All Fermion Masses and Charges Are Determined
By Two Calculated Numbers

All the fermion masses may be determined from merely two numbers dependent on π , e , and a few rational fractions, and all the fermion charges thereafter.,

In this, now, dimension independent revision; the electron mass and the ratio of the muon mass to the electron mass are shown calculable from simple quadratic functions of π , e , and a few rational fractions. All the remaining masses may be determined from from these constants and their indexes determined by the mass-generalized Maxwell's equations. These calculated masses are all well within current specs as of this publication. In fact, more recent neutrino measurements and estimates have put their values into a rather tight range which the computed values in this update fall within.

My book, "Reality is a Mathematical Model" (reference [1]), lays out the foundations of the algebraic construction of the vector-geometry of space-time and how the smooth functions represent the fundamental objects therein.

From there, my book, "A Mathematical Preon Foundation for the Standard Model" (reference [2]), gives an introductory look at how fundamental object mass originates from charge; an architecture of these fundamental objects; and the interactions of these fundamental objects.

Here, the picture of the mass of the fundamental objects is extended.

the field equations of the electromagnetic-nuclear field, which can be expressed in the form:

$$\overset{m}{\nabla}_3 \times \mathbf{E} + D_0\mathbf{B} = \mathbf{0} \quad \text{and} \quad \overset{m}{\nabla}_3 \cdot \mathbf{B} = \mathbf{0}$$

$$\overset{m}{\nabla}_{3\Updownarrow} \times \mathbf{B} - D_0\mathbf{E} = \mathbf{J}_3 \quad \text{and} \quad \overset{m}{\nabla}_{3\Updownarrow} \cdot \mathbf{E} = \rho \equiv J^0 \;\; ;$$

$$\text{where: } \overset{m}{\nabla}_3 \equiv \mathbf{w}^{4;1}D_1 + \mathbf{w}^{4;2}D_2 + \mathbf{w}^{4;3}D_3$$

$$\overset{m}{\nabla}_{3\Updownarrow} \equiv \mathbf{w}^{4;1}D_1^{\Updownarrow} + \mathbf{w}^{4;2}D_2^{\Updownarrow} + \mathbf{w}^{4;3}D_3^{\Updownarrow}$$

$$D_i^{+} \equiv (\partial_i + m_i) \quad , \quad D_i^{-} \equiv (\partial_i - m_i)$$

$$D_i \equiv \begin{pmatrix} D_i^{+} & 0 \\ 0 & D_i^{-} \end{pmatrix} \quad , \quad D_i^{\Updownarrow} \equiv \begin{pmatrix} D_i^{-} & 0 \\ 0 & D_i^{+} \end{pmatrix}$$

$$\mathbf{E} = \mathbf{w}^{4;1}\left(-D_0^{\Updownarrow}f^1 - D_1f^0\right) + \mathbf{w}^{4;2}\left(-D_0^{\Updownarrow}f^2 - D_2f^0\right) + \mathbf{w}^{4;3}\left(-D_0^{\Updownarrow}f^3 - D_3f^0\right)$$

$$\mathbf{B} = \mathbf{w}^{4;1}(D_2f^3 - D_3f^2) + \mathbf{w}^{4;2}(-D_1f^3 + D_3f^1) + \mathbf{w}^{4;3}(D_1f^2 - D_2f^1)$$

$$f^i \equiv \begin{pmatrix} f_+^i \\ f_-^i \end{pmatrix}$$

that is, the mass-generalized Maxwell's or Maxwell-Cassano equations, are a representation of the equations also obtained from the Helmholtzian matrix product form noted at the begining of my video, [3]:

Now, from [2], the fermion architecture is as follows:

$e^- = e(1) = \overline{(E^1,E^2,E^3)}_1$	$\mu^- = e(2) = \overline{(E^1,E^2,E^3)}_2$	$\tau^- = e(3) = \overline{(E^1,E^2,E^3)}_3$
$\nu_e = \nu(1) = (B^1,B^2,B^3)_1$	$\nu_\mu = \nu(2) = (B^1,B^2,B^3)_2$	$\nu_\tau = \nu(3) = (B^1,B^2,B^3)_3$
$u_R = u_1(1) = (B^1,E^2,E^3)_1$	$c_R = u_1(2) = (B^1,E^2,E^3)_2$	$t_R = u_1(3) = (B^1,E^2,E^3)_3$
$u_G = u_2(1) = (E^1,B^2,E^3)_1$	$c_G = u_2(2) = (E^1,B^2,E^3)_2$	$t_G = u_2(3) = (E^1,B^2,E^3)_3$
$u_B = u_3(1) = (E^1,E^2,B^3)_1$	$c_B = u_3(2) = (E^1,E^2,B^3)_2$	$t_B = u_3(3) = (E^1,E^2,B^3)_3$
$d_R = d_1(1) = \overline{(E^1,B^2,B^3)}_1$	$s_R = d_1(2) = \overline{(E^1,B^2,B^3)}_2$	$b_R = d_1(3) = \overline{(E^1,B^2,B^3)}_3$
$d_G = d_2(1) = \overline{(B^1,E^2,B^3)}_1$	$s_G = d_2(2) = \overline{(B^1,E^2,B^3)}_2$	$b_G = d_2(3) = \overline{(B^1,E^2,B^3)}_3$
$d_B = d_3(1) = \overline{(B^1,B^2,E^3)}_1$	$s_B = d_3(2) = \overline{(B^1,B^2,E^3)}_2$	$b_B = d_3(3) = \overline{(B^1,B^2,E^3)}_3$

