From Coherent Cosmic Oscillations to the Steady-State Cyclic Ultrafast-Reconstructing Universe.

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Abstract. A Coherent Quantum Cosmology resolves the main cosmical enigma: Large Number correlations, dark matter, baryon density, vacuum energy. This is obtained from a non-reductionism analysis of data, and taking account of the Eddington's Fundamental theory and the non-Doppler cosmic oscillations with period t_{cc} = 9600.606(12) s. The absence of Doppler effect (apart dephasages) induces the Tachyonic Principle: the world is divided in the *c*-visible part and a weakly interacting tachyonic one. In a gravitational Hydrogen Molecule, the Coherence Principle (identifying the ratio energy/h to an unifying frequency) gives the redshift (or Hubble) radius compatible with *cT*, where $T \approx 13.80(4)$ Gyr is the standard so-called Universe age. This model introduces an external Grandcosmos, considered as the source of the microwave background, the lacking element of the steady-state cosmology, and is tied to the vacuum energy, explaining its relative density about 10^{120}. In the critical Universe, classical and quantum energies egalise, in a new application of the Coherence Principle, and the Eddington's Number 136×2^{256} of hydrogen atoms gives a baryon energy density related to the black matter one by $\Omega_b \approx \Omega_m^2/2 \approx 0.045$. With $t_{eF} \equiv \hbar\lambda\!\!\!^{-}_e{}^3/G_F$ the electron Fermi time, a *c*-free analysis defines a time $2t_{cc}^2/t_{eF}$, again compatible with *T*, confirming this is not any age but a fundamental period (Cycling Principle). In a Galilean critical steady-state Universe, the Coherent Principle applies a third time with the kinetic and potential energies equalised with the Eddington's one. The corresponding density is 3/10, resolving an unsolvable mystery of mainstream cosmology: the black energy density, compatible with the density 7/10. This Eddington model is shown to corresponds to a gravitational deuterium atom. This triple concordance, confirmed by many (40 or so) other correlations giving our proposal for $T_U = R_U/c$, calls for an unification of the two major cosmologies; the Primordial Big Bang is then toppled in favor of the Permanent (13.812 Gyr Cycling) Vibrating Universe ($t_U \approx 0.838\ 10^{-103}$ s), with a predicted value 70.79 km s^{-1} Mpc^{-1} for the invariant recession constant, connected plausibly with a matter-antimatter scanned oscillation, resolving the antimatter and parity violation dilemma.

Keywords: steady-state cosmology, Grandcosmos, Coherence Principle, Eddington's Fundamental Theory, Coherent Cosmic Oscillation, Resonance Principle, Holophysics Principle, Tachyonic vacuum energy, Dark Matter, Dark Energy, BEH boson.

1. Introduction. Non-reductionist analysis of data and new Cosmology

1.1. 'Immergence' versus Emergence

Over several centuries, *contrary to old tradition*, a majority of scientists believed that the Small will explain the Large. So, cosmology is nowadays considered as the most complex scientific domain, with a final complete blockage of both cosmology and theoretical physics[1,2]. Also, the reductionist attitude has the consequence that the scientific domain is divided in separated disciplines, so that Chemistry and Biology seem to be distinct from physical basic principles by mysterious 'emergent' phenomena. We definitely show here that the concept of *'immergence*' is far

more efficient, with for instance, the presentation in this article of precise *cosmic* relations between triple point temperatures of basic molecules and the mammal temperature. This permits an inverse interpretation of the Anthropic Principle, putting an end to its monstrous application leading to such an aberration as the unobservable Multiverse[3]. The fact that the scientific community was forced to accept this scientific deviation confirms the above announced complete failure of the reductionist approach. By contrast, our Grandcosmos is directly observable via the Cosmic Microwave Background (CMB), and is a lacking decisive element to complete the steady-state theory[4,5], based on the Perfect Cosmological Principle[4], which is confirmed in the present article.

