Coherent Cosmology

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QSCP XX (Sept. 2015), Varna, Bulgaria

Summary. Analysis of present day cosmology crisis suggests a return to the steady-state model, but adding a new source of the cosmic microwave background: the *Grandcosmos*. Indeed, elementary dimensional analysis shows the temporal invariance of both the horizon radius, the mean material density and the background temperature, reestablishing the *perfect cosmological principle.* This temporal invariance permits to apply the *holographic principle*, with 1D terms explaining both Grandcosmos, extending Universe radius by 10^{61}, and critical condition (flatness), with a general quantization reducing the Plank units by a factor of 10^{61}, while a tachyonic parallel world ($C \approx 10^{61}c$) resolves the vacuum energy dilemma. The time quantization is tied to a general mono-frequency *coherence principle*, so that the Universe would be a computer ruled by a 10^{104} Hz Big-Bang/Big-Crunch oscillation. The dramatic appearance of the neutrino background wavelength in the special holographic series confirms the need for a synthesis of the two main cosmological models. This explains the apparent confirmations of the standard model, but with necessity of a radical re-interpretation (inflation and multiverse are unnecessary). The non-Doppler Kotov-Lyuty coherent cosmic oscillation confirms tachyonicity and is an absolute clock in tight holographic connexion with the background temperature, itself tied to Grandcosmos, absolute space. The rejection of Relativity at Universe level leads to the critical condition and matter density 3/10, eliminating the dark energy problem, and corresponds to the Eddington prediction for the hydrogen atom number 136×2^{256}. The formula shows a symmetry between the Newton and Fermi constants supporting an oriented cosmical sweeping character (parity violation) of the matter-antimatter oscillation (dark matter would vibrate in quadrature). A hydrogen gravitational molecule model confirms the formula and precises the black matter density, while a Black atom model relies directly micro and macro physics. Holographic analysis leads to graviton and photon masses, and to a Topological Axis rehabilitating the tachyonic bosonic string theory. Physical and biological essential parameters are interconnected, in relation with musical and economic numbers, as the Combinatorial Hierarchy, pointing to a *Diophantine Grand Theory,* rejecting Darwin evolution and favoring universality of Intelligent Life.

Keywords: Quantum Theory, Holographic Principle, Steady-state Cosmology, Coherent Cosmology, Eddington Theory, Dark energy, Antimatter, Dark matter, Combinatorial Physics, Photon mass, String Theory, Cosmo-biology.

1. Introduction: a necessary synthesis between two cosmologies

It is the general opinion that something got wrong in present day standard cosmology. In a recent overall perspective, one reads [1]: *"No-one yet knows how the theoretical maladies of cosmology will be solved, if they can be solved, or even if they need to be solved. As more 'conventional' attempts to find solutions have failed to make headway, however, it becomes tempting to try more radical ideas. As evidenced by past 'paradigm shifts' in physics, radical ideas are often necessary for progress, and we, as a community, must be open to their exploration. Certainly, there is no point in being dogmatic about Cold Dark Matter (CDM) when there is consensus that it cannot be the full picture. Still, it should be a principled radicalism that we insist upon. Smashing the foundations of the standard cosmological model is all well and good, but the end result cannot be considered successful unless it is a truly predictive theory – one that not only fits the bulk of current and future data, but explains it as a non-trivial consequence of its deeper structure. Simply introducing additional unconstrained degrees of freedom to fit-out deviations will not do. An alternative theory should ideally strengthen the connections between cosmology and the rest of physics too, as CDM has done so ably; theories with special constructions that disconnect the causes of cosmological phenomena from their possible consequences elsewhere look feeble. But even if evolution, rather than revolution, is needed to fix up CDM, there may still be something to recommend a more radical stance – perhaps a shake-up of our perspective, rather than our theory, is what has been needed all along?"*

In particular, consider the 'flatness problem', i.e. why the horizon radius R and the equivalent mass of Universe M are tied by the simple relation $M = Rc^2/2G$. This problem is currently resolved by an ad-hoc inflation step, but this introduces new theoretical difficulties [2]. Also, a main problem is the special value of the cosmological constant, corresponding to the dark energy density, which is Ω_Λ = 0.685(17), according to the recent Planck mission [3][4]. Now, this is compatible with the trivial value 7/10, one obtains by applying the well-known gravitational energy of an homogeneous sphere $-(3/5)GM^2/R$, which, by eliminating G with the above critical condition is $(3/10)Mc^2$, letting the density 7/10 apart. This seems to indicate that cosmology would be simpler that it is ordinary believed.

Another intriguing point concerns the Hubble constant. While the recent direct measurement by supernovae 1a [5] leads to the value 73.8(2) km s^{-1} Mpc^{-1}, the Planck mission result [3][4] is 67.8(9) km s^{-1} Mpc^{-1}. These values are discordant but their mean value is very close to the value tied to the so-called universe age 13.81(5) Gyr. Such a direct correspondence is found in *the single time-invariant parameter steady-state cosmology* [6][7], while present-day standard cosmology optimizes 6 *time-dependent free parameters.*

It is recalled that *the forgotten steady-state cosmology have correctly foreseen the acceleration of galaxy recession and the critical character (flatness).*

Moreover, the main argument which have led to his abandon, the discovery of the Cosmic Microwave Background (CMB), was in fact not pertinent. Indeed, the steady-state is *the only cosmology which have predicted correctly its temperature,* from only the Helium density [8]. This density was correctly estimated at the epoch. Indeed, from Oort estimation 10^{-30} g cm^{-3} of real matter density, and from the energy associated to each Helium atom formation, one obtains about 3 K in a single line of calculus. By contrast, complicated calculation from the Primordial Big Bang model, with transition from cold to hot Big Bang model, led to temperatures between 5 K and 19 K, as described in a review article [9], where one can read a source of error '*It might be noted that the large overestimate of Hubble's constant at that time, with the use of a close to realistic present matter density ...'*

More generally, it is clear that a so quasi-perfect thermal distribution is better explained in a steady-state than in an explosive one. So the Ockham razor is clearly favorable to the steady-state cosmology.

But, contrary to the Primordial Big Bang model, the steady-state model was highly refutable, which is a necessary criteria for a scientific theory. So opponents to this theory (but not only from scientific grounds) found many ways for its refutation, which appeared later to be disputable arguments [10]. It is true that the founders of steady-state cosmology embarked in the search for a thermalizing agent, such as metallic or carbon whiskers [8], which were not convincing enough. This was a main cause of rejection of steady-sate cosmology, but this objection also is not pertinent, because a 'Grandcosmos' may play this thermalization role, as explained below. So, the observations of the CMB, which seem to confirm the standard model, could be merely a misinterpretation of Grandcosmos properties. It is significant that opponents concentrated effort to the problem of this thermal agent: *this means they have no stronger arguments*. The irony is that standard cosmology introduces now a multiverse [11], which is unscientific in character, because its is unobservable, contrary to the Grandcosmos, manifested by the CMB.

A delicate point in the steady-state cosmology is that, as a consequence of its basic assumption, the Perfect Cosmological Principle, new matter must appear to compensate for the galaxy recession. This has been called a violation of energy conservation, but it is not really so, since *in an invariant horizon the energy must remains invariant*. It is true that this new matter rate production is no-directly measurable (about one neutron by century in a cathedral volume), but it implies a coherence of the whole universe, implying a tachyonic physics [12] tied to quantum non-locality, and, in the extreme, a discrete and deterministic physics [13] Moreover, this new matter apparition could be related to the strange observations of Halton Arp [14], as discussed in the conclusion.

Another dramatic observation is the non-Doppler oscillation [15], with period 9600.60 s observed by Valery Kotov and Victor Lyuty since decades, in several quasars, which is directly related to gravitational and Fermi constant G and G_F, as recalled below. *This is the sure sign that new tachyonic physics is on stage.*

So, the steady-state cosmology, a hightly refutable model, not only has not been

refuted, but has also been very predictive.

But there is an apparent terrible objection against the steady-state model: for an observer *A,* a given galaxy can exceed the celerity *c* when she passes across the horizon of *A*, while for an another observer, this is not the case, since the horizons of observers *A* and *B* are not the same. But this is easily resolved by supposing that special relativity is ruled out at cosmological level. Indeed, by summing the galactic kinetic energy $(dm)v^2/2$ in the *R*-radius sphere, with the simple non-relativistic law, a galaxy speed proportional to its distance *l*: $v = cl/R$, one obtains the non-relativistic result $(3/10)Mc^2$. Now, as recalled above, the classical gravitational potential energy of an homogeneous sphere is $-(3/5)GM^2/R$. *Equalizing to zero the sum of these energies,* the simplest hypothesis, this corresponds to the critical condition $R/2 = GM/c^2$, and one gets a complementary density 7/10, suppressing the so-called 'dark energy problem'.

This rejection of Special Relativity could be surprising, but in fact, as explained above, general relativity must be avoided in cosmology. Indeed standard model itself gets in final a flat space with an apparent absolute time, tied to the so-called Universe age. *The two Relativities would be only local phenomena*. Indeed, physicists have now a special reference frame: the cosmic microwave background (associated to the Grandcosmos) and absolute velocity have a signification: the speed of the sun is about 369(1) km/s. An absolute clock is also known, the above cosmic coherent oscillation. *It is show in Section* 9 *that this absolute clock is tied to the CMB absolute space*.

Now, what is the meaning of the traditional expression 'expansive Universe' ? If one defines the Universe as the totality of everything, it is a contradiction, since one cannot answer the question 'in what the Universe is expanding ?' But with a separation between Universe and Grandcosmos, the situation is clearer. However, since the radius horizon is time-invariant, this means the term 'expansion ' must be replaced by 'galactic recession'. Indeed, by admitting that a repulsive force between two galaxies of mass m_1 and m_2 is proportional to their mutual distance *l*, its simplest expression is $\sqrt{(m_1m_2)}l/T$, where $T = R/c$ is the single free parameter in the steady-state model. This force corresponds to an exponential recession, and exceeds the gravitational force for a distance superior to $(\sqrt{(m_1m_2)}GT^2)^{1/3}$, which is of order 10^6 light year, i.e. the dimension of a galaxy group. *The non-reconnaissance of this simple argument led to historical misconception: Lemaître and Hubble have taken into account galaxies which belong to the Local group, and so the values of the corresponding so-called 'Hubble constant' was underestimated by an order of magnitude. By the way, the diagram presented by Hubble was anything but a straight line, and was supported by a single galaxy studied by Humason, the ex-mule driver of the Hubble observatory (Mount Wilson)* [8].

It remains to explain the considerable apparent success of the standard Primordial Big Bang theory, called 'the Λ–CDM concordance model', with a cold dark matter (CDM) and a repulsive 'dark energy' tied to a constant Λ. The aim of this paper is to show that the two cosmologies are mutually compatible, if one

replaces the Primordial Big-Bang phenomena by a very rapid Big-Bang/Big-Crunch oscillation. This model [16] was first proposed in 2011, and is thoroughly detailed here.

Section 2 is a logical reappraisal of cosmology foundations, leading to the conclusion that *a speed-limited tachyonic computing Cosmos* must be envisaged, implying a Diophantian Physics, as suggested by Poincaré.