If the fermion masses may be described by the mass-generalized Maxwell's equations, then denote them as follows:

$m(3,1) = m_e : e^- = e(1)$	$m(3,2) = m_\mu : \mu^- = e(2)$	$m(3,3) = m_\tau : \tau^- = e(3)$
$m(0,1) = m_{\nu_e} : \nu_e = \nu(1)$	$m(0,2) = m_{\nu_\mu} : \nu_\mu = \nu(2)$	$m(0,3) = m_{\nu_\tau} : \nu_\tau = \nu(3)$
$m(2,1) = m_u : u_X = u_X(1)$	$m(2,2) = m_c : c_X = u_X(2)$	$m(2,3) = m_t : t_X = u_x(3)$
$m(1,1) = m_d : d_X = d_X(1)$	$m(1,2) = m_s : s_X = d_X(2)$	$m(1,3) = m_b : b_X = d_X(3)$

Where for an object's mass: $m(h,i)$:

h indicates the number of $E's$ In the object's $\mathbf{S_R}$ architecture.

i indicates the generation of the object's $\mathbf{S_R}$ architecture.

After much analysis, the following relationships arise.

Define:

$$v(h,i) \equiv \left(\frac{i + T_0(i)(-1)^i}{2\left[2h + (-1)^h\right]^2 (hi^2 + 2) + (h+1)(h-i)^2} \right)^{T_0(h)T_0(i-1)}$$

$$u(h,i) \equiv \left(\frac{\left[2i + (-1)^i\right]^2 - 2T_0(i)}{\left[2i + (-1)^i\right]^2} \right)^{\frac{\delta_1^{(-1)^{T_0(h)}} \delta_{-1}^{(-1)^h}}{2^{T_0(i-1)}}}$$

$$\varphi(h) \equiv \Big((2k)2\big[2h+(-1)^h\big]\Big)^{\left[2h+(-1)^h-1\right]\cdot T_0(T_0(h+1))}$$

$$f(h) \equiv (h^2+1)\varphi(h)$$

$$g(h,i) \equiv u(h,i)\Bigg[v(h,i)\bigg(\Big[2h+(-1)^h 2^{\frac{1}{2}\left[1+(-1)^h\right]}\Big]k\bigg)^{(i-1)[T_0(h+1)-T_0(T_0(h+1))]}\Bigg]^{(i-1)^{T_0(h)}}$$

$$T_0(j) = \tfrac{1}{2}\left[j-1+\delta^1_{(-1)^j}\right]$$

$$\big(h,i \in \mathbb{N}\ ;\ 0 \le h \le 3\ ,\ 1 \le i \le 3\big)$$

From which the masses may be written:

$$\frac{m(h,1)}{m\left(\left[h+\delta_{-1}^{(-1)^{T_0(h+1)}}\right]\delta_{-1}^{(-1)^{T_0(h+1)}},1\right)} = f(h)$$

$$\frac{m(h,i)}{m\left(h+(-1)^{h+1}\delta_{-1}^{(-1)^{T_0(h+1)}}(1-\delta_1^i),1\right)} = g(h,i)$$

which may be written out explicitly as:

$\frac{m(0,1)}{m(0,1)} = f(0)$	$\frac{m(0,i)}{m(0,1)} = g(0,i)$
$\frac{m(1,1)}{m(2,1)} = f(1)$	$\frac{m(1,i)}{m(2,1)} = g(1,i)\ ,\ \ (i \ne 1)$
$\frac{m(2,1)}{m(3,1)} = f(2)$	$\frac{m(2,i)}{m(1,1)} = g(2,i)\ ,\ \ (i \ne 1)$
$\frac{m(3,1)}{m(0,1)} = f(3)$	$\frac{m(3,i)}{m(3,1)} = g(3,i)$

or:

$m(0,1) = m(0,1)f(0)$	$m(0,i) = m(0,1)g(0,i)$
$m(1,1) = m(2,1)f(1)$	$m(1,i) = m(2,1)g(1,i)\ ,\ \ (i \ne 1)$
$m(2,1) = m(3,1)f(2)$	$m(2,i) = m(1,1)g(2,i)\ ,\ \ (i \ne 1)$
$m(3,1) = m(0,1)f(3)$	$m(3,i) = m(3,1)g(3,i)$

Note:

h	$2h+(-1)^h$
0	1
1	1
2	5
3	5

$$\Rightarrow 2h+(-1)^h = \begin{cases} 1\ ,\ \ h = 0,1 \\ 5\ ,\ \ h = 2,3 \end{cases}$$

h	h^2+1
0	1
1	2
2	5
3	10

$$\varphi(h) \equiv \left(2\left[2h+(-1)^h\right]\right)^{\left[2h+(-1)^h-1\right]\cdot T_0(T_0(h+1))}$$

h	$\varphi(h)$
0	1
1	1
2	1
3	10^4

$$\Rightarrow \varphi(h) = \begin{cases} 1 & , \ h = 0,1,2 \\ 10^4 \bullet (2k) & , \ h = 3 \end{cases}$$

So, the $f(h)$ are: :

$f(0) \equiv w(0)\varphi(0) = 1$
$f(1) \equiv w(1)\varphi(1) = 2$
$f(2) \equiv w(2)\varphi(2) = 5$
$f(3) \equiv w(3)\varphi(3) = 10^5 \bullet (2k)$

Continuing, the following table may be built:

$f(0) = 1$	$m_{\nu_e} = m(0,1) = m(0,1)f(0) = m(0,1)$
$f(1) = 2$	$m_d = m(1,1) = m(2,1)f(1) = 2m(2,1)$
$f(2) = 5$	$m_u = m(2,1) = m(3,1)f(2) = 5m(3,1)$
$f(3) = 10^5 \bullet (2k)$	$m_e = m(3,1) = m(0,1)f(3) = 10^5 \bullet (2k)m(0,1)$

The fermion measured to the greatest accuracy is the electron.
It's current measured value is: $m_e \approx .0.510998928(11)MeV/c^2$

However, consider:

$$\frac{1}{10}\left[\frac{15}{8}+\frac{1}{4000}\left(\frac{486}{25}\right)\right]e = 0.51099892780470207761443900058 97$$

Since this is right in the middle of the margin of error of a quantity measured to eight significant figures, it is not even remotely out of line to make the assignment:

$$m_e = \frac{1}{10}\left[\frac{15}{8}+\frac{1}{4000}\left(\frac{486}{25}\right)\right]e$$

It may seem odd that a physical constant with units may be calculable, but like converting from centimeters to inches or liters to quarts there is only a proportionality constant involved, so the dimensionless quantity involved would be some multiple of this (which, here may be $\frac{e}{10}$).

So, taking the mass of the electron as the basis, from the above analysis (in MeV/c^2):

$$
\left\{
\begin{array}{|l|}
\hline
m_e = m(3,1) = 0.510998927804702077614439 0005897 \\
\hline
m_u = m(2,1) = m(3,1)f(2) = 5m(3,1) = 2.5549946390235103880721950029485 \\
\hline
m_d = m(1,1) = m(2,1)f(1) = 2m(2,1) = 5.109989278047020776144390005897 \\
\hline
\end{array}
\right.
$$

Note:

h	$T_0(h)$	$T_0(h+1)$	$T_0(T_0(h+1))$	$T_0(h) - T_0(T_0(h+1))$	$T_0(h+1) - T_0(T_0(h+1))$
0	0	0	0	0	0
1	0	1	0	0	1
2	1	1	0	1	1
3	1	2	1	0	1

$$
u(h,i) \equiv \left(\frac{[2i + (-1)^i]^2 - 2T_0(i)}{[2i + (-1)^i]^2} \right)^{\frac{\delta_1^{(-1)^{T_0(h)}} \delta_{-1}^{(-1)^h}}{2^{T_0(i-1)}}}
$$

h	i	$u(h,i)$
0	1	1
0	2	1
0	3	1
1	1	1
1	2	$\frac{23}{25}$
1	3	$\sqrt{\frac{23}{25}}$
2	1	1
2	2	1
2	3	1
3	1	1
3	2	1
3	3	1

$$
\Rightarrow u(h,i) = \begin{cases} 1 & , h = 0,2,3 \\ \left(\frac{23}{25}\right)^{\frac{1}{2^{T_0(i-1)}}} & , h = 1 \end{cases} = \begin{cases} 1 & , h = 0,2,3 \\ 1 & , i = 1 \\ \left(\frac{23}{25}\right)^{\frac{1}{2^{T_0(i-1)}}} & , h = 1 \end{cases}
$$