1.2. Correlated versus free parameters

A central point is that *the physical parameters are numbers which are not recognized by any mathematical domain*. The mainstream interpretation is they are not mathematical constants, they would be given by chance in a Primordial Big Bang (PBB). But this supposes that nowadays mathematics is complete. The fact that differential equations were issued from a physical analysis (an historical dispute between Newton and Leibniz), and not the contrary, was long forgotten. So, the logical step is to look for relations between these thirty or so parameters, called 'free' by the mainstream interpretation. This task is much easier with large numbers than with small numbers. Indeed, relations between large numbers were observed from the beginning of modern cosmology, in particular from Weyl's conjecture[6], followed by Dirac's large Number's hypothesis[7], then Eddington's Fundamental Theory[8]. But many considered this as sterile numerology and preferred to resort to '*an order of magnitude explanation*', characteristic of the Anthropic Principle[9,10]. But this approach is refuted now by the recent access of cosmology to precision: the so-called Universe age is estimated to 0.3%, from the recent (March 2013) Planck mission[11]. In fact a precise cosmical parameter was foreseen for years by the community: the *non-Doppler* Coherent Cosmic Oscillation (CCO) period, measured in the ppm range[12]. Altough theorists call for revolutionnary observations, they reject it when it is *too* revolutionary (a preliminary version of this article was rejected without explanation by the astro-ph ArXivs in November 2013).

1.2.1. The rehabilitation of Eddington's theory

In a mainstream reductionist context, when Eddington[8] claimed he has found the atomic number of the Universe, he was considered as a fool, and severely mocked. Contrary to Dirac, Eddington rejected the PBB concept of a definite Universe age. *This article will rehabilitate completely the Eddington's Theory, showing, in particular, that it gives directly both the matter and the baryon densities.*

1.2.2. A censored prediction now validated

Half the Universe recession radius was obtained in the first 3 minutes of a first sabbatical year (September 1997), through a logical *c*-free formulation analysis, a more precise terminology than the misleading one: 'three-fold elementary dimensional analysis' (Sanchez 1998, rejected by the CRAS, Comptes Rendus à l'Académie des Sciences, but deposed in the closed archives of the Academy, to be open publicly in near future). This draft contains the correct prediction, apart a 2 factor, of the so-called Universe age estimated now to 0.3 %, as recalled above. The censure continued even after the predicted galactic recession acceleration was observed. It was finally published in 2006 and confirmed in 2011 and 2013[13]. *New decisive advances are presented here*. The case is so constrained that a Coherent Quantum Cosmology emerges naturally from the holistic physical analysis, inducing a number of Principles, summarized in the Conclusion.

1.2.3. The CCO period

A decisive step was the reconnaissance that the CCO period $t_{cc} \approx 9600.606(12)$ s was directly connected, again by a *c*-free analysis, with the weak Fermi Constant[13]. Thus the correlations

between Large Numbers begin to reach the 10^{-4} imprecision of the Newton constant. There is therefore no more doubt that *a totally new advance in physics is on stage. Moreover, precise relations, of holographic conservation type, ties the Universe and a Grandcosmos radii with the CCO length*[13].

Such a non-Doppler phenomena is simply declared 'impossible' by current standard *c*-limited physics. But it took 3 seconds to tie very precisely its period, measured in the ppm range, with the Fermi constant. This CCO seems to introduce an absolute time, because of the invariance of the phase for each quasar[12], over tenths of years: this introduces naturally a 'Tachyonic Principle', as will be explained in this article. Detailed analysis led in 2004 to a *G*-free precise relation with the muon-electron mass ratio, which permitted to predict correctly two more decimals in the Fermi constant, which was validated in 2012, as explained in this article. So the decimal more we predict in this article for the Newton gravitational constant (at 2 sigma from the tabulated value) must be taken seriously.

1.2.4. The CMB and CNB characteristics

Apart CCO, the CMB properties gives the most precise cosmic parameters, in the 0.1 % range. We present here new decisive correlations, *including the standard Cosmic Neutrino Background (CNB)*. So, the standard cosmology has something right, even without any PBB, but need drastic reinterpretation.

The precision of these relations is such that *the Primordial Big Bang (PBB) is refuted for years*. Also, the cosmic application of the Anthropic Principle, - and its associated Multiverse concept- is refuted, since it is valid only in the order of magnitude range.