Section 3 recalls basic *c*-free definitions, iwith proposals for horizon radius *R* and period of cosmic oscillation t_{cc}. This shows a dramatic symmetry between Newton and Fermi constants, interpreting the parity violation.

Section 4 is devoted to an overall coherence analysis of the Universe, showing that the critical condition is merely an application of standard holography principle, another raison to suppress any need for inflation, which is replaced by very rapid Big Bang/Big Crunch oscillation. This is tied with quantization of length-time and under-quantization of mass, by a factor of 4×10^{60}, a factor which is related to the vacuum energy. The later is known to be about 10^{122} larger than visible energy, this being described as the largest discrepancy of theoretical physics.

Section 5 presents the Black Atom model, showing tight connexion between micro and macro-physics, leading to the discovery of dramatic properties of the electric coefficient $a \approx 137.0359991$.

Section 6 is devoted to Holographic two-step interaction, leading to a proposal for photon and graviton masses, with a gravitational speed exceeding *c* by the ratio 2.46×10^{36}.

Section 7 presents the approach of cosmology from the view-point of a quantum system, with a model of a *gravitational* Hydrogen Molecule, with a solution for the dark matter problem.

Section 8 is devoted to the Combinatorial Hierarchy, definitely proving that physical parameters has nothing to do with chance.

Section 9 shows special holographic relations, merging in a topological axis (section 10), connected with the tachyonic bosonic string theory, so rehabilitating the later, which was precisely discarded because of its tachyonic character.

Section 11 is an introduction to Cosmo-biology.

Section 12 presents the Harmonic Principle, confirming that the fundamental laws are arithmetical.

A conclusion (section 13) resumes the misconceptions which have led to the present blockage of Theoretical Physics ans Cosmology, and recall general principles to be used in the search for the future Diophantian Grand Theory. A guide to this is given in an Appendix, connecting the Coherent Cosmology with the SO(32) superstring and the BEH scalar boson through the generalized (by Eddington and others) Dirac electron equation.

2. A reappraisal of cosmology foundations: the Coherence Principle

The usual presentation of Universe as 'an ensemble of particle in statistical *c*-limited interaction tied by differential equations' is reductionist non-sense, as shown in the following.

According to the 'Poincaré Principle', the laws of physics must be invariant [17]: this was the premonition of the very basis for the steady-state cosmology: the Perfect Cosmological Principle, extending the usual Cosmological Principle (space homogeneity) to time regularity,

More generally, the very concept of a 'physical law' implies that there is a calculus behind. This is in contradiction with the usual statistical interpretation of quantum physics, but will be confirmed by the following 'coherence analysis' (section 4). Note that Henri Poincaré was the first to show that the quanta hypothesis is the single one which leads to the Planck law [18] '*L'hypothèse des quanta est la seule qui conduise à la loi de Planck'*. Later, this specialist in differential equations claimed that Physics can no more be founded on differential equations [19] '*la physique ne peut s'appuyer sur des équations différentielles'*.

Now there are two kinds of laws: local or global. The first ones are of differential type, so sensible to boundary or initial conditions, and thus cannot be applied successfully to Cosmology, since the observable Universe is unique, as Poincaré also remarked, because free parameters would be involved [19]. The second type of laws is of conservation type, so without free parameters. For example, the energy conservation in a closed system, a phenomena which is not really understood (the classical association with an homogeneous time is not really explanation). But if one introduces a Coherence Principle, stating that a closed system is vibrating with an invariant frequency *f* (for instance a vibration matter-antimatter [16][20]), then the meaning of energy conservation is that energy is associated with frequency, a more basic concept. Now, an invariant frequency is the essential requirement to practice holography. This technique is, by far, the more efficient way to deal with information, and corresponds to global conservation laws.

Interestingly enough, independently of the present Coherence Principle, and the *arithmetic* Holic Principle of the author [20], theoretical physicists introduced a reduced 'Holographic Principle' [21], generally limited to the consideration of a single holographic unit: the Planck area. We have shown [22][23], and will extend this below, that other units enter such holographic conservation relations. In particular *the linear Planck length*, introducing the Grandcosmos, *the Universe wavelength* (justifying at once the critical condition), as well as the main particle and cosmic wavelengths,

But the essential point for applying holography have been overlooked: holography needs complete coherence of all the waves, meaning a single frequency is at work, and this is not possible if the Universe is limited by *c*, far too slow a speed to assure any coherence in the Universe.

Moreover, the so-called wave-particle dualism was never really explained. In fact matter *propagates by wave and is absorbed by quanta* (the usual sentence

'matter is both quantum and wavy' is imprecise and misleading). So, the simplest explanation is that rapid precursors analyses the situation before deciding where the quantum effect will arise [25]. So non-locality is essential in wavy mechanics. But, since physics allows only measurable quantities, even a tachyonic celerity cannot be infinite, so *one cannot understand quantum physics without involving speed limited tachyonic cosmology*. One main goal of the present article is to compute this tachyonic celerity C.

3. The fundamental formula: evidence for tachyonic sweeping

In each of the following definitions, c is eliminated [25]. Here $a \equiv \hbar c/q_e^2 \approx 137.0359991$ and $\lambda\!\!\!^{-}_e \equiv \hbar/m_e c \equiv ct_e$. Moreover, a_G and a_w are the gravitational and electro-weak analogs of a in the famous article of Carr and Rees [11]. However, these authors choose rather the gravitational force between two protons, while we consider the force between a proton and an Hydrogen Atom, which is free from electric component and will be confirmed below by involving a gravitational Hydrogen molecule (Section 7). With $r_H^{(0)}$ the bare Bohr radius:

$$r_H^{(0)} \equiv a\lambda\!\!\!^{-}_e \tag{3.1}$$

$$a_G \equiv \hbar c/Gm_p m_H \tag{3.2}$$

$$R/2 \equiv a_G \lambda\!\!\!^{-}_e \tag{3.3}$$

$$m_P^4 \equiv Mm_e m_p m_H \tag{3.4}$$

$$a_w \equiv \hbar/cG_F m_F^2 \tag{3.5}$$

$$t_{cc} \equiv \sqrt{(a_G a_w)}\, t_e \tag{3.6}$$

The elimination of c is exactly what is expected in a Coherent Universe. Indeed, this speed is clearly too small to connect a so vast space. For this reason, in order to explain the homogeneity of CMB, the standard cosmology invokes again an ad-hoc super-rapid inflation. It is of course more logical to invoke *quantum non-locality*. In fact, the above c-free electricity-gravitation symmetry has been suggested by the author as soon as 1998, but rejected by the Orsay University, on the basis of an anonymous expertise, but Jean-Claude Pecker took it seriously, and, on his recommendation, a closed draft was deposed at the French Academy of Science in March 1998. Interestingly enough, the associated time R/c, was, apart a 2 factor which is justified below, exactly the so-called 'Univers age', 18 years before its present day 0.3% precision determination. This was deduced from c-free

dimensional analysis, in the three first minutes of a sabbatical year (September 1997), but using rather the symmetrical product of electron-proton-neutron masses. This means *the simplest mandatory calculation, eliminating the Primordial Big-Bang dilemma and the associated Large Number Problem, was not made during nearly a century, containing more scientists than in all History*. This is simply due to the fact that putting $c = 1$ in formula, (even Eddington did so), any c-free dimensional analysis was excluded. Note that this catastrophic identification of the concepts of Time and Space, was denounced in advance by Poincaré, the true discoverer of 4D Relativity theory himself [26].

But, in reverse, this 0.3% *correlation means there is something right in the standard cosmology, confirming the need for a combination of the two main cosmologies as will be confirmed below by the dramatic apparition of the neutrino background field (Section 9).*

Since the Fermi constant G_F, the associated Fermi mass $m_F \approx 573007.33(25)m_e$ and the cosmic period t_{cc} are about 100 times better defined than G, this correspond to a value G' we adopt in all the following, 2 sigma higher from the tabulated value [3] $G \approx 6.6738(8)$ $kg^{-1}m^3s^{-2}$, which is a compromise between discordant measurements:

$$G' \approx 6.675455 \ kg^{-1}m^3s^{-2} \tag{3.7}$$

The corresponding value for R is

$$R \equiv 2\hbar^2/G'm_em_pm_H \equiv 2G_Ft_{cc}^2/m_e\lambda\!\!\!^{-}_e{}^4 \approx 13.8123 \text{ Gly} \tag{3.8}$$

corresponding respectively to a c-free definition and a $\hbar$-free one. Note that the first expression corresponds to a special case of Eddington's formula, see [27]: $R/2\sigma = \sqrt{N}$, with the identification $\sigma \equiv \lambda\!\!\!^{-}_H$, and $N \equiv M/m'_e$, with $m'_e \equiv m_em_p/(m_p + m_e)$, the classical reduced electron mass. This would mean that *the electron is a basic stuff in the Universe* (see the Appendix). Combined with the critical condition, this corresponds to the following symmetric multiple relation, resolving the Large Number 'Problem', and making very precise (limited by uncertainty 2×10^{-4} on W) the known fact [11] that a_G is of order W^8, where W and Z are the masses of the weak bosons by respect to the electron:

$$R/2\lambda\!\!\!^{-}_H \equiv \sqrt{(M/m'_e)} \equiv \hbar c/Gm_em_p \equiv \sqrt{(10/\pi_{Pt})} \times 2^{137} \approx (WZ)^4/2 \tag{3.9}$$

where appears neatly the famous Ptolemaeus approximation $\pi_{Pt} \approx 2 + 137/120 = 377/120$, justifying an identification. This defines a more precise value for G'

$$G' \approx 6.67545525 \ kg^{-1}m^3s^{-2} \tag{3.10}$$

This precise value is confirmed by the observation: $p_G = m_P/2^{63.5}m_e \approx 2^{12}/\sqrt{5}$, precise to 139 ppm, inducing a role of the Babylonian value $\pi_{Bb} = 25/8$. Then, a systematic search on computer shows the following ppb (10^{-9}) relation, with *p, H* and *n* the mass ratios of proton, Hydrogen and neutron, relative to the electron one:

$$\pi_{Pt}/\pi_{Bb} \approx 6\pi^5 pH^9/p_G^4 n^7 \tag{3.11}$$

Moreover, the above definitions implies the dramatic relation:

$$\sqrt{(G'G_F)} \equiv (\lambda\!\!\!^{-}_e{}^2/t_{cc})\ \hbar/\sqrt{(m_p m_H)} \tag{3.12}$$

showing two terms which are *both area speeds*, characteristic of the second Kepler law. This is significant of a sweeping construction-deconstruction of the Universe by a single point [20] (called the 'Hol'), corresponding with *zero dimension holography*. Since such a sweep is necessarily oriented, this justify at last the dis-symmetry right-left, which is called 'violation parity' in particle physics and appears also in biology.

Note that the common assertion that quantum physics is limited to the micro-physics is false since the Pauli exclusion principle enters the calculation of a star radius, via the concept of degeneracy energy. Also, considering that all atoms are identical, a natural question is the limit of a star radius when its number of atoms goes to unity, This *leads to the above redshift radius R*, a fact nobody has realized during nearly a century. The following calculation of a star radius is given by Paul Davies [28].

