

Super Unification of Physics and Mathematics

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Abstract.

This short letter proposes to convert physics and mathematics not to classical mathematical physics but to a far more radically different entity. We call this new logical product "wild topology" which is also known as a general kind of topology ramifying into a Cantor set. Thus the work goes far more beyond our older P-Adic unification of physics and mathematics.

In the course of this process, we enhance both understanding as well as computation of not only classical physics but more importantly also quantum physics and cosmology. In particular, we free quantum mechanics from several of the paradoxes and counter intuitive features which has historically plagued it since its very inception.

Keywords: Penrose's fractal tiling universe; Witten's topology; Alain Connes' non-commutative geometry; Feigenbaum's golden mean groups; David Gross' heterotic strings; P-Adic unification; Golden mean number system; Alexandria School of philosophy; El Naschie quantum relativity theory.

1. Prelude

The present work [1-35] is more than a serious attempt to go far beyond mathematical physics [1, 2] as well as our much earlier P-Adic unification of physics and mathematics by introducing what we labeled, in want of a stronger word, super unification of physics and mathematics [3]. Having said that, we still feel we need to qualify this title yet again and stress that we do not mean by the word physics something simply tangible and real and we neither mean by the word mathematics the tool with which we describe and model the physical world [4]. However, what we mean is that the final result of the super unification is neither physics nor mathematics but a "third state" which is radically different from the two. We could liken this situation to something which is neither water nor ice nor yet again vapor [5]. In fact, we mean wild topology [6] which is totally different from classical topology and far more powerful. The theory is also related to the author's quantum relativity theory [23-27]. This is our proposal for the super unification of physics and mathematics [19-24].

2. Introductory Remarks

Phase transition is a well-known concept in physics [7] and examples abound for this fundamental phenomenon which implies symmetry breaking [8]. In this letter, we propose that both computation efficiency and deep understanding of physics and mathematics will be sharpened when our traditional way of making sharp distinctions between the two fields is made to disappear or at a minimum is blurred [9]. In simple terms, we find that our present aim will be achieved via the most general form of topology namely wild topology [6] which is a topology ramifying at cantor set of the Mauldin-Williams type [10] as we will explain in the next section.

3. Background information and a global general analysis

In the following we will give a bird's eye view analysis of the landscape that will unify physics with mathematics. The role played by spacetime and dimensions in this undertaking is profound. Consequently, it is wise to start by outlining the part of the theory of dimensions [18] that is most significant for our present proposal [11], [19]. There are two fundamental dimensions that are basic to E-Infinity theory [12], [23-35]. The first is the topological dimension and the second is the Hausdorff dimension. Euclidean space of classical mechanic is a three dimensional topologically and yet we can design a myriad of fractal objects with higher arbitrary Hausdorff dimension in those 3 topological space dimensions [13]. The Hausdorff dimension on the other hand is a measure of the morphology of a line or a body living in 3 dimensions i.e. it is a measure of its smoothness or roughness and its porosity as well such as in the case the Menger sponge [14]. The same could be said to be true for higher dimensions as pointed out to one of us (MSE) by Prof. Shokry Nada [27].

It was, thanks to the insights gained by A. Connes' non-commutative geometry conception of Penrose's fractal tiling universe via his dimensional function [12.15.16], that we discovered that an equivalent role was played by the bijection formula of E-Infinity Cantorian spacetime which made us realize the importance of the simultaneous utility of topological dimensions and the corresponding Hausdorff dimension in tackling difficult questions in quantum mechanics and with considerable ease [11, 12]. This realization led us to invent the mathematical formulation of the prequantum particle Zero set and the prequantum wave empty set [11, 12] which we discussed earlier on in numerous publications so that all what we need to mention here briefly is that the zero pre-quantum particle is given by [11, 12], [18]

$$D(0) = [0, \bar{f}] \quad (1)$$

while the empty set pre-quantum wave is given by [11, 12, 15, 16]

$$D(-1) \circ [-1, \bar{f}^2] \quad (2)$$

Here the zero denotes the Menger-Uhryson deductive topological dimension while minus one [11,12] is the same Menger-Uhryson dimension for the empty set [11, 12]. Finally, \bar{f} is the Hausdorff dimension corresponding to the zero while \bar{f}^2 is that corresponding to -1 where $\bar{f} = (\sqrt{5} - 1)/2$ is the universally famous golden mean minor form [11, 12], [18]. Let us stress again that the dimensions in equations (1) and (2) are written in a very unconventional way and this was necessary because the two dimensions are related to each other namely, a topological and a fractal Hausdorff dimension [15.16.18],

