Characterization of the Minkowski Matrix

(and full expansion of mass and Electromagnetism)

(and other topics)

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Reference PDF's

Proof of Fermat's Last Theorem

Proof of Goldbach's Conjecture

Goldbach's Conjecture (relation to vectors/matrices/STR

The Relativistic Unit Circle

Lines and Circles (and the Pauli Matrices)

The Schrodinger Equation (In progress)

ScratchPad (Notes to myself)

Lie Groups and the Pauli Matrices

(Note: This document started originally as a discussion of the Minkowski Matrix (soon to be revised/ updated) but has become my working document with a number of topics not yet arranged in order. (But I have now provided links to the topics below)

Document Links

Space and Time

The Interaction of Light with Matter

The "Wave" Equation

Counting

Light Propagation

The Pauli Matrices

Quarks and Fermat's Theorem

General Energy Equation

Quantum Triviality **(Wikipedia)**

Absorption and Radiation in the Relativistic Unit Circle

An Imaginary Relativistic Derivative

String Theory

Update: 1/2/2020, 1/3/2020, 1/4/2020, 1/5/2020, 1/6/2020, 1/7/2020,1/8/2020, 1/13/2020, 1/19/2020, 1/25/2020, 1/26/2020, 1/27/2020, 1/28/2020, 1/29/2020, 1/30/2020, 1/31/2020, 2/1/20202,2/2/2020,2/3/2020, 2/4 2020, 2/5/2020, 2/6/2020,2/7/2020,2/9/2020,2/10/2020, 2/11/2020, 2/14/2020,2/20/2020, 5/13/2020, 5/28/2020, 6/19/2020

Brief comments (to be inserted in context and possibly revised when I get time. I may put them at the end at some point.

1. Since the condition $(c\tau')^2 = 0$ is the condition for even numbers, then $(c\tau')^2 \neq 0$ must be the condition for odd numbers, so that $\left(\frac{\tau}{\tau}\right)^2 = 1^2$ and $\left(\frac{\tau'}{\tau'}\right)^2 = (1')^2$ are the bases for the initial state and final state, respectively (in a single dimension, for a single physical system).
2. Pauli Matrices - The Pauli matrices are not complete, since they do not include the identity matrix $|I| = \begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix}$ where $Tr|I| = 2$, and therefore the dot product where

$$I^2 = \begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix}^2 = \begin{vmatrix} \vec{1}\cdot\vec{1} & 0 \\ 0 & \vec{1}\cdot\vec{1} \end{vmatrix} = \begin{vmatrix} 1^2 & 0 \\ 0 & 1^2 \end{vmatrix}$$, where $Tr(I^2) = 1^2 + 1^2 = 2(1^2)$ or the cross product

$$\begin{vmatrix} 1 \\ -1 \end{vmatrix} \otimes \begin{vmatrix} 1 \\ 1 \end{vmatrix} = \det\begin{vmatrix} 1 & 1 \\ -1 & 1 \end{vmatrix} = 2(1^2)$$ and where

$\varphi = 1+1$

$\varphi^2 = (1+1)^2 = \left(1^2+1^2\right)+2(1^2) = Tr(I^2)+\left|\frac{1}{-1}\right| \otimes \left|\frac{1}{1}\right| = Tr(I^2)+\det\begin{vmatrix} 1 & 1 \\ -1 & 1 \end{vmatrix}$. where the cross product is identified as h^2 as the interaction term.

Therefore, Pauli (and Dirac) are inconsistent with the full expansion of the interaction equation:

$$ct' = ct + vt'$$

$$(ct')^2 = (ct)^2 + (vt')^2 + 2(ct)(vt')$$

, where $2(ct)(vt') = h^2$

3. Derivative

   The expanded derivative for two particles should be redefined as

$$f'(c\tau)^2 = \frac{df(c\tau')^2}{d\left(c\tau\right)^2} = \lim_{(v\tau')\to 0} \frac{f\left[(c\tau)^2+\left(v\tau'\right)^2+2\left(c\tau\right)\left(v\tau'\right)\right]-f(c\tau)^2}{\left[(v\tau')^2+2\left(c\tau\right)\left(v\tau'\right)\right]}$$

   , which will be different depending on whether the context is radiation ($\frac{\tau'}{\tau}, \frac{v}{c} < 1$) or or absorption $\frac{\tau'}{\tau}, \frac{v}{c} > 1$

4. Complex Plane

   The complex plane should be characterized by the Cartesian pair $(\left|\sqrt{x}\right|, \left|\sqrt{y}\right|, -i, i)$, so that $\psi\psi^* = \left(\sqrt{x}+i\sqrt{y}\right)\left(\sqrt{x}-i\sqrt{y}\right) = |x|+|y|$ for positive definite conjugation (i.e., positive real numbers only).

5. Even and Odd numbers (Fermat's Theorem for the case $n=2$)

   Consider the relation $|\mathbb{Z}| = \{Even\}+\{Odd\}$

   Then

$$|\mathbb{Z}|^2 = \left[\{Even\}+\{Odd\}\right]^2 = \{Even\}^2+\{Odd\}^2+2\{Even\}\{Odd\}$$

$$|\mathbb{Z}|^2 = \{Even\}^2+\{Odd\}^2 \Leftrightarrow 2\{Even\}\{Odd\} = 0$$

$$2\{Even\}\{Odd\} \neq 0$$

$$|\mathbb{Z}|^2 \neq \{Even\}^2+\{Odd\}^2$$

From the RUC, $\gamma^{2} = 1^2 + \left(\beta\gamma\right)^2 + 2\beta\gamma,\ \beta\gamma > 1$

Since this is complete under the positive integers $|\mathbb{Z}| \in |\mathbb{R}|$,

$\gamma^{2} - 2\beta\gamma = 1^2 + \left(\beta\gamma\right)^2 = \{odd\}$ and under the condition $\gamma^2 = \left(\frac{c\tau'}{c\tau'}\right)^2 = 0$,

$1^2 + \left(\beta\gamma\right)^2 + 2\beta\gamma = 0$ That is, either both $1^2 + \left(\beta\gamma\right)^2$ and $2\beta\gamma = 0$ or

$\left[1^2 + \left(\beta\gamma\right)^2\right] - |2\beta\gamma| = 0$. Since $2\beta\gamma = 0 \Leftrightarrow 1^2 = 0$ and $1^2 \neq 0$, then $\left[1^2 + \left(\beta\gamma\right)^2\right] = |2\beta\gamma|$

But $\dfrac{1^2}{2\beta\gamma}$ is not a positive integer so integer division is not valid under this constraint, and

therefore $\left(\beta\gamma\right)$ and $\left(\beta\gamma\right)^2$ are prime numbers

(Note that $\log_{\beta\gamma}\left(\beta\gamma\right) = 1_{\beta\gamma} \neq \log_{\beta\gamma}\left(\beta\gamma\right)^2 = 2_{\beta\gamma}$)

6. **The Uniqueness of Unity**

The expression for unity must be defined uniquely for each group (and their elements) as:

$$A = A \leftrightarrow 1(A) \triangleq \frac{A}{A},\ 1(A) = 1(B) \Leftrightarrow A = B$$
$$\left[1(A)\right]_A = \log_A(1(A)),\ \left[1(A)\right]_A = \left[1(A)\right]_B \Leftrightarrow B = A$$

7. Electromagnetism

$$c\tau' = c\tau + v\tau'$$

$$(c\tau')^2 = (c\tau)^2 + (v\tau')^2 + 2(c\tau)(v\tau')$$

$$\mu_0 E = \varepsilon_0 E + \mu_0 B$$

$$(\mu_0 E)^2 = (\varepsilon_0 E)^2 + (\mu_0 B)^2 + 2(\varepsilon_0 E)(\mu_0 B)$$

Radiation

$$1^2 = \left(\frac{\varepsilon_0}{\mu_0}\right)^2 + \left(\frac{B}{E}\right)^2 + 2\frac{(\varepsilon_0)(B)}{(\mu_0)(E)} \triangleq \cos^2\theta + \sin^2\theta + 2\cos\theta\sin\theta$$

$$1^2 = \frac{1}{\gamma^2} + \beta^2 + 2\frac{\beta}{\gamma},\ h^2 \triangleq 2\frac{\beta}{\gamma}$$

Absorption

$$\frac{(\mu_0 E)^2}{(\mu_0 B)^2} = \frac{(\varepsilon_0 E)^2}{(\mu_0 B)^2} + 1^2 + \frac{2(\varepsilon_0 E)}{(\mu_0 B)} = 1^2 + \frac{(\varepsilon_0 E)^2}{(\mu_0 B)^2} + \frac{2(\varepsilon_0 E)}{(\mu_0 B)}$$

$$\left(\frac{E}{B}\right)^2 = 1^2 + \frac{(\varepsilon_0)(E)^2}{(\mu_0)(B)^2} + 2\frac{\varepsilon_0}{\mu_0}\frac{E}{B} \triangleq \cosh^2\theta = 1^2 + \sinh^2\theta + 2\cosh\theta\sinh\theta$$

$$\gamma^2 = 1^2 + (\gamma\beta)^2 + 2\beta\gamma,\ h^2 \triangleq 2\beta\gamma$$

Note: θ is a function of perturbation parameters $\frac{B(\theta)}{E} \triangleq \frac{v(\theta)}{c}$ for signal/sensor localized at $E \triangleq c$ invariant for the local "vacuum"; so the interaction in its simplest form is a $\frac{1}{r^2}$ function of position multiplying the interaction so that $h_r{}^2 \triangleq \frac{1}{r^2} h^2$

8. (From proof of Fermat's last theorem)

$$\left|M_{\exists}\right| \triangleq \begin{vmatrix} a & b \\ -b & a \end{vmatrix}$$

$$Tr\left|M_{\exists}\right| = 2a$$

$$\det\left|M_{\exists}\right| = a^2 + b^2$$

$$\left|M_{\otimes}\right| \triangleq \begin{vmatrix} a & a \\ -b & b \end{vmatrix}$$

$$\det\left|M_{\otimes}\right| = 2ab$$

$$Tr\left|M_{\otimes}\right| = a + b$$

$$\varphi = a + b = Tr\left|M_{\otimes}\right|$$

$$\varphi^2 = a^2 + b^2 + 2ab = \det\left|M_{\exists}\right| + \det\left|M_{\otimes}\right|$$

(End of brief additional comments..)

(Beginning of Topics)

Existence and Interaction

$|1| = \left(\sqrt{1}\right)^2$

The matrix $|M| = (|1|,|1|) \triangleq \begin{vmatrix} |1| & 0 \\ 0 & |1| \end{vmatrix}$ means that two particles exist $Tr(|1|,|1|) = 2$ but do not interact $\det\left(|1|,|1|\right) = 0$.

The matrix $\left(|1|,-|1|\right)$ means the two particles are equal, where $Tr(|1|,-|1|) = |1| - |1| = 0$ but do not interact $\det\left(|1|,-|1|\right) = 0$

The matrix $\left(|0|,|0|\right)$ means there are no particles, and therefore nothing interacts.

The matrix $|M| = \begin{vmatrix} 1 & 0 \\ 0 & 0 \end{vmatrix}$ or $|M| = \begin{vmatrix} 0 & 0 \\ 0 & 1 \end{vmatrix}$ means there is only one particle where $Tr(|M|) = 1$

The matrix $|M| = (1^2, 1^2) = \begin{vmatrix} 1^2 & 0 \\ 0 & 1^2 \end{vmatrix}$ means that there are two particles satisfying Newton's Third Law with equal and opposite forces $Tr|M| = (1^2 + 1^2) = 2\left(1^2\right)$, but that neither interacts with the other .

$|M|^2 = ((1+1)^2, (1+1^2)) = \begin{vmatrix} (1+1)^2 & 0 \\ 0 & (1+1)^2 \end{vmatrix} = \begin{vmatrix} \left(1^2+1^2\right) + 2(1)^2 & 0 \\ 0 & \left(1^2+1^2\right) + 2(1)^2 \end{vmatrix} = \begin{vmatrix} 4 & 0 \\ 0 & 4 \end{vmatrix}$ where $\left(1^2+1^2\right)$ characterizes the existence of the particles/fields $2(1)^2$ represents their interaction energy.

Matrix Formulation of "Special Theory of Relativity"

The (positive definite) existence of the mass of a single particle/field $m_c = \left(\sqrt{m_c}\right)^2$ in its initial state is represented by its one dimensional matrix

$$\left|(m_c)\right| = \left|(c\tau)\right| \Leftrightarrow \left|(m_c)\right|^2 = \left|(c\tau)\right|^2 = \left|(c\tau)^2\right|$$

which is parameterized to represent a "mass creation rate" c and a "mass creation" time τ , where the second order self energy. ((n the context of Newton, the first order expression can be interpreted as the momentum of the particle $P = m_c c$ at a unit velocity $c = 1$, and the second order equivalence as an example of Newton's Third Law)

(Some suggest that this should be interpreted as $x_0 = c\tau$ as a "ruler creation rate" and a "ruler creation time" but a problem arises with the second order term.)

A second independent particle $\left|(m_v)\right| = \left|(v\tau')\right| \Leftrightarrow \left|(m_v)\right|^2 = \left|(v\tau')\right|^2 = \left|(v\tau')^2\right|$ with v and τ' interpreted in a similar manner.

If the particles do not interact, then they can be represented by a two-dimensional matrix

$$\begin{vmatrix} (c\tau) & 0 \\ 0 & (v\tau') \end{vmatrix} \Leftrightarrow \begin{vmatrix} (c\tau)^2 & 0 \\ 0 & (v\tau')^2 \end{vmatrix}$$ as vectors $\left[(c\tau),(v\tau')\right]$ where

$Det\begin{vmatrix} (c\tau)^2 & 0 \\ 0 & (v\tau')^2 \end{vmatrix} = 0,\ Tr\begin{vmatrix} (c\tau)^2 & 0 \\ 0 & (v\tau')^2 \end{vmatrix} = (c\tau)^2 + (v\tau')^2$. Here the trace of the matrix establishes the existence of the particles (under addition), and the determinant is a model of their interaction (under multiplication), which is equal to 0 if there is no interaction.

However, if there is interaction, the system is characterized by a single valued function ("particle") $(c\tau')$ which is composed by a single parameter of each element contributing to the interaction, and the first order expression ("existence") is represented by the relation $(c\tau') = (v\tau') + (c\tau)$

The interaction is represented by the single valued function

$(c\tau')^2 = \left[(v\tau') + (c\tau)\right]^2 = (v\tau')^2 + (c\tau)^2 + 2(c\tau)(v\tau')$ (by the Binomial Expansion as a single valued function), where the non-interacting matrix has "collapsed" (i.e., "contracted") to represent the interaction, so that

$\left|(c\tau')^2\right| = \left|(v\tau')^2 + (c\tau)^2 + 2(c\tau)(v\tau')\right|$ as a vector in one dimension.

.

The matrix formulation of the Special Theory of Relativity can be represented by

$$|M| \triangleq \begin{vmatrix} (c\tau) & -(v\tau) \\ (v\tau) & (c\tau) \end{vmatrix},\ Det|M| = (c\tau)^2 + (v\tau')^2, Tr|M| = 2(c\tau)$$ and equated to

$$|M'| \triangleq |(c\tau')|^2,\ Det|M'| = 0, Tr|M'| = (c\tau')^2$$, so that

$$(c\tau')^2 = (c\tau)^2 + (v\tau')^2 \Leftrightarrow Tr|M'| = Det|M| \ .$$

Note that "existence" has been equated to "interaction", but $(v\tau')$ has not been included in $Tr|M| = 2(c\tau)$. Nevertheless, solving for τ' yields the so-called "time dilatation" equation for the Special Theory of Relativity.

$$\tau' = \tau \frac{1}{\sqrt{1-\beta^2}} = \tau\gamma_L,\ \gamma_L = \frac{1}{\sqrt{1-\beta^2}},\ \beta = \frac{v}{c}$$

Note that multiplying by c give the mass increase with "velocity" (second particle mass creation rate)

$m' = (c\tau') = (c\tau)\gamma_L = (m_c)\gamma_L$. Note that $\beta^2 = \frac{v^2}{c^2} = \frac{mv^2}{mc^2}$ which can be interpreted as an energy expression valid for all masses, so that γ_L can be interpreted as an increasing density from an invariant "rest mass" m_0 for $v < c$ but that $\sqrt{1-\beta^2}$ becomes imaginary for $v > c$ and that $m_0 = 0$ for $v = c$ ($x_0 = 0$ for $x_0 = c\tau$).

