_{23}\text{V-51}$  (5) ;  $_{24}\text{Cr-52}$  (4) ;  $_{25}\text{Mn-55}$  (5) ;  $_{26}\text{Fe-56}$  (4) ;  $_{27}\text{Co-59}$  (5) ;  $_{28}\text{Ni-58}$  (2) ;  $_{29}\text{Cu-63}$  (5) ;  $_{30}\text{Zn-64}$  (4) . The even number  $Z$  (except for nickel) have argon's  $4E$  , while the odd  $Z$  all have  $5E$ , so the four extra neutrons must be in the nucleo, with the extra  $n-p$  pairs and the fifth, odd-numbered  $E$  counterbalancing the odd outer site.

Iron,  $_{26}\text{Fe-56}$  (4) is noteworthy, having the lowest mass per nucleon (highest mass defect), and greatest magnetic ability in the Periodic Table. We thus should expect some major symmetry with iron, and we get it—two  $n-p$  pairs at each octet site and one  $n-p$  pair at each face-site, wrapped around the argon nucleo, (four  $n-p$  pairs,  $4E$ ).

Nickel has two common isotopes Ni-58 (2) and Ni-60 (4), with 67.7 % and 26.2 % relative abundances, respectively. We can assume nickel-60 follows the above pattern. Nickel-58, having only two extra neutrons likely has an extra  $n-p$  pair in the nucleo, with cobalt's outer configuration. Nickel and cobalt are weakly magnetizable—the only two metals besides iron (and uranium). Without researching the idea, I'm guessing Ni-58 is noticeably more magnetizable than Ni-60. If so, this indicates it has a different outer nuclear configuration.

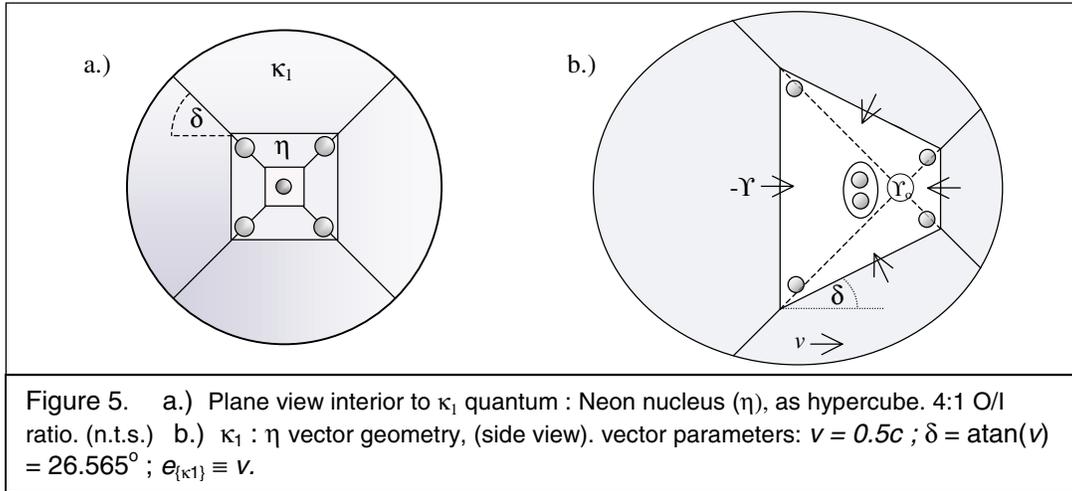
These proposed configurations should be sufficient evidence that cubic symmetry provides a basic methodology for understanding nuclear geometry, with logical causality for isotopic anomalies in the Periodic Table. While some questions remain regarding nickel and scandium, a more careful investigation of their isotopic properties than is afforded here will likely reveal their most logical configurations.

15. This model conforms to data on elemental electronic energy levels. For example in an isolated atom, let all electrons in its filled outer octet have an identical (lowest), ionization potential. Let energy quanta be input sufficient to successively ionize these electrons. The first ionization may then occur to any one of the eight. The second ionization, occurring to one of the remaining seven outer electrons, will occur at a higher energy quanta (because of the ionic charged condition), the third at a still higher energy level, and so on.

This pattern conforms to the ionization energies of the sodium atom, [27] which has jumps in ionization energy between the 3s and 2p orbital levels, as well as between the 2s and 1s levels, however, the eight ionizations of the 2p and 2s orbitals proceed in a near linear progression, so that there is no clear way to differentiate between them; i.e., what evidence do we have that they are in different energy levels?

The finding of cubic symmetry in the noble element progression supports the primary hypothesis of charge projection. Thus, a line drawn from the nucleos through a filled outer site defines a line of greater  $\epsilon$  potential in  $K$ . Electron potential well sites conform to these projection lines—so that a regular structure of electron well groups: (nucleo, octet, face), in the atomic spatial field is ascribed to  $\eta$  proton map projection containing symmetric patterns, as determined by the constraining dimensions of the prototypal cubic nuclear surface. Thus, the causal source of elemental physical patterns, generally defined as the *octet rule*, is determined to be nuclear cubic symmetry.

16. In accordance with inferred quantum space-time, (Sec.3.7) we consider a regular quantum folding of space around the nucleus as to result in the  $\eta$ -cubic interface. The simple model with this result assumes wireframe connections for the adjacent  $K$  shell quanta ( $\kappa$ ), in dimensions congruent with the local gravity vector, thus indicating six 3d right trapezoidal quanta, (comprising the " $\kappa_1$  shell"), that, through planar connections, forms the cubic  $s_\eta$  wireframe interior to  $\kappa_1$ .



From the wireframe connection angle, the angle  $\theta$  for  $\kappa_1$  can then be calculated. In plane geometry (Fig.5a), angle  $\delta$  is related to the vector as,

$$\delta = \text{atan}(v) . \quad (30)$$

It is clear that if the  $\kappa_1$  quanta are connected as proposed, then,  $\delta = \pi/4$  ;  $\theta = \pi/2$  and;  $g = c$ . Thus,  $\kappa_1$  defines a "Swartzchilde volume" folded around the nucleus, with its outer surface ( $s_\kappa$ ), the effective Swartzchilde radius in the surrounding spatial field,  $K$ .

17. We propose the *principle of least energy* applies to  $Y$  in regard to spatial *curvature* and spatial *surface tension*. At elementary particle/quanta levels, and given proper conditions, this *principle of least curvature* indicates spatial tension can determine radial (spherical) symmetry, and/or gravitationally connected wells, which may effectively delimit the strict application of the gravitational inverse square law.

18. As an application of I.17, we assume the  $\kappa_1$  outer surface is spherical. This identity: a) provides the simplest explanation for the spherically isotopic gravity vector; b) indicates frictionless motion for matter through space, i.e., "dragging" the  $\kappa_1$  shell results in a smooth spatial interface at the  $\kappa_1$  surface for the cubic  $\eta$  ; c)  $\kappa_1$  shell-dragging seems a necessary condition in "anchoring" the nucleus, with its hyperspatial components, in the 3d manifold. (It is

possible charge projection represents the "electromagnetic shadow" of the hypercube nucleus.)

