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On The Origin of Four π in Physics

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ABSTRACT

We find the highest symmetry of the fields intrinsic to free particles (free particles having only mass, charge and spin), and show their close relationship to force and entropy. Upon substitution of Planck Units into The Schwarzschild Radius, we find that the mass and radius of any black hole define both the gravitational constant and the natural force. We then find that the spherical Gaussian surface area of a particle is equal to the surface area of an equally massed black hole, if we define the gravitational field of that particle to be the quotient of The Planck Force and the particle's mass. By these simple substitutions, we find that gravity is quantized in units of surface entropy. Finally, we show that Pythagorean Triples are the most fundamental geometry of Special Relativity, and show this to be the dimensional aspects of single particles observing one another, coupled with the intrinsic Hubble nature of the universe, both of which affirm the aerial (entropic) nature of gravity found in black holes.

Indexing terms/Keywords

Unified field theory. Black holes. Entropic gravity. Special Relativity. Twin Paradox.

Academic Discipline And Sub-Disciplines

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SUBJECT CLASSIFICATION

Unified Field Theory. Special Relativity. Quantum Gravity.

TYPE (METHOD/APPROACH)

Unitary field composition analysis. Unitary analysis. Classical thought experimentation. Geometric analysis.

INTRODUCTION

The Unified Field Theory is said to be found resting inside the equations and philosophies of black hole physics, because it is within these objects that both gravitational and quantum mechanical phenomena coalesce into unity. It would be prudent then to explore the gravitational properties of the quantum mechanical constituents of the universe: the elementary particles. By substituting natural units into the constants of nature found in The Schwarzschild Radius, we find that not only are black holes inhabiting a very unique and distinct position in relativistic space, but also that the Gaussian surface area of an elementary particle is exactly equal to the surface area of an equally massed black hole, when the gravitational field of that particle is defined as The Planck Force over the particle's mass. We find that the entropy of a black hole, and thus it's number of surface pixels in natural units, is an exact measurement of the gravitational flux, and thus the *number* of field lines.

Elementary particles, when taken to a free state, lose their strong and weak interaction properties, yet retain their infinite range attributes. The mass, charge, and spin of an elementary particle, corresponds to its gravitational, electric, and magnetic properties (the magnetic flux of a particle being the quotient of its spin and charge). These properties are intrinsic to their nature, whether in a quantum mechanically free or bound state, unlike their nuclear features (if they have them).

Nuclear forces only occur when particles are confined to interact with one another in sub-atomic-like circumstances, but yet quantum mechanics shows that when free from interaction, the Quarks, and the W and Z Bosons (and even the Gluon) lose their nuclear characteristics, and retain only that of their infinite-range fields (mass, charge and spin). Thus, it is factual for one to say that the nuclear forces are not an intrinsic property of the universe, because the pieces that make up the universe (the elementary particles) only retain gravitational (mass), electric (charge) and spin (magnetic) characteristics at all times.

Why then should one consider these nuclear forces (which can be turned on or off depending upon their environment) to be at the highest pinnacle of symmetry breaking in the universe? While quark confinement may be an oddity in itself - one that seems like the freeing of the quark to be an impossible task - it remains to be true that quantum mechanics gives the very simple result that free subatomic species lose their nuclear attributes depending upon their situation. Quark-Gluon Plasma of course describes the free state.

We find that in unitizing the dimensions of a particle, one has simply devised an independent unit system based upon the properties of a single quantum object. We show that the squares of the magnetic, electric and gravitational flux of that particle, when each divided by their corresponding field constants, are not only equivalent to one another for The Planck Black Hole and a unitized particle, but also equal to the product of the natural force and the entropy. We find that both the product and quotient of force and entropy are equal to the free space fields and fluxes of particles and black holes. Unitizing the inherent qualities of a single particle is a natural consequence of Special Relativity, because the base dimensions of physical phenomena (MLT-et) are all inherently relativistic (save charge), and non-absolute in their magnitudes. Charge though, we find to be a mirror symmetry to mass, as it is shown to cancel from all dynamical equations, via the electromagnetic field constants (Permittivity and Permeability of Free Space), leaving force to always be the product of mass and the gravitational field, even if the phenomena is electrical or magnetic in nature.

Simplification of The Schwarzschild Radius and Bekenstein-Hawking Entropy, by implementation of natural units into the constants of nature found in these equations, shows that black hole entropy is an exact measurement of the gravitational flux and field lines of black holes. One can then quantify the number of gravitational field lines emanating or penetrating a black hole, by dividing its surface area into its number of Planck surface pixels. If one were to place a black hole of relative entropy within the vicinity of many black holes, a quantification of their force of interaction may be achieved by a measurement of their entropy content, and thus their number of field lines. It is then logical to see that the entropy content of a black hole dictates the mechanics of their interactions, because each black hole will minimize the net force upon itself by fulfilling all of its potential field lines. We then find that black holes with particle properties implemented upon them shows their equality as quantum objects (fundamental particles), via their Gaussian free-space properties.

The universe is composed of the elementary quanta, of which there are 18, and it evolves in the direction dictated by the mechanics of their interactions. The interactions are deducible from the properties characteristic of the particles themselves, and in order to find high symmetry among the fundamental particles, we begin by generalizing their most basic properties. For one to search for symmetry amongst particles in general, it is reasonable to begin by listing the dynamic, thermodynamic and intrinsic properties of an *individual* particle [1], and then set all of these qualities equal to unity, thus forming an independent and integrated unit system, whose dimensions are based upon those of an actual quantum object.

A particle relative to a single observer has a velocity, total energy, momentum, thermodynamic temperature, mass, charge, spin, gravitational, electric and magnetic flux - and we set all of these equal to one. Because this is so, the base dimensions of mass, length, time, charge and temperature are *intrinsic* to this particle as seen by a single relative observer. Relativity of dimensions (length contraction, and time and mass dilation) is then applicable between two relative particles each having their properties defined in this manner. What one finds is that the natural symmetry embedded within the physical unit system is ascribable to a single particle. The natural unit symmetry between two relative observers (quanta) is one that elucidates with utmost clarity the highest symmetry intrinsic within particles, and thus the constituents of the universe itself.

For the myriad of physical phenomena one can quantify with symbolic expression, it remains to be true that when released of philosophical interpretation, underneath all physical equations are units. Science has done remarkably well at identifying the underlying physical symmetries, and unifying them categorically in terms of the now known four modern forces of nature. Interestingly, there have always been four forces of nature, present throughout antiquity, and known as Fire, Earth, Wind, and Water: four seasons, four cardinal directions, four winds, and four forces. Of course, it is remarkably neat that physicists should find themselves in the same position as their scientific ancestors: working to find relationships and symmetry amongst four known forces of nature. It is then exponentially more remarkable that the Permeability of Free Space (the magnetic constant) equals the permeability of Water, and the Permittivity of Free Space (the electric constant) equals the permittivity of Air. The gravitational constant of course pertains to all matter, or Earth, as it were. What force then is Fire?

The history of physics is one that combines two or more distinct physical phenomena and unifies them by showing a true underlying mechanism or force at work, one that then, in various situations, shows many sides of its full self. This act of unification – of looking to combine physical phenomena to find a larger mechanism at work – is one that in and of itself brings us to a rather concrete and definitive conclusion, albeit highly general:

All physical phenomena – when expressed symbolically – are at their core are no more than physical units with non-absolute magnitudes.

The Unified Field Theory of Physics must symbolically be written in terms of the same units as all physical phenomena. Simultaneously, all physical phenomena that one may symbolically quantify are at their core nothing more than units with non-absolute magnitudes. Why then should it not be sensible to propose that the Unified Field Theory be one which upon reaching the highest symmetry, simply encompasses that which is intrinsic to all physical phenomena, and sheds itself of any special relationship to any one system?

