SCITECH
RESEARCH ORGANISATION

Volume 15, Issue 3
Published online: November 04, 2019|

Journal of Progressive Research in Mathematics
www.scitecresearch.com/journals

From fractal - Cantorian classical music to the symphony of the standard model of high energy particles physics

Leila Marek-Crnjac[1]
Technical School Center of Maribor, Maribor, Slovenia

M. S. El Naschie[2]
Distinguished Professor
Department of Physics
Faculty of Science, Faculty of Science, Alexandria University, Alexandria, Egypt

[1]e-mail: leila.marek@guest.arnes.si
[2]e-mail: msnaschie10@gmail.com

Abstract

We report in this short letter on what we think is a major finding which could remove forever the schism that exists between Science and Art in an unprecedented way. In particular we believe that we were able to uncover an entire spectrum of scale invariant fractal Cantorian space-time manifolds starting from Einstein's D = 4 space-time and continuing via Kaluza-Klein D = 5, Superstring D = 10, Witten's M-theory D = 11 and Vafa's F-theory D = 12 to reach some tantalizing connections to the standard model of high energy particle physics as well as Arnold Schoenberg's twelve tone music.Our quantitative mathematical analysis depends in a crucial way on the golden mean number system of E-Infinity theory which implies not only a real possibility of a theory of everything unifying all fundamental forces, but goes also far beyond that, suggesting a unification of facts and values i.e. Science and Art, encompassing music, poetry and philosophy.

1. Scientificf acts and humanistic values mathematically unified. A short summary

In short the present letter to the Editor is effectively a concise report on the final results of our decades long efforts to unify all the fundamental interactions of nature using the E-Infinity theory methodology[1-35] which is based on the "pointless" geometry of Von Neumann [34, 36, 37]and the dimensional function which A. Connes devised to describe Penrose's fractal universe [19,34,37,38,39]

$$D = a + b\phi \tag{1}$$

where $a, b \in \mathbb{Z}$ and $\phi = (\sqrt{5} - 1)/2$.

Continuing along this line of scientific interrogation, it became evident that much of the limitations inherent in Einstein's relativity theory can be removed by making Einstein's space-time strictly scale invariant and this leads us to the self-similar Hausdorff dimension of a self-similar space-time manifold $D = 4 + \phi^3$ [1,3,5,6]. Subsequently we found that the same ideas can be directly applied to Witten's D = 11 and lead us directly to a fractal version of M-

theory with $D = 11 + \phi^5$ as can be seen in the attached figures and charts [see chart 1 to 3 plus tables 1 to 3] as well as the relevant references [5,22,40,41]. Furthermore, it was subsequently noticed that if a topological photon is put into the space $D = 11 + \phi^5$ of the fractal-Cantorian M-theory [5,40,41], then one finds that $D = \sqrt{\bar{\alpha}_O}$ where $\bar{\alpha}_o = 137 + k_o$ is the inverse electromagnetic fine structure constant and $k_o = \phi^5(1 - \phi^5)$ [5, 41,42]. On the other hand $\sqrt{\bar{\alpha}_O} = 11.7082039$ is the exact number of bosons in the standard model when we use fractal logic and fuzzy-fractal counting of the 12 messenger particles and arrive at the superficially absurd equation namely [41,42],

$$\mathbf{12 - 2}\,\phi^4 = 11.7082039325 \tag{2}$$

Needless to say, that the deep meaning of equation number (2) could be understood with fuzzy-fractal logic only [10,32,42]. Having made this realization and resolved the paradox which is not a real paradox but rather a super reality obeying super non classical logic [10,33,42], we were struck by yet another surprising discovery namely that Vafa's 12 dimension F-theory possesses a fractal version with fractal dimension equal to:

$$D(F) = 12 - 2\phi^4 \tag{3}$$

where ϕ^4 is the topological Unruh temperature [24,28,32]. On the other hand and again to our own great surprise this value is exactly equal to $\sqrt{\bar{\alpha}_o}$ and correspond in the same time to a fractal variant of F-theory space-time. That means the number theory center of our brain and logic tell us that:

$$D(F) = \sqrt{\bar{\alpha}_o} = 11.7082039325 \tag{4}$$

In other words, the fractal F-theory is in fact the space not only where the complete fractal standard model, including the Higgs and the graviton, lives but it is actually topologically identical, from a number theoretical viewpoint, to the standard model itself. Furthermore, looking at the 12-tone music "harmony" of A. Schoenberg [43], one is almost compelled to call it "a fractal music" and it is hard for us to overlook its connection to Vafa's F-theory on several counts [44,45]. The point is that $\phi = (\sqrt{5} - 1)/2$ is a composition principle known, since the design of the pyramids of Egypt [46, 47], to play a major role in visual art as well as music [31,43].