19. The missing mass 'defect' (Graph 3.), has been shown to correlate to Einstein's mass-energy relationship, as energy released in the formation of nuclei. [9] However, the proton and neutron masses have been determined to six places, so it is doubtful a credible hypothesis of actual physical mass loss in the nucleons could be made. So where did the expelled mass-energy come from? In MT, this is something of an enigma, similar to 'covariant mass', (Sec.3.6). In GDT, the mass defect is indicative of lesser curvature. Just as invariant mass results in covariant (relativistic) momentum (17), here we likewise assume invariant nucleon mass and a functional relationship defining covariant spatial curvature and *effective* mass. We then see the source of the (mass defect) energy release must be the spatial field, i.e.,

$$E^* = \Delta Y . \quad (23.1)$$

In macroscopic systems, gravitational attraction results in a net reduction in energy stored in spatial field curvature. Or in other words, 'one big pile is better than two small piles'. At the nuclear scale however, the mass-defect curve indicates the relationship between matter particle volume and spatial field energy is not described by the same smooth proportional function. This may prove indicative of  $\kappa_1$  quantum spatial interaction with the quantum particle nucleus.

### Electron Identities

20. The general condition of atomic stability requires an atomic theory to explain why charge attraction doesn't result in electrons falling into the nucleus. In fact, particle accelerator experiments, e.g. Stanford Linear Accelerator (1968), indicate elastic, near-elastic or destructive results in high-energy electron-nucleon collisions. It seems there is no momentum-energy in which an electron and proton may combine into a single particle.

An obvious hypothesis of causality for this phenomena is that a force of repulsion exists between electrons and nucleons—a force which effectively counter-acts charge attraction at close distances. This particle-field model has identified gravity as being "closer" to the nucleus than its projected charge field. The remaining identity required to causally justify nuclear stability in the GD particle-field model, then, is to assume *the nucleons' positive gravity field repels electrons*. The projective geometry imposed by the electron must then be in the negative  $G$  dimension, ( $-g$ ).

Surprisingly, this radical departure from conventional wisdom is not contradicted by any evidence at this time. Even given the premise of nuclear singularities (25), the hypothesis of gravitational repulsion between nucleons and electrons has apparent congruence with the physical world and may be impossible to experimentally disprove. [48] The reason this condition is not obvious is that the mass of the electron is much less than the nucleons ( $\sim 1/3676$  the mass of an  $n$ - $p$  pair), so that the net gravitational field of the atom is always positive. (Compare to the atomic electric field, where proton and electron charges are equal and opposite, resulting in a neutral charge field.)

21. In the globally positive gravity field, the recurvature in the electron's  $g$ - field likely imposes a significant energy tension, so it is not then unexpected that electrons tend to cluster together despite mutual charge repulsion. This explains, for example, why the excess electrons of an  $\epsilon^-$  charged metal plate collect together on its surface .

However, note that this condition exists in spite of the electron's slight mass, compared to the nuclear mass: From the principle of least curvature, it is proposed "electron clustering" indicates the energy stored in spatial curvature induces the condition of local  $g$ - domains to spread between electron loci—beyond that indicated by simple application of the inverse square law.

Or, looking at it in terms of surface tension, a unified "standing ripple" in a surface may have less curvature (less energy) than separated "dimples".

22. In terms of the atomic field then, we propose from *least curvature* that the ( $g^-$ ) domain of outer electrons will tend to normalize lateral to the nucleus'  $g^+$  vector and parallel to adjacent electron domains. Thus, a sufficient density of outer electrons can produce a spherical  $g^-$  (or reduced  $g^+$ ) shell centered on the nucleus. This then defines a global well for the outer electrons, (as well as defining the atomic surface.)

23. Analyzing the nuclear vector forces acting on an atomic electron, we find that in addition to the vertically opposing forces of charge attraction and gravitational repulsion, relative lateral motion produces a magnetic force vector. This vector curls perpendicular to the motion, resulting in globally normalizing motion between the electron and nucleus.

We also note from least curvature, that the  $g^-$  shell domain redirects vector forces acting on the electron through spatial curvature, with the resulting tendency of keeping the electron in the  $g^-$  domain. Thus, lateral relative motion between the nucleus and electron results in partial redirection of the opposing  $g-\epsilon$  vectors in parallel with the  $g^-$  domain. Due to the spherical geometry of the  $g^-$  shell, this vector then curls perpendicular to the motion, resulting in globally normalizing motion between the electron and nucleus. But this description appears identical to the magnetic force. Although speculative at this time, it appears not impossible these forces are one and the same, i.e. that the magnetic vector defines an interface between gravitational and electrical forces, in terms of least curvature,

24. Returning to the example of the  $\epsilon^-$  metal plate, suppose we isolate it in a vacuum with an  $\epsilon^+$  charged plate a short distance away. The excess electrons will collect on the facing surface of the  $\epsilon^-$  plate until the electric field is sufficiently charged to overcome the vacuum's resistance to the electrons' passage. When you think about it, vacuum resistivity appears baffling; why should a vacuum resist the motion of an electron? However, analyzing this problem of causality in terms of gravitational domains, an obvious solution is obtained. The positive mass of the plates is much greater than their negative mass; thus the vacuum has a positive gravity field. The electrons then require sufficient electrical force, before they can "climb out" of their  $g^-$  well.

This also explains why current flow across a vacuum is "congregated" as in an electrical spark—the electrons bring their  $g^-$  domain with them—hence, the collective nature of the spark is determined by the principle of least curvature.

25. Molecular bonds, then, must be defined in terms of both gravitational and charge field domains. For example, the exothermic or endothermic nature of chemical reactions indicates considerable energy stored in molecular bonds. Why is this energy present? What form of energy is it? Where is this energy stored?

Modern theory, in terms of *potential energy*, does not offer completely satisfactory answers to these questions. However, from the principle of least curvature, we propose molecular bond energy resides in the spatial field in the form of curvature tension. For example, in the reaction,



The exothermic nature of the reaction indicates the reaction product has less intrinsic spatial curvature than the sum of the reactants' curvature, with resulting net release of heat energy indicated in the reaction. (Fig 5.)