Now we are in a position to spell out the quintessence of our discovery, namely that the unification of what we call "physics" with what we call "mathematics" takes place at an optimal number of what we call "topological dimension" and a corresponding "Hausdorff (fractal) dimension" of the surrounding {ambient} spacetime [11-14]. Furthermore, and to our own mild surprise, we found that the involved Hausdorff dimensions belong all to the family of dimensions known as golden mean dimensions i.e., some powers of \bar{f}^n Cantor sets [11-16]. In other words, the ambient spacetime is akin to a self-similar Penrose fractal tiling universe ramifying at a golden mean to the power of n of a Cantor set [2,3,6,11,12,14]. Such a topology is known to be a very general form of topology

labeled usually "wild topology" [6]. Needless to say, these new ideas go far beyond our earlier work on P-Adic unification [23,24].

In concluding this section, we should remind the reader as well as ourselves of the intricate connection between:

- (i) Period doubling bifurcation to chaos (i.e., Feigenbaum's turbulence).
- (ii) Rene Thom's generalized catastrophe theory [20-22] and its relation to (i).
- (iii) The ramification of (i) and (ii) into a golden mean Cantor set for the non-commutative Penrose's fractal tiling universe which we claim to be the mathematical model for our real universe [1-22].
- (iiii) The definite connection between (i) and (iii) results into a subtle relation between the high-dimensionality of the corresponding spacetime and the Matrix theory of Werner Heisenberg's quantum mechanics [1-22].

4. Closing remarks and the role of background and personal inclination in scientific research

This section may be thought of as having been written with tongue in cheek but even so it is still instructive and is executed in earnest by all four concerned Authors. In this regard, we could say that the first step in our "unification" program was to bring the four very different authors to unify, work together and agree on the whole about the subject, method and conclusion.

To start with, we could divide the authors into two groups. In the first group, the authors are predominantly engineering scientists and that is Mohamed El Naschie and Ji-Huan He [34,35]. In the second group, the authors are professors of Mathematics working in mathematics departments, namely Prof. A. Helal and Prof. L. Crnjac [34]. If this seems a bit complicated, just hang on here a little and things will become even more complex. The reason we say so is that Mohamed El Naschie's love at first sight was quantum physics ever since he got to know the work and persona of K. F. von Weizächer and W. Heisenberg. As for Prof. A. Helal [28], his first choice was to study engineering and become an engineer and sure enough he went first to an elite school for engineering before quitting and enrolled in the Mathematics Department, Cairo University. Later on he obtained his Ph.D. in France from the leading University of Grenoble for his work on turbulence after which he joined the Department of Mathematics in Cairo University where he is now a full professor and highly popular among his students and colleagues. If this is not sufficiently complex, then the reader is warned that both Prof. He [31] and Prof. Crnjac [25] found themselves deeply interested in nanotechnology and physics and both have excelled and are internationally recognized in these fields.

The direct relevance of these autobiographical revelations to the present paper is that Prof. A. Helal [28] thought for the better part of his life that one has to care in the first instance about applications and one could not start from high notch theories and expect to get anywhere. Prof. Helal thought just this way because examples and applications are what make a theory easily understood pretty much as L. Wittgenstein said in his famous magical book: *The Tractatus* [17]. Similarly, Prof. Ji-Huan He [34] was keen to work in physics and has authored a large number of outstanding physics and nanotechnology books as well as patents [18]. The remarkable thing is that when M. S. El Naschie at long last realized that total unification of physics and mathematics leads to topology, it was A. Helal, of all the people, who encouraged M. S. El Naschie to go on with this project despite that his past belief in the opposite philosophy namely, that pure mathematics is a waste of time, idle and empty and it is only a tool used to formulate physical and engineering problems. However, he never felt completely happy with this philosophy and felt that something is missing in the larger picture. It was finally the complete consensus of all the four Authors which carried the day and led to the present more or less advanced announcement of the main core of the present new theory [2,3,16,19,20,21] for which we will have many full length and detailed publications in the very near future [16,19].

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