This is the matrix formulation of Special Theory of Relativity, However, it eliminates interaction between $(c\tau)$ and $(c\tau)$ by complex conjugation, where

$$\psi = (c\tau) + i(v\tau')$$
$$\psi\psi^* = (c\tau)^2 + (v\tau')^2$$

If there is no interaction between the two particles/fields the system is represented by the matrix

$$\begin{vmatrix} (c\tau) & 0 \\ 0 & (v\tau') \end{vmatrix}$$

However, this model is lacking the interaction term $2(c\tau)(v\tau')$, where

$$|M_h| \triangleq \begin{vmatrix} (c\tau) & -(c\tau) \\ (v\tau') & (v\tau') \end{vmatrix}$$ so that $Det|M_h| = 2(c\tau)(v\tau'),\ Tr|M_h| = (c\tau)+(v\tau')$

The complete model is then given by

$$\varphi \triangleq (c\tau') = \left[(c\tau)+(v\tau')\right]$$
$$\varphi^2 = (c\tau')^2 = (c\tau)^2 + (v\tau')^2 + 2(c\tau)(v\tau') = (c\tau)^2 + (v\tau')^2 + h^2,\ h^2 \triangleq 2(c\tau)(v\tau') \triangleq 2S^2$$

That is,

$$|M_f| \triangleq \begin{vmatrix} (c\tau') & 0 \\ 0 & (c\tau') \end{vmatrix} \Leftrightarrow |M_f|^2 = \begin{vmatrix} (c\tau') & 0 \\ 0 & (c\tau') \end{vmatrix}^2 = \begin{vmatrix} (c\tau')^2 & 0 \\ 0 & (c\tau')^2 \end{vmatrix}$$
$$\det|M_f|^2 = (c\tau')^2,\ Tr|M_f|^2 = 2(c\tau')^2$$

$$\left|M_{\exists}\right| \triangleq \begin{vmatrix} (c\tau) & 0 \\ 0 & (v\tau') \end{vmatrix} \Leftrightarrow \left|M_{\exists}\right|^2 = \begin{vmatrix} (c\tau) & 0 \\ 0 & (v\tau') \end{vmatrix}^2 = \begin{vmatrix} (c\tau)^2 & 0 \\ 0 & (v\tau')^2 \end{vmatrix}, Det\left|M_{\exists}\right|^2 = (c\tau)^2 (v\tau')^2, \; Tr\left|M_{\exists}\right|^2 = (c\tau)^2 + (v\tau')^2$$

$$S \triangleq \sqrt{(c\tau)(v\tau')}$$

$$\left|M_S\right| \triangleq \begin{vmatrix} S & 0 \\ 0 & S \end{vmatrix}$$

$$Det\left|M_S\right| = S^2, \; Tr\left|M_S\right| = S + S = 2S$$

$$\left|M_S\right|^2 = \begin{vmatrix} S & 0 \\ 0 & S \end{vmatrix}^2 = \begin{vmatrix} S^2 & 0 \\ 0 & S^2 \end{vmatrix} = \begin{vmatrix} (c\tau)(v\tau') & 0 \\ 0 & (c\tau)(v\tau') \end{vmatrix}$$

$$Tr\left|M_S\right|^2 = 2S^2 = 2(c\tau)(v\tau') = h^2$$

$$\left|M_f\right|^2 = Tr\left|M_{\exists}\right|^2 + Tr\left|M_S\right|^2$$

$$(c\tau)^2 = \left[(c\tau)^2 + (v\tau')^2\right] + 2(c\tau)(v\tau') = \left[(c\tau)^2 + (v\tau')^2\right] + h^2$$

$$\left|M_{\Delta}\right| \triangleq \begin{vmatrix} (c\tau) & (c\tau) \\ -(v\tau') & (v\tau') \end{vmatrix}, \; Tr\left|M_{\Delta}\right| = (c\tau) + (v\tau'), \; Det\left|M_{\Delta}\right| = 2(c\tau)(v\tau') = h^2$$

$$\left|M_f\right|^2 = Tr\left|M_{\exists}\right|^2 + Det\left|M_{\Delta}\right|$$

The $\{3,4,5\}$ Physical System

Consider a one-dimensional inertial physical system modeled by the (momentum/force/mass) matrix:

$$\left|\varphi_{c\tau}\right| = |3| \triangleq (c\tau) = m_0$$
$$Tr\left(\left|\varphi_{c\tau}\right|\right) = 3 \qquad ,$$
$$\det\left(\left|\varphi_{c\tau}\right|\right) = 0$$

where the energy is represented by Newton's Third Law of equal and opposite force as

$$\begin{aligned}
&\left|\varphi_{c\tau}\right|^2 = \left|3\right|^2 = \left|9\right| \triangleq \left(c\tau\right)^2 = \left(m_0\right)^2 \\
&Tr\left(\left|\varphi_{c\tau}\right|^2\right) = 9 \\
&det\left(\left|\varphi_{c\tau}\right|^2\right) = 0
\end{aligned}$$

.

At some point, the system interacts with a second inertial system $\left|\varphi_{v\tau'}\right| = \left|4\right| \triangleq \left(v\tau'\right) = m_v$ with energy $\left|\varphi_{v\tau'}\right|^2 = \left|16\right| \triangleq \left(v\tau'\right) = m_v$, where the energy of the interaction is given by $\left|h\right|^2 = 2\left|3\right|\left|4\right|$. Then the final state is characterized by the matrix

$$\left(\varphi_{c\tau'}\right)^2 = \left(c\tau'\right)^2 = \begin{vmatrix} \left(c\tau\right)^2 & 0 & 0 \\ 0 & \left(v\tau'\right)^2 & 0 \\ 0 & 0 & 2\left(c\tau\right)\left(v\tau'\right) \end{vmatrix} = \begin{vmatrix} \left(3\right)^2 & 0 & 0 \\ 0 & \left(4\right)^2 & 0 \\ 0 & 0 & 2\left(3\right)\left(4\right) \end{vmatrix} = \begin{vmatrix} 9 & 0 & 0 \\ 0 & 16 & 0 \\ 0 & 0 & 24 \end{vmatrix}$$

$$= \begin{vmatrix} \left(c\tau\right)^2 & 0 & 0 \\ 0 & \left(v\tau'\right)^2 & 0 \\ 0 & 0 & h^2 \end{vmatrix},\ h^2 = 2\left(c\tau\right)\left(v\tau'\right) = 2S^2,\ S = \frac{h}{\sqrt{2}}$$

$$\begin{aligned}
&Tr\left(\varphi_{c\tau'}\right)^2 = 49 = \left(c\tau\right)^2 + \left(v\tau'\right)^2 + 2\left(c\tau\right)\left(v\tau'\right) = \left(c\tau\right)^2 + \left(v\tau'\right)^2 + h^2 \\
&49 = \left(3\right)^2 + \left(4\right)^2 + 2\left(3\right)\left(4\right) = 9 + 16 + 24 = (25) + (24),\ h^2 = 24
\end{aligned}$$

In “radial” coordinates:

$$\pi\left(\varphi_{c\tau'}\right)^2 = \pi(49) = \pi(7)^2 = \pi(3)^2 + \pi(4)^2 + 2\pi(3)(4)$$
$$= \pi(3)^2 + \pi(4)^2 + \pi(24)$$
$$= \pi(c\tau)^2 + \pi(v\tau')^2 + \pi h^2,\ h^2 = 24$$

A more complete discussion of this perspective is given in The Relativistic Unit Circle

(in “Cartesian” coordinates, the (“Spin”) interaction point $2(c\tau)(v\tau')$ is at the center of the RUC; in “radial” coordinates is at the circumference where $2\pi(c\tau)(v\tau') = (c\tau)\left[2\pi(v\tau')\right] = \left(r_{c\tau}\right)\left(C_{(v\tau')}\right) = h^2$, so the “spin” S is defined as

Cartesian Coordinates:

$$h^2 = 2(c\tau)(v\tau') = 2S^2$$
$$S \triangleq \frac{h}{\sqrt{2}}$$

Radial Coordinates:

$$h^2 = 2\pi S^2 = 2\pi\left(r_{c\tau}\right)\left(r_{v\tau'}\right)$$
$$S^2 = \left(r_{c\tau}\right)\left(C_{v\tau'}\right)$$
$$h^2 = 2\pi S^2$$
$$S \triangleq \frac{h}{\sqrt{2\pi}}$$

In second order, the equations can be modified by multiplying by π to characterize the interactions in “radial coordinates”.

The $\{3,4,5\}$ Physical System

For this system,

$$|\varphi_{c\tau}| = |3| \triangleq (c\tau) = m_0$$
$$Tr(|\varphi_{c\tau}|) = 3$$
$$\det(|\varphi_{c\tau}|) = 0$$

As before, but now $|\psi_{v\tau'}| = |3+4i| \triangleq |3+(v\tau')| = |3+m_v|$

so that $|\psi_{v\tau'}|^* = |3-4i| \triangleq |3-v\tau'| = |3-m_v|$, and

$$|\psi|^2 \triangleq |\psi_{v\tau'}||\psi_{v\tau'}|^* = |3+4i||3-4i|$$
$$\triangleq \begin{vmatrix} 0 & -|3+4i| \\ |3-4i| & 0 \end{vmatrix}$$
$$Tr\left(|\psi|^2\right) = 0$$
$$(c\tau')^2 \triangleq \det\left(|\psi|^2\right) = 3^2 + (4)^2 = (c\tau)^2 + (v\tau')^2 = 9 + 16 = 25$$

That is, $25 = 9 + 16$ and

$$(c\tau')^2 = (c\tau)^2 + (v\tau')^2$$

Solving the latter for τ' yields

$$\tau' = \tau\gamma,\ \gamma = \frac{1}{\sqrt{1-\beta^2}},\ \beta = \frac{v}{c}$$

Note that h^2 does not exist, and that for the impulse $\tau = 1$, τ' is the impulse response of the system γ
.

Goldbach's Conjecture (again)

Let $\{e\} \triangleq 2|\mathbb{Z}|$ be the set of positive even integers

Then $\{|o|\} = \{|e-1|\}$ is the set of positive odd integers

$$\frac{\{|o|\}}{\{|e|\}} \notin \{|\mathbb{Z}|\}$$
$$\frac{\{|e|\}}{\{|o|\}} \notin \{|\mathbb{Z}|\}$$

Therefore, $\{|e|\}$ and $\{|o|\}$ must be relatively prime and $|\mathbb{Z}| = \{|e|\} + \{|o|\}$ is complete.

$$\{|\mathbb{Z}|\} \triangleq \{|e|\} + \{o\}$$
$$|\mathbb{Z}|^2 = |e|^2 + |o|^2 + 2(|o||e|) = |p_1|^2 + |p_2|^2 + 2(|p_1||p_2|) = L = 2N$$

And Goldbach's conjecture is proved.

Consider the expression

$$(c\tau') = (c\tau) + (v\tau')$$
$$(c\tau')^2 = (c\tau)^2 + (v\tau)^2 + 2(c\tau)(v\tau')$$

This expression expresses the interaction between the variables $(c\tau)$ and $+(v\tau')$, and is complete in in the positive integers $\{c, v, \tau, \tau'\}$

Let $(c\tau')^2 = 0$

Then there is no interaction (multiplication) between c and τ', so either one of the integers in

$(c\tau)(v\tau') = 0$ or the numbers are prime (there is no distributive multiplication). (Any integer is prime if referred to its unit base.)

Then in the case where the numbers are prime, the relation between the operations of addition and multiplication are indicated in red and blue, respectively. Note that Goldbach's conjecture makes no assumption of powers of primes.

Then the absolute values of both sides of the equation are equal

$$\left(c\tau\right)^2+\left(v\tau\right)^2=-2(c\tau)(v\tau')$$
$$\left|\left(c\tau\right)^2+\left(v\tau\right)^2\right|=\left|-2(c\tau)(v\tau')\right|=2(c\tau)(v\tau')$$
$$p=c\tau,q=v\tau',p=c\tau,q=v\tau'$$
$$\left(p^2\right)=\left(c\tau\right)^2,\left(q^2\right)=\left(v\tau'\right),\left(p\right)=\left(c\tau\right),\left(q\right)=\left(v\tau'\right)$$

For $\left\{p^2,q^2,p,q\right\}$ positive prime integers

$$Tr\left(\begin{vmatrix} p^2 & 0 \\ 0 & q^2 \end{vmatrix}\right)=p^2+q^2$$
$$\begin{vmatrix} p \\ -q \end{vmatrix}\otimes\begin{vmatrix} p \\ q \end{vmatrix}=2pq$$
$$L=p^n+q^m=2p^{n-1}q^{m-1}=2N$$

By fundamental Theorem of arithmetic $L=2N$ is uniquely expressible as a product of prime numbers, and so is complete for all integers, and Goldbach's Conjecture is again proven.

Consider the following expression, which includes the set of positive real integers),

$$(c\tau')^2=Tr\begin{vmatrix} N & 0 \\ 0 & N \end{vmatrix}+Tr\left|1\right|=\left\{2N\right\}+1=\left\{Even\right\}+1=\left\{Odd\right\}=Tr\begin{vmatrix} p^2 & 0 \\ 0 & q^2 \end{vmatrix}+1=\left\{L+1\right\}=\left|\mathbb{Z}\right|$$

This describes a complete non-interacting Universe (☺), say as a source at the edge (e.g. lhs) of Maxwell's displacement capacitor before radiation. When the system radiates, the remaining system becomes the noninteracting $\left\{Odd\right\}$ remainder of the source while the non-interacting even set propagates across the displacement:

$$(l.h.s.)$$
$$(c\tau')^2=\left[\left\{odd\right\}+\left\{even\right\}\right]\rightarrow$$
$$\left[\left\{Even+1\right\}\right]\rightarrow\left\{Even\right\}-----\left[\left\{1=h^2\right\}\right]------\rightarrow|$$
$$(r.h.s.)$$
$$\left[\left\{even\right\}+1\right]=(c\tau')^2$$
(and vice versa)

Upon arrival, the even set is absorbed by the $\left\{odd\right\}$ sensor on the rhs, conserving energy.

This means that Einstein's energy equation should be $\Delta E = h^2 = 2(c\tau)(v\tau')$ and not $E = h\nu = h\frac{c}{\gamma} = \frac{h}{\tau}$.

Since Note that although $\{odd\}$ and $\{even\}$ do not interact, the source $\left[\{odd\}+\{even\}\right]$ emits an an interaction term $\left[\{even = h^2\}\right]$ which is recovered by the sensor $\left[\{odd\}+\{even\}\right]$.

The Reality Metric

$|\mathbb{R}| = \left(\sqrt[4]{c\tau}, -\sqrt[4]{c\tau}, \sqrt[4]{v\tau'}, -\sqrt[4]{v\tau'}\right)$ where $|\mathbb{R}| = (1,-1,1,-1)$ for $c\tau = v\tau' = 1$.

Then $|\mathbb{R}|^2 = \left(\sqrt{c\tau}, \sqrt{c\tau}, \sqrt{v\tau'}, \sqrt{v\tau'}\right)$, where $|\mathbb{R}|^2 = \left(\sqrt{c\tau}, \sqrt{c\tau}, \sqrt{v\tau'}, \sqrt{v\tau'}\right) = \left(\sqrt{1}, \sqrt{1}, \sqrt{1}, \sqrt{1}\right)$, again where $c\tau = v\tau' = 1$, and finally,

$|\mathbb{R}|^4 = (c\tau, c\tau, v\tau', v\tau')$, where $|\mathbb{R}|^4 = (1,1,1,1)$ for $c\tau = v\tau' = 1$

Then $Tr\left(|\mathbb{R}|^4\right) = 4$ which corresponds to the expressions

$$\varphi = 1+1$$
$$\varphi^2 = (1+1)^2 = 1^2 + 1^2 + 2(1^2)$$

For $(c\tau)$ and $(v\tau')$ independent in the variables (c,τ) and (v,τ') , these expressions can be identified as

$$\varphi = (c\tau) + (v\tau')$$
$$\varphi^2 = \left[(c\tau) + (v\tau')\right]^2 = (c\tau)^2 + (v\tau')^2 + 2(v\tau')(c\tau)$$

Where $h^2 = 2(v\tau')(c\tau) = 2S^2$ is the interaction energy in Cartesian “coordinates” in the RUC, and in “radial” coordinates:

$$\pi\varphi^2 = \pi\left[(c\tau) + (v\tau')\right]^2 = \pi(c\tau)^2 + \pi(v\tau')^2 + \pi\left[2(v\tau')(c\tau)\right] = \pi\left[(c\tau) + (v\tau')\right]^2 = \pi(c\tau)^2 + \pi(v\tau')^2 + \pi h^2$$

Then $|\mathbb{R}|$ can be interpreted as four dimensions of mass, where c and v are mass creation rates, and τ and τ' mass creation times, so that $m_{c\tau} = c\tau$ and $m_{v\tau'} = v\tau'$

$|\mathbb{R}|^2$ can be interpreted as the characterization of equal and opposite (non-interacting) momenta where now τ and τ' are re-interpreted as masses so that $P_{c\tau} = (m_{c\tau})c = (\tau')c,\ \tau' \triangleq (m_{c\tau})$ and $P_{v\tau'} = (m_{v\tau'})(v) = (\tau')v,\ \tau' \triangleq (m_{v\tau'})$, and

$|\mathbb{R}|^4$ can be interpreted as energies where the independent pair

$(c\tau, v\tau')^2 = \left[(c\tau)^2, (v\tau')^2\right] \triangleq |E| = \begin{vmatrix} (c\tau)^2 & 0 \\ 0 & (v\tau')^2 \end{vmatrix}$, where $|E|$ characterizes the non- interacting “fields” $(c\tau)^2$ and $(v\tau')^2$, $Tr(|E|) = (c\tau)^2 + (v\tau')^2$ and $\det(|E|) = 0$

However, the interacting energies cannot be interpreted in matrix (linear) form in two dimensions, where the interaction must be characterized as the third dimension, and the RUC is characterized by radiation and absorption.

Radiation

In this case, the expression $(\varphi')^2 = (c\tau')^2 = [(c\tau)+(v\tau')]^2 = (c\tau)^2 + (v\tau')^2 + 2(v\tau)(c\tau)$ is divided by $(c\tau')^2$ so that $[\varphi_r(\gamma,\beta)]^2 = \frac{(\varphi')^2}{(c\tau')^2} = (1)^2 = \gamma^2 + \beta^2 + 2\frac{\beta}{\gamma}$, $\gamma = \frac{\tau'}{\tau}$, $\beta = \frac{v}{c}$, where $\left[h_{r,(\gamma,\beta)}\right]^2 = 2\frac{\beta}{\gamma}$, $\gamma^2 < 1^2$ and $\beta^2 < 1^2$ Then the radiation matrix for $0 < \beta^2 < 1^2$ is

$|E_r| = \begin{vmatrix} \left(\frac{1}{\gamma}\right)^2 & 0 & 0 \\ 0 & \beta^2 & 0 \\ 0 & 0 & 2\frac{\beta}{\gamma} \end{vmatrix}$, where $|E_r|$ characterizes a (decreasing) change due to radiation where

$Tr(|E_r|) = \varphi^2 = 1^2 = \left(\frac{1}{\gamma}\right)^2 + \beta^2 + 2\frac{\beta}{\gamma}$, where the colors indicate that the values have changed from the non-interacting case. Note that

$\left(\frac{1}{\gamma}\right)^2 + \beta^2 = \left(\frac{1}{\gamma}\right)\vec{i} \cdot \left(\frac{1}{\gamma}\right)\overleftarrow{i} + \left(\beta\vec{j}\right)\cdot\left(\beta\overleftarrow{j}\right) = \left(\frac{1}{\gamma}\right)^2\left(\vec{i}\cdot\overleftarrow{i}\right) + \beta^2\left(\vec{j}\cdot\overleftarrow{j}\right)$, where the opposing vector arrows indicate energy interaction, but that $h^2 = 2\frac{\beta}{\gamma}$ **is not an outer product**, since $\left(\frac{1}{\gamma}\right)^2\vec{i}$ and $\left(\beta^2\right)\vec{j}$ do not vanish during the interaction.