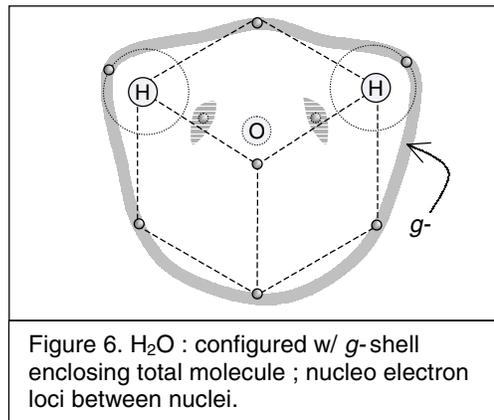


Figure 6. H<sub>2</sub>O : configured w/  $g^-$  shell enclosing total molecule ; nucleo electron loci between nuclei.

As further example,  $g$ - domain sharing provides an accessible rationale for ionic reactions; e.g. in a sodium chloride water solution, the sodium ion, ( ${}_{11}\text{Na}^{+1}$ ) is able to release an electron because it only requires eight outer electrons to maintain a closed  $g$ - shell, while the chloride ion, ( ${}_{17}\text{Cl}^{-1}$ ) requires an extra electron to close its  $g$ - shell.

26. The evident mass of an electron is three orders of magnitude less than the mass of a nucleon. And, we have presented evidence for nucleon-scale spatial quanta imposing regular nuclear structure. It is proposed the electron particle has volume in  $G$ , but, does not possess sufficient mass-volume to successfully oppose  $Y$  in creating a stable  $\eta$ -like spatial envelope in  $K$  ; so that the electron's particle-spatial interface is point-dimensional, rather than volumetric. This indicates the electron and nucleon volumetric values may be closer to equivalent in the  $G$ -dimension, (say, within one order of magnitude), but with greater *apparent* mass disparity manifest in terms of curvature at the electron's  $\kappa_1$  shell, i.e., electron:  $-\pi/2 < \theta\{\kappa_1\} < 0$ . This also indicates the electron does not logically *require* the inference of charge projection in its 1d connection in the same manner as a nucleus.

27. An "electron-family" particle model is developed from the intrusion principle and (I.26).

a.) The *muon* particle  $\mu$ , is created in high-energy particle collisions. It is proposed the muon's deep penetration ability, (non-reactivity) in matter fields indicates it is a negative gravity particle—with path tendency of avoiding nuclear gravity wells.

( $\mu$ ):  $m = 207$  e.m.u.  $\cong 1/9$  a.m.u. (electron mass units), (atomic mass units) ;

$t_{1/2} = 2.2 \times 10^{-6}$  sec. ;

$\mu \rightarrow e + 2 \nu$  .

The *muon* is often described as a 'heavy electron' and in fact decays into an electron and two neutrinos ( $\nu$ ). It is proposed the muon is indicative of a high-energy electron forming a  $g$ -nucleus, i.e., *muon*: ( $\theta\{\kappa_1\} = -\pi/2$ ). Its short half-life indicates the electron particle does not possess sufficient internal energy to sustain the nuclear construct. Thus, the apparent mass disparity in the decay, ( $207 \rightarrow 1$ ) is indicative of the muon's  $\eta$ -space collapsing, rather than a loss of physical matter i.e. invariant mass remains constant, change in covariance. The muon's interior electron remains intact and after decay, adopts the electron property of a one-dimensional connection to  $K$ , with particle volume in  $G$ .

b.) The *pion* (pi-meson),  $\pi$ , is highly reactive in matter fields, with comparable mass to the muon.

( $\pi$ ):  $m = 270$  e.m.u.  $\cong 1/7$  a.m.u. ;

$t_{1/2} = 2.6 \times 10^{-8}$  sec. ;

$\pi \rightarrow \mu + \nu$  ;

$\pi \rightarrow e + \nu$  (rare) ;

$\pi^0 \rightarrow 2 \gamma$  .

It is proposed the pion is indicative of a high-energy electron particle forming a non-stable  $g+$ ,  $\eta^+$  construct. Its high reactivity, esp. in comparison to the muon and electron, is then resultant of gravitational *attraction* to nuclear wells. The apparent mass disparity in the decay reactions: ( $270 \rightarrow 207$ ), ( $270 \rightarrow 1$ ), are thus causally explained as a  $\kappa$ -space transformation from positive to negative curvature and  $\eta$ -space collapse, respectively. The disparity in the  $\pi$  and  $\mu$  covariant masses indicate apparent  $K$  asymmetry. The neutral pion decay ( $\pi^0$ ), resulting in

two gamma rays, is reminiscent of an electron-positron collision, suggesting the possibility of their presence in its composition.

c.) Particle physicists describe the *tauon*  $\tau$ , (like the muon), as "electron-like". [6] Here it is considered a high energy, highly unstable electron nucleus.

( $\tau$ ) :  $m = 3500 \text{ e.m.u.} \cong 19/10 \text{ a.m.u.}$  ;

$t_{1/2} = 5 \times 10^{-9} \text{ sec.}$  ;

$\tau \rightarrow \mu + \nu$  .

This proposed classification system reduces the number of particles in the MT 'particle zoo' significantly; as *muons*, *pions*, *tauons*, and their anti-particles, are but different physical manifestations of the *electron*.

28. In GDT longitudinal length increases with relative motion. This would indicate a *photon* traveling at the speed of light would have infinite length: ( $a_2 \rightarrow \infty$  as  $v \rightarrow c$ ), or, that the photon's  $S'$  body length increases to infinity at the speed of light. However, we note the photon's interaction with the spatial ( $K$ ) is limited to its concurrent electromagnetic wave, i.e., it has no gravitational connection other than following curvature lines. In MT the photon has momentum, but no mass; it is grouped in the *boson* family, which share the curious property of being able to pack an infinite number of particles into any given point in space-time.

Applying the principle of *physical particle-waves* to the photon requires a particle with mass-volume traveling at  $c$  to carry the concurrent e-m wave. At first glance it seems impossible to achieve this within the principles of relativity. However, to find a physical particle state with congruency to the properties of the photon, we first turn to the electron. In electron identity I.26, the electron particle is defined as having a point-dimensional connection to  $K$ , resulting in its small apparent mass and no apparent volume. It then appears logical to assume the nature of the photon's  $K$  connection is solely electromagnetic. This allows the photon particle to have mass-volume: ( $m = \hbar v/c^2$ ), but, with momentum ( $p = 0$ ), as momentum is contingent on a particle volume  $V \leftrightarrow K$  connection. Upon absorption by matter, the mass-energy of the photon may transform into matter, momentum, or e-m energy.

To achieve a boson-like state without bringing infinities into the equation, it is proposed that the photon e-m connection has length in  $G \perp K$ , and proportional to  $\lambda$ . This indicates a very large, but finite number of photons can be connected to a given  $\kappa$  (space-time) quantum. The temperature proportional bell-curve of black-body radiation appears to correlate to this hypothesis, as a filling of low-energy (long wavelength) photon "slots" in the  $\kappa$  quantum, with higher temperatures indicating additional photons must move to vacant higher energy slots.