We show the base units of most compound units and begin to illustrate the relationships and symmetry they share with one another. We take it of highest importance to first reflect upon the fact that all pieces of the universe, when decomposed into elementary particles, naturally retain only three intrinsic properties: mass-gravity, charge-electric, spin-magnetic.

$$\mathrm{M} = \mathrm{Mass} \;:\; \mathrm{L} = \mathrm{Space} \;:\; \mathrm{T} = \mathrm{Time} \;:\; \mathrm{e} = \mathrm{Charge} \;:\; \mathrm{Q} = \mathrm{Temperature}$$

$$\mathrm{F} = \mathrm{Force} = \frac{\mathrm{ML}}{\mathrm{T}^2}$$

$$\mathrm{E} = \mathrm{Energy} = \frac{\mathrm{ML}^2}{\mathrm{T}^2}\,\mathrm{P} = \mathrm{Momentum} = \frac{\mathrm{ML}}{\mathrm{T}}$$

$$\mathrm{h} = \mathrm{Spin} = \frac{\mathrm{ML}^2}{\mathrm{T}}$$

A particle under constant force gains equal energy per its unit spatial displacement, and equal momentum per its unit temporal displacement. During an infinitesimal period where the particle has constant energy, it gains equal parts spin per unit spatial displacement, and under constant momentum gains equal parts spin per unit temporal displacement.

$$\mathrm{F} = \frac{\mathrm{E}}{\mathrm{L}} = \frac{\mathrm{P}}{\mathrm{T}} \qquad \mathrm{h} = \mathrm{ET} = \mathrm{PL}$$

The next set of compound units are the fluxes and the fields for the three intrinsic properties of the elementary quanta. We show the unit base of the gravitational field, the electric field, and the magnetic field, along with gravitational flux, electric flux, and magnetic flux.

$$\vec{\mathrm{g}} = \frac{\mathrm{L}}{\mathrm{T}^2}\,\vec{\mathrm{E}} = \frac{\mathrm{ML}}{\mathrm{eT}^2}\,\vec{\mathrm{B}} = \frac{\mathrm{M}}{\mathrm{eT}}$$

$$\phi_{\mathrm{G}} = \frac{\mathrm{L}^3}{\mathrm{T}^2}\,\phi_{\mathrm{E}} = \frac{\mathrm{ML}^3}{\mathrm{eT}^2} \qquad \phi_{\mathrm{B}} = \frac{\mathrm{ML}^2}{\mathrm{eT}}$$

Naturally, each field has its own specific field constant, as does each flux by their very definition, and they themselves of course also have a unique unit base.

$$\mathrm{G} = \frac{\mathrm{L}^3}{\mathrm{MT}^2}\,\epsilon_0 = \frac{\mathrm{e}^2\mathrm{T}^2}{\mathrm{ML}^3}\,\mu_0 = \frac{\mathrm{ML}}{\mathrm{e}^2}$$

$$\mathrm{G} = \frac{\mathrm{EL}}{\mathrm{M}^2}\,\epsilon_0 = \frac{\mathrm{e}^2}{\mathrm{EL}}\,\mu_0 = \frac{\mathrm{EL}}{\mathrm{c}^2\mathrm{e}^2}$$

For each of the fields and fluxes are two ratios, one of space and time (velocity), and one of charge and mass (the gyromagnetic ratio). They are applicable to the fluxes and fields because they quantify the symmetry between them.

$$\mathrm{G}\varepsilon_0 = \gamma^2 = \frac{\mathrm{e}^2}{\mathrm{M}^2}\,\mu_0\varepsilon_0 = \frac{1}{\mathrm{c}^2} = \frac{\mathrm{T}^2}{\mathrm{L}^2}$$

Temperature enters the unit system via the introduction of Entropy. Energy and Entropy are both internal characteristics, when applied to elementary particles. Temperature itself can then be identified as a unique base unit, because it only enters into the unit system when coupled with entropy. We find that the temperature dimension measures units of Planck Energy when applied to moving particles, suggesting that the Planck Energy is intrinsically kinetic.

$$S = \frac{E}{Q} \qquad k_B Q = \left(\frac{Q}{Q_{\mathrm{Planck}}}\right) \cdot E_{\mathrm{Planck}} = \left(\frac{Q}{Q_{\mathrm{Planck}}}\right) \cdot M_{\mathrm{Planck}}\, c^2$$

$$v^2 = \frac{2k_B Q}{m} \rightarrow \frac{\frac{1}{2} m v^2}{E_{\mathrm{Planck}}} = \frac{Q}{Q_{\mathrm{Planck}}}$$

We show the highest symmetries of a free particle in terms of these fields. In the highest symmetry, the fields and fluxes are squared, denoting a fourth-dimensional volume. At this level of symmetry, these fields are unified. As the symmetry breaks, the gravitational field couples with the electric field, and the magnetic field inversely couples with the electric field, as well. In the linear symmetry equations, the dimension charge remains coupled with the velocity of light, denoting a magnetic “particle.” This symmetry is vivid, and takes the role analogous to mass/gravity and charge/electric.

$$\frac{\phi_G \cdot \vec{g}}{G} = \frac{\phi_E \cdot \vec{E}}{\varepsilon_0^{-1}} = \frac{\phi_B \cdot \vec{B}}{\mu_0}$$

$$\frac{{\phi_G}^2}{G} = \frac{{\phi_E}^2}{\varepsilon_0^{-1}} = \frac{{\phi_B}^2}{\mu_0}$$

$$\frac{\vec{g}^2}{G\varepsilon_0} = \vec{E}^2 = \frac{\vec{B}^2}{\mu_0 \varepsilon_0}$$

$$\phi_G \cdot \vec{g} = \gamma^2 \cdot \phi_E \cdot \vec{E} \phi_E \cdot \vec{E} = c^2 \cdot \phi_B \cdot \vec{B}$$

$$\phi_G = \gamma \cdot \phi_E \qquad \phi_E = c \cdot \phi_B$$

$$\vec{g} = \gamma \cdot \vec{E}\vec{E} = c \cdot \vec{B}$$

The linear symmetry begins to break into the corresponding linear dimensions: mass, charge, etc. The unique combination of charge and velocity remains unified together, and is thus indicative of a particle attribute itself, for the magnetic field, just as mass and charge pertain to the other two fields. The linear symmetry one finds breaking particle into field, or particle into flux, retains an aerial symmetry forming the gateway between flux and field. Spatial area (A), is the one defining factor between field and flux, but at the level of the universal constants, it is shown that the aerial mass and charge and magnetic “particle” (ce) are defining the symmetry.

$$M \cdot \phi_G = e \cdot \phi_E = ce \cdot \phi_B$$

$$M^2 \cdot G = e^2 \cdot \epsilon_0^{-1} = (ce)^2 \cdot \mu_0$$

$$M \cdot \vec{g} = e \cdot \vec{E} = ce \cdot \vec{B}$$

The electric field is at the center of the field breaking. Both combinations of field constants yield an electrical part, and thus the symmetry is breaking from the electric field to the magnetic and the gravitational. In terms of base units, time – when coupled with these two fields – begins the breaking of the symmetry from the highest squared fields and fluxes.

$$\frac{1}{(\vec{B}\cdot T)^2} = G\cdot\epsilon_0 = \gamma^2 = \left(\frac{\vec{g}}{\vec{\vec{E}}}\right)^2 = \left(\frac{\phi_G}{\phi_E}\right)^2 = \left(\frac{e}{M}\right)^2$$

$$\frac{1}{(\vec{g}\cdot T)^2} = \epsilon_0\cdot\mu_0 = \frac{1}{c^2} = \left(\frac{\vec{B}}{\vec{\vec{E}}}\right)^2 = \left(\frac{\phi_B}{\phi_E}\right)^2 = \left(\frac{T}{L}\right)^2$$

1. SIMPLIFICATION OF THE SCHWARZSCHILD RADIUS

We simplify the equation for the radius of a black hole by substitution of natural units for the constants of nature found in The Schwarzschild Radius.

$$R_S = \frac{G}{c^2}\cdot(2m)G = \frac{E_{Planck}\cdot L_{Planck}}{{M_{Planck}}^2}\frac{1}{c^2} = \mu_0\epsilon_0 = \frac{M_{Planck}}{E_{Planck}}$$

We let l and m represent the radius and mass of a black hole. We eliminate the factor of two by letting the radius of a black hole be the radius of the sphere whose surface area defines the entropy content. Because the entropy of a black hole is defined by the surface area of the event horizon divided by four[2], the sphere that this is referring to is one with a radius equal to half that of the event horizon. We refer to this sphere's surface as the "entropic horizon," whose radius is the "entropic radius." Thus, The Planck Mass Black Hole has an entropic radius equal to The Planck Length.

$$\frac{R_S}{2} \equiv l = \left(\frac{m}{M_{Planck}}\right)\cdot L_{Planck}$$

The Planck Entropy is the natural energy over the natural temperature, and is equivalent to The Boltzmann Constant. The entropy of a black hole with respect to the natural entropy:

$$S_{BH} = \frac{4\pi\cdot l^2}{A_{Planck}}\cdot S_{Planck}$$

$$\frac{S_{BH}}{S_{Planck}} = \frac{A_{BH}/4}{A_{Planck}} = \frac{4\pi\cdot(R_S)^2/4}{A_{Planck}} = \frac{4\pi\cdot\left(\frac{R_S}{2}\right)^2}{A_{Planck}} = \boxed{\frac{4\pi\cdot l^2}{A_{Planck}}}$$

2. SIMPLIFICATION OF THE BEKENSTEIN-HAWKING ENTROPY

We further simplify the entropy of a black hole by substituting the gravitational coupling constant for the area term. This also creates a new definition for the gravitational coupling constant that is specific for black holes, because length equals mass.

$$\frac{S_{BH}}{4\pi\, S_{Planck}} = \left(\frac{m}{M_{Planck}}\right)^2 = \left(\frac{l}{L_{Planck}}\right)^2 = \alpha_G$$

$$S_{BH} = \alpha_G\cdot 4\pi\, S_{Planck}$$

The gravitational flux of a general black hole holds the same relationship to the gravitational coupling constant as the entropy. Thus the gravitational flux, just as The Planck Force, shares an intimate connection to elementary particles, because the gravitational flux of any massive particle is equal to the gravitational flux of a black hole with equal mass.