At the same time ϕ is the basis of the work of A. Connes' non-commutative geometry [39]of Penrose's fractal tiling universe as well as being the exact solution to Hardy's celebrated quantum entanglement probability [4,15].

Having reached these conclusions, it is impossible not to speculate that the schism between hard core science and high level visual art as well as poetry and music is an illusion and a historic misunderstanding and that facts and values meet in the golden mean based deep reality and truth of Nature which is in turn Spinoza's God [31]. Interestingly, when D = 14 is formerly considered as the complete number of an integer counting of the standard model messenger bosons obtained by adding to the 12 generators of the combined Lie symmetry groups U(1)SU(2)SU(3) the Higgs and the graviton i.e. 12 + 2 = 14, then the fractal version of our present theory using the same previous logic [10,33,42] would lead to:

$$\begin{aligned} D &= 14 - 2\phi^4 \\ &= 13.702803935 \\ &= (\bar{\alpha}_o)/10 \end{aligned} \tag{5}$$

As incredible as it may be, we have retried yet again Wolfgang Pauli's magical prime number i.e. 137 with a golden mean k_o irrational tail, made of Hardy's quantum entanglement ϕ^5 and disentanglement $1-\phi^5$ as can be deduced from $k_o = \phi^5(1-\phi^5) = 0.082039325$ [4-15].

2. Closing remarks – Superstring Fractal Music

The reader may be at least mildly surprised that we have already paved the way to a complete unification of all fundamental interactions including gravity via electromagnetism[34,35]. However he or she will find out that we have done much more than that thanks to the fractal-fuzzy golden mean number system [32,41], as evident from the suggested unification of science and art in the preceding sense stated above [31,32].

Nevertheless, the reader may have noticed that we did not tackle D = 10 super strings and super gravity particularly D = (10/2) = 5 where D = 5is the dimension of Kaluza-Klein's fermionic space-time which is fundamental and indispensable in understanding bright and dark energy[28,42] (see also table 3).

On the other hand, there is a method and meaning behind the ensuing mad procedure linking

D = 10 and $D = 5 + \phi^3$. The point is that we can regard the union of two $5 + \phi^3$ as superspace leading to:

$$\begin{aligned} D &= (2)(5+\phi^3) \\ &= 10.47213595 \end{aligned} \tag{6}$$

Let us put a topological photon in this space and we will immediately find that:

$$\begin{aligned} D &= 10.47213595 + \phi \\ &= 11 + \phi^5 \\ &= \text{Witten's fractal M space} \end{aligned} \tag{7}$$

From the preceding elementary calculation, we see how D = 10 and $D = 11 + \phi^5$ are all interlinked as a real spectrum of a fractal universe made of Hausdorff and topological dimensions [33,41], [45-49]. With that we rest our case and hope that we have presented it in an acceptable way and in particular that the reader has benefitted from the charts and tables contained in this letter which hopefully will result in a deep understanding of the basic structure of E-Infinity theory and the present basic message of this letter.

References

[1] El Naschie, M.S., 2004. A reviewof E-Infinitytheoryandthemassspectrumofhighenergyparticlephysics. Chaos, Solitons&Fractals, 19(1), pp.209-236.

[2] El Naschie, M.S., 1998. Superstrings, Knots, and Non-commutativegeometry in E-infinityspace. InternationalJournalofTheoreticalPhysics, 37(12), pp.2935-2951.

[3] El Naschie, M.S., 2009. ThetheoryofCantorianspacetimeandhighenergyparticlephysics (aninformalreview). Chaos, Solitons&Fractals, 41(5), pp.2635-2646.

[4] A Helal, M., Marek-Crnjac, L. and He, J.H., 2013. The three page guide to the most important results of M. S. El Naschie's research in E-Infinity quantum physics and cosmology. Open Journal of Microphysics, 3, pp.141-145.

[5] El Naschie, M.S., 2016. On a fractal version of Witten's M-theory. International Journal of Astronomy and Astrophysics, 6, pp.135-144.

[6] Marek-Crnjac, L. and He, J., 2013. An Invitation to El Naschie. International Journal of Astronomy and Astrophysics, 3(4), pp.464-471.

[7] Marek-Crnjac, L., El Naschie, M.S. and He, J.H., 2013. Chaotic fractals at the root of relativistic quantum physics and cosmology. International Journal of Modern Nonlinear Theory and Application, 2(1), pp.78-88.