29. Assuming an analogous track with electroweak theory, the above electron transformations and  $n \leftrightarrow p$  transformations are considered indicative of a *weak nuclear force analog* in GDT. The basic assumption in this electroweak analog is that the e-m and weak forces are carried by particles with similar properties. This indicates we look for a particle in weak interactions similar to the photon, i.e., a) has no apparent mass, b) infinite lifetime, c) neutral charge, d) travels at the speed of light, e) carries mass-energy, f) can manifest as mass-energy, g) has near-infinite packing capacity, h) is detected in weak interactions, i) can initiate weak interactions.

There actually is a particle that fulfills all these criteria—the *neutrino*. It is proposed the neutrino particle ( $\nu$ ), is the photon-like manifestation of the weak force. Thus, all nuclear reactions with neutrino products are indicative of the (GDT) weak interaction. The principal difference between the photon and neutrino, then, is that photons are absorbed by all forms of matter, while only matter in an unstable energy state, (i.e. subject to the weak interaction)

absorbs neutrinos. The photon carries energy adjusting the local ratio of mass/energy; the neutrino carries energy adjusting the configuration of the local nuclear construct:

$$\eta: \nu \leftrightarrow \Delta[\Upsilon/(m \cdot \epsilon)]. \quad (31)$$

#### Section 4. Summary

The proposed GD particle-fields model conforms well to physical particle behavior with no obvious reasons to disallow its premises, i.e. no apparent predictive paradoxes. It is assumed the majority of scientists have come to accept modern quantum theory (some unconditionally, some reluctantly), so that mere approximately equivalent congruence to the MT model might likely fail to persuade, but that the improved causality in particle-fields here will provide sufficient evidence of the likelihood of GDT being the correct solution.

For example, the parameters inferred of the nuclear strong force: (a very short field, stronger than particle e-m force), parallel the characteristics of the nuclear  $\Upsilon$  force in GDT, (I.6). The difference proposed is theoretical rather than in effect. The MT strong force relies on inter-particle attraction, while  $\Upsilon$  is an external compressive force. The energy stored in spatial field curvature is then proportional to the local mass-energy, from (23), as,

$$E = m\Upsilon. \quad (23.2)$$

Where:  $\Upsilon = c^2$ . As analogy, think of four equal length metal straps, laid flat on a table in the form of a cross; one end of each strap is bolted onto the table near its edges, while the other ends meet in the center of the table. The metal straps are fairly rigid but flexible, (spring tension). Then, to place a box, in their center one must bend the metal straps back against their spring tension. Once the box, (nucleus), is in the center, though, it will stay there—held in place by the curvature tension of the straps. As analogy to ( $-\Upsilon$ ) then, the straps' curvature (tensile force), decreases with the square of the distance from the box, (inverse square).

1. We see then that GDT does not require the strong force premise of a non-inverse square, "short" field, i.e. ( $E_1 \ll E_o / D^2$ ), for which physical evidence is unobtainable, (due to Heisenberg uncertainty).

2. Moreover, GDT does not require the nuclear strong interaction to be a distinct force, i.e. a model 'add-on'. It is the same force ( $\Upsilon$ ) which governs the gravitational and motion vector parameters: (spatial curvature).

3. Theoretical simplicity is considered a valued physical trait—while an axiomatic, unverifiable energy source: (MT strong force), with purported properties *not known to exist in the physical world*, is—usually, considered a causal liability.

4. Evidence of the  $\Upsilon$  *upsilon* nuclear containment field is proposed in (Sec.5.1.4).

5. It is proposed that statements 1-4 indicate a fatal comparative paradox in MT.

The mathematical relationship of nuclear cubic geometry displays greater symmetrical correlation to the Periodic Table's proton, neutron and isotope progressions than does the modern assumption of the spherical nucleus, and coupled with a correlating heterogeneous charge projection field, 4.(I.8-9) it yields the electron energy levels more accurately and less arbitrarily than does the quantum number - electron shell model of MT. Furthermore, the similar premise to identity (I.16), which provides the causal framework for nuclear cubic structure and thus for cubic symmetry, and thus for the octet rule—cannot be made in modern quantum theory. This indicates a comparative paradox in MT.

An obvious inference is that the basis for quantum wave mechanics, the Bohr-deBroglie equations for hydrogen spectra, [10] can be theoretically justified in GDT parameters. This

further indicates all relevant and predictively significant relationships in quantum wave mechanics, the standard model, quantum gravity and string theory can be incorporated in GDT as well. For example, if Hideki Yukawa had been working from GDT parameters in 1935, he might have predicted *both* the meson and muon particles. [5] Except for theoretical aspects then, the two systems are not completely incompatible. In this sense the particle-field identities relationship to modern theory indicates MT explains *how* things occur, GDT explains *why* they occur.

Michu Kaku notes that Hinton's three methods of visualizing or determining four-dimensional figures in three-dimensional space—from their: a) shadows, b) cross-sections, c) unravellings, are the principle methods used by mathematicians and physicists today. He also describes Hinton's search for evidence of the fourth dimension, in the example of cigarette smoke in a closed room,

*"Because the atoms of the smoke, by the laws of thermodynamics, spread and diffuse into all possible locations in the room, we can determine if there are any regions of ordinary three-dimensional space that the smoke molecules miss. However, experimental observations show that there are no such hidden regions... Thus if the fourth dimension actually exists, it must be incredibly small, even smaller than an atom." [26]*

We see this conclusion is consonant with the GDT fourth-dimensional nucleus, which is 'even smaller than an atom,' and that, *"physicists today adopt essentially the same philosophy as Hinton."* [26] However, given the GDT atom, it is more than a little ironic that smoke particles in the above example, composed of four-dimensional nuclei, are used as reference points in an unsuccessful search for evidence of fourth-dimensional Space.

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## 5. The SQP Set in MT & GDT Comparative Physics

We now have presented a sufficient database of physical systems theory in GDT to begin a comparative study with modern theory in regards to the SQP Set. Each set member is considered individually in relevance to the comparative models.

### 5.1 Invisible Paradox: SQP-1

*Our visible world is composed of a totality of invisible particles.*

As the logical structure of the general sorites paradox has been analyzed in depth, e.g. [40] the focus here is on the physical paradoxical component of SQP-1. Examination of the physical context of the invisible paradox requires defining the principle modes of light interactions with atoms as behavioral identities in the MT and GDT models. Electromagnetic radiation is described as visible light spectrum (VLS) rays incident upon a uniform matter field having a well-defined surface of refraction.

#### 5.1.1 Specular Reflection

VLS radiation is reflected at the refractive surface of matter fields. This typically occurs across the VLS spectrum, with a well defined angle of incidence resulting in an equal reflection angle with respect to the normal of the surface. Information transmitted concerning the matter field is limited to surface features, (resolution  $\cong \lambda$ ). If all light emanating from matter fields

consisted of specular reflection, the world would look like a hall of mirrors. As VLS  $\lambda \gg$  atomic diameter, the atomic field is not rendered visible in specular reflection.