$$\phi_{G-\mathrm{Relative}} = -4\pi m G = \vec{g} \cdot AG = \frac{F_{\mathrm{Planck}} \cdot L_{\mathrm{Planck}}{}^{2}}{M_{\mathrm{Planck}}{}^{2}}$$

$$\phi_{G-\mathrm{Natural}} = -4\pi\, M_{\mathrm{Planck}}\, G = \left(\frac{-F_{\mathrm{Planck}}}{M_{\mathrm{Planck}}}\right) \cdot (4\pi\, A_{\mathrm{Planck}})$$

$$\phi_{G-\mathrm{Relative}} = \left(\frac{m}{M_{\mathrm{Planck}}}\right) \cdot \phi_{G-\mathrm{Natural}}$$

The gravitational flux of a black hole thus has an intrinsic surface area and gravitational field from which to compose its qualities. If we were to define the gravitational field of a particle of equal mass in terms of its interaction via the natural force, then its Gaussian surface area would be the entropic sphere of its corresponding black hole. This is possible via The Schwarzschild Radius implemented with Planck Units.

$$\phi_{G-\mathrm{Electron}} = -4\pi\, m_{\mathrm{Electron}}\, G = \left(\frac{-F_{\mathrm{Planck}}}{m_{\mathrm{Electron}}}\right) \cdot \left(4\pi \cdot l_{BH}{}^{2}\right)$$

$$A_{\mathrm{Planck}} = \frac{M_{\mathrm{Planck}}{}^{2}}{m_{\mathrm{Electron}}{}^{2}} \cdot l_{BH}{}^{2}$$

If instead we were to define the gravitational flux of a black hole or elementary particle with respect to The Planck Area, then we find the gravitational coupling constant intrinsic to the definition. The entropy of a black hole is thus equal to the square of the gravitational flux of a particle with the same mass.

$$\alpha_G = \left(\frac{\phi_{G-\mathrm{Relative}}}{\phi_{G-\mathrm{Planck}}}\right)^{2}$$

$$\frac{S_{BH}}{4\pi \cdot S_{\mathrm{Planck}}} = \left(\frac{\phi_{G-\mathrm{Relative}}}{\phi_{G-\mathrm{Planck}}}\right)^{2} = \alpha_G$$

The square of the gravitational flux is of a very high symmetry with respect to its relationship with the electric and magnetic flux of a particle. For example, if one were to characterize the gravitational, electric and magnetic flux (spin per charge) of a single particle by having each of these quantities set equal to unity, essentially unitizing the basic properties of a particle, then one would find that the symmetry between the fluxes and their associated fields is truly unique. At this level, force and area (entropy) are the two defining characteristics of the three intrinsic free space particle properties.

$$FA = FS$$

$$FA = \frac{\phi_G{}^{2}}{G} = \frac{\phi_E{}^{2}}{\varepsilon_0{}^{-1}} = \frac{\phi_B{}^{2}}{\mu_0}$$

3. INVARIANT FORCE OF BLACK HOLE DIMENSIONS

The simplified Schwarzschild Radius shows that The Planck Force is equivalent to the gravitational field constant G times the ratio of *any* black hole's mass squared to the entropic radius squared. Thus, The Planck Force is equal to G times the ratio of the mass surface area to the entropic surface area, for any black hole. For example, two Strange Quarks will experience the natural gravitational force when they are placed apart at a distance equal to the entropic radius of a black hole whose mass is The Strange Mass.

$$\frac{l}{m} = \frac{L_{Planck}}{M_{Planck}} \frac{l}{L_{Planck}} = \frac{m}{M_{Planck}}$$

The Planck Force is the gravitational attraction between any two particles of equal mass separated by a spatial distance of magnitude equal to the entropic radius of a black hole with the same mass. For every black hole, there are two equivalent dimensions: length and mass, and black holes hold the property that a gravitational force defined by this pair is always equal to the natural force. Black hole dimensions define the natural force, and thus the natural unit system.

$$F_{Planck} = G \cdot \frac{m^2}{l^2} = G \cdot \frac{M_{Planck}{}^2}{L_{Planck}{}^2}$$

The gravitational constant G equals the natural force coupled with the aerial dimensions of any black hole. Thus, as before, the natural force is an intrinsic property of black holes, or conversely, the dimensions of a black hole define the gravitational constant.

$$G_{Newton} = F_{Planck} \cdot \left(\frac{l}{m}\right)^2 = F_{Planck} \cdot \left(\frac{L_{Planck}}{M_{Planck}}\right)^2$$

If two black holes of equal mass were to join and come to rest apart from one another at this distance (the entropic radius), they would also experience the natural force.

4. FIELD BREAKING FROM FORCE AND AREA

The properties of the natural black hole are all in terms of Planck Units, save for intrinsic factors of 4π and 2π within in the physical constants of nature. If the net force of the universe were zero, then we could take this to be the natural force, because Relativity shows that when proper frame measurements are taken to be unity, the relative frame measures that dimension to be the full expression of the relative magnitude from the *origin*.

$$\sqrt{1-\beta^2} = \frac{L}{L_0} = \frac{L}{L_{Planck}} = \frac{L * L_{Planck}}{1 * L_{Planck}} = |L|$$

Force is the product of mass and the gravitational field, and the squared mass of a black hole equals its number of pixels, and thus its entropy content. Thus, black holes with particle attributes define both The Planck Force *and* the dimensions of the constituent pieces of the universe (the elementary particles). By setting all unit magnitudes equal to unity, and eliminating the fundamental factors of 4π intrinsic to the constants of nature and the definitions for magnetic and electrical forces, one finds that force and area (thus entropy) continue to define the free space parameters of fundamental particles and black holes. Since black holes are invariant in the natural force, their entropy, or surface area simply defines all of their fields and fluxes.

$$F = m \cdot \frac{l}{t^2}$$

$$F = m \cdot \vec{g} = e \cdot \vec{E} = ce \cdot \vec{B}$$

$$F = G \cdot \frac{m^2}{l^2} = \epsilon_0^{-1} \cdot \frac{e^2}{l^2} = \mu_0 \cdot \frac{e^2}{t^2}$$

$$\frac{F}{A} = \frac{\vec{g}^2}{G} = \frac{\vec{E}^2}{\varepsilon_0{}^{-1}} = \frac{\vec{B}^2}{\mu_0{}^{+1}}$$

5. THE ORIGIN OF FOUR π

The base dimensions (MLT-et) from which these fields and fluxes are built are then no different from the natural units, in that they are integrated and set equal to unity in and of themselves. The Planck Particle has base dimensions equal to the natural units for all of its dynamical and intrinsic properties, and relativity tells us that the base dimensions of the universe are inherently non-absolute in nature, save charge, but charge cancels out of all dynamical equations via the electromagnetic field constants.

$$F_{Coulomb} = \frac{\epsilon_0^{-1}}{4\pi} \cdot \left(\frac{e}{l}\right)^2 = \left(\frac{F_{Planck} \cdot L_{Planck}{}^2}{e_{Planck}{}^2}\right) \cdot \left(\frac{e}{l}\right)^2 = \frac{\alpha_E}{\alpha_G} \cdot (M_P \cdot \vec{g}_{Planck})$$

There is a natural symmetry for each of the three intrinsic qualities of any free elementary particle. Photons and Gluons have no mass or charge, the Higgs has no charge, and the weak nuclear messengers have a positive-negative-null symmetry for charge. We attribute this to these particles inhabiting distinct and unique positions in relativistic space, holding a special geometry relative to the other particles.

The field constants are all similarly defined, save for the factors of 4π contained only within the electric and magnetic constants. Four π naturally is indicative of a spherical surface area, which is consistent when coupled to the squared linear dimensions of universal phenomena.

$$G = \frac{F_{Planck} \cdot L_{Planck}{}^2}{M_{Planck}{}^2} \quad \epsilon_0^{-1} = \frac{F_{Planck} \cdot (4\pi\, L_{Planck}{}^2)}{(e_{Planck}{}^2)} \qquad \square_0 = \frac{F_{Planck} \cdot (4\pi\, T_{Planck}{}^2)}{(e_{Planck}{}^2)}$$

$$F_G = G \cdot \left(\frac{m}{l}\right)^2 \qquad F_{Coulomb} = \frac{\epsilon_0^{-1}}{4\pi} \cdot \left(\frac{e}{l}\right)^2 \qquad F_B = \frac{\square_0}{4\pi} \cdot \left(\frac{e}{t}\right)^2$$

The gravitational, Coulomb, and magnetic forces are thus relative to the natural unit system, but note that the field constants carry with them intrinsic factors of 4π, as well as the definitions for force. We find then that the electric and magnetic forces are naturally built with two factors of 4π, fittingly belonging with the corresponding squared dimensions.

$$F_G = \frac{\left(\frac{m}{M_{Planck}}\right)^2}{\left(\frac{l}{L_{Planck}}\right)^2} \cdot F_P \, F_E = \frac{4\pi \cdot \left(\frac{e}{e_{Planck}}\right)^2}{4\pi \cdot \left(\frac{l}{L_{Planck}}\right)^2} \cdot F_P \, F_B = \frac{4\pi \cdot \left(\frac{e}{e_{Planck}}\right)^2}{4\pi \cdot \left(\frac{t}{T_{Planck}}\right)^2} \cdot F_P$$

The magnetic force takes its most natural state when the distance between two particles is temporal in nature. Because the magnetic force per unit length between two current carrying wires is in terms of current squared per distance apart, we may take the length of the wire to be the Planck Length, thus rendering it to be a universal infinitesimal. Magnetic phenomena result from viewing electrostatic phenomena from a frame of relative velocity. Relative velocity is no more than a change with respect to an orthogonal dimension, which we call time. In the static frame of the particle, space is the orthogonal dimension. Thus, the fundamental difference between the electric and the magnetic field is that electrical forces arise from charges separated in space, and magnetic forces from charges separated in time. The geometry of the magnetic dipole is defined by a separation in space.

