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Theodor Kaluza's five dimensional space and its mathematical and engineering ramifications

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Abstract
We show in this short scientific announcement the logical and mathematical connections between the famous quintic problem of mathematics and T. Kaluza's five dimensional space time theory. The likelihood of the appearance of Cantorian fractals fine structure in this case is highlighted and the connection to Newtonian mathematics and engineering nonlinear dynamics is explained in some reasonable detail.
Keywords: *Newton fractals, N. body problem, Cantorian spacetime, E-Infinity theory, Superstrings, Fractal M-theory, E.Witten, D.Gross, Penrose tiling universe, Golden mean number system, G.Parisi, G. 'tHooft, Platonic network, T.Kaluza the son, T. Kaluza the father, Nonlinear dynamic, Deterministic chaos, M. Feigenbaum.*

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I. Introduction

In recent years it became reasonably well known that Newtonian iterations for solving complex algebraic equations of higher order are actually examples of deterministic chaos [1-20] which has also uncovered the impossibility of solving exactly a fifth order equation [1-4] to a degree which obviously surpasses the difficulties encountered in the non-integrability of the three body problem of classical mechanics [21-24]. Due to this obvious fact, the Author started speculating on the possibility that T. Kaluza (the father) who was a Gottingen university pure mathematics professor strongly interested in physics [20-26] may have had some intuition or hunch leading him to consider five dimensional space time [25] which would be the ideal space to contain the richness of "Newtonian" fractals [1-4] of the quintic problem [1-4]. In fact, the present Author had the unique honor long time ago as an undergraduate studying engineering to be a student of Theodor Kaluza (the son) who taught him mathematics at the Technical University of Hanover in the sixties of the last century [25, 27]. With the benefit of hindsight, this may have been one of several other reasons which ignited the Author's fascination by the work on Kaluza-Klein theory as well as the work of the great super string and M-Theory pioneers, M. Green, J. Schwartz, E. Witten and D. Gross' heterotic string team [5-15]. This old interest was relatively recently rekindled by P. S. Wesson's super book and papers on five dimensional space time theories [28]. Finally, it was the more direct source and motivation to get "spell-bounded" by Kaluza's work which undoubtedly came from the very important Newtonian fractals particularly for a researcher like the Author who is actually an applied mechanics man and engineer with background in varied fields like buckling instability of elastic thin walled shell structures [29] as well as Rene Thom's catastrophe theory [33], non linear dynamics and deterministic chaos [5-25].

Putting all this together and adding a pinch of sense for scientifically founded speculation led finally in a natural way to the present short announcement which we hope to become the beginning of a more focused and detailed flow of research papers.

II. Simple logical analysis of the connection between T. Kaluza's space time with the quintic problem and the resulting ramifications.

The case which we are presenting here is very simple as well as deceptively so. That may be the reason why even experts and in all genuine modesty, the present author not excluded have not noticed the above-mentioned connections for almost half a century. One could go as far as saying it was too obvious to notice and

was taken silently for granted. Let us consider the following simplistic and in fact trivial thoughts about reality and deep theories. In reality we do not have one or two dimensional anything. In "real" life we have only three dimensional objects and things i.e. there are three dimensions plus time making four dimensions. This "reality" is just Einstein's 4D universe. Now we may extend this 4D reality to super reality by reasoning gained from the transaction theory [30,31] which maintains that we have 4D running in one direction and another 4D running in the opposite direction without cancelling each other as one may wrongly think but rather enforcing each other by uniting into 2(4D) i.e., 4+4=8D super symmetric reality [32]. On the other hand, to observe the two 4D in union, we need to put them into a larger volume with 4D dimensionality so that we get 8+4=12 of G. Vafa's musical space [16]. Without including time, the above would lead naively to 3+3 = 6 and putting them into 3D, we find that 6+3 = 9 and now adding time, we get D = 9+1 = 10 of super string theory [6-9]. Not dissimilar, we could see the ten dimensions as the union of D=5 and $\overline{D}$ = 5 and adding time, we find the dimensionality of Witten's M-Theory 10 + 1 = 11 [14]. On the other hand, the intersection of D = 5 and $\overline{D}$ = 5 and adding time leads to (5)(5)+1 = 25+1=26 where 25 and 26 are the critical dimensions of the old bosonic string theory [5-15]. Needless to mention that D = 10 and D = 26 gives us Gross' et al Heterotic string theory in the familiar way discussed in various previous papers [5-25]. All the previous discussions, we must admit that it must seem to be very naive. However, naive as it may seem, we assure the reader it is not all that naive as we hope to show in the forthcoming papers. For now we will focus our attention in the next section on a less "naive" quite advanced mathematical discussion [19].

