
Spinoza's God, Leibniz's Monadology and the Universal Music of Einstein's Cantorian Nature

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Abstract – The paper starts with Spinoza's conception of nature as a Deity and ends with the golden mean number system as the universal language in quantum physics and cosmology. Between these two main road markers we visit many interconnected transfinite network of ideas, concepts and pioneers who shaped our world view - Zeit Geist and we also ponder many results of cutting edge scientific research. Our tour de force includes but is not limited to Leibniz Monadology, Cantor triadic sets, Heisenberg's central order, Pauli's Zweiteilung and reduction of symmetry, 'tHooft's dimensional renormalization, Schoenberg's twelve tone music, Poincare-Lorenz's nonlinear dynamics and deterministic chaos as well as Gross et al Heterotic superstring theory and Witten's fractal M-Theory. In addition we consider Feigenbaum's structural universalities as well as how the discovery of the universality of musical harmony led to our present fundamental conjecture that the universe can be likened to a gigantic golden mean computer based on a golden mean number system which we believe to be effectively the deep intrinsic language of our apparent quantum universe.

Keywords – Spinoza, Leibniz, Monadology, Nonlinear Dynamics, Universal Music, Einstein, Cantorian Spacetime, E-Infinity.

I. INTRODUCTION

The aim of the present scientific and mathematical work is predominantly philosophical at the roots with the sweeping main theme of infinite unification of all things and non-things more or less along what was spelled out uncompromisingly by Benedict (actually Baruch) Spinoza, the great Hebrew Dutch pioneer of Enlightenment [1] - [10] who not surprisingly was admired and embarrassed in various respects by no one less than Albert Einstein [4] - [6]. The problem which the present author faces in achieving the task of this paper on the other hand, is quite honestly, where to start in order to attain maximal or at a minimum optimal clarity particularly when the objective is infinitely interconnected as it is in the present case [1] - [56]. On a deep philosophical level, we would like to demonstrate that the universality of musical perception by mankind and even birds and mammals [20]-[23] is a facet of the universal language of nature [23]-[29] and probably more fundamental to Epistemology (Erkenntnistheorie) than Physics while on a more technical level we aim at showing that the very same deep ideas conveyed by music converge towards a golden mean, Goedel-Turing transfinite cellular automata version of that proposed by 'tHooft's deterministic quantum mechanics [7], [14], [15], [19], [35]. At the same time and in the same spirit it is not possible to talk about the role of nonlinear dynamics and Cantorian space time in physics [23]-[37] without mentioning the relation to Leibniz's Monadology, Mauldin-Williams Random Cantor sets and Heisenberg's Central Order as inspired by Spinoza's God who is for all pragmatic reasons the same as that of Einstein's [4-6].

For all these reasons our task seems infinitely contradictory, beautiful and inevitably in the science of N. Bohr complementary being at the limit of nothing more or less than the ultimate unification theory of the ultimate duality not only of quantum wave and quantum particles but also of being and nothingness [36] as revealed in the work of M. Heidegger, J. P. Sartre and their school of thought. However, no matter how daunting or too ambitious

and extremely doubtful to attain our aim is the least we can do here is to try. The following magically beautiful poem of W. Blake may help the reader understand our frame of mind and sums it all up [37]:

"To see the world in a grain of sand and Heaven in a wild flower. To hold Infinity in the palm of your hand and eternity in an hour."

Very true and it is indeed a wonderful world after all.

II. A BIRD'S EYE VIEW OF SCIENTIFIC PHILOSOPHY

In a relatively excessive simplification of the history of scientific philosophy we could divide the Scientific Philosophical Schools into two main groups namely, the British Empiricists (Locke, Berkeley and Hume) [38, 39] and the Continental Rationalists (Descartes, Spinoza and Leibniz) [3]. This division may be seen as a continuation of two ancient schools of philosophical discourses namely that of Plato (Rationalist) and Socrates (Empiricist) [39]. It may be said here from the outset that the present author, being a strong believer in the deep rationality of G. Cantor's transfinite set theory [7, 12], [15], number theory and the golden mean Mauldin-Williams random Cantor Sets [12, 15, 16], is a mildly skeptical rationalist but a rationalist all the same. This stance will be illuminated as we proceed with our present analytical discussion [32-53].