A ball of gas of radius *R* will remain in equilibrium if its self-gravity is supported by the combined effort of its internal thermal pressure and its electron degeneracy pressure. This will be the case if the gravitational energy by particle is comparable to the sum of the thermal energy and the degeneracy energy. For hydrogen gas this implies

$$k\theta + N^{2/3}\hbar^2/m_e R^2 \sim GMm_p/R \tag{3.13}$$

with $N = M/m_p$. At low density (large *R*), the term is small, so the temperature θ is inversely proportional to *R*. This is the case when the star first forms from a slowly contracting cloud of gas. Eventually, however, as the radius shrinks, the degeneracy term becomes important, and the temperature reaches a maximum when

$$Gm_p{}^2N/R \ \sim\ N^{2/3}\hbar^2/m_e R^2 \tag{3.14}$$

is greatest. This occurs for

$$R \sim\ 2\hbar^2/Gm_p{}^2 m_e N^{1/3} \tag{3.15}$$

which is, for N going to unity, the above redshift radius (3.3), apart a hydrogen/proton mass ratio. *So the redshift radius was present, since decades, in the astrophysical textbooks.*

It is recalled that the Eddington's prediction [27] for the number of Hydrogen atoms in the Universe is 136×2^{256}, a prediction which was largely mocked, but which is consistent with the official concordance value $T =$ 13.80(5) Gy, taking account of the above 3/10 relative density for matter, this writes:

$$M_{mat}/m_H = (3/10)Tc^3/2Gm_H \approx 2^{256} \times 136.2(5) \qquad (3.16)$$

probably the most remarkable scientific prediction in History. *So, the dark matter would be in fact ordinary matter, but as these two kinds of matter are not photon-interacting, this would mean they are vibrating in quadrature.* So the solutions of the Dark matter and antimatter problems are directly connected, see Section 7.

4. Coherence Analysis: The Computing Cosmos

4.1. The General Coherence Condition

Several authors have advanced the hypothesis that the laws of physics result from a calculation process [29]. This is sustained by the dramatic properties of cellular automates [30]. Moreover, Gerard 't Hooft has shown that quantum field theory can be adapted to deal with a deterministic cellular automaton [31]. This suggests that behind the so-called 'indeterminacy' of quantum physics, a deterministic process is at work.

This induces the following 'coherence analysis', where numerical coefficients are omitted first for simplicity.

Consider the critical Universe of radius horizon R. Filling the sphere interior with observers of virtual mass m, (recall that the vacuum is not really empty) this forms a volume referential, far more realistic than the ordinary academic three-axis frame. We define a 'coherence domain' associated to the mass m by $\lambda\!\!\!^{-}_m \equiv \hbar/cm$. The total mass is limited by the critical condition $M = Rc^2/2G$, so the number N_{obs} of observers is limited to the value $R\lambda\!\!\!^{-}_m/2l_{Pl}^2$. Note that this critical condition applies for a black hole, and is considered as a limitation for preventing a collapse. The formula is the same for the Universe, but, for the latter, *the galaxy recession prevents such a collapse*. Calling d the mean distance between observers, the number of observers is:

$$N_{obs} \sim (R/d)^3 \qquad (4.1)$$

so:

$$(Rl_{Pl})^2 \sim \lambda\!\!\!^{-}_m d^3 \qquad (4.2)$$

This General Condition will be applied in the following four ways.

4.2. The Global Coherence condition: **the 'Large Number Problem' resolved**

With the global coherence condition $\lambda\!\!\!^{-}_m \sim R$, one gets $N_{obs} \sim (R/l_{Pl})^2$, and:

$$d \sim (Rl_{Pl}^2)^{1/3} \sim 10^{-15} \text{ m} \tag{4.3}$$

a result also obtained by Y. Ng [32], but considering, with the c - limitation, the Universe as a 'greatly parallel computer'. By contrast we interpret the tachyonic Universe as coherent and sequential. The obtained length 10^{-15} m has no signification in the standard R-variable scheme, but of course, it is close to both the nuclear scale and the classical electron radius r_e. This is the origin of the Large Number Hint, considered as a 'problem' by a majority who believe in the variability of R, and introduced an ad-hoc application of a so-called 'Anthropic Principle'. Note that the radius r_e^3/l_P^2 corresponds again to an elimination of c between r_e and l_P. Moreover it writes in function of the Nambu mass $m_N = am_e$, which plays a central role in particle physics [33]. So we introduces the following radius

$$R' = 2\hbar^2/Gm_N^3 \tag{4.4}$$

the factor 2 coming from the fact that the associated critical mass is then very simple: $M' = m_P^4/m_N^3$. This radius R' is slightly larger than R, by the ratio

$$R'/R = m_e m_p m_H/m_N^3 \approx 1.31084 \tag{4.5}$$

The simplest interpretation is that R' is the holographic equivalent of the Grandcosmos behind, as confirmed in the following. As this factor is close to 4/3, this leads to the following half-sphere holographic quasi-conservation of the Bekenstein-Hawking Universe entropy:

$$S_{BH} = \pi(R/l_{Pl})^2 \approx (2\pi/3)\,(R/r_e)^3 \tag{4.6}$$

this holography defines also a wavelength $\lambda\!\!\!^{-}_{hol}$ associated to the Bohr radius r_H:

$$\pi(\lambda\!\!\!^{-}_e/\lambda\!\!\!^{-}_{hol})^2 = (4\pi/3)\,(r_H/\lambda\!\!\!^{-}_e)^3 \tag{4.7}$$

corresponding to a mass ratio $m_{hol}/m_e \approx 1853.8$, close to $(6m_F/m_e)^{1/2}$, to 0.02 %.

4.3. The One-observer condition: Critical Condition, General quantization and Universe vastness

With $N_{obs} \sim 1$, or the condition $d \sim R$, one gets

$$\lambda\!\!\!^{-}_m = \lambda\!\!\!^{-}_M = \hbar/cM = 2l_P^2/R \sim 10^{-95} \text{ m} \tag{4.8}$$

This is the Universe wavelength, of central importance, since it enters the

following *holographic form of the critical condition* $R = 2GM/c^2$:

$$\pi(R/l_P)^2 = 2\pi R/\lambda\!\!\!^{-}_M \tag{4.9}$$

The standard limitation of length to the Planck unit is toppled, as well as the limitation of the standard 'Holographic Principle', which considers only the area l_P^2.

Introducing the *General Quantification Principle: any particle of mass* $m = M/N_m$ *is a sub-multiple of the total mass* M, so the associated wavelength $\lambda\!\!\!^{-}_m$ is a whole multiple N_m of $\lambda\!\!\!^{-}_M$, this permits to extend the above holographic conservation in the following manner:

$$S_{BH} = \pi(R/l_P)^2 = 2\pi R/\lambda\!\!\!^{-}_M = 2\pi N_m R/\lambda\!\!\!^{-}_m \tag{4.10}$$

this collection of circles generates the approximation of a sphere. But, for this approach to be acceptable, N_m must be large numbers. So *the considerable vastness of the Universe receives a justification*, far better than the standard one, which states that the initial conditions for the Primordial Big Bang were adjusted to 10^{-60} or so.

Note that the characteristic mass $m_0 = \hbar/Rc \approx 2.69\ 10^{-69}$ kg is not a quantum, but a sub-quantum $m_0 = M/N_0$ of the total mass M, with $N_0 = (R/l_P)^2/2$. *This shows an interpretation of the above standard Bekeinstein-Hawking entropy, apart a factor* $\sqrt{2}$. This is sustained by the 2% formula, on a number of order 10^{61} :

$$\sqrt{S_{BH}} = (\pi/2)\hat{}(F/\sqrt{(pn)}) \tag{4.11}$$

where the exponent is the Fermi mass, relative to the mean mass proton-neutron.

4.4. The Standard Coherence condition: Grandcosmos and vacuum energy

In standard physics, the limit of a spatial dimension is the Planck length. With the condition $d \sim l_{Pl}$, one gets:

$$\lambda\!\!\!^{-}_m \sim R^2/l_{Pl} \sim 10^{87}\ \text{m} \sim R_{GC} \tag{4.12}$$

This defines a length of order the Grandcosmos radius, defined more precisely by the following way. Applying the monochromatic holographic principle to the above sphere of radius R', with l_{Pl} as the monochrome unit:

$$\pi(R'/l_P)^2 = 2\pi R_{GC}/l_P \tag{4.13}$$

this defines a radius $R_{GC} = 2R'^2/l_P \approx 6.94\ 10^{60}\ R$.

Admitting Grandcosmos is closed itself by a critical condition with a super-speed C, the uniformity of equivalent material density with the Universe implies $C/c = R_{GC}/R$. So a mass m is associated with two energies, the standard one mc^2 and

the tachyonic one mC^2, with a ratio $(C/c)^2 \sim 10^{122}$. This resolves the central problem of present-day theoretical physics: the vacuum energy, which shows itself in the Casimir effect [34], which have been checked [35], but is 10^{122} larger than visible energy. The pertinence of this Grandcosmos is assured by *the dramatic value of its volum*e, with unit length the Bohr radius:

$$(4\pi/3)(R_{GC}/r_H)^3 \approx a^a/\pi \approx (1/\ln 2)^{\sqrt{(pH)}} \qquad (4.14)$$

The simplest hypothesis is that the Grandcosmos is the source of the cosmic microwave background (CMB). Indeed, R' is directly tied to the Wien CMB wavelength, in a dramatic manner, to 0.1%:

$$4\pi (R'/l_{Wien})^2 \approx e^a \qquad (4.15)$$

This casts a *serious doubt on the general belief that a thermal field loses information.*

4.5. The field Coherence condition: CMB and Biology

With the field coherence condition $\lambda\!\!\!^{-}_m \sim d$, one gets:

$$\lambda\!\!\!^{-}_m \sim d \sim (Rl_{Pl})^{1/2} \sim 10^{-4} \text{ m} \qquad (4.16)$$

of order the Cosmic Microwave Background (CMB) wavelength, but with a significant departure which will be interpreted below, in Section 11, in liaison with an identification of some cosmic parameters with biological ones. This means:

$$N_{obs} \sim (R/l_{Pl})^{3/2} \sim (\lambda\!\!\!^{-}_m/l_{Pl})^3 \qquad (4.17)$$

Showing another generalization of the standard Holographic Principle, since the volume of the redshift sphere is involved, with unit the linear Planck length.

