Review Article

Modeling Method Based on Prespacetime Model II

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ABSTRACT

Some applications of Prespacetime Model II are stated. The applications relate to presenting and modeling energy-momentum-mass relationship, self-referential matrix rules, elementary particles and composite particles through self-referential hierarchical spin in prespacetime. In particular, method and model for generating energy-momentum-mass relationship, self-referential matrix rules, elementary particles and composite particles are stated.

Key Words: prespacetime, spin, self-reference, elementary particule, fermion, boson, unspinized particle, generation, sustenance, evolution, energy-momentum relation.

I. Modeling Method Based on Prespacetime Model II

(1) A method for presenting and/or modeling generation of an energy-momentum-mass relationship of an elementary particle through hierarchical self-referential spin in prespacetime, as a research aide, teaching tool and/or game, comprising the steps of:

generating a first representation of said spin producing said energy-momentum-mass relationship of said elementary particle through said hierarchical self-referential spin in said prespacetime, said first representation comprising:

$$1 = e^{i0} = e^{-iL+iL} = (\cos L - i\sin L)(\cos L + i\sin L) =$$
$$\left(\frac{m}{E} - i\frac{|\mathbf{p}|}{E}\right)\left(\frac{m}{E} + i\frac{|\mathbf{p}|}{E}\right) = \left(\frac{m^2 + \mathbf{p}^2}{E^2}\right) \to E^2 = m^2 + \mathbf{p}^2$$

where e is natural exponential base, i is imaginary unit, L is a phase, E, m and $\boldsymbol{p}$ represent respectively energy, mass and momentum of said elementary particle, and speed of light c is set equal to one; and

presenting and/or modeling said first representation in a device for research, teaching and/or game.

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(2) A method as in (1) wherein said first representation is modified to include an electromagnetic potential $(\boldsymbol{A},\phi)$ generated by a second elementary particle, said modified representation comprising:

$$1 = e^{i0} = e^{-iL+iL} = (\cos L - i\sin L)(\cos L + i\sin L) =$$

$$\left(\frac{m}{E-e\phi} - i\frac{|\mathbf{p}\text{ - }e\mathbf{A}|}{E-e\phi}\right)\left(\frac{m}{E-e\phi} + i\frac{|\mathbf{p}\text{ - }e\mathbf{A}|}{E-e\phi}\right) =$$

$$\left(\frac{m^2 + |\mathbf{p}\text{ - }e\mathbf{A}|^2}{(E-e\phi)^2}\right) \to (E-e\phi)^2 = m^2 + (\mathbf{p}\text{ - }e\mathbf{A})^2$$

where e next to ϕ or $\boldsymbol{A}$ is electric charge of said elementary particle.

(3) A method as in (1) for presenting and/or modeling generation of a self-referential matrix rule further comprising the steps of:

generating a second representation of said spin forming said matrix rule from said energy-momentum-mass relationship, said second representation comprising:

$$\to 1 = \frac{E^2 - m^2}{\mathbf{p}^2} = \left(\frac{E-m}{-|\mathbf{p}|}\right)\left(\frac{-|\mathbf{p}|}{E+m}\right)^{-1} \to \frac{E-m}{-|\mathbf{p}|} = \frac{-|\mathbf{p}|}{E+m} \to \frac{E-m}{-|\mathbf{p}|} - \frac{-|\mathbf{p}|}{E+m} = 0$$

$$\to \begin{pmatrix} E-m & -|\mathbf{p}| \\ -|\mathbf{p}| & E+m \end{pmatrix} \to \begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p} \\ -\boldsymbol{\sigma}\cdot\mathbf{p} & E+m \end{pmatrix} \text{ or } \begin{pmatrix} E-m & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E+m \end{pmatrix},$$

$$\to 1 = \frac{E^2 - \mathbf{p}^2}{m^2} = \left(\frac{E-|\mathbf{p}|}{-m}\right)\left(\frac{-m}{E+|\mathbf{p}|}\right)^{-1} \to \frac{E-|\mathbf{p}|}{-m} = \frac{-m}{E+|\mathbf{p}|} \to \frac{E-|\mathbf{p}|}{-m} - \frac{-m}{E+|\mathbf{p}|} = 0$$

$$\to \begin{pmatrix} E-|\mathbf{p}| & -m \\ -m & E+|\mathbf{p}| \end{pmatrix} \to \begin{pmatrix} E-\boldsymbol{\sigma}\cdot\mathbf{p} & -m \\ -m & E+\boldsymbol{\sigma}\cdot\mathbf{p} \end{pmatrix} \text{ or } \begin{pmatrix} E-\mathbf{s}\cdot\mathbf{p} & -m \\ -m & E+\mathbf{s}\cdot\mathbf{p} \end{pmatrix},$$

$$\to 1 = \frac{m^2 + \mathbf{p}^2}{E^2} = \left(\frac{E}{-m+i|\mathbf{p}|}\right)^{-1}\left(\frac{-m-i|\mathbf{p}|}{E}\right)$$

$$\to \frac{E}{-m+i|\mathbf{p}|} = \frac{-m-i|\mathbf{p}|}{E} \to \frac{E}{-m+i|\mathbf{p}|} - \frac{-m-i|\mathbf{p}|}{E} = 0$$

$$\to \begin{pmatrix} E & -m-i|\mathbf{p}| \\ -m+i|\mathbf{p}| & E \end{pmatrix} \to \begin{pmatrix} E & -m-i\boldsymbol{\sigma}\cdot\mathbf{p} \\ -m+i\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix} \text{ or } \begin{pmatrix} E & -m-i\mathbf{s}\cdot\mathbf{p} \\ -m+i\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}, \text{ or}$$

$$\rightarrow 1 = \frac{E^2 - \mathbf{p}_i^{\,2}}{m^2} = \left(\frac{E - |\mathbf{p}_i|}{-m}\right)\left(\frac{-m}{E + |\mathbf{p}_i|}\right)^{-1} \rightarrow \frac{E - |\mathbf{p}_i|}{-m} = \frac{-m}{E + |\mathbf{p}_i|} \rightarrow \frac{E - |\mathbf{p}_i|}{-m} - \frac{-m}{E + |\mathbf{p}_i|} = 0$$

$$\rightarrow \begin{pmatrix} E - |\mathbf{p}_i| & -m \\ -m & E + |\mathbf{p}_i| \end{pmatrix} \rightarrow \begin{pmatrix} E - \boldsymbol{\sigma}\cdot\mathbf{p}_i & -m \\ -m & E + \boldsymbol{\sigma}\cdot\mathbf{p}_i \end{pmatrix} \text{ or } \begin{pmatrix} E - \mathbf{s}\cdot\mathbf{p}_i & -m \\ -m & E + \mathbf{s}\cdot\mathbf{p}_i \end{pmatrix},$$

where $\boldsymbol{\sigma} = (\sigma_1, \sigma_2, \sigma_3)$ are Pauli matrices, $|\mathbf{p}| = \sqrt{\mathbf{p}^2} = \sqrt{-Det(\boldsymbol{\sigma}\cdot\mathbf{p})} \rightarrow \boldsymbol{\sigma}\cdot\mathbf{p}$ represents fermionic spinization of $|\mathbf{p}|$, $\mathbf{s} = (s_1, s_2, s_3)$ are spin operators for spin 1 particle, $|\mathbf{p}| = \sqrt{\mathbf{p}^2} = \sqrt{-\left(Det(\mathbf{s}\cdot\mathbf{p} + I_3) - Det(I_3)\right)} \rightarrow \mathbf{s}\cdot\mathbf{p}$ represents bosonic spinization of $|\mathbf{p}|$, $\mathbf{p}_i$ represents imaginary momentum, $|\mathbf{p}_i| = \sqrt{\mathbf{p}_i^{\,2}} = \sqrt{-Det(\boldsymbol{\sigma}\cdot\mathbf{p}_i)} \rightarrow \boldsymbol{\sigma}\cdot\mathbf{p}_i$ represents fermionic spinization of $|\mathbf{p}_i|$, and $|\mathbf{p}_i| = \sqrt{\mathbf{p}_i^{\,2}} = \sqrt{-\left(Det(\mathbf{s}\cdot\mathbf{p}_i + I_3) - Det(I_3)\right)} \rightarrow \mathbf{s}\cdot\mathbf{p}_i$ represents bosonic spinization of $|\mathbf{p}_i|$;

presenting and/or modeling said second representation in said device for research, teaching and/or game.

(4) A method for presenting and/or modeling generation, sustenance and evolution of an elementary particle through hierarchical self-referential spin in prespacetime, as a research aide, teaching tool and/or game, comprising the steps of:

generating a first representation of said generation, sustenance and evolution of said elementary particle through said hierarchical self-referential spin in said prespacetime, said first representation comprising:

$$1 = e^{i0} = e^{i0}e^{i0} = e^{-iL+iL}e^{-iM+iM} = L_e L_i^{-1}\left(e^{-iM}\right)\left(e^{-iM}\right)^{-1} \rightarrow$$

$$\begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix}\begin{pmatrix} A_e e^{-iM} \\ A_i e^{-iM} \end{pmatrix} = L_M \begin{pmatrix} \psi_e \\ \psi_i \end{pmatrix} = 0$$

where e is natural exponential base, i is imaginary unit, L is a first phase, M is a second phase, $A_e e^{-iM} = \psi_e$ represents external object, $A_i e^{-iM} = \psi_i$ represents internal object, L_e represents external rule, L_i represents internal rule, $L = (L_{M,e}\ L_{M,i})$ represents matrix rule, $L_{M,e}$ represents external matrix rule and $L_{M,i}$ represents internal matrix rule; and

presenting and/or modeling said first representation in a device for research, teaching and/or game.

(5) A method as in (4) wherein said external object comprises of an external wave function; said internal object comprises of an internal wave function; said elementary particle comprises of a fermion, boson or unspinized particle; said matrix rule containing an energy operator $E \rightarrow i\partial_t$, momentum operator $\mathbf{p} \rightarrow -i\nabla$, spin operator **σ** where **σ** = (σ_1, σ_2, σ_3) are Pauli matrices, spin operator **S** where **S =** (s_1, s_2, s_3) are spin 1 matrices, and/or mass; said matrix rule further having a determinant containing E^2-$\boldsymbol{p}^2$-m^2=0, E^2-$\boldsymbol{p}^2$=0, E^2- m^2=0, or 0^2-$\boldsymbol{p}^2$-m^2=0; c=1 where c is speed of light; and $\hbar$=1 where ħ is reduced Planck constant.