[8] Mukhamedov, A.M., 2007. E-infinity as a fiber bundle and its thermodynamics. Chaos, Solitons & Fractals, 33(3), pp.717-724.

[9] Marek-Crnjac, L., 2015. On El Naschie's fractal-Cantorian space-time and dark energy-A tutorial review. Natural Science, 7(13), pp.581-598.

[10] El Naschie, M.S., Olsen, S., He, J.H., Nada, S., Marek-Crnjac, L. and Helal, A., 2012. On the need for fractal logic in high energy quantum physics. International Journal of Modern Nonlinear Theory and Application, 1(3), pp.84-92.

[11] El Naschie, M.S., 2017. Elements of a new set theory based quantum mechanics with applications in high energy quantum physics and cosmology. International Journal of High Energy Physics, 4, pp.65-74.

[12] El Naschie, M.S., 2014. Electromagnetic—Pure gravity connection via Hardy's quantum entanglement. Journal of Electromagnetic Analysis and Applications, 6(9), pp.233-237.

[13] El Naschie, M.S., 2015. An Exact mathematical picture of quantum space-time. Advances in Pure Mathematics, 5, pp.560-570.

[14] Dariescu, M.A., Dariescu,C. and Pighie, A.C., 2009. Mass spectrum in 5D warped Einstein and El Naschie's quantum golden field theory; Chaos, Solitons & Fractals, vol. 42, issue 1, pp.247-252.

[15] El Naschie, M.S., 2017. The Aether of space-time physics is the empty set of pure mathematics. Natural Science, 9(9), pp.289-292.

[16] Gottlieb, I. and Agop, M., 2007. El Naschie's ε (∞) theory and an alternative to gauged space-time scale relativity theory. Chaos, Solitons & Fractals, 34(4), pp.1025-1029.

[17] El Naschie, M.S., 2015. Three quantum particles Hardy entanglement from the topology of Cantorian-fractal space-time and the Casimir effect as dark energy- A great opportunity for nanotechnology. American Journal of Nano Research and Applications, 3(1), pp.1-5.

[18] El Naschie, M.S., 2018. SymmetriaMassima of the fractal M-theory via the golden mean number system- A new language for a deep dialogue between man and nature. International Journal of Artificial Intelligence and Mechatronics, 7(3), pp.11-14.

[19] Marek-Crnjac, L., 2011. The Hausdorff dimension of the Penrose universe. Physics Research International, September 2011,pp.1-4.

[20] Zhong, T., 2009. From the numerics of dynamics to the dynamics of numerics and vise versa in high energy particle physics. Chaos, Solitons & Fractals, 42(3), pp.1780-1783.

[21] He, J.H., Zhong, T., Xu, L., Marek-Crnjac, L., Nada, S.I. and Helal, M.A., 2011. The importance of the empty set and non-commutative geometry in underpinning the foundations of quantum physics. Nonlinear Science Letters B, 1(1), Chaos, Fractal & Synchronization, pp.14-23.

[22] El Naschie, M.S., 2016. Completing Einstein's space-time. Journal of Modern Physics, 7, pp.1972-1994.

[23] El Naschie, M.S., 2013, August. Electromagnetic and Gravitational Origin of dark energy in Kaluza-Klein D= 5 Space-time. In PIERS Proceedings. pp. 94-98.

[24] ElNaschie, M.S., 2018. Super quantization of a Cantorian electromagnetic field and the cosmic dark energy density of the universe. International Journal of Innovation in Science & Mathematics, 6(1), pp. 33-37.

[25] El Naschie, M.S., 2018. From Nikolay Umov E= kmc^2 via Albert Einstein's E= γ ymc2 to the dark energy density of the cosmos E=(21/22) mc^2. World Journal of Mechanics, 8, pp.73-81.

[26] El Naschie, M.S., 2018. NASA's EM Drive Thrust from the forces of the quantum vacuum of spacetime. Technology, 3, pp.1-9.

[27] Sommer, H., 2006, June. A toy-world that satisfies some principles of` El Naschie's E-Infinity theory. In Computing Anticipatory Systems: CASYS'05,Vol. 839, pp. 212-221).

[28] El Naschie, M.S., 2018. QED Cosmic Dark Energy Density Using Schwinger-Fredkin and E-Infinity Theory. Journal of Applied Mathematics and Physics, 6, pp.621-627.