$$v(h,i) \equiv \left(\frac{i + T_0(i)(-1)^i}{2\left[2h+(-1)^h\right]^2 (hi^2+2) + (h+1)(h-i)^2} \right)^{T_0(h)T_0(i-1)}$$

h	i	$v(h,i)$
0	1	1
0	2	1
0	3	1
1	1	1
1	2	1
1	3	1
2	1	1
2	2	1
2	3	$\frac{3}{1003}$
3	1	1
3	2	1
3	3	$\frac{2}{1450}$

$$\Rightarrow v(h,i) = \begin{cases} 1 & ;\ i \neq 3 \\ 1 & ;\ i = 3, h = 0,1 \\ \frac{3}{1004} & ;\ i = 3, h = 2 \\ \frac{2}{1450} & ;\ i = 3, h = 3 \end{cases}$$

The $g(h,i)$ simplify to:

$$g(h,1) = u(h,1)\left[v(h,1)\left(\left[2h+(-1)^h 2^{\frac{1}{2}\left[1+(-1)^h\right]}\right]k\right)^{(1-1)[T_0(h+1)-T_0(T_0(h+1))]} \right]^{(1-1)^{T_0(h)}}$$

$$= 1 \cdot \left[v(h,1)\left(\left[2h+(-1)^h 2^{\frac{1}{2}\left[1+(-1)^h\right]}\right]k\right)^{0} \right]^{0^{T_0(h)}} = 1$$

and:

$$g(h,2) = u(h,2)\left[v(h,2)\left(\left[2h+(-1)^h 2^{\frac{1}{2}\left[1+(-1)^h\right]}\right]k\right)^{(2-1)[T_0(h+1)-T_0(T_0(h+1))]} \right]^{(2-1)^{T_0(h)}}$$

$$= u(h,2)\left[v(h,2)\left(\left[2h+(-1)^h 2^{\frac{1}{2}\left[1+(-1)^h\right]}\right]k\right)^{1\cdot[T_0(h+1)-T_0(T_0(h+1))]} \right]^{1^{T_0(h)}}$$

$$= u(h,2)v(h,2)\left(\left[2h+(-1)^h 2^{\frac{1}{2}\left[1+(-1)^h\right]}\right]k\right)^{[T_0(h+1)-T_0(T_0(h+1))]}$$

$$= u(h,2)\left(\left[2h+(-1)^h 2^{\frac{1}{2}\left[1+(-1)^h\right]}\right]k\right)^{[T_0(h+1)-T_0(T_0(h+1))]}$$

and:

$$g(h,3) \equiv u(h,3)\left[v(h,3)\left(\left[2h+(-1)^h 2^{\frac{1}{2}\left[1+(-1)^h\right]}\right]k\right)^{(3-1)\cdot[T_0(h+1)-T_0(T_0(h+1))]} \right]^{(3-1)^{T_0(h)}}$$

$$= u(h,3)\left[v(h,3)\left(\left[2h+(-1)^h 2^{\frac{1}{2}\left[1+(-1)^h\right]}\right]k\right)^{2\cdot[T_0(h+1)-T_0(T_0(h+1))]} \right]^{2^{T_0(h)}}$$

Yielding:

$$m(h,1) = m(h,1)$$
$$\frac{m(h,2)}{m\left(h + (-1)^{h+1}\delta_{-1}^{(-1)^{T_0(h+1)}},1\right)} = g(h,2)$$
$$\frac{m(h,3)}{m\left(h + (-1)^{h+1}\delta_{-1}^{(-1)^{T_0(h+1)}},1\right)} = g(h,3)$$

which may be written out explicitly as:

$m(0,1) = m(0,1)$	$\frac{m(0,2)}{m(0,1)} = g(0,2)$	$\frac{m(0,3)}{m(0,1)} = g(0,3)$
$m(1,1) = m(1,1)$	$\frac{m(1,2)}{m(2,1)} = g(1,2)$	$\frac{m(1,3)}{m(2,1)} = g(1,3)$
$m(2,1) = m(2,1)$	$\frac{m(2,2)}{m(1,1)} = g(2,2)$	$\frac{m(2,3)}{m(1,1)} = g(2,3)$
$m(3,1) = m(3,1)$	$\frac{m(3,2)}{m(3,1)} = g(3,2)$	$\frac{m(3,3)}{m(3,1)} = g(3,3)$

Since the first column is a set of identities $(g(h,1) = 1)$, the case: $i = 1$ may be ignored.

The $g(h,i)$ may be calculated into the following table ($g(h,1) = 1$).