1.3. Vibration versus Primordial Inflationary Big Bang

This article shows that *several justified calculations* of the redshift timescale enter this precision 0.3%, meaning it is constant, so this is not an age, rather the time constant of the exponential redshift law of the steady-state cosmology[4,5], and the connection with the non-Doppler Cosmic Oscillations[12] suggests that it is a period, so that the number of physical events is limited[13]. Indeed, without such a cycling process, no-age civilizations would have filled up the Universe. This Cycling Principle enters the General Quantification Principle (GQP) stating that infinity is not physical.

So, even the concept of continuity must be rejected, as detailed below, and we propose that the Universe is vibrating with ultra-high frequency $F_U = E_U/h$, where E_U is its energy in the redshift sphere of invariant radius[13]. *So, the first message of quantum physics, namely that an energy is associated to a frequency must be applied firstly to the whole Universe, defined by its invariant redshift radius.*

The second physical message of quantum physics is that (with some extrapolation) every rotation is characterized by a whole multiple of $\hbar \equiv h/2\pi$, this is a special case of GQP. For a spin, the unit is $\hbar/2$. The formulation of this fundamental quantity, called 'action' by mathematicians is in fact a 'kinetic momentum' whose formulation writes ML^2T^{-1} (M for mass, L for Length, T for time) Now, the latter plays a central role in classical mechanics: this casts serious doubt on the official separation between macro- and micro-physics. So the first thing to check is a clear participation of $\hbar$ in cosmology, as is immediately obtained[13], as precised in this article, not only by the above c-free formula, but also by a "Black Atom model". By itself, this rules out both the PBB and the above rough anthropic argument[9,10] (and the associate Multiverse concept[3]).

This article confirms the synthesis[13] between the two main cosmologies: *the Universe is vibrating with a period* $t_U \approx 0.838\ 10^{-103}$ *s and a quasi-period* $T_U \approx 13.81$ *Gyr*. By assuming a matter-antimatter vibration[13], the enigma of the apparent absence of antimatter is resolved. By assuming an oriented sweeping process, tied to a Resonant holo-scanning principle, this justifies also the parity violation[13].

1.4. Tachyonic Optimization versus *c*-limited Chance

It is generally said: 'sometimes a particle is a wave, sometimes a corpuscle'. It is not the correct way to describe the situation: in fact all observations are compatible with the following, revealing a profound 'mater-radiation symmetry (or fermion-boson symmetry, a prefiguration of modern Supersymmetry); '*every propagation phenomena is wavy, while every emission or detection is localized*. This confirms a fundamental discontinuity and computation process is at work: a particle disappears when propagating, and is devoted to be detected by a specific detector, determined *by an optimization process* among all the possible detectors of the universe, without information lost: namely the information that *there was and it will be a localized particle or energy packet*.

It is the only way to explain for instance the 'photon'. So the latter needs an 'analyzing precursor wave' with speed much larger than the light speed to explore and analyze which detector is the best to accept all the particle or energy packet. This wave must be independent of material obstacle, a characteristic property of gravitation. This means that our analysis of quantum electromagnetism favors a two-step process, with the necessity of tachyonic gravitation waves. So, contrary to what is generally taught, there must be an a-priory profound relation between electricity and gravitation, with the speed of gravitation greatly exceeding *c*. According to Van Flandern[14], that is what is really observed, with a speed ratio exceeding 10^{10}. But a complete electricity-gravitation symmetry needs an even larger speed we call the Superspeed. So, a primary aim of the present article is to determine this Superspeed. A taboo has fallen down: '*c must no longer be the limit speed for interaction*', and, so, one must not be surprised by the quantum 'non-local' phenomena.

1.5. 'Quantinuum' versus continuum

Quantum Physics is incomprehensible without invoking a cosmos, and cosmology is incomprehensible if one considers, as usualy presented, the Universe as an ensemble of particles tied by probabilistic *c*-limited interactions. If the rules of Quantum Physics seem mysterious, this is due to a reductionist thinking. In fact*, whole numbers appeared first in Chemistry, optical spectra and heredity laws. So, normally, no real physicist ought to have been surprised by the Plank's quantum discovery*; namely, that a frequency f is tied to energy $E = hf$ by the Plank's constant h. The conundrum came from the fact that no clear distinction was made between physics and *known* mathematics, and the latter was dominant, in particular imposing continuity, a *non-physical* concept. The same inversion of priority runs until now, with the result of a total blockage of 'theoretical physics' (really a sterile playing of *known* mathematical theories).