[29] El Naschie, M.S., 2018.World formula interpretation of $E = mc^2$. International Journal of Applied Science and Mathematics, Vol.5(1), pp. 67-75

[30] El Naschie, M.S. and Marek-Crnjac, L., 2018. Set theoretical foundation of quantum mechanics. NASA's EM drive technology and minimal surface interpretation of the state vector reduction of the quantum wave collapse. Chaos and Complexity Letters, 12(2), pp.85-100.

[31] El Naschie, M.S., 2019, Spinoza's God, Leibniz's monadology and the universal music of Einstein's Cantorian nature. International Journal of Innovation in Science and Mathematics, Volume 7, Issue 1. pp.33-39.

[32] El Naschie, M.S., 2019. Simulating the quantum Universe via the golden mean number expert-like -system, International Journal of Artificial Intelligence and Mechatronics, Volume 7, Issue 4, ISSN 2320 – 5121. pp.15-18.

[33] El Naschie, M.S., 2016. Computational Fractal Logic for Quantum Physics and Cosmology. American Journal of Astronomy and Astrophysics, Volume 4, Issue 4, July 2016, pp. 42-53

[34] El Naschie, M.S., 2018. Why we live in a Penrose fractal pointless non-commutative multi-universe: A simple proof using the bijection formula of E-Infinity Cantorian space-time. International Journal of Engineering Innovation & Research, 7(5), pp.249-253.

[35] El Naschie, M.S., 2019. Gravity looks like electro-magnetism when seen through fractal logic glasses. International Journal of Innovation in Science and Mathematics. Volume 7, Issue 4, ISSN (Online): 2347–9051. pp. 180-185.

[36] El Naschie, M.S., 1998. Von Neumann geometry and E-Infinity quantum space-time. Chaos, Solitons & Fractals, vol. 9, issue 1, pp.2023-2030.

[37] El Naschie, M.S., 1998. Penrose Universe and Cantorian space-time as a model for non-commutative quantum geometry. vol. 9, issue 6, pp. 931-933.

[38] Iovane, G., 2004. Varying G, accelerating Universe, and other relevant consequences of a stochastic self-similar and fractal Universe. Chaos, Solitons & Fractals, 20(4), pp.657-667.

[39] Connes, A., 1994. Non-commutative Geometry. Academic Press, San Diego.

[40] El Naschie, M.S., 2006. On an eleven dimensional E-infinity fractal space-time theory. International Journal of Nonlinear Sciences and Numerical Simulation, 7(4), pp.407-409.

[41] El Naschie, M.S., 2013. Nash embedding of Witten's M-theory and the Hawking-Hartle quantum wave of dark energy. Journal of Modern Physics, 4(10), pp.1417-1428.

[42] El Naschie, M.S., 2016. High energy physics and cosmology as computation. American Journal of Computational Mathematics, 6(03), pp.185-199

[43] Ashby, A., 2001. Schoenberg, Boulez, and twelve-tone composition as "Ideal Type". Journal of the American Musicological Society, 54(3), pp.585-625. Published by University of California press on behalf of the American Musicological Society, Oakland-CA,2001.

[44] Vafa, C., 1996. Evidence for F-theory. Nuclear Physics B, 469(3), pp.403-415.

[45] El-Okaby, A.A., 2008. The exceptional E-infinity theory holographic boundary, F-theory and the number of particles in the standard model. Chaos, Solitons & Fractals, 38(5), pp.1286-1291.

[46] Stakhov, A., Olsen, S., 2009. The mathematics of harmony. World Scientific. Singapore.

[47] Olsen, S., 2006. The golden section: nature's greatest secret. Wooden Books, Bloomsbury Publishing USA.

[48] El Naschie, M.S., 1999. The golden mean in quantum geometry, knot theory and related topics. Chaos, Solitons & Fractals, 10(8), pp.1303-1307.

[49] Bras-Amorós, M., 2017. Tempered Monoids of Real Numbers, the Golden Fractal Monoid, and the Well-Tempered Harmonic Semigroup. arXiv preprint arXiv:1703.01077.

Appendix

Table (1)

The fractal - Cantorian space-time Hausdorff dimensions of the fractal version of C. Vafa's F-Theory discovered recently within the framework of E-Infinity Cantorian theory compared with the other scale invariant theories of Einstein, Kaluza-Kein and Witten.