$g(0,2) = 1 \cdot \left(\left[2 \cdot 0 + (-1)^0 2^{\frac{1}{2}\left[1+(-1)^0\right]}\right]k\right)^{[T_0(0+1)-T_0(T_0(0+1))]}$
$= 1 \cdot ([0+2^1]k)^0 = 1 \cdot 1 = 1$
$g(1,2) = \left(\frac{23}{25}\right)^{\frac{1}{2^{T_0(2-1)}}} \cdot \left(\left[2 \cdot 1 + (-1)^1 2^{\frac{1}{2}\left[1+(-1)^1\right]}\right]k\right)^{[T_0(1+1)-T_0(T_0(1+1))]}$
$= \left(\frac{23}{25}\right) \cdot ([2-2^1]k)^1 = \left(\frac{23}{25}\right) \cdot (k)$
$g(2,2) = 1 \cdot \left(\left[2 \cdot 2 + (-1)^2 2^{\frac{1}{2}\left[1+(-1)^2\right]}\right]k\right)^{[T_0(2+1)-T_0(T_0(2+1))]} = 1 \cdot ([4+2^1]k)^1 = 1 \cdot (6k)$
$g(3,2) = 1 \cdot \left(\left[2 \cdot 3 + (-1)^3 2^{\frac{1}{2}\left[1+(-1)^3\right]}\right]k\right)^{[T_0(3+1)-T_0(T_0(3+1))]} = 1 \cdot ([6-2^0]k)^1 = 1 \cdot (5k)$
$g(0,3) = 1 \cdot \left[1 \cdot \left(\left[2 \cdot 0 + (-1)^0 2^{\frac{1}{2}\left[1+(-1)^0\right]}\right]k\right)^{2 \cdot [T_0(0+1)-T_0(T_0(0+1))]}\right]^{2^{T_0(0)}}$
$= 1 \cdot \left[([0+2^1]k)^{2 \cdot 0}\right]^{2^0} = 1 \cdot ([0+2^1]k)^0 = 1 \cdot (1)^2 = 1$
$g(1,3) = \left(\frac{23}{25}\right)^{\frac{1}{2^1}} \cdot \left[v(1,3)\left(\left[2 \cdot 1 + (-1)^1 2^{\frac{1}{2}\left[1+(-1)^1\right]}\right]k\right)^{2 \cdot [T_0(1+1)-T_0(T_0(1+1))]}\right]^{2^{T_0(1)}}$
$= \left(\frac{23}{25}\right)^{\frac{1}{2}} \cdot \left[([2-2^0]k)^{2 \cdot 1}\right]^{2^0} = \left(\frac{23}{25}\right)^{\frac{1}{2}} \cdot (k)^2 = \left(\frac{23}{25}\right)^{\frac{1}{2}} \cdot (k)^2$
$g(2,3) = 1 \cdot \left[\left(\frac{3}{1004}\right)\left(\left[2 \cdot 2 + (-1)^2 2^{\frac{1}{2}\left[1+(-1)^2\right]}\right]k\right)^{2 \cdot [T_0(2+1)-T_0(T_0(2+1))]}\right]^{2^{T_0(2)}}$
$= 1 \cdot \left[\left(\frac{3}{1004}\right)([4+2^1]k)^{2 \cdot 1}\right]^{2^1} = 1 \cdot \left[\left(\frac{3}{1004}\right)(6k)^2\right]^2$
$g(3,3) = 1 \cdot \left[\left(\frac{2}{1450}\right)\left(\left[2 \cdot 3 + (-1)^3 2^{\frac{1}{2}\left[1+(-1)^3\right]}\right]k\right)^{2 \cdot [T_0(3+1)-T_0(T_0(3+1))]}\right]^{2^{T_0(3)}}$
$= 1 \cdot \left[\left(\frac{2}{1450}\right)([6-2^1]k)^{2 \cdot 1}\right]^{2^1} = 1 \cdot \left[\left(\frac{2}{1450}\right)(5k)^2\right]^2$

From these tables the constant k may be determined, as well as a host of relationships between the fermion masses.

The upper generation fermion masses fill out the following table.

(It is rather remarkable how simple the relationships are.)

$\frac{m(0,2)}{m(0,1)} = 1$	$\frac{m(0,3)}{m(0,1)} = 1$
$\frac{m(1,2)}{m(2,1)} = \left(\frac{23}{25}\right) \cdot (k)$	$\frac{m(1,3)}{m(2,1)} = \left(\frac{23}{25}\right)^{\frac{1}{2}} \cdot (k)^2$
$\frac{m(2,2)}{m(1,1)} = 1 \cdot (6k)$	$\frac{m(2,3)}{m(1,1)} = 1 \cdot \left[\left(\frac{3}{1004}\right)(6k)^2\right]^2$
$\frac{m(3,2)}{m(3,1)} = 1 \cdot (5k)$	$\frac{m(3,3)}{m(3,1)} = 1 \cdot \left[\left(\frac{2}{1450}\right)(5k)^2\right]^2$

