

# The Aether as the Source of the Cosmic Dark Energy Sector

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**Abstract** – In the present work we are concerned with giving a topological, geometrical and physical proof that the empty set of pure mathematics is Maxwell’s Aether and that this Aether effectively stores the dark energy sector of our cosmos.

**Keywords** – Einstein Spacetime, Tesla’s Aether, Zero Point Energy, Cantorian - Fractal Spacetime, Casimir - Dark Energy Reactor, E Infinity Theory, The Empty Set, Frank Wilczek Aether, El Naschie Empty Set Aether, Noncommutative Geometry.

## I. INTRODUCTION AND BACKGROUND INFORMATION

The main starting point of the present work is a theoretical and experimental resolution of one of the most basic fundamental problems of physics, namely the very existence and reality of the Aether of J.C. Maxwell [1-11]. These basic philosophical and scientific insightful results in theoretical physics and cosmology [1-24] are converted here into a serious attempt to actually realizing an old futuristic dream, namely obtaining free energy from empty space or spacetime singularities [2, 5], with undreamed of possibilities in physics, chemistry, engineering and cosmology [25-31]. Our mathematical and indirect experimental verdict which was announced recently [29] is that the Aether exists and it can be equated to the empty set of pure mathematics [3] [12-16]. More precisely the Aether may be understood for all mathematical and physical purposes as being identical to the empty set [8-14] underlying the Penrose fractal tessellation universe [17] which obeys the A. Connes’ corresponding dimensional function of his noncommutative geometry [18-21].

From this astounding conclusion it is relatively very easy to deduce from the above that cosmic dark energy is simply the energy stored in the Aether empty set [22-24] so that the agreement between the theoretical calculation and the numerous accurate cosmological measurements may be taken as an indirect experimental confirmation of this spectacular model for the Aether [10-16], [22-24]. In fact the mere fact that Penrose fractal tessellation is a well known and valid model for quasi crystals, i.e. a real material with five fold symmetry as well as for the topology and geometry of the cosmos at large [10, 17], is actually a sufficient reason to reinvigorate an old analogy between photons and phonon [7-11]. Not only that but far more importantly, one can look for methods of harnessing the energy of empty spacetime using nanotechnology [25-31] as a scientific fact, not fiction.

Seen in this larger imaginative new reality advocated in part in a brilliant lecture by F. Wilczek and subsequent brain

storming discussions jointly with L. Kraus [7], we can go on confidently repeating what we have claimed for many years, namely that spacetime is physically real and may be regarded as a highly advanced material which can be used to yield practically infinite clean, free energy via what we called a dark energy-Casimir nanotech reactor [15]. As we said earlier on, such a reactor was thought of by many visionaries before but was never given anything like a firm mathematical and experimental justification as we did within the E-infinity theory proposal [21-36]. In fact based on these ideas two of the most active researchers in the Romanian chapter of fractal Cantorian spacetime realized as early as in 2007 that nanotechnology is the tool to construct a spacetime Casimir energy reactor [30].

We leave it to the historians of science to relate our findings to that of the Tesla-Einstein discussion about the Aether [5]. However it is interesting to note that while Einstein started by thinking of his theory of relativity as a proof that the Aether could not exist or at a minimum is a totally unnecessary assumption, in his later years Einstein modified his stance and came much nearer to the thinking of legendary Serbian-American N. Tesla who was a firm believer in the reality of the Aether [2] [5-7].

## II. FROM A DIMENSIONAL MASTER EQUATION DIRECTLY TO THE THREE ENERGY DENSITIES OF THE COSMOS

This section is deliberately running ahead of the main body of the present work in order to emphasize the mathematical power of the E-infinity formalism [10] and its unheard of simultaneous simplicity. The main point is to make the reader very much aware of the sweeping power of the golden mean number system [21-29] as a universal code and blue print of the existing cosmos and the key notes for creation. We give here an extremely short account of the idea and let the details be the subject of a forth coming paper. We just state here without proof that the most fundamental constant according to E-infinity is not the gravity constant nor the quantum gravity constant but simply the famous Sommerfeld electromagnetic constant  $\bar{\alpha}_o \approx 137$  [15]. The exact E-infinity value is in fact  $\bar{\alpha}_o = (20)(1/\phi)^4 = 137 + k_o$  where  $\phi$  is the golden mean  $(\sqrt{5} - 1)/2$ ,  $k_o = \phi^5 (1 - \phi^5)$  is the topological index number for the Higgs boson and  $\phi^5$  is Hardy’s probability for the quantum entanglement of two quantum particles. This leads us directly to a generalized reconstruction equation of  $\bar{\alpha}_o$ ,

from all the fundamental inverse coupling constants including that of quantum gravity, namely.