The original "integer" theory	The corresponding scale invariant fractal - Cantorian theory	Interpretation of the Theory	Continued fraction representation of the Hausdorff dimension of the theory
Einstein's spacetime D=4	$D = 4 + \phi^3$ where $\phi = \left(\sqrt{5} - 1\right)/2$	Scale invariant fractal space-time	$4 + \phi^3 = 4 + \cfrac{1}{4 + \cfrac{1}{4 + \ldots}}$
Kaluza-Keinspacetime $D = 4 + \phi + \phi^2 = 5$ where $\phi = \left(\sqrt{5} - 1\right)/2$	$D = 5 + \phi^3$	Scale invariant fractal space-time	$5 + \phi^3 = 5 + \cfrac{1}{4 + \cfrac{1}{4 + \ldots}}$
Witten's M-Theory D=11	$D = 11 + \phi^5$ where ϕ^5 is Hardy's quantum entanglement	Scale invariant correlated space-time	$11 + \phi^5 = 11 + \cfrac{1}{11 + \cfrac{1}{11 + \ldots}}$
C. Vafa's F-Theory D=12	$\mathbf{D = 12 - 2\phi^4} = \sqrt{\bar{\alpha}_O} = 11.7082039$ where ϕ^4 is the Unruh topological temperature and $\bar{\alpha}_0$ is inverse electromagnetic fine structure constant $\bar{\alpha}_0 = (20)(1/\phi)^4$ and $= 137 + k_0$ $k_0 = \phi^5\left(1 - \phi^5\right)$.	This is the most remarkable case connected to $\bar{\alpha}_0$ as well as Schoenberg's 12 tunes music and the standard model	$11 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{2 + \ldots}}} = 11.7082039325$

Table (2)

Comparison between the self-similar i.e. scale invariant fractal versions of Einstein, Kaluza-Klien, Witten,Heteroctic superstrings, 'tHooft-Veltman-Wilson and El Naschie space-time

Name of space-time theory	Smooth space-time dimension	Non-smooth (fractal) space-time dimension of El Naschie
Einstein	D=4	$D = 4 + \phi^3$ $4 + \cfrac{1}{4 + \cfrac{1}{4\ldots\ldots}}$ $\phi = \left(\sqrt{5} - 1\right)/2 = 0.618033989$ Note that the above table is based on A. Connes dimensional fuction $D = a + b\phi$ where a,b$\in$ Z and ϕ is the golden mean. In this way we have the following bi-dimensions $D(0) = (0, \phi)$ and $D(-1) = \left(-1, \phi^2\right)$, for the zero set quantum particle and the empty set quantum wave
Kaluza-Klein	D=4+1=5	$D = 4 + \phi^3$ $= 5 + \phi^3$ $= 5 + \cfrac{1}{4 + \cfrac{1}{4 + \ldots\ldots}}$
Witten M-theory and super gravity	D=11	$D = 11 + \phi^5$ $= 11 + \cfrac{1}{11 + \cfrac{1}{11 + \ldots.}}$
D. Gross et al Heterotic superstring theory	D=26,16,10	$D = 26 + k, k, 10$ $k = \phi^3\left(1 - \phi^3\right) = 0.18033989$
'tHooft-Veltman-Wilson dimensional regularization space-time	$D = 4 - \varepsilon, \varepsilon \ll 1$	D=4-k

Table (3)

The mass-energy equivalence equations according to the theories of Nikolay Umov, Friedrich Hasenöhrl, Einstein-Lorentz, Poincare and E-Infinity of El Naschie

Theory	Equation	Comments
Nikolay Umov mass-energy Aether theory 1873	$E = kmc^2$ $0.5 \le k \le 1$	Formally when k=1/2 and c =v we have Newton's kinetic energy. For k=1 we have Einstein's maximal energy density. However "ordinary" energy density and dark matter energy density requires k<1/2
Friedrich Hasenöhrl Electromagnetic apparent mass 1904	$E = \frac{3}{4} m_0 c^2$	Since 3/4=0.75 this is very close to the pure dark energy density found by El Naschie, namely 0.733111.
Einstein-Lorentz and Poincare maximal energy 1905	$E = mc^2$	
El Naschie ordinary cosmic energy density 2012	$E(0) = (\phi^2/2)(mc^2)$ $= mc^2/22.1803398$ $= mc^2/22$	Note that $(\phi^2/2)+(5\phi^2/2)=1$ which means this result, together with that of dark energy, constitutes a proof of the correctness of $E = mc^2$ of Einstein.
El Naschie cosmic dark energy density 2013	$E(D) = (5\phi^2/2)(mc^2)$ $= (mc^2)(21+k)/(22+k)$ $= mc^2(21/22)$	Note that E(D) consists again of two parts, namely dark matter energy density 0.2218 and pure dark energy density 0.73311 both found by El Naschie.