III. SPINOZA MEETS LEIBNIZ - THE BIRTH OF MONADOLGY

We will not attempt in the present work to go in any depth into the scientific legacy of Spinoza nor Leibniz as there are countless pedagogical articles and books and excellent videos easily available about this subject [4]-[10]. However, first the fact that the young Leibniz visited the great Spinoza and second the subsequent remarkable creation of Monadology should be noted and appreciated as precursor to the "Cantorian" of the Author's E-Infinity Cantorian "Pointless" spacetime [24]-[25] who like a few other scientists before him have come as far as realizing how absurd a classical definition of a classical point in physics is. Consequently we must look next at Von Neumann's work on his continuous geometry and its major development by A. Connes, the father of non-commutative geometry [31], [32], [40]. We cannot emphasize strongly enough how A. Connes' Golden Mean Dimensional Function is central to the understanding of quantum physics and cosmology [29], [34], [36].

IV. VON NEUMANN-CONNES' GOLDEN DIMENSIONAL FUNCTION AND E-INFINITY

As mentioned earlier on, one of, if not the most important equation connecting the golden mean harmony with fundamental physics, is that posed in principle by Von Neumann and specified more accurately for Penrose's Fractal non-commutative universe [34], [40] by the outstanding French Mathematician and Physicist A. Connes. This equation may be stated as follows [34], [40]: $D = a + b\phi$

Where D is basically a bi-dimensional function, $a, b \in Z$ and $\phi = (\sqrt{5} - 1) / 2$. It was shown elsewhere that marrying this equation with the deductive dimensional theory for K. Menger and P. Urysohn [7], [12], [15], [19], [22], [30] we can construct a rational theory of the quantum wave-particle duality and a stringent quantum wave collapse explanation which is mathematically and factually waterproof. To explain this important point and derive a self-similar Einstein spacetime manifold which satisfies not only Spinoza's philosophy but also scale invariance [6], [7] will be our next undertaking.

V. FROM MENGER-URYSOHN VIA VON NEUMANN-CONNES TO EINSTEIN'S FRACTAL SPACETIME

The M-U dimensional theory of the Austrian-American Karl Menger and the Russian R. Urysohn was explained in previous publications in great detail [7], [12], [15], [19]. Thus the Zero set topological dimension is not surprisingly zero while the first empty set is the surface of the zero set and possesses therefore the dimension minus one. Plugging these values in E-Infinity bijection formula [7], [28]

$$d_c^{(n)} = (1 / \phi)^{n-1}$$

where n is the topological dimension corresponding to a Hausdorff dimension $d_c^{(n)}$, one finds for the zero set that [7, 12, 28]

$$d_c^{(0)} = (1 / \phi)^{-1} = \phi$$

while for the empty set the Hausdorff dimension is clearly given by [7, 12, 28, 40]

$$d_c^{(-1)} = (1 / \phi)^{-2} = \phi^2.$$

This is exactly the same result one would obtain from the bi-dimensional function D of A. Connes [28], [40]. Furthermore it is one of the fundamentals of E-Infinity theory to posit that the zero set is just another name for what we call the pre-quantum particle while the empty set is the set theoretical name for the pre-quantum wave [23]-[34]. Now, as reasoned earlier on, the quantum wave empty set is the surface (or Cobordism) of the quantum particle zero set and consequently they are inseparable [7] and more importantly it follows that taken measurement would imply "touching" or "penetrating" the empty set surface and thus rendering it non-empty [7], [12]. In other words by taking measurement, an empty set surface constituting a pre-quantum wave is converted instantly to a non-empty interior constituting a pre-quantum particle Zero set [7], [21], [47], [98] Quantum wave collapse i.e. state vector reduction is indeed as unbelievably simple as that and nothing more when seen through the eyes of Spinoza's God who gave us the genius of Leibniz Monads, Menger-Urysohn Deductive Dimensional Theory, Von Neumann-Connes' Dimensional Function as well as Penrose's Fractal Universe, Witten's fractal M-Theory [52] and Cantorian Spacetime [19], [22]. The only thing left to explain is that the surface of the empty set quantum wave $(-1, \phi^2)$ is an emptier set $(-2, \phi^3)$ which leads us to the simplest form of a scale invariant Einstein's spacetime [6], [47], [48]. To reach this conclusion we just need to realize that ϕ^3 is a normed topological probability while the inversion of ϕ^3 namely [12], [32].