5. The Black Atom model

The *black atom* model [16] considers a hydrogen atom which is immersed inside a black hole of radius R_{ba}, limiting electron circular trajectories. The intermediate space is paved with spheres of radius $r_n = n\lambda\!\!\!^{-}_e$ where $\lambda\!\!\!^{-}_e = \hbar/m_e c$. and n an integer number The corresponding electron speeds are given by $\hbar = m_e r_n v_n$, implying $v_n = c/n$, so the first trajectory (n = 1) is excluded. Equating the corrected Bohr radius $r_H = a\lambda\!\!\!^{-}_e(1+1/p)$, where p is the proton-electron mass ratio, with the mean radius of the spheres, limited by $R_{ba}/\ell\!\!\!^{-}_e$ – each with probability proportional to n^{-2} – one gets:

$$r_H/\lambda\!\!\!^{-}_e = \Sigma(1/n)/\Sigma(1/n^2) \qquad (5.1)$$

Therefore, with $z \approx 0.422784335$, the complement to 1 of the Euler constant, this defines the radius

$$R_{\rm ba} = \lambda\!\!\!^{-}_e \exp[(\pi^2/6 - 1)r_{\rm H}/\lambda\!\!\!^{-}_e + z] \approx 1.4923 \times 10^{26} \text{ m} \approx 15.775 \text{ Glyr} \quad (5.2)$$

which is found to be very close to $2\hbar^2/G((ad_{\rm a}+2\pi)m_e)^3$, with the abnormal electron magnetic coefficient $d_{\rm a} \approx 1.001159652$. The number $a + 2\pi$ is very close to the canonic term of the Planck law $e^g \approx 143.3249$, where $g \equiv 5(1\text{-}e^{-g})$ is the Wien coefficient, i.e. the ratio between the nominal wavelength $hc/k\theta$ and the Wien length. This proximity with $a + 2\pi$ suggests that a is a trigonometric line, indeed:

$$\cos a \approx 1/e \quad (5.3)$$

to 22 ppm. Now a characteristic property is:

$$(ad_{\rm a}+2\pi)^3 \approx a^{3/2}m_n^2/m_e m_p \quad (5.4)$$

to 1 ppm, where appears the neutron and proton masses. So, there is a relation between $R_{\rm ba}$, R' and R, specifying the first (0.25%) approximation $R_{\rm ba} \approx (RR')^{1/2}$, where $R' \equiv 2\hbar^2/Gm_{\rm N}^3$ is the above ``Cosmic Nambu radius''. This "black atom relation" can be approximated by

$$a/\ln(2a_{\rm G}) \approx (\pi^2/6 - 1)^{-1} \quad (5.5)$$

This makes precise the following rough relation

$$a \sim \ln(a_{\rm G}) \quad (5.6)$$

justified by basic theoretical considerations, see Carr and Rees [11].

6. Holographic two-step interaction

As explained above (end of Section 2) rapid wavy precursors analyses any situation before deciding where the quantum effect will arise [23] [24]. Now, even the electromagnetic interaction is not really understood [36]. Consider for simplicity two identical system of mass m in their basic state. They are each characterized by a stationary wave, which may be seen as the sum of a diverging wave and a converging one: $s + s^*$, with $s = \exp(if2\pi(t\text{-}r/c))$, where f is the proper frequency $mc^2/\hbar$. The second system is characterized by an analogous standing wave $r + r^*$. Supposing that the vacuum is *not* empty, an hologram is formed: $(s + s^*)(r + r^*)$, which includes the *resonant* terms $sr^* + s^*r$. So, the simple presence of two systems create such an inhomogeneity in the Universe. Now, if the first system has an excess of energy, this means it is receiving an excess signal of a form

proportional to s^*. By diffraction on the above hologram it gives rise to $s^*(sr^* + s^*r)$, with resonant term r^*. Note the parallel between this holographic formalism and the unitary matrix of quantum physics, but the above argument shows that *convergent waves are of primordial importance, instead of current diverging ones*. Now the process is symmetrical, so this leads to an oscillation. This is known as the particle exchange (implying a boson with mass m_B) associated with any interaction. But it is assumed here that the boson has a tachyonic speed C_B. Now, the resonance condition is that the wavelengths are identical (in analogy with the Gabor's holographic microscopy condition [35]). So, for the electron:

$$\lambda_e = \hbar/m_e c = \hbar/m_B C_B \tag{6.1}$$

Now, the preceding Section shows the primordial importance of the ratio R/r_H, so one tries:

$$R/r_H = C_B/c = m_e/m_B \approx 2.46 \times 10^{36} \tag{6.2}$$

This could define the gravitational speed, associated with a graviton mass:

$$m_{gr} = m_e r_H/R = a m_0 \approx 3.689 \times 10^{-67} \text{ kg} \tag{6.3}$$

where $m_0 = \hbar/Rc \approx 2.69\ 10^{-69}$ kg is the Universe quantic mass (but not a quantum of mass).

By extending the argument to electroweak interaction, with characteristic mass $m_w = a_w m_e$:

$$R/r_H = C_B/c = m_w/m_B \approx 2.46 \times 10^{36} \tag{6.4}$$

this defines a photon mass:

$$m_{ph} = m_w r_H/R = a m_0 \approx 1.211 \times 10^{-55} \text{ kg} \tag{6.5}$$

The following proposition of Christian Marchal for the photon mass [38], which is associated to the cosmic oscillation, with above non-Doppler Coherent period $t_{cc} \approx 9600.60$ s, is very close to the above value:

$$m'_{ph} = \hbar/c^2 t_{cc} \approx 1.222 \times 10^{-55} \text{ kg} \tag{6.6}$$

showing a departure of only 0.9 %. Note that the present-day [3] selected maximal value for the maximal photon mass, which have not varied since 2004 [36], is 1.8×10^{-54} kg .

7. The Universe as a quantum system

7.1. The Basic Hydrogen Spectra

Three years before Niels Bohr, see [39], Arthur Haas have equalized three forms of energy, the kinetic, the potential and the quantum form *nhf* using the frequency of the electron rotation: $nhv_e/2\pi r = n\hbar v_e/r$, in a 2D circular model of an electron orbiting around a proton with the speed v_e on a circle of radius *r*. In fact, from the virial theorem, twice the kinetic energy must be considered, *s*o, neglecting at first the equivalent mass problem in this two-body system:

$$m_e v_e^2 = \hbar c/ar = n\hbar v_e/r_n \tag{7.1}$$

Where $a \approx 137.036$ is directly involved in the electric force between two elementary charges $(q_e/r)^2 = \hbar c/ar^2$ meaning $a = \hbar c/q_e^2$ (its inverse is called 'structure-fine constant', a non-central concept, contrary to general belief). Note that the official electrical charge unit (Coulomb) is completely misleading: indeed, as any electric force is a whole multiple of this unitary force, a choice of a specific unit for an electric charge is not necessary, *so an electric charge is directly related to a whole quantum number*. The so-called 'electric permittivity of vacuum' is also completely misleading. The above relations contain the Bohr quantum relation $n\hbar = r_n m_e v_e$, and lead to:

$$v_{en} = c/an \tag{7.2}$$

$$r_n^{(0)} = n^2 a\hbar/cm_e \equiv n^2 a\lambda\!\!\!^{-}_e \tag{7.3}$$

In fact Haas was the first to apply the Coherence Principle, but using the true kinetic energy, he obtained in fact twice the correct value for r_n, in particular for the bare Bohr radius $r_1 = r_H^{(0)} = a\lambda\!\!\!^{-}_e$. Note that with the mass correction, the real Bohr radius is $r_H = r_H^{(0)} \times (1 + m_e/m_p) \approx r_H^{(0)} \times (H/p)$, with *p* and *H* the electron and Hydrogen masses, by respect to the electron one.

7.2. The *Gravitational* Hydrogen Molecule

Now, consider a Hydrogen-proton couple, orbiting by gravitation on a circle of *invariant radius R*, where an electron is also circulating with speed v_e. The gravitational absolute potential energy is $Gm_H m_p/2R$, but can be written in the same form as above by introducing the 'gravitational interaction constant' $a_G = \hbar c/Gm_H m_p$. In this three-body system, the Coherence Principle gives, for n = 1:

$$v_e = c/2a_G \tag{7.4}$$

$$R = 2a_G \lambda\!\!\!^{-}_e = 2\hbar^2/Gm_e m_H m_p \approx 13.812 \text{ Glyr} \tag{7.5}$$

which is the above definition, compatible with the 0.3 % precise so-called 'Universe age' 13.81(5) Gigayears in standard cosmology [4] [5].

As explained in Section 2, this formula is, in the simplest model, that of a star radius for its number of Hydrogen atoms going to 1, so this length exists for decades in astrophysical textbooks. *Note that this induces for the values n > 1 an external Grandcosmos.*

By adding the standard critical condition, or, equivalently, the Schwarzschild radius formula of a black hole horizon $R = 2GM/c^2$, this can be written, using the reduced mass $m_e' = m_e m_p/(m_p+m_e)$, as seen above:

$$R/2\lambda\!\!\!^{-}_H = \sqrt{(M/m_e')} = \hbar c/Gm_e m_p \qquad (7.6)$$

which is, as recalled above, the Eddington's statistical formula [27]: $R/2\sigma = \sqrt{(M/m)}$, with the identification $\sigma = \lambda\!\!\!^{-}_H \equiv \hbar/m_H c$ and $m = m_e'$. This is the response to Carr and Rees, which in their famous paper [11] state that current physics cannot explain the Large Number Correlation. Note that Eddington had not recognized this very symmetric identification because, at his epoch, the Hubble radius was underestimated by an order of magnitude. Let us recall here the basic Eddington's argument: in a black hole of radius R, the position of a particle is uncertain by the length $R/2$. If one considers N particles, this is reduced by the statistical factor $\sqrt{N}$, giving a reduced length $R/2\sqrt{N}$, a length Eddington associated with the nuclear force range. The above equation shows it is rather the reduced Hydrogen wavelength. But the surprise comes from N, the *equivalent number* of electrons, as if everything in Universe would be made of electrons, or if there is only one electron whose sweep defines all the rest (see the Appendix).

Note that, in function of the Planck mass $m_P = (\hbar c/G)^{1/2}$ the above relations lead to the Machian formula:

$$M\, m_e\, m_H\, m_p = m_P^4 \qquad (7.7)$$

opening further connexion with fundamental theory.

7.3. The Quantum Universe and *Real* Matter

The above section was limited to the case $n = m_e R v_e/\hbar = 1$, but seems to product the real radius of Universe: this suggests again the existence of an external Grandcosmos.

We suppose now that the single equivalent electron is associated with a large celerity V_e which obeys the above Coherence Principle applied to the Poincaré energy Mc^2:

$$m_e V_e^2 = Mc^2 \qquad (7.8)$$

The question is 'what is the corresponding quantum number $n = m_e R V_e/\hbar$?' This

writes, taking account of the above Eddington statistical relation:

$$(n\hbar/m_eR)^2 = c^2M/m_e = (\hbar c^2/Gm_em_p)^2 \tag{7.9}$$

which shows a symmetry (*m, -m*), so expressing *the double solution matter-antimatter*:

$$n\hbar/m_eR = \pm \hbar c^2/Gm_em_p \tag{7.10}$$

Limiting to positive values, this leads to

$$n = Rc^2/Gm_H = 2M/m_H \tag{7.11}$$

which is the overall number of 'particles' electrons + protons in the sphere of radius *R*, which is a natural quantum number, widely used by Eddington [6]. This is a validation of the Coherence Principle justifying (4.1), for which an equipartition of the energy $m_eV_e^2$ among the M/m_H electrons leads to an elementary kinetic term:

$$m_e v_e^2 = m_Hc^2 \tag{7.12}$$

this implying:

$$v_e = c\sqrt{(m_H/m_e)} \tag{7.13}$$

But this is not permitted by Relativity to *real* electrons. As the liberation celerity is *c* at the periphery of a black hole, one would have rather $v_e \approx c$, i.e. a replacement of (4.1) by:

$$m_HV_e^{(r)2} \approx Mc^2, \tag{7.14}$$

showing the way the above model must be adjusted. So, consider a reduced number of real Hydrogen atoms, with density $\Omega^{(r)}_H$, the corresponding quantum number is $n^{(r)} = 2\Omega^{(r)}_H M/m_H = m_e RV_e/\hbar$, corresponding to $V_{e\,/} = 2\Omega^{(r)}_H M\hbar/Rm_e m_H$ and the kinetic term becomes:

$$m_eV_e^2 = \Omega^{(r)}_H{}^2Mc^2 \tag{7.15}$$

In order to satisfy the above condition $m_HV_e^2 \approx Mc^2$, this implies

$$W^{(r)}_H \approx \sqrt{(m_e/m_H)} \approx 0.0233 \tag{7.16}$$

So the apparently strange fact that the Universe is only scarcely occupied by ordinary matter comes from the rather large ratio of the proton-electron ratio.

