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World Formula Interpretation of E = mc²

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Abstract **– The deceptively simple and well known E = mc² is shown here to bear undreamed of deep meaning elevating it from a famous result of Einstein's special theory of relativity to a quasi world formula uniting relativity and quantum mechanics apart from having the status of a fundamental cosmological constant. In the course of reaching these conclusions we will encounter numerous relevant connections to Schwinger's quantum field theory, Planck-Einstein relation and Gross heterotic string theory to mention only a few of a multitude of interesting theories leading to a better understanding of dark energy and macroscopic time irreversibility of classical mechanics.**

Keywords **– Schwinger Quantum Field, Einstein Maximal Energy, Quantum Relativity E-Infinity Theory, Golden Mean Number System, Cosmic Dark Energy, Gross Heterotic Strings, Accelerated Expansion and Time Reversibility.**

I. Introduction

Although the present work would seem to be a tour de force dealing with relativity and quantum physics as well as minimal surfaces and philosophy of science [1-86] taking the arguably most famous formula of theoretical physics, E = mc² and elevating it to a cosmological constant of nature, the task turned out to lead to an unreasonably simple theory based on simple mathematics [1]-[15]. Superficially, it would look as if we have changed all fundamental equations and mathematics but on a deeper examination the reader will eventually discover that we changed only the conventional view point and in so doing, we start seeing the cosmos in a new light [2], [4], [10], [11], [15]. For instance we did not hesitate to admit that the formal Schwinger quantum field theory [3], [16] is at times simpler and easier to handle than the intuitive and popular quantum field theory of one of the great heroes of the present author, namely Richard Feynman [17]-[19]. This becomes most apparent when we used it here to derive E = mc² where E is the energy, m is the mass and c is the speed of light and subsequently connect it to D. Gross' heterotic super string theory [19], [20], [21] by means of which we achieve a comprehensive and better understanding of the dark energy and ordinary energy sectors of the cosmos [20]-[26]. In the course of our discussion we will also touch upon many other fundamental questions such as the transition from high energy physics time reversibility to the classical real life time irreversibility [27]-[29]. Needless to say, the central and main key mathematical tool in developing the above is the extensive use of the golden mean number system [30]-[32] in conjunction with the Cantorian set theory of E-infinity theory [11], [30], [32]. In fact by focusing on the golden mean number system we gain a panorama view of the most important and fundamental subjects in modern physics, cosmology and applications [30]-[89].

II. The Implicit Cosmological Constant E = mc²

For the last decade or so the main thrust of the work of the present author was to show that E = mc² is the absolute largest energy density possible in our cosmos which does not follow from complex mathematical equations of physics and cosmology but rather an evident logical axiom which was really too obvious to be easily noticed at once [22]-[36]. It is not a far shoot to presume that the many wrong attempts to give a watertight proof of E = mc² by a host of theoretical physicists and mathematicians, not withstanding the many derivations by A. Einstein himself may be explained by the simplicity rather than the complexity lurking behind this famous result which was thought for a long time to be inseparable from the postulate and the mathematical physical structure of the special theory of relativity [32]-[26].

In the present work, one of our most important objectives is to demonstrate that E = mc² may be viewed as a fundamental cosmological constant more or less in the mould of what Einstein was looking for when he proposed what he later wrongly considered to be his greatest blunder, namely Einstein cosmological constant [22], [23], [36], [37]. We will consider these points in more depth and connect it to quantum gravity and the unification of all fundamental forces in the coming sections [38]-[40].

III. From Schwinger Quantum Field Theory to E = mc²

It is a well known fact that Schwinger's quantum field theory, unlike for instance Feynman's quantum field theory, does not over emphasize the particle aspect of the quantum and treats wave and particle on an almost equal footing and calls it the field where a mass m produces a vibration in this field which is given by [16], [37]

$$f = mc^2/h \tag{1}$$

and h denotes the Planck constant as usual. On the other hand it is equally an elementary well known fact that energy in this quantum context is given simply by the Planck-Einstein relation [16], [37]