(6) A method as (5) wherein said first representation of said generation, sustenance and evolution of said elementary particle comprises:

$$1 = e^{i0} = e^{i0}e^{i0} = e^{+iL-iL}e^{+iM-iM} = (\cos L + i\sin L)(\cos L - i\sin L)e^{+iM-iM} =$$

$$\left(\frac{m}{E} + i\frac{|\mathbf{p}|}{E}\right)\left(\frac{m}{E} - i\frac{|\mathbf{p}|}{E}\right)e^{+ip^\mu x_\mu - ip^\mu x_\mu} = \left(\frac{m^2 + \mathbf{p}^2}{E^2}\right)e^{+ip^\mu x_\mu - ip^\mu x_\mu} = \frac{E^2 - m^2}{\mathbf{p}^2}e^{+ip^\mu x_\mu - ip^\mu x_\mu} =$$

$$\left(\frac{E-m}{-|\mathbf{p}|}\right)\left(\frac{-|\mathbf{p}|}{E+m}\right)^{-1}\left(e^{-ip^\mu x_\mu}\right)\left(e^{-ip^\mu x_\mu}\right)^{-1} \longrightarrow \frac{E-m}{-|\mathbf{p}|}e^{-ip^\mu x_\mu} = \frac{-|\mathbf{p}|}{E+m}e^{-ip^\mu x_\mu} \rightarrow$$

$$\frac{E-m}{-|\mathbf{p}|}e^{-ip^\mu x_\mu} - \frac{-|\mathbf{p}|}{E+m}e^{-ip^\mu x_\mu} = 0 \rightarrow \begin{pmatrix} E-m & -|\mathbf{p}| \\ -|\mathbf{p}| & E+m \end{pmatrix}\begin{pmatrix} a_{e,+}e^{-ip^\mu x_\mu} \\ a_{i,-}e^{-ip^\mu x_\mu} \end{pmatrix} = 0$$

$$\rightarrow \begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p} \\ -\boldsymbol{\sigma}\cdot\mathbf{p} & E+m \end{pmatrix}\begin{pmatrix} A_{e,+}e^{-ip^\mu x_\mu} \\ A_{i,-}e^{-ip^\mu x_\mu} \end{pmatrix} = \begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix}\begin{pmatrix} \psi_{e,+} \\ \psi_{i,-} \end{pmatrix} = 0 \quad \text{or}$$

$$\begin{pmatrix} E-m & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E+m \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e,+}e^{-ip^\mu x_\mu} \\ \mathbf{A}_{i,-}e^{-ip^\mu x_\mu} \end{pmatrix} = \begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix}\begin{pmatrix} \psi_{e,+} \\ \psi_{i,-} \end{pmatrix} = 0$$

where $\begin{pmatrix} E-m & -|\mathbf{p}| \\ -|\mathbf{p}| & E+m \end{pmatrix}\begin{pmatrix} a_{e,+}e^{-ip^\mu x_\mu} \\ a_{i,-}e^{-ip^\mu x_\mu} \end{pmatrix} = 0$ is a first equation for said unspinized particle, $\begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p} \\ -\boldsymbol{\sigma}\cdot\mathbf{p} & E+m \end{pmatrix}\begin{pmatrix} A_{e,+}e^{-ip^\mu x_\mu} \\ A_{i,-}e^{-ip^\mu x_\mu} \end{pmatrix} = 0$ is Dirac equation in Dirac form for said fermion, and $\begin{pmatrix} E-m & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E+m \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e,+}e^{-ip^\mu x_\mu} \\ \mathbf{A}_{i,-}e^{-ip^\mu x_\mu} \end{pmatrix} = 0$ is a first equation for said boson;

$$1=e^{i0}=e^{i0}e^{i0}=e^{+iL-iL}e^{+iM-iM}=(\cos L+i\sin L)(\cos L-i\sin L)e^{+iM-iM}=$$

$$\left(\frac{m}{E}+i\frac{|\mathbf{p}|}{E}\right)\left(\frac{m}{E}-i\frac{|\mathbf{p}|}{E}\right)e^{+ip^\mu x_\mu-ip^\mu x_\mu}=\left(\frac{m^2+\mathbf{p}^2}{E^2}\right)e^{+ip^\mu x_\mu-ip^\mu x_\mu}=\frac{E^2-\mathbf{p}^2}{m^2}e^{+ip^\mu x_\mu-ip^\mu x_\mu}=$$

$$\left(\frac{E-|\mathbf{p}|}{-m}\right)\left(\frac{-m}{E+|\mathbf{p}|}\right)^{-1}\left(e^{-ip^\mu x_\mu}\right)\left(e^{-ip^\mu x_\mu}\right)^{-1}\rightarrow\frac{E-|\mathbf{p}|}{-m}e^{-ip^\mu x_\mu}=\frac{-m}{E+|\mathbf{p}|}e^{-ip^\mu x_\mu}\rightarrow$$

$$\frac{E-|\mathbf{p}|}{-m}e^{-ip^\mu x_\mu}-\frac{-m}{E+|\mathbf{p}|}e^{-ip^\mu x_\mu}=0\rightarrow\begin{pmatrix}E-|\mathbf{p}| & -m\\ -m & E+|\mathbf{p}|\end{pmatrix}\begin{pmatrix}a_{e,l}e^{-ip^\mu x_\mu}\\ a_{i,r}e^{-ip^\mu x_\mu}\end{pmatrix}=0$$

$$\rightarrow\begin{pmatrix}E-\boldsymbol{\sigma}\cdot\mathbf{p} & -m\\ -m & E+\boldsymbol{\sigma}\cdot\mathbf{p}\end{pmatrix}\begin{pmatrix}A_{e,l}e^{-ip^\mu x_\mu}\\ A_{i,r}e^{-ip^\mu x_\mu}\end{pmatrix}=\begin{pmatrix}L_{M,e} & L_{M,i}\end{pmatrix}\begin{pmatrix}\psi_{e,l}\\ \psi_{i,r}\end{pmatrix}=0 \quad \text{or}$$

$$\begin{pmatrix}E-\mathbf{s}\cdot\mathbf{p} & -m\\ -m & E+\mathbf{s}\cdot\mathbf{p}\end{pmatrix}\begin{pmatrix}\mathbf{A}_{e,l}e^{-ip^\mu x_\mu}\\ \mathbf{A}_{i,r}e^{-ip^\mu x_\mu}\end{pmatrix}=\begin{pmatrix}L_{M,e} & L_{M,i}\end{pmatrix}\begin{pmatrix}\psi_{e,l}\\ \psi_{i,r}\end{pmatrix}=0$$

where $\begin{pmatrix}E-|\mathbf{p}| & -m\\ -m & E+|\mathbf{p}|\end{pmatrix}\begin{pmatrix}a_{e,l}e^{-ip^\mu x_\mu}\\ a_{i,r}e^{-ip^\mu x_\mu}\end{pmatrix}=0$ is a second equation for said unspinized particle, $\begin{pmatrix}E-\boldsymbol{\sigma}\cdot\mathbf{p} & -m\\ -m & E+\boldsymbol{\sigma}\cdot\mathbf{p}\end{pmatrix}\begin{pmatrix}A_{e,l}e^{-ip^\mu x_\mu}\\ A_{i,r}e^{-ip^\mu x_\mu}\end{pmatrix}=0$ is Dirac equation in Weyl form for said fermion, and $\begin{pmatrix}E-\mathbf{s}\cdot\mathbf{p} & -m\\ -m & E+\mathbf{s}\cdot\mathbf{p}\end{pmatrix}\begin{pmatrix}\mathbf{A}_{e,l}e^{-ip^\mu x_\mu}\\ \mathbf{A}_{i,r}e^{-ip^\mu x_\mu}\end{pmatrix}=0$ is a second equation for said boson;

$$1=e^{i0}=e^{i0}e^{i0}=e^{+iL-iL}e^{+iM-iM}=(\cos L+i\sin L)(\cos L-i\sin L)e^{+iM-iM}=$$

$$\left(\frac{m}{E}+i\frac{|\mathbf{p}|}{E}\right)\left(\frac{m}{E}-i\frac{|\mathbf{p}|}{E}\right)e^{+ip^\mu x_\mu-ip^\mu x_\mu}=\left(\frac{E}{-m+i|\mathbf{p}|}\right)\left(\frac{-m-i|\mathbf{p}|}{E}\right)^{-1}\left(e^{-ip^\mu x_\mu}\right)\left(e^{-ip^\mu x_\mu}\right)^{-1}\rightarrow$$

$$\frac{E}{-m+i|\mathbf{p}|}e^{-ip^\mu x_\mu}=\frac{-m-i|\mathbf{p}|}{E}e^{-ip^\mu x_\mu}\rightarrow\frac{E}{-m+i|\mathbf{p}|}e^{-ip^\mu x_\mu}-\frac{-m-i|\mathbf{p}|}{E}e^{-ip^\mu x_\mu}=0$$

$$\rightarrow\begin{pmatrix}E & -m-i|\mathbf{p}|\\ -m+i|\mathbf{p}| & E\end{pmatrix}\begin{pmatrix}a_e e^{-ip^\mu x_\mu}\\ a_i e^{-ip^\mu x_\mu}\end{pmatrix}=0$$

$$\rightarrow\begin{pmatrix} E & -m-i\boldsymbol{\sigma}\cdot\mathbf{p} \\ -m+i\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_e e^{-ip^{\mu}x_{\mu}} \\ A_i e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = \begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix}\begin{pmatrix} \psi_e \\ \psi_i \end{pmatrix} = 0 \quad \text{or}$$

$$\begin{pmatrix} E & -m-i\mathbf{s}\cdot\mathbf{p} \\ -m+i\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathbf{A}_e e^{-ip^{\mu}x_{\mu}} \\ \mathbf{A}_i e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = \begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix}\begin{pmatrix} \psi_e \\ \psi_i \end{pmatrix} = 0$$

where $\begin{pmatrix} E & -m-i|\mathbf{p}| \\ -m+i|\mathbf{p}| & E \end{pmatrix}\begin{pmatrix} a_e e^{-ip^{\mu}x_{\mu}} \\ a_i e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = 0$ is a third equation for said unspinized particle, $\begin{pmatrix} E & -m-i\boldsymbol{\sigma}\cdot\mathbf{p} \\ -m+i\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_e e^{-ip^{\mu}x_{\mu}} \\ A_i e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = 0$ is Dirac equation in a third form for said fermion, and $\begin{pmatrix} E & -m-i\mathbf{s}\cdot\mathbf{p} \\ -m+i\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathbf{A}_e e^{-ip^{\mu}x_{\mu}} \\ \mathbf{A}_i e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = 0$ is a third equation for said boson; or