So, from tables above:

$$\frac{m(0,3)}{m(0,1)} = 1 = \frac{m(0,2)}{m(0,1)} \Rightarrow m(0,3) = m(0,2) = m(0,1) = \frac{m(3,1)}{10^5 \cdot (2k)}$$

And:

$$k = \frac{m(1,2)}{m(2,1)}\left(\frac{25}{23}\right) = \frac{1}{6}\left[\frac{m(2,2)}{m(1,1)}\right] = \frac{1}{5}\left[\frac{m(3,2)}{m(3,1)}\right]$$

$$= \sqrt{\frac{m(1,3)}{m(2,1)}\sqrt{\frac{25}{23}}} = \frac{1}{6}\sqrt{\frac{1004}{3}\sqrt{\frac{m(2,3)}{m(1,1)}}} = \frac{1}{5}\sqrt{\frac{1450}{2}\sqrt{\frac{m(3,3)}{m(3,1)}}}$$

Now, the constant k may be established as follows:

$$k = 4\pi^2 + \frac{15}{8} + \frac{1}{4000}\sum_{k=0}^{\infty}\left(-\frac{1}{20}\right)^k = 4\pi^2 + \frac{15}{8} + \frac{1}{4000}\left(\frac{20}{21}\right)$$

$$= 41.353655699595552971343320209474 3$$

So, using the already above determined value:

$$m(3,1) = m_e = 0.51099892780470207761443900058 97 MeV/c^2$$

$$\Rightarrow m(3,2) = 5km(3,1) = 105.65836861649061337988846727846 MeV/c^2$$

It's current measured value is:

$$m_\mu = m(3,2) \approx 105.6583715(35) MeV/c^2$$

All the above mass ratio relationships may be verified using this value.

$$\Rightarrow m(3,1) = m\left(\left[0 + \delta_{-1}^{(-1)^{T_0(0+1)}}\right]\delta_{-1}^{(-1)^{T_0(0+1)}}, 1\right) \cdot f(3)$$

$$= m\left(\delta_{-1}^{(-1)^{T_0(1)}} \cdot \delta_{-1}^{(-1)^{T_0(1)}}, 1\right) \cdot 10^5 \cdot (2k)$$

$$= m\left(\delta_{-1}^{(-1)^0} \cdot \delta_{-1}^{(-1)^0}, 1\right) \cdot 10^5 \cdot (2k)$$

$$= m(\delta_{-1}^1 \cdot \delta_{-1}^1, 1) \cdot 10^5 \cdot (2k)$$

$$= m(0 \cdot 0, 1) \cdot 10^5 \cdot (2k) = m(0,1) \cdot 10^5 \cdot (2k)$$

$$\Rightarrow m_{\nu_e} = m(0,1) = \frac{m(3,1)}{10^5 \cdot (2k)}$$

$$= \frac{0.51099892780470207761443900058 97}{10^5 \cdot 2 \cdot 41.353655699595552971343320209474 3}$$

$$= 6.1784009074885734562227824476 1 \times 10^{-8} MeV/c^2 = m_{\nu_e}$$

So, the first generation fermion masses fill the following table.

(in Mev/c^2)

$m_e = m(3,1) = 0.51099892780470207761443900058 97$
$m_{\nu_e} = m(0,1) = 6.1784009074885734562227824476 1 \times 10^{-8}$
$m_u = m(2,1) = 2.5549946390235103880721950029485$
$m_d = m(1,1) = 5.1099892780470207761443900058 97$

Thus:

$$m(0,3) = m(0,2) = m(0,1) = 6.17840090748857345622278244761 \times 10^{-8} MeV/c$$

And the rest of the mass values may also be computed (in Mev/c^2):

$$\frac{m(1,2)}{m(2,1)} = \left(\frac{23}{25}\right) \cdot (k)$$
$$\Rightarrow m_s = m(1,2) = m(2,1)\left(\frac{23}{25}\right)k = 97.2056991271713643094973898896187$$

$$\frac{m(2,2)}{m(1,1)} = 1 \cdot (6k)$$
$$\Rightarrow m_c = m(2,2) = 6m(1,1)k = 1267.90042339788736055866160734 16$$

$$\frac{m(3,2)}{m(3,1)} = 1 \cdot (5k)$$
$$\Rightarrow m_\mu = m(3,2) = 5m(3,1)k = 105.658368616490613379888467278 46$$

$$m_{\nu_{\mu e}} = m(0,2) = m(0,1) = 6.17840090748857345622278244761 \times 10^{-8}$$

$$\frac{m(1,3)}{m(2,1)} = \left(\frac{23}{25}\right)^{\frac{1}{2}} \cdot (k)^2$$
$$\Rightarrow m_b = m(1,3) = m(2,1)\left(\frac{23}{25}\right)^{\frac{1}{2}} k^2 = 4190.9426907545271186849743851983$$

