Towards a Solution to the So-Called 3-Generations Problem of Elementary Particles
Or: Why are There 3 masses for Charged Leptons, Neutrons and Quarks?

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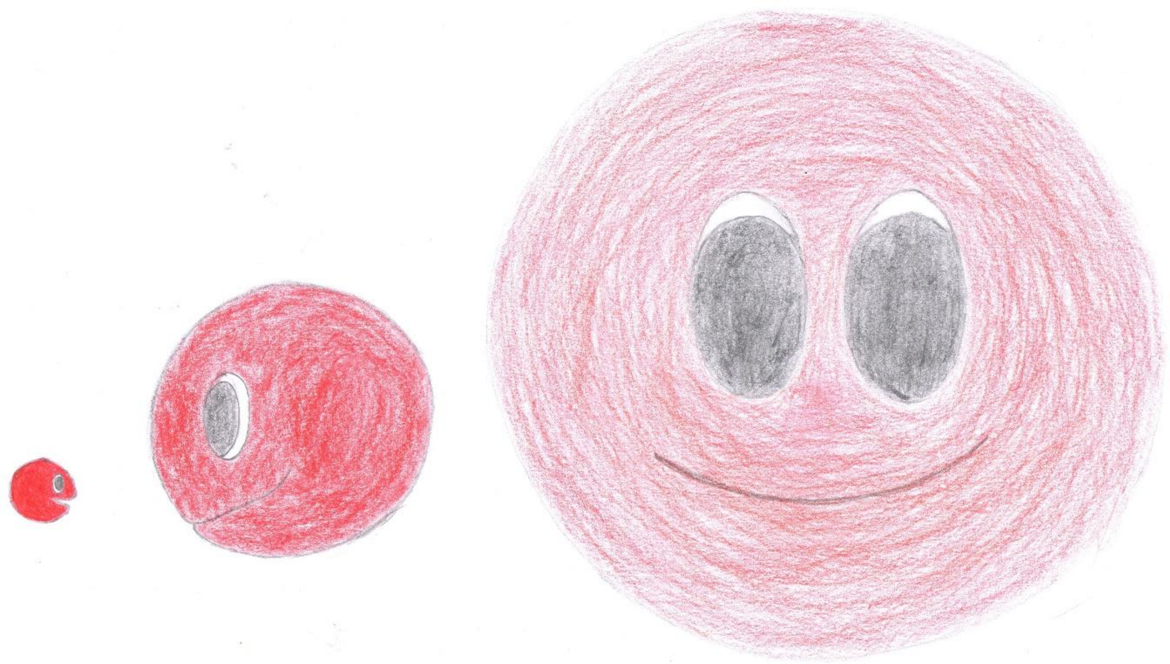

The Three Generations of Particles, by Livia Schwarzer

Theory: The Ricci Scalar for a Scaled Metric

In [1, 2, 3] (and quite some other papers by this author) it was demonstrated how we can find a direct extraction of the Klein-Gordon, the Schrödinger and the Dirac equation from the Ricci scalar R^* of a modified metric of the kind $G_{\alpha\beta}=F[f]*g_{\alpha\beta}$. Namely: With a yet arbitrary scalar function F[f] the corresponding modified Ricci scalar R^* reads:

$$R^* = \frac{1}{F[f]^3}\cdot\left(\begin{array}{c}\left(C_{N1}\cdot\left(\frac{\partial F[f]}{\partial f}\right)^2 - C_{N2}\cdot F[f]\cdot\frac{\partial^2 F[f]}{\partial f^2}\right)\cdot\overbrace{\left(\tilde{\nabla}_g f\right)^2}^{=f_{,\alpha}g^{\alpha\beta}f_{,\beta}} \\ -C_{N2}\cdot F[f]\cdot\frac{\partial F[f]}{\partial f}\cdot\Delta_g f\end{array}\right) \quad . \tag{1}$$

$$\xrightarrow{n=4} = \frac{1}{F[f]^3}\cdot\left(\left(\frac{3}{2}\cdot\left(\frac{\partial F[f]}{\partial f}\right)^2 - 3\cdot F[f]\cdot\frac{\partial^2 F[f]}{\partial f^2}\right)\cdot\left(\tilde{\nabla}_g f\right)^2 - 3\cdot F[f]\cdot\frac{\partial F[f]}{\partial f}\cdot\Delta_g f\right)$$

Thereby the C_{N1} and C_{N2} are constants depending on the number of dimensions n of the space-time being considered. For illustration we also gave the case n=4 (n=number of dimensions). Thereby f is to be understood as a function of the coordinates $f=f[x_0, x_1, x_2, \ldots]$. It was shown in [1 - 6] (especially [2]) that we can write:

$$\begin{array}{c} C_{N1} = -\frac{3}{2} + \frac{7}{4}\cdot n - \frac{1}{4}\cdot n^2 \\ C_{N2} = n-1 \end{array}, \tag{2}$$

Demanding certain conditions for the function F[f] of f then gives us Dirac or Klein-Gordon equations [1, 2, 3].