$$\begin{aligned} \bar{\alpha}_o &= (\bar{\alpha}_1)(1/\phi) + \bar{\alpha}_2 + \bar{\alpha}_3 + \bar{\alpha}_4 \\ &= (60)(1/\phi) + (\bar{\alpha}_2 = \bar{\alpha}_1/2) + (\bar{\alpha}_3 = (8+1)=9) + (\bar{\alpha}_4 = 1) \\ &= (97+k_o) + (30) + (9) + (1) \\ &= (127+k_o) + 10 \\ &= 137+k_o \end{aligned} \tag{1}$$

The fundamental master equation of dimensions then reads as

$$\sum_1^4 \bar{\alpha}_i = 60 + 30 + 9 + 1 = 100 \tag{2}$$

Asserting that Einstein's theory  $D = 4$  as well as the strong interaction string theory  $D = 26$  are both accurate facets of nature, we can subdivide the above equation as follows:

$$\sum_1^4 \bar{\alpha}_o = 26 + 74 = 4 + 22 + 74 \tag{3}$$

It is not difficult to show subsequently that 4 must be the 4% integer value of the ordinary energy density while 22% and 74% are the energy density in integer form of the dark matter and pure dark energy respectively. To obtain the exact value we just have to remember that the ordinary energy density is given by  $(\phi^5/2)(100) = 4.508497197$  percent which by Herman Otto's theorem is directly related to the dark matter density in percent of the total and is simply given by the inverse value of  $\phi^5/2$ , i.e.  $2/\phi^5 = (22+k)\%$  where  $k = 2\phi^2 = \phi^3(1-\phi^3)$  is 'tHooft's renormalon topological weight. Consequently the master equation becomes.

$$\begin{aligned} \sum_1^4 \bar{\alpha}_i &= (\phi^5/2)(100) + [2/\phi^5] + \text{pure dark energy density} \\ &= 4.508497197 + 22.18033989 + \gamma(\text{PD}) \\ &= 26.688837044 + \gamma(\text{PD}) \end{aligned} \tag{4}$$

That leads to the exact result for the pure dark energy

$$\begin{aligned} \gamma(\text{PD}) &= 100 - 26.68883904 \\ &= 73.311162\% \end{aligned} \tag{5}$$

exactly as found using many different methods in previous publications [16, 23]. The above results are summarized graphically in Fig. 1. Next we look at the entire situation in more detail.

### III. A SHORT OUTLINE OF THE DARK ENERGY – E-INFINITY THEORY

In what follows and in spite of the limited space of the present work we should and will give at least some mathematical elaboration of our ideas in addition to the most important equations of our theory [8-36]. Proceeding in this way it will become evident that  $E = mc^2$  of Einstein implicitly included a recognition of the existence of the Aether by unconsciously including the energy of the Aether, i.e. a totally empty spacetime via the energy of the

quantum wave as explained by the author on many previous occasions [3, 4] [9-18] [34-36].

This conclusion, as easily reasoned, is a natural consequence of modelling the quantum pre-particle by the zero set [3, 6, 9, 11] and assign to it two dimensions, namely the topological dimension zero as befitting a point particle and the second Hausdorff dimension  $\phi = (\sqrt{5}-1)/2$  as

obvious from Sir R. Penrose geometrical tessellation and Prof. A. Connes' dimensional function of the Penrose fractal universe [11, 17, 19, 20]. The pre-quantum wave on the other hand is interpreted in our theoretical model as the cobordism, i.e. the surface of the pre-particle [11-16]. Consequently it is an empty set and possesses two dimensions, similar to the zero set [4] [8-15]. The first is the Menger-Urysohn dimension minus one and the second is the Hausdorff dimension  $\phi^2$  [11-20]. Thus following the rationale of our theory we see that the cobordism of the pre-quantum wave must be given by a topological dimension minus two and a Hausdorff dimension  $\phi^3$  [10, 11]. On the other hand the average Hausdorff dimension of spacetime is  $4 + \phi^3$  [10, 11, 21]. Consequently the inverse of  $4 + \phi^3$  is  $\phi^3$  [12-14] [29-36]. That means on average the surface of the pre-quantum wave is spacetime itself [12, 13]. That way we may see the quantum particle with its surrounding guiding pre-quantum wave as ripples in spacetime just as phonon are vibrational ripples in the quasi crystal [7-16]. Taking a bird's eye view of the entire situation, Aether, quantum field, quantum wave and spacetime become different names and scientific labels for very similar, in fact almost identical physico-mathematical entities [10-24]. Since spacetime is an empty set then deep philosophical implications with a bearing in both physics and metaphysics as well scientific philosophy follows. Thus whenever a zero set particle moves its surrounding empty set becomes a non-empty zero set. This is a self referential statement which implies fractals [35]. It also implies zenon paradox about motion being an illusion [36].