$$E = \mathrm{h}F \tag{2}$$

Now if we set $h = \mathrm{h}$ and $f = F$ i.e. ignoring the subtle difference between the latin and the italic forms of writing then we find a new instructive identity, namely [32]-[40]

$$E = \frac{(mc^2)}{h}(h) = mc^2 \tag{3}$$

In the light of the above we do not need to see E = mc² as the code prescription which corresponds to a physical process by which m is magically converted into E but far simpler than that, E and m represent an irreducible philosophical tautology, albeit a very useful one for a process taking place in our brain and commonly known as deeper understanding [2], [3]. Having said all that, upon further reflection we reason that it is a grossly inadequate simplification to gloss over the fact that frequencies and thus masses are different and that we may distinguish at a minimum three fundamental ratios of h/h which we will explain in the next section.

IV. From E = mc² Via Gross Heterotic String Theory to the Dark and Ordinary Cosmic Energy Densities of Our Universe

Let us take a lovely and vague conception befitting a pre-quantum particle and pre-quantum wave satisfying the basic mental pictures of both of the great two men of quantum field theory, Richard Feynman and Julian Schwinger with almost the same degree of inaccuracy [16]-[19]. Proceeding in this fractal fuzzy manner [41]-[43] we equate linguistically and numerically the transfinite dimensions of heterotic string theory with the physical meaning of entropy and frequency so that a systematic misuse of the nomenclature presented here results in a positive use of the Planck-Einstein relation on the one side and Schwinger's quantum field equation for mass and frequency on the other side [16], [32]. That way one finds a relatively accurate estimation of the three fundamental energy sectors density based on dissection of the bosonic dimension $D = 26 + k$ [9] - [14] which we can now "rename" as mentioned earlier on in the following manner [4], [9], [10].

$$\begin{aligned} f \square D(H) \quad & (26+k) - D^{(4)} \\ & = 26.18033989 - 4 \\ & = 22.18033989 \end{aligned} \qquad (4)$$

Here D = 4 is the four dimensions of Einstein spacetime and $k = \phi^3\left(1-\phi^3\right) = 0.18033989$ is 'tHooft's renormalon. Setting $k \simeq 0$ one finds that 22 may be divided as follows [9], [10], [20], [21]

$$22 = 1 + 5 + 16 \qquad (5)$$

That way our maximal energy density E = mc² may be broken down to three components and redefined as [9]-[14]

$$\begin{aligned} E &= \frac{(1+5+6)}{22}mc^2 \\ &= \left(\frac{1}{22}\right)mc^2 + \left(\frac{5}{22}\right)mc^2 + \left(\frac{16}{22}\right)mc^2 \qquad (6) \\ &\square (4.5mc^2 + 22.5mc^2 + 73mc^2)\% \\ &= E(O) + E(DM) + E(PDE) \\ &= mc^2 \\ &= E(\text{Einstein}) \\ &= E(\text{maximal}) \end{aligned}$$