$$\frac{m(2,3)}{m(1,1)} = 1 \cdot \left[\left(\frac{3}{1004}\right)(6k)^2\right]^2$$
$$\Rightarrow m_t = m(2,3) = \left[\left(\frac{3}{1004}\right)(6k)^2\right]^2 m(1,1) = 172924.17191486611744398343538627$$

$$\frac{m(3,3)}{m(3,1)} = 1 \cdot \left[\left(\frac{2}{1450}\right)(5k)^2\right]^2$$
$$\Rightarrow m_\tau = m(3,3) = \left[\left(\frac{2}{1450}\right)(5k)^2\right]^2 m(3,1) = 1776.9680674108457768918379570944$$

$$m_{\nu_\tau} = m(0,3) = m(0,1) = 6.17840090748857345622278244761 \times 10^{-8}$$

And all the fermion masses may be tabulated as follows, along side reported mass values.

(as of this publication)

(in Mev/c^2)

Calculated	**Measured**
$m_d = m(1,1) = 5.1099892780470207761443900058 97$	$m_d = m(1,1) \approx 5.0(0.5)$
$m_u = m(2,1) = 2.5549946390235103880721950029485$	$m_u = m(2,1) \approx 2.4(0.6)$
$m_e = m(3,1) = 0.51099892780470207761443900058 97$	$m_e = m(3,1) \approx 0.510998928(11)$
$m_{\nu_e} = m(0,1) = 10^{-7} \times 0.6178400907488573456222782447 61$	$m_{\nu_e} = m(0,1) \approx 10^{-7} \times 0.583(183)$
$m_s = m(1,2) = 97.205699127171364309497389896187$	$m_s = m(1,2) \approx 95(5)$
$m_c = m(2,2) = 1267.9004233978873605586616073416$	$m_c = m(2,2) \approx 1275(25)$
$m_\mu = m(3,2) = 105.65836861649061337988846727846$	$m_\mu = m(3,2) \approx 105.6583715(35)$
$m_{\nu_{\mu e}} = m(0,2) = 10^{-7} \times 0.6178400907488573456222782447 61$	$m_{\nu_{\mu e}} = m(0,2) \approx 10^{-7} \times 0.583(183)$
$m_b = m(1,3) = 4190.9426907545271186849743851983$	$m_b = m(1,3) \approx 4180(30)$
$m_t = m(2,3) = 172924.17191486611744398343538627$	$m_t = m(2,3) \approx 172970(620)$
$m_\tau = m(3,3) = 1776.9680674108457768918379570944$	$m_\tau = m(3,3) \approx 1,776.82(16)$
$m_{\nu_\tau} = m(0,3) = 10^{-7} \times 0.6178400907488573456222782447 61$	$m_{\nu_\tau} = m(0,3) \approx 10^{-7} \times 0.583(183)$

https://en.wikipedia.org/wiki/Lepton#Mass
https://en.wikipedia.org/wiki/Electron
https://en.wikipedia.org/wiki/Muon
https://en.wikipedia.org/wiki/Tauon
https://en.wikipedia.org/wiki/Quark
https://en.wikipedia.org/wiki/Down_quark
https://en.wikipedia.org/wiki/Up_quark
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https://en.wikipedia.org/wiki/Current_quark_mass
https://en.wikipedia.org/wiki/Neutrino#Mass
http://pdg.lbl.gov/2012/tables/rpp2012-sum-leptons.pdf
http://pdg.lbl.gov/2012/tables/rpp2012-sum-quarks.pdf
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There are variations between the references on some of the masses, but the tightest ranges have been used, and the value centered in the error range.

All the calculated masses above are accurate well within their margin of error.

The error ranges for all the masses are rather tight (even the neutrino mass estimates, now), so confidence on the formulation is high.

There is an affine transformation that relates the above two constants to two rational fractions:

$$\frac{m(3,1)}{10e} \Big/ 1Mev/c^2 = \left(\frac{15}{8}\right) + \frac{486}{25}\left(\frac{1}{4000}\right)$$

$$k = \left(\frac{15}{8}\right) + \frac{20}{21}\left(\frac{1}{4000}\right) + 4\pi^2$$

Is it just a coincidence that all the fermion masses may be calculated from merely two well chosen constants, indexed via the two field strength fundamentals founded by the constructed doublet-$\mathbb{R}$–algebra?

Even if so, how does the Higgs mechanism explain the above mass ratio relationships?

Does SUSY predict this relationship? How about S&M Theory?

Now, that it has just been shown that all the fermion masses may be determined by fixed constants via the mass-generalized Maxwell's equations field strengths $\mathbf{E}$ & $\mathbf{B}$; the issue of the relationship of charge to the mass-generalized Maxwell's equations field strengths and possibly to mass may be re-examined in this new context from another direction.

