

Gravity Looks Like Electro-Magnetism When Seen Through Fractal Logic Glasses*

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Abstract – The present paper gives a NEW short proof of the electromagnetic origin of gravity as well as all fundamental interactions by utilizing the fuzzy logic of fractal counting of elementary particles, Witten's fractal M-theory and E-infinity theory.

Keywords – Fractal Logic, Fuzzy counting, Feigenbaum Renormalization, Quantum Gravity, Unification of all Fundamental Interactions, Golden Mean Number System, E8 Exceptional Lie Symmetry Groups, Golden Mean Scaling, E-infinity Theory.

I. INTRODUCTION

Fractal logic and fractal counting, which was proposed some time ago, [1-3] is extended as to have a bearing on the classical theory of quantum gravity [4-7] and give it a new twist leading to effectively forming a general theory for the unification of all fundamental forces [8-15]. The rather surprising conclusion of an equally surprisingly short tour de force is that the electromagnetic field could be seen as not only the source of an emergent gravity but also the origin of all fundamental interactions [4-16]. The key to understanding this unexpected conclusion lies in the use of fractal counting related to a new fuzzy logic that is akin to the fuzzy sets of L. Zadeh [17-20] as well as the golden mean renormalization groups of M. Feigenbaum et al and the associated golden mean number system [21-30].

Needless to mention that in our effort to keep this paper relatively short without undermining the ease of smooth reading and quick comprehension, we resorted to a rather larger than usual list of References which we hope is adequate for the present purpose [1-50].

II. FRACTAL LOGIC AND THE GOLDEN MEAN NUMBER SYSTEM IN A NUTSHELL

The paradoxical completeness of the conventional standard model of high energy physics [1, 2] which comprises the well-known 12 messenger particles given by a combined Lie symmetry groups U(1), SU(2) and SU(3) i.e.

$$\begin{aligned} & \dim(U(1) SU(2) SU(3)) \\ &= (1 + 3 + 8) \\ &= 12 \end{aligned} \tag{1}$$

Is a very subtle point lurking at the very core of our analysis [1, 2]. This paradox lies in the fact that although the above-mentioned equation (1) does not include on its face value either the Higgs nor the Graviton i.e. $12 + 2 = 14$, when seen through the fractal logic of fuzzy fractal counting, we are led to the conclusion that a smaller value $12 - 2\phi^4 = 11.70820393$ where $\phi = (\sqrt{5} - 1)/2 = 0.618033929$ rather than the larger value $12 + 2 = 14$ is sufficient to describe all fundamental interactions [1, 2].

*Dedicated to the memory of Professor Mitchell Feigenbaum, an exceptional person in every respect.

In other words the incomplete standard model is actually complete when our number of degrees of freedom 12 is transfinitely correct to become $12 - \phi^4$ where $\phi = (\sqrt{5} - 1) / 2$ is the classical golden ratio which is well known in nonlinear dynamics in general and KAM theorem [15,16] as well as Feigenbaum's renormalization groups and E-Infinity theory in particular [15,16,26,28]. In the light of the above it is bordering on absurdity that the following more than outrageous equation could be stated in the expedient sense of E-infinity fractal Logic [1, 2], [38-43]:

$$12 = 14 = 12 - 2k^2 = 11.708039325 \tag{2}$$

We recall that equation (2) is part and parcel of the transfinite correction techniques of E-Infinity theory [14, 16], [21, 40] which may be in turn be an expression of the simplicity of the corresponding Penrose fractal tiling universe [30, 34] modeling our actual cosmos and obeying Von-Neumann-Alain Connes' golden mean dimensional function [15], [33-43].

$$D = a + b\phi \tag{3}$$

where $a, b \in \mathbb{Z}$ and ϕ is again the golden mean $(\sqrt{5} - 1) / 2$ as discussed for instance in [15, 16, 34, 38]. Proceeding this way and minding the expert system consistency [39-41] of the above, we can explain and compute $12 - 2k^4$ in the following four steps:

- (a) The photon U(1) is assigned the numerical weight ϕ which means Connes'-Hausdorff dimension of the zero set modeling the pre-quantum particle [2, 3, 38].
- (b) The $w^+, w^-,$ and z_0 of the electroweak SU(2) are now given by the well-known 16 extra dimensions of Grosse et al heterotic strings [40] multiplied with 'tHooft's renormalization k which in turn is twice the value of Hardy's quantum entanglement ϕ^5 so that $\dim SU(2) = 3$ is trans finitely corrected to $16k = 32\phi^5 = 2.88543206$ where $k = \phi^3 (1 - \phi^3) = 2\phi^5$ [36-43].
- (c) Furthermore we have the transfinite value corresponding to the 8 gluons of $\dim SU(3) = 8$ [1, 2] namely half the transfinite heterotic string dimension $16 + k$ i.e. $(16 + k)/2 = 8 + (k/2)$ [36-43].
- (d) Now we have to find the fractal number corresponding to one Higgs and one graviton [1, 2]. This was reasoned in previous publications to be neither the entangled nor disentangled Higgs $k_0 = \phi^5 (1 - \phi^5)$ representing the well-known fractal tale of the theoretical inverse electromagnetic constant $\overline{\alpha}_0 = 137 + k_{0s}$ and the intersection of two 'tHooft's renormalizations $k^2 = (\phi^3 (1 - \phi^3))^2$ representing the graviton [1-7], [36-43].

In the next section we utilize the union of the above four-step computations to assert the final result and the present claim, namely that all fundamental interactions are originally anchored into the electromagnetic field [39-50].

III. THE ELECTROMAGNETIC ORIGIN OF ALL FUNDAMENTAL INTERACTIONS INCLUDING GRAVITY

Now we reached the point where we can demonstrate in unheard of simplicity our claim that seen through the golden fractal logic glasses, all fundamental interactions may be straightforwardly shown to be essentially electromagnetic in nature [44-50]. This interpretation is not mere expediency prompted by number theoretical reasoning only but far more than that a clear aspect of the connection between the arrangement of sunflower and the beauty of Hardy's quantum entanglement i.e. the intimate well hidden bond between the micro and macro cosmos [1-50]. To arrive at this startling but very simple and persuasive conclusion, we just need to look at the total fractal numbers of messenger particles just found to be the degree of freedom of an interactive universe which may be viewed as a single photon in a fractal Witten's spacetime [35,36]. Recalling that the fractal Witten spacetime dimension is simply a Russian doll-like eleven dimensional space with the self-similarity expressed via the inverse of Hardy's quantum entanglement, one finds that [35].

$$\begin{aligned}
 D_f(\text{Witten}) &= 11 + \frac{1}{11 + \frac{1}{11 + \dots}} \\
 &= 11 + \phi^5 \\
 &= \frac{1}{\phi^5} + \phi^5
 \end{aligned} \tag{4}$$

This way we see clearly the union of Witten's fractal M theory spacetime with a single photon inside this space leading to the same weight number of all messenger particles which means that

$$\begin{aligned}
 \sum_1^5(\text{SM}) &= \phi + (32)(\phi^5) + \left(8 + \frac{k}{2}\right) + k_0 + k^2 \\
 &= 12 - 2\phi^4
 \end{aligned} \tag{5}$$

is exactly equal to the weight given by equation (5):

$$11 + \phi^5 + \phi = 12 - 2\phi^4 \tag{6}$$

Let us look now at the "self intersectional" intersection of the total number of the messenger particles fractal manifold as given by (6) and (7) and find the result which surpasses our most optimistic number theoretical expectation, namely that [44 - 48]

$$\begin{aligned}
 \left(\sum_1^5 \text{SM}\right)^2 &= (12 - 2\phi^4)^2 \\
 &= 144 + 8\phi^8 - 4\phi^4 \\
 &= 137.082039325 \\
 &= 137 + k_0 \\
 &= \overline{\alpha_0}
 \end{aligned} \tag{7}$$

where $\overline{\alpha_0}$ is the well known E-infinity theoretical value of the inverse electromagnetic constant [46-49]. In turn, the experimental value of $\overline{\alpha_0}$ at the ordinary scales was shown in many previous occasions to be a projection of $\overline{\alpha_0} = 137 - k$ namely $\overline{\alpha_0} = 137.06$ [44].