On the one hand the values of the preceding reduction and dissections of the original 26 leads as we see above to a remarkably close result to the measured ordinary cosmic energy (4.5%) and the conjectured dark matter cosmic energy (22%) as well as the presumed negative pressure pure dark energy density (33%) [44]-[46], on the other hand however the rationale of this dissection needs more elaboration in order to be tied to the Princeton quartet's original heterotic super string theory [9]-[14]. To start with we deducted from the 26 bosonic dimensions an obvious 4 for Einstein's spacetime. However we could also have reserved with equal right, if not more, 5 dimensions corresponding to Kaluza-Klein space [19], [36] [47]-[50]. In all events we know for sure that the messenger particles, i.e. the bosons are the carriers of force and consequently of energy as well as that the extra fifth dimension of the Kaluza-Klein theory may be interpreted as corresponding to extra spin half degree of freedom of fermions [47]-[50]. From the above we see that we may divide things into two kinds of energy sector at the very beginning, namely real energy and dark matter forming a largely matter-like sector with the usual attractiveness characteristic for ordinary matter-energy phenomenology. This part is intuitively linked to one dimensional extended objects which we call strings plus five dimensional objects [9], [10], [49], [50]. Together this makes $5+1=6$ dimensions are reminiscent of the six compactified dimensions of the ten dimensions to which the heterotic dimensional equation $26-16=10$ reduces to. The rest, i.e. the 16 extra bosonic dimensions correspond to the extra bosons of D. Gross et al [1], [9], [51]. The reader is by now surely in no doubt that our theory is based on the premise that the carrier of the pure dark energy section is nothing but these extra bosons of the heterotic super string theory. That way things are unusually and unexpectedly clear with regards to the supposedly very mysterious pure dark energy thought to be responsible for the equally mysterious accelerated expansion of the universe and we also have a similarly clear situation with the ordinary energy accounting for the $1/(26-4) = 1/22$ percent of the maximal energy as per our axiom introduced at the very beginning elevating Einstein's maximal energy to a fundamental cosmic constant of nature. It is dark matter energy which is not clear cut as it somehow belongs to both sections, the ordinary and the dark in a not straight forward way. This is so because it is intimately connected to ordinary energy and at the same time, it is related to the compact 22 dimensions of the 26 by the obvious subtraction $26 - D^{(4)} = 26 - 4 = 22$. However and as mentioned earlier on, it could equally be looked upon as $26 - D^{(5)} = 26 - 5 = 21$. Not surprisingly the ratio $21/22$ leads to an excellent approximate value for the energy density of the entire dark section, i.e. pure dark enery density plus dark matter density. It is yet again not surprising that this is true because we do not have only one

critical value for the Nambu-Veneziano old string theory [51]-[53] playing a part in our Gross et al heterotic theory, namely $D_1(\text{critical}) = 26$ since it is well known that we also have a second critical value $D_2(\text{critical}) = 25$ explained clearly in the relevant literature [52], [53]. Putting all the previous points together we see that as a first approximation in dissecting the 26 bosonic dimensions we must regard them as $26-4=22$, then take 22 to be $6+16=22$ and finally distinguishing between the strings of ordinary energy and the Kaluza-Klein objects of dark matter and write our final first approximate dissection as $1+5+16=22$ [9], [10]. None the less we hasten to say that although the 5 of the dark matter section are completely independent of the 1 of the ordinary energy section, it is coupled to the 16 of the pure dark energy section in a remarkable way related to 'tHooft's renormalon [36], [54] and this we discuss in the next section.

V. The Reciprocity Relation of Herman Otto and the Exact Dissection of the Maximal Cosmic Energy Density Of The Universe

Independent of the present authors, the notable physicist and material science engineer, Prof. Herman Otto in Germany [6], [55], [56] discovered a remarkable reciprocity relation between ordinary energy density and dark matter energy which is both a confirmation of the results of E-infinity theory as well as being a consequence of the coupling between pure dark energy and dark matter energy [4], [6] [57]-[59]. These relations will lead as we will see momentarily to the same exact results found some time ago by the present author. Herman Otto's relations are given simply by the elementary equality [6], [55], [56]

$$\frac{1}{\gamma(\text{dark matter})\ \text{percent}} = \gamma(\text{ordinary energy})\ \text{percent} \quad (7)$$

Now we know from previous work that the exact ordinary cosmic energy density is given by

$$\gamma(\text{ordinary}) = 1/(22+k) \quad (8)$$

where $k = \phi^3(1-\phi^3)$ is 'tHooft renormalon [25], [54]. Consequently we have

$$\frac{1}{\gamma(\text{dark matter})} = \frac{1}{22+k} \quad (9)$$

and therefore

$$\gamma(\text{dark matter}) = (22+k)\% \quad (10)$$

Neglecting k = 0.18033989 compared to unity we find the classical approximation [23, 24, 57, 59]

$$\gamma(\text{dark matter}) = 22\% \quad (11)$$

This is the remarkable discovery of Herman Otto [6], [56] from which we can find all the three fundamental energy densities of the cosmos when we add to it our basic insight, i.e. the axiom that E = mc^2 is the maximal energy density in the universe which means [20]-[26][57]-[59]

$$\gamma(\text{max}) = 1 \quad (12)$$

or equivalently [24]

$$\gamma(\text{max}) = 100 \quad (13)$$

Consequently we see that [23]-[25]

