

The Interplay between Numerics and Physical Concepts in E-Infinity Cantorian Spacetime, Wild Topology, Constructor Theory and Recent Trends in Unifying Mathematics, Physics and Consciousness

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Abstract – The paper is a novel way to link pure number theoretical results with a host of recent modern physical and mathematical theories in particular nonlinear dynamics, constructor theory, E-Infinity and related cutting edge research on the unification of mathematics, physics and consciousness using Penrose's Platonic number system which is based on the Golden mean number system invented a long time ago by the Alexandria School of Pythagoras and Plato.

Keywords – Constructor Theory, Wild Topology, Nonlinear Dynamics, Random Cantor Sets, Cantorian Theory, G. 'Thoof Automaton, Penrose Platonic Theory, Golden Mean Number System, David Deutsch, David Gross, E. Witten.

I. INTRODUCTION AND A LOOK BACK AT SMOOTH SPACE TIME GEOMETRY AND CONTRASTING IT WITH THE CORRESPONDING FRACTAL VARIANT

At the beginning there were two fundamental and relatively non-controversial geometrical models for space time namely the three dimensional Newtonian space with time being simply a parameter preserving causality and the more advanced Lorenz-Einstein four dimensional space which looks at time as being an additional dimension added to the three spatial ones [1]-[5].

Let us regress and look at the results we have obtained in the past in order to check our path towards the newly revealed interrelation alluded to in the title abstract and the introduction of the present paper. In a nutshell we have established in the last 5 years a host of important results and insights which may be summarized as follows: [5]-[37].

(1) The pre-quantum particle maybe modeled by a zero set given by the bi-dimension $D(0) \equiv (0, \phi)$ where

$\phi = (\sqrt{5} - 1)/2$ is the golden mean [10]-[19].

(2) The surface of the zero set is always the empty set which models the pre-quantum wave and is given by the bi dimension $D \equiv (-1, \phi^2)$ [13-33].

(3) The zero set comes into the E-Infinity Cantorian space time theory via the fractal part of its space time dimension. Consequently, the zero set would correspond in the fractal version of $D = 5$ Witten's M theory via the ϕ^3 added to $D = 5$ leading to $D = 5 + \phi^3$ as discussed in detail elsewhere [26].

In other words, the ϕ^3 corresponds to Cantor dust which is basically akin to Leibniz monads [20]. In fact, any point in the space described by $D = 5 + \phi^3$ would be a transfinite monad or a Cantor point i.e., not really a point but uncountable many nested Cantor set points [12,] [15], [26].

- (4) From the above we can see the difficult task of defining consistently what a point in a smooth space such as $D = 3$, $D = 4$ or $D = 5$ is. Consequently, we will start from a fractal space such as $D = 5 + \phi^3$ and then see what we can say about it when ϕ^3 goes to zero [23]-[33].
- (5) Taking all of the above on board, it was established that the dark energy cosmic density is fixed by the ratio $5/(5 + \phi^3) = \phi^5 / 2$ [18]-[19]. In other words, dark energy density is exactly equal to 95.4915028 percent of the total maximal energy given by Einstein's famous formula [22-32]. It follows then that the ordinary energy is given by $1 - [5/(5 + \phi^3)] = 5\phi^2 / 2$ [24]-[26]. Contemplating the entire situation and apart from the fact that ϕ^5 is the Hardy quantum entanglement probability we must regard the case $5/(5 + \phi^3)$ when ϕ^3 becomes zero as a totally unstable space which must be expansive upon the slightest disturbance [26] and consequently belong to the physics which is connected with cosmic expansion [26], [32], [33]. Nevertheless, we could speculate on the possibility that these unstable spaces may give us a deeper understanding of complex behavior of the more realistic fractal spaces [15]. To see if this conjecture is true, we will work things backwards in a somewhat unorthodox way as we show in the next section [29]-[33].
- (6) Last but not least it must be stressed that the work was influenced in a subtle way was influenced by the philosophy of Ref 34 and also in a profound way by the constructor theory of David Deutsch and his followers as well as a host of leading scientists aiming at unifying mathematics with physics, art and consciousness [33], [34], [37].