6. FIELD UNIFICATION FROM MAGNETIC FLUX

In a technical sense, all magnetic flux is zero, even for the quantum magnetic flux particle. It is a beautiful symmetry then that we find the gravitational flux to be an intrinsic negative to a particle's electric flux. When each are multiplied with their specific linear dimension, they are equal and opposite in dimension and magnitude for any particle. Thus, quite simply, magnetic flux equals gravitational flux plus electric flux.

$$\phi_{\mathrm{G}} = -\frac{\mathrm{FL}^2}{\mathrm{M}} = -\frac{\mathrm{L}^3}{\mathrm{T}^2} \qquad \phi_{\mathrm{E}} = +\frac{\mathrm{FL}^2}{\mathrm{e}} = +\frac{\mathrm{ML}^3}{\mathrm{eT}^2}$$

$$\phi_{\mathrm{B}} = 0 = \mathrm{M}\phi_{\mathrm{G}} + \mathrm{e}\phi_{\mathrm{E}}$$

The three free-space properties of the elementary particles are thus exhibiting a simple in/out symmetry. It becomes easier to see how these fields are all representing three aspects of a singular geometry. We have shown that the product of force and entropy breaks its symmetry into the linear dimensions of these fields through the fields themselves. At this high level of symmetry breaking with respect to the physical units, particle and field are breaking from "quantum object."

$$\mathrm{FA} = \mathrm{EL} = \mathrm{hc} = 0 = \mathrm{ce}\phi_{\mathrm{B}} = -\mathrm{M}\phi_{\mathrm{G}} = +\mathrm{e}\phi_{\mathrm{E}}$$

7. EMERGENT ENTROPIC NATURE OF GRAVITY[3]

7.1 Layers of The Kerr Black Hole

For the maximally spinning black hole[4] (with a Kerr Metric), the unfolding layers of the radii form an interesting pattern. The first layer, at radius l, defines the entropy content. At this layer, both mass & light are prograde (+). At the second layer, radius $2 \cdot \mathrm{l}$ (The Event Horizon), only mass is prograde. The third layer, at radius $3 \cdot \mathrm{l}$ (The Photon Sphere), only light is prograde. The following two layers, at radii $4 \cdot \mathrm{l}$ and$9 \cdot \mathrm{l}$, mass is retrograde (-) to the former and light is retrograde to the latter.

$$\mathrm{l}\text{: Entropic Horizon} - \text{Mass } \& \ \mathit{Light}\ (+/+)$$

$$2 \cdot \mathrm{l}\text{: Event Horizon} - \text{Mass } (+)$$

$$3 \cdot \mathrm{l}\text{: Photon Sphere} - \text{Light } (+)$$

$$4 \cdot \mathrm{l}\text{: Mass } (-)$$

$$9 \cdot \mathrm{l}\text{: Light } (-)$$

Note the unfolding pattern of prograde versus retrograde with respect to the squares of the radii ($2^2 = 4, 3^2 = 9$). It is then indicative that these are not linear layers extending outward from the center of the black hole, but rather the natural aerial dimensions about the black hole. Squared mass is indicative of the gravitational coupling constant, and thus a gravitational measurement of entropy, as shown before. The square of the light radius (The Photon Sphere), could thus be an equally indicative measurement of an aerial dimension describing the magnitude of the charge squared. The fine structure constant then counts the number of electric field lines, analogous to the gravitational coupling constant, and the entropy.

$$\phi_{\mathrm{E}} = \pm \mathrm{e} \cdot \epsilon_0^{-1} = \frac{\mathrm{e}}{\mathrm{e}_{\mathrm{Planck}}} \cdot \left(\frac{\pm \mathrm{F}_{\mathrm{Planck}}}{\mathrm{e}_{\mathrm{Planck}}}\right) \cdot (4\pi\, \mathrm{A}_{\mathrm{Planck}})$$

$$\alpha_{\mathrm{E}} = \left(\frac{\phi_{\mathrm{E-Relative}}}{\phi_{\mathrm{E-Planck}}}\right)^2$$

7.2 Multiplicity of The Planck Mass Black Hole.

The entropy of a black hole with mass equal to the natural mass (the natural black hole, as it were) is equal to 4π times the natural entropy.

$$S_{BH} = 4\pi \cdot \alpha_G \cdot S_{Planck}$$

$$S_{BH-Planck} = 4\pi\, S_{Planck}$$

By taking time to be at right angles to temperature, we can redefine the entropy to be an imaginary angular momentum. In a not so far reaching sense, this result is actually very grammatically correct, in that the word entropy comes from the Greek meaning “In + Spin”, which is generally taken to mean “internal transformation” or “change,” but in the literal, the root word tropos means “turn” or “rotate.”

$$S = \frac{E}{Q} = E \cdot (iT) = ih$$

One can calculate the multiplicity of the natural black hole using the Euler Identities, and find it equal to – in the most fundamental mathematical sense – one *squared* (the first natural area).

$$\ln(\Omega) = 4\pi i \quad \rightarrow \quad \Omega = e^{4\pi i} = 1^2$$

By way of the Euler Identities, it seems that the dimensions of space themselves are congruent with the unfolding of natural numbers. The number one raised to the power of one is equal to a straight line pointing only in the positive direction. The next step in the sequence is the square root of one, where we find still a one-dimensional object, the line, but the equations now denote both positive and negative directions. The third root forms the equilateral triangle, and is the first root of the natural numbers to yield an imaginary, and thus second-dimensional geometry. The fourth root is of course the imaginary unit itself, and is geometrically indicative of the second dimension as well, being at a right angle to the first dimension mathematically.

This is certainly exemplary evidence in support of the inherent connection that gravity has to entropy, whilst strange in the sense that this result is emergent from the natural numbers themselves, as opposed to the geometric elegance one finds dictating the myriad symmetries underlying particle physics via group theory and such. This result is unique in that it stems from the natural numbers themselves - a subtle, but profound difference.

The pattern of adding a geometric point to an empty space in consecutive series has an interesting dimensional consequence. We take the circular distance between two points to be as fundamental as the linear distance in terms of geometric symmetry breaking. Two points in space then denote both the linear and aerial dimensions – the first and second dimension. Three points denotes both the aerial and spherical (or three-dimensional) dimensions.

As the Euler Identities show, the natural numbers are indicative of the physical dimensions themselves, but the pattern of adding an additional point to empty geometric space yields two distinct directions in which to unfold. The natural numbers – as expressed as roots of unity – adhere to the linear unfolding, which results in the number one being equal to a geometric point, and not a line. The number two represents two dimensions in the sense of forward and backward, but still is linear in dimensionality.

7.3 Natural entropic bits in The Boltzmann Constant

The following example, albeit brief, is one that requires an introduction that allows for the supposition that experiments carried out in the general region of Earth are intrinsically inaccurate. The gravitational and magnetic field of the Earth, the natural oscillation frequency of the Earth’s core, gravitational effects from outside the solar system, etc., all of which may be constant in magnitude, may render measurements of universal constants (such as the gas constant) to be offset by some factor.