Note that the above density is about half the standard 'baryonic' density value [3], but confirms the steady-state cosmology (SSC). Indeed, the SSC model have predicted a thermal background, resulting from a thermalization of stellar radiation. Taking for the Helium mass density the standard value 0.252, this means a total Helium mass of $0.252 \times 0.0233 \times M \approx 5.172 \times 10^{50}$ kg, or 7.726×10^{76} Helium atoms. For each Helium atom, the released energy is $(4m_H - m_{He})c^2 \approx 4.283 \times 10^{-12}$ Joule. Thus, the total energy is 3.309×10^{65} J, corresponding to an energy density, in the volume of the R-sphere : 3.541×10^{-14} J m^{-3}. By equalizing this with a black body energy density $(\pi^2/15)(kT)^4/(\hbar c)^3$, this leads to $\theta \approx 2.616$ K, which is sufficiently close to the CMB measured temperature 2.7255 K to confirm the above real matter density.

Now, taking $n_m = \Omega_m M/m_e$, this defines a reduced energy, by respect to Mc^2 :

$$(n_m\hbar/R)^2/m_e = (\Omega_m/2)^2 Mc^2 \quad => \quad \Omega_m' = (\Omega_m/2)^2 \approx 0.0225 \qquad (7.17)$$

which differs from the above value $\Omega^{(r)}_H \approx \sqrt{(m_e/m_H)} \approx 0.0233$ for *real* matter density by only 3.7 %.

8. **The Combinatorial Hierarchy**

The question arises: is there a direct relation between these 3 interaction constants: a, a_w, a_G ? An interesting point here is the remarkable 0.56% property of a_G :

$$a_G \approx 2^{127} - 1 \qquad (8.1)$$

which is a Mersenne prime number, belonging to the famous Catalan series, defined by a very special property, indeed $127 = 2^7 - 1$, then $7 = 2^3 - 1$, and finally $3 = 2^2 - 1$ are also prime Mersenne numbers. Now their sum is $3 + 7 + 127 = 137$, which is the entire value of a, the whole number 137 justified by Eddington. Note that his Fundamental Theory was rejected as soon as a appeared to be slightly distinct from 137. Such a rejection is of course not justified, according to the *Approach Principle, distinguishing Physics from applied mathematics* (see the conclusion).

The above series is known as the 'Combinatorial Hierarchy', which ends at the 127th power [40].

Now, 137 and a are clearly related by:

$$(137^2 + \pi^2)^{1/2} \approx 137.0360157 \qquad (8.2)$$

a 0.12 ppm approximation for a. Now π appears also in the Lenz-Wyler

approximation for the proton-electron mass ratio $p \approx 6\pi^5$. Eliminating π between these two relations leads to the discovery of

$$(137^2 + (1834/6)^{2/5})^{1/2} \approx 137.035999097586 \qquad (8.3)$$

which is compatible with the measured value 137.035999074(44).

It is interesting to look if the abnormal coefficient of the electron magnetic moment $d \approx 1.001159652$ can be limited to its first term by introducing a specific value π_d:

$$d \approx 1+1/2\pi_d a \qquad (8.4)$$

This number π_d shows a spectacular development

$$\pi_d/3 \approx 1+2/(41-1/(2\times137)) \qquad (8.5)$$

to 2 ppb: this of course cannot be chance, opening the way for further study, where 41 is the 4th term in the numerators of rational approximations of $\sqrt{2}$: 3,7,17,41. Note that the value from the 3 first terms leads to the remarkable 23 ppm Ptolemae approximation for π, which is encountered above:

$$\pi \approx 3+1/(7+1/17) = 377/120 = 2 + 137/120 \qquad (8.6)$$

while the harmonic series of order 5 is involved:

$$1+1/2+1/3+1/4+1/5 = 137/60 \qquad (8.7)$$

Here are the first harmonic numbers:

$1+1/2 = 3/2$

$1+1/2 +1/3 = 11/6$

$1+1/2 +1/3 +1/4 = 5^2/12$

$1+1/2 +1/3 +1/4 + 1/5 = 137/60$

$1+1/2 +1/3 +1/4 + 1/5 + 1/6 = 7^2/20$

$1+1/2 + 1/3 +1/4 + 1/5 + 1/6 + 1/7 = 3^2 \times 11^2/420$

showing an astounding property. If one let apart the 3, the maximal prime numbers in this series shows a recurrence for 11:

$$11: 5; 137; 7; 11 \qquad (8.8)$$

with the 7th harmonic number being 11 = 7 + 4, which is precisely the decomposition of the supergravity dimension number between 7 hidden dimensions and the 4 of ordinary space-time. Moreover, the numbers 4, 11, and 137, all being the maximal number of parts in a n-cutting process: n(n+1)/2 + 1 (for n = 3, 4, 16 respectively) are connected by:

$$11^2 + 4^2 = 137 \qquad (8.9)$$

confirming the Eddington's definition: 137 = 136 + 1 (136 was his first prediction for the electric parameter). Moreover, 4 = 3 + 1 is the canonic relativity partition of dimensions into space and time, while 11 = 10 + 1 is the connexion between 11, the supergravity dimension and 10, the superstring one.

As ancian egyptians used only unitary fractions $1/n$, they were probably aware of the special *monstrous* character of 137 (as shown above the harmonic series of order 6 and 7 produce respectively maximal prime numbers 7 and 11). Indeed, it seems that the Hypostyle Room, located between the second and third pillars of the Amon Temple in Karnak represents numbers characteristic of the above Combinatorial Hierarchy and harmonic series. On each side, there is a square of seven by seven columns, (the square of 7 is present in the 6th term of the above series), separated as 4×7 and 3× 7 groups by a transverse axis (called the royal one), which makes a group of 28 columns (the second perfect number) and a group of 21, which, with another group of 12 columns, makes 33, while 137 is the 33th prime number (the square of 33 is also present in the 7th term of the above series). So the total on each side is, by adding the 6 (the first perfect number) central columns: 28 + 33 + 6 = 67, so the total number is 134 = 7 + 127, which added with the pillar number 3 makes 137. What is also fascinating is that the two extremal huge central columns are partially immersed in the wall, as if the architect was representing 11.7, the square root of 137. This architecture is so special that there is little doubt it represents the Combinatorial Hierarchy and the above harmonic series. Moreover, the pharaoh was accustomed to pray at the intersection of the two axes, the divine one and the royal one, as if *the egypytians have devined that the following term involves a vast Universe.* Of course, egyptians could not know by themselves the law giving the order of a prime P , which is $P/\ln P$, so they probably ignored the fact that 137/ln137 is close to 28. So this number have been represented only because it is a perfect number. Also the difference between these numbers 33 and 28 is 5, which was sacred, and corresponds to the number of the free huge columns on each side. So their total is the famous tetractys 10 = 3 + 7, the precursor of 137 in the Combinatorial Hierarchy, Indeed, the sum 3 + 7 + 127 is the natural prolongation of the famous tetractys 1 + 2 + 3 + 4 = 10 = 3 + 7. Recall that Pythagoras lived 13 years in Egypt, so it is possible that this was the origin for his fascination for the tetractys:

$$3 + 7 = 10 \tag{8.10}$$

while the completed tetractis is

$$3 + 7 + 127 = 137 \tag{8.11}$$

The electrical parameter a is connected with 137, not only by the above relation to π, but also by internal relation:

$$a \approx (a/137)^{a^2} \tag{8.12}$$

or, equivalently, the relativistic factor in the first Hydrogen orbit, is, to 0.15 ppm:

$$\beta^2 = 1/(1-1/a^2) \approx lna/ln137 \tag{8.13}$$

Now, a direct relation is found involving the three large numbers directly implying the electron: a, a_w, and $P = m_P/m_e$:

$$P^{10} \approx a_w^{\,7} (\sqrt{a})^{134} \tag{8.14}$$

precise to 50 ppm. One recognizes the characteristic numbers of the CH in exponents. Now, separating 10 = 3 + 7, and 134 = 7+127, one gets:

$$P^3 (P/\sqrt{a}a_w)^7 \approx (\sqrt{a})^{134} \tag{8.15}$$

where the neutron-electron mass ratio n appears,

$$P/a_w\sqrt{a} \approx n^3 \tag{8.16}$$

precise to 90 ppm. This is a dramatic relation, undetected by standard analysis, but encountered already by a systematic elimination of c involving the cosmic Oscillation period [16].

9. Special Holographic Conservations

The following holographic expression, of type the area of a 4D-sphere $2\pi^2r^3$, involves very precisely the CMB wavelength $\lambda_{CMB} = hc/k\theta_{CMB}$, giving a temperature compatible with the measured one $\theta_{CMB} \approx 2.7255(6)$ K:

$$2^{127} \approx 2\pi^2(\lambda_{CMB}/\lambda_e) \times (\lambda_{CMB}/\lambda_H)^2 \quad => \quad \theta_{CMB} \approx 2.7258204 \text{ K} \tag{9.1}$$

this is confirmed by the following formula involving the Fermi wavelength:

$$F^5 \equiv (\lambda\!\!\!^{-}_e/\lambda\!\!\!^{-}_F)^5 \approx 6\,(\lambda\!\!\!^{-}_{CMB}/\lambda\!\!\!^{-}_e)^3 \quad \Rightarrow \theta_{CMB} \approx 2.725820(1)\ \mathrm{K} \qquad (9.2)$$

Admitting Eq. 9.3, this would permit to precise $G_F \approx 1.435850902 \times 10^{-62}$ Joule.m^3, corresponding to the following Fermi-electron mass ratio, while the present day measured value is $F = 573007.33(14)$:

$$F \approx 573007.325 \qquad (9.3)$$

It is this value we use in the following, and the corresponding CMB wavelength:

$$\lambda\!\!\!^{-}_{CMB} \approx 0.84007165 \quad \mathrm{mm} \qquad (9.4)$$

Now, the above formula $R = 2\hbar^2/Gm_em_pm_H$ may be written in terms of a 1D-2D holographic conservation:

$$2\pi R/\lambda\!\!\!^{-}_e \equiv 4\pi\lambda\!\!\!^{-}_H\lambda\!\!\!^{-}_p/l_P^2 \qquad (9.5)$$

while the connexion with $l_{cc} = ct_{cc}$ permits to add a 4D term implying both the Fermi wavelength and the CCO one. Moreover, another 4D term involves neatly both the CMB and neutrino wavelengths (CNB), through their characteristic ratio $11/4 \equiv (T_{CMB}/T_{CNB})^3$ being the cube of their temperature ratio:

$$2\pi R/\lambda\!\!\!^{-}_e \equiv 4\pi\lambda\!\!\!^{-}_H\lambda\!\!\!^{-}_p/l_P^2 \equiv 4\pi((\lambda\!\!\!^{-}_F l_{cc})^{1/2}/\lambda\!\!\!^{-}_e)^4 \approx 4\pi(\lambda\!\!\!^{-}_{CMB}/\lambda\!\!\!^{-}_e)^4 \times (11/4)^2\, p6\pi^5/H^2 \qquad (9.6)$$

precise to 0.1 ppm. This calls for a 3D holographic term, which dramatically gives the CMB nominal wavelength alone in function of the Hydrogen molecule one (which was the starting point):

$$2\pi R/\lambda\!\!\!^{-}_e \equiv 4\pi\lambda\!\!\!^{-}_H\lambda\!\!\!^{-}_p/l_P^2 \approx (4\pi/3)(\lambda\!\!\!^{-}_{CMB}/\lambda\!\!\!^{-}_{H2})^3 \qquad (9.7)$$

Note that this corresponds, one more time, to an elementary c-free calculation: *starting from the constants G, ħ, and the characteristic energy $k\theta_{CMB}$, one gets a length close to the Hydrogen wavelength, with a geometric factor 8/3 appearing, inducing directly the above holographic relation*.