So, for instance, by setting F[f] to fulfill the following condition:

$$C_{N1}\cdot\left(\frac{\partial F[f]}{\partial f}\right)^2 - C_{N2}\cdot F[f]\cdot\frac{\partial^2 F[f]}{\partial f^2} = 0, \tag{3}$$

we obtain:

$$R^* = -\frac{1}{F[f]^3}\cdot C_{N2}\cdot F[f]\cdot\frac{\partial F[f]}{\partial f}\cdot\Delta_g f$$

$$\xrightarrow{n=4\ \ \&\ \ F[f]=\left(f+\frac{C_f}{M^2}\right)^2} = -\frac{1}{F[f]^2}\cdot 3\cdot\frac{\partial F[f]}{\partial f}\cdot\Delta_g f \xrightarrow{F[f]=\left(f+\frac{C_f}{M^2}\right)^2} = -\frac{6}{\left(f+\frac{C_f}{M^2}\right)^3}\cdot\Delta_g f \cdot \tag{4}$$

$$\Rightarrow \frac{R^*}{6}\cdot\left(f+\frac{C_f}{M^2}\right)^3 + \Delta_g f = 0$$

Towards an Explanation for the 3-Generations Problem (?)

Now we know that the classical Klein-Gordon equation always is of the kind:

$$-M^2 f+\Delta_g f=\left(-M^2+\Delta_g\right)f=0 \\ \text{with:}\quad M^2\equiv\frac{m^2\cdot c^2}{\hbar^2} \tag{5}$$

(c… speed of light in vacuum, m… rest mess, $\hbar$ …reduced Planck constant).

Comparing the last line of (4) with the first line of (5) tells us, that finding a linearization for the expression $\frac{R^*}{6}\cdot\left(f+\frac{C_f}{M^2}\right)^3$ with respect to the function f, would immediately give us the classical Klein-Gordon quantum equation from a completely metric origin. Thus, we have to look for possible – potentially approximated - solutions to the equation:

$$M^2\cdot f\equiv\frac{m^2\cdot c^2}{\hbar^2}\cdot f=\frac{R^*}{6}\cdot\left(f+\frac{C_f}{M^2}\right)^3. \tag{6}$$

This, however, is a polynomial of third order and it can have three solutions.

A bit of reshaping the last equation is going to help us to realize how this will possibly also solve the 3-generations mass problem:

$$\Psi\equiv M^2\cdot f\equiv\frac{m^2\cdot c^2}{\hbar^2}\cdot f=\frac{R^*}{6}\cdot\left(f+\frac{C_f}{M^2}\right)^3=\frac{R^*}{M^6\cdot 6}\cdot\left(\Psi+C_f\right)^3 \\ \xrightarrow{R^{**}=\frac{R^*}{M^6\cdot 6};\quad R^{***}=C_f} R^{**}\cdot\left(\Psi+R^{***}\right)^3-\Psi=0 \\ =\left(\Psi+R^{***}\right)^3-\frac{\Psi}{R^{**}}=\left(R^{***}\right)^3-\frac{\Psi}{R^{**}}+3\cdot\left(R^{***}\right)^2\cdot\Psi+3\cdot R^{***}\cdot\Psi^2+\Psi^3 \tag{7}$$

The general solution to a three-order polynomial could be given via the following product form:

$$\left(\Psi-\Psi_1\right)\cdot\left(\Psi-\Psi_2\right)\cdot\left(\Psi-\Psi_3\right)= \\ \Psi^3-\Psi^2\cdot\left(\Psi_1+\Psi_2+\Psi_3\right)+\Psi\cdot\left(\Psi_1\Psi_2+\Psi_1\Psi_3+\Psi_2\Psi_3\right)-\Psi_1\Psi_2\Psi_3\cdot \\ \left(R^{***}\right)^3-\frac{\Psi}{R^{**}}+3\cdot\left(R^{***}\right)^2\cdot\Psi+3\cdot R^{***}\cdot\Psi^2+\Psi^3 \tag{8}$$