Absorption

In this case, the expression $(\varphi')^2 = (c\tau')^2 = \left[(c\tau)+(v\tau')\right]^2 = (c\tau)^2 + (v\tau')^2 + 2(v\tau)(c\tau)$ is divided by $(c\tau)^2$ so that $\left[\varphi_a(\gamma,\beta)\right]^2 = \frac{(\varphi')^2}{(c\tau')^2} = \gamma^2 = (1)^2 + (\gamma\beta)^2 + 2\beta\gamma$, $\gamma = \frac{\tau'}{\tau}$, $\beta = \frac{v}{c}$, where $\left[h_{a,(\gamma,\beta)}\right]^2 = 2\beta\gamma$, $\gamma^2 < 1^2$ and $\beta^2 > 1^2$ Then the absorption matrix for $1 < \beta^2 < \infty^2$ is

$$|E_a| = \begin{vmatrix} (1)^2 & 0 & 0 \\ 0 & (\gamma\beta)^2 & 0 \\ 0 & 0 & 2(\gamma\beta) \end{vmatrix}$$

, where $|E_a|$ characterizes an (increasing) change due to absorption

where

$Tr(|E_a|) = (\varphi_a)^2 = (\gamma)^2 = 1^2 + (\gamma\beta)^2 + 2(\gamma\beta)$, where the colors indicate that the values have changed from the non-interacting case. Note again that

$(1)^2 + (\gamma\beta)^2 = \left[(1)\vec{i}\cdot(1)\overleftarrow{i}\right] + \left[(\gamma\beta)\vec{j}\cdot(\gamma\beta)\overleftarrow{j}\right] = (1)^2\left(\vec{i}\cdot\overleftarrow{i}\right) + (\gamma\beta)^2\left(\vec{j}\cdot\overleftarrow{j}\right)$, where the opposing vector arrows indicate energy interaction, but that $\left[h_{a,(\gamma,\beta)}\right]^2 = 2\beta\gamma$ **is not an outer product**, since $(1)^2\vec{i}$ and $(\gamma\beta)^2\vec{j}$ do not vanish during the interaction $v > 0$.

Space and Time

Space and time can only be independent if they are characterized in Cartesian products as:

$(x,t) \Leftrightarrow \left(x^2, t^2\right)$ where $Tr(x^2, t^2) \triangleq Tr\begin{vmatrix} x^2 & 0 \\ 0 & t^2 \end{vmatrix} = x^2 + t^2$

However, $(x+t)^2 = x^2 + t^2 + 2(xt)$ which defines the interaction $h^2 \triangleq 2xt$ between space and time (i.e., gravity or anything else that is interacting)

Many Physicists (particularly Special Relativists and Cosmetologists) maintain that the Universe is somehow described by

$r = x + it \triangleq r + ir, r \triangleq t$
$r^2 = rr^* = (x+it)(x-it) = x^2 + t^2$
with imaginary numbers characterized by the color magenta as being in their fevered imaginations. (If you want to be persnickety, multiply the squared equations by π)

However, the proof of Goldbach'2 conjecture means they are removing the interactions +/- xt by conjugation which means they are only including even (interacting) numbers (x^2 + t^2) in their analyses, but not odd numbers (lone particles).

(Some Engineers have a misguided faith in cosmetologists).

Imaginary numbers are complex only for those who think they are somehow real.

Relativistic Change in Energy (entropy)

(**Radiation**)

ΔE is the difference between the initial state $(c\tau)^2$ and the final state $(c\tau')^2$

$$\tau' < \tau,\ v < c,\ \frac{1}{\gamma} = \frac{\tau}{\tau'} < 1,\ \ \beta < 1$$

$$\Delta E = h_r^{\,2} = (c\tau)^2 - (c\tau')^2 = 2(c\tau)(v\tau') = 2\frac{\beta}{\gamma}$$

$$h_r^{\,2} = 2|\cos\theta||\sin\theta|;\ \cos\theta = \frac{1}{\gamma} = \frac{\tau}{\tau'},\ \sin\theta = \beta = \frac{v}{c}$$

$$1^2 = \cos^2\theta + \sin^2\theta + h^2$$

$$1^2 = \left(\frac{1}{\gamma}\right)^2 + \beta^2 + 2\left(\frac{\beta}{\gamma}\right)$$

$$(h_r)^2 \triangleq 2(S_r)^2 = 2\frac{\beta}{\gamma}$$

$$S_r = \frac{h_r}{\sqrt{2}}$$

(**Absorption**)

$\Delta E = h_a^{\,2}$ is the difference between the initial state $(c\tau)^2$ and the final state $(c\tau')^2$

$$\tau' > \tau,\ v > c,\ \gamma = \frac{\tau'}{\tau} > 1,\ \ \beta > 1$$

$$\Delta E \triangleq h_a^{\,2} = (c\tau')^2 - (c\tau)^2 = 2(c\tau)(v\tau') = 2\beta\gamma$$

$$h_a^{\,2} = 2|\sinh\theta||\sinh\theta|;\ \cosh^2\theta = \gamma^2 = \left(\frac{\tau'}{\tau'}\right)^2,\ \sinh^2\theta = (\gamma\beta)^2 = \left(\frac{\tau'}{\tau}\frac{v}{c}\right)^2$$

$$\gamma^2 = 1^2 + (\gamma\beta)^2 + 2\beta\gamma = 1^2 + (\gamma\beta)^2 + h_a^{\,2}$$

$$\cosh^2\theta = 1^2 + \sinh^2\theta + h_a^{\,2}$$

$$(h_a)^2 \triangleq 2(S_a)^2 = 2\beta\gamma$$

$$S_a = \frac{h_a}{\sqrt{2}}$$

Limit on Unity Perturbation

(Unit basis approaches 0 with increasing perturbation on a “rest mass)

$$(c\tau')^2 = (c\tau)^2 + (v\tau')^2 + 2(c\tau)(v\tau')$$

$$\left(\frac{c\tau'}{v\tau'}\right)^2 = \left(\frac{c\tau}{v\tau'}\right)^2 + \left(\frac{v\tau'}{v\tau'}\right)^2 + 2\frac{(c\tau)(v\tau')}{(v\tau')^2}$$

$$\left(\frac{1}{\beta}\right)^2 = \left(\frac{1}{\beta\gamma}\right)^2 + \left(1_{\frac{1}{\beta\gamma}}\right)^2 + 2\frac{(1)}{(\beta\gamma)}$$

$$\left(\frac{1}{\beta}\right)^2 = \left(\frac{1}{\beta\gamma}\right)^2 + \left(1_{\frac{1}{\beta\gamma}}\right)^2 + 2\frac{(1)}{(\beta\gamma)}$$

$$\left(1_{\frac{1}{\beta\gamma}}\right)^2 = \left(\frac{1}{\beta}\right)^2 - \left(\frac{1}{\beta\gamma}\right)^2 - 2\frac{(1)}{(\beta\gamma)}$$

$$\lim_{\beta^2 \to \infty} \left(1_{\frac{1}{\beta\gamma}}\right)^2 = 0$$

Imaginary Time and Space (deconstruction of β)

If τ' is interpreted as a "time" coordinate, then γ is a coordinate "density" which increases with $\beta = \frac{v}{c}$. (It is worthwhile to deconstruct $\beta = \frac{v}{c}$ into its space and time components so that

$$\beta = \frac{v}{c} = \frac{x_v}{t_v}\frac{t_c}{x_c} .$$

Setting $x_v = x_c = 1$ so that $\beta = \frac{v}{c} = \frac{1}{t_v}\frac{t_c}{1} = \frac{t_c}{t_v}$ means that a light signal will light signal will travel a common distance at velocity c faster than one traveling at a velocity v (i.e., $t_v > t_c$ so the medium γ is more dense for t_v than for t_c. Alternatively, setting $t_v = t_c = 1$ means that a light signal traveling with a velocity v will cover a shorter distance in a common time than a light signal traveling at c (i.e., $x_v < x_c$

(No one can fault Pythagoras and Einstein from not having great **imaginations**.)

That said,

$$\psi = 1 + i$$
$$\psi\psi^* = (1+i)(1-i) = 1^2 + 1(i) - 1(i) + i^2 = 1^2 + 1$$

Note that

$$\log_1\left(1^2\right) = 2$$
$$\log_i\left(i^2\right) = 2 \neq \log_i\left(-1\right) = 1$$
$$\log_1\left(1^2\right) = \log_i\left(i^2\right) \neq \log_i\left(-1\right) = 1$$

That is, $(1,i)^2 = \left(1^2, -1\right)$ so $i^2 = -1$ corresponds to an **imaginary** momentum (one component of an "equal and opposite" force, which is a violation of the "principle of simultaneity".

Also that conjugation eliminates interaction between the real and complex numbers (in light of the fact that their logarithms are not equal).

$$|\Psi| = \begin{vmatrix} 1 & & & \\ & 1+i & & \\ & & 1+i & \\ & & & 1+i \end{vmatrix} = \begin{vmatrix} 1 & & & \\ & \psi & & \\ & & \psi & \\ & & & \psi \end{vmatrix}$$

$$|\Psi^*| = \begin{vmatrix} 1 & & & \\ & 1-i & & \\ & & 1-i & \\ & & & 1-i \end{vmatrix} = \begin{vmatrix} 1 & & & \\ & \psi^* & & \\ & & \psi^* & \\ & & & \psi^* \end{vmatrix}$$

$$|\Gamma| = |\Psi||\Psi^*| = \left(1^2, 1^2+1, 1^2+1, 1^2+1\right) = \left(0, 1^2, 1^2, 1^2\right) + (1^2, 1, 1, 1,) = \left(0, 1^2, 1^2, 1^2\right) + \left(1^2, -i^2, -i^2, -i^2,\right)$$

$$|\mathbb{R}_0| = \left(0, 1^2, 1^2, 1^2\right)$$

$$|\mathbb{R}_1| = \left(1^2, 1^2, 1^2, 1^2\right)$$

$$|\mathbb{C}_0| = (0, -i^2, -i^2, -i^2,) = (0, -i^2, -i^2, -i^2)$$

$$|\mathbb{C}_1| = \left(1^2, -i^2, -i^2, -i^2\right)$$

The Minkowsi Metric

A quaternion might be characterized by

$$|Q| = (1, i, j, k)$$
$$Tr|Q| = 1 + i + j + k$$

$$|Q| \triangleq \begin{vmatrix} 1 & & & \\ & i & & \\ & & i & \\ & & & i \end{vmatrix}$$

The form of a quaternion is characterized by

$$Tr(|Q|) = 1 + i(\vec{i}) + i(\vec{j}) + i(\vec{k})$$

The Minkowsi Metric (Wiki) would then be characterized by the matrix $|\eta|$, where

$$|\eta| = -|Q|^2 = (-1^2, -i^2, -i^2, -i^2) = (-1^2, 1, 1, 1) = (-1^2, 1, 1, 1)$$

That is,

$$|\eta| = \begin{vmatrix} -1^2 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{vmatrix}$$

(Sometimes I've seen the Minkowski Metric expressed as:

$$|\eta| = |Q|^2 = (1^2, i^2, i^2, i^2) = (1^2, -1, -1, -1),$$

which makes more sense to me physically (real energy, imaginary coordinates), where energy is second order (equal and opposite force), and the **coordinate system** characterizing the (first order) force has an **imaginary** (first order) basis.

A Second Perspective

Consider the Minkowski Metric:

$$|\eta| = \begin{vmatrix} 1 & & & \\ & (-1)_x & & \\ & & (-1)_y & \\ & & & (-1)_z \end{vmatrix}$$

This metric can be characterized as the basis in which each coordinate entry can be taken to be equal to the "radial" metric in turn, where, for example

$|\sigma_3|_i = \begin{vmatrix} 1 & 0 \\ 0 & -1_i \end{vmatrix}$ as the Pauli Matrix for $i=1$ (the "i" here is an index, not an imaginary number, where

$Tr(|\sigma_3|_i) = \begin{vmatrix} 1 & 0 \\ 0 & -1_i \end{vmatrix} = 0$, establishing for that basis that $1-(-1_i)=0 \Leftrightarrow 1=(-1_i)$

Then

$$\left(|\sigma_3|_i\right)^2 = \begin{vmatrix} 1 & 0 \\ 0 & -1_i \end{vmatrix}^2 = \begin{vmatrix} (1)^2 & 0 \\ 0 & (1_i)^2 \end{vmatrix}$$

Then three equal "coordinate" dimensions are represented by:

$$|\eta|_3 = \begin{vmatrix} 3 & 0 & 0 & 0 \\ 0 & (-1)_x & 0 & 0 \\ 0 & 0 & (-1)_y & 0 \\ 0 & 0 & 0 & (-1)_z \end{vmatrix}$$

$$Tr\left(|\eta|_3\right) = 3 + \left[(-1)_x + (-1)_y + (-1)_z\right] = (3-3) = 0$$

With the same definition applied to n "dimensions". Then

$$\left(|\eta|_3\right)^2 = \begin{vmatrix} 3 & 0 & 0 & 0 \\ 0 & (-1)_x & 0 & 0 \\ 0 & 0 & (-1)_y & 0 \\ 0 & 0 & 0 & (-1)_z \end{vmatrix}^2 = \begin{vmatrix} (3)^2 & 0 & 0 & 0 \\ 0 & \left[(1)_x\right]^2 & 0 & 0 \\ 0 & 0 & \left[(1)_y\right]^2 & 0 \\ 0 & 0 & 0 & \left[(1)_z\right]^2 \end{vmatrix} = \begin{vmatrix} 9 & 0 & 0 & 0 \\ 0 & \left[(1)_x\right]^2 & 0 & 0 \\ 0 & 0 & \left[(1)_y\right]^2 & 0 \\ 0 & 0 & 0 & \left[(1)_z\right]^2 \end{vmatrix}$$

However,

$$Tr\left(|\eta|_3\right)^2 = 9 - 3(1)^2 = 6 \neq 0$$

This problem can be remedied by multiplying by $\left(\frac{1}{\sqrt{n}}\right)^2$ in the first dimension only $(3)^2\left(\frac{1^2}{(3)^2}\right) = 1^2$,

yielding again the unit matrix for

$$\sqrt{\left(|\eta|_3\right)^2} = \left(|\eta|_3\right) = \begin{vmatrix} 1 & & & \\ & -1 & & \\ & & -1 & \\ & & & -1 \end{vmatrix}$$

but then

$$Tr\left(|\eta|_3\right) = 1 + \left[\left\{(-1)_x + (-1)_y\right\} + (-1)_z\right] = (1-3) = -2 \neq 0$$

Note that the trace is now negative, which violates the principle that "reality" is positive definite.

The Minkowski metric as a quaternion characterizes a local coordinate system (i, j, k) at a distance $a = r$ a from an observer, where $(ijk) = (-1)^3$ and (eg) $(ij) = -(ji)$ (characteristic of a cross product) but which really provides a **local** basis for each of three dimensions which can be rotated independently of the distance r .

Physically, if r^2 represents the zero point energy, then if the distant coordinate system interacts with r , the negative values are only negative locally, and define the center of the local coordinate system w.r.t. r . If there is no interaction, then r is simply a positive coordinate in the direction of observation, and is not affected by the distance of the system as a source (except in perspective).

For $r = 0$ the coordinate system is simply that of the observer. If there IS interaction between the observer and the distant galaxy, then the coordinate r must represent mass, with continuity existing along r between the observer and the galaxy. That is, there are no individual photons, but only a "displacement length" r defining Maxwell's equations without including a source or sensor.

The bottom line is that linear systems cannot represent this “reality”, unless the “-2”) represents an interaction with a larger positive “zero point” energy, or Fermi level, where “gravity” is repreented by this interaction in the large scale as “entropy” (interaction energy), where

$$\varphi = m_1 + m_0$$
$$\varphi^2 = \left(m_1 + m_0\right)^2 = \left(m_1\right)^2 + \left(m_0\right)^2 + 2\left(m_1\right)\left(m_0\right) = \left(m_1\right)^2 + \left(m_0\right)^2 + h_{(m_1,m_0)}{}^2,\ h_{(m_1,m_0)}{}^2 = 2\left(m_1\right)\left(m_0\right)$$
$$m_1 = G_0 m_0 \Rightarrow 2G_0\left(m_0\right)^2$$

An inverse r^2 function can be added by making masses equivalent to Electromagnetism, where

$m_0 = c\tau = \varepsilon_0 E$, $m_v = v\tau' = \mu_0 B$, and $\varphi = m' = \left(c\tau'\right) = \sqrt{\left(\left(\varepsilon_0 E\right)^2 + \left(\mu_0 B\right)^2 + 2\left(\varepsilon_0\mu_0\right)\left(EB\right)\right)}$

$$\varphi_{E,B} = \varepsilon_0 E + \mu_0 B$$
$$\left(\varphi_{E,B}\right)^2 = \left(\varepsilon_0 E + \mu_0 B\right)^2 = \left(\varepsilon_0 E\right)^2 + \left(\mu_0 B\right)^2 + 2\left(\varepsilon_0\mu_0\right)\left(EB\right)$$

where $2\left(\varepsilon_0\mu_0\right)\left(EB\right) = (\frac{1}{c^2})2\left(EB\right) = 2\left[\frac{1}{\left(c\tau\right)^2})\left(EB\right)\right] = \left[\frac{1}{r_{(c\tau)}{}^2})\left(EB\right)\right],\ \tau = 1$

Then

$$\pi\left(\varphi_{E,B}\right)^2 = \pi\left(\varepsilon_0 E + \mu_0 B\right)^2 = \pi\left(\varepsilon_0 E\right)^2 + \pi\left(\mu_0 B\right)^2 + \pi\left[2\left(\varepsilon_0\mu_0\right)\left(EB\right)\right]$$

where $\left(h_{EB}\right)^2 = \pi\left[2\left(\varepsilon_0\mu_0\right)\left(EB\right)\right] = \left(\frac{1}{r_{c\tau}}\right)^2\left(E\right)\left(2\pi B\right) = \left(r_E\right)\left(C_B\right)$ and

$2S^2 \triangleq \left(h_{EB}\right)^2$ so that $S = \frac{h_{EB}}{\sqrt{2}}$

Similar analysis applies (from the RUC) to :

$$\varphi^2 = (m_1)^2 + (m_0)^2 + h_{(m_1,m_0)}{}^2 \Leftrightarrow \pi\varphi^2 = \pi(m_1)^2 + \pi(m_0)^2 + \pi h_{(m_1,m_0)}{}^2$$

$$\varphi^2 = (c\tau') = (v\tau')^2 + (c\tau)^2 + 2(c\tau)(v\tau')$$

$$\pi\varphi^2 = \pi(r'')^2 = \pi(r')^2 + \pi(r_0)^2 + (r_0)(2\pi r') = \pi(r')^2 + \pi(r_0)^2 + (r_0)(C_{r'})$$

$$1^2 = \left(\frac{1}{\gamma}\right)^2 + \beta^2 + 2\left(\frac{\beta}{\gamma}\right) = \left(\cos^2\theta + \sin^2\theta\right) + 2\sin\theta\cos\theta,\ \gamma^2 = 0^2 < \left(\frac{\tau'}{\tau}\right)^2 < 1^2, 0^2 < \beta^2 = \left(\frac{v}{c}\right)^2 < 1^2$$

$$\gamma^2 = 1^2 + (\beta\gamma)^2 + 2(\beta\gamma) = \cosh^2\theta = \left(1^2 + \sinh^2\theta\right) + 2\cosh\theta\sinh\theta,\ \gamma^2 = \left(\frac{\tau'}{\tau}\right)^2 > 1^2 > 0^2,\ \beta^2 = \left(\frac{v}{c}\right)^2 > 1^2$$

Electromagnetism (Full Expansion)

(The Lorentz force $F(\varepsilon_0,\mu_0)=mA=q(|\varepsilon_0|E+v\otimes|\mu_0|B)=q(E+v\otimes B),\ |\varepsilon_0|=|\mu_0|=|1|$ is not correct relativistically because the existence of B as a perturbing element $\left(v\tau'\right)$ is not specified for equal and opposite force.)