### IV. THE FUNDAMENTAL EQUATION OF THE ORDINARY AND DARK COSMIC ENERGY SECTORS IN A NUTSHELL

It remains only to quantify the preceding situation. Putting the five fold quasi crystal symmetry which was thought not long ago to be forbidden [37, 38] in a Kaluza-Klein five dimensional manifold we find a five dimensional zero set topological volume  $\phi^5$  [16-21]. Thus the surface of  $\phi^5$  is clearly an additive five dimensional surrounding area equal  $5\phi^2$  representing the pre-quantum wave [3, 4] [10-16]. Now we have shown in many previous publications [10-16] that  $\phi^5$  is related to the ordinary measurable energy density of the universe which is retrieved from the ordinary formula of classical kinetic energy when we let the velocity tend to that of light and find that  $E(O) = (1/2)(m = \phi^5)(c^2)$  where  $c = \phi$  is the topological speed of light. This amounts to about 4.5% of

the energy density of special relativity, namely  $E = mc^2$  divided by 22 [10-16] [22-24]. As for the pre-quantum wave which is what gives us the dark energy sector and which cannot be measured directly because an empty set becomes non-empty and simulates a quantum wave collapse on measurement, i.e. a state vector reduction [10-16] [21-24], one finds  $E(D) = (1/2)(m = 5)(c^2)$  which amounts to 95.5% of Einstein's density [12-24] that is approximately equal to Einstein's maximal density  $mc^2$  multiplied by 21 and divided again by 22.

The beauty of the present theory is summarized in unexpected confirmation of Einstein's famous formula, namely [22-24].

$$\begin{aligned} E &= E(O) + E(D) \\ &= \left[ (\phi^5/2)mc^2 + (5\phi^2/2)mc^2 \right] \\ &= (1/2)(\phi^5 + 5\phi^2)mc^2 \\ &= (1/2)(2)mc^2 \\ &= E(\text{Einstein}) \end{aligned} \quad (6)$$

so that equation (1) may be regarded as a waterproof confirmation of Einstein's famous formula  $E = mc^2$ . Note that the most important point in all of the above results is the complete agreement with the accurate cosmic measurements [11-16] [22-24]. Consequently our theory is an accurate model of reality and not just another theory [21-36].

Finally the present theory may be refined to account for dark matter energy and pure dark energy as well [23, 24]. That way we can rewrite equation (1) using the fractal Kaluza-Klein spacetime theory which replaces 5 by  $5 + \phi^3$  as the sum of not two but three energy sectors densities as follows:

$$E = E_1 + E_2 + E_3 \quad (7)$$

Where [22-24] [28, 29]

$$\begin{aligned} E_1 &= E(O) \\ &= \left( \frac{\phi^3}{5 + \phi^3} \right) mc^2 = 0.04508497178mc^2 \end{aligned} \quad (8)$$

while  $E_2$  is the energy density of dark matter in the universe given by

$$E_2 = \left( \frac{1 + \Delta}{5 + \phi^3} \right) (mc^2) = 0.2218033994mc^2 \quad (9)$$

and  $\Delta = 0.1613776766$  is a coupling constant as explained elsewhere [28, 29]. Finally  $E_3$  is the pure dark energy in the universe and is given by [22-24] [28, 29].

$$E_3 = \left( \frac{4 - \Delta}{5 + \phi^3} \right) (mc^2) = 0.7331116289mc^2 \quad (10)$$

It was the great German material scientist and physicist at Clausthal University who noticed first explicitly that the ordinary energy density when inversed gives the exact dark matter percentage [31]. This is of course implicitly understood from the E-infinity relations between the various fundamental equations of the golden mean harmony [32-34]. In Fig. 1 below we give a graphical representation of our numerical results contained in equations 2 to 5.