### 5.1.2 Refractive transmission

The speed of VLS radiation transmitted through a transparent matter field is in accordance to its refractive index ( $n$ ):  $| (c_n = 1/n); (n \geq 1) |$ . Refraction has proportionality to matter field density and  $\lambda$  of incident light. The angle of refraction  $\phi$ , between matter field surfaces, relative to the normal (orthogonal to surface), is defined by Snell's Law:  $(n_i / n_r = \sin \phi_r / \sin \phi_i)$ . [12] Atomic structural information of the through matter field is absent in VLS transmission.

*"For light reflected from—or transmitted through—an object smaller, roughly, than the wavelength of that light will not provide a pattern representing the shape and structure of the object but rather produce a diffraction pattern characteristic of the light wave." [39]*

However, does a diffraction pattern result from light transmitted through matter fields, e.g. in transparent crystalline structures? It appears this is not the case, in fact, radiation in the x-ray spectra of wavelengths ( $\lambda \cong$  atomic diameter), or shorter is required to produce detectable diffraction patterns in well ordered matter fields. Longer wavelength radiation such as VLS is refracted (*in uniform direction*) through matter fields.

### MT Refractive Model

In modern theory, the proportional slowing of the speed of light in refractive transmission is attributed to an absorption-emission sequence of the light by atoms of the matter field; in which, successive emissions follow the exact line of the refractive path angle. We see this absorption-emission model is used to causally justify the refractive slowing of the speed of light. However, it indicates that a single event (a refracted ray), is typically the sum of a very long chain of discrete events. The number  $n$ , of successful discrete events is proportional to the light ray's path-length through the matter field:  $[(l)(n) = L]$ , where  $l$  is the average length between absorption-emission events and the probability of success of each event must be 100% for a successful event set.

The probability of this event-set differs markedly from that of reflection, where only one successful event is required in each reflected ray—yet, they have roughly comparable scatter percentages. This indicates a statistically improbable correlation: (refractive paradox). Furthermore, it is noted the MT refractive absorption-emission event occurs without transfer of momentum or energy, without transfer of structural information of the matter particles and occurs across the electromagnetic spectrum, (pan-spectrum absorption-emission).

### GDT Refractive Model

It is an axiom in this model that atoms have strong nuclear gravity fields, with upper boundary: ( $g = c$ ). (25) We then see the nuclear ( $g$ ) value set contains the refractive value set ( $1/n$ ). A proportional relationship is inferred between the nuclear density distribution in a matter field and  $n$ ; so that refraction is treated as the light path bent in a gravitational field, i.e. in accordance with time dilation and spatial curvature. With Snell's Law then,

$$c_n = 1/n = c/\tau = c \sin(\phi_r) / \sin(\phi_i) = \cos(\theta) , \quad (32)$$

$$g_n = \sin[\arccos(c_n)] . \quad (32.1)$$

Where:  $c_n$  is the refractive speed of light, and  $\theta$  and  $\tau$  are determined as a function of the gravitational topography of the matter field:  $f(g) = g_n$ , as in (2), (11.1). This hypothesis indicates the refractive speed of light is a function of particle gravity wells in the matter field. A dramatic variance of the speed of light is evident, *vacuum*:  $|(c_n = c) ; (g_n = 0)|$ , *diamond*:  $|(c_n = 0.41c) ; (g_n = 0.91c)|$ . [12] Indicated, is that the determinate of the refractive value occurs near the upper gravitational limit in highly refractive materials. Also indicated is a proportional function between wavelength and nuclear density distribution, so that, diffraction and refraction may be considered jointly as a continuum property of the refractive gravity field topography. For example, x-rays transmitted through a crystal either pass with no deflection (no refraction), or weakly refracted, or diffracted, depending on angle relative to the crystal lattice, (i.e. path intersection with nuclear  $g$  fields.)

The above function does not require absorption-emission of radiation in the matter field to explain refractive time dilation: we infer *refractive transmission indicates non-absorption*. Thus, the successful passage of a refracted ray through a matter field is a set of zero absorption events, or  $n$  non-events. This definition excludes the parameters of the above MT refractive paradox.

### 5.1.3 Spontaneous Emission

Energy in a matter field is spontaneously emitted as VLS radiation. Example: electrical energy in a circuit containing a light bulb is translated into vibrational energy of electrons in the filament, thereby emitting VLS radiation at universal angles from the filament surface, with  $\lambda$  bell-curve in proportion to surface temperature. Spontaneous emission is generally indicative of an energy field gradient, in which a hot (high energy), object or region, distributes energy into its less energetic environment.

### 5.1.4 Reflexive Emission

In diffuse monoatomic and ionized matter fields, incident light is absorbed or emitted at element-specific wavelengths (spectral lines). In diffuse molecular fields the more numerous individual absorption-emission lines 'smear' into band spectra. In denser molecular fields, this mode of light interaction produces color and opacity and is thus central to the topic of the invisible paradox. Typically, VLS radiation incident with an opaque matter field is scattered, (reflected), or absorbed and re-radiated, (depending on interpretation), at universal angles from the surface, with selective absorption resulting in characteristic color. Thin slices of opaque materials show increased refractive transmission, indicating reflexive emission occurs interior to the refractive surface

#### Modern theoretical model

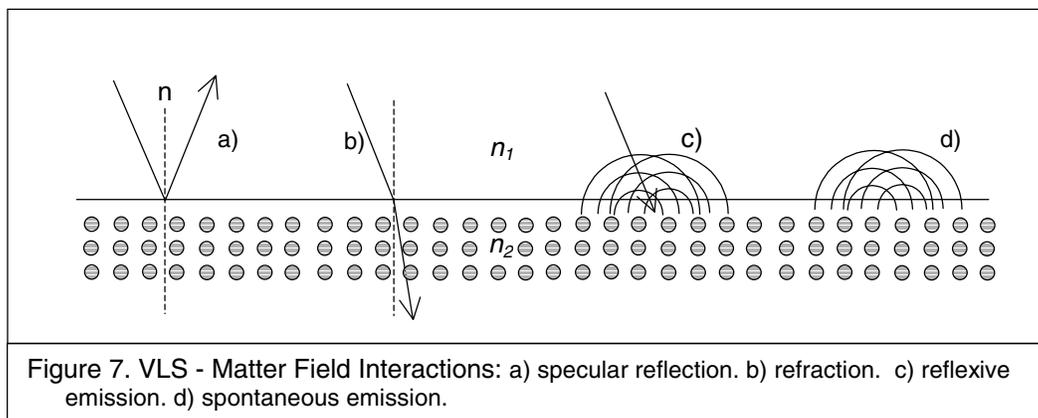
*Reflexive emission*, (scatter), (diffuse reflection), is defined as incident VLS being reflected at random angles due to uneven contours, (height:  $h_1 - h_2 > \lambda$ ), in the matter field surface. The typically non-opalescent effect indicates randomness of angle reflection  $\cong 100\%$ . This indicates two modes of reflection having very different degrees of randomness in reflection angle affect. Specular: the light is reflected with 0% angle uncertainty. Scatter: the light is reflected with 100% angle uncertainty.