$$\gamma(O) + \gamma(DM) + \gamma(PD) = 100 \quad (14)$$

means that

$$(100)(1/22+k) + (22+k) + \gamma(PD) = 100 \quad (15)$$

Therefore the pure dark energy density is given by [55]-[59]

$$\begin{aligned}(100) - \left[(1/22+k) + 22 + k\right] &= 100 \\ &= 100 - 26.68883708 \\ &= 73.31116292\%\end{aligned} \quad (16)$$

exactly as expected and in full agreement with our previous analysis. Setting $k \simeq 0$ leads to essentially consistent approximation.

In this connection we may mention another remarkable quasi "reciprocal" relation that leads to similar results but we have to use here the normality of the unit interval. In this unitarity inspired theory we have $\gamma(O)$ not 4.5 percent but $(1/22) = 0.04545....$ Proceeding in this way we find in the unit interval that

$$\frac{\gamma(O)\%}{100} + \frac{\gamma(DM)\%}{100} + \frac{\gamma(PD)\%}{100} = 1 \quad (17)$$

is equal to

$$\frac{(\gamma(DM)\%)^2}{100} + \left(\frac{\gamma(DM)\%}{100}\right) + \frac{\gamma(PD\%)}{100} = 1 \quad (18)$$

Consequently using the integer approximation $\gamma(DM) = 22\%$ we find

$$\left(\frac{22\%}{100}\right)^2 + \frac{22\%}{100} + \frac{\gamma(PD)\%}{100} = 1 \quad (19)$$

That means

$$\begin{aligned}\frac{\gamma(PD)}{100} &= 1-\left[0.22+(0.22)^2\right] \\ &= 1-[0.22+0.0484] \\ &= 1-0.2684 \\ &= 0.7316\end{aligned} \qquad (20)$$

In other words the pure dark energy density is [44-49]

$$\gamma(PD)=73.16\% \quad (21)$$

which is not an exact yet an excellent approximation. However, unlike the previous reciprocity of Herman Otto by using the exact value (22 + k)%, the result becomes less accurate as we will find that

$$\gamma(PD)=72.8999\% \qquad (22)$$

This shows that the ignored coupling between dark matter and pure dark energy renders the relation given by equation (19) not as exact as one would have hoped. Next we will show how the previous reciprocity result of Otto Herman [6, 56] can be reproduced using E-infinity theory fundamental inverse coupling equation and that the total dimensions of spacetime could be seen via this equation as a one hundred dimensional fictitious "Rechen", i.e. "computational" space [76, 78].

VI. The Energy Density Computational Space of E-Infinity Theory

One of the most miraculous basic equations of E-infinity Cantorian spacetime [32, 28] is undoubtedly the exact renormalization equation by the help of which the theoretical inverse coupling of electromagnetism at low energy scale is reconstructed from all other coupling constants. This is as is well known given by [32, 38, 59] [60-65].

$$\bar{\alpha}_o = \bar{\alpha}_1(1/\phi)+\bar{\alpha}_2+(\bar{\alpha}_3+\bar{\alpha}_4)+\bar{\alpha}_5 \qquad (23)$$

Here $\phi=(\sqrt{5}-1)/2$, $\bar{\alpha}_1$ is the electromagnetic inverse coupling at the electroweak scale, $\bar{\alpha}_2$ is the inverse coupling of the weak force, $(\bar{\alpha}_3+\bar{\alpha}_4)$ is the inverse coupling of the strong coupling also at the electroweak scale and finally $\bar{\alpha}_5 = 1$ is the Planck quantum gravity maximal coupling. This may thus be evaluated and found to be [60-65]

$$\begin{aligned}\bar{\alpha}_1 &= (60)(1/\phi)+30+(8+1)+1 \\ &= (97+k_o)+40 \\ &= 137+k_o \\ &= 137.082039325\end{aligned} \qquad (24)$$

where $k_o=\phi^5(1-\phi^5)$, ϕ^5 is Hardy's quantum entangle--ment, $\phi^5=2k$ and $k=\phi^3(1-\phi^3)$ is 'tHooft's renormalon [54].