$$1 = e^{i0} = e^{i0}e^{i0} = e^{+iL-iL}e^{+iM-iM} = (\cos L + i\sin L)(\cos L - i\sin L)e^{+iM-iM} =$$

$$\left(\frac{m}{E} + i\frac{|\mathbf{p}_i|}{E}\right)\left(\frac{m}{E} - i\frac{|\mathbf{p}_i|}{E}\right)e^{+ip^{\mu}x_{\mu}-ip^{\mu}x_{\mu}} = \left(\frac{m^2+\mathbf{p}_i^{\,2}}{E^2}\right)e^{+ip^{\mu}x_{\mu}-ip^{\mu}x_{\mu}} = \frac{E^2-m^2}{\mathbf{p}_i^{\,2}}e^{+ip^{\mu}x_{\mu}-ip^{\mu}x_{\mu}} =$$

$$\left(\frac{E-m}{-|\mathbf{p}_i|}\right)\left(\frac{-|\mathbf{p}_i|}{E+m}\right)^{-1}\left(e^{-ip^{\mu}x_{\mu}}\right)\left(e^{-ip^{\mu}x_{\mu}}\right)^{-1} \longrightarrow \frac{E-m}{-|\mathbf{p}_i|}e^{-ip^{\mu}x_{\mu}} = \frac{-|\mathbf{p}_i|}{E+m}e^{-ip^{\mu}x_{\mu}} \rightarrow$$

$$\frac{E-m}{-\mathbf{p}_i}e^{-ip^{\mu}x_{\mu}} - \frac{-|\mathbf{p}_i|}{E+m}e^{-ip^{\mu}x_{\mu}} = 0 \rightarrow \begin{pmatrix} E-m & -|\mathbf{p}_i| \\ -|\mathbf{p}_i| & E+m \end{pmatrix}\begin{pmatrix} s_{e,+}e^{-iEt} \\ s_{i,-}e^{-iEt} \end{pmatrix} = 0$$

$$\rightarrow\begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p}_i \\ -\boldsymbol{\sigma}\cdot\mathbf{p}_i & E+m \end{pmatrix}\begin{pmatrix} S_{e,+}e^{-iEt} \\ S_{i,-}e^{-iEt} \end{pmatrix} = \begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix}\begin{pmatrix} \psi_{e,+} \\ \psi_{i,-} \end{pmatrix} = 0 \quad \text{or}$$

$$\begin{pmatrix} E-m & -\mathbf{s}\cdot\mathbf{p}_i \\ -\mathbf{s}\cdot\mathbf{p}_i & E+m \end{pmatrix}\begin{pmatrix} \mathbf{S}_{e,+}e^{-iEt} \\ \mathbf{S}_{i,-}e^{-iEt} \end{pmatrix} = \begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix}\begin{pmatrix} \psi_{e,+} \\ \psi_{i,-} \end{pmatrix} = 0$$

where $\begin{pmatrix} E-m & -|\mathbf{p}_i| \\ -|\mathbf{p}_i| & E+m \end{pmatrix}\begin{pmatrix} s_{e,+}e^{-iEt} \\ s_{i,-}e^{-iEt} \end{pmatrix} = 0$ is a first equation for said unspinized particle with said imaginary momentum $\mathbf{p}_i$, $\begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p}_i \\ -\boldsymbol{\sigma}\cdot\mathbf{p}_i & E+m \end{pmatrix}\begin{pmatrix} S_{e,+}e^{-iEt} \\ S_{i,-}e^{-iEt} \end{pmatrix} = 0$ is Dirac equation in Dirac form for said fermion with said imaginary momentum $\mathbf{p}_i$, and

$\begin{pmatrix} E-m & -\mathbf{s}\cdot\mathbf{p}_i \\ -\mathbf{s}\cdot\mathbf{p}_i & E+m \end{pmatrix}\begin{pmatrix} \mathbf{S}_{e,+}e^{-iEt} \\ \mathbf{S}_{i,-}e^{-iEt} \end{pmatrix}=0$ is a first equation for said boson with said imaginary momentum $\mathbf{p}_i$.

(7) A method as in (6) wherein said elementary particle comprises of:

an electron, equation of said electron being modeled as:

$$\begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p} \\ -\boldsymbol{\sigma}\cdot\mathbf{p} & E+m \end{pmatrix}\begin{pmatrix} A_{e,+}e^{-ip^{\mu}x_{\mu}} \\ A_{i,-}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0, \begin{pmatrix} E-\boldsymbol{\sigma}\cdot\mathbf{p} & -m \\ -m & E+\boldsymbol{\sigma}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} A_{e,l}e^{-ip^{\mu}x_{\mu}} \\ A_{i,r}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0 \text{ or}$$

$$\begin{pmatrix} E & -m-i\boldsymbol{\sigma}\cdot\mathbf{p} \\ -m+i\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_{e}e^{-ip^{\mu}x_{\mu}} \\ A_{i}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0;$$

a positron, equation of said positron being modeled as:

$$\begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p} \\ -\boldsymbol{\sigma}\cdot\mathbf{p} & E+m \end{pmatrix}\begin{pmatrix} A_{e,-}e^{+ip^{\mu}x_{\mu}} \\ A_{i,+}e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0, \begin{pmatrix} E-\boldsymbol{\sigma}\cdot\mathbf{p} & -m \\ -m & E+\boldsymbol{\sigma}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} A_{e,r}e^{+ip^{\mu}x_{\mu}} \\ A_{i,l}e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0 \text{ or}$$

$$\begin{pmatrix} E & -m-i\boldsymbol{\sigma}\cdot\mathbf{p} \\ -m+i\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_{e}e^{+ip^{\mu}x_{\mu}} \\ A_{i}e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0;$$

a massless neutrino, equation of said neutrino being modeled as:

$$\begin{pmatrix} E & -\boldsymbol{\sigma}\cdot\mathbf{p} \\ -\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_{e,+}e^{-ip^{\mu}x_{\mu}} \\ A_{i,-}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0, \begin{pmatrix} E-\boldsymbol{\sigma}\cdot\mathbf{p} & \\ & E+\boldsymbol{\sigma}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} A_{e,l}e^{-ip^{\mu}x_{\mu}} \\ A_{i,r}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0 \text{ or}$$

$$\begin{pmatrix} E & -i\boldsymbol{\sigma}\cdot\mathbf{p} \\ +i\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_{e}e^{-ip^{\mu}x_{\mu}} \\ A_{i}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0;$$

A massless antineutrino, equation of said antineutrino being modeled as:

$$\begin{pmatrix} E & -\boldsymbol{\sigma}\cdot\mathbf{p} \\ -\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_{e,-}e^{+ip^{\mu}x_{\mu}} \\ A_{i,+}e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0, \begin{pmatrix} E-\boldsymbol{\sigma}\cdot\mathbf{p} & \\ & E+\boldsymbol{\sigma}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} A_{e,r}e^{+ip^{\mu}x_{\mu}} \\ A_{i,l}e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0 \text{ or}$$

$$\begin{pmatrix} E & -i\boldsymbol{\sigma}\cdot\mathbf{p} \\ +i\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_{e}e^{+ip^{\mu}x_{\mu}} \\ A_{i}e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0;$$

a massive spin 1 boson, equation of said massive spin 1 boson being modeled as:

$$\begin{pmatrix} E-m & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E+m \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e,+}e^{-ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i,-}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0, \quad \begin{pmatrix} E-\mathbf{s}\cdot\mathbf{p} & -m \\ -m & E+\mathbf{s}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e,l}e^{-ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i,r}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0 \text{ or}$$

$$\begin{pmatrix} E & -m-i\mathbf{s}\cdot\mathbf{p} \\ -m+i\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e}e^{-ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0;$$

a massive spin 1 antiboson, equation of said massive spin 1 antiboson being modeled as:

$$\begin{pmatrix} E-m & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E+m \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e,-}e^{+ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i,+}e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0, \quad \begin{pmatrix} E-\mathbf{s}\cdot\mathbf{p} & -m \\ -m & E+\mathbf{s}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e,r}e^{+ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i,l}e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0 \text{ or}$$

$$\begin{pmatrix} E & -m-i\mathbf{s}\cdot\mathbf{p} \\ -m+i\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e}e^{+ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i}e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0;$$

a massless spin 1 boson, equation of said massless spin 1 boson being modeled as:

$$\begin{pmatrix} E & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e,+}e^{-ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i,-}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=\begin{pmatrix} E & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathbf{E} \\ i\mathbf{B} \end{pmatrix}=0,$$

$$\begin{pmatrix} E-\mathbf{s}\cdot\mathbf{p} & \\ & E+\mathbf{s}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e,l}e^{-ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i,r}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0 \text{ or } \begin{pmatrix} E & -i\mathbf{s}\cdot\mathbf{p} \\ +i\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e}e^{-ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0$$

where $\begin{pmatrix} E & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathbf{E} \\ i\mathbf{B} \end{pmatrix}=0$ is equivalent to Maxwell equation $\begin{pmatrix} \partial_t\mathbf{E}=\nabla\times\mathbf{B} \\ \partial_t\mathbf{B}=-\nabla\times\mathbf{E} \end{pmatrix}$;

a massless spin 1 antiboson, equation of said massless spin 1 antiboson being modeled as:

$$\begin{pmatrix} E & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e,-}e^{+ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i,+}e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0, \quad \begin{pmatrix} E-\mathbf{s}\cdot\mathbf{p} & \\ & E+\mathbf{s}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e,r}e^{+ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i,l}e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0 \text{ or}$$

$$\begin{pmatrix} E & -i\mathbf{s}\cdot\mathbf{p} \\ -m+i\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e}e^{+ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i}e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0;$$

an antiproton, equation of said antiproton being modeled as:

$$\begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p}_i \\ -\boldsymbol{\sigma}\cdot\mathbf{p}_i & E+m \end{pmatrix}\begin{pmatrix} S_{e,+}e^{-iEt} \\ S_{i,-}e^{-iEt} \end{pmatrix}=0, \quad \begin{pmatrix} E-\boldsymbol{\sigma}\cdot\mathbf{p}_i & -m \\ -m & E+\boldsymbol{\sigma}\cdot\mathbf{p}_i \end{pmatrix}\begin{pmatrix} S_{e,l}e^{-iEt} \\ S_{i,r}e^{-iEt} \end{pmatrix}=0 \text{ or}$$

$$\begin{pmatrix} E & -m-i\boldsymbol{\sigma}\cdot\mathbf{p}_i \\ -m+i\boldsymbol{\sigma}\cdot\mathbf{p}_i & E \end{pmatrix}\begin{pmatrix} S_{e}e^{-iEt} \\ S_{i}e^{-iEt} \end{pmatrix}=0; \text{ or}$$

a proton, equation of said proton being modeled as:

$$\begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p}_i \\ -\boldsymbol{\sigma}\cdot\mathbf{p}_i & E+m \end{pmatrix}\begin{pmatrix} S_{e,-}e^{+iEt} \\ S_{i,+}e^{+iEt} \end{pmatrix}=0, \begin{pmatrix} E-\boldsymbol{\sigma}\cdot\mathbf{p}_i & -m \\ -m & E+\boldsymbol{\sigma}\cdot\mathbf{p}_i \end{pmatrix}\begin{pmatrix} S_{e,r}e^{+iEt} \\ S_{i,l}e^{+iEt} \end{pmatrix}=0 \text{ or}$$

$$\begin{pmatrix} E & -m-i\boldsymbol{\sigma}\cdot\mathbf{p}_i \\ -m+i\boldsymbol{\sigma}\cdot\mathbf{p}_i & E \end{pmatrix}\begin{pmatrix} S_e e^{+iEt} \\ S_i e^{+iEt} \end{pmatrix}=0.$$