$$1 / \phi^3 = 4 + \phi^3$$

is an un-normed probability representing a fractal dimension whose continued fraction representation is effectively the scale invariant dimension of Einstein's spacetime as revealed by [6], [47], [48]:

$$\begin{aligned} 1 / \phi^3 &= 4 + \frac{1}{4 + \frac{1}{4 + \dots}} \\ &= 4 + \phi^3 \\ &= 4.23606799 \end{aligned}$$

This result may be viewed exactly as we anticipated namely a four-dimensional spacetime inside another four dimensional spacetime and so on ad infinitum. In other words any pseudo point in this space however small is four dimensional and thus it is a scale invariant as befitting a pointless spacetime manifold and maybe called a fractal golden mean Einstein spacetime. We think both Spinoza and Einstein would have liked that [53].

A similar extension related to E. Witten's celebrated M-Theory leads to an equally remarkable fractal dimension in eleven dimensional space namely [52],

$$D = 11 + \frac{1}{11 + \frac{1}{11 + \dots}} = 11 + \phi^5$$

where ϕ^5 is Hardy's quantum entanglement [43].

VI. THE CANTORIAN IS HERE, THE CANTORIAN IS THERE, YOU CAN SEEK THE PRE-QUANTUM PARTICLE (CANTORIAN) EVERYWHERE - THE TWO SLIT EXPERIMENT

One of the most remarkable thing about the fractal version of Einstein space is its non-locality due to an intrinsic equality of the concerned probabilities [30], [33], [35] the situation is as follows: Since the un-normed probability to find a pre quantum particle is the inverse of ϕ which means $1/\phi = 1 + \phi$ while the un-normed probability to find a pre-quantum wave is the inverse of ϕ^2 i.e. $1/\phi^2 = 2 + \phi$, we see that to be either wave or a particle leads to the union of both probabilities i.e. we invoke the addition theorem [29], [32], [34].

$$(1/\phi) + \left(\frac{1}{\phi}\right)^2 = 1 + \phi + 2 + \phi = 4 + \phi^3$$

while to be both particle and wave at the same time is given by invoking the intersection i.e. the multiplication theorem which means [29], [32], [34]

$$(1/\phi)(1/\phi^2) = 1/\phi^3 = 4 + \phi^3$$

Evidently union and intersection lead to the same Einstein fractal spacetime Hausdorff dimension and implies the "quasi-illusion" of non-locality, particle wave duality and state vector reduction [7], [13]. The preceding analysis was given previously in painstaking details in connection with the famous two slit experiment with quantum particles [13].

VII. THE GOLDEN MEAN AND THE GOLDEN MEAN NUMBER SYSTEM IN PHYSICS

Even a fleeting glance at the analysis of the past sections would indirectly reveal that all the so obtained results depend crucially on the subtleties involved in the number theoretical properties of the golden mean $(\sqrt{5} - 1)/2$. However they are even more subtle than that and we must emphasize that our sweeping generalization to uncover the dissection of $E = mc^2$ to three parts [29], [52], [53] relating to dark matter energy, pure dark energy and ordinary energy can be only fully understood and comprehended via an entire golden mean number system replacing not only our decimal or digital number system but we suspect that this new golden mean system is even more efficient than a quantum computer and could be the lingua franca of nature as discussed in previous publications [23], [26], [27], [28].

In this section we will give briefly an outline of first the golden mean as a unique irrational number in physics and then proceed to the possibility of adopting the golden mean number system not only as a basis of all our computation but also as a basis of our understanding of the universe and creation [8], [16], [21], [22].