Note that a matter-radiation symmetry was the guide for Einstein[15] to introduce his troublesome 'propagating photon', an extrapolation based on the misleading 'continuously propagating particle' concept. "*D'après l'hypothèse envisagée ici, lors de la propagation d'un rayon lumineux issu d'un point, l'énergie ne se répartit pas continûment dans un volume de plus en plus grand, mais elle se compose d'un nombre fini de quanta d'énergie, localisés en des points de l'espace, quanta qui se meuvent sans se diviser et ne peuvent être absorbés et créés qu'en entier.*"

However, this mistake had a positive consequence: this initiated de Broglie[16] to associate in reverse a wave with a 'propagating particle'. '*'When I conceived the first basic ideas of wave mechanics in 1923-24, I was guided by the aim to perform a real physical synthesis, valid for all particles, of the coexistence of the wave and of the corpuscular aspects that Einstein had introduced for photons in his theory of light quanta in 1905*". This was a double mistake based on the continuum conundrum, but with a correct final idea: the association of a wave to a particle. But de Broglie (who embarked in a misleading 'double solution') and all other physicists omitted to recognize a 'vibrating' character of a particle, from which the above basic relation $E = hf$ would have become clearer. In a Resonance Vibrating Principe, we propose that matter is in fact a rapid matter-antimatter vibration[13], with frequency a sub-multiple of the Universe one F_U. This resolves at once a profound mystery of official cosmology, which wonders where has gone antimatter.

This general conundrum resulted from the 'continuity' and '*c*-limit' taboos. We recall that the concepts of mass and energy are distinct, and must be separated, (the same for the concepts of Length and Time), as Poincaré[17] expressly recommended, the very discoverer of 4D relativity himself. If mainstream physics had followed this advice, the unit system with $c = 1$ would have been avoided, and would not have masked the decisive *c*-free cosmical formulation analysis, and theoretical physics would probably not suffer the present blockage.

1.6. Galilean Universe versus relativist cosmology

Let us precise this 'wavy propagation'. The above analysis implies that the simple movement of a free particle is a succession of dis-integrations and re-integrations involving the whole universe. So, the concept of an 'isolated particle' is a reductionist nonsense, and the Inertia Principle means there is a cosmic conservation of the following information: *there is a particle moving with an invariant speed in an invariant Universe*. This also implies that the vacuum must be considered as a series of detectors, enlightening a central point of quantum physics. Recall that Poincaré[18] has insisted on the fact that the academic foundation of mechanics is not logical. In fact, it must involves cosmology from the start, and Poincaré[19] precised elsewhere: s*ince the Universe is unique, local equations cannot give a complete description: this excludes the use of General Relativity, a local theory, in cosmology foundation*. The lacking definition of what is a Galilean referential for which the laws of physics are the simplest possible is tied to the so-called 'Mach Principle', we interpret as saying that *the very concept of inertia involves a cosmic information conservation.*

This article shows that the Galilean Hypothesis leads directly to a resolution of the Dark Energy density.

1.7. Holographic conservations versus differential equations

Now, the best way to deal with information is holography[20], so it is predicted that the conservation laws of physics will be tied to holographic conservations: these are 'summing up' relations, instead of differential ones, so the very concept of 'free' parameter, characteristic of differential equations, disappears. It is the basic reason why a series of conservation quantities appear in physics, a fact that was never *really* explained. During several years an article from one of the authors, an holography specialist, was blocked for publication by the de Broglie foundation itself. At the same epoch, the term 'Holographic Principle' appeared curiously in theoretical physics, introduced by t'Hooft[21], then followed by a sterile essay to apply it in cosmology[22]. Moreover, this official holographic principle is reduced to a very special form, while it was