The expression should be

$F=mA=q(E+B+v\otimes B)$ where v can be identified with E in and "inertial" frame, so that
$F=mA=q(E+B+E\otimes B),\ v\triangleq E$

Then for $|m|=|q|=|1|$ (vectors assumed as matrices)

$$\mu^0\triangleq\varepsilon_0=\frac{1}{\mu_0}$$
$$|F|\triangleq|A|=\begin{vmatrix}\varepsilon_0 E & 0\\ 0 & \mu^0 B\end{vmatrix}$$
$$|F|\cdot|F|=|A|\cdot|A|=|A|^2=\begin{vmatrix}\left(\varepsilon_0 E\right)^2 & 0\\ 0 & \left(\mu^0 B\right)^2\end{vmatrix}$$
$$Tr\left(|A|^2\right)=\left(\varepsilon_0 E\right)^2+\left(\mu^0 B\right)^2$$

However, for

$$F=A=(E+B+E\otimes B)$$
$$F\cdot F=A\cdot A=(E\cdot E+B\cdot B+EB(\vec{k}\cdot\vec{k})+BE(\vec{k}\cdot\overrightarrow{-k})$$
$$=(E^2+B^2+2EB)$$

(Equal and opposite positive forces)

When not interacting,

$$|\varphi|=\begin{vmatrix}E & 0\\ 0 & B\end{vmatrix}=\left(E,B\right)$$
$$Tr|\varphi|=E+B,\ \det|\varphi|=0$$
$$|\varphi|^2=\left(E^2,B^2\right)$$
$$Tr|\varphi|^2=E^2+B^2$$

If Interacting (the φ^2, E, and B fields will change)

$$\left|(\varphi')^2\right| = \begin{vmatrix} (E')^2 & 0 & 0 \\ 0 & (B')^2 & 0 \\ 0 & 0 & 2(E')(B') \end{vmatrix}$$

$$Tr\left|\varphi^2\right| = (E')^2 + (B')^2 + 2(E')(B')$$

$$\det\left|\varphi^2\right| = 0$$

When the interaction is over, if B still exists (e.g., at the interaction point in the Stern-Gerlach experiment)

$$|\varphi'| = \begin{vmatrix} E' & 0 \\ 0 & B' \end{vmatrix} = (E', B)'$$

$$Tr|\varphi'| = E' + B',\ \det|\varphi| = 0$$

$$|\varphi|^2 = \left((E')^2, (B')^2\right)$$

$$Tr|\varphi|^2 = (E')^2 + (B')^2,\ \det|\varphi| = 0$$

If B is turned off immediately after the interaction, then two non-interacting particles will still exist $(E', E') = (vB, -(vB))$ so that $vB = vB$ where $Tr(vB, -(vB)) = 0$

$$Tr\left(|A|^2\right) = (\varepsilon_0 E)^2 + \left(\mu^0 B\right)^2$$

$$2Tr\left(|A| \otimes |A|\right) = 2\left(\frac{1}{(r_{c\tau})^2}\right)(BE)^2$$

$$Tr\left(|A|^2\right) + 2Tr\left(|A| \otimes |A|\right) = (\varepsilon_0 E)^2 + \left(\mu^0 B\right)^2 + 2\left(\frac{1}{(r_{c\tau})^2}\right)(BE)^2,\ r_{c\tau} = c\tau,\ \tau = 1$$

$$|L| = \begin{vmatrix} m^2 & 0 \\ 0 & (\varepsilon_0 E)^2 + \left(\mu^0 B\right)^2 + 2\left(\frac{1}{(r_{c\tau})^2}\right)(BE)^2 \end{vmatrix}$$

$$Tr\left(|L|\right) = m^2 + (\varepsilon_0 E)^2 + \left(\mu^0 B\right)^2 + 2\left(\frac{1}{(r_{c\tau})^2}\right)(BE)^2 = m^2 + Tr\left(|A|^2\right) + 2Tr\left(|A| \otimes |A|\right)$$

Let m_φ characterize the mass due to Electromagnetic interaction.

$$m_\varphi \triangleq Tr\left(|A|^2\right) + 2Tr\left(|A| \otimes |A|\right)$$

Then the relation to mass for the Minkowski metric is $(-m^2, 1, 1, 1)$

However, for positive definite (existing) mass,

$$\Phi = m + m_\varphi$$
$$\Phi^2 = m^2 + {m_\varphi}^2 + 2mm_\varphi$$

Where $2mm_\varphi$ is the interaction between (mass-equivalent) light and mass (i.e., Gravity)

Covariance and the EM Tensor

Note that these links apply to vectors ONLY

Connection (Principle bundle)

CoVariant Derivative

Jacobian

(From proof of Fermat’s last theorem)

$$\left|M_{\exists}\right| \triangleq \begin{vmatrix} a & b \\ -b & a \end{vmatrix}$$

$$Tr\left|M_{\exists}\right| = 2a$$

$$\det\left|M_{\exists}\right| = a^2 + b^2$$

$$\left|M_{\otimes}\right| \triangleq \begin{vmatrix} a & a \\ -b & b \end{vmatrix}$$

$$\det\left|M_{\otimes}\right| = 2ab$$

$$Tr\left|M_{\otimes}\right| = a + b$$

$$\varphi = a + b = Tr\left|M_{\otimes}\right|$$

$$\varphi^2 = a^2 + b^2 + 2ab = \det\left|M_{\exists}\right| + \det\left|M_{\otimes}\right|$$

Complex Conjugation

$$\psi = a + ib = Tr\begin{vmatrix} a & 0 \\ 0 & ib \end{vmatrix}$$

$$\psi^* = a - ib = Tr\begin{vmatrix} a & 0 \\ 0 & -ib \end{vmatrix}$$

$$\psi\psi^* = a^2 + b^2 \neq \det\left|M_{\exists}\right| = a^2 + b^2$$

First order (Existence, counting)

(Does not include interaction

$$\varphi = 1+1+1$$

$$Tr\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix} = 3$$

$$\det\varphi = 0$$

$$\varphi = 1+1+1 = 3 \Rightarrow \varphi^2 = 3^2 = 9$$

Second order (Energy, Entropy)

$$\varphi = 1+1+1$$

$$\varphi^2 = 1^2+1^2+1^2+\operatorname{Re} m(1,1,1,3) = 3(1^2)+\operatorname{Re} m(1,1,1,2)$$

$$\varphi^2 = 1^2+1^2+1^2 \Leftrightarrow \operatorname{Re} m(1,1,1,2) = 0$$

$$\operatorname{Re} m(1,1,1,2) \neq 0$$

$$\varphi^2 \neq 1^2+1^2+1^2$$

$$\varphi^2 \neq Tr\begin{vmatrix} 1^2 & 0 & 0 \\ 0 & 1^2 & 0 \\ 0 & 0 & 1^2 \end{vmatrix}$$

$$\varphi = 1+1+1+1$$

$$\varphi^2 = 1^2+1^2+1^2+1^2+\operatorname{Re} m(1,1,1,1,2) = 4(1^2)+\operatorname{Re} m(1,1,1,1,2)$$

$$\varphi^2 = 1^2+1^2+1^2+1^2 \Leftrightarrow \operatorname{Re} m(1,1,1,1,2) = 0$$

$$\operatorname{Re} m(1,1,1,1,4) \neq 0$$

$$\varphi^2 \neq 1^2+1^2+1^2+1^2$$

$$\varphi^2 \neq Tr\begin{vmatrix} 1^2 & 0 & 0 & 0 \\ 0 & 1^2 & 0 & 0 \\ 0 & 0 & 1^2 & 0 \\ 0 & 0 & 0 & 1^2 \end{vmatrix}$$

$$\left|B\right| \triangleq \begin{vmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{vmatrix}$$

$$\det \begin{vmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{vmatrix} = \det \begin{vmatrix} 1 & -1 \\ 1 & 1 \end{vmatrix} = \begin{vmatrix} 1 \\ 1 \end{vmatrix} \otimes \begin{vmatrix} -1 \\ 1 \end{vmatrix} = 2$$

$$\begin{vmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{vmatrix}^{-1} = \begin{vmatrix} -1/2 & 1/2 & 1/2 \\ 1/2 & -1/2 & 1/2 \\ 1/2 & 1/2 & -1/2 \end{vmatrix}$$

$$Tr \begin{vmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{vmatrix} = 0,\ Tr \begin{vmatrix} 1 & -1 \\ 1 & 1 \end{vmatrix} = 2$$

$$\left|M\right| \triangleq \begin{vmatrix} 0 & 1 & 1 \\ -1 & 1 & 1 \\ -1 & -1 & 1 \end{vmatrix}$$

$$\det\left|M\right| = 2$$

$$Tr\left|M\right| = 2$$

$$\left|B\right| = \begin{vmatrix} 1 & 1 \\ -1 & 1 \end{vmatrix}$$

$$\det\left|B\right| = 2$$

$$Tr\left|B\right| = 2$$

Electromagnetic Tensor

Levi-Civita Symbol

Levi-Civita Connection

(Covariant form)

$$F_{\mu\nu} \triangleq \begin{vmatrix} 0 & \frac{E_x}{c} & \frac{E_y}{c} & \frac{E_z}{c} \\ -\frac{E_x}{c} & 0 & -B_z & B_y \\ -\frac{E_y}{c} & B_z & 0 & -B_x \\ -\frac{E_z}{c} & -B_y & B_x & 0 \end{vmatrix} \triangleq \begin{vmatrix} 0 & 1 & 1 & 1 \\ -1 & 0 & -1 & 1 \\ -1 & 1 & 0 & -1 \\ -1 & -1 & 1 & 0 \end{vmatrix}, \text{ (unit bases)}$$

$$F_{\mu\nu} = \begin{vmatrix} 0 & E_x & E_y & E_z \\ -E_x & 0 & -B_z & B_y \\ -E_y & B_z & 0 & -B_x \\ -E_z & -B_y & B_x & 0 \end{vmatrix}, c = 1$$

$$\det\left(F_{\mu\nu}\right) = \left[\left(E_xB_x\right)^2 + \left(E_yB_y\right)^2 + \left(E_zB_z\right)^2\right] + 2\left[\left(E_xB_x\right)\left(E_yB_y\right) + \left(E_xB_x\right)\left(E_zB_z\right) + \left(E_yB_y\right)\left(E_zB_z\right)\right]$$

$$= \left[\left(E_xB_x\right)^2 + \left(E_yB_y\right)^2 + \left(E_zB_z\right)^2\right] + h^2,\ h^2 \triangleq 2\left[\left(E_xB_x\right)\left(E_yB_y\right) + \left(E_xB_x\right)\left(E_zB_z\right) + \left(E_yB_y\right)\left(E_zB_z\right)\right] \triangleq 2S^2$$

$$F_{\mu\nu}(M) \triangleq \begin{vmatrix} M & E_x & E_y & E_z \\ -E_x & 0 & -B_z & B_y \\ -E_y & B_z & 0 & -B_x \\ -E_z & -B_y & B_x & 0 \end{vmatrix}, c = 1$$

$$\det\left[F_{\mu\nu}(M)\right] = \det\left(F_{\mu\nu}\right)$$

$$Tr\left(F_{\mu\nu}\right) = 0$$

$$Tr\left[F_{\mu\nu}(M)\right] = M$$

That is, interactions of $F_{\mu\nu}$ are independent of M even though M exists, and can be anything whatever (e.g. mass), and can be equivalent to the gauge vector A where

$$F = mA = q(E + v \otimes B)$$

$$A = \frac{q}{m}(E + v \otimes B)$$

as the Lorentz Force. This is also true of the contravariant form $F^{\mu\nu}$.

$$\det\left(F_{\mu\nu}\right)=\det\begin{vmatrix}0 & 1 & 1 & 1\\ -1 & 0 & -1 & 1\\ -1 & 1 & 0 & -1\\ -1 & -1 & 1 & 0\end{vmatrix}=9=3^2=3(1^2)=1^2+1^2+1^2$$

$$Tr\left(F_{\mu\nu}\right)=Tr\begin{vmatrix}0 & 1 & 1 & 1\\ -1 & 0 & -1 & 1\\ -1 & 1 & 0 & -1\\ -1 & -1 & 1 & 0\end{vmatrix}=0$$

$$Tr\left(F_{\mu\nu}\right)=Tr\left(F^{\mu\nu}\right)=0$$

Note that the determinant is unchanged by adding a unit element (Gauge?) to the top slot, but the trace is now unity:

$$F_{\mu\nu}=\begin{vmatrix}0 & 1 & 1 & 1\\ -1 & 0 & -1 & 1\\ -1 & 1 & 0 & -1\\ -1 & -1 & 1 & 0\end{vmatrix}+\begin{vmatrix}m & 0 & 0 & 0\\ 0 & 0 & 0 & 0\\ 0 & 0 & 0 & \\ 0 & 0 & 0 & 0\end{vmatrix}=\begin{vmatrix}m & 1 & 1 & 1\\ -1 & 0 & -1 & 1\\ -1 & 1 & 0 & -1\\ -1 & -1 & 1 & 0\end{vmatrix}$$

$$Det\left(F_{\mu\nu}\right)=Det\left(F_{\mu\nu}\right)=9$$

$$Tr\left(F_{\mu\nu}\right)=m\neq Tr\left(F_{\mu\nu}\right)=0$$

E Field

$$|E| = \begin{vmatrix} 0 & 1 & 1 & 1 \\ -1 & 0 & 0 & 0 \\ -1 & 0 & 0 & 0 \\ -1 & 0 & 0 & 0 \end{vmatrix}$$

$$Tr|E| = 0,\ Det|E| = 0$$

B Field

$$|B| = \begin{vmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & 1 \\ 0 & 1 & 0 & -1 \\ 0 & -1 & 1 & 0 \end{vmatrix}$$

$$Tr|B| = 0,\ Det|B| = 0$$

Electromagnetic Tensor

$$F^{\mu\nu} = \begin{vmatrix} 0 & -1 & -1 & -1 \\ 1 & 0 & -1 & 1 \\ 1 & 1 & 0 & -1 \\ 1 & -1 & 1 & 0 \end{vmatrix} = \begin{vmatrix} 0 & -X & -Y & -Z \\ X & 0 & -z & y \\ Y & z & 0 & -x \\ Z & -y & x & 0 \end{vmatrix}$$ (Contravariant form)

$$F_{\mu\nu} = \begin{vmatrix} 0 & 1 & 1 & 1 \\ -1 & 0 & -1 & 1 \\ -1 & 1 & 0 & -1 \\ -1 & -1 & 1 & 0 \end{vmatrix} = \begin{vmatrix} 0 & X & Y & Z \\ -x & 0 & -z & y \\ -y & z & 0 & -x \\ -z & -y & x & 0 \end{vmatrix}$$ (Covariant form)

$$\left|F^{\mu\nu}\right|\left|F_{\mu\nu}\right| = \begin{vmatrix} 0 & -1 & -1 & -1 \\ 1 & 0 & -1 & 1 \\ 1 & 1 & 0 & -1 \\ 1 & -1 & 1 & 0 \end{vmatrix} \begin{vmatrix} 0 & 1 & 1 & 1 \\ -1 & 0 & -1 & 1 \\ -1 & 1 & 0 & -1 \\ -1 & -1 & 1 & 0 \end{vmatrix} = \begin{vmatrix} 3 & 0 & 0 & 0 \\ 0 & -1 & 2 & 2 \\ 0 & 2 & -1 & 2 \\ 0 & 2 & 2 & -1 \end{vmatrix}$$

$$Tr\left(\left|F^{\mu\nu}\right|\left|F_{\mu\nu}\right|\right) = 3 - 3 = 0$$

$$Det\left(\left|F^{\mu\nu}\right|\left|F_{\mu\nu}\right|\right) = 81 = (9)^2 = \left[\det\left(\begin{vmatrix} 0 & -1 & -1 & -1 \\ 1 & 0 & -1 & 1 \\ 1 & 1 & 0 & -1 \\ 1 & -1 & 1 & 0 \end{vmatrix}\right)\right]^2$$

$$\det\left(F_{\mu\nu}\right) = \begin{vmatrix} 0 & 1 & 1 & 1 \\ -1 & 0 & -1 & 1 \\ -1 & 1 & 0 & -1 \\ -1 & -1 & 1 & 0 \end{vmatrix} = 9 = 3^2 = 3(1^2) = 1^2 + 1^2 + 1^2$$

$$Tr\left(F_{\mu\nu}\right) = \begin{vmatrix} 0 & 1 & 1 & 1 \\ -1 & 0 & -1 & 1 \\ -1 & 1 & 0 & -1 \\ -1 & -1 & 1 & 0 \end{vmatrix} = 0$$

Relativistic Quantum Mechanics

$$(E') = \left[(m_0\gamma)c^2\right] = (Pc) + \left[(m_0c^2)\right],\ Pc = \left[(m_0\gamma)\beta\right]c = m'v,\ m' = (m_0\gamma)$$

$$(E') = (m'c^2) = (m'v) + \left[(m_0c^2)\right] = (m'v) + [E_0]$$

$$(E')^2 = (m'v)^2 + [E_0]^2 + 2(m'v)[E_0] = (m'v)^2 + [E_0]^2 + h^2,\ h^2 = 2(m'v)[E_0]$$