#### GDT model

It is proposed that opacity is indicative of absorption-emission of photons occurring in light radiation incident upon a matter field. Opacity indicates emission is biased to surface, away from matter density, thus indicative of an energy field gradient (inherent in the denser matter field), and thus similar to spontaneous emission.

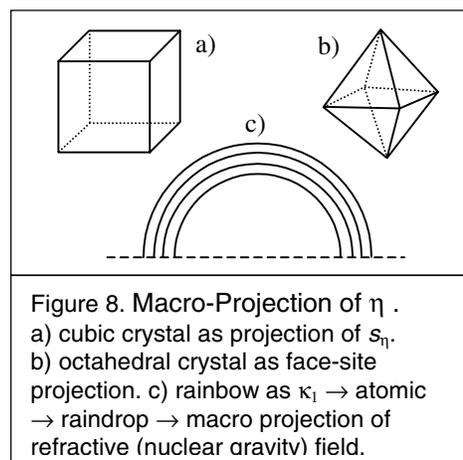
Comparing reflected and "reflexed" light from a common source, e.g. light from a lamp onto a smooth opaque table top, the reflected and reflexed modes of interaction are clearly distinguishable. It is apparent they transmit two different images—each of its source. The reflected light produces an image of the lamp. The reflexed light provides the image of the table. Reflected light also produces a polarized image of the table's surface contour. The reflexed image of the table is deeper, seeming beneath the surface reflection.

This identity is logical and consistent with the evidence; and so it is not clear to the author why it is not clearly inclusive in modern theory. The principal reason may be the paradoxical situation it raises with respect to its refraction premise; i.e., if absorption occurs in both modes,



why does refraction emission result in a well-defined ray through the material, while reflexive emission is omnidirectional from the surface of the absorption field? Assuming this premise would result in the inverse of the above refractive paradox.

Spontaneous and reflexive emissions may be considered indicative of visible atoms, in that photons are being emitted by atoms; however, the photon is a single quanta, with average width approximately fifty atoms. Even a photon produced by a single isolated atom does not convey atomic structural information. However, there is another possibility. Reflexed light, through color and diffraction, may provide information on atomic and molecular structure. Typically this information-image is blurred because the molecular structure is not well ordered. However, crystalline structures are well ordered, and so are GDT atoms. Thus, structural projection may result in: a) molecular and macro-molecular structures that are projections of its nuclear and electron sub-structures, b) at particular angles these can, through diffraction and color, be projected through reflexive emission into the macroscopic (visible) scale.



### SQP-1 Conclusions in MT

To summarize, the absorption-emissive sequence in refraction imparts no visible atomic field to the radiation, while specular reflection transmits refractive surface information only. Scatter, as it occurs within the matter field, could theoretically provide molecular structural information from diffractive effects, but the high randomness in diffuse reflection angles precludes this possibility. Luminescent and resonant emissions are emitted from atoms and have the potential to transmit atomic structural

information; however, the axiomatic high "noise level" in quantum theory (uncertainty in the loci of electrons), indicate atomic structural information cannot be conveyed in VLS wavelengths. Therefore, no resolution of the invisible paradox is obtained

### SQP-1 Conclusions in GDT

The nuclear model proposed in Section 4, with projected proton charge map defining electron loci, implies the general principle of *structural projection*, wherein basic structures tend to configure in similar arrangements: (nuclear ↔ electron ↔ molecule ↔ macroscopic). With the inference of structural projection, and above identities of light-matter interactions, sufficient causality is provided in GDT to resolve the invisible paradox. That is,

*Subatomic particles are invisible in 3d space because they are not in 3d space (space curves around them). While we cannot see the nucleus, we can nonetheless see its structural projection in the macroscopic world.*

As noted in the Section 4 summary, Heisenberg uncertainty indicates there can be no evidence of the (MT) strong force. Is there physical evidence of  $\Upsilon$ , its GDT counterpart? Considering it is the 'strongest force in the universe', the principle of structural projection would imply some manner of evidence should be present. In fact, as proposed above, the properties of refraction: time dilation, bending of light rays, are considered indicative of high local gravity fields in atoms, (Fig.8c) thus proposed:

*Refraction properties constitute physical evidence of the GDT strong force ( $\Upsilon$ ) upsilon, projected from nuclear to macroscopic scales of measurement.*

## 5.2 Uncertainty Paradox (SQP-2)

*Large matter, which is under the 'determinist principle', is formed by a totality of elementary particles, which are under Heisenberg's 'indeterminacy principle'.*

The definition of determinist: "*..every event act or decision is the inevitable consequence of antecedents independent of the human will.*" [3] indicates it to be the principle of *objectivity*, a fundamental assumption in the scientific method. Indeterminacy in elementary particles refers to our limits of resolution, in regards to momentum, position and particle-wave nature of particles, but in quantum theory it also defines the particle's limits of existence. Quantum indeterminacy then, appears contrary to the scientific method.

Although quantum theory is notoriously difficult to explain non-mathematically, essentially, there are neither physical waves nor particles in the physical world, but rather potential waves, with their translation into physicality, as waves or particles, dependent on the manner of measurement. When first proposed, this was not considered an obvious assumption, nor a particularly desirable one. It came to be accepted because it is the only viable conclusion quantum theory can allow. It can be worded similar to the above definition of 'determinist' as *Every event in the subatomic world is the consequence of waves of probability collapsing into particles or waves—dependent on the act or decision of the human will.* Worded thus, quantum theory is at obvious odds with the determinist principle and therefore with the classical scientific method.

We must then question why uncertainty is an important principle in modern quantum theory. Beyond simple considerations of experimental resolution, uncertainty is a critical assumption at fundamental levels of causality in MT. Obviously, an equivalent theory which did not require similar fundamental indeterminacy would possess an inherent logical superiority.

The MT quantum dilemma:

The prototype atomic model proposed by Rutherford, (1907), maintained electron stability in the atom through orbital opposition between electron momentum and charge attraction to the nucleus. However, this appeared contrary to Maxwell's electromagnetic equations, as the electron should lose energy through its motion, eventually falling into the nucleus. To resolve the energy paradox and incorporate hydrogen spectra, this model was reformulated in the Bohr (1913) - de Broglie (1924) - Pauli (1925) - Schrödinger (1926) - Heisenberg (1927), progression of quantum mechanics. Atomic electron loci came to be defined as probability distributions of quantum wave functions—(thus formalizing the suspension of Maxwell theory in the atomic electron). Quantum theory disallows the physical electron, (because it would violate electromagnetic principles); yet, because the electron *can* manifest as a physical particle, it must *also* disallow the physical wave—ultimately removing intrinsic physicality from the physical world—prior, to measurement. Thus, the indeterminate paradox is unresolved in modern theory.