(8) A method as in (6) wherein said elementary particle comprises an electron and said first representation is modified to include a proton, said proton being modeled as a second elementary particle, and interaction fields of said electron and said proton, said modified first representation comprising:

$$1=e^{i0}=e^{i0}e^{i0}e^{i0}e^{i0}=\left(e^{i0}e^{i0}\right)_p\left(e^{i0}e^{i0}\right)_e=\left(e^{+iL-iM}e^{+iM-iM}\right)_p\left(e^{-iL+iL}e^{-iM+iM}\right)_e$$

$$=\left((\cos L+i\sin L)(\cos L-i\sin L)e^{+iM-iM}\right)_p\left((\cos L-i\sin L)(\cos L+i\sin L)e^{-iM+iM}\right)_e$$

$$=\left(\left(\frac{m}{E}+i\frac{|\mathbf{p}_i|}{E}\right)\left(\frac{m}{E}-i\frac{|\mathbf{p}_i|}{E}\right)e^{+ip^\mu x_\mu-ip^\mu x_\mu}\right)_p\left(\left(\frac{m}{E}-i\frac{|\mathbf{p}|}{E}\right)\left(\frac{m}{E}+i\frac{|\mathbf{p}|}{E}\right)e^{-ip^\mu x_\mu+ip^\mu x_\mu}\right)_e$$

$$=\left(\frac{m^2+\mathbf{p}_i^{\,2}}{E^2}e^{+ip^\mu x_\mu-ip^\mu x_\mu}\right)_p\left(\frac{m^2+\mathbf{p}^2}{E^2}e^{-ip^\mu x_\mu+ip^\mu x_\mu}\right)_e$$

$$=\left(\frac{E^2-m^2}{\mathbf{p}_i^2}e^{+ip^\mu x_\mu-ip^\mu x_\mu}\right)_p\left(\frac{E^2-m^2}{\mathbf{p}^2}e^{-ip^\mu x_\mu+ip^\mu x_\mu}\right)_e=$$

$$\left(\left(\frac{E-m}{-|\mathbf{p}_i|}\right)\left(\frac{-|\mathbf{p}_i|}{E+m}\right)^{-1}\left(e^{+ip^\mu x_\mu}\right)\left(e^{+ip^\mu x_\mu}\right)^{-1}\right)_p\left(\left(\frac{E-m}{-|\mathbf{p}|}\right)\left(\frac{-|\mathbf{p}|}{E+m}\right)^{-1}\left(e^{-ip^\mu x_\mu}\right)\left(e^{-ip^\mu x_\mu}\right)^{-1}\right)_e$$

$$\rightarrow\left(\begin{pmatrix} E-m & -|\mathbf{p}_i| \\ -|\mathbf{p}_i| & E+m \end{pmatrix}\begin{pmatrix} s_{e,-}e^{+iEt} \\ s_{i,+}e^{+iEt} \end{pmatrix}=0\right)_p\left(\begin{pmatrix} E-m & -|\mathbf{p}| \\ -|\mathbf{p}| & E+m \end{pmatrix}\begin{pmatrix} s_{e,+}e^{-iEt} \\ s_{i,-}e^{-iEt} \end{pmatrix}=0\right)_e$$

$$\rightarrow\begin{pmatrix} \left(\begin{pmatrix} E-e\phi-m & -\boldsymbol{\sigma}\cdot(\mathbf{p}_i-e\mathrm{A}) \\ -\boldsymbol{\sigma}\cdot(\mathbf{p}_i-e\mathrm{A}) & E-e\phi+m \end{pmatrix}\begin{pmatrix} S_{e,-}e^{+iEt} \\ S_{i,+}e^{+iEt} \end{pmatrix}=0\right)_p \\ \left(\begin{pmatrix} E+e\phi-m & -\boldsymbol{\sigma}\cdot(\mathbf{p}+e\mathbf{A}) \\ -\boldsymbol{\sigma}\cdot(\mathbf{p}+e\mathbf{A}) & E+e\phi+m \end{pmatrix}\begin{pmatrix} S_{e,+}e^{-iEt} \\ S_{i,-}e^{-iEt} \end{pmatrix}=0\right)_e \end{pmatrix}$$

where $(\ )_e$ denotes electron, $(\ )_p$ denotes proton and $((\ )_e(\ )_p)$ denotes an electron-proton system.

(9) A method as in (6) wherein said elementary particle comprises an electron and said first representation is modified to include a unspinized proton, said unspinized proton being modeled as a second elementary particle, and interaction fields of said electron and said unspinized proton, said modified first representation comprising:

$$1 = e^{i0} = e^{i0}e^{i0}e^{i0}e^{i0} = \left(e^{i0}e^{i0}\right)_p\left(e^{i0}e^{i0}\right)_e = \left(e^{+iL-iM}e^{+iM-iM}\right)_p\left(e^{-iL+iL}e^{-iM+iM}\right)_e$$

$$= \left((\cos L + i\sin L)(\cos L - i\sin L)e^{+iM-iM}\right)_p\left((\cos L - i\sin L)(\cos L + i\sin L)e^{-iM+iM}\right)_e$$

$$= \left(\left(\frac{m}{E}+i\frac{|\mathbf{p}_i|}{E}\right)\left(\frac{m}{E}-i\frac{|\mathbf{p}_i|}{E}\right)e^{+ip^\mu x_\mu - ip^\mu x_\mu}\right)_p\left(\left(\frac{m}{E}-i\frac{|\mathbf{p}|}{E}\right)\left(\frac{m}{E}+i\frac{|\mathbf{p}|}{E}\right)e^{-ip^\mu x_\mu + ip^\mu x_\mu}\right)_e$$

$$= \left(\frac{m^2+\mathbf{p}_i{}^2}{E^2}e^{+ip^\mu x_\mu - ip^\mu x_\mu}\right)_p\left(\frac{m^2+\mathbf{p}^2}{E^2}e^{-ip^\mu x_\mu + ip^\mu x_\mu}\right)_e$$

$$= \left(\frac{E^2-m^2}{\mathbf{p}_i^2}e^{+ip^\mu x_\mu - ip^\mu x_\mu}\right)_p\left(\frac{E^2-m^2}{\mathbf{p}^2}e^{-ip^\mu x_\mu + ip^\mu x_\mu}\right)_e =$$

$$\left(\left(\frac{E-m}{-|\mathbf{p}_i|}\right)\left(\frac{-|\mathbf{p}_i|}{E+m}\right)^{-1}\left(e^{+ip^\mu x_\mu}\right)\left(e^{+ip^\mu x_\mu}\right)^{-1}\right)_p\left(\left(\frac{E-m}{-|\mathbf{p}|}\right)\left(\frac{-|\mathbf{p}|}{E+m}\right)^{-1}\left(e^{-ip^\mu x_\mu}\right)\left(e^{-ip^\mu x_\mu}\right)^{-1}\right)_e$$

$$\rightarrow \left(\begin{pmatrix} E-m & -|\mathbf{p}_i| \\ -|\mathbf{p}_i| & E+m \end{pmatrix}\begin{pmatrix} s_{e,-}e^{+iEt} \\ s_{i,+}e^{+iEt} \end{pmatrix}=0\right)_p\left(\begin{pmatrix} E-m & -|\mathbf{p}| \\ -|\mathbf{p}| & E+m \end{pmatrix}\begin{pmatrix} s_{e,+}e^{-iEt} \\ s_{i,-}e^{-iEt} \end{pmatrix}=0\right)_e$$

$$\rightarrow \begin{pmatrix} \left(\begin{pmatrix} E-e\phi-m & -|\mathbf{p}_i-e\mathrm{A}| \\ -|\mathbf{p}_i-e\mathrm{A}| & E-e\phi+m \end{pmatrix}\begin{pmatrix} s_{e,-}e^{+iEt} \\ s_{i,+}e^{+iEt} \end{pmatrix}=0\right)_p \\ \left(\begin{pmatrix} E+e\phi-V-m & -\boldsymbol{\sigma}\cdot(\mathbf{p}+e\mathbf{A}) \\ -\boldsymbol{\sigma}\cdot(\mathbf{p}+e\mathbf{A}) & E+e\phi-V+m \end{pmatrix}\begin{pmatrix} S_{e,+}e^{-iEt} \\ S_{i,-}e^{-iEt} \end{pmatrix}=0\right)_e \end{pmatrix}$$

where $(\ )_e$ denotes electron, $(\ )_p$ denotes unspinized proton and $((\ )_e(\ )_p)$ denotes an electron-unspinized proton system.