IV. THE GLOBAL LOGICAL UNITY OF THE PROPOSED COMPUTATIONAL SCHEME

Physics and cosmology as computation was considered in various earlier E-infinity publications [15, 16, 23, 25, 27, 30, 31]. In this section we aim at recalling a few facts to attest to the monolithic unity and irreducible logical oneness of our present number theoretical and physical mathematical schemata [31-34]. To take this viewpoint, we can do nothing better than restate the following well-known documented facts gained from E-infinity applications to high energy physics and quantum cosmology of dark energy as well as accelerated cosmic expansion of which the following concise listings are nothing more than some examples [1], [31-50].

- (1) First and foremost we should mention the reconstruction equation of $\overline{\alpha}_0$ using the methodology of the golden quantum field equation of E-infinity [23-27]. It is essentially a renormalization equation, which uses three integers and the ideal inverse coupling to determine $\overline{\alpha}_0$. These inverse couplings are $\overline{\alpha}_1 = 60$ of electromagnetism, $\overline{\alpha}_2 = \overline{\alpha}_1 / 2 = 30$ of the weak force, $\overline{\alpha}_3 = 8+1=9$ of the strong force and $\overline{\alpha}_4 = 1$ of the plank scale [23-27]. The Clebsh factor in this equation is not the classical one and surprisingly is the inverse of the golden mean ϕ namely $(1/\phi) = 1 + \phi$ [1,2], [23-27], [39].

That way the fundamental equation reads [31-38]

$$\begin{aligned}
 \overline{\alpha}_0 &= \overline{\alpha}_1 (1/\phi) + \overline{\alpha}_2 + \overline{\alpha}_3 + \overline{\alpha}_4 \\
 &= (60)(1/\phi) + 30 + 9 + 1 \\
 &= 137 + k_0 \\
 &= 137 + \phi^5 (1 - \phi^5) \\
 &= 137.082039325
 \end{aligned}
 \tag{8}$$

exactly as should be [46, 47]

- (2) The second most important example may be the generation of the transfinite heterotic super strings hierarchy from $\overline{\alpha}_0 / 2$ by golden mean scaling as follows [15,16]:

$$\begin{aligned}
 (\overline{\alpha}_0 / 2)(\phi) &= 42 + 2k \simeq \\
 (\overline{\alpha}_0 / 2)(\phi^2) &= 26 + k \simeq \\
 (\overline{\alpha}_0 / 2)(\phi^3) &= 16 + k \simeq \\
 (\overline{\alpha}_0 / 2)(\phi^4) &= 10 \\
 (\overline{\alpha}_0 / 2)(\phi^5) &= 6 + k \simeq \\
 (\overline{\alpha}_0 / 2)(\phi^6) &= 4 - k \simeq
 \end{aligned}
 \tag{9}$$

- (3) Next we must mention the remarkable and exact result of Hardy's quantum entanglement [31] namely ϕ^5 and the corresponding total dark energy density of the universe which is given simply by [39-43]

$$\begin{aligned}
 \frac{(\overline{\alpha}_0 / 2)(\phi^6)}{4} &= (4 - k) / 4 \\
 &= 95.4915\%
 \end{aligned}
 \tag{10}$$

On the strength of the above mentioned examples alone, we are more than confident that at a minimum, Nature obeys to the letter the fuzzy fractal counting and the golden mean tongue and music [42], when quantum mechanics is involved at the scale of Interest [30, 32, 37, 39].

V. CONCLUSION

With the benefit of long-term hindsight and contemplative retrospective looking back with "amazement", one must admit that much of the ideas underlying our E-infinity theory as well as the present analysis have been out there and around for a long time and not in a minor measure implicit or explicit in the work of at least two great scientific giants who are free spirited and courageous pioneers, namely Zadeh, the American-Persian father of Fuzzy Set Theory [17, 18] and the man who is credited with the discovery of the Golden Mean Renormalization Groups and the Universalities of Chaotic as well as Deterministic Mathematical and Physical systems. This credit goes to the exceptional American Engineer and Physicist of Polish and Jewish descent, the late Professor Mitchell Feigenbaum [22].

There is no doubt at least in the mind of the present Author that E-infinity theory and the present paper could not have been possible without the work of these two towering personalities as well as many other pioneers such as the French Mathematician and Mathematical Physicist Field Medalist A. Connes, Nobel Laureate G.'tHooft and Nobel Laureate David Gross and the great Israeli Physicist and close friend, Itamar Procaccia, to all of whom the Author is deeply indebted.

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AUTHOR'S PROFILE



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