Resolution in GDT:

We now can see the problem in MT. To achieve stability for the atom, the initial hypothesis (Rutherford) assumed physical electron particles (logical), in 'perpetual-motion' orbits, (which appeared logical at the time—as analogous to the stable solar system). However, when the second assumption proved non-logical, they removed the first assumption, assuming instead potentially physical particles. From Sec.2.(1), ( $B \rightarrow S$ ), this is non-logical; it assumes potential physicality can exist in the subatomic world without any structural projection, whatsoever, into the macro world.

To validate a return to the assumption of physical particles, the electron must have atomic stability that is non-orbital (non-motion) dependent. An electron that is not required to move for stability, can be presumed to be physical, (logical), and in motiveaccord with the Maxwell equations in all respects, (logical). As defined in section 4, this is in fact the case with the GDT  $g/\epsilon$  field model. And, if we presume the particle is physical, we must assume the wave-aspect is physical as well. Thus, particle-wave duality indicates physically coexisting particles and waves and indicates a return to true (classical) logical causality.

To remove a possible objection before it is raised, it is pointed out that Heisenberg uncertainty, ( $\Delta p \Delta x \geq \hbar$ ) [13] doesn't mathematically preclude physically coexisting particle-waves—it simply indicates we can't detect both simultaneously.

The physically coexistent wave is defined in terms of an electromagnetic wave—or because of significant particle induced curvature—in terms of a spatial field wavefront (gravity wave), or both. Emission of e-m radiation by atomic electrons then indicates orbital-like electron motion, as corresponding to electromagnetic theory and quantum wave mechanics. This theory indicates resolution of the uncertainty paradox in G-dimensional theory.

### 5.3 Unstable Paradox (SQP-3):

*Stable matter is formed of unstable elementary particles (elementary particles decay when free).*

The paradoxical component of SQP-3 appears to shift depending on how one interprets it. It can be viewed as a structural projection paradox, ( $B \rightarrow S$ ), or as a problem in compositional construction. By way of analogy, think of a house built of bricks, which disappear or explode

when separated from the house. One might consider it difficult to construct a house utilizing such building materials.

There is also a question of definition. The elementary particle is defined as "*any of the subatomic particles that compose matter and energy, esp. one which is hypothesized or regarded as an irreducible constituent of matter.*" [2] It would seem that an elementary particle which decays cannot also be 'an irreducible constituent of matter'. But then, Einstein's mass-energy equivalence indicates any particle of matter can be transformed into energy, and vice-versa, so it would seem no particle is truly irreducible in the strictest sense.

This paradoxical aspect can be circumvented by using the less strict definition above, i.e., defining an elementary particle as, "*any of the subatomic particles that compose matter and energy.*" In this aspect SQP-3 is nearly identical in content to SQP-4; (just substitute long-life for stable and short-life for unstable).

The origin of the concept of unstable nuclear components may be traced back to the discovery of the neutron. It is stable inside the stable multi-nucleon nucleus, but unstable in discrete form. Discrete neutron instability may then have been used as theoretical justification for further presumption of undetectable unstable particles in the MT nucleus. Thus we focus on a solution for SQP-3 in terms of the neutron.

Consider the neutron as an elementary particle inclusive in SQP-3. The neutron is stable in a stable nucleus, but as a discrete particle has a half-life of ~890 seconds, [42] thereupon decaying into a proton, electron, and neutrino. The condition of the unstable neutron as a constituent of the stable nucleus can be expressed as:

$$| \eta \ni (n_i + p_j) | : \eta \rightarrow T_{1/2} , \quad (33a)$$

$$| n \notin \eta | : n \rightarrow t_{1/2} , \quad (33b)$$

where:  $\eta$  is a stable nucleus,  $\{n_i, p_j\}$  are the numbers of neutrons and protons in the nucleus;  $T_{1/2}$  is the half-life of the stable matter,  $t_{1/2}$  is the half-life of the discrete neutron, and,  $T_{1/2} \gg t_{1/2} \cong 14.9$  minutes

#### MT Interpretation:

The weak interaction governs neutron particle decay in the MT model. Research by the author failed to uncover discussion(s) relevant to resolution of the disparity between inter-nuclear and extra-nuclear neutron decay rates. It is tentatively assumed that causality of the phenomena: ( $T \gg t$ ) for the neutron has not been fully resolved in this model.

#### GDT Interpretation

The weak force analog in GDT, Sec.4.(I.29), mediates the transformation of the discrete neutron into a proton, with the release of an electron and neutrino: ( $n \rightarrow p + e^- + \nu$ ). We note this reaction can also occur in the multi-nucleon nucleus, as well as its inverse reaction : ( $p \rightarrow n + e^+ + \nu$ ). We surmise these events occur because:

- a.) The nuclear mass/charge balance is critical to the stability of the  $\kappa_1$  ( $\eta$ -space) construct;
- b.) The reactants are subject to interactive mediation with the  $\kappa_1$  construct, so as to affect a more stable, less energetic system: [ $\kappa_1$  appears to be the common factor during these nuclear reactions];
- c.) The weak interaction is the least destructive method of affecting stability, i.e. the unstable nucleus doesn't explode, disintegrate, or fission—rather it converts to a stable form with minimal energy release. Thus the weak interaction, as a form of *least energy*, is fundamental to holding structural matter in the universe together.

It is then obvious that the decay of the discrete neutron is itself a nuclear reaction—it is not in this sense a 'free' particle—and therefore, (33b) is a false statement. Then relative to the neutron, SQP-3 may be restated in GDT as,

*Some nuclei are stable; the discrete neutron describes a nucleus which is unstable.*

As this statement is non-paradoxical, we have resolution for the unstable paradox in context of the neutron.

#### 5.4 Lifetime Paradox (SQP-4):

*Long-lived matter is formed by very short-lived elementary particles.*

As noted above, this paradox is similar to SQP-3. Here we focus on *virtual particles*, with existences spanning the length-time between subnuclear elementary particles.

MT: *Virtual particles* are axiomatic in modern theory as attractive force carriers. Heisenberg uncertainty indicates the virtual particle lifetime is far too short for an event to be recorded; hence their existence in the nucleus is forever indeterminate. As such, no resolution is obtained given the MT nucleus, where near-infinite numbers of strong and weak force carriers, pions, quarks, gluons, etc., are thought to swarm and decay in time-lengths too short to detect.