Looking for a 5D term leads to the discovery of the dramatic relation:

$$R/\lambda\!\!\!^{-}_e \approx (2\pi^2 a^3)^5(H/6\pi^5) \qquad (9.8)$$

where $2\pi^2 a^3$ is the area of the 4-sphere of radius a, which is also the product of the

perimeter by the area of a disk of radius a, which is *a characteristic of 4D space*. The dramatic correcting factor, involving the Hydrogen-electron mass ratio H and the Lenz-Wyler approximation $6\pi^5$ for the proton-electron mass ratio confirms the above specified value G', to 0.3 ppm, and a factor π is eliminated:

$$6R/\lambda\!\!\!^{-}_{e} \approx (2\pi a^3)^5 H \approx \exp(2^{26/4}) \tag{9.9}$$

showing the appearance of the tachyo-bosonic dimension 26, with 1.6 ppm precision (see the following section 10).

According to the Holic principle the 210D term (where $2\times3\times5\times7 = 210$) could be pertinent. Indeed with the central constant $k = 2R/R' = 2a^3/pH$, *with a deviation of 15 ppm on k, which must be so an important mathematical constant:*

$$R/\lambda\!\!\!^{-}_{e} \approx (k)^{2\times3\times5\times7} \tag{9.10}$$

Another geometric dramatic property is:

$$\pi R R_{Ed}/\lambda\!\!\!^{-}_{e}{}^2 \approx \pi^{12\times13} \tag{9.11}$$

precise to 4.5 ppm. As $(R/\lambda\!\!\!^{-}e)^2 \approx 2^{256}$, this means a relation between powers of 2 and π. In fact 137 appears in:

$$2^{1/155} \approx \pi^{1/256} \approx (2\pi)^{1/3\times137} \approx (2p)^{1/p} \tag{9.12}$$

in the last relation 137 is replaced by 137.0365, a good approximation for a. This example shows how the considerations of cosmic quantities help to connect the physical parameters.

Note that the invariance of cosmical temperature may be obtained in a second c-free dimensional analysis: starting from the Fermi constant G_F and the quantum cosmic energy $\hbar c$/R: this leads to the nominal thermal background wavelength, apart a canonic factor 10, surely connected with the above canonic factor 10/3.

Moreover, the c-free length defined from $\hbar$, G and the Universe mass density, is, within the geometrical factor $\sqrt{(8\pi/3)}$, very close to $\lambda\!\!\!^{-}_{e}{}^2/l_P$ corresponding to a new symmetry between G and G_F:

$$\lambda\!\!\!^{-}_{F}\, a_G\{m_e\} \equiv \lambda\!\!\!^{-}_{F}\hbar c/Gm_e^2 \approx \sqrt{(8\pi/3)}R \approx 9R'/4 \tag{9.13}$$

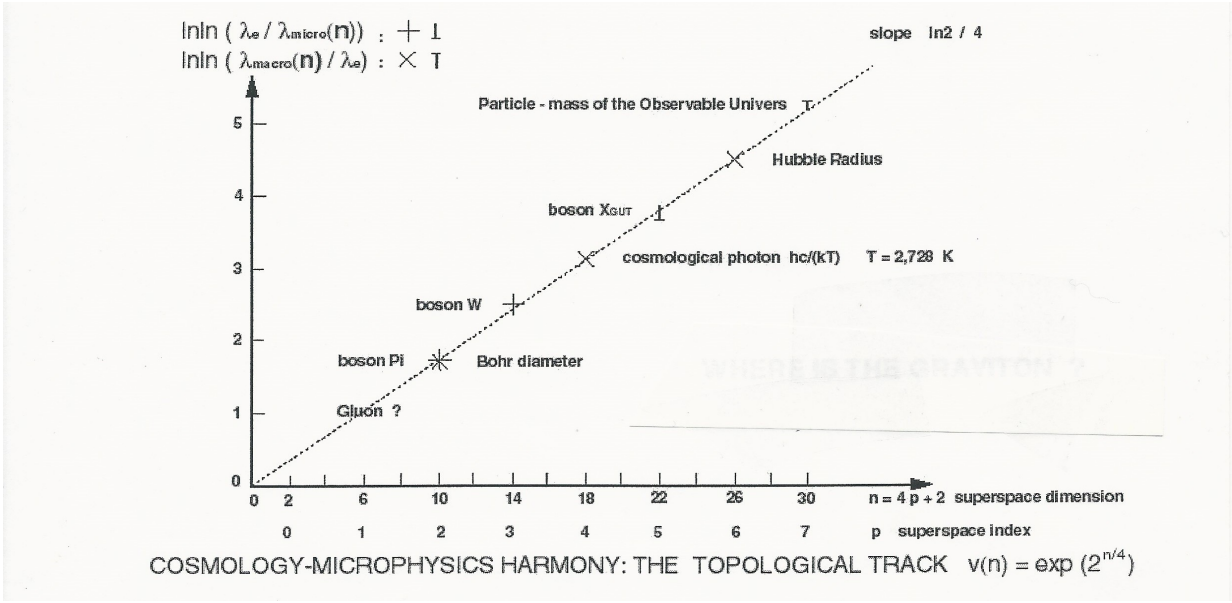
this is tied to the discovery of the 10^{-4} precise relation:

$$8\pi/3 \approx (3Z/2W)^4 \tag{9.14}$$

So, the simplest technique, the dimensional analysis, proves the temporal invariance of both the horizon radius, the background temperature and the mean density. so the return to the Perfect Cosmological Principle is directly justified.

10. The Topological Axis

It is difficult to represent the large numbers of macro and micro-physics on a single graph, even with normal logarithmic scale. But double logarithmic representation leads to the following regularity, which resume the main above holographic conservations. The surprise is that *the numeration of the large numbers appears to be the special dimension series of string theory:*



Topological Axis : double logarithm of large numbers appearing in micro and macro-physics. The x - axis numeration shows the string theory special series [38].

By alternating micro and macro-physical numbers, the holographic relations show the series:

$$\lambda\!\!\!^{-}_e/d \sim (R/\lambda\!\!\!^{-}_e)^2 \sim (\lambda\!\!\!^{-}_e/l_X)^4 \sim (\ell\!\!\!^{-}/\lambda\!\!\!^{-}_e)^8 \sim (\lambda\!\!\!^{-}_e/l_W)^{16} \sim (l_{at}/\lambda\!\!\!^{-}_e)^{32} \sim (\lambda\!\!\!^{-}_e/l_{Gl})^{64} \sim (t_{string}/\lambda\!\!\!^{-}_e)^{128} \sim 2^{256}$$

The two first relations are well-known (Weyl, Eddington, Dirac). The third one, implying the CMB is noted by Davies [28]. The forth, implying the intermediary boson is signaled by Carr and Rees [11]. According to Green et al [41] '*In string theory diffeomorphism anomalies arise from chiral fermions and only exist if*

space-time has 4p + 2 dimensions': it is precisely this series which appears in the horizontal axis. Note that the gauge bosons W and X have odd p-numbers. Extrapolating to p = 1, this predict a mass for the Gluon, about 10 m_e. For p = 7, the 'topon', whose mass is that of the Universe, would be a new gauge boson, probably tied to the force that repel galaxies. Note these gauge bosons show a periodicity Δn = 8, recalling the famous Bott 8-periodicity [42] (In mathematics, the topology of the orthogonal group has a mod 8 periodicity called Bott periodicity).

According to Joseph Polchinski [43] '*A key feature of string theory is that it is not consistent in all space-time backgrounds, but only in those satisfying certain conditions. For the bosonic string theory in flat space-time, the spectrum is Lorentz-invariant only if the number of space-time dimensions is D = 26.... if D> 2: the state is a tachyon.*' The point n = 26, the characteristic dimension of bosonic string theory, relies with the Hubble radius, by: $\exp(2^{26/4}) \approx 6R/\lambda\!\!\!^{-}_e$ (0.066%).

The point n = 10, characteristic of superstring theory [38], which have been preferred to the bosonic string theory for its suppression of tachyons, shows a remarkable micro-macro-physical symmetry, since it shows both the Hydrogen atom and the Pion, a non-gauge bososn.. Extending this symmetry to the point n = 30 (the bosonic 26 + 4 of normal space-time), this predicts a Grandcosmos, correcting the general asymmetry of the scheme.

11. Cosmo-Biological Relations

For explaining a number of correlations between physical parameters, many invoked an Anthropic Principle, a non-scientific argument opening the way to the Multiverse conundrum. In fact, interestingly enough, tenants of the Anthropic Principle has not seen that some biologic constants are closed to physical ones. For instance, consider the DNA anhydrous nucleotides masses, in m_H units :

A- anhydrid desoxyadenosine monophosphate (anhydrid dAMP) $A \approx 310.78$
G- anhydrid desoxyguanosine monophosphate (anhydrid dGMP) $G \approx 326.65$
C- anhydrid desoxycytidine monophosphate (anhydrid dCMP) $C \approx 286.93$
T- anhydrid desoxythymidine monophosphate (anhydrid dTMP) $T \approx 301.84$

These masses enters the following 3×10^{-5} precise relation

$$A + T = G + C - 1 \qquad (11.1)$$

As each bi-codon of the DNA chain is composed of 3 couples from the dual choice AT or GC, this means the bi-codon mass is about an invariant, differing by ±1H, 2H, 3H. This *essential fact is apparently not noticed by biologists: indeed, the necessary term 'bicodon' is absent of present-day nomenclature.*

The mean bicodon mass is:

$$6(A + T + G + C)/4 \approx 1839.3 \approx m_H/m_e \tag{11.2}$$

precise to 0.1 %, so:

$$m_{bc} \approx m_H^2/m_e \tag{11.3}$$

Note that the Fermi mass is 311.8996 m_H, close to the mean nucleotide mass, showing a connexion between Biology and Particle Physics, which share another common point: the parity violation.