Chart (1)

A chart explaining the logic and mathematic combining A. Connes' non-commutative geometry with E-Infinity which leads to an exact calculation of the "ordinary" bright energy and cosmic dark energy density of the universe as well as explain how Kaluza-Klein theory leads to the scale invariant Einstein space-time dimension $D = 4 + \phi^3$ where ϕ is the golden mean $\phi = \left(\sqrt{5} - 1\right) / 2$

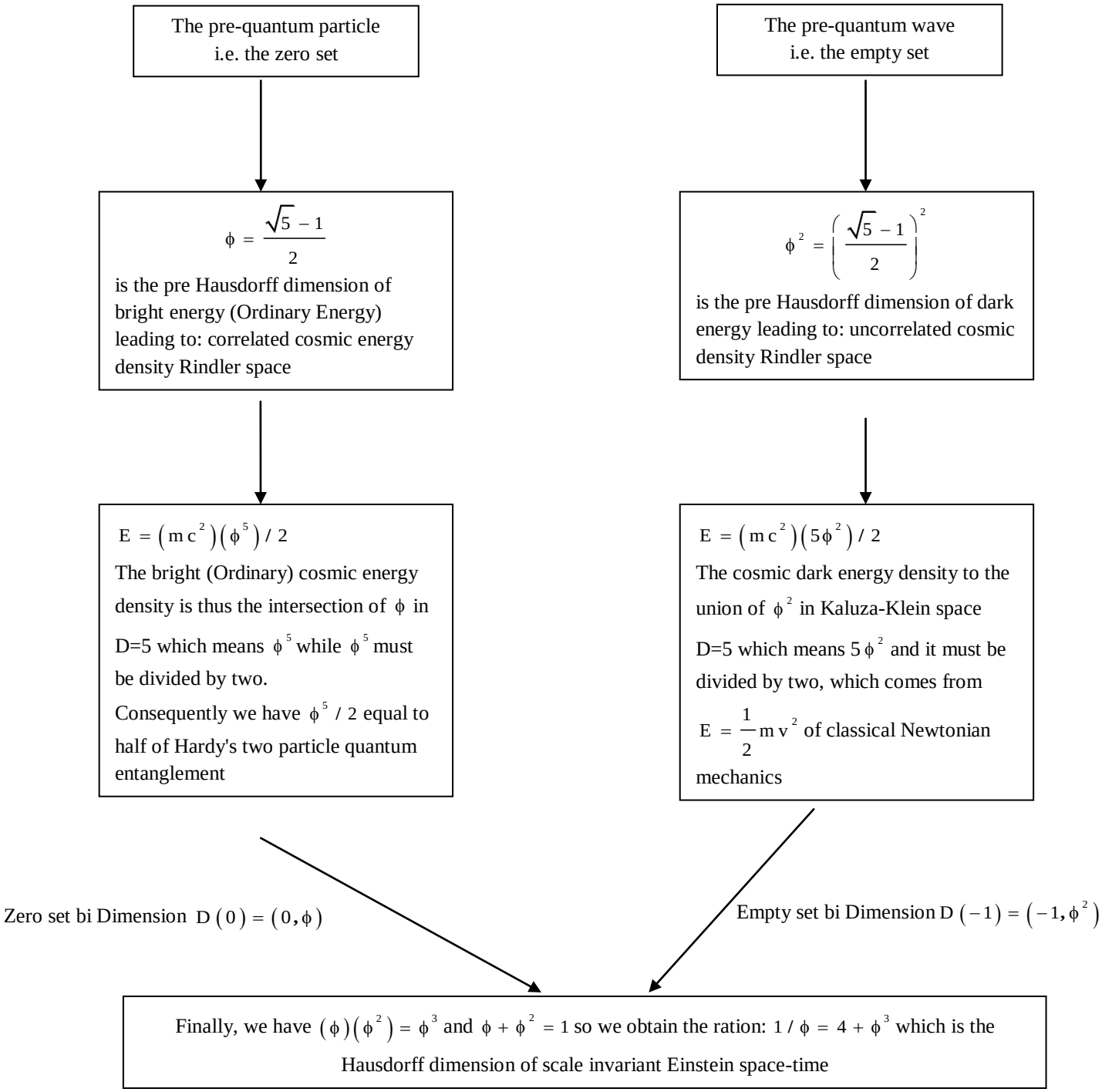
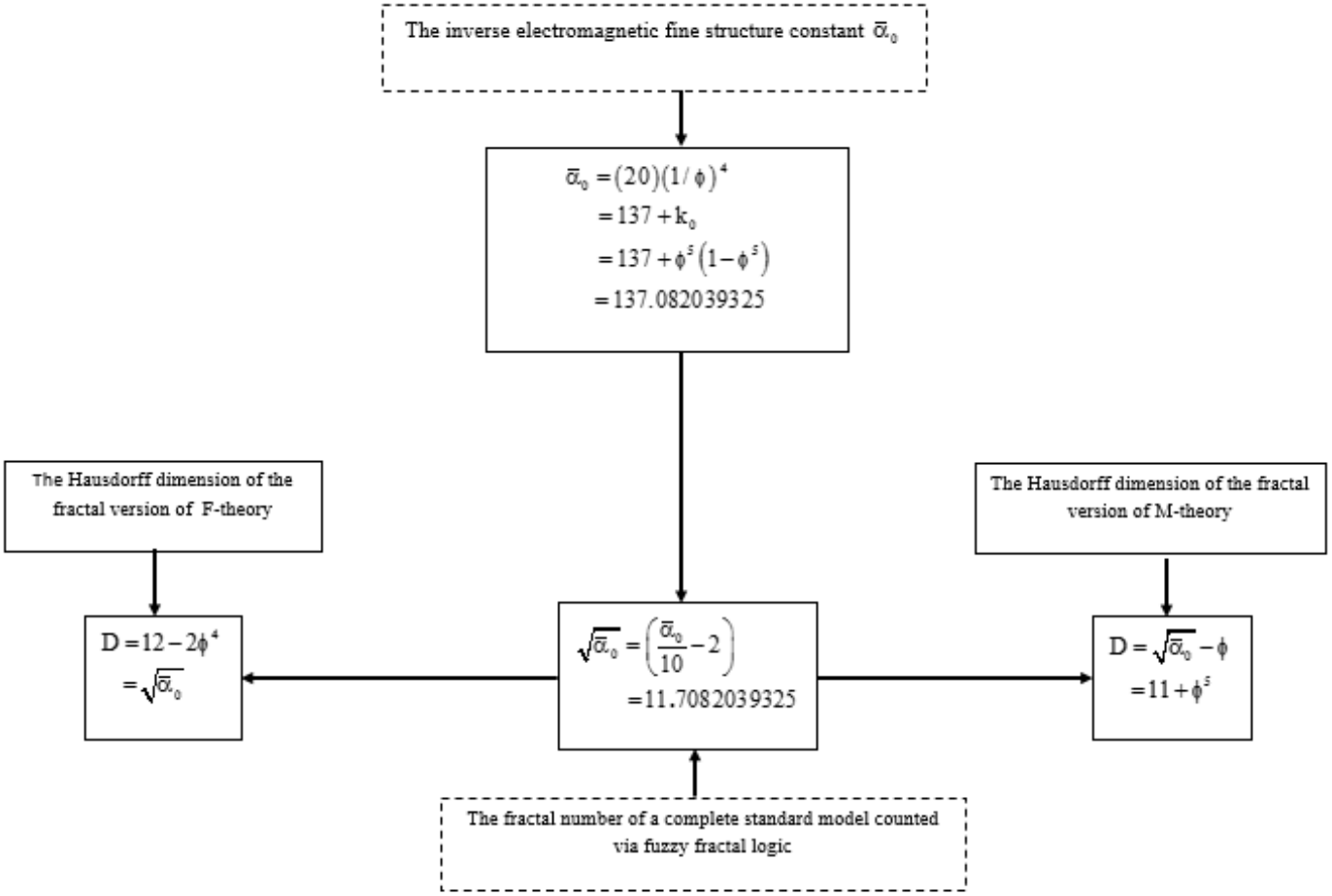
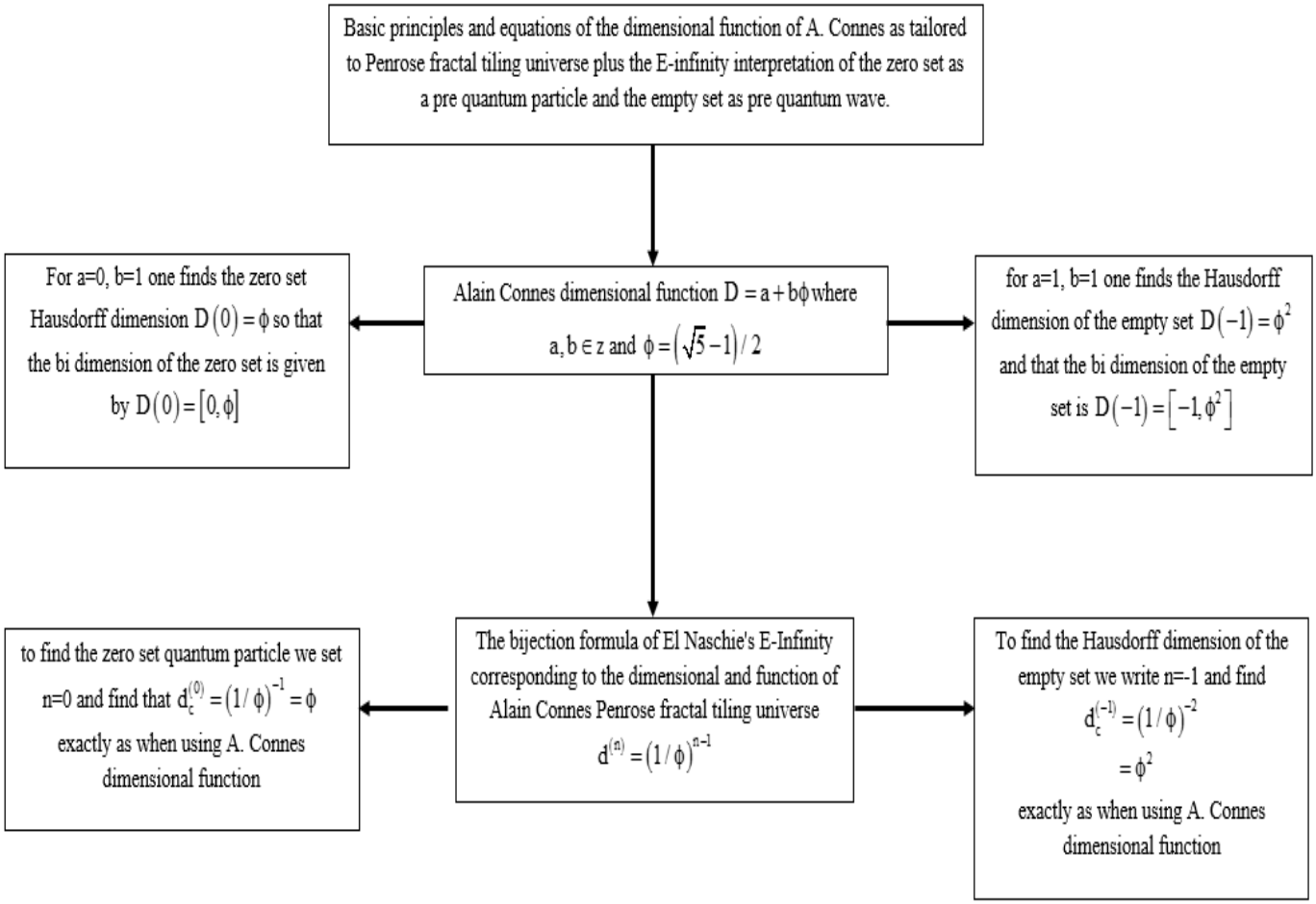