As far as the golden mean is a number outside art, aesthetics and computation [21], [22] it is the solution of a simple quadratic equation but at the same time it is the basic element in the celebrated KAM theorem of nonlinear dynamics [16] deterministic chaos and fractals. It is deeply involved in Feigenbaum's period doubling route to chaos [41], which in turn represents a threshold at $\lambda = 4 + \phi^3$. Apart of all that, the golden mean was found relatively recently both theoretically and experimentally in connection with E8 exceptional Lie symmetry group, complex phase transitions and the famous Ising chain [42]. Even more profoundly than that, Hardy's probability of quantum entanglement of two quantum particles was found to be exactly equal to the golden mean to the power of five and this exact theoretical result was confirmed experimentally beyond any doubt [43]. Last but not least it was revealed rather recently that the best method to deal with F. Wilczek Anyons is the golden mean number system and that the secret of dark matter and dark energy could be best understood and computed via a golden mean number system [26], [31]. It does strike even the most pragmatic and down to earth person who rejects off hand anything which looks in any sense as miraculous that there must be something very profound and unsuspected lurking at the roots of the golden mean number system in order to be found in such an abundant way in both the micro macro and large scale structure of the universe [22], [26], [29], [31]. This aspect of our investigation will be the subject of the last section of the present paper.

VIII. IS MUSIC MORE FUNDAMENTAL TO SCIENCE THAN PHYSICS?

The author freely admits that the title of this section is of the kind he would have not approved of at all in general or would have considered a mere twenty years ago to be grossly overstated and unduly scientifically exaggerated. One explanation for the change of heart of an engineering scientist and theoretical physicist like the present author is age. It was said in gesture on many occasions that scientists become frequently wearied as they grow older and start pondering God and the universe. Apart from such age related degeneration, I genuinely believe that we are in a post modernistic phase of the history of science and that the above title is objectively justified by unprecedented advances in our experimental knowledge and capabilities [43]-[45]. Aside from all of the above, it seems logically possible at least since the discovery of the universal harmony of all kinds of music regardless of cultures [20], [21] that music is a universal language [24], [27]. Noting the profound role which the golden mean plays in the structure of music starting from Palestrina [45] passing by Rameau and arriving at Bela Bartok [44]-[46] it is not farfetched to conjure that the golden mean number system is the language of Nature. The consequence of this conjecture explains at a minimum the shape of the sunflower, the beauty of Botticelli's Venus as well as Hardy's quantum entanglement and our own work on dark energy, dark matter and ordinary energy [15], [18], [23], [25].

IX. CONCLUSION

We started here with Spinoza's Ethics and moved from there to Leibnitz's Monadology until we returned to our relatively older research results on the Golden Anyons [26], 'tHooft's renormalization [47], Gross' Heterotic Strings [48], Chomsky's Theory of Language [49] and countless other topics which occupied us for some 30 years or so and taking this route we arrived finally to the conclusion that based on the universal harmony of music, it is

very likely that the golden mean number system constitutes a magnificent and simple system which we suspect to be essentially equivalent to Nature's very own language and our best bet to unravel the remaining secrets of the magical Universe [27].

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AUTHOR'S PROFILE



Professor **M.S. El Naschie** was born in Cairo, Egypt on 10th October 1943. He received his elementary education in Egypt. He then moved to Germany where he received his college education and then his undergraduate education at the Technical University of Hannover where he earned his (Dipl-Ing) diploma, equivalent to a Master's degree in Engineering plus being a professional chartered engineer. After that he moved to the UK where he enlisted as a post-graduate student in the stability research group of the late Lord Henry Chilver and obtained his Ph.D. degree in structural mechanics under the supervision of Professor J.M.T. Thompson, FRS. After his promotions up to the rank of full professor, he held various positions in the UK, Saudi Arabia and USA and was a visiting professor, senior scholar or adjunct professor in Surrey University, UK, Cornell, USA, Cambridge University, UK and Cairo University, Egypt. In 2012 he ran for the Presidency of Egypt but withdrew at the final stage and returned to academia and his beloved scientific research. He is presently a Distinguished Professor at the Dept. of Physics, Faculty of Science of the University of Alexandria, Egypt. Professor El Naschie is well known for his research in structural stability in engineering as well as for his work on high energy physics and more recently for his work in cosmology and elucidation of the secret of dark energy and dark matter as well as for proposing a dark energy Casimir nanoreactor. He is the creator of E-infinity theory, which is a physical theory based on random Cantor sets and can be applied to micro, macro and mesoscopic systems. Professor El Naschie is the single or joint author of about one thousand publications in engineering, physics, mathematics, cosmology and political science. His current h-index is 78 and his i-10 index is 767 and total citations are 33208 according to Google Scholar Citation.