II. Modeling Apparatus Based on Prespacetime Model II

(10) A model for presenting and/or modeling generation of an energy-momentum-mass relationship of an elementary particle through hierarchical self-referential spin in prespacetime, as a research aide, teaching tool and/or game, comprising:

a first drawing which represents said spin producing said energy-momentum-mass relationship of said elementary particle through said hierarchical self-referential spin in said prespacetime, said first drawing comprising:

$$1 = e^{i0} = e^{-iL+iL} = (\cos L - i\sin L)(\cos L + i\sin L) =$$
$$\left(\frac{m}{E} - i\frac{|\mathbf{p}|}{E}\right)\left(\frac{m}{E} + i\frac{|\mathbf{p}|}{E}\right) = \left(\frac{m^2 + \mathbf{p}^2}{E^2}\right) \to E^2 = m^2 + \mathbf{p}^2$$

where e is natural exponential base, i is imaginary unit, L is a phase, E, m and $\boldsymbol{p}$ represent respectively energy, mass and momentum of said elementary particle, and speed of light c is set equal to one; and

a device for presenting and/or modeling said drawing, said device being for research, teaching and/or game.

(11) A model as in (10) wherein said first drawing is modified to include an electromagnetic potential ($\boldsymbol{A}$,ϕ) generated by a second elementary particle, said modified drawing comprising:

$$1 = e^{i0} = e^{-iL+iL} = (\cos L - i\sin L)(\cos L + i\sin L) =$$
$$\left(\frac{m}{E - e\phi} - i\frac{|\mathbf{p} - e\mathbf{A}|}{E - e\phi}\right)\left(\frac{m}{E - e\phi} + i\frac{|\mathbf{p} - e\mathbf{A}|}{E - e\phi}\right) =$$
$$\left(\frac{m^2 + |\mathbf{p} - e\mathbf{A}|^2}{(E - e\phi)^2}\right) \to (E - e\phi)^2 = m^2 + (\mathbf{p} - e\mathbf{A})^2$$

where e next to ϕ or $\boldsymbol{A}$ is electric charge of said elementary particle.

(12) A model as in (10) for presenting and/or modeling generation of a self-referential matrix rule further comprising:

a second drawing which represents said spin forming said matrix rule from said energy-momentum-mass relationship, said second drawing comprising:

$$\rightarrow 1=\frac{E^2-m^2}{\mathbf{p}^2}=\left(\frac{E-m}{-|\mathbf{p}|}\right)\left(\frac{-|\mathbf{p}|}{E+m}\right)^{-1}\rightarrow\frac{E-m}{-|\mathbf{p}|}=\frac{-|\mathbf{p}|}{E+m}\rightarrow\frac{E-m}{-|\mathbf{p}|}-\frac{-|\mathbf{p}|}{E+m}=0$$

$$\rightarrow\begin{pmatrix}E-m & -|\mathbf{p}|\\ -|\mathbf{p}| & E+m\end{pmatrix}\rightarrow\begin{pmatrix}E-m & -\boldsymbol{\sigma}\cdot\mathbf{p}\\ -\boldsymbol{\sigma}\cdot\mathbf{p} & E+m\end{pmatrix}\text{ or }\begin{pmatrix}E-m & -\mathbf{s}\cdot\mathbf{p}\\ -\mathbf{s}\cdot\mathbf{p} & E+m\end{pmatrix},$$

$$\rightarrow 1=\frac{E^2-\mathbf{p}^2}{m^2}=\left(\frac{E-|\mathbf{p}|}{-m}\right)\left(\frac{-m}{E+|\mathbf{p}|}\right)^{-1}\rightarrow\frac{E-|\mathbf{p}|}{-m}=\frac{-m}{E+|\mathbf{p}|}\rightarrow\frac{E-|\mathbf{p}|}{-m}-\frac{-m}{E+|\mathbf{p}|}=0$$

$$\rightarrow\begin{pmatrix}E-|\mathbf{p}| & -m\\ -m & E+|\mathbf{p}|\end{pmatrix}\rightarrow\begin{pmatrix}E-\boldsymbol{\sigma}\cdot\mathbf{p} & -m\\ -m & E+\boldsymbol{\sigma}\cdot\mathbf{p}\end{pmatrix}\text{ or }\begin{pmatrix}E-\mathbf{s}\cdot\mathbf{p} & -m\\ -m & E+\mathbf{s}\cdot\mathbf{p}\end{pmatrix},$$

$$\rightarrow 1=\frac{m^2+\mathbf{p}^2}{E^2}=\left(\frac{E}{-m+i|\mathbf{p}|}\right)^{-1}\left(\frac{-m-i|\mathbf{p}|}{E}\right)$$

$$\rightarrow\frac{E}{-m+i|\mathbf{p}|}=\frac{-m-i|\mathbf{p}|}{E}\rightarrow\frac{E}{-m+i|\mathbf{p}|}-\frac{-m-i|\mathbf{p}|}{E}=0$$

$$\rightarrow\begin{pmatrix}E & -m-i|\mathbf{p}|\\ -m+i|\mathbf{p}| & E\end{pmatrix}\rightarrow\begin{pmatrix}E & -m-i\boldsymbol{\sigma}\cdot\mathbf{p}\\ -m+i\boldsymbol{\sigma}\cdot\mathbf{p} & E\end{pmatrix}\text{ or }\begin{pmatrix}E & -m-i\mathbf{s}\cdot\mathbf{p}\\ -m+i\mathbf{s}\cdot\mathbf{p} & E\end{pmatrix},\text{ or}$$

$$\rightarrow 1=\frac{E^2-\mathbf{p}_i^{\,2}}{m^2}=\left(\frac{E-|\mathbf{p}_i|}{-m}\right)\left(\frac{-m}{E+|\mathbf{p}_i|}\right)^{-1}\rightarrow\frac{E-|\mathbf{p}_i|}{-m}=\frac{-m}{E+|\mathbf{p}_i|}\rightarrow\frac{E-|\mathbf{p}_i|}{-m}-\frac{-m}{E+|\mathbf{p}_i|}=0$$

$$\rightarrow\begin{pmatrix}E-|\mathbf{p}_i| & -m\\ -m & E+|\mathbf{p}_i|\end{pmatrix}\rightarrow\begin{pmatrix}E-\boldsymbol{\sigma}\cdot\mathbf{p}_i & -m\\ -m & E+\boldsymbol{\sigma}\cdot\mathbf{p}_i\end{pmatrix}\text{ or }\begin{pmatrix}E-\mathbf{s}\cdot\mathbf{p}_i & -m\\ -m & E+\mathbf{s}\cdot\mathbf{p}_i\end{pmatrix},$$

where $\boldsymbol{\sigma}$ = (σ_1, σ_2, σ_3) are Pauli matrices, $|\mathbf{p}|=\sqrt{\mathbf{p}^2}=\sqrt{-Det(\boldsymbol{\sigma}\cdot\mathbf{p})}\rightarrow\boldsymbol{\sigma}\cdot\mathbf{p}$ represents fermionic spinization of $|\mathbf{p}|$, $\mathbf{s}$ = (s_1, s_2, s_3) are spin operators for spin 1 particle, $|\mathbf{p}|=\sqrt{\mathbf{p}^2}=\sqrt{-\left(Det(\mathbf{s}\cdot\mathbf{p}+I_3)-Det(I_3)\right)}\rightarrow\mathbf{s}\cdot\mathbf{p}$ represents bosonic spinization of $|\mathbf{p}|$, $\mathbf{p}_i$ represents imaginary momentum, $|\mathbf{p}_i|=\sqrt{\mathbf{p}_i^{\,2}}=\sqrt{-Det(\boldsymbol{\sigma}\cdot\mathbf{p}_i)}\rightarrow\boldsymbol{\sigma}\cdot\mathbf{p}_i$ represents fermionic spinization of $|\mathbf{p}_i|$, and $|\mathbf{p}_i|=\sqrt{\mathbf{p}_i^{\,2}}=\sqrt{-\left(Det(\mathbf{s}\cdot\mathbf{p}_i+I_3)-Det(I_3)\right)}\rightarrow\mathbf{s}\cdot\mathbf{p}_i$ represents bosonic spinization of $|\mathbf{p}_i|$.

(13) A model for presenting and/or modeling generation, sustenance and evolution of an elementary particle through hierarchical self-referential spin in prespacetime, as a research aide, teaching tool and/or game, comprising:

a drawing which represents said generation, sustenance and evolution of said elementary particle through said hierarchical self-referential spin in said prespacetime, said drawing comprising:

$$1 = e^{i0} = e^{i0}e^{i0} = e^{-iL+iL}e^{-iM+iM} = L_e L_i^{-1}\left(e^{-iM}\right)\left(e^{-iM}\right)^{-1} \rightarrow$$

$$\begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix}\begin{pmatrix} A_e e^{-iM} \\ A_i e^{-iM} \end{pmatrix} = L_M \begin{pmatrix} \psi_e \\ \psi_i \end{pmatrix} = 0$$

where *e* is natural exponential base, *i* is imaginary unit, *L* is a first phase, M is a second phase, $A_e e^{-iM} = \psi_e$ represents external object, $A_i e^{-iM} = \psi_i$ represents internal object, L_e represents external rule, L_i represents internal rule, $L = (L_{M,e}\ L_{M,i})$ represents matrix rule, $L_{M,e}$ represents external matrix rule and $L_{M,i}$ represents internal matrix rule; and

a device for presenting and/or modeling said drawing, said device being for research, teaching and/or game.

(14) A model as in (13) wherein said external object comprises of an external wave function; said internal object comprises of an internal wave function; said elementary particle comprises of a fermion, boson or unspinized particle; said matrix rule containing an energy operator $E \rightarrow i\partial_t$, momentum operator $\mathbf{p} \rightarrow -i\nabla$, spin operator **σ** where **σ** = (σ_1, σ_2, σ_3) are Pauli matrices, spin operator **S** where **S =** (s_1, s_2, s_3) are spin 1 matrices, and/or mass; said matrix rule further having a determinant containing E^2-$\boldsymbol{p}^2$-m^2=0, E^2-$\boldsymbol{p}^2$=0, E^2- m^2=0, or 0^2-$\boldsymbol{p}^2$-m^2=0; *c*=1 where *c* is speed of light; and *ħ*=1 where ħ is reduced Planck constant.