Interestingly enough, c-free dimensional analysis starting from $\hbar$, G, t_{cc}, leads to the Balmer wavelength, and from $\hbar$, G, $2l_{cc}$, leads to the above quasi-invariant DNA bicodon mass, to 0.7%:

$$\hbar^2/Gm_{bc}^3 \approx 2l_{cc} \tag{11.5}$$

So the DNA is directly connected with the absolute cosmic clock of period t_{cc}.
Now, consider the mammal temperature $\theta_{mam} \approx 310$ K, and the triple point temperatures of Hydrogen $\theta_{H2} \approx 13.83$ K, Oxygen $\theta_{O2} \approx 54.33$ K, and water $\theta_{H2O} \approx 273.15$ K. They are connected by the 1% precise relations:

$$\theta_{H2} \times \theta_{O2} \approx \theta_{H2O} \times \theta_{CMB} \tag{11.6}$$

Moreover, in the relation

$$a/(1+\ln a) \approx e^{\pi} \tag{11.7}$$

the Steinheimer scaling factor [44] appears: $j \equiv 8\pi^2/\ln 2 \approx a - e^{\pi} \approx e^{\pi}\ln(a)$, which enters the canonical form

$$(R/r_H)^{1/2} \approx e^{j/e} \tag{11.8}$$

and one observes:

$$\theta_{mam}/\theta_{CMB} \approx j \tag{11.9}$$

Moreover, the symmetry between the Universe and Nambu radius is reinforced by considering the wavelength associated to the mammal and triple point water temperatures $\lambda_{mam} \equiv hc/k\theta_{mam}$, $\lambda_{H2O} \equiv hc/k\theta_{H2O}$:

$$(R'l_{Pl})^{1/2} \approx \lambda_{H2O} \tag{11.10}$$

$$(Rl_{Pl})^{1/2} \approx \lambda_{mam} \tag{11.11}$$

precise respectively to 0.1% and 1%. Recall that temperature is noted by Schrödinger [45] to be an essential parameter for Life (tied to the mutation rate). Indeed the mammal temperature is the same for the polar bear and the African antilop, which means apparently a large waste of energy [46]. But *it seems here that the Water molecule and the mammal organism are even more important, from a cosmical computer point of view, than the CMB*. This is not a come back to the anthropomorphic Anthropic Principle, but rather its inversion, *the Cosmos would use human calculators to help in its computational research*: this is the natural answer to the basic question: 'why do we ask questions ?'.

The 20 amino acid masses are, in unit of Hydrogen mass, 088.40 ALANINE, 131.09 ASPARAGINE, 132.07 ASPARTIC ACID, 120.21 CYSTEINE, 074.49 GLYCINE, 130.15 ISOLEUCINE, 130.15 LEUCINE, 114.24 PROLINE, 104.27 SERINE, 118.19 THREONINE, 116.24 VALINE. Their mean value is 114.34. The masses of the 9 other *normal* amino acids are 172.85 ARGININE, 145.02 GLUTAMINE, 145.99 GLUTAMINIC ACIDE, 153.96 HISTIDINE, 145.05 LYSINE, 148.05 METHIONINE, 163.91 PHENYLALANINE, 202.64 TRYPTOPHANE, 179.78 TYROSINE,

The mean value of these 20 normal amino-acids is:

$$<\text{normal amino-acid}>_{arith} \approx 135.75 \qquad (11.12)$$

while their geometric mean is

$$<\text{normal amino-acid}>_{geo} \approx 132.40 \qquad (11.13)$$

Now, adding the two 'proteinogen' amino acids of masses 166,74 SELENOSYSTEINE and 253.33 PYRROLYSINE the means values of the total of the 22 amino-acid are:

$$<\text{amino-acid}>_{arith} \approx 142.50 \qquad (11.14)$$

close to e^g within 0.3%, while their geometric mean is

$$<\text{amino-acid}>_{geo} \approx 137.71 \qquad (11.15)$$

So, one observes :

$$<\text{normal amino-acid}>_{arith} + 1 \approx <\text{amino-acid}>_{geo} - 1 \approx 136.7 \qquad (11.16)$$

These observations confirm that the masses play a direct role in Biology.

12. The Harmonic Principle

Following the old tradition of Pythagoras, the Harmonic Principle states that there is a connection between canonical large numbers appearing in Music and the physical parameters. In the Jeans classification [47] of best musical scales, obtained by the so-called 'continuous fraction' analysis, there are, following the 12 degrees of occidental music, the numbers of notes 41; 53; 306;...

Note firstly that the occidental music involves the large number correlation : $2^{19} \approx 3^{12}$, which prolongates, by introducing the golden number ϕ:

$$2^{19} \approx 3^{12} \approx \phi^{137/5} \tag{12.1}$$

Many authors have tried, without notable success, to connect the golden number $\phi = (1 + \sqrt{5})/2$ with musical scales. Thus, the ancestral problem of connecting the golden ratio with music is resolved, simply by introducing the number 137. This is not a unique property of occidental scale, since this introduces the large number associated to the old Han Chinese scale $3^{60} \approx \phi^{137}$, which is very close to a large integer, noted already for his very special properties [18]. Moreover, the 5th harmonic ratio 137/60 appears in the relation between ϕ and 3, the optimal integer base (the closest to e):

$$3 \approx \phi^{137/60} = \phi^{1+1/2+1/3+1/4+1/5} \tag{12.2}$$

Note that the number 3 correlates also very precisely with the ratio F/a, where F is the Fermi/electron mass ratio

$$3 \approx (a/137)^{F/a} \tag{12.3}$$

It is well known that musician experts divide the tone (about the sixth part of the octavos) into 9 commas, 4 forming a minor semi-tone, 5 forming a major semi-tone só leading to a $9 \times 6 = 54$ commas in the octave. But the Hindustan scale, with 53 notes, is more precise, so the perfect number 6 is obtained at the 137th note:

$$2^{1/53} \approx 3^{1/84} \approx 6^{1/137} \tag{12.4}$$

Thus, 137 is really present in advanced occidental music, where a 'comma' is distinguished by violinists. But the presence, in the following scale of the number $306 = 1836/6 \approx \pi^5$ is even more dramatic, when expressed by the associated large number 3^{306}:

$$3^{1836/3} \sim 137^{137} \sim \exp(e(2\pi)^3) \tag{12.5}$$

Recall that a^a appears neatly in the Grandcosmos volume. Now the operational definition of the optimal base e is that $e^{1/e}$ is maximal, and 3 is the nearest whole number from e. It is known in computer theory that the calculation base 3 would be far more efficient that the base 2, but there are many technical problems. Now:

$$\exp(e(2\pi)^3) \approx a^a \tag{12.6}$$

defines a within 24 ppm. In a letter to Christian Goldbach, 17 april 1712, Gottfried Leibnitz writes "Musica est exercitium arithmeticae occultum nescientis se numerare animi" (Music is a secret exercise on numbers). Let us precise this by arguing that the brain is a multi-base computer, mainly using the bases 2, 3, 5 and 137, which appears in the harmonic series of order 5. The above relation suggests that a is even a better base than 137.

Note that physical parameters shows arithmetic properties which are of no direct musical pertinence. For instance one observes:

$$R/\lambda\!\!\!^{-}_e \approx 2^{128} = 2\text{^}(2\text{^}7) \tag{12.7}$$

$$R'/\lambda\!\!\!^{-}_e \approx 27\text{^}27 = (3\text{^}3)\text{^}(3\text{^}3) \tag{12.8}$$

exhibiting 'economic numbers', i.e. large numbers depending only on one or two small numbers. The first one is correct to 0.6%, and connects directly with the last term of the Combinatorial Hierarchy [37]. The second one is even more precise, showing a 0.03 % precision. Thus, the symmetry between the two radius R and R' is confirmed, in connection with the two main whole bases 2 and 3.

The canonic ratio R_{GC}/R shows also such a singularity, to 2%:

$$R_{GC}/R = C/c \approx 3\text{^}(2^7\text{-}1/2) \tag{12.9}$$

all this cannot be due to chance, and call for further analysis, in the search for a Grand Diophantine theory.

13. Conclusions

This study resolves the main problems of Cosmology, and debunks Theoretical Physics. It is concluded that the 20th century Physics has been blocked by basic misconceptions: reductionism, formalism, undeterminism, anti-tachyonism and anti-Pythagorism.

Note firstly that the bosonic string theory was unduly rejected for its tachyonic character, and is thus here strongly rehabilitated.

The reductionist credo is to consider the Universe as merely 'an ensemble of

particles in *c*-limited probabilistic interaction', resulting in a separation between scientific domains, in particular an isolation of Biology. By opposition, *the holistic approach* unifies all scientific domain, including Biology: even *micro-physics cannot be understood without involving cosmology*, en-lighting the famous problem of hidden variables (indeed, experiments show that the latter cannot be local). The arguments in favor of a liaison Computing Cosmos - Biology are so strong that Universality of intelligent life is predicted. The answer of the Fermi question 'Where are they', being of course that they are not interested to communicate with 'pre-civilizations'.

The excess of reductionism led also to the general belief that cosmology is the most difficult scientific domain. It is shown here, quite the contrary, that it is the simplest, as proved, in particular, by the above 'Black Atom' model.

The formalist misleading credo is to mix Time and Space, putting $c = 1$ in the formula, so avoiding to recognize that elementary dimensional analysis proves the temporal invariance of both the Universe horizon, the mean Universe density and background temperature. Anyway, formalists consider dimensional analysis as sterile numerology, because there is no theoretical explanation for its incredible efficiency, apart the author analysis, leading to the Holic Principle [18], a *Diophantine* prefiguration of the Holographic Principle, supposing that the ultimate pertinent mathematical domain is *arithmetics*, meaning a quantization of mathematics itself (a return to Pythagoras). In particular the general belief of 'continuity' is no physical, since it corresponds to infinity, which is not in principle measurable. So, in parallel with a Coherence Principle, the model of a very rapid universal construction-deconstruction imposes itself from the start.

While general interpretation of quantum physics is of statistical nature, *our deterministic view-point is that Cosmos has no choice: the origin of the physical laws is pure calculus*. So the hazardous Darwin evolution by micro-mutations is nonsense, since an organism is a whole entity, so macro-mutations must be the rule: indeed observation shows a systematic lack of intermediate forms. The present study proves that $a \approx 137.036$ must be considered as an optimal computation basis. Indeed the Grandcosmos volume is precisely $r_H^3 \times 137.036^{137.036}/\pi$. *The search for optimal basis would be a guide for future Theoretical Physics, as well as future mathematics.* Indeed, note that *a* has not been identified by present-day mathematics, but its proximity with the egyptian monster 137 (a number justified by Eddington) clearly indicates that *a revolution in arithmetics is on stage.*

Dimensional analysis and Holographic Principle are tied together, and directly leads to an overall quantization of space-time (a reduction of Planck units by a factor 10^{61} and the concept of Grandcosmos (an extension of Universe radius by the same factor). This opens the way for selecting the right theoretical formalism.

It is known that one main problem in connecting quantum physics with Relativity is the very nature of Space-time. The present analysis shows the complete victory of quantum physics, with elimination of Relativity at the

Universe level. And this, to the point that the time itself is quantized, in conformity with the Pythagoras dogma 'all is whole number' and that holographic cosmology is reduced to properties of Circles and Spheres: a realization of Platon's dream.