Comparing the latter with the last line in (7) gives us:

$$3\cdot R^{***}=3\cdot C_f=-\left(\Psi_1+\Psi_2+\Psi_3\right) \\ 3\cdot\left(R^{***}\right)^2-\frac{1}{R^{**}}=3\cdot\left(C_f\right)^2-\frac{6\cdot M^6}{R^*}=\Psi_1\Psi_2+\Psi_1\Psi_3+\Psi_2\Psi_3\cdot \\ \left(C_f\right)^3=-\Psi_1\Psi_2\Psi_3 \tag{9}$$

Thus, we have obtained the three generations of quantum gravity solutions to the combined mass²-times-f-function, given via $\Psi\equiv M^2\cdot f\equiv\frac{m^2\cdot c^2}{\hbar^2}\cdot f$, as functions or dependencies of the Ricci scalar

R^* of the quantum-gravity (just scalar) variated metric $G_{\alpha\beta}=F[f]*g_{\alpha\beta}$, the mass-values $M^2 \equiv \frac{m^2 \cdot c^2}{\hbar^2}$ and a constant C_f.

Please note: As the expression $\Psi_1\Psi_2+\Psi_1\Psi_3+\Psi_2\Psi_3$ on the right-hand side in the second line in (9) should be just a constant and thus, could not depend on the various masses M_i, we have to demand the Ricci-scalar R^* to be directly connected with the M_i via a constant const:

$$\frac{6\cdot M^6}{R^*}=\text{const} \quad \Rightarrow \quad R^*=\frac{6\cdot M^6}{\text{const}}. \tag{10}$$

This gives two equations for the extraction of two of the three states Ψ_i out of the other:

$$\begin{gathered} R^{***}=C_f=-\frac{\Psi_1+\Psi_2+\Psi_3}{3} \\ \Rightarrow \begin{cases} \frac{1}{3}\cdot\left(\Psi_1+\Psi_2+\Psi_3\right)^2-\frac{6\cdot M^6}{R^*} \\ =\frac{1}{3}\cdot\left(\Psi_1+\Psi_2+\Psi_3\right)^2-\text{const}=\Psi_1\Psi_2+\Psi_1\Psi_3+\Psi_2\Psi_3 \end{cases} . \\ \Rightarrow\left(\frac{\Psi_1+\Psi_2+\Psi_3}{3}\right)^3=\Psi_1\Psi_2\Psi_3 \end{gathered} \tag{11}$$

We find with a vanishing constant const (the curvature term) we would obtain one solution, namely:

$$\Psi_1=\Psi_2=\Psi_3. \tag{12}$$

We also find that with a vanishing constant C_f (the shift of the function f with the value F[f]=f=0 moving away from the origin), we would only obtain the solution

$$\Psi_2=\Psi_3=\frac{1}{2}\left(-\Psi_1\pm\sqrt{4\cdot\text{const}-3\cdot\Psi_1^2}\right). \tag{13}$$

A bit more discussion shall be presented in [2].

References

[1] N. Schwarzer, "Societons and Ecotons - The Photons of the Human Society - Control them and Rule the World", Part 1 of "Medical Socio-Economic Quantum Gravity", Self-published, Amazon Digital Services, 2020, Kindle

[2] N. Schwarzer, "Masses and the Infinity Options Principle - Can We Explain the 3-Generations and the Quantized Mass Problem?", Part 5 of "Medical Socio-Economic Quantum Gravity", Self-published, Amazon Digital Services, 2020, Kindle

[3] N. Schwarzer, "The World Formula: A Late Recognition of David Hilbert 's Stroke of Genius", ISBN: 9789814877206 (hardcopy available in print in December 2020 from T&F and Jenny Stanford Publishing)

[4] N. Schwarzer, "Humanitons - The Intrinsic Photons of the Human Body - Understand them and Cure Yourself", Part 2 of "Medical Socio-Economic Quantum Gravity", Self-published, Amazon Digital Services, 2020, Kindle

[5] N. Schwarzer, "Mastering Human Crises with Quantum-Gravity-based but still Practicable Models - First Measure: SEEING and UNDERSTANDING the WHOLE: Part 3 of Medical Socio-Economic Quantum Gravity", Self-published, Amazon Digital Services, 2020, Kindle

[6] N. Schwarzer, "Self-Similar Quantum Gravity - How Infinity Brings Simplicity", Part 4 of "Medical Socio-Economic Quantum Gravity", Self-published, Amazon Digital Services, 2020, Kindle