$h^2 = 2(m'v)[E_0]$ is the interaction energy

$$h^2 = 0 \Rightarrow (|E'|)^2 = (m'v)^2 + [E_0]^2 = \left((m'v)^2, [E_0]^2\right) = \begin{pmatrix} (m'v)^2 & 0 \\ 0 & [E_0]^2 \end{pmatrix},\ \text{(no interaction)}$$

$$(E') = \left[(m_0\gamma)c^2\right] = \left[(m_0c^2)\right] + i(Pc),\ Pc = \left[(m_0\gamma)\beta\right]c = m'v,\ m' = (m_0\gamma)$$

$$(E')^* = \left[(m_0c^2)\right] - i(Pc)$$

$$(E')(E')^* = \left\{\left[(m_0c^2)\right] + i(Pc)\right\}\left\{\left[(m_0c^2)\right] + i(Pc)\right\}$$

$$= \left[(m_0c^2)\right]^2 + (Pc)^2$$

$$(m_0\gamma)c^2 = (Pc)^2 + \left[(m_0c^2)\right]^2$$

$$(E')^2 = (Pc)^2 + [E_0]^2$$

$$\psi = (\omega\tau) + i(kx) \triangleq E_0\tau + i(Pc)x$$

$$\psi^* = \left((\omega\tau) + i(kx)\right)^* = (\omega\tau) - i(kx) \triangleq E_0\tau - i(Pc)x$$

$$\psi\psi^* = \left[E_0\tau + i(Pc)x\right]\left[E_0\tau - i(Pc)x\right] = (E_0\tau)^2 + \left[(Pc)x\right]^2$$

$$\psi\frac{\partial}{\partial\tau}(\psi^*) = \psi(E_0)(\psi^*) = (E_0)\psi\psi^*$$

$$\psi\frac{\partial}{\partial x}(\psi^*) = \psi(Pc)\psi^* = (Pc)\psi\psi^*$$

Note on Binomial Expansion (See proof on Fermat's Last Theorem)

$$c^n = (a+b)^n = a^n + b^n + \operatorname{Re}m(a,b,n)$$
$$\psi^n = (a^n + b^n) + i\operatorname{Re}m(a,b,n)$$
$$(\psi^n)^* = (a^n + b^n) - i\operatorname{Re}m(a,b,n)$$
$$\psi^n(\psi^n)^* = (a^n + b^n)^2 + [\operatorname{Re}m(a,b,n)]^2 = (a^n + b^n)^2 + [h]^2, h = \sqrt{\operatorname{Re}m(a,b,n)}$$

$$c\tau' = \sum_i x_i = \sum_i (c\tau)_i + (v\tau')_i$$
$$(c\tau')^n = \sum_i [(c\tau)_i]^n + \sum_i [(v\tau')_i]^n + \operatorname{Re}m((c\tau)_i, (v\tau')_i, n)$$
$$(c\tau')^2 = \sum_i [(c\tau)_i]^2 + \sum_i [(v\tau')_i]^2 + \operatorname{Re}m((c\tau)_i, (v\tau')_i, 2)$$
$$(c\tau')^2 = \sum_i [(c\tau)_i]^2 + \sum_i [(v\tau')_i]^2 \Leftrightarrow h^2 = \operatorname{Re}m((c\tau)_i, (v\tau')_i, 2) = 0$$
$$h^2 \neq 0$$
$$(c\tau')^2 \neq \sum_i [(c\tau)_i]^2 + \sum_i [(v\tau')_i]^2$$

$$\pi(c\tau')^2 = \pi\left(\sum_i [(c\tau)_i]^2\right) + \pi\left(\sum_i [(v\tau')_i]^2\right) + \pi\left(\operatorname{Re}m((c\tau)_i, (v\tau')_i, 2)\right)$$

Particle Pairs, Magnetic Monopoles, and Goldbach's Conjecture

Proof of Goldbach's Conjecture

Consider the expression

$$(c\tau')^2 = (c\tau)^2 + (v\tau')^2 + 2(c\tau)(v\tau')$$, where $h^2 \triangleq 2(c\tau)(v\tau') = 2S^2 = (S^2 + S^2)$

So that

$$(c\tau')^2 - h^2 = (c\tau)^2 + (v\tau')^2 = \left(\sqrt{(c\tau')^2 - h^2}\right)^2 = \left(\sqrt{(c\tau')^2 - 2S^2}\right)^2$$

Since $(c\tau)^2$ and $(v\tau')^2$ form a Cartesian pair $\{(c\tau)^2, (v\tau')^2\} = (c\tau)^2 \times (v\tau')^2$, they do not interact, and therefore must be prime numbers (sets). From the proof of Goldbach's conjecture where the relation $L = (p_1)^2 + (p_2)^2 = 2(p_1)(p_2) = 2N = 2S^2 = h^2$ characterizes the even numbers $\{N_e\}$, we see that the expression $\left[(c\tau')^2 - h^2\right] + \{N_o\} = \{N_e\} + \{N_o\} = \{|\mathbb{R}|\}$ must characterize the total set of numbers, and since the expression is continuous, positive real numbers are also characterized that way, so that prime integers are a subset of the real numbers.

Then $(c\tau')^2$ can be thought of as an initial state which ejects a particle pair $h^2 = 2S^2$ resulting in two free (non-interacting) particles $(c\tau)^2 + (v\tau')^2$.

Multiplying by π gives radial components $\pi\left[(c\tau')^2 - S^2\right] = \pi(c\tau)^2 + \pi(v\tau')^2$ which shows why there are no **magnetic monopoles**. The location of the interaction energy $h^2 = 2S^2$ is at the center of the RUC in “Cartesian” coordinates, but at the circumference in “Radial” coordinates.

$$\varphi_s = s_1 + s_2 \Rightarrow \varphi^2 = (s_1 + s_2)^2 = (s_1)^2 + (s_2)^2 + 2(s_1)(s_2),\ s_i \triangleq \text{"sides"}$$
$$\varphi_r = r_1 + r_2 \Rightarrow \varphi^2 = (r_1 + r_2)^2 = (r_1)^2 + (r_2)^2 + 2(r_1)(r_2),\ r_i \triangleq \text{"radii"}$$
$$\pi\varphi_r^{\ 2} = \pi(r_1 + r_2)^2 = \pi(r_1)^2 + \pi(r_2)^2 + 2(r_1)\left(C_{r_2}\right),\ C_{r_2} = (2\pi r_2)$$

(Note that π is only relevant in second order; its definition requires a relation between two circles.)

Since particles are generated in pairs, $\{N_o\}$ represents a third dimension (quark); physically, all three dimensions are “filled in, reconstituted” immediately by the surrounding “vacuum” so it appears as if the triple $\left\{(p_1)^2, (p_2)^2, N_o\right\}$ is reverting to a “bound triple” or a single particle (“Higgs Boson”)

Comment on Goldbach proof

Definition of prim numbers

$(c\tau') = (c\tau) + (v\tau')$ (This asserts the existence of $(c\tau) + (v\tau')$ and their interaction $(c\tau')$ as a single valued function.

$$(c\tau')^2 = \left[(c\tau) + (v\tau')\right]^2 = (c\tau)^2 + (v\tau')^2 + 2(c\tau)(v\tau')$$

Setting $(c\tau')^2 = 0$ so that $\left[(c\tau)^2 + (v\tau')^2\right] + 2(c\tau)(v\tau') = 0$ means that

$\left[(c\tau)^2 + (v\tau')^2\right] = -2(c\tau)(v\tau')$ is an expression that

$$Tr(\begin{vmatrix} (c\tau)^2 + (v\tau')^2 & 0 \\ 0 & -2(c\tau)(v\tau') \end{vmatrix}) = (c\tau)^2 + (v\tau')^2 - 2(c\tau)(v\tau') = 0$$

So that $\left|(c\tau)^2 + (v\tau')^2\right| = \left|2(c\tau)(v\tau')\right|$

This expression preserves $(c\tau)(v\tau')$ as a "nomial" in which the multiplicative distributive law is not applied; if it were, then $(c\tau)(v\tau') = (c\tau')(v\tau) = (0)(v\tau) = 0$. This means that dividing the expression by $(c\tau')$ implies that $(v\tau)$ in the r.h.s. of the expression so that $2(c\tau)(v\tau') = 0 = (c\tau)^2 + (v\tau)^2 = 0$

For $(v\tau') = (c\tau)$, $2(c\tau)(c\tau) = 2(c\tau)^2 = (c\tau)^2 + (c\tau)^2 = 2(c\tau)^2$, implying that division by $(c\tau)^2$ is possible so that $2(1)^2 = 2(1)^2$; that is,

$$(1)^2 + (1)^2 = 2(1^2) = Tr\begin{vmatrix} (1)^2 & 0 \\ 0 & (1)^2 \end{vmatrix} = Tr\begin{vmatrix} (1)^2 & 0 \\ 0 & (-1)^2 \end{vmatrix} = Tr(\left|I^2\right|) = Tr(\left|\sigma_3\right|^2),$$

and shows that the "−" in the Pauli matrix represents equality of the absolute values of its elements, **not** charge.

Since the elements of the expression $(c\tau)^2 + (v\tau')^2 = 2(c\tau)(v\tau')$ are independent, one can always hold one element constant, and find a second element that will satisfy the equation for $(c\tau)^2 \neq (v\tau')^2$ with a corresponding value $(c\tau) \neq (v\tau')$ so the expression applies to all values in the positive real numbers where the l.h.s. consists of the sum of squares of two primes, and therefore the expression $(c\tau) + (v\tau')$ is also the sum of two primes, and the l.h.s. $2(c\tau)(v\tau')$ is always even.

Therefore, “any even number can be expressed as the sum of two primes” QED for Golbach’s conjecture.

This also shows that counting is consistent under addition and multiplication, since

$n^2 + n^2 = 2n^2$ for $n = (c\tau) = (v\tau')$

Even and Odd numbers

$$|E|^2 = \begin{vmatrix} (p_1)^2 & 0 \\ 0 & (p_2)^2 \end{vmatrix}$$

$$Tr\left(|E|^2\right) = (p_1)^2 + (p_2)^2 = L = 2N$$

$$\begin{vmatrix} (p_1) & 0 \\ 0 & (p_2) \end{vmatrix} \Leftrightarrow \begin{vmatrix} (p_1) & 0 \\ 0 & (p_2) \end{vmatrix}^n = \begin{vmatrix} (p_1)^n & 0 \\ 0 & (p_2)^n \end{vmatrix}$$

If (p_1) and (p_2) are prime, then so are $(p_1)^2$ and $(p_2)^2$ and vice versa

Then $L \triangleq Tr \begin{vmatrix} (p_1)^2 & 0 \\ 0 & (p_2)^2 \end{vmatrix} = (p_1)^2 + (p_2)^2$ is the sum of two primes.

$$\begin{vmatrix} (p_1) \\ -(p_2) \end{vmatrix} \otimes \begin{vmatrix} \dfrac{(p_1)}{(p_2)} \end{vmatrix} = 2(p_1)(p_2) = 2N$$

Then

$$Tr\left(|E|^2\right) = (p_1)^2 + (p_2)^2 = L = 2N$$

Therefore every even number $2N$ is the sum of two primes $(p_1)^2 + (p_2)^2$, and is complete by the Fundamental Theorem of arithmetic.

QED

$$\{|\mathbb{R}|\} - \{|L|\} = \{|O|\}$$
$$\{|\mathbb{R}|\} = \{|L|\} + \{|O|\}$$

$$|\mathbb{R}| = \begin{vmatrix} \{p_1\} & & \\ & \{p_2\} & \\ & & \{O\} \end{vmatrix} \Leftrightarrow |\mathbb{R}|^2 = \begin{vmatrix} \{p_1\}^2 & & \\ & \{p_2\}^2 & \\ & & \{O\}^2 \end{vmatrix}$$

$$(c\tau') = \{e\} + \{o\}$$
$$(c\tau')^2 = \{e\}^2 + \{o\}^2 + 2\{e\}\{o\}$$
$$(c\tau')^2 = \{e\}^2 + \{o\}^2 \Leftrightarrow 2\{e\}\{o\} = 0$$
$$2\{e\}\{o\} \neq 0$$
$$(c\tau')^2 = \{e\}^2 + \{o\}^2$$

That is, there is no interaction, and the even and odd numbers are distinct in the matrix

$$\begin{vmatrix} \{e\} & 0 \\ 0 & \{o\} \end{vmatrix} \Leftrightarrow \begin{vmatrix} \{e\} & 0 \\ 0 & \{o\} \end{vmatrix}^n = \begin{vmatrix} \{e\}^n & 0 \\ 0 & \{o\}^n \end{vmatrix}$$

and the cross product, defined by $\begin{vmatrix} \{o\} \\ -\{o\} \end{vmatrix} \otimes \begin{vmatrix} \{e\} \\ \{e\} \end{vmatrix} = \det \begin{vmatrix} \{o\} & \{e\} \\ -\{o\} & \{e\} \end{vmatrix} = 2\{e\}\{o\} = 0$

Russell's Paradox

"A Barber in a village shaves all those and only those who don't shave themselves. Does the Barber shave himself?"

Short answer: "A Barber cannot both shave and not shave himself, so such a Barber cannot exist. A non-existent Barber cannot exist in an existing village, much less a non-existent village."

Let $\{|\mathbb{Z}|\}$ characterize the set of all possible villagers, with positive definiteness characterize existence.

Let the odd numbers $\{|o|\}$ characterize the villagers who shave themselves and the even numbers $\{|e|\}$ characterize the villagers who do not shave themselves with the stipulation that a number cannot be both even and odd.

Then the set of all possible villagers is characterized by the set $\{|\mathbb{Z}|\} = \{|e|\} \cup \{|o|\} \triangleq \{|e|\} + \{|o|\}$ and is complete, and can be represented by the matrix $\{|\mathbb{Z}|\} = Tr\begin{vmatrix} \{|e|\} & 0 \\ 0 & \{|o|\} \end{vmatrix}$ where

$\{|\mathbb{Z}|\}^n = Tr\begin{vmatrix} \{|e|\} & 0 \\ 0 & \{|o|\} \end{vmatrix}^n = Tr\begin{vmatrix} \{|e|\}^n & 0 \\ 0 & \{|o|\}^n \end{vmatrix}$.

In order for a barber to shave a villager, there must be an interaction between them, characterized by $\{|S|\}^2 \triangleq \{\{|e|\}\{|o|\}\}$ for $n = 2$ which is represented by multiplication between the even and odd integers, which is again complete in $\{|\mathbb{Z}|\}$, and is characterized by $\{|\mathbb{Z}|\}^2 = \{|e|\}^2 + \{|o|\}^2 + 2\{\{|e|\}\{|o|\}\}$

Then $\{|\mathbb{Z}|\}^2 - \{|o|\}^2 = \{|e|\}^2 + \{\{|e|\}[2\{|o|\}]\}$ where $2\{|o|\} \in \{|e|\}$, so that

$\{|\mathbb{Z}|\}^2 - \{|o|\}^2 = \{|e|\}^2$ again, and in particular, since there is only one Barber, he belongs in the odd set $1 \in \{|o|\}$

Note that $Det\begin{vmatrix} \{|e|\} & \{|o|\} \\ -\{|o|\} & \{|e|\} \end{vmatrix} = 2\{|e|\}\{|o|\} \triangleq h^2 = 2S^2$, $S \triangleq \dfrac{h}{\sqrt{2}}$

In an analogous matter, since $\{|\mathbb{R}|\} \triangleq \{|(c\tau')|\} = \{|(c\tau)|\} + \{(|v\tau'|)\}$ describes the interaction between parameterized "nomials", where $\{|(c\tau)|\} \notin \{|(c\tau')|\}$ and $\{|(v\tau')|\} \notin \{|(c\tau')|\}$ then

$$\{|\mathbb{R}|\}^2 \triangleq \{|(c\tau')^2|\} = \{\{|(c\tau)|\} + \{(|v\tau'|)\}\}^2 = \{|(c\tau)|\}^2 + \{(|v\tau'|)\}^2 + 2\{|(c\tau)|\}\{(|v\tau'|)\}$$

And $\{|(c\tau')^2|\} \neq \{\{|(c\tau)^2|\} + \{(|v\tau'|)^2\}\}$, but for $\psi = \{|(c\tau)|\} + i\{(|v\tau'|)\}$, $\psi^* = \{|(c\tau)|\} - i\{(|v\tau'|)\}$, $\psi\psi^* = \{|(c\tau)^2|\} + \{(|v\tau'|)^2\}$ and setting $\psi\psi^* = \{|(c\tau')^2|\}$ so that $\{|(c\tau')^2|\} = \{|(c\tau)^2|\} + \{(|v\tau'|)^2\}$,

solving for τ' yields the expression $\tau' = \tau\gamma$, $\gamma = \frac{\tau'}{\tau} = \frac{1}{\sqrt{1-\beta^2}}$, $\beta = \frac{v}{c}$, which is the Einstein expression for the "time dilation" equation (the change in time is imaginary).

Proof of Fermat's Last Theorem (Via Binomial Expansion) for n > 1

$$|\mathbb{Z}| = \{|e|\} + \{|o|\}$$

$$|\mathbb{Z}|^n = \{|e|\}^n + \{|o|\}^n + \operatorname{Re} m(|e|,|o|,n)$$

$$|\mathbb{Z}|^n = \{|e|\}^n + \{|o|\}^n \Leftrightarrow \operatorname{Re} m(|e|,|o|,n) = 0$$
$$\operatorname{Re} m(|e|,|o|,n) \neq 0$$
$$|\mathbb{Z}|^n \neq \{|e|\}^n + \{|o|\}^n$$

Q.E.D.