The very nature of any interaction has been replaced in a cosmic context, and leads to a proposal for graviton and photon masses. Note that the misconception of a 'propagative photon' led De Broglie to the vain research of a 'double solution', and Einstein to propose that hidden *local* variables exist, which was, *of course*, refuted by experiment. Some consider this is a triumph for Bohr' s completeness, but thus is itself reductionism nonsense, because it does not include *the cosmos, the obvious source of hidden variables*, in a necessary holistic approach.

This study was principally initiated by a simple idea: conservation of geometric forms of different dimensions, by analogy with the holographic technique. This leads to very precise relations between the canonic physical ratios. As these numbers are not recognized by any mathematical fields, the standard thinking is to attribute them to chance, for instance at the occasion of a primordial Big Bang, and, in order to explain the relations between them, by invoking a multitude of Universes, called the Multiverse. But we have gone further, showing that these relations are connected with the determination of approximations for $\prec$, and a liaison with the special series of dimensions in string theory, with emphasis to the bosonic special value $n = 26$ and the superstring one $n = 10$. This means the ancestral idea of a unique Universe should be restored, with the existence of a Grand Theory, which must be connected with the Eddington Fundamental Theory, since the latter predicted correctly the number 136×2^{256} of atoms in the material part of the Universe (see the Appendix). Note that holographic conservations could not occur in an Universe with variable radius, so the refutation of the Primordial Big Bang cosmology is a necessity. But note also that intriguing common points have been found between the two cosmologies, leading to the hypothesis of a 'Permanent Big Bang', an oscillation matter-antimatter with hight frequency (10^{104} Hz).

In fact, the holographic relations seems to reveal more than a simple geometric analogy. Indeed the associated 'Coherence Principle' can be related to the fact that holographic technique use a coherent, i.e. mono-frequency radiation. Considering that holography is the designated role of coherent waves, it may be deduced that all waves associated with particles have a mutual coherence. This is the signification of the Coherence Principle: in the Coherent Cosmology, a single frequency is at work, $f = h/E \approx 10^{104}$ Hz, and can be associated with matter-antimatter oscillation, which suggest to define 'dark matter' as oscillation in quadrature. This connects with some de Broglie considerations about the relation electron-positron, as noted independently by Jean Maruani [48].

From the same value of the horizon radius, with the 10^{-6} precise Fermi constant on one hand and the gravitational one on the other hand, this permits to propose a more precise value for the latter (G), and show a dramatic relation between the Newton and Fermi constants confirming the sweeping aspect of the cosmic 10^{104}

Hz disintegration-reintegration giving at last an explanation for the parity violation in micro-physics and biology.

This leads to the idea of a computing Universe, using the mysterious physical parameters as optimal calculation basis. This answers the question 'why do we ask questions ?' Animals and human beings would be peripheral calculators of Cosmos. But, as infinity of events is excluded, this must be periodic, so there would be only one cyclic History. Thus, the 'indeterministic' interpretation of quantum mechanics would be replaced by an hidden deterministic calculation. The famous 'hidden variables' would be in fact the rest of the Cosmos, and, of course, are subject to the quantum non-locality. But strict non-locality is also excluded, because it would involve an infinite velocity. So we have proposed that a super-celerity is at work, about $10^{61}c$.

So, the whole science seems to need a complete reformulation, based on the following principles, which are neither exhaustive nor mutually independent, which come after the very basic one of Physics, the ZERO PRINCIPLE: *the Approach Principle: one can learn something without the need to know everything:*

1. General Quantification Principle: the physical laws are arithmetical ones, excluding both infinity and continuum concepts. As Kronecker said 'God invented whole numbers, but humans defined all the other sorts of numbers'. One may add the prediction of an ULTIMATE ARITHMETICS PRINCIPLE : Nature uses an yet unknown optimal *inductive* arithmetics, so justifying the Approach Principle.
2. Perfect Cosmical Principle: The laws of physics are the same everywhere and every time (a spatial generalization of Poincaré's Principle) implying the steady-state cosmology,
3. Cyclic Principle : all the events reproduce themselves with a periodicity multiple of $T = R/c \approx 13.812$ Gyr,
4. Ambivalence Principle: a physical phenomena can be explained by very different models.
5. Coherence Principle: an unique frequency governs each phenomena, including the Universe, a DNA chain, a biological cell, or a whole organism.
6. General quantization Principle: the universe with energy E is vibrating with a periodicity $t = h/E = 2t_P^2/T$. The period of the vibration matter-antimatter of each particle is a whole multiple of $t_{..}$ Equivalently its mass is a whole sub-multiple of total equivalent mass $M = Rc^2/2G$.
7. Tachyonic Principle: there is a quasi- invisible tachyonic world, with speed $C = cR_{GC}/R \approx 6.94\times10^{60}\ c$, associated with the quantum vacuum.
8. Generalized Holographic Principle: Holographic conservations (in fact dimensional transferts) are the fundamental physical laws.
9. Grandcosmos Principle: an external thermostat is the source of the CMB and CNB, with radius $R_{GC} = R'^3/2l_{Pl}$.

10. Computing Principle: the numerical constants are computation basis in a calculating Cosmos.
11. Harmonic Principle: numerical physical constants are connected with musical numbers.
12. Immergence Principle, or Inverted Anthropic Principle. Life helps cosmic computation: biological parameters are tied to cosmic ones.

Leaving apart the far-reaching philosophical consequences of *this refutation of the Primordial Big Bang hypothesis, with, in particular, the definitive refutation of any global universal evolution or the non-scientific Multiverse concept,* this study leads to dramatic observational predictions, *(a*) by selecting *the true cosmic redshifts*, the recession time must be identified with the period T (which is no longer any age), corresponding to the recession constant 70.79 km s^{-1} Mpc^{-1}, *(b)* the far-field galaxies, in average, could present the same features as near field ones, with identical physical characteristics (notice it is already supported by "abnormal" old galaxies, and even groups of galaxies, in the deep field), *(c)* the existence of young galaxies in the near field (in this respect the observations of Halton Arp must be revisited), *(d)* the identical CMB temperature everywhere, *(e)* the Wolf solar cycle $(Tt_{cc}^2)^{1/3}1/3 \approx 11$ yr and the large climatic period, $(T^1t_{cc})^{1/3}1/3 \approx 400000$ yr, might be present in other celestial objects (e.g., a cycle of 11.4 yr has been already detected in the monstrous blazar OJ 287) [49]. *(f)* a mass for gluons, which is not excluded by theory [50] is predicted, about 10 electron mass. (g) a specified value for G is proposed, in the ppm range. (h) the galaxy recession is exponential**,** meaning that the acceleration is itself accelarated.

Acknowledgments. The author is indebted to Oya Sanchez, Valery Kotov, Jean-Claude Pecker, Cynthia Whitney, Christian Marchal, Christian Bizouard, Roland Lefebvre, Grigori Tomski, Christiane Bonnelle, Dominique Weigel, Christian Velpry and Ivan Todorov for stimulating discussions. He is especially indebted to Jean Maruani for his encouragements and criticisms and for having him invited to QSCP meetings in Taipei QSCPIX and Varna. The present work was presented at the QSCPXX, Varna, 16 September 2015. Thanks also to Denis Gayral for informatics assistance.

Appendix. After the Varna meeting, (September 2015), it was realized in November that the first role of the equivalent number of electron, in the Eddingtonian canonic relation:

$$R/2\lambda\!\!\!^{-}_H = \sqrt{(M/m_e')} = \hbar c/Gm_e m_p \qquad \text{(A.1)}$$

would mean that *cosmology would be tied to the properties of a single electron* (m_e' is the electron reduced mass in the Hydrogen atom), as if a single electron was describing the whole Universe. This would justify the principle of identity between

electrons. This idea of an Universe described by the sweep of a single electron was advanced by Feynman [51], based on the possibility for the electron to go backwards in time by transforming in positron. Wheeler argued '*in that case there would be the same quantity of matter and antimatter*'. So, Feynman abandoned this idea. But the objection of Wheeler was not valid, since it suffices that ordinary matter is in fact a matter-antimatter oscillation [16]. Now, the Eddington number $N_{Ed} = 136 \times 2^{256}$, which gives with accuracy the number of Hydrogen atoms in the material part (3/10) of the Universe, shows clearly that cosmology is tied to the Eddington matrix 16 × 16. Indeed 136 is the symmetric term in $16^2 = 256 = 136 + 120$, the natural decomposition of the matrix. This was a generalization of the Dirac matrix 4 × 4 (see [52]). So it is asked if the following number *x*, defined by

$$N_{Ed} = 136 \times 2\text{^}256 = x \text{ ^ } 256^2 \qquad (A.2)$$

could be tied to particle properties. Indeed, one observes :

$$x \approx \sqrt{(6p^5 H)}/p_G \approx (p/p_G)(a/137) \qquad (A.3)$$

where $p_G = \sqrt{(\hbar c/2^{127} G')}/m_e \approx 1831.531$, confirming the chosen value, in the principal text for the value of G'. Indeed, due to the exponent $256^2 = 2^{16}$, a 10^{-4} variation on G' would means a final deviation of several hundreds. Now, as explained in [52], the generalization of Dirac equation leads to a space-time matter of 5 dimensions, so corresponding to the superstring SO(32) group, a 496-dimensional manifold. Now, the scalar boson mass is close to 496^2 times the electron mass, and one observes :

$$496^2 = 134 \times 1836 - 8 \qquad (A.4)$$

A research of maximal correlation defines a value close to 495.84, corresponding to 125.620 Mev. Now, considering the modified separation of 256 = 137 + 119, one observes that

$$2 \times 119^2/137 \approx 206.73 \qquad (A.5)$$

giving the muon mass ratio to $2\ 10^{-4}$. By extrapolating to the symmetric 25 × 25 matrix, this defines a number close to 2*a*:

$$299^2/326 \approx 2aH/p(H\text{-}p)^2 \qquad (A.6)$$

precise to 0.4 ppm. Now introducing 137 in the decomposition: $25^2 = 137 + 488$,

one observes this gives the tau mass :

$$2 \times 488^2/137 \approx 3476.55 \qquad \text{(A.7)}$$

precise to 2.5 10^{-4}. So, the above principles lead, via cosmology, to a reappraisal of superstring theory. Pursuing the generalization, one can wonder if the number 6^4 would play a role. Indeed, one observes :

$$32^2 + 2 \times 136 \quad = \quad 6^4 \quad \approx \quad 1834.421 /\sqrt{2} \qquad \text{(A.8)}$$

$$32^2 + 2 \times a \quad \approx \quad 1835.751 /\sqrt{2} \qquad \text{(A.9)}$$

where appears the number $p^2 d_a/n \approx 1836.7515$, where d_a is the electron magnetic coefficient 1.001159652. This shows a transition from 136 to a, comforting the Eddingon's approach. Looking for a property the Eddington's ratio $\beta\pi = 137/136$, pone observes that the number 5^4 is a new time involved :

$$137/136 \approx \pi\text{^}(4/5^4) \approx 3\text{^}(1/150) \qquad \text{(A.10)}$$

while:

$$3\text{^}(1/150) \approx a/(a - 1) \qquad \text{(A.11)}$$

to 27 ppb: this of course have a vanishing probability to be chance. This confirms that a is a mathematical constant tied to a future progress in arithmetics. Contrary to the present-day tendency of theorists to include known mathematical models in physics, it is the contrary that must be done: *invent new mathematics to match physics.*

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