III. Beyond the simplistic logical analysis and down to "Newton's" fractals details.

Since we have already established the connection between the quintic problem and Newton's fractal [1-4] in its broad outline, we may turn our attention to the stringent mathematics of E-Infinity Cantorian space time [5-25]. As we proceed in this manner we see that our transfinite extension of D = 5 to the fractal version [9-15]

$$D = 5 + \cfrac{1}{4 + \cfrac{1}{4 + \ldots}} = 5 + \phi^3 \qquad (1)$$

where ϕ is the minor form of the golden section is for sure the true fractal contra part for moving from D = 4 of Einstein's to the scale invariance dimension of Einstein-El Naschie [14]

$$D = 4 + \cfrac{1}{4 + \cfrac{1}{4 + \ldots}} = 4 + \phi^3 \qquad (2)$$

With this important result being clear and quite well known, we hope we were able to cement the rather descriptive and qualitative simple logical analysis by the mathematical stringent self-similarity concept being an exact invariant requirement [5-15]

IV. Conclusion

Five dimensionality leads to Newton's fractals and in turn we are spell-bounded by the fractal version of D = 5 and D = 11 namely [12-21].

$$D_F(=5) = 5 + \phi^3 \text{ and } D_F(11) = 11 + \phi^5 \qquad (3)$$

where $\phi^3 = 1/(4 + \phi^3), 4 + \phi^3$ is the scale invariant four dimensional spacetime, $k = \phi^3(1 - \phi^3)$ is 'tHooft's renormalon, $\phi^5 = k/2$ is Hardy's probability of the two quantum particle entanglement [10-21]. These results are all obtained via the fundamental wisdom of the quintic problem [2-4] as well as engineering nonlinear dynamics and the golden mean wild topology cantor sets [13].

Acknowledgement and very personal words of thanks

The Author would like to let it be known before his time is over and feeling that the end is near and facing the final curtain that he was never as happy for a very well deserved Nobel prize in physics as when it was awarded a year ago to the open minded, adventurous, versatile as well as kind and modest Professor Sir Roger Penrose. The Author's reasons are also egoistic because the Penrose Fractal universe is one of the main pillars upon which the Author's E-Infinity Cantorian space time theory is based beside 'tHooft's renormalization, A. Connes' non-commutative geometry and D. Gross' Heterotic string theory. Then came a second reason to be happy when the same prize was given to a 71 years young man, the wonderful scientist G. Parisi (age is a very relative thing when you are 80 years old as you see).

On the other hand, the Author was again very sad that the exceptional pioneer of deterministic chaos, his very dear friend and a true genius, Mitchell Feigenbaum was not given the prize before his untimely departure. However, Feigenbaum will be remembered by all those who love him for his knowledge and true humanity. Mitchell will always live in the Author's memory and will never be forgotten.

Last but not least, the Author is grateful to have met Kaluza the son who taught him kindness and introduced him to his father's lifelong work and to his writings which made the Author love mathematics and physics and hate Hitler and all that is connected to racism and all the Nazi maniacs and cowards who could have destroyed Germany forever. But luckily for the Author the forces of good defeated the forces of evil as his beloved Egyptian President Elsisi taught him and as a result the Author had the good fortune to complete his education in Egypt, Germany, England, Saudi Arabia and the United States. To all those people who helped him and taught him right from wrong, he extends his deep thanks with the hope that: "We'll meet again. Don't know where, don't know when, but I know we'll meet again some sunny day."

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