Chart (2)



Electromagnetic interpretation of the fractal version of Witten's M-theory and Vafa's F-theory.

Chart (3)


Basic principles and equations of the dimensional function of A. Connes as tailored to Penrose fractal tiling universe plus the E-infinity interpretation of the zero set as a pre quantum particle and the empty set as pre quantum wave.
Alain Connes dimensional function $D = a + b\phi$ where $a, b \in z$ and $\phi = \left(\sqrt{5}-1\right)/2$
For a=0, b=1 one finds the zero set Hausdorff dimension $D(0) = \phi$ so that the bi dimension of the zero set is given by $D(0) = [0, \phi]$
for a=1, b=1 one finds the Hausdorff dimension of the empty set $D(-1) = \phi^2$ and that the bi dimension of the empty set is $D(-1) = \left[-1, \phi^2\right]$
The bijection formula of El Naschie's E-Infinity corresponding to the dimensional and function of Alain Connes Penrose fractal tiling universe $d^{(n)} = (1/\phi)^{n-1}$
to find the zero set quantum particle we set n=0 and find that $d_c^{(0)} = (1/\phi)^{-1} = \phi$ exactly as when using A. Connes dimensional function
To find the Hausdorff dimension of the empty set we write n=-1 and find $d_c^{(-1)} = (1/\phi)^{-2} = \phi^2$ exactly as when using A. Connes dimensional function