(15) A model as in Claim 14 wherein said drawing of said generation, sustenance and evolution of said elementary particle comprises:

$$1 = e^{i0} = e^{i0}e^{i0} = e^{+iL-iL}e^{+iM-iM} = (\cos L + i\sin L)(\cos L - i\sin L)e^{+iM-iM} =$$

$$\left(\frac{m}{E} + i\frac{|\mathbf{p}|}{E}\right)\left(\frac{m}{E} - i\frac{|\mathbf{p}|}{E}\right)e^{+ip^\mu x_\mu - ip^\mu x_\mu} = \left(\frac{m^2 + \mathbf{p}^2}{E^2}\right)e^{+ip^\mu x_\mu - ip^\mu x_\mu} = \frac{E^2 - m^2}{\mathbf{p}^2}e^{+ip^\mu x_\mu - ip^\mu x_\mu} =$$

$$\left(\frac{E-m}{-|\mathbf{p}|}\right)\left(\frac{-|\mathbf{p}|}{E+m}\right)^{-1}\left(e^{-ip^\mu x_\mu}\right)\left(e^{-ip^\mu x_\mu}\right)^{-1} \longrightarrow \frac{E-m}{-|\mathbf{p}|}e^{-ip^\mu x_\mu} = \frac{-|\mathbf{p}|}{E+m}e^{-ip^\mu x_\mu} \rightarrow$$

$$\frac{E-m}{-|\mathbf{p}|}e^{-ip^\mu x_\mu} - \frac{-|\mathbf{p}|}{E+m}e^{-ip^\mu x_\mu} = 0 \rightarrow \begin{pmatrix} E-m & -|\mathbf{p}| \\ -|\mathbf{p}| & E+m \end{pmatrix}\begin{pmatrix} a_{e,+}e^{-ip^\mu x_\mu} \\ a_{i,-}e^{-ip^\mu x_\mu} \end{pmatrix} = 0$$

$$\rightarrow \begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p} \\ -\boldsymbol{\sigma}\cdot\mathbf{p} & E+m \end{pmatrix} \begin{pmatrix} A_{e,+}e^{-ip^{\mu}x_{\mu}} \\ A_{i,-}e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = \begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix} \begin{pmatrix} \psi_{e,+} \\ \psi_{i,-} \end{pmatrix} = 0 \quad \text{or}$$

$$\begin{pmatrix} E-m & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E+m \end{pmatrix} \begin{pmatrix} \mathbf{A}_{e,+}e^{-ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i,-}e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = \begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix} \begin{pmatrix} \psi_{e,+} \\ \psi_{i,-} \end{pmatrix} = 0$$

where $\begin{pmatrix} E-m & -|\mathbf{p}| \\ -|\mathbf{p}| & E+m \end{pmatrix} \begin{pmatrix} a_{e,+}e^{-ip^{\mu}x_{\mu}} \\ a_{i,-}e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = 0$ is a first equation for said unspinized particle, $\begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p} \\ -\boldsymbol{\sigma}\cdot\mathbf{p} & E+m \end{pmatrix} \begin{pmatrix} A_{e,+}e^{-ip^{\mu}x_{\mu}} \\ A_{i,-}e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = 0$ is Dirac equation in Dirac form for said fermion, and $\begin{pmatrix} E-m & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E+m \end{pmatrix} \begin{pmatrix} \mathbf{A}_{e,+}e^{-ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i,-}e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = 0$ is a first equation for said boson;

$$1 = e^{i0} = e^{i0}e^{i0} = e^{+iL-iL}e^{+iM-iM} = (\cos L + i\sin L)(\cos L - i\sin L)e^{+iM-iM} =$$

$$\left(\frac{m}{E} + i\frac{|\mathbf{p}|}{E}\right)\left(\frac{m}{E} - i\frac{|\mathbf{p}|}{E}\right)e^{+ip^{\mu}x_{\mu}-ip^{\mu}x_{\mu}} = \left(\frac{m^2+\mathbf{p}^2}{E^2}\right)e^{+ip^{\mu}x_{\mu}-ip^{\mu}x_{\mu}} = \frac{E^2-\mathbf{p}^2}{m^2}e^{+ip^{\mu}x_{\mu}-ip^{\mu}x_{\mu}} =$$

$$\left(\frac{E-|\mathbf{p}|}{-m}\right)\left(\frac{-m}{E+|\mathbf{p}|}\right)^{-1}\left(e^{-ip^{\mu}x_{\mu}}\right)\left(e^{-ip^{\mu}x_{\mu}}\right)^{-1} \rightarrow \frac{E-|\mathbf{p}|}{-m}e^{-ip^{\mu}x_{\mu}} = \frac{-m}{E+|\mathbf{p}|}e^{-ip^{\mu}x_{\mu}} \rightarrow$$

$$\frac{E-|\mathbf{p}|}{-m}e^{-ip^{\mu}x_{\mu}} - \frac{-m}{E+|\mathbf{p}|}e^{-ip^{\mu}x_{\mu}} = 0 \rightarrow \begin{pmatrix} E-|\mathbf{p}| & -m \\ -m & E+|\mathbf{p}| \end{pmatrix} \begin{pmatrix} a_{e,l}e^{-ip^{\mu}x_{\mu}} \\ a_{i,r}e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = 0$$

$$\rightarrow \begin{pmatrix} E-\boldsymbol{\sigma}\cdot\mathbf{p} & -m \\ -m & E+\boldsymbol{\sigma}\cdot\mathbf{p} \end{pmatrix} \begin{pmatrix} A_{e,l}e^{-ip^{\mu}x_{\mu}} \\ A_{i,r}e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = \begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix} \begin{pmatrix} \psi_{e,l} \\ \psi_{i,r} \end{pmatrix} = 0 \quad \text{or}$$

$$\begin{pmatrix} E-\mathbf{s}\cdot\mathbf{p} & -m \\ -m & E+\mathbf{s}\cdot\mathbf{p} \end{pmatrix} \begin{pmatrix} A_{e,l}e^{-ip^{\mu}x_{\mu}} \\ A_{i,r}e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = \begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix} \begin{pmatrix} \psi_{e,l} \\ \psi_{i,r} \end{pmatrix} = 0$$

where $\begin{pmatrix} E-|\mathbf{p}| & -m \\ -m & E+|\mathbf{p}| \end{pmatrix}\begin{pmatrix} a_{e,l}e^{-ip^{\mu}x_{\mu}} \\ a_{i,r}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0$ is a second equation for said unspinized particle, $\begin{pmatrix} E-\boldsymbol{\sigma}\cdot\mathbf{p} & -m \\ -m & E+\boldsymbol{\sigma}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} A_{e,l}e^{-ip^{\mu}x_{\mu}} \\ A_{i,r}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0$ is Dirac equation in Weyl form for said fermion, and $\begin{pmatrix} E-\mathbf{s}\cdot\mathbf{p} & -m \\ -m & E+\mathbf{s}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} \mathsf{A}_{e,l}e^{-ip^{\mu}x_{\mu}} \\ \mathsf{A}_{i,r}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0$ is a second equation for said boson;

$$1=e^{i0}=e^{i0}e^{i0}=e^{+iL-iL}e^{+iM-iM}=(\cos L+i\sin L)(\cos L-i\sin L)e^{+iM-iM}=$$

$$\left(\frac{m}{E}+i\frac{|\mathbf{p}|}{E}\right)\left(\frac{m}{E}-i\frac{|\mathbf{p}|}{E}\right)e^{+ip^{\mu}x_{\mu}-ip^{\mu}x_{\mu}}=\left(\frac{E}{-m+i|\mathbf{p}|}\right)\left(\frac{-m-i|\mathbf{p}|}{E}\right)^{-1}\left(e^{-ip^{\mu}x_{\mu}}\right)\left(e^{-ip^{\mu}x_{\mu}}\right)^{-1}\to$$

$$\frac{E}{-m+i|\mathbf{p}|}e^{-ip^{\mu}x_{\mu}}=\frac{-m-i|\mathbf{p}|}{E}e^{-ip^{\mu}x_{\mu}}\to\frac{E}{-m+i|\mathbf{p}|}e^{-ip^{\mu}x_{\mu}}-\frac{-m-i|\mathbf{p}|}{E}e^{-ip^{\mu}x_{\mu}}=0$$

$$\to\begin{pmatrix} E & -m-i|\mathbf{p}| \\ -m+i|\mathbf{p}| & E \end{pmatrix}\begin{pmatrix} a_{e}e^{-ip^{\mu}x_{\mu}} \\ a_{i}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0$$

$$\to\begin{pmatrix} E & -m-i\boldsymbol{\sigma}\cdot\mathbf{p} \\ -m+i\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_{e}e^{-ip^{\mu}x_{\mu}} \\ A_{i}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=\begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix}\begin{pmatrix} \psi_e \\ \psi_i \end{pmatrix}=0 \quad \text{or}$$

$$\begin{pmatrix} E & -m-i\mathbf{s}\cdot\mathbf{p} \\ -m+i\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathsf{A}_{e}e^{-ip^{\mu}x_{\mu}} \\ \mathsf{A}_{i}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=\begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix}\begin{pmatrix} \psi_e \\ \psi_i \end{pmatrix}=0$$

where $\begin{pmatrix} E & -m-i|\mathbf{p}| \\ -m+i|\mathbf{p}| & E \end{pmatrix}\begin{pmatrix} a_{e}e^{-ip^{\mu}x_{\mu}} \\ a_{i}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0$ is a third equation for said unspinized particle, $\begin{pmatrix} E & -m-i\boldsymbol{\sigma}\cdot\mathbf{p} \\ -m+i\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_{e}e^{-ip^{\mu}x_{\mu}} \\ A_{i}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0$ is Dirac equation in a third form for said fermion, and $\begin{pmatrix} E & -m-i\mathbf{s}\cdot\mathbf{p} \\ -m+i\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathsf{A}_{e}e^{-ip^{\mu}x_{\mu}} \\ \mathsf{A}_{i}e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0$ is a third equation for said boson; or

$$1 = e^{i0} = e^{i0}e^{i0} = e^{+iL-iL}e^{+iM-iM} = (\cos L + i\sin L)(\cos L - i\sin L)e^{+iM-iM} =$$

$$\left(\frac{m}{E} + i\frac{|\mathbf{p}_i|}{E}\right)\left(\frac{m}{E} - i\frac{|\mathbf{p}_i|}{E}\right)e^{+ip^\mu x_\mu - ip^\mu x_\mu} = \left(\frac{m^2 + \mathbf{p}_i^{\,2}}{E^2}\right)e^{+ip^\mu x_\mu - ip^\mu x_\mu} = \frac{E^2 - m^2}{\mathbf{p}_i^{\,2}}e^{+ip^\mu x_\mu - ip^\mu x_\mu} =$$

$$\left(\frac{E-m}{-|\mathbf{p}_i|}\right)\left(\frac{-|\mathbf{p}_i|}{E+m}\right)^{-1}\left(e^{-ip^\mu x_\mu}\right)\left(e^{-ip^\mu x_\mu}\right)^{-1} \longrightarrow \frac{E-m}{-|\mathbf{p}_i|}e^{-ip^\mu x_\mu} = \frac{-|\mathbf{p}_i|}{E+m}e^{-ip^\mu x_\mu} \rightarrow$$