What we mean to say is that measurements of the Boltzmann Constant - and possibly other fundamental constants - may be highly precise, but ultimately inaccurate with respect to the properties of free space, and the entirety of the universe in general.

$$S_{\text{Planck}} = k_B = 1.38064852 \times \frac{1}{10^{23}} \cdot \frac{J}{K}$$

$$1.38064852 = 99.59\% \times \ln(4) \approx 2 \cdot \ln(2) \quad \leftrightarrow \quad \frac{1}{10^{23}} = \frac{6.02214}{1 \text{ Mol}}$$

$$S_{BH-\text{Planck}} = 4\pi \, S_{\text{Planck}}$$

Thus there are natural entropic bits resting within The Planck Entropy, or Boltzmann Constant. The thermodynamic *nat* is the definition of black hole entropy then, because four π times the entropy of the natural black hole is equal to one Shannon per nat.

$$\boxed{4\pi \cdot \frac{\ln(2)}{6.02214} = 1.44638 = 99.74\,\% \times \frac{1}{\ln(2)}}$$

$$\boxed{12 \cdot \frac{\ln(2)}{6.02214} = 1.38119 = 99.63\,\% \times \ln(4)}$$

$$12 \cdot \frac{\ln(2)}{\text{Mol}} = 1.38 \times 10^{-23} \cdot \frac{\text{Bits}}{\text{Mol}}$$

$$1 \text{ Shannon} = \frac{1}{\ln(2)} \times \text{nat}$$

$$S_{BH-\text{Planck}} = 4\pi \ln(4) = 8\pi \ln(2)$$

7.4 Force and entropy defining The Einstein Field Equations

The entropic nature of gravity should be present when conceptualizing and quantifying the geometry of gravitational phenomena in General Relativity. The entropy's relationship to gravitational coupling, as well as it being so describable and intimately related to two-dimensional areas (pixels), makes it is certainly notable that the Einstein Field Equations describing the gravitational geometry for a given energy density are at their core in terms of geometric areas.

$$\left(R_{\mu\nu} + \Lambda g_{\mu\nu}\right) - \frac{1}{2} R g_{\mu\nu} = 8\pi \cdot \frac{G}{c^4} T_{\mu\nu}$$

Note the factor of 8π in front of the Stress Energy Tensor and of course the factor of $\frac{1}{2}$ along with the Scalar Curvature. The constants in front of the Stress Energy Tensor simplify to the inverse of the Planck Force (or Planck Length over Planck Energy).

$$\frac{G}{c^4} = \frac{L_P}{E_P} = \frac{1}{F_{\text{Planck}}} \frac{F_{BH}}{F_{\text{Planck}}} = 1$$

In order to be dimensionally consistent, we further simplify the Stress Energy Tensor by finding the natural stress about a Planck Mass confined to The Planck Volume. The units of the tensor are energy density, whose symbolic two-dimensional analog (with equivalent units) is pressure, or force per area.

$$T_{\mu\nu} = \left[\frac{F}{A}\right] = [\text{Pressure}] = [\text{Energy Density}] = \left[\frac{E}{L^3}\right]$$

$$T_{\mu\nu,\text{Planck}} = \left[\frac{E_P}{{L_P}^3}\right] = \left[\frac{F_P}{{L_P}^2}\right]$$

The Stress Energy Tensor - when implemented with natural units - simplifies to units of inverse Planck Area. Thus, for black holes, any relative dimensions are simply denoting the tensor to be the entropic surface area, the same as the gravitational coupling constant.

Force times area is force times entropy, and at this symmetry level, one defines all of the internal dimensions of a black hole. We attribute particle properties upon a black hole (mass, charge, spin), and show the force entropy unification breaks again into the three distinct fields of these properties.

$$\frac{G}{c^4} \cdot T_{\mu\nu-\text{Relative}} = \left[\frac{F}{F_P}\right] \div \left[\frac{l^2}{{L_P}^2}\right] = F \div A$$

$$\frac{4\pi G}{c^4} \cdot T_{\mu\nu-\text{BH}} = \left[\left(\frac{F_{\text{BH}}}{F_{\text{Planck}}}\right) \div \left(\frac{S_{\text{BH}}}{S_{\text{Planck}}}\right)\right]$$

The Einstein Field Equations are thus exhibiting the same exact symmetry breaking as shown before, where the defining characteristic fields of particles or black holes stem from the natural force and the entropy.

$$\frac{F}{A} = \frac{\vec{g}^2}{G} = \varepsilon_0 \vec{E}^2 = \frac{\vec{B}^2}{\mu_0}$$

$$FG = \vec{g}^2 \cdot A \qquad F{\epsilon_0}^{-1} = \vec{E}^2 \cdot A \qquad F\mu_0 = \vec{B}^2 \cdot A$$

$$F = \frac{\phi_G \cdot \vec{g}}{G} = \frac{\phi_E \cdot \vec{E}}{{\varepsilon_0}^{-1}} = \frac{\phi_B \cdot \vec{B}}{\mu_0}$$

7.5 The geometry of black holes and particles

We would like to deliberate upon what we consider the most important object in physics to understand the geometry of all quanta (the elementary particles or “pieces of the universe”). The object is the point, and through understanding it a whole world of phenomena becomes visually available: quanta, black holes, and even the universe as a whole.

We begin by posing some down-to-earth questions (physics questions):

- *Is an electron (or any elementary particle) material?*
- *What is its shape?*
- *Does it have a surface?*
- *What is its size?*

A free particle retains its three fundamental properties of mass, charge, and spin (or magnetic quality). Each of these attributes has associated fields of gravity, electric and magnetic. Each of these characteristics has infinite length (or volume) emanating spherically outward from some place within an imaginary surface surrounding the particle. A logical question to ask is:

- Do these three infinite fields begin at the supposed electron's surface? If so, what is the radius of the surface from the electrons geometric center?

Because the only defining properties physically present regarding the electron in free space are infinite in length, we have a wonderfully useful piece of information to help us answer the proposed questions. By wrapping an imaginary surface around the electron and applying a definitive radius to its size, we are intrinsically considering a geometric center to the electron, i.e., a point. Fermions fields reach an infinite distance from a Gaussian surface around them, thus it prudent to speculate as to the nature of their fields directed inward toward their centers (such as the gravitational field).

All geometric points are infinitely linearly approachable, because points have no magnitude in the first dimension. Lines have two endpoints, but those points have zero length. A line can thus move forward into a point infinitely, which yields the most natural line length to be infinity. Lines are infinite in length, but still finitely bounded by the center of a point. It is a natural consequence then that the universes dimensions are inherently relativistic, because two observers naturally dictate a linear separation in geometric space bound by the intrinsic natures of the line and point. The observational modifications, forming the fundamental paradigm shifts set forth in Special Relativity, are the equations concerning the universe's linear base dimensions: mass, length, and time (contraction, dilation).

If we begin at the center of an electron, the length to the surface must be infinite, because conversely the distance to the center is also infinite. It is infinite, but also finitely bounded, as mentioned afore. Perhaps a good way to visualize this, is by recalling the infinite gravitational depth of a black hole's center. There is a center, but it is infinitely approachable, and thus the distance from any point outside the center of the black hole *to* the center of the black hole is infinity.

This conceptualization creates an intrinsic curvature and depth regarding geometric points. As one approaches a point linearly, because any successive steps taken in the approach are becoming infinitely shorter, they themselves are also approaching points. Because points have no length, there is no distance between any two points other than infinity (which we define to be unity). The mathematical expressions encapsulating these fundamental geometric notions comes from The Euler Identities, where one finds that the natural and complex numbers are all equivalent to one another.

$$\tau = 2\pi$$

$$\mathrm{i} = \mathrm{e}^{\mathrm{i}\frac{\tau}{4}} = \sqrt{\mathrm{i}^2}$$

$$1 = \mathrm{e}^{\mathrm{i}\tau} = \sqrt{1^2}$$

$$\mathrm{e}^{\mathrm{i}\tau} = \mathrm{e}^{\tau \mathrm{e}^{\frac{\tau}{4}\mathrm{e}^{\frac{\tau}{4}\mathrm{e}^{\frac{\tau}{4}\mathrm{e}^{\frac{\tau}{4}\mathrm{e}^{\cdots}}}}}} = \infty = \mathrm{e}^{\mathrm{i}\frac{\tau}{4}} = \mathrm{e}^{\frac{\tau}{4}\mathrm{e}^{\frac{\tau}{4}\mathrm{e}^{\frac{\tau}{4}\mathrm{e}^{\frac{\tau}{4}\mathrm{e}^{\frac{\tau}{4}\mathrm{e}^{\cdots}}}}}}$$

$$\ln(1) = \ln(\infty) = 0 = \infty$$

$$\boxed{0 = \mathrm{i} = 1 = 2 = 3 = \cdots = \infty}$$

Finitely defining the geometric point is impossible; its geometry is only available with respect to the infinite nature of other dimensions. One can define the point as the center of a circle or a sphere, and thus there are an infinite number of lines passing out of the point and through the surface of the sphere. The point will always retain the property that approaching it will be an infinite process, as one may recede into it infinitely.

We use the linear dimension to define the geometry of the point. One may simply approach a point infinitely in the first dimension, but this begs the question as to nature of defining the first dimension, as well. The first dimension is just a line whose cross sectional area is reduced to zero. There are no other ways to define these objects other than to approach them infinitely from a higher dimension.

One might wrap an imaginary rectangular cylinder around the first dimension, and say that the line has an infinite number of lines emanating outward from itself to the interior surface of the cylinder. By then shrinking the cylinder infinitely, one may define the line, but this causes the issue that the corners of the rectangular cylinder will reach the line later than the top, bottom or sides. Velocity coupled with simple geometric shapes seems to be the only way to quantify the dimensions of nature. Changing positions with respect to higher dimensions is the only way one may define lines and points to be infinitely small.