The above equation is consistent with all other equations of E-infinity theory to the extent that it is not only representing an astounding and generic example for the unreasonable effectiveness of mathematics, but also mathematical physics when nearly anything which is found mathematically and logically correct is also reproduced in the real physical world and thus physically correct [7, 11, 19, 32]. We note further that the difference of $\bar{\alpha}_o = 137+k_o = 137.082039325$ and the experimentally measured, namely $\bar{\alpha}_o = 137.036$ is due to projecting the micro world via the intricate micro and macro experimental apparatus onto the macro world where we and our measuring devices exist and which are at the same time unfortunately prone to quantum wave collapse in the absence of non-demolition technology [11, 60, 61]. There is of course much more to this point than what we said but this is not our main subject here. We just mention these points to motivate our important observations of the reconstruction equation of $\bar{\alpha}_o$, namely that the sum of all involved theoretically exact inverse coupling from $\bar{\alpha}_1$ to $\bar{\alpha}_5$ add precisely to one hundred [7, 32] [60-65].

$$\begin{aligned}\sum_1^5 \bar{\alpha}_i &= \bar{\alpha}_1+\bar{\alpha}_2+(\bar{\alpha}_3+\bar{\alpha}_4)+\bar{\alpha}_5 \\ &= 60+30+(8+1)+1 \\ &= 100\end{aligned} \qquad (25)$$

In addition these 100 represents some abstract dimension which is akin to the dimensions not of a real spacetime but to a "Rechen" that means a computational spacetime [86] which is furthermore indirectly connected with the spacetime of the heterotic superstrings [51] as well as Einstein spacetime and more. Proceeding within the above mental-computational model we can write [1], [2], [24]

$$\begin{aligned}\sum_1^5 \bar{\alpha}_i &= D^{(26)}+74 \\ &= D^{(4)}+22+74 \\ &= 4+22+74 \\ &= \gamma(O)+\gamma(DM)+\gamma(PD)\end{aligned} \qquad (26)$$

These are obviously integer approximations for the three main densities of cosmic energy and is easily converted to the exact one by noting Herman Otto's reciprocity which is a trivial exercise to do and will not be reproduced here. We note on passing that all three preceding results were possible only because we recognized the golden mean numbering system as the lingua franca of nature which covers not only the macro world with all its complexities but also the quantum world of Hardy's entanglement as well as the world of art as documented in various excellent classical books on the connection between mathematics, geometry and topology on the one side and the golden section and perfect beauty on the other [5], [9], [11], [15], [41].

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VII. Further Developments and Discussion

There is no doubt what so ever in our minds that the golden mean number system of E-infinity theory has given us a handle on most, if not all of the difficult questions of quantum physics and cosmology [64], [65]. This is true with relatively older mysteries as that of the dark cosmic energy of our universe as well as various new questions and findings which periodically pops up unexpectedly as a result of the world wide intensive research in quantum physics and cosmology conducted virtually everywhere on the globe. One recent such question came to the author's knowledge from his colleague, Prof. M. Habeeb from Al Nahrain University in Iraq. Prof. Habeeb wanted to know if E-infinity theory could help to support or refute the recent argument in favour of the multiverse theory for which some of its proponents have recently found new evidence [66]-[68]. Our answer to this question was clear cut positive since E-infinity theory by its very nature is a multiverse theory [68]. This is a natural consequence of the fractal nature of E-infinity theory that implies maximal self-affinity ergo in built multiverse [66]-[68]. A second example for a simple resolution for a perplexing problem, which occupied the minds of many eminent scientists, is the time irreversibility in real life which is in stark contradiction to the fundamental running back of time on the level of elementary particles where a positron may be conceptualized as an electron running back in time [27], [28]. We propose a new resolution to this problem, which we tackled previously also in the context of Cantorian E-infinity theory, by appealing to the work of Vito Volterra [69]-[71] who used fat Cantor sets to reason that there are Cantor functions that are differentiable but the derivatives are not integrable. It seems therefore that it must follow from that as an almost trivial result that fractal time, as used y G. Ord, L. Nottale and the present author [72], must "flow" irreversibly at a certain coarse resolution although the same "phenomena" is reversible at the very fine "thin" Cantor set level of the pre-quantum so that the entire situation is resolution dependent. In the limit we have classical thermodynamics-like irreversibility [7], [19], [27] while at the pre-quantum physics level we have reversibility.