$$\frac{E-m}{-\mathbf{p}_i}e^{-ip^\mu x_\mu} - \frac{-|\mathbf{p}_i|}{E+m}e^{-ip^\mu x_\mu} = 0 \rightarrow \begin{pmatrix} E-m & -|\mathbf{p}_i| \\ -|\mathbf{p}_i| & E+m \end{pmatrix}\begin{pmatrix} s_{e,+}e^{-iEt} \\ s_{i,-}e^{-iEt} \end{pmatrix} = 0$$

$$\rightarrow \begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p}_i \\ -\boldsymbol{\sigma}\cdot\mathbf{p}_i & E+m \end{pmatrix}\begin{pmatrix} S_{e,+}e^{-iEt} \\ S_{i,-}e^{-iEt} \end{pmatrix} = \begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix}\begin{pmatrix} \psi_{e,+} \\ \psi_{i,-} \end{pmatrix} = 0 \quad \text{or}$$

$$\begin{pmatrix} E-m & -\mathbf{s}\cdot\mathbf{p}_i \\ -\mathbf{s}\cdot\mathbf{p}_i & E+m \end{pmatrix}\begin{pmatrix} \mathbf{S}_{e,+}e^{-iEt} \\ \mathbf{S}_{i,-}e^{-iEt} \end{pmatrix} = \begin{pmatrix} L_{M,e} & L_{M,i} \end{pmatrix}\begin{pmatrix} \psi_{e,+} \\ \psi_{i,-} \end{pmatrix} = 0$$

where $\begin{pmatrix} E-m & -|\mathbf{p}_i| \\ -|\mathbf{p}_i| & E+m \end{pmatrix}\begin{pmatrix} s_{e,+}e^{-iEt} \\ s_{i,-}e^{-iEt} \end{pmatrix} = 0$ is a first equation for said unspinized particle with said imaginary momentum $\mathbf{p}_i$, $\begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p}_i \\ -\boldsymbol{\sigma}\cdot\mathbf{p}_i & E+m \end{pmatrix}\begin{pmatrix} S_{e,+}e^{-iEt} \\ S_{i,-}e^{-iEt} \end{pmatrix} = 0$ is Dirac equation in Dirac form for said fermion with said imaginary momentum $\mathbf{p}_i$, and $\begin{pmatrix} E-m & -\mathbf{s}\cdot\mathbf{p}_i \\ -\mathbf{s}\cdot\mathbf{p}_i & E+m \end{pmatrix}\begin{pmatrix} \mathbf{S}_{e,+}e^{-iEt} \\ \mathbf{S}_{i,-}e^{-iEt} \end{pmatrix} = 0$ is a first equation for said boson with said imaginary momentum $\mathbf{p}_i$.

(16) A model as in (15) wherein said elementary particle comprises of:

an electron, equation of said electron being modeled as:

$$\begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p} \\ -\boldsymbol{\sigma}\cdot\mathbf{p} & E+m \end{pmatrix}\begin{pmatrix} A_{e,+}e^{-ip^\mu x_\mu} \\ A_{i,-}e^{-ip^\mu x_\mu} \end{pmatrix} = 0, \begin{pmatrix} E-\boldsymbol{\sigma}\cdot\mathbf{p} & -m \\ -m & E+\boldsymbol{\sigma}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} A_{e,l}e^{-ip^\mu x_\mu} \\ A_{i,r}e^{-ip^\mu x_\mu} \end{pmatrix} = 0 \text{ or}$$

$$\begin{pmatrix} E & -m-i\boldsymbol{\sigma}\cdot\mathbf{p} \\ -m+i\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_e e^{-ip^\mu x_\mu} \\ A_i e^{-ip^\mu x_\mu} \end{pmatrix} = 0;$$

a positron, equation of said positron being modeled as:

$$\begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p} \\ -\boldsymbol{\sigma}\cdot\mathbf{p} & E+m \end{pmatrix}\begin{pmatrix} A_{e,-}e^{+ip^\mu x_\mu} \\ A_{i,+}e^{+ip^\mu x_\mu} \end{pmatrix} = 0, \begin{pmatrix} E-\boldsymbol{\sigma}\cdot\mathbf{p} & -m \\ -m & E+\boldsymbol{\sigma}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} A_{e,r}e^{+ip^\mu x_\mu} \\ A_{i,l}e^{+ip^\mu x_\mu} \end{pmatrix} = 0 \text{ or}$$

$$\begin{pmatrix} E & -m-i\boldsymbol{\sigma}\cdot\mathbf{p} \\ -m+i\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_e e^{+ip^{\mu}x_{\mu}} \\ A_i e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0;$$

a massless neutrino, equation of said neutrino being modeled as:

$$\begin{pmatrix} E & -\boldsymbol{\sigma}\cdot\mathbf{p} \\ -\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_{e,+} e^{-ip^{\mu}x_{\mu}} \\ A_{i,-} e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0\,,\ \begin{pmatrix} E-\boldsymbol{\sigma}\cdot\mathbf{p} & \\ & E+\boldsymbol{\sigma}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} A_{e,l} e^{-ip^{\mu}x_{\mu}} \\ A_{i,r} e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0 \text{ or}$$

$$\begin{pmatrix} E & -i\boldsymbol{\sigma}\cdot\mathbf{p} \\ +i\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_e e^{-ip^{\mu}x_{\mu}} \\ A_i e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0;$$

A massless antineutrino, equation of said antineutrino being modeled as:

$$\begin{pmatrix} E & -\boldsymbol{\sigma}\cdot\mathbf{p} \\ -\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_{e,-} e^{+ip^{\mu}x_{\mu}} \\ A_{i,+} e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0\,,\ \begin{pmatrix} E-\boldsymbol{\sigma}\cdot\mathbf{p} & \\ & E+\boldsymbol{\sigma}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} A_{e,r} e^{+ip^{\mu}x_{\mu}} \\ A_{i,l} e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0 \text{ or}$$

$$\begin{pmatrix} E & -i\boldsymbol{\sigma}\cdot\mathbf{p} \\ +i\boldsymbol{\sigma}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_e e^{+ip^{\mu}x_{\mu}} \\ A_i e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0;$$

a massive spin 1 boson, equation of said massive spin 1 boson being modeled as:

$$\begin{pmatrix} E-m & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E+m \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e,+} e^{-ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i,-} e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0\,,\ \begin{pmatrix} E-\mathbf{s}\cdot\mathbf{p} & -m \\ -m & E+\mathbf{s}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e,l} e^{-ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i,r} e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0 \text{ or}$$

$$\begin{pmatrix} E & -m-i\mathbf{s}\cdot\mathbf{p} \\ -m+i\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathbf{A}_e e^{-ip^{\mu}x_{\mu}} \\ \mathbf{A}_i e^{-ip^{\mu}x_{\mu}} \end{pmatrix}=0;$$

a massive spin 1 antiboson, equation of said massive spin 1 antiboson being modeled as:

$$\begin{pmatrix} E-m & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E+m \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e,-} e^{+ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i,+} e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0\,,\ \begin{pmatrix} E-\mathbf{s}\cdot\mathbf{p} & -m \\ -m & E+\mathbf{s}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} \mathbf{A}_{e,r} e^{+ip^{\mu}x_{\mu}} \\ \mathbf{A}_{i,l} e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0 \text{ or}$$

$$\begin{pmatrix} E & -m-i\mathbf{s}\cdot\mathbf{p} \\ -m+i\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathbf{A}_e e^{+ip^{\mu}x_{\mu}} \\ \mathbf{A}_i e^{+ip^{\mu}x_{\mu}} \end{pmatrix}=0;$$

a massless spin 1 boson, equation of said massless spin 1 boson being modeled as:

$$\begin{pmatrix} E & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathsf{A}_{e,+}e^{-ip^{\mu}x_{\mu}} \\ \mathsf{A}_{i,-}e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = \begin{pmatrix} E & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathbf{E} \\ i\mathbf{B} \end{pmatrix} = 0,$$

$$\begin{pmatrix} E-\mathbf{s}\cdot\mathbf{p} & \\ & E+\mathbf{s}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} \mathsf{A}_{e,l}e^{-ip^{\mu}x_{\mu}} \\ \mathsf{A}_{i,r}e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = 0 \text{ or } \begin{pmatrix} E & -i\mathbf{s}\cdot\mathbf{p} \\ +i\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathsf{A}_{e}e^{-ip^{\mu}x_{\mu}} \\ \mathsf{A}_{i}e^{-ip^{\mu}x_{\mu}} \end{pmatrix} = 0$$

where $\begin{pmatrix} E & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} \mathbf{E} \\ i\mathbf{B} \end{pmatrix} = 0$ is equivalent to Maxwell equation $\begin{pmatrix} \partial_t\mathbf{E} = \nabla\times\mathbf{B} \\ \partial_t\mathbf{B} = -\nabla\times\mathbf{E} \end{pmatrix}$;

a massless spin 1 antiboson, equation of said massless spin 1 antiboson being modeled as:

$$\begin{pmatrix} E & -\mathbf{s}\cdot\mathbf{p} \\ -\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_{e,-}e^{+ip^{\mu}x_{\mu}} \\ A_{i,+}e^{+ip^{\mu}x_{\mu}} \end{pmatrix} = 0, \begin{pmatrix} E-\mathbf{s}\cdot\mathbf{p} & \\ & E+\mathbf{s}\cdot\mathbf{p} \end{pmatrix}\begin{pmatrix} A_{e,r}e^{+ip^{\mu}x_{\mu}} \\ A_{i,l}e^{+ip^{\mu}x_{\mu}} \end{pmatrix} = 0 \text{ or}$$

$$\begin{pmatrix} E & -i\mathbf{s}\cdot\mathbf{p} \\ -m+i\mathbf{s}\cdot\mathbf{p} & E \end{pmatrix}\begin{pmatrix} A_{e}e^{+ip^{\mu}x_{\mu}} \\ A_{i}e^{+ip^{\mu}x_{\mu}} \end{pmatrix} = 0;$$

an antiproton, equation of said antiproton being modeled as:

$$\begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p}_i \\ -\boldsymbol{\sigma}\cdot\mathbf{p}_i & E+m \end{pmatrix}\begin{pmatrix} S_{e,+}e^{-iEt} \\ S_{i,-}e^{-iEt} \end{pmatrix} = 0, \begin{pmatrix} E-\boldsymbol{\sigma}\cdot\mathbf{p}_i & -m \\ -m & E+\boldsymbol{\sigma}\cdot\mathbf{p}_i \end{pmatrix}\begin{pmatrix} S_{e,l}e^{-iEt} \\ S_{i,r}e^{-iEt} \end{pmatrix} = 0 \text{ or}$$