Goldbach Proof

$$\{|e|\} \triangleq 2|\{\mathbb{Z}\}|$$

$$\{|o|\} = \{|e-1|\}$$

$$\left|\mathbb{Z}\right| = \left|\{e\}\right| + \left|\{o\}\right|$$

$$\left|\mathbb{Z}\right| = \left|\{e\}\right|^2 + \left|\{o\}\right|^2 + 2\left|\{e\}\right|\left|\{o\}\right|$$

$$\frac{\{|o|\}}{\{|e|\}} \notin \{|\mathbb{Z}|\}$$

$$\frac{\{|e|\}}{\{|o|\}} \notin \{|\mathbb{Z}|\}$$

$$\frac{\{|o|\}}{\{|e|\}} \in \{0\}, \frac{\{|e|\}}{\{|o|\}} \in \{|0|\}$$

$$\left|\{0\}\right| = \left|\{e\}\right|^2 + \left|\{o\}\right|^2 - 2\left|\{e\}\right|\left|\{o\}\right|$$

$$Tr\begin{vmatrix} a & 0 \\ 0 & -b \end{vmatrix} = 0 \Leftrightarrow a = b$$

$$Tr\begin{vmatrix} \left|\{e\}\right|^2 + \left|\{o\}\right|^2 & 0 \\ 0 & -2\left|\{e\}\right|\left|\{o\}\right| \end{vmatrix} \Leftrightarrow \left|\{e\}\right|^2 + \left|\{o\}\right|^2 = 2\left|\{e\}\right|\left|\{o\}\right|$$

$$\left|\{e\}\right|^2 + \left|\{o\}\right|^2 = 2\left|\{e\}\right|\left|\{o\}\right| = Tr\begin{vmatrix} \left|\{e\}\right|^2 + \left|\{o\}\right|^2 & 0 \\ 0 & 2\left|\{e\}\right|\left|\{o\}\right| \end{vmatrix}$$

Therefore, $\{|e|\}$ and $\{|o|\}$ must be relatively prime and $\left|\mathbb{Z}\right| = \{|e|\} + \{|o|\}$ is complete.

$$\left|\mathbb{Z}\right|^2 = |e|^2 + |o|^2 + 2\left(|o||e|\right) = |p_1|^2 + |p_2|^2 + 2\left(|p_1||p_2|\right)$$

$$\left|\left\{\mathbb{Z}\right\}\right| \triangleq \left|\left\{e\right\}\right| + \left|\left\{o\right\}\right| = \left|\left\{e\right\}\right| + \left|\left\{e-1\right\}\right|$$
$$\left|\mathbb{Z}\right|^2 = \left|e\right|^2 + \left|o\right|^2 + 2\left(\left|o\right|\left|e\right|\right) = \left|p_1\right|^2 + \left|p_2\right|^2 + 2\left(\left|p_1\right|\left|p_2\right|\right)$$

$$\left|\left\{\mathbb{Z}\right\}\right|^2 = \left|\left\{e\right\}\right|^2 + \left\{\left|e-1\right|\right\}^2 + 2\left|\left\{e\right\}\right|\left|\left\{e-1\right\}\right|$$

$$h^2 \triangleq 2\left(\left|o\right|\left|e\right|\right) \triangleq 2S^2,\ S = \frac{h}{\sqrt{2}}$$
$$h^2 \triangleq 2\left(\left|o\right|\left|e\right|\right) = \left(2\left\{o\right\}\right)\left\{e\right\} = \left\{e\right\}^2$$

$$= \left\{2\left|o\right|\right\}\left|e\right|$$
$$\left|\mathbb{Z}\right|^2 = \left|e\right|^2 + \left|o\right|^2 + 2\left\{e-1\right\}\left\{e\right\}$$
$$h^2 = \left\{2\left|o\right|\right\}\left|e\right| = 2\left\{e-1\right\}\left\{e\right\}$$
$$h = \left(\sqrt{2}\right)\sqrt{\left\{2\left|o\right|\right\}\left|e\right|} = \left(\sqrt{2}\right)S,\ S \triangleq \left(\sqrt{2}\right)$$

Interaction Limits

The RUC applies to one or two physical systems (which can comprise any number of particles as entropy), but it is important to examine the limits of the interaction.

Case $\left(\frac{\tau'}{\tau}\right)^2 < 1^2$ **(Radiation)**

Consider the expression

$(1')^2 = \left(\frac{1}{\gamma}\right)^2 + \beta^2 + 2\frac{\beta}{\gamma} \triangleq \left(\frac{1}{\gamma}\right)^2 + \beta^2 + h^2$, which can be re-written as:

$$(1')^2 - h^2 = \left(\frac{1}{\gamma}\right)^2 + \beta^2,\ h^2 \sim 2\sin\theta\cos\theta$$

In the limit, as $h^2 \to 0$, $sin^2\theta \to 0,\ \cos^2\theta \to 1$, so the product tends to vanish. However, the term $\sin\theta$ scales $\cos\theta$, which means that the basis where $\theta \to 0,\ 1^2 \to (1')^2 \to 0$. therefore, $(1')^2$ is also decreasing, so that

$$\lim_{h^2\to 0}\left[(1')^2 - h^2\right] = \lim_{h^2\to 0}\left(\frac{1}{\gamma}\right)^2 + \beta^2 = \lim_{h^2\to 0}\left(\frac{1}{\gamma}\right)^2 + \beta^2 = 0, \qquad h^2 \sim 2\sin\theta\cos\theta$$

That is, as the entropy (interaction decreases), the particle masses goe to zero (Weakly Interacting Midget Particles) , and eventually there is “nothing there” at the limit, and linear system theory is working on a non-existent system.

However, if there are a large number of particles, the interactions will be observed as a group, so that the system approaches trigonometry for very large particle counts (each of which have very low mass)… as mass – equivalent light particles. In the end, the Electromagnetic system (with zero trace) is reached, but at that point the vector potential $A = 0$, so the system is imaginary (all hat and no cattle).

Case $\left(\frac{\tau'}{\tau}\right)^2 > 1^2$ **(Absorption)**

Consider the case

$$\lim_{h^2\to\infty}\left[\gamma^2 = (1')^2 + (\gamma\beta)^2 + 2\beta\gamma\right],\ h^2 \sim 2\sinh\theta\cosh\theta$$

∞ In this case, $(\gamma\beta)\to(1)^2$ so that $\lim_{h^2\to\infty}(\gamma\beta)^2 + 2\beta\gamma = \lim_{h^2\to\infty}\left[(1\times 1)+2(1)\right]\gamma^2 = \lim_{\gamma^2\to\infty} 4\gamma^2$ which characterizes the four dimensional basis of the RUC (never quite reached) as the entropy $2\sinh\theta\cosh\theta$ tends to ∞ ($\theta\to\frac{\pi}{2}$). For two particles, the absorption approaches (but never reaches) one particle, and for an extreme number of light-equivalent masses, the expression models gravitational interaction (masses) as well as electromagnetic interaction.

Whether the system radiates or absorbs particles is modeled by the rotation of θ in the RUC, and can be increasing or decreasing or achiral depending on the model selected. If the system is no longer interacting, then $v = 0$, but $(c\tau') = (c\tau)$ as a changed (non-interacting particle/system) , and the mass can be rotating or translating freely until it encounters another field/particle, at which the process starts all over again.

This means that red shift or geometric “curvature” is best described as photon on photon interaction during a travel through otherwise empty space, where the path or color changes only during the interaction, but the totality of such interactions suggests either red shift or path curvature, both described at its most fundamental level as comprised of such interactions.

(There is more to this story, of course…… just ask me…)

Relativistic Addition of Velocities

$$u = \frac{v+u'}{1+\left(\frac{vu'}{c^2}\right)} = (v+u')\left(1+\left(\frac{vu'}{c^2}\right)\right) = (v+u')\Gamma_{vu'}$$

$$\Gamma_{vu'} = \left(1+\left(\frac{vu'}{c^2}\right)\right)$$

$$c^2\Gamma_{vu'} = \left(c^2+vu'\right)$$

$$\varphi = v+u'$$

$$\varphi^2 = (v+u')^2 = v^2+(u')^2+2vu' = v^2+(u')^2+h_{vu'}{}^2$$

$$2(vu') = h_{vu'}{}^2 \Rightarrow \frac{h_{vu'}{}^2}{2} = (vu') \triangleq S^2$$

$$S = \frac{h_{vu'}}{\sqrt{2}} = \sqrt{(vu')}$$

$$u = (v+u')\left(1+\left(\frac{S^2}{c^2}\right)\right)$$

$$S = 0 \Rightarrow h_{vu'} = 0 \Rightarrow u = (v+u')$$

$$S = 0 \Leftrightarrow (v=0)\vee(u'=0)$$

$$S \neq 0$$

$$u = \frac{v+u'}{1+\left(\frac{vu'}{c^2}\right)} = \frac{v}{1} = v,\ u'=0$$

If each velocity is multiplied by unit mass, the term in the numerator is the traditional Galilean addition of velocities, but the term in the denominator is modified by the interaction $S^2 = vu'$, which is a product of velocities, with equal and opposite energy of $c^2 = 1^2, c = 1$, and thus an energy term.

$$u = \frac{v+u'}{1+vu'} = \frac{v+u'}{1+S^2},\ \ c^2 = 1^2$$

The Relativistic Addition of Velocities is consistent with the concept of "Spin" (as defined in the RUC where $S_{vu'} = \frac{h_{vu'}}{\sqrt{2}}$, but h is a function of the added velocities. So the RUC is inconsistent with QM and STR (since they do not include "Spin" in second order (Energy) (both of which eliminate h in different ways to "define" a "linear wave equation>, either by dividing it out as in the Schroedinger equation, eliminating it by conjugation in STR, or trying to model gravity by re-introducing "spacetime" in GTR with calculus (where $h^2 \to 0^2$ in the definition of the derivative with h defined as an infinitesimal “neighborhood” – i.e., an “area”/interaction energy).

However, note that the addition of Relativistic Velocities does NOT include v^2 or $(u')^2$ and so is inconsistent with Fermat’s Theorem and the RUC.

This means that concepts such as "parallel universes", "universal holograms", the Big Bang, etc. are all wrong, since they are dependent on the fact that the Pythagorean triple (which is simply wrong) if reality is modeled by positive definite elements (and it must be, since the logarithm of an imaginary number is not equal to the logarithm of its equivalent real number, and thus cannot be used to "destroy" it in second order. Rather, "destruction" (i.e., radiation) is modeled by the rotation of the gamma vector $\gamma = \frac{\tau'}{\tau}$ (NOT the Lorentz factor).

Note that there is NO mention of the "Lorentz" factor in the equation for addition of velocities for each velocity, which shows that "space" and "time" are irrelevant in inertial frames. (the addition of velocities describes addition of momenta for unit (invariant) masses.

Poisson Brackets

Phase Space

Poisson Brackets

A Poisson bracket is characterized by anti-commutativity, where $[f,g]=-[g,f]$

Consider the expression:

$$\vec{\varphi}=(f)\vec{i}+(g)\vec{j}$$
$$(\varphi)^2=\vec{\varphi}\cdot\overleftarrow{\varphi}=(f)^2(\vec{i}\cdot\overleftarrow{i})+(g)^2(\vec{j}\cdot\overleftarrow{j})\pm 2(f)(g)(\vec{k}\otimes\overleftarrow{k})$$
$$[f,g]-[g,f]=2[f,g]$$
$$-(\vec{k}\otimes\overleftarrow{k})=(\vec{k}\otimes\vec{k})=1^2$$
$$\varphi^2=f^2+g^2+2fg=f^2+g^2+2[f,g]$$

Therefore, the Poisson bracket represents $h^2=2[f,g]=2S^2$ where h^2 is the "interaction energy" of the physical systems f and g. If the systems do not interact, they are represented in two dimensions by $(f,g)^n=\begin{vmatrix} f & 0 \\ 0 & g \end{vmatrix}^n=\begin{vmatrix} f^n & 0 \\ 0 & g^n \end{vmatrix}$

Then

$\varphi^2=f^2+g^2+2fg=f^2+g^2+2S^2$ ("Cartesian" coordinates for equal and opposite force elements)

And

$\pi\varphi^2=\pi(f^2)+\pi(g^2)+f(2\pi g)=f^2+g^2+2S^2,\ 2S^2=fC_g$ ("radial" coordinates, where the interaction occurs at the point of contact between the radii and circumference of the two "circles" $r_f=f$ and $r_g=g$) The circles are then interpreted as energies, with the entropy as the "area" $h^2=2S^2$ or $\pi h^2=2\pi S^2$, respectively.

Christoffel Symbols

For the Levi-Civita torsion free geometry (where geodesics can rotate freely around their axes of propagation), the "affine connection" is defined by the **Christoffel symbols**.

Levi-Civita Connection

Fundamental Theorem of Riemannian Geometry

However, this defines a parallel transport condition **without light-on-light interaction** (i.e., "Spin") and so is non-physical, since it is Spin that "changes" via interaction between the "parallel" geodesics in the complete (my?) relativistic analysis, where Fermat's Last Theorem is valid for $n > 1$, That is, Spin (whether Cartesian or Radial) is actually the "affine" connection between two geodesics, which is $h^2 = 2S^2$ in terms of Planck's "constant", expressed in terms of Newton's Third Law AND the RUC as $S = \frac{h}{\sqrt{2}}$ (not mentioned by Relativity), since h does not exist in one dimension.

Green's Function

For STR, the "time dilation" equation is"

$\tau' = \tau(\gamma_L)$, where $\gamma_L = \frac{1}{\sqrt{1-\beta^2}}$, $\beta = \frac{v}{c}$ so that

$$(\tau')^2 = \tau^2 (\gamma_L)^2$$

Then $1^2 = \left(\frac{\tau}{\tau'}\right)^2 (\gamma_L)^2$, where $\left(\frac{\tau}{\tau'}\right)^2$ is the Green's function for the linear system $(\gamma_L)^2$ defining the "impulse" 1^2 as the basis of its vector space, which characterizes absorption only. However, for the expanded RUC that encompasses both absorption and radiation, the linear system is defined by $\gamma^2 = \left(\frac{\tau'}{\tau}\right)^2$, where radiation is characterized by $\left(\frac{\tau'}{\tau}\right)^2 < 1^2$ and absorption by $\left(\frac{\tau'}{\tau}\right)^2 > 1^2$

Then $1^2 = \left(\frac{\tau}{\tau'}\right)^2 \left(\frac{\tau'}{\tau}\right)^2 = \left(\frac{\tau\tau'}{\tau'\tau}\right)^2$ where the Green's function is now $\left(\frac{\tau'}{\tau}\right)^2$ (or vice versa). However, this chararacterization of the system does not include the interaction between v and c (i.e., β), where $h^2 = 2(c\tau)(v\tau') = 2(vc)(\tau\tau') = 2S^2$

Space, time, and Interaction

Energy

(Note that radial coordinates are obtained by multiplying the second order equations by pi, which makes the distinction between entropies (as areas) in Cartesian “coordinates” vs Radial “coordinates.)

Note that globally, We (or at least Me anyway) only absorbs energy ("Information"), but does not radiate it. Locally, radiation is confined to, uh, relevant bodily functions (which may include falling in love, bar fights, and more....)

In the expanded RUC, there are three states determined by $\beta^2 = \left(\frac{v}{c}\right)^2$ and $\gamma^2 = \left(\frac{\tau'}{\tau}\right)^2$. These states and their interaction h^2 are interpreted the following way:

1. **Absorption** $\left(\tau' > \tau,\ v > c\right)$, where $\beta^2 = \left(\frac{v}{c}\right)^2$ and $\gamma = \frac{\tau'}{\tau}, (h^2 = 2\gamma\beta)$.

   Absorption (of energy) begins from an initial state $\gamma^2 = 1^2$ where $\beta^2 = 0$ and $\tau' = \tau$ and increases with increasing β and γ until there is no more field particle is left (or the particles no longer interact), in which case $\beta^2 = 0$ but with an increased $(\gamma')^2$ where $(\gamma')^2 > (\gamma)^2$. Here h^2 represents the added energy (change in entropy) due to the interaction, with final state $(h')^2$ at the end of the process. When $v^2 = \beta^2 = 0$, $(h')^2 = 0$.

$$(\gamma)^2 = 1^2 + (\beta\gamma)^2 + 2\beta\gamma$$
$$cosh^2\theta = 1^2 + sinh^2\theta + 2(\sinh\theta)(\cosh\theta)$$
$$h^2 = 2(\sinh\theta)(\cosh\theta)$$

2. **Radiation** $(\tau')^2 < (\tau)^2,\ (v)^2 < (c)^2$, where $\beta^2 = \left(\frac{v}{c}\right)^2$ and $\gamma^2 = \left(\frac{\tau'}{\tau}\right)^2, h^2 = 2\left(\frac{\beta}{\gamma}\right)$.

   Radiation (of energy) begins from an initial state $\gamma^2 = 1^2$ where $\tau' = \tau$ and decreases with decreasing β^2 and $\left(\frac{1}{\gamma}\right)^2$ until there is no more field (or particle) is left (or the particles no longer interact, in which case $v = \beta = 0$) but with a decreased $(1')^2 = \left(\frac{1}{\gamma'}\right)^2$ where $\left(\frac{1}{\gamma'}\right)^2 < \frac{1}{(\gamma_{v=0})^2} = 1^2$.

Here h^2 represents the decreased (changed in) energy (entropy) due to the interaction, with final state $(h')^2$ at the end of the process.

$$(1)^2 = \left(\frac{1}{\gamma}\right)^2 + (\beta)^2 + 2\left(\frac{\beta}{\gamma}\right)$$
$$1^2 = \sin^2\theta + \cos^2\theta + 2(\sin\theta)(\cos\theta)$$
$$h^2 = 2(\sin\theta)(\cos\theta)$$

3. **No Interaction** (h^2 = 0, v=0, t'=t)

In this case the energy is unchanged (no interaction), the change in entropy $h^2 = 0$ and the system is unperturbed. This case can be represented by the Cartesian product of two non-interacting statesC, where $(c\tau, v\tau')^n = \begin{vmatrix} (c\tau) & 0 \\ 0 & (v\tau') \end{vmatrix}^n = \begin{vmatrix} (c\tau)^n & 0 \\ 0 & (v\tau')^n \end{vmatrix}$ and energy is represented by $n = 2$ and thus by $SU(2)$. Then

$$Tr(c\tau, v\tau')^2 = Tr\begin{vmatrix} (c\tau) & 0 \\ 0 & (v\tau') \end{vmatrix}^2 = Tr\begin{vmatrix} (c\tau)^2 & 0 \\ 0 & (v\tau')^2 \end{vmatrix} = (c\tau)^2 + (v\tau')^2$$

Setting $(c\tau')^2 = (c\tau)^2 + (v\tau')^2 = Tr(c\tau, v\tau')^2$ as a single valued function yields the equation for the "Lorentz factor" by solving for τ'; $\frac{\tau'}{\tau} = \frac{1}{\sqrt{1-\beta^2}}; \beta = \frac{v}{c}$

If there is interaction then the system is represented by

$$(c\tau')^2 = \left[(c\tau) + (v\tau')\right]^2 = (c\tau)^2 + (v\tau')^2 + 2(c\tau)(v\tau')$$
$$h^2 = 2(c\tau)(v\tau') \triangleq 2S^2$$

(The RUC)

Note that $\det\begin{vmatrix} (c\tau) & 0 \\ 0 & (v\tau') \end{vmatrix} = (c\tau)(v\tau') \neq 2(c\tau)(v\tau')$ where the factor of 2 indicates the element count on the r.h.s. if the condition $(c\tau')^2 = 0$ defines prime numbers, then

$$L = (p_1)^2 + (p_2)^2 = 2(p_1)(p_2) = 2N$$

where $L = 2N$ and (p_1) and (p_2) are prime numbers (satisfying Goldbach's conjecture) and $\{L\} = \{2N\}$ is the complete set of even numbers (so the set of odd numbers is $\{(c\tau')\}^2 - \{2N\}$).