In conclusion of this intermediate discussion, it is instructive to revisit our cosmic energy density formula and this time using Kaluza-Klein theory showing the flexibility and versatility of our E-infinity theory [7], [19], [30], [38], [49]. We start again from the cosmological axiom which we will call henceforth the world formula E = mc^2 and rewrite it as [36], [49], [73], [74]

$$E=\left(mc^2\right)\left[\left(5+\phi^3\right)/\left(5+\phi^3\right)\right] \qquad (27)$$

where $5+\phi^3$ is the dimension of the fractal version of Kaluza-Klein five dimensional spacetime. Now we use the Unruh topological temperature ϕ^4 and the holographic coupling Δ to rewrite our world formula as follows:

$$E=\left[\frac{\left(1+\phi^4+\Delta\right)+\left(4-\phi^4-\Delta\right)+\phi^3}{5+\phi^3}\right]\left(mc^2\right) \qquad (28)$$

Here the coupling Δ is given by the ratio of $5+\phi^3$ to the well known holographic boundary degrees of freedom of the compactified version of Felix Klein modular 336 degrees of freedom. This mean [36], [49]

$$\Delta=\frac{5+\phi^3}{336+16k} \qquad (29)$$

where $k=\phi^3\left(1-\phi^3\right)$ is 'tHooft's renormalon. Consequently we have

$$\begin{aligned}\Delta&=\left(5+\phi^3\right)/(338.88)\\&=0.0154508472\end{aligned} \qquad (30)$$

Inserting back we find again the three types of cosmic energy in full agreement with our earlier results [75]-[83]

$$\begin{aligned}E&=(22.1803)+73.3111+\left(\phi^5/2\right)\\&=E(DM)+E(PD)+E(O)\end{aligned} \qquad (31)$$

and we may remind our readers that if we lump pure dark energy density and dark matter energy density together, then the dark energy density becomes simply the energy of the pre-quantum wave E(QW) and that of the ordinary energy is the energy of a pre-quantum particle. This is, as well known from previous publications is given by [47]

$$\begin{aligned}E&=\left(5\phi^2/2\right)mc^2+\left(\phi^5/2\right)mc^2\\&=E(QW)+E(QP)\\&=mc^2\\&=E(\text{Einstein})\\&=E(\text{maximus})\end{aligned} \qquad (32)$$

VIII. Alain Connes' Noncommutative Geometry, Fusion Algebra, F. Wilczek Anyons and Macroscope Analogies

It is appropriate at this point to acknowledge that one of the main pillars upon which the present theory is based is von Neumann-Connes' dimensional function describing Penrose fractal tiling universe [7], [76], [77] $D=a+b\phi$ where $a,b\in Z$ and ϕ is the golden mean $\left(\sqrt{5}-1\right)/2$. It is only via D that we could define the zero set $d_c^{(0)}=\phi$ and the empty set $d_c^{(-1)}=\phi^2$ and consequently do simple computations for the zero set pre-quantum particle and the empty set pre-quantum waves as explained in numerous previous publications [2], [11]. A similar situation exists for fusion algebra where $d(1)=d(\in)=1$ and $d(x)=d(\beta)=(1/\phi)=1+\phi$ as explained previously in

connection to the topological quantum field theories and its relation to sub-factors [75]. Even more recently and quite striking is the golden anyon based on Wilczek's original proposal where a quantum dimension t leads to a single non-trivial function prescription $t \otimes t = 1 \otimes t$ which is easily derived from E-infinity theory. Last but not least, we draw attention to the fact that a soap bubbles collapse upon touching it to a simple drop as an instructive macroscopic analogy to quantum wave collapse. This "experimentally" illustrates the transition from an empty set quantum wave to a zero set quantum particle [2], [11]. It is obvious that this phenomenon is clearly related to minimal surface theory and deserves further careful examination [84], [85]. There is also another really subtle point regarding golden mean solutions. This is the fact that it is often a solotonic one because it is exact non-perturbative so that we may discover that symmetry breaking is scale dependent phenomena an inaccurate experiment could lead us to a completely wrong conclusion.