Approaching these dimensions is impossible because they do not exist. The line has no aerial dimensions from which to quantify it, yet the simplest way to describe a line is to have it pass through the center of a circle, or an infinite series of circles, and show that there are an infinite number of radii about the circles' center, and those radii approach the center to the line infinitely. Yet this still does not diminish the line's two-dimensional geometry, because approaching a line from an infinite number of lines aligned circularly around it still leaves the line with a geometric cross-sectional area, because an infinite approach never actually reaches a definitive shape other than the one from which it is approaching. In a free space, lengths and sizes are all non-absolute; a sphere reduced to infinitesimal volume is still a sphere.

This creates a natural velocity, just as velocity in 2-space is length over time: one dimension with respect to another. Thus defining a point or a line has a certain "lowest-energy" state, one which we may quantify by taking the shortest path to approach it. The most energy-efficient shapes are of course the circle and the sphere, because all of their surface points will reach the center simultaneously with respect to time.

When two geometric points "observe" one another, they do so by connecting a line between them. In 3-space, we are forced to impose infinite binds in order to define these objects, and the simplest definition for what a point "sees" when looking at another point is a flat circular area, because we have defined the two points themselves as infinitesimal spheres. It is interesting then that one quantifies a black hole's properties by the surface area of a sphere that is equal to the flat area one can see in full.

Standing at a reasonable distance from a black hole, one would only see the flat area of the event horizon, which is exactly equal to the surface area of the smaller entropic sphere. Two black holes, if placed next to one another, would see only the flat surface areas of their event horizons, whilst simultaneously being defined physically by a spherical area. This is a simple consequence of the fact that from the fourth dimension, a point can observe the entirety of a sphere's surface, and thus an observation of the entropic sphere in the fourth dimension, is equivalent to an observation of the flat area of the event horizon in three-dimensions.

It is a fractal-like pattern, in that the surface area of a sphere is equal to the area of a circle of twice the radius, or that the area of a circle times four is equal to the surface area of a sphere of the same radius *and* the flat area of a circle of twice the radius.

$$\mathrm{A_{Sphere}} = 4\pi \cdot \mathrm{r}^2 = \pi \cdot (2\mathrm{r})^2$$

$$4 \cdot \mathrm{A_{Circle}} = 4 \cdot (\pi \cdot \mathrm{r}^2) = 4\pi \cdot \mathrm{r}^2 = \pi \cdot (2\mathrm{r})^2$$

7.6 The geometry of the universe

We may take a moment to discuss the geometry of the universe. An electron's volume is infinite because its fields are infinite in length. The volume of the universe must then also be infinite for it not to be smaller than its constituent pieces. Velocities are increasing without bound the farther we observe from Earth. Because the universe is infinite in volume, it has geometric centers at any point. The distance between each point is infinity, or one – only relative lengths between points are finite in magnitude, otherwise the natural line distance between two universal points is unity.

This makes sense when considering the non-absolute nature of linear dimensions in Relativity. Because we now know that black holes define the base units employed in scientific measurement, the fact that the energy density and distance to the bottom of a black hole's gravitational well is infinity, is simply no more than a statement of their dimensions defining the physical base units of the universe.

We present a thought experiment regarding the relativistic boundary (horizon) of the universe. The experiment goes as follow: as you approach the horizon, the velocities of particles goes to c, but yet infinitely, and so we see another infinite yet bounded condition at work. The interesting points are in the subtle details: as you approach the horizon, you do not have to go out in length as far as you once previously did in order for velocities to increase by more than they did in the previous interval, due to the exponential nature of relativity. As one increases in spatial magnitude, velocities are increasing, but the exponential nature takes off and soon you only have to go out another foot, millimeter, nanometer, Planck Length, etc., before the velocities (and thus the energies, momenta, mass, etc.) dilate to infinity.

It is easy to see that the horizon of the universe is one of infinite approach, yet still bounded by a finite edge. Keep in mind that you may approach this infinite border continuously, and still the velocities will increase exponentially at each successive length. Because the energy of particles is going to infinity exponentially, we conclude that in the highest (or most basic) level of symmetry, the energy and mass of the universe is infinity, or one. It is an infinite length to travel into this bounded horizon, containing infinite matter, and we can conclude that any place of rest in the universe is itself at the center of the horizon.

7.7 The intrinsic Hubble Law between relativistic universal points

If we look at The Hubble Law and its implications upon the intrinsic geometry of the universe, we see that the farther any observer looks in any particular direction, objects traveling at that distance have a higher velocity, where the increase in velocity with respect to distance is a linear relationship. The depth of a black hole's gravitational well in infinity, and thus all black holes have a radius of one, or infinity, as shown before.

Black holes under the conditions of The Hubble Law would find that from their centers, velocities would be approaching unity the farther toward their surface one traveled. As one approaches an infinite velocity at the black hole's surface, three-dimensional objects shrink to flat areas[5]. If we take time to be the linear dimension denoting the depth of black holes, then the relative velocity between the center and a point within the black hole would indicate an intrinsic gravitational field at this point, equal to that relative velocity per the temporal displacement from the center.

Because the elementary quanta (the fundamental particles) have infinite intrinsic gravitational and electrical fields, we can deduce that the universe itself must also be infinite in volume, for it cannot be smaller than that of its constituent pieces, as mentioned previously. Furthermore, one can then conclude that since The Hubble Law is intrinsic upon any two points in the universe, and coupled with the fact that lengths are non-absolute in magnitude, and only finite relative to *other* lengths, that the intrinsic Hubble nature of the universe must be equivalent to the Relativity of dimensions (contraction, dilation), because the equations of Einstein's Special Relativity transcend third-party observations, and are only applicable between *two* relativistic positions.

$$\frac{\mathrm{L}}{\mathrm{L_0}} = \sqrt{1-\left(\frac{\mathrm{v}}{\mathrm{c}}\right)^2}\ \frac{\mathrm{T_0}}{\mathrm{T}} = \sqrt{1-\left(\frac{\mathrm{v}}{\mathrm{c}}\right)^2}$$

Because geometric points are infinitely linearly approachable – that is to say, a line *naturally* approaches a geometric point infinitely, as points have a magnitude of naught for all dimensions above zero – the natural line distance between any two observers relative only amongst themselves is infinity, or just simply one. One can see directly from the modifications made by Special Relativity upon relative dimensional magnitudes, that the length of any distance between two observers in the universe is tied directly with their relative velocity, but the most fascinating bit is that the equations of Relativity are not written in terms of linear dimensions, but rather *aerial* ones [6].

$$\frac{\mathrm{L}^2}{\mathrm{L_0}^2} + \frac{\mathrm{v}^2}{\mathrm{c}^2} = 1^2\ \frac{\mathrm{T_0}^2}{\mathrm{T}^2} + \frac{\mathrm{v}^2}{\mathrm{c}^2} = 1^2$$

Thus, between any two points in the universe there is a natural velocity associated with that distance, because the universe experiences The Hubble Law between any two points, and not just from a geocentric perspective.

The universe then does not exhibit The Hubble Law as we have measured it between two spatial positions. Only the temporal component of Special Relativity shows velocities to be increasing as dimensional distance grows as well. Because the temporal dilation equation is inverted with respect to the linear dimension of time, it will maintain a linear growth with velocity that matches the constraint that sum of their squares must remain a constant unity.

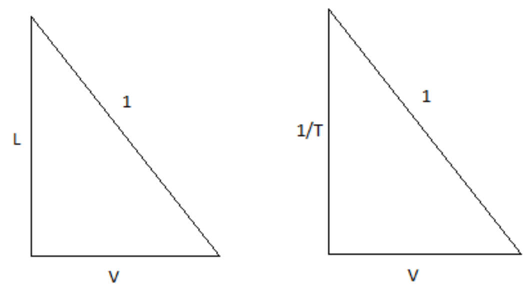

Fig 1: The Hubble Law

7.8 Pythagorean Triples defining particle-particle observation

If we were to create a space whose orthogonal base dimensions were space and time, then two particles represented as two points in this space would each have an intrinsic temporal component, an intrinsic spatial component, *and* an intrinsic velocity. By setting one of them to have components equal to the unit vectors of this space, at position (1,1), then Special Relativity tells us that measurements taken between the particles *of their intrinsic dimensions,* are geometrically equivalent to Pythagorean Triples.

$$\left(\frac{L}{L_{Planck}}\right)^2 + \left(\frac{\frac{L}{T}}{\frac{L_{Planck}}{T_{Planck}}}\right)^2 = 1 \qquad \left(\frac{T_{Planck}}{T}\right)^2 + \left(\frac{\frac{L}{T}}{\frac{L_{Planck}}{T_{Planck}}}\right)^2 = 1$$

$$\left(\frac{L}{L_{Planck}}\right)^2 + \frac{\left(\frac{L}{L_{Planck}}\right)^2}{\left(\frac{T}{T_{Planck}}\right)^2} = 1 \qquad \left(\frac{T_{Planck}}{T}\right)^2 + \frac{\left(\frac{L}{L_{Planck}}\right)^2}{\left(\frac{T}{T_{Planck}}\right)^2} = 1$$

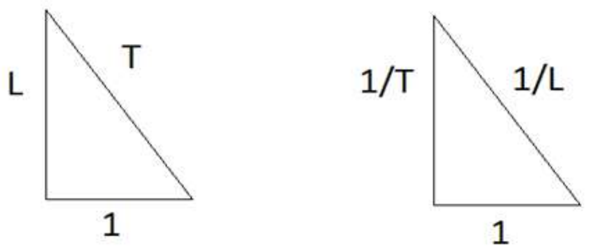

Fig 2: Dimensional Pythagorean Triples

7.9 Resolution of The Twin Paradox

Two observers moving at a relative velocity of B = v/c will naturally measure the ratio of two finite space lengths and two finite time intervals to be proportional to a singular factor of gamma. In other words, a relative velocity between two observers denotes an intrinsic ratio (gamma) that occurs between any two finite lengths, be they spatial, temporal or mass like.

Between these two observers, there is an equivalence of reference frames, called “paradoxical” in the physical literature (The Twin Paradox). It is paradoxical because from either reference frame, there appears to be an equivalent perspective occurring from each observer’s rest frame, where they each measure the same relative motion between one another, even though a third party observer (a ground observer) measures only one particle to have undergone any sort of relativistic motion. One resolves the paradox by removing the third party observer, and noting that the equations themselves are only participatory of events measured between two relativistic positions only.

The equations of Relativity transcend any notion of an absolute reference frame, because any attempt to ascribe the relative velocity as an intrinsic negative to the proper frame is nullified by fact that the contraction and dilation equations only express dimensions in terms of squared dimensions (area), and squares of the relative velocity.

$$1 = \beta^2 + \left(\frac{L}{L_0}\right)^2 = \beta^2 + \left(\frac{T_0}{T}\right)^2 = \beta^2 + \left(\frac{M_0}{M}\right)^2$$

By releasing the physical interpretations from any notion of absolute reference frames, then the higher truth remains to be that from either observer’s inertial reference frame, they consider themselves to be at rest and the relative particle to be in motion. It is impossible for an observer to measure a relative velocity between itself and another observer, and not measure its own reference frame to be at rest, because to do otherwise would require a third reference frame (which we call “ground”) from which to measure a relative velocity.

8. MLT SPACE

A space whose orthogonal base vectors are equal to the base dimensions of universal phenomena (MLT-et) is one in which we can compose all the observable attributes of a single particle by assigning it a position in this space. It is natural to take temperature and charge to be imaginary (ninety-degree) rotations of mass and time, but we reserve these deliberations for another time, and focus solely upon a space spanned by the fundamental dimensions of mass, space, and time.

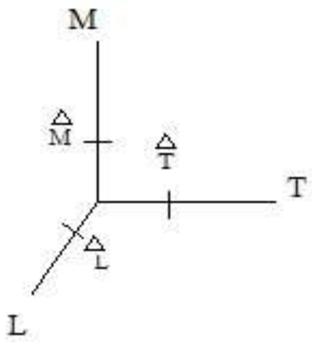

Fig 3: MLT Space

If we take two sets of dimensional coordinates in MLT Space, and implement Special Relativity upon the relationships that two points have with one another, we find a staggering result. By measuring the base dimensions in the same unit system, say the natural units, for instance, then we notice that any division of the relative set to the base set (the proper frame) will cancel the units, and leave only the magnitude of the relative dimension. For example, an observer at 5 natural units of mass divided by the length of a proper observer's mass yields 5/1 = 5, which is simply the length of the relative particle's mass *from the origin.*

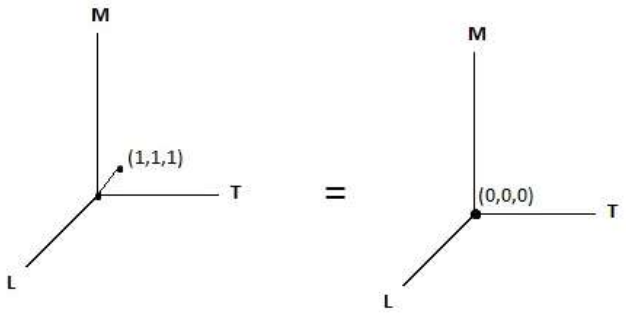

Fig 4: Unitary Dimensions in Special Relativity

Notice how relative velocity and relative dimensional magnitudes in Special Relativity are divisions and not subtractions. The velocity of a particle relative to the Planck Velocity is the division of these two quantities, and not their difference. The relative and proper lengths in length contraction are not relative to one another as one being larger by some difference (proper length minus relative length), but rather relativity of the two magnitudes are divisions of the two – a fraction we call gamma – yielding the resulting magnitude to be in *units of the proper length*.

This subtle point is greatly illuminating, and is expressive of the true nature of relative observers being only relative between themselves. Because two isolated observers must intrinsically measure their proper frame to be one of naught for velocity, as well as all dynamical attributes, the mathematical expressions encapsulating this notion are ones that only measure the properties and dimensions of the relative particle relative to zero for all. By assigning the proper frame dimensions set equal to unity, and measuring the dimensions of the relative system in the same units, then the fractions one finds in Special Relativity conform to the interpretation that one is measuring the relative particle relative to the origin, where the rest mass of a particle is zero in its own proper frame, when it is observing *only* a single other particle.

The relative length divided by the proper length, where the proper length has been set equal to one, equals the magnitude of the relative length in full, as if the proper length was equal to zero. This is a consequence of the isolation of two observers as being relative only between them.

A particle's dynamic properties are describable in full,simply by assigning it three intrinsic base dimensions of MLT, and then building up its compound properties from there. The key to understanding MLT Space, is to understand that between any two isolated observers, one will always place itself as having natural units equal to unity for its own properties, and the relative observer will have its own integrated set of units.

In MLT Space, one defines the notion of an observer or particle to be at rest with respect to another position in Special Relativity, by assigning unit coordinates for its dimensions.

$$\frac{T_0}{T} = \frac{1 * T_{Planck}}{T * T_{Planck}} = \frac{1}{T}\frac{L}{L_0} = \frac{L * L_{Planck}}{1 * L_{Planck}} = L$$

When one unitizes the relative elementary properties of a real particle (gravitational flux, electric flux, mass, spin, thermodynamic temperature, etc.), then the base dimensions of that unit system are all that is required to construct the dynamical and observable properties of that particle. Those base dimensions are inherently subject to the observational modifications of base dimensions given by Special Relativity. The act of unitizing a particle's properties is necessary when boosting to a true proper frame, where any third party ground measurements are no longer relatable.

Special Relativity relates these observational laws in terms of dimensional areas, and not linear dimensions themselves. The proper lengths are taken as unity, which leaves the relative lengths as full expressions of their positions in MLT Space, as shown above. This means that true observations between one quanta and another, upon unitizing all observable properties to denote a true proper frame, are bound in simple 2D areas, shown to be the famous Pythagorean Triples. The triples found in Relativity then bind the observable transitions that particles can make in the universe. A relativistic separation in space between two particles is intimately tied with their temporal and mass separation. By changing positions in one dimension, they are forced to change positions in the other dimensions, automatically.

The Planck Unit system can be conformed to the base dimensions describing the intrinsic properties of a real particle, because we are always free to boost to a frame that renders these dimensions to be unity anyways, and thus it is strictly advantageous to assign the natural units to the proper frame of a single particle. We take it as axiomatic to include mass as a linear dimension because its relativistic behavior is equivalent to that of space and time and we note that relativistic momentum and energy are nothing more than relativity of mass scaled by factors of c, and so only the base dimensions of universal phenomena are experiencing relativity of observation. Thus, we extend the notion of a particle occupying a relativistic position to include a component for mass as well as time and space.

$$\frac{L}{L_0} = \sqrt{1-\beta^2}\frac{T_0}{T} = \sqrt{1-\beta^2}\frac{M_0}{M} = \sqrt{1-\beta^2}$$

The only reason that the three base dimensions MLT are not all the same in their relativistic behavior (mass and time are inversely relativistic to space) is that we define the relative attribute separating the particles to be of the form L/T. If we defined velocity to be a relativity of T/M, where these two dimensions are still the intrinsic properties of free elementary particles, then the relativity of dimensions would be of a similar, but different form than the former, because the particles are not observing one another to be relative in the dimensions of length and time in this case, but rather time and mass instead:

$$\frac{T}{T_0} = \sqrt{1-\beta^2}\frac{M_0}{M} = \sqrt{1-\beta^2}\frac{L_0}{L} = \sqrt{1-\beta^2}$$

Beta is now of the form T/M, whereas the first generation form is of the form L/T, denoting the speed of light as space per time. Here we have extended relativity to include relative dimensions that take mass as a relativistic position in a singular linear dimension, which we place at right angles to space and time. Motivation for this extension comes from the evidence that Special Relativity modifies the base dimensions MLT to include relativistic effects occurring at high velocity.