Matrix Representation of Interaction

The matrix representations consistent with the interaction equation are:

$$\left|(c\tau')^2\right| = \det\begin{vmatrix}(c\tau') & 0 \\ 0 & (c\tau')\end{vmatrix} = Tr\begin{vmatrix}(c\tau)^2 & 0 \\ 0 & (v\tau')^2\end{vmatrix} + \det\begin{vmatrix}c\tau & c\tau \\ -v\tau' & v\tau'\end{vmatrix}$$

$$\left|(c\tau')^2\right| = \left|(c\tau)^2\right| + \left|(v\tau')^2\right| + 2\left|(c\tau)\right|\left|(v\tau')\right| = \left|(c\tau)+(v\tau')\right|^2$$

Note that:

$$\left(\det\begin{vmatrix}c\tau & c\tau \\ -v\tau', & v\tau'\end{vmatrix}\right)\vec{k} = \begin{vmatrix}c\tau \\ -v\tau'\end{vmatrix}\vec{i} \otimes \begin{vmatrix}c\tau \\ v\tau'\end{vmatrix}\vec{j} = 2(c\tau)(v\tau')\vec{k} \triangleq (h^2)\vec{k} \triangleq (2S^2)\vec{k}$$

$$\begin{vmatrix}i & j & k \\ c\tau & c\tau & 0 \\ -v\tau' & v\tau' & 0 \\ 0 & 0 & 0\end{vmatrix} \Rightarrow \begin{vmatrix}i & j & k \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 2(c\tau)(v\tau')\end{vmatrix}$$

Radiation

$$\left|1^2\right| = \det\begin{vmatrix}1 & 0 \\ 0 & 1\end{vmatrix} = Tr\begin{vmatrix}\left(\dfrac{1}{\gamma}\right)^2 & 0 \\ 0 & \beta^2\end{vmatrix} + \det\begin{vmatrix}\dfrac{1}{\gamma} & \dfrac{1}{\gamma} \\ -\beta & \beta\end{vmatrix}, \quad \det\begin{vmatrix}\dfrac{1}{\gamma} & \dfrac{1}{\gamma} \\ -\beta & \beta\end{vmatrix} = 2\left(\dfrac{\beta}{\gamma}\right) \triangleq h^2 = 2S^2$$

Absorption

$$\left|\gamma^2\right| = \det\begin{vmatrix}\gamma & 0 \\ 0 & \gamma\end{vmatrix} = Tr\begin{vmatrix}(1)^2 & 0 \\ 0 & (\gamma\beta)^2\end{vmatrix} + \det\begin{vmatrix}\gamma & \gamma \\ -\beta & \beta\end{vmatrix}, \quad \det\begin{vmatrix}\gamma & \gamma \\ -\beta & \beta\end{vmatrix} = 2\beta\gamma \triangleq h^2 = 2S^2$$

Note that

$$Tr\begin{vmatrix}1^2 & 0 \\ 0 & 1^2\end{vmatrix} + \det\begin{vmatrix}1 & 1 \\ -1 & 1\end{vmatrix} = 1^2 + 1^2 + 2(1^2) = (1+1)^2$$

Space and Time

In the characterization above, h^2 (change in entropy) is the only observable for the observer (Me), where the "point of observation" on the RUC is at its center, but the characterization of h^2 in Cartesian "coordinates" will be at the center of the RUC (equal and opposite forces/energies) or at the junction of the radius and circumference ("Spin"), where in the latter case it is interpreted as torque at the center of the RUC. Entropy thus depends on the Source of the perturbation and the existence of the interaction between the initial and final states of the physical system

If an interpretation of Space and Time is to be included, a first step is to include a $\left(\frac{1}{r}\right)^2$, $r^2 > 1^2$ "space"factor (for an isotropic physical system, which indicates at least some of the radiation is being dispersed into the background, so that the Interaction is represented by $\left(h_r{}'\right)^2 = \frac{1}{r^2}(h)^2$.

If the source (or sensor) varies in time, the second step is to include it as a multiplier of the interaction:

e.g. $f(t) = \sin(t)$ and $(h')^2 = [\sin(t)]^2(h^2 / r^2)$

If space and time are independent, then in the general case, we have

$(h')^2 = \left[\frac{f(t)}{f(x)}\right]^2\left(\frac{h^2}{r^2}\right)$; otherwise $(h')^2 = [f(\frac{t}{x})] = f(\frac{1}{v})$.

Note that $x = 0 \Rightarrow f\left(\frac{1}{v}\right) = f(t)$, but $\beta = \frac{t'}{t}$ for $x_v = x_c$ in the deconstruction of $\beta = (v / c)$ into its spacetime components in the classical model where $c = 1$ or Special Relativity where $\gamma_L = \frac{1}{\sqrt{1^2 - \beta^2}}$ so that $t' = t\gamma_L$.

The intellectual characterization for the vacuum <> laboratory light density is therefore an intellectual model of "spacetime" model of energy change at the sensor (i.e. Me), which is taken as an interpretation of experimental evidence developed in my imagination.

"**When you achieve the all-encompassing California mellow surfing WOW, you'll never blow your Buddhist cool**"

The Interaction of Light with Matter

$$\varphi = M + L$$
$$\varphi^2 = M^2 + L^2 + 2ML$$
$$L = (c\tau')$$
$$\varphi^2 = M^2 + (c\tau')^2 + 2M(c\tau')$$

$$\varphi = (M_1 + M_2) + L$$
$$\varphi^2 = (M_1 + M_2)^2 + L^2 + 2(M_1 + M_2)L$$

$$L = (c\tau') = (c\tau) + (v\tau')$$
$$L^2 = (c\tau')^2 = (c\tau)^2 + (v\tau')^2 + h^2, h^2 = 2(c\tau)(v\tau')$$
$$\pi L^2 = \pi(c\tau')^2$$

$$\varphi^2 = (M_1 + M_2)^2 + (c\tau')^2 + 2(M_1 + M_2)(c\tau')$$
$$= \left[(M_1)^2 + (M_2)^2 + 2M_1M_2\right] + (c\tau')^2 + 2(M_1 + M_2)(c\tau')$$
$$\left[(M_1)^2 + (M_2)^2 + 2M_1M_2\right] + (c\tau')^2 + h^2, h^2 \triangleq 2(M_1 + M_2)(c\tau')$$
$$\pi\varphi^2 = \pi(M_1 + M_2)^2 + \pi L^2 + 2\pi(M_1 + M_2)L$$

The "Wave" Equation

Consider the expression $\left[(Px),(Et)\right]$ If (Px) does not interact with (Et), then there are two independent "fields" (Cartesian product) which can be expressed in the two dimensional matrix:

$$\left|\sqrt{E}\right| \triangleq \begin{vmatrix} (Px) & 0 \\ 0 & (Et) \end{vmatrix} \text{ so that } |E| = \begin{vmatrix} (Px)^2 & 0 \\ 0 & (Et)^2 \end{vmatrix} \text{ and } Tr|E| = (Px)^2 + (Et)^2$$

However, if the particles interact, the single-valued interaction equation can be expressed as:

$$E_0 x = Px + E_0 t \text{ so that } (E_0 x)^2 = (Px)^2 + (E_0 t)^2 + 2(Px)(E_0 t)$$

Note that the sum of squares is only possible with complex conjugation, which eliminates the interaction $(E_0 t)(Px)$

$$\begin{aligned} (E_0 x) &= (E_0 t) + iPx \\ (E_0 x) &= \left[(E_0 t) + iPx\right]\left[(E_0 t) - iPx\right] \\ (E_0 x)^2 &\triangleq (E_0 x)(E_0 x)^* = (Px)^2 + (E_0 t)^2 \end{aligned}$$

Radiation

Dividing both sides by $(E_0 x)^2$ yields:

$$(1)^2 = \left(\frac{P}{E_0}\right)^2 + \left(\frac{t}{x}\right)^2 + 2\frac{(P)(t)}{(E_0)(x)} = \left(\frac{P}{E_0}\right)^2 + \left(\frac{1}{v}\right)^2 + 2\left(\frac{1}{v}\right)\left(\frac{P}{E_0}\right) \text{ where}$$

$$(E_0)2 > P^2, v^2 = \left(\frac{x}{t}\right)^2 > 1^2 \Rightarrow \left(\frac{t}{x}\right)^2 = \left(\frac{1}{v}\right)^2 < 1 \text{ and } h^2 = 2\left(\frac{1}{v}\right)\left(\frac{P}{E_0}\right) < 1^2$$

$$(1)^2 = \beta^2 + \left(\frac{1}{\gamma}\right)^2 + 2\left(\frac{\beta}{\gamma}\right) \gamma = v,\ \beta^2 = \left(\frac{P}{E_0}\right)^2$$

$$(1)^2 = \sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta,\ \sin^2\theta = \beta^2,\ \cos^2\theta = \left(\frac{1}{\gamma}\right)^2$$

Absorption

Dividing both sides by $\left(E_0 t\right)^2$ yields:

$$\frac{\left(x\right)^2}{\left(t\right)^2} = \frac{\left(Px\right)^2}{\left(E_0 t\right)^2} + 1^2 + \frac{2\left(Px\right)}{\left(E_0 t\right)}$$

$$v^2 = 1^2 + \left(\frac{P}{E_0}\right)\left(v^2\right) + 2\left(\frac{P}{E_0}\right)v$$

$$\gamma^2 = 1^2 + \left(\gamma\beta\right)^2 + 2\beta\gamma$$

$$\cosh^2\theta = 1^2 + \sinh^2\theta + 2\sinh\theta,\ \cosh^2\theta = \gamma^2, \sinh^2\theta = \left(\gamma\beta\right)^2$$

$$h^2 = 2\left(\frac{P}{E_0}\right)v > 1^2$$

The Schrodinger Equation

Trig Identities (Wiki)

The relation to the Schroedinger equation is through its argument:

$$\psi(\theta)=\psi\left[\frac{2\pi i}{h}(Px+Et)\right]=\psi\left[i\frac{\pi}{h/2}(Px+Et)\right]=\psi\left[i\frac{\pi}{\sqrt{S}}(Px+Et)\right]$$

(TBD) Stay tuned

Counting

$$Tr(|1|) = 1$$

$$Tr(\begin{vmatrix}1 & 0\\0 & 1\end{vmatrix}) = 2 = Tr\left(|2|\right)$$

$$Tr(\begin{vmatrix}1 & 0\\0 & 1\end{vmatrix}) + Tr(|1|) = 3 = Tr\left(|3|\right)$$

$$2Tr(\begin{vmatrix}1 & 0\\0 & 1\end{vmatrix}) = 4 = Tr\left(4\right)$$

$$n\left(Tr(\begin{vmatrix}1 & 0\\0 & 1\end{vmatrix})\right) = 2n = 2N = 2(p_1 p_2) = Tr\begin{vmatrix}(p_1)^2 & 0\\0 & (p_2)^2\end{vmatrix} = L = (p_1)^2 + (p_2)^2$$

$$\{2n\} = \{S_{even}\}$$

$$n\left(Tr(\begin{vmatrix}1 & 0\\0 & 1\end{vmatrix})\right) + 1 = 2n + 1$$

$$\{2n+1\} + 1 = \{S_{odd}\}$$

$$\{Z^+\} = \{S_{even}\} + \{S_{odd}\} = L + \{2n+1\}$$

$$Tr(\begin{vmatrix}1^2 & 0\\0 & 1^2\end{vmatrix}) = 2\left(1^2\right) = \det\begin{vmatrix}1 & 1\\-1 & 1\end{vmatrix} = \begin{vmatrix}1\\-1\end{vmatrix} \otimes \begin{vmatrix}1\\1\end{vmatrix}$$

Counting and SU(2)

$$\mathbb{Z}\begin{matrix}k\\i,j\end{matrix} = E_{i,j} + O^k = \left\{Tr\begin{vmatrix}(p_i)^2 & 0\\0 & (p_j)^2\end{vmatrix}\right\} + \left\{|o^k|\right\}$$

$$\left\{Tr\begin{vmatrix}(p_i)^2 & 0\\0 & (p_j)^2\end{vmatrix}\right\} = (p_i)^2 + (p_j)^2 = 2h^2$$

$$c = |1|$$
$$c^2 = |1|^2$$
$$c = 1 + 1 = 2 = Tr\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix}$$
$$c = 1^2 + 1^2 = Tr\begin{vmatrix} 1^2 & 0 \\ 0 & 1^2 \end{vmatrix} = 2\left(1^2\right)$$
$$h^2 \triangleq Det\begin{vmatrix} 1 & 1 \\ -1 & 1 \end{vmatrix} = 2\left(1^2\right) = Tr\begin{vmatrix} 1^2 & 0 \\ 0 & 1^2 \end{vmatrix}$$

$\left\{\mathbb{Z}\begin{matrix} k \\ i,j \end{matrix}\right\} = \left\{E_{i,j}\right\} + \left\{O^k\right\} = \left\{Tr\begin{vmatrix} (p_i)^2 & 0 \\ 0 & (p_j)^2 \end{vmatrix}\right\} + \left\{Tr\left|O^k\right|\right\}$ (by proof of Goldbach's conjecture).

Consider the set of positive integers $\left\{\mathbb{Z}\begin{matrix} k \\ i,j \end{matrix}\right\}$ to consist of the union of the set of even numbers $\left\{E_{i,j}\right\}$ and the set of odd numbers $\left\{O^k\right\}$

$\left\{E_{i,j}\right\} \cup \left\{O^k\right\}$ referred to sets of unit bases, so that they are all prime with respect to each other (an integer ring with no division):

$$(p) \triangleq \sum_{p=1}^{p} p_1$$
$$1_{(p)} = \log_{(p)}(p)$$

Note that the even numbers are expressible as a two dimensional array of squares of prime numbers equated to twice the multiplication of two numbers expressed as primes (the latter is possible because i and j each run over the full range of positive numbers in one dimension independently of i and j since $\log(p_i)^2 \neq \log(p_i)$.

$$\left\{Tr\begin{vmatrix} (p_i)^2 & 0 \\ 0 & (p_j)^2 \end{vmatrix}\right\} \triangleq L = (p_i)^2 + (p_j)^2 = 2\sqrt{(p_i)^2}\,2\sqrt{(p_j)^2} = \left\{Tr\left|2(p_i)(p_j)\right|\right\} = \left\{Tr\left|2N\right|\right\}$$

The interaction between two prime numbers (which is complete over the set of prime numbers and squares of prime numbers) can then be defined as

$$h^2 \triangleq \left(\sqrt{\left[(p_i)^2+(p_j)^2\right]}\right)^2 = \left(\sqrt{2(p_i)(p_j)}\right)^2,\ p\geq 1$$

$$Det\begin{vmatrix} p_1 & p_2 \\ -p_2 & p_1 \end{vmatrix} = Tr\begin{Bmatrix} (p_1)^2 & 0 \\ 0 & (p_2)^2 \end{Bmatrix} = (p_1)^2+(p_2)^2 = h^2$$

Therefore, $SU(2)$ only includes even numbers, and is therefore incomplete in the set of positive real numbers (integers referred to unit bases).

Consider the equation $\{(ct')^2\} = \{p^2\}+\{q^2\}+\{o^2\} = \{2pq\}+\{o^2\}$, where p and q are prime numbers (by Goldbach's conjecture). Then the set $\{p,q\}$ exhausts the set of even numbers, so $\{o^2\}$ must be the odd numbers, since $\{o^2\}$ exhausts all positive real numbers under the operations of addition and multiplication without division (a ring), with the condition on prime numbers that of $p^2+q^2=2pq$, where the actual numbers on the l.h.s. are different from the r.h.s, but the expression exhausts all squares of prime numbers under addition, and products of prime numbers under multiplication via the parameterized definition of prime numbers $(ct')^2=0$ (see proof).

No matter how large the set of even numbers, an addition of only one element to the set of even numbers $\{Even\}=\{p^2\}+\{q^2\}$ will make $(ct')^2$ odd $\{o^2\}=\{p^2\}+\{q^2\}+1$, so $(ct')^2 = p^2+q^2$ only if $\{o\}^2=\{0\}$.

This has profound implications for Quantum Field Theory.

TRUST me... :)

Even and Odd Numbers

If n is an positive integer, then the even numbers are represented by $e\triangleq\{e\}\triangleq 2N = 2\{n\},\ n=0,1,2,.....$ and the odd numbers by $o\triangleq\{o\}\triangleq 2N+1=\{n\}+1,\ n=0,1,2,.....$

Then the positive system of integers can be represented by

$$\begin{vmatrix} 2n+1 & 0 \\ 0 & 2n \end{vmatrix} \triangleq \begin{vmatrix} o & 0 \\ 0 & e \end{vmatrix},\ n=0,1,2,.....$$, where

$$0 \triangleq Tr\begin{vmatrix} 0 & 0 \\ 0 & 0 \end{vmatrix},$$

$$1 \triangleq Tr\begin{vmatrix} 1 & 0 \\ 0 & 0 \end{vmatrix},$$

$$2 \triangleq Tr\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} = 1+1,$$

$$3 \triangleq Tr\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} + Tr\begin{vmatrix} 1 & 0 \\ 0 & 0 \end{vmatrix} = 2+1,$$

$$4 \triangleq Tr\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} + Tr\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} = 2Tr\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} = 2+2 = 2*2 = 2^2,$$

$$5 \triangleq 2Tr\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} + Tr\begin{vmatrix} 1 & 0 \\ 0 & 0 \end{vmatrix} = 4+1 = 5,$$

$$6 \triangleq 3Tr\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} = 2+2+2 = 3*2$$

$$7 = 3Tr\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} + Tr\begin{vmatrix} 1 & 0 \\ 0 & 0 \end{vmatrix} = 6+1,$$

$$8 = 4Tr\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} = 2+2+2+2 = 4*2 = 2^3$$

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If the positive integers are to represent physical particle, then the existence of a single non-interacting particle is represented by first order integers where $\exists(m) \triangleq \left|\sqrt{m}\right|$ with a "momentum" $P_{mc}(mc) = \sqrt{mc} = \sqrt{m},\ c = 1$ in an "inertial frame at velocity c" where $c = 1$.