II. ANALYSIS AND RESULT

Let us start from the simple and obvious following example where we have the familiar four dimensional space time plus 22 compactified dimensions corresponding to dark matter sector i.e., the 26 old bosonic string space minus the $D = 4$ relativity ergo $26 - 4 = 22$. [26], [30]

Since we know that the total dimension of the core of the E-Infinity standard model is given by $\sum_{i=1}^4 \bar{\alpha}_0 = 100$

then the following subdivision makes a great deal of sense and meaning [22]-[37].

$$\begin{aligned} \sum_{i=1}^4 \bar{\alpha}_0 &= 100 \\ &= 26 + 74 \\ &= 4 + 22 + 74 \end{aligned}$$

The above is obviously the trilogy of cosmic energy, namely the 4% ordinary energy, the 22% dark matter energy and the 74% pure dark energy cosmic energy [22]-[33]. This shows clearly how what we call dimension can be viewed as the percentage of energy density.

Now we are ready to speculate the possibility that the 74% dark energy corresponds to the ration of Newton's smooth space $D = 3$ and Einstein's smooth space $D + 4$. This would lead to $(3/4) \times 75\%$ and not 74 but this is alright in our scheme of things to come. Now we write our near "hypothetical" dimension equation namely [22]-[37].

$$100 = 3 + 22 + 75$$

Where our space dimensions are: $3 = 100 - (22 + 75) = 100 - 97$.

Interestingly, we could work with $D = 3$, $D = 4$ and $D = 5$ and arrive that way at $D = 12$ of smooth Witten's M-Theory or super gravity for which $D = 12$ in both cases [15]-[20].

To do this we consider $3/4 = 0.75$ as well as $3/5 = 0.6$. The arithmetic mean in this case leads to $\frac{1}{2}(0.75 + 0.6) = 0.673$ while the geometrical means gives us $\sqrt{(0.75)(0.6)} = 0.6708$.

Simplifying we opt for 0.67 and our hypothetical equation becomes the "ideal case".

$$\begin{aligned} 100 &= (100 - 89) + (22 + 67) \\ &= 11 + 89 \end{aligned}$$

Which implies the said $D = 11$, [15]-[20].

There is here some instructive connection to Gross et al Heterotic string theory which could be made exact or excellent integer approximation and would lead to the exact solution for the magnitude of the expansive pure dark energy for which we give the final exact equation but without derivation using Otto's reciprocity [15-37] namely:

$$\begin{aligned} \sum_1^4 \bar{\alpha}_i &= 100 \\ &= (22 + k) + \frac{100}{22 + k} + x \end{aligned}$$

Consequently, we find:

$$\begin{aligned} x &= \gamma(\text{PDE}) \\ &= 100 - 26.6888376 \\ &= 73.31116292\% \end{aligned}$$

Which is the well known exact result [35-37].

III. CONCLUSION

It is fascinating to see how by blurring the obvious big differences one can gain more understanding and eliminate contradictions. This may be the tacit philosophy behind the enormous success of LotfiZa'da's fuzzy set theory. In non-linear science fractal logic plays a similar, if not a more profound role. The whole idea is also implicit in the grand scheme of Deutsch-Marletto constructor theory and the different unification.

In the present work we showed how a fractal space can be better understood starting from basically unstable geometry so that number theory and stability considerations shed more light on cosmic expansion and the nature

of reality. The fact that we do not only have an ordinary attractive cosmic energy and dark repulsive one but we have more than that namely pure dark energy and dark matter energy beside ordinary energy with completely unexpected properties is an astounding result. It is feasible to see differences when none are expected and also to see similarities where the fleeting look says there is none.

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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 nano reactor and a fuelless interstellar spaceship. 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 84 and his i-10 index is 809 and total citations are 38585 according to Google Scholar Citation.