IX. Discussion and Conclusion

In the present work we stated and showed explicitly what we have been using more or less implicitly for a relatively long time, that $E = mc^2$ is not only the maximal cosmic energy density in our universe but it is practically a world formula unifying classical, relativistic and quantum physics in one stroke [1]-[4] [23]-[24] and may even be regarded as a cosmological constant of nature. To come to this in retrospect obvious conclusion and short step it was a long journey. Again in retrospect and hindsight, it seems the journey started with realizing that nature has its own indigenous language that we must master before embarking on a dialogue with it to learn all about what we think of as its jealously guarded secret. No matter how potent the dictionary that we may use to translate our language to that of nature and visa-versa, this would not do optimally and will leave much room for misunderstanding. We simply need to learn the lingua franca of nature and this is simply the golden mean number system, which implies fractal logic and fractal counting [15], [76], [78]. For instance when this frame of mind is applied to some classical problems, it leads to outrageous results such as [78]

$$12 = 14 = 11 + \phi^3 \qquad (33)$$

Of course equation (33) is more than outrageous. Never the less, seen from a different point of view this illogical counting is a true situation of the current status of the standard model which has 12 bosons given by SU(3) SU(2) U(1) generators but need the Higgs and the graviton to be at least 14 and has a chance to capture reality although because reality is fractal it is sufficient to have the eleven dimension of Witten's M-theory after adding to it Hardy's quantum entanglement probability ϕ^5 to convert M-theory to a fractal M-theory [49]. That way we see that this truly outrageous equality is meaningful after all or at a minimum not as ridiculous as it seems at the beginning. Thus the golden mean number system is a giant leap forward towards the understanding of high energy physics and quantum cosmology but it is not the entire story and we do need a blueprint for a fundamental theory in order to talk sensibly about it and not just talk without having a meaningful objective for talking. For that we may develop theories starting from Newton and Einstein, passing by bosonic strings and heterotic super string theory as well as Feynman's quantum field theory and more than anything else, Schwinger's quantum field theory and finally the golden field theory of E-infinity [63]-[65]. Coming that far we could not overlook the role the golden mean plays not only in the computational aspect but also on the very structure of the fundamental theories as manifested in the dimensional function of von Neumann-Connes [77] which is central to noncommutative geometry, the dimensional function of the four dimensional fusion algebra of the sub-factors related to topological quantum field theories as well as the exciting ideas of Nobel Laureate Frank Wilczek anyons proposal [83] which is easily rephrased into golden anyons using E-infinity golden field theory [63]-[65]. All this must ultimately converge to the view that the golden mean is in the meantime a mainstream theoretical tool and since it received the Nobel Prize in chemistry when Dan Shechtman's experimental discovery of quasi crystals was at long last accepted as a fact, it seems to be about time that the golden mean in all its guises should be accepted in physics and not in a shy way utilized in high energy physics and quantum cosmology. In fact the experimental verification of the existence of the golden mean in fundamental quantum physics is so strong that playing it down would be a tragic mistake which would result in one single negative result, namely to delay the advancement of science.

In conclusion of this conclusion we should point out that although we addressed almost entirely questions of primarily theoretical interest, the fact is that spacetime has enormous practical technical applications beyond our dreams. These applications range from using spacetime as a "material" to produce infinite clean energy as well as making fuelless interstellar travel possible [79]-[82]. Never the less, and with all due respect to technological applications, it is the sweeping philosophical implications connecting science with the linguistic research advances connecting Wittgenstein, Chomsky with Dirac and recent advances in understanding the role of language in developing our own thoughts is what we consider the most important and novel aspect of the present work which elevated $E = mc^2$ to the status of a world formula [86]-[92].

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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 chartere--d 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 is 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 77 and his i-10 index is 762 andtotal citations are 32781 according to Google Scholar Citation.