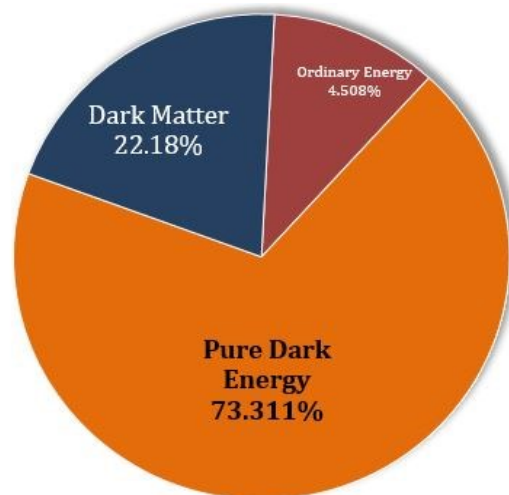


Fig. 1. Graphical representation of the exact three cosmic energy sectors given by equations 2 to 5.

## V. DERIVATION OF THE TOPOLOGICAL SPEED OF LIGHT $C = \phi$ FROM MAXWELL'S THEORY OF ELECTROMAGNETISM

It may be quite instructive for a deep understanding of our theory to realize that  $E = mc^2$  as well as the constancy of the speed of light are both implied and refuted by the same great theory of the very great man of Scotland, James Clark Maxwell. In a nutshell  $c$  may be found in Maxwell's theory as the inverse of the square root of the multiplication of his two constants  $\mu_o$  and  $\epsilon_r$  so that  $c$  can write [41].

$$c = 1/\sqrt{(\mu_o \epsilon_o)} \quad (11)$$

where  $\epsilon_o$  is the electric permittivity of the vacuum and  $\mu_o$  is the analogous magnetic permeability of free space. On the other hand we have dimensionless related values, namely the relative permittivity or dielectric constant  $\epsilon_r$ , which we regard as a topological index and is always equal or larger than unity. Then by strict symmetry implying monopoles, we have  $\mu_r$  or the analogue of  $\epsilon_r$  constant. Taking  $\epsilon_r$  to be a fractal line in space, i.e.  $1 + \phi$  rather than the classical unity of a topological classical line then  $\mu_r$  is also  $1 + \phi$  and we find

$$c(\text{topological}) = \sqrt{1/(1 + \phi)^2} = \phi \quad (12)$$

In other words in a fractal spacetime with monopoles and total symmetry between fractal electrical fields and magnetic fields, we have a variable speed of light with topological expectation value equal  $\phi$  where  $\phi$  is the golden mean [10-31].

## VI. GENERAL CONCLUSION AND THE WORK OF HERMANN OTTO

From the preceding result we see that there is no doubt that the Aether exists and that it is basically a five dimensional empty set akin to the Penrose tessellation universe which is described by A. Connes' dimensional

function of his noncommutative geometry as we indicated earlier on [17-19].

As for the actual design of the reactor, we stress yet again that this is actually a nanotechnology problem of restructuring empty space as we indicated earlier on and is basically building nano universes using nano fullerene buckyballs [39] particles in a way not dissimilar to what we discussed in some preliminary design proposals (see for instance Fig. 4 of Ref. [25]). Last but not least, the importance of the recent work of the leading German crystallographer, material engineer and physicist, Hermann Otto for the present paper cannot be overlooked and the reader is advised to read his papers attentively [31, 40].

As a last word and on an optimistic note, we should be glad to see that we have come a long way from Tesla's dreams [5] to a Nobel winner in physics saying that spacetime is a material [7] and from forbidden 5 fold symmetry to a Nobel Prize for quasi crystals and buckyballs [37-39]. Finally we showed why Maxwell implies maximal constant speed of light for smooth classical spacetime as well as a topological variable speed of light with  $c = \phi$  as the expectation value when monopoles exist and spacetime is Cantorian fractal. We suspect that reformulating Maxwell's equation in a Cantorian spacetime would lead to the final correct theory of everything.

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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 Chartered Structural Engineering. 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, Cairo University, Egypt and 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 is cosmology and elucidation of the secret of dark energy and dark matter as well as for proposing a dark energy Casimir nanoreactor.

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 74 and his i-10 index is 751 according to Google Scholar Citation.