$$\begin{pmatrix} E & -m-i\boldsymbol{\sigma}\cdot\mathbf{p}_i \\ -m+i\boldsymbol{\sigma}\cdot\mathbf{p}_i & E \end{pmatrix}\begin{pmatrix} S_{e}e^{-iEt} \\ S_{i}e^{-iEt} \end{pmatrix} = 0; \text{ or}$$

a proton, equation of said proton being modeled as:

$$\begin{pmatrix} E-m & -\boldsymbol{\sigma}\cdot\mathbf{p}_i \\ -\boldsymbol{\sigma}\cdot\mathbf{p}_i & E+m \end{pmatrix}\begin{pmatrix} S_{e,-}e^{+iEt} \\ S_{i,+}e^{+iEt} \end{pmatrix} = 0, \begin{pmatrix} E-\boldsymbol{\sigma}\cdot\mathbf{p}_i & -m \\ -m & E+\boldsymbol{\sigma}\cdot\mathbf{p}_i \end{pmatrix}\begin{pmatrix} S_{e,r}e^{+iEt} \\ S_{i,l}e^{+iEt} \end{pmatrix} = 0 \text{ or}$$

$$\begin{pmatrix} E & -m-i\boldsymbol{\sigma}\cdot\mathbf{p}_i \\ -m+i\boldsymbol{\sigma}\cdot\mathbf{p}_i & E \end{pmatrix}\begin{pmatrix} S_{e}e^{+iEt} \\ S_{i}e^{+iEt} \end{pmatrix} = 0.$$

(17) A model as in (15) wherein said elementary particle comprises an electron and said drawing is modified to include a proton, said proton being modeled as a second elementary particle, and interaction fields of said electron and said proton, said modified drawing comprising:

$$1 = e^{i0} = e^{i0}e^{i0}e^{i0}e^{i0} = \left(e^{i0}e^{i0}\right)_p\left(e^{i0}e^{i0}\right)_e = \left(e^{+iL-iM}e^{+iM-iM}\right)_p\left(e^{-iL+iL}e^{-iM+iM}\right)_e$$
$$= \left((\cos L + i\sin L)(\cos L - i\sin L)e^{+iM-iM}\right)_p\left((\cos L - i\sin L)(\cos L + i\sin L)e^{-iM+iM}\right)_e$$

$$=\left(\left(\frac{m}{E}+i\frac{|\mathbf{p}_i|}{E}\right)\left(\frac{m}{E}-i\frac{|\mathbf{p}_i|}{E}\right)e^{+ip^\mu x_\mu-ip^\mu x_\mu}\right)_p\left(\left(\frac{m}{E}-i\frac{|\mathbf{p}|}{E}\right)\left(\frac{m}{E}+i\frac{|\mathbf{p}|}{E}\right)e^{-ip^\mu x_\mu+ip^\mu x_\mu}\right)_e$$

$$=\left(\frac{m^2+\mathbf{p}_i{}^2}{E^2}e^{+ip^\mu x_\mu-ip^\mu x_\mu}\right)_p\left(\frac{m^2+\mathbf{p}^2}{E^2}e^{-ip^\mu x_\mu+ip^\mu x_\mu}\right)_e$$

$$=\left(\frac{E^2-m^2}{\mathbf{p}_i^2}e^{+ip^\mu x_\mu-ip^\mu x_\mu}\right)_p\left(\frac{E^2-m^2}{\mathbf{p}^2}e^{-ip^\mu x_\mu+ip^\mu x_\mu}\right)_e=$$

$$\left(\left(\frac{E-m}{-|\mathbf{p}_i|}\right)\left(\frac{-|\mathbf{p}_i|}{E+m}\right)^{-1}\left(e^{+ip^\mu x_\mu}\right)\left(e^{+ip^\mu x_\mu}\right)^{-1}\right)_p\left(\left(\frac{E-m}{-|\mathbf{p}|}\right)\left(\frac{-|\mathbf{p}|}{E+m}\right)^{-1}\left(e^{-ip^\mu x_\mu}\right)\left(e^{-ip^\mu x_\mu}\right)^{-1}\right)_e$$

$$\rightarrow\left(\begin{pmatrix}E-m & -|\mathbf{p}_i|\\ -|\mathbf{p}_i| & E+m\end{pmatrix}\begin{pmatrix}s_{e,-}e^{+iEt}\\ s_{i,+}e^{+iEt}\end{pmatrix}=0\right)_p\left(\begin{pmatrix}E-m & -|\mathbf{p}|\\ -|\mathbf{p}| & E+m\end{pmatrix}\begin{pmatrix}s_{e,+}e^{-iEt}\\ s_{i,-}e^{-iEt}\end{pmatrix}=0\right)_e$$

$$\rightarrow\begin{pmatrix}\left(\begin{pmatrix}E-e\phi-m & -\boldsymbol{\sigma}\cdot(\mathbf{p}_i-e\mathrm{A})\\ -\boldsymbol{\sigma}\cdot(\mathbf{p}_i-e\mathrm{A}) & E-e\phi+m\end{pmatrix}\begin{pmatrix}S_{e,-}e^{+iEt}\\ S_{i,+}e^{+iEt}\end{pmatrix}=0\right)_p\\ \left(\begin{pmatrix}E+e\phi-m & -\boldsymbol{\sigma}\cdot(\mathbf{p}+e\mathbf{A})\\ -\boldsymbol{\sigma}\cdot(\mathbf{p}+e\mathbf{A}) & E+e\phi+m\end{pmatrix}\begin{pmatrix}S_{e,+}e^{-iEt}\\ S_{i,-}e^{-iEt}\end{pmatrix}=0\right)_e\end{pmatrix}$$

where $(\ )_e$ denotes electron, $(\ )_p$ denotes proton and $((\ )_e(\ )_p)$ denotes an electron-proton system.

(18) A model as in (15) wherein said elementary particle comprises an electron and said drawing is modified to include a unspinized proton, said unspinized proton being modeled as a second elementary particle, and interaction fields of said electron and said unspinized proton, said modified drawing comprising:

$$1=e^{i0}=e^{i0}e^{i0}e^{i0}e^{i0}=\left(e^{i0}e^{i0}\right)_p\left(e^{i0}e^{i0}\right)_e=\left(e^{+iL-iM}e^{+iM-iM}\right)_p\left(e^{-iL+iL}e^{-iM+iM}\right)_e$$

$$=\left((\cos L+i\sin L)(\cos L-i\sin L)e^{+iM-iM}\right)_p\left((\cos L-i\sin L)(\cos L+i\sin L)e^{-iM+iM}\right)_e$$

$$=\left(\left(\frac{m}{E}+i\frac{|\mathbf{p}_i|}{E}\right)\left(\frac{m}{E}-i\frac{|\mathbf{p}_i|}{E}\right)e^{+ip^\mu x_\mu-ip^\mu x_\mu}\right)_p\left(\left(\frac{m}{E}-i\frac{|\mathbf{p}|}{E}\right)\left(\frac{m}{E}+i\frac{|\mathbf{p}|}{E}\right)e^{-ip^\mu x_\mu+ip^\mu x_\mu}\right)_e$$

$$=\left(\frac{m^2+\mathbf{p}_i{}^2}{E^2}e^{+ip^\mu x_\mu-ip^\mu x_\mu}\right)_p\left(\frac{m^2+\mathbf{p}^2}{E^2}e^{-ip^\mu x_\mu+ip^\mu x_\mu}\right)_e$$

$$=\left(\frac{E^2-m^2}{\mathbf{p}_i^2}e^{+ip^\mu x_\mu-ip^\mu x_\mu}\right)_p\left(\frac{E^2-m^2}{\mathbf{p}^2}e^{-ip^\mu x_\mu+ip^\mu x_\mu}\right)_e=$$

$$\left(\left(\frac{E-m}{-|\mathbf{p}_i|}\right)\left(\frac{-|\mathbf{p}_i|}{E+m}\right)^{-1}\left(e^{+ip^\mu x_\mu}\right)\left(e^{+ip^\mu x_\mu}\right)^{-1}\right)_p\left(\left(\frac{E-m}{-|\mathbf{p}|}\right)\left(\frac{-|\mathbf{p}|}{E+m}\right)^{-1}\left(e^{-ip^\mu x_\mu}\right)\left(e^{-ip^\mu x_\mu}\right)^{-1}\right)_e$$

$$\rightarrow\left(\begin{pmatrix}E-m & -|\mathbf{p}_i|\\ -|\mathbf{p}_i| & E+m\end{pmatrix}\begin{pmatrix}s_{e,-}e^{+iEt}\\ s_{i,+}e^{+iEt}\end{pmatrix}=0\right)_p\left(\begin{pmatrix}E-m & -|\mathbf{p}|\\ -|\mathbf{p}| & E+m\end{pmatrix}\begin{pmatrix}s_{e,+}e^{-iEt}\\ s_{i,-}e^{-iEt}\end{pmatrix}=0\right)_e$$

$$\rightarrow\begin{pmatrix}\left(\begin{pmatrix}E-e\phi-m & -|\mathbf{p}_i-e\mathrm{A}|\\ -|\mathbf{p}_i-e\mathrm{A}| & E-e\phi+m\end{pmatrix}\begin{pmatrix}s_{e,-}e^{+iEt}\\ s_{i,+}e^{+iEt}\end{pmatrix}=0\right)_p\\ \left(\begin{pmatrix}E+e\phi-V-m & -\boldsymbol{\sigma}\cdot(\mathbf{p}+e\mathbf{A})\\ -\boldsymbol{\sigma}\cdot(\mathbf{p}+e\mathbf{A}) & E+e\phi-V+m\end{pmatrix}\begin{pmatrix}S_{e,+}e^{-iEt}\\ S_{i,-}e^{-iEt}\end{pmatrix}=0\right)_e\end{pmatrix}$$

where $(\ )_e$ denotes electron, $(\ )_p$ denotes unspinized proton and $((\ )_e(\ )_p)$ denotes an electron-unspinized proton system.

Reference

1. Hu, H. & Wu, M. (2010), The Principle of Existence II: Genesis of Self-Referential Matrix Law, & the Ontology & Mathematics of Ether. *Scientific GOD Journal 1:8, pp. 520-550*. Also see: http://vixra.org/abs/1012.0042