The relationship between the mass-generalized Maxwell's equations field strengths and the fermion charges may be established by constructing a function $c()$ is defined simply by:

$$c((R^1,R^2,R^3)_h) = c(R_h^1) + c(R_h^2) + c(R_h^3),$$
$$c\left(\overline{R_h^i}\right) = -c(R_h^i),$$
$$c(E_h^i) = x,$$
$$c(B_h^i) = y,.$$

then the objects are:

$$c(e(i)) = -3x, c(\nu(i)) = 3y, c(u_j(i)) = 2x + y, c(d_j(i)) = -(x + 2y).$$

From here, two different calibrations are consistent with current empirical evidence. Each has its advantages.

Calibrating this with: $-1 = c(e(1)) = -3x, 0 = c(\nu(1)) = 3y \Rightarrow x = \frac{1}{3}, y = 0$

Operating this linear function on the objects, yields:

$c(e(i)) = -1, c(\nu(i)) = 0$

$c(u_j(i)) = \frac{2}{3}, c(d_j(i)) = -\frac{1}{3}$

These correspond to the charge characteristics of all the fermions.

If, on the other hand, the calibration is as follows:

Let: $x = \lambda m^2_{e((h))}$, $y = \lambda m^2_{\nu((h))}$

Calibrating this with: $-1 = c(e(1)) = -3x = -3\lambda m^2_{e((h))} \Rightarrow x = \frac{1}{3}$

and: $\lambda = \frac{1}{3} m^{-2}_{e((h))}$

$\Rightarrow c(\nu(h)) = 3y = 3\lambda m^2_{\nu((h))} = \left(\frac{m_{\nu((h))}}{m_{e((h))}}\right)^2 \Rightarrow y = \frac{1}{3}\left(\frac{m_{\nu((h))}}{m_{e((h))}}\right)^2$

Operating this linear function on the objects, yields:

$c(e(h)) = -1, c(\nu(h)) = \left(\frac{m_{\nu((h))}}{m_{e((h))}}\right)^2$

$c(u_j(h)) = \frac{2}{3} + \frac{1}{3}\left(\frac{m_{\nu((h))}}{m_{e((h))}}\right)^2, c(d_j(i)) = -\frac{1}{3} - \frac{2}{3}\left(\frac{m_{\nu((h))}}{m_{e((h))}}\right)^2$

From the above discussion:

$$\left(\frac{m_{\nu((1))}}{m_{e((1))}}\right)^2 = \left(\frac{m(0,1)}{m(3,1)}\right)^2 = \left(\frac{10^{-7} \times 0.6178400907}{.5109989278}\right)^2 \approx 1.209082949 \times 10^{-14}$$

(Please excuse the rounding off to ten significant figures.)

Since the neutrino masses are the same and the higher generation lepton masses are significantly greater, the charge differences for the higher generations are significantly smaller.

The advantage of this calibrationis that because Noether's Theorem applied to the charge density (see [1]) insists the above charge function is a global invariant, so is mass/energy. Noether's Theorem doesn't have to be asserted twice, but Hamilton's principle (for charge density) is a consequence of the $\mathbb{R}$-algebra and Noether's Theorem applied to that, with the above insight, establishes conservation of charge and mass/energy, as a single consequence.

And, this illustrates that charge, being a measure of first order object (lepton) masses, only exists where a fermion rest mass exists. That is, charges do not exist in isolation - in a vacuum - but only where $\mathbf{S_R}$ field strength component matrix entries exist. The generalized electric field strength $\mathbf{S_R}$ matrix entries are basically directly proportional to the charge, and also where the preponderance of the mass of second order objects (quarks) rests.

Nowhere here was there found in this discussion Hilbert space, annhilation operators, spontaneous symmetry breaking, path integrals, Feynman diagrams, or any other inveigles or obfuscations.

The coincidences mount.

The space-time we recognize is described by the constructive $\mathbb{R}$-doublet-algebra

The vector dot and cross products we all learned in high school are natural products in the constructed $\mathbb{R}$-doublet-algebra.

The mass-generalized Maxwell's equations are satisfied for all smooth functions in the constructed $\mathbb{R}$-doublet-algebra which satisfy the four-vector-doublet Klein-Gordon equation, yet reduce to Maxwell's equations for zero mass (something the Dirac equation does not do).

The fermions and photons are natural fundamental constructions from the field strengths of the mass-generalized Maxwell's equations. (and the hadrons are natural constructions therein, as well).

The charges of the fermions are a natural function of the field strength components of the mass-generalized Maxwell's equations.

The masses of all the fermions may be calculated from merely two fixed constants indexed via the field strength components of the mass-generalized Maxwell's equations.

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