Taking the proton as example of a long-lived particle sustained by virtual particles, logic indicates an extremely large number of successful discrete force-carrying events are required in the average proton's lifetime. If we assume these events occur sequentially: (*minima*), then the number of events,  $n$ , is proportional to the particle's lifetime  $T$ , so that,  $(t)(n) = T$ , where  $t$  is the average time between force-carrying events. If  $T$  is infinite, then  $n$  must be infinite, and the probability of success of each force-carrying event must be 100%. Uncertainty in the possibility of a non-successful event indicates protons have finite lifetimes.

Experiments have been conducted at Kamiokande, IMB and Frejus to detect proton decay, based on the quark→lepton transformation predicted in grand unified theories (GUT)s. Thus far, the predicted proton decay has not been observed and the most simple, (SUSY GUT), has thereby been ruled out. [42] As Roger C. Jones describes quantum theory,

*"The Copenhagen Interpretation of quantum theory, developed primarily by Bohr and Heisenberg, has generally come to prevail among the majority of physicists ... The theory is complete: anything it does not tell us may be interesting conjecture or metaphysics, but it is neither observable nor measurable, and therefore is irrelevant to science."* [23]

This statement indicates an apparent incompatibility *virtual particles* have with the Copenhagen Interpretation: i.e., while they '*may be interesting conjecture*', virtual particles in the nucleus are '*neither observable nor measurable, and therefore are irrelevant to science*'.

$$\text{MT: } B \neq A \rightarrow S \quad (1.1)$$

It is proposed that a sufficient body of evidence has been presented in Sections 2-5 of this paper to conclude that (1.1) is a false statement.

GDT: Thus far the neutron is the only particle which decays in discrete form that is also clearly indicated as an element of the multi-nucleon nucleus—yet, the neutron is a nucleus in its own right. The 'electron-family' hypothesis has reduced the number of elementary particles significantly, Sec.4.(I.27). We now analyze the short-list of modern theory's virtual, unstable and/or undetected particles, for possible analogs in GDT.

a.) Gravity is carried by connections between spatial field quanta. This indicates the *graviton* analog is a wave-form of energy ( $\Upsilon$ ), self-propagating through the spatial field, rather than a discrete particle.

- b.) The strong force analog, also  $\Upsilon$ , is carried by spatial field connection and manifests as spatial field exclusion at the particle interface. It is not carried by a discrete particle. This eliminates an analog to the *pion* as the virtual strong force particle in the nucleus.
- c.) The *neutrino*, the carrier particle for the GDT weak-force is long-lived and only in evidence as a product of a weak nuclear reaction. Its stability indicates it doesn't meet the criteria for an unstable virtual particle.
- d.) *Mesons, kaons, W particles, hyperons, omega minus*, and similar massive, unstable particles are only physically evident as short-lived products of high-energy events, such as near- $c$  particle collisions. It is logical to assume they represent temporary states of energy  $\rightarrow$  mass conversion; i.e. they do not exist in the nucleus prior to the collision.
- e.) There is only one area of possible virtual particles remaining to investigate—the interior of the nucleon (baryon). It is noted that:
  - 1.) There has been no logical necessity in GDT to propose unstable or virtual elementary particles in the stable nucleus or anywhere else, other than in the temporary (unstable) existences in which they are found.
  - 2.) The logical inference is that: *elementary particles which may comprise the nucleon are intrinsically stable.*
  - 3.) This conclusion signifies effective resolution of both SQP 3-4.

$$\text{GDT: } B \approx A \rightarrow S \quad (1.2)$$

It is proposed that a sufficient body of supporting evidence has been presented in Sections 2-5 of this paper to conclude that (1.2) is a true statement.

This indicates particle-field theories such as quantum electrodynamics, Gell-Mann's 'eight-fold way', chromodynamics, and string theory, which, through inferred symmetrical properties and mathematical relationships have been able to predict some of the above "temporary particle constructs"—subsequently found in high-energy particle collisions, are indicative of symmetrical patterns in the spatial-particle-field relationship, and as such, are important clues to its underlying structure—but they should not be considered as conclusive evidence of virtual particles in stable constructs.

### 5.5 FTL Paradox (SQP-5):

*No speed barrier in the universe.*

The Smarandache (FTL) Hypothesis, inferred from non-locality in quantum theory, proposes 'no speed limit' i.e., the potential for instantaneous, or  $c+$  space-time events, (FTL connection). This postulate runs counter to the second principle of relativity, assumed valid in both classical and GDT relativity. In this discussion we consider SQP-5 a causal paradox, in which an axiom-derived hypothesis of causality indicates resolution.

MT:

As indicated in the Sec.4 Summary, modern theory has had better success at explaining *how* things occur than at logically justifying *why* they occur. The atomic electron potential, in jumping from one energy shell to another, provides an example of an instantaneous space-time connection. It is thus indicative of an incompatibility between quantum mechanics and special relativity, with similarities to its Maxwell incompatibility. No resolution is indicated.

GDT: Two alternate solutions for the FTL connection are offered. Neither is contrary to the second principle of relativity as translated into GD particle-fields theory, nor are they mutually incompatible.

- 1.) The FTL connection does not exist in *K* space.
- 2.) The FTL connection exists in *G* space.
  - a.) The second principle of relativity does not apply to *G* Space.
  - b.) The *G* Space FTL connection has the potential to manifest as an apparent *K* Space FTL connection

This is considered a non-quantified but logical resolution of the FTL paradox within the tenets of G-dimensional theory.

Table 5. SQP Comparative Analysis Results						
<i>Theory</i>	SQP-1	SQP-2	SQP-3	SQP-4	SQP-5	<i>Total</i>
MT	0	0	0	0	0	0
GDT	1	1	1	1	1	5

The Boolean score of Table 5 indicates 0% resolution of the Smarandache quantum paradoxes by modern theory and 100% successful resolution of the SQP by G-dimensional theory, thus demonstrating intrinsic logical superiority.

Table 5 indicates that if one accepts modern theory as correct, then each of the SQP elements must be either a true physical paradox or an unresolved paradox. If one accepts G-dimensional theory as correct, then each of the SQP is both a resolved paradox and an axiomatic paradox, idiomatic to modern theory.

Thus far, every indication has been that G-dimensional theory is a powerful theoretical tool in developing our understanding of the physical universe. It is hoped this analysis proves sufficient incentive for other researchers to explore this strange, new universe.

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**The *Smarandache Quantum Paradoxes* [“Nature”, Vol. 413, No. 6854] and *Smarandache Hypothesis (FTL)* are defined as a formal set of (anti-logic) statements inclusive in modern quantum theory. To determine whether they constitute theoretical artifacts or can be considered true physical paradoxes, *G Dimensional Theory*, a unique, logical and physically congruent system of physics, at significant variance with modern and classical theory, is presented in Sections 3-4. A comparative analysis of the Smarandache quantum paradoxes within context of the two theories follows in Section 5.**

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