The second-generational velocity in MLT space is of the form M/L. It too has its own unique set of relative dimensions dictated by two observers sharing a relative velocity of this form. Because free particles only carry with them three intrinsic properties, an orthogonal vector space spanned by these properties as base vectors is no different from any other three base dimensions, if we are to infer that relativity of base dimensions is an intrinsic property of the universe in general.

$$\frac{M}{M_0} = \sqrt{1-\beta^2}\,\frac{L_0}{L} = \sqrt{1-\beta^2}\,\frac{T_0}{T} = \sqrt{1-\beta^2}$$

An equating of the gamma factors holds for two observers with a relative velocity of form L/T. We extend this equality to include the three dimensions of Special Relativity:

$$\sqrt{1-\beta^2} = \frac{L}{L_0} = \frac{M_0}{M} = \frac{T_0}{T}$$

This equation holds for any two observers with a relative velocity of L/T. If we assign two observers intrinsic mass, length (space) and frequency, then we could see how a simple separation in MLT Space of relative velocity would affirm the above equation to a relevant system. The above equation separates into three distinct constraints as follows:

$$M_0L_0 = MLL_0T_0 = LT \qquad MT_0 = M_0T$$

For any two observers, measurements of mass, length, or time will always naturally come in pairs (one set for each observer), and in MLT Space the measurements are bound to the relative measurements of the other base dimensions intimately. We know thus far, that for any two observers, any measurements made upon a mass or length, or time is constrained by Relativity in terms of areas.

9. BLACK HOLES IN MLT SPACE

The length of a black hole's entropic radius (R/2) as being directly equivalent to the length of its mass suggests that black holes hold a unique position in relativistic space. Rewriting the simplified Schwarzschild Radius to illuminate a ratio of dimensions in this space, we note that it is not dissimilar to the relativity of base dimensions found in Special Relativity.

$$\text{Schwarzschild Radius: } \frac{l}{L_{Planck}} = \frac{m}{M_{Planck}}$$

$$\text{Special Relativity: } \sqrt{1-\frac{v^2}{c^2}} = \frac{L}{L_0} = \frac{M_0}{M}$$

Note that the relativistic positions for black holes is not present between two observers sharing a relative velocity of the first generation (L/T). The black hole condition shown within The Schwarzschild Radius is only present when two observers are relative in the dimensions of the third generational form, T/M.

$$\text{Relativity } \left(\beta \equiv \frac{T}{M}\right)\text{: } \frac{L}{L_0} = \frac{M}{M_0}$$

This shows that in MLT space, the plane formed by the axes of time and mass are invariant in terms of the gravitational force. One may place a rotating phasor in this plane, defining the relativistic position of all black holes, and the natural force dictated by the dimensions that this phasor passes through will remain invariant with respect to the natural force of gravity. This is the *only* invariant amongst any forces dicated by these relativistic extensions.

$$F_G = G \cdot \frac{M^2}{L^2} = G \cdot \frac{{M_0}^2}{{L_0}^2}$$

The spin of an elementary particle is then equal to the quotient of the entropic surface area of its correspondingly-massed black hole and its third generational velocity.

$$\mathrm{v_T} = \frac{\mathrm{T}}{\mathrm{M}} \qquad \mathrm{h} = \frac{\mathrm{L}^2}{\mathrm{v_T}}$$

Black hole area is equal to 4π times the product of its mass and entropic radius. The radius of a black hole is equivalent to its mass in natural dimensions, and so we can define two orthogonal dimensions upon the flat surface face of the event horizon called mass and space. Measurements of the area contained within the great circle of the black hole's event horizon would still conform to the dimensions of this vector space. We have shown that time, taken to be the dimension describing a black hole's depth, would conform to the interpretation that a measurement of a gravitational field at any point within the black hole, would be equal to its Hubble Velocity as taken from its geometric center, per the temporal displacement from the center.

Because the simplified Schwarzschild Radius shows mass and length to be equivalent vectors, imposing ML space upon the event horizon of a black hole is quite natural. The radius defining the depth to the black hole's center would also be of equivalent magnitude, all orthogonal base dimensions just being radii about the black hole's center in three-dimensions. The Hubble Law has been shown to conform to the interpretation that time is the linear depth between two universal points experiencing linear growth in velocity with respect to separation distance. Because the depth of a black hole's gravitational well is infinity, The Hubble Law, when applied to the center of a black hole, conforms to the geometry that as one reaches an infinite distance from the black hole's center (at the surface of the entropic sphere), velocities will go to unity and three-dimensional objects will reduce to area. Thus, in order to be consistent with the Hubble nature, time *must* be the linear dimension denoting a black hole's depth, and thus the volume of a black hole (or a particle's Gaussian Sphere), is simply equal to MLT, where each dimension is intrinsically unitary in their own proper frame.

The spin then can be defined with respect to this volume through the gravitational field of the black hole or particle. The gravitational field of a black hole or particle in MLT Space would then be symmetrically broken with spin, as the dimensions of MLT (intrinsic to the particle) are its only defining properties in this space. Unification of the three dimensions of a particle (equal the ratio of its spin to its gravitational field), is similar to how the three free-space field constants, when also multiplied together, are equal to the invariant ratio of a black hole's length to its mass.

$$\mathrm{h} = \vec{\mathrm{g}} \cdot \mathrm{MLT} \qquad \mathrm{G}\mu_0\varepsilon_0 = \mathrm{l/m}$$

10. CONCLUSIONS

The equations built from simple physical units and their symmetry are the most honest in physics. They relate to no one system for the same reason that they relate to every system. Each equation that employs the physical unit system (all physics equations), has at its core a unit structure. The relationships between the units themselves are very elegant, symmetrical, and quite beautiful to behold. Devoid of philosophical and empirical interpretation, all physical equations are no more than compound dimensions with non-absolute magnitudes.

The units are the fundamental dimensions of the universe (MLT), that Special Relativity tells us are no more than orthogonal linear dimensions (lines or information bits), and have lengths that are not absolute in magnitude, but rather are *relative to the dimensions of the observer.* Because there are an infinite number of relative magnitudes from which observers can position themselves, finite lengths become non-absolute, in the sense that dimensions are only finite relative to other dimensions.

Dimensions are intrinsic properties of the universe, in that the pieces of the universe are no more than geometric configurations relative to their own geometric configuration. Mass, length, time, charge and temperature are linear and aerial dimensions. Particles, fields, and all physical phenomena are nothing more than geometric shapes. The geometry that Special Relativity dictates for the base dimensions MLT is elucidated by constructing a three dimensional space whose orthogonal base units are mass, length and time. A point in this space is a "particle" and its dimensions, when compounded, create its dynamical, thermodynamic, and intrinsic properties. A relative particle then, positioned at a different mass, length and time, has different energy, velocity, gravitational flux, etc.

The reason why this is possible is because all of the real particles in the universe (the elementary quanta), when released from their nuclear bonds and taken to a quantum mechanically free state, only retain three properties: mass, charge and spin. Thus, a particle with mass, charge, gravitational flux, thermodynamic temperature, velocity, electric flux, *total* energy, momentum, and intrinsic entropy (total energy divide thermodynamic temperature) can have all its properties set equal to unity, thus creating an independent unit system, from which one can extrapolate a set of units, all based upon the properties of the particle itself.

It is interesting to find a unification of fields resting in forces outside of the natural paradigm. From here, we suggest that the philosophy of unification with respect to the nuclear forces be looked upon as a finite reflection of these infinite range forces. The next natural course of action will be to place the elementary particles in MLT Space, and determine their geometric relationships with one another. As for the Strong and Weak Nuclear Forces, we conjecture that they are mirroring the Electric and Magnetic Forces, respectively, although that is just an intuition.

The undeniable applicability and potential for MLT Space cannot be overstated. Momentum Space holds such bountiful value to science and physics that one can only imagine the possibilities of an even further simplification, straight to the heart of the physical dimensions themselves. As for testing any theories of Quantum Gravity, MLT Space (and the simplified velocity of a particle at thermal equilibrium) provides a new gateway for testing high-energy particle physics at low temperature. In taking mass to be an orthogonal dimension, and thus extending relativity as shown, one is now free to boost to frames where the relative properties of particles define the same conditions one finds at high energy. We have devised the basis for a theory consisting of a “relativistic chain,” wherein one parameterizes an observation based upon a compounding of gamma factors.

We are now in a position to quantize the geometry of black holes with respect to their infinite range parameters. The fact that we can now numerically quantify both the size and number of gravitational field lines from both particles and black holes, based upon their pixel content, means that we are able to quantify the gravitational, electrical, and magnetic evolution of a system based upon the allowable number of connections they have. Because the number of field lines are now finite and countable for black holes, black hole interaction is just a maximum number of allowable transition states with which to bind with other field lines. The state of highest entropy would thus dictate a black hole seeking to find its lowest energy state by increasing its number of field lines at all times, in order to continuously maintain the net force upon it at zero.

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