Such a single particle "frame" (with a mass $\sqrt{m}$ " everywhere") can be represented by

$\sqrt{m} = Tr\begin{vmatrix} \sqrt{m} & 0 \\ 0 & 0 \end{vmatrix}$ with its "destructor" by the matrix $i\sqrt{m} = Tr\begin{vmatrix} i\sqrt{m} & 0 \\ 0 & 0 \end{vmatrix}$

However, for Newton's Third Law to be satisfied, its "equal and opposite" force (an "event") is represented by the concept that "momentum" is actually interpreted to be force of a single particle, so that equal and opposite momentum for a single existing (odd) particle is represented by

$$(mc)^2 = \left(\sqrt{mc}\right)^2 = Tr\begin{vmatrix} \sqrt{mc} & 0 \\ 0 & 0 \end{vmatrix}^2 = Tr\begin{vmatrix} m & 0 \\ 0 & 0 \end{vmatrix} = Tr\begin{vmatrix} 1 & 0 \\ 0 & 0 \end{vmatrix},\ m=1,\ c=1$$

Then its "destructor" is represented by $i^2 = -1$, so that $0 = Tr\begin{vmatrix} 1 & 0 \\ 0 & 0 \end{vmatrix} + Tr\begin{vmatrix} i^2 & 0 \\ 0 & 0 \end{vmatrix} = 1 + i^2 = 1 + (-1)$

Then the "destruction" of odd and even particles is characterized by

$$Tr\begin{vmatrix} 0 & 0 \\ 0 & (2n) \end{vmatrix} + Tr\begin{vmatrix} 0 & 0 \\ 0 & i^2(2n) \end{vmatrix} = (2n) + i^2(2n) = 2(n-n) = 0$$

And

$$Tr\begin{vmatrix} (2n+1) & 0 \\ 0 & 0 \end{vmatrix} + Tr\begin{vmatrix} i^2(2n) & 0 \\ 0 & 0 \end{vmatrix} = (2n+1) + i^2(2n+1) = 2\left((n+1)-(n+1)\right) = 0$$

This means that the physical "complex plane" should be represented in first order (the "inertial frame" by the Cartesian half planes

$\left((i)\sqrt{2n}, \sqrt{2n}\right) \triangleq \left(\sqrt{2n}, \sqrt{2n}\right)$ for even numbers, and by

$\left((i)\sqrt{2(n+1)}, \sqrt{2(n+1)}\right) = \left(\sqrt{2(n+1)}, \sqrt{2(n+1)}\right)$ for odd numbers

Then in second order (at event points), (self-interacting) particles satisfying Newton's Third Law are represented by

$\left(2n\left(i^2\right), \sqrt{2n}\right) \triangleq 2(n,n)$ for even numbers, and by

$\left((i)^2\sqrt{2(n+1)}, \sqrt{2(n+1)}\right) = \left(2\left((n+1)\right), 2(n+1)\right)$ for odd numbers

Light Propagation

Consider the following expression, which includes the set of positive real integers),

$$(c\tau')^2 = Tr\begin{vmatrix} N & 0 \\ 0 & N \end{vmatrix} + Tr|1| = 2N + 1 = \{Even\} + 1 = \{Odd\} = Tr\begin{vmatrix} p^2 & 0 \\ 0 & q^2 \end{vmatrix} + 1 = \{L + 1\} = |\mathbb{Z}|$$

This describes a complete non-interacting Universe (☺), say as a source at the edge (e.g. lhs) of Maxwell's displacement capacitor before radiation. When the system radiates, the remaining system becomes the noninteracting $\{Odd\}$ remainder of the source while the non-interacting even set propagates across the displacement:

$$(c\tau')^2 = \left[\{odd\} + \{even\}\right] \rightarrow$$
$$\left[\{odd\}\right] \rightarrow -----\left[\{even = h^2\}\right]------\rightarrow|$$
$$\left[\{odd\} + \{even\}\right] = (c\tau')^2$$

Upon arrival, the even set is absorbed by the $\{odd\}$ sensor on the rhs, conserving energy.

This means that Einstein's energy equation should be $\Delta E = h^2 = 2(c\tau)(v\tau')$ and not

$$E = h\nu = h\frac{c}{\gamma} = \frac{h}{\tau} \ .$$

Since although $\{odd\}$ and $\{even\}$ do not interact, the source $\left[\{odd\} + \{even\}\right]$ emits an an interaction term $\left[\{even = h^2\}\right]$ which is recovered by the sensor $\left[\{odd\} + \{even\}\right]$.

The Pauli Matrices

Representation Theory of SU(2)

$$|\sigma_3| = \begin{vmatrix} 1 & 0 \\ 0 & -1 \end{vmatrix},\ Tr(\sigma_3) = 0 \Rightarrow 1 + (-1) = 0 \Rightarrow 1 = 1$$

$$|\sigma_{1+2}| = \sigma_1 + \sigma_2 = \begin{vmatrix} 0 & 1 \\ 1 & 0 \end{vmatrix} + \begin{vmatrix} 0 & -i \\ i & 0 \end{vmatrix} = \begin{vmatrix} 0 & 1-i \\ 1+i & 0 \end{vmatrix} \triangleq \begin{vmatrix} 0 & (E-iB) \\ (E+iB) & 0 \end{vmatrix} \triangleq \begin{vmatrix} 0 & \psi^* \\ \psi & 0 \end{vmatrix}$$

$$\det(|\sigma_{1+2}|) = -2 = i^2(2) \triangleq \det \begin{vmatrix} 0 & (E-iB) \\ (E+iB) & 0 \end{vmatrix} = -(E^2 + i^2B^2) = -\psi\psi^*, \psi = (E-iB)$$

$$\begin{vmatrix} 0 & 1-i \\ -(1+i) & 0 \end{vmatrix} \triangleq \begin{vmatrix} 0 & (E-iB) \\ -(E+iB) & 0 \end{vmatrix} \Rightarrow$$

$$\det \begin{vmatrix} 0 & 1-i \\ -(1+i) & 0 \end{vmatrix} = 1^2 - i^2 = 1^2 + 1$$

$$\det \begin{vmatrix} 0 & (E-iB) \\ -(E+iB) & 0 \end{vmatrix} = E^2 + B^2 = (E+iB)(E+iB)$$

Note that the interaction terms $\pm EB$ have been eliminated by conjugation. Therefore, the matrix $\begin{vmatrix} (E)^2 & 0 \\ 0 & (B)^2 \end{vmatrix}$ suggests that the elements do not interact, but this is not equivalent to the real number case $\begin{vmatrix} E^2 & 0 \\ 0 & B^2 \end{vmatrix}$ since $i^2B^2 = (-1)B^2 \neq (-1)^2 B^2$ and $\log(-1) = 1 \neq \log(-1)^2 = 2 = \log(1)^2$

The actual Stern-Gerlach experiment should have been represented by

$|\sigma_3| = \begin{vmatrix} 1 & 0 \\ 0 & -1 \end{vmatrix}$ (representing the equality (of charge) of participants)

$|\sigma_0| = \begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix}$ (representing the existence of participants)

$(|\sigma_0|)^2 = \left(\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} \right)^2 = \left(\begin{vmatrix} 1^2 & 0 \\ 0 & 1^2 \end{vmatrix} \right) = (|\sigma_3|)^2$, where $Tr(|\sigma_0|)^2 = Tr(|\sigma_3|)^2 = 1^2 + 1^2$ is the energy of non-interacting elements.

If interacting, the single valued equation that characterizes the interaction is

$$Tr\left(\left|\sigma_3\right|\right)^2 + Det\left(\begin{vmatrix} 1 & 1 \\ -1 & 1 \end{vmatrix}\right) = 1^2 + 1^2 + 2\left(1^2\right) = \left(1+1\right)^2 = 4(1^2)$$

$$Tr\left(\left|\sigma_{E,B}\right|\right)^2 = Tr\begin{vmatrix} E^2 & 0 \\ 0 & B^2 \end{vmatrix} + Det\begin{vmatrix} \sqrt{E} & \sqrt{B} \\ -\sqrt{B} & \sqrt{E} \end{vmatrix} = E^2 + B^2 + 2EB$$

Where the interactions $2\left(1^2\right)$ and $2EB$ are now included in their respective characterizations.

Relation to Lorentz Force: $F = mA = q\left(E + v \otimes B\right)$

To see this relation w.r.t the Lorentz force, consider the alternative:

$$mA = q(E+B)$$

$$A^2 = \left(\frac{q}{m}\right)^2\left(E^2 + B^2 + 2EB\right) = \left(\frac{q}{m}\right)^2\left[E^2 + B^2 + \left(E \otimes B\right) + \left(-B \otimes E\right)\right]$$

$$v = E \text{ in cross products (interaction)}$$

$$mA = q\left(E^2 + B^2 + v \otimes B\right)$$

$$m = q = 1$$

$$m^2 A^2 = q^2\left[E^2 + B^2 + \left(v \otimes B\right) + \left(B \otimes -v\right)\right] = q^2\left[E^2 + B^2 + 2vB\right]$$

$$mA = q(\varepsilon_0 E + \mu_0 B)$$

$$m^2 A^2 = q^2\left[\left(\varepsilon_0 E\right)^2 + \left(\mu_0 B\right)^2 + 2\left(\varepsilon_0 E\right)\left(\mu_0 B\right)\right] = q^2\left[\left(\varepsilon_0 E\right)^2 + \left(\mu_0 B\right)^2 + 2\left(\varepsilon_0 \mu_0\right)\left(EB\right)\right]$$

$$= q^2\left[\left(\varepsilon_0 E\right)^2 + \left(\mu_0 B\right)^2 + \left(\frac{1}{c^2}\right)\left(2EB\right)\right] = q^2\left[\left(\varepsilon_0 E\right)^2 + \left(\mu_0 B\right)^2 + \left(\frac{1}{r^2}\right)\left(2EB\right)\right],\ r = ct,\ t = 1$$

$$= q^2\left[\left(\varepsilon_0 E\right)^2 + \left(\mu_0 B\right)^2 + \left(\frac{1}{r^2}\right)\left(h^2\right)\right],\ h^2 \triangleq \left(2EB\right) = 2S^2,\ S \triangleq \sqrt{EB}$$

Quarks and Fermat's Theorem for the case n=2, 3 particles (Quarks)

The context in the following is in one dimension with existing particles/field sets $\{\{c\tau\},\{v\tau\},\{v\tau\}\}$

, characterizing the change in energy (entropy) from $\{(c\tau)^2\}$ to $\{(c\tau')^2\}$ (the reference particle/set) in terms of the perturbations $\{v\tau\},\{v\tau\}$

$$c\tau' = c\tau + v\tau + v\tau = (x)+(y)+(z)$$
$$(c\tau')^2 = (c\tau + v\tau + v\tau)^2$$
$$= (c\tau)^2 + (v\tau)^2 + (v\tau)^2 + 2(c\tau)(v\tau) + 2(c\tau)(v\tau) + 2(v\tau)(v\tau)$$
$$= (c\tau)^2 + (v\tau)^2 + (v\tau)^2 + 2\left[(c\tau)(v\tau) + (c\tau)(v\tau) + (v\tau)(v\tau)\right]$$
$$h^2 = 2\left[(c\tau)(v\tau) + (c\tau)(v\tau) + (v\tau)(v\tau)\right] = 2(c\tau)\left[\left[(v\tau)+(v\tau)\right] + (v\tau)(v\tau)\right]$$

Fermat's Theorem and Quarks

$$(c\tau')^2 = (c\tau)^2 + (v\tau)^2 + (v\tau)^2 + h^2$$
$$= (c\tau)^2 + (v\tau)^2 + (v\tau)^2 + 2(c\tau)\left[\left[(v\tau)+(v\tau)\right] + (v\tau)(v\tau)\right]$$
$$(c\tau')^2 = (c\tau)^2 + (v\tau)^2 + (v\tau)^2 \Leftrightarrow h^2 = 2(c\tau)\left[\left[(v\tau)+(v\tau)\right] + (v\tau)(v\tau)\right] = 0$$
$$h^2 \neq 0$$
$$(c\tau')^2 \neq (c\tau)^2 + (v\tau)^2 + (v\tau)^2$$

Fermat's Theorem and Spin

$$h^2 \triangleq 2\left[(c\tau)(v\tau) + (c\tau)(v\tau) + (v\tau)(v\tau)\right]$$
$$(h_{rg})^2 \triangleq 2(c\tau)(v\tau) \triangleq 2(S_{rg})^2$$
$$(h_{rb})^2 \triangleq 2(c\tau)(v\tau) \triangleq 2(S_{rb})^2$$
$$(h_{rb})^2 \triangleq 2(v\tau)(v\tau) \triangleq 2(S_{gb})^2$$
$$S^2 \triangleq \left[(S_{rg})^2 + (S_{rb})^2 + (S_{gb})^2\right]$$
$$h^2 = (h_{rg})^2 + (h_{rb})^2 + (h_{rb})^2 = 2\left[(S_{rg})^2 + (S_{rb})^2 + (S_{gb})^2\right] = 2S^2$$
$$h^2 = 2S^2 \Leftrightarrow S = \frac{h}{\sqrt{2}}$$

General Energy Equation (Quantum Triviality)

Consider a system of n particles

$$S = (c\tau) + \sum_{i=1}^{n} (v_i \tau_i)$$

$$S^2 = (c\tau)^2 + \left(\sum_{i=1}^{n} (v_i \tau_i) \right)^2$$

$$= (c\tau)^2 + \sum_{i=1}^{n} (v_i \tau_i)^2 + \operatorname{Re} m((c\tau, v_1\tau_1 ....v_n\tau_n, 2))$$

$$S^2 = (c\tau)^2 + \sum_{i=1}^{n} (v_i \tau_i)^2 \Leftrightarrow \operatorname{Re} m((c\tau, v_1\tau_1 ....v_n\tau_n, 2)) = 0$$

$$\operatorname{Re} m((c\tau, v_1\tau_1 ....v_n\tau_n, 2)) \neq 0$$

$$S^2 = (c\tau)^2 + \sum_{i=1}^{n} (v_i \tau_i)^2$$

Absorption and Radiation in the Relativistic Unit Circle

2/20/2020

Radiation ($\gamma \triangleq \frac{\tau'}{\tau} \le 1,\ \beta \triangleq \frac{v}{c} \le 1$ **)**

In “Cartesian coordinates”:

$$\gamma \triangleq 0 < \frac{\tau'}{\tau} \le 1$$
$$\pm\beta = \frac{\pm v}{c}, \qquad 0 < |\beta| < 1$$
$$\cos\theta \triangleq \gamma^{-1}$$
$$\sin(\pm\theta) \triangleq \pm\beta$$
$$\varphi = 1' = \cos\theta \pm \sin\theta = \gamma^{-1} \pm \beta$$
$$\varphi^2 = (1')^2 = \cos^2\theta + \sin^2\theta \pm 2\cos\theta\sin\theta = (1)^2 \pm 2\left(\frac{\beta}{\gamma}\right)$$
$$(1')^2 = (1)^2 \pm 2\left(\frac{\beta}{\gamma}\right) = (1)^2 \pm h^2,\ h^2 \triangleq 2\left(\frac{\beta}{\gamma}\right) = 2S^2, S \triangleq \left(\frac{\beta}{\gamma}\right),\ (1)^2 < (1)^2$$
$$(1')^2 = (1)^2 \pm h^2 = (1)^2 \pm 2S^2,\ (1)^2 \le (1')^2,\ (1)^2 = (1')^2 \Leftrightarrow h^2 = 0$$

In “radial coordinates” the expression becomes

$$\pi(1')^2 = \pi(1)^2 \pm \pi\left[2\left(\frac{\beta}{\gamma}\right)\right] \triangleq \pi h_\pi^{\ 2} \ne h^2$$
$$\pi h_\pi^{\ 2} = \left[\left(2\pi\gamma^{-1}\right)\beta\right] = \left[\left(C_\gamma\right)\beta\right],\ h_\pi^{\ 2} \triangleq \frac{h^2}{\pi} \triangleq \hbar$$

h^2 is defined as the change in entropy (particle count)

Not that the expression in radial coordinates has a different value, so that in coordinate transformations are not conserved; a particle can have both cartesian “spin” and radial “spin”, where (C_h) is the circumference of the Relativistic Unit Circle, and the interaction parameter is at the junction of the radius and circumference (of all four quadrants of the RUC) in the radial case, instead of at the center, as in the Cartesian case.

Here h^2 is the change (decrease) in entropy (energy) from the initial state $(1)^2$ to the final state $(1')^2$

This is the reason the laws of physics (as expressed by vectors) cannot be covariant (coordinate independent); the changes in entropy are different for the same value of θ

In an (even numbered) polyhedron, each section's entropy is modified by using the chord to define the entropy for even numbered ($L = 2N$ polyhedral, whereas the description is only complete if odd numbers ($2N+1$) are included.

Aborption ($\gamma \triangleq \frac{\tau'}{\tau} \geq 1,\ \beta \triangleq \frac{v}{c} \geq 1$)

$$\gamma \triangleq \frac{\tau'}{\tau} \geq 1$$
$$\beta = \frac{v}{c} \geq 0, \qquad 0 \leq |\beta| < \gamma$$
$$\cosh\theta \triangleq \gamma$$
$$\sinh(\pm\theta) \triangleq \pm\beta$$
$$\varphi = \cosh\theta = 1' = 1 \pm \sinh\theta = \gamma \pm \beta$$
$$\varphi^2 = (1')^2 = \cosh^2\theta = 1^2 + \sinh^2\theta \pm 2\sinh\theta = (1)^2 \pm 2\beta\gamma$$
$$(1')^2 = (1)^2 \pm 2\beta\gamma = (1)^2 \pm h^2,\ h^2 \triangleq 2\beta\gamma = 2S^2,\ S^2 \triangleq \beta\gamma,\ (1')^2 \geq (1)^2$$

$$(1')^2 = (1)^2 \pm h^2 = (1)^2 \pm 2S^2,\ (1')^2 \geq (1)^2,\ (1)^2 = (1')^2 \Leftrightarrow h^2 = 0$$

$$\pi(1')^2 = \pi(1)^2 \pm 2\pi(\beta\gamma) = \pi h_\pi^{\ 2} \neq h^2$$
$$2\pi h_\pi^{\ 2} = (2\pi\gamma)\beta = (C_\gamma)\beta$$

An Imaginary Relativistic Derivative (Proposal ☺)

(I have others…. ☺

The derivative can only be defined in second order as an energy (entropy) change between two particles/fields.

$$(c\tau') = (c\tau) + (v\tau')$$

$$(c\tau')^2 = \left[(c\tau) + (v\tau')\right]^2 = (c\tau)^2 + (v\tau')^2 + 2(c\tau)(v\tau') = (c\tau)^2 + (v\tau')^2 + h^2$$

$$f(c\tau')^2 = f\left((c\tau)^2 + (v\tau')^2 + h^2\right)$$

$$\psi = (c\tau) + i(v\tau')$$

$$\psi^* = (c\tau) - i(v\tau')$$

$$\psi\psi^* = (c\tau)^2 + (v\tau')^2$$

$$f'(c\tau')^2 = \lim_{h^2 \to 0}\left\{\frac{f\left[(c\tau)^2 + (v\tau')^2 + h^2\right] - f\left[\psi\psi^*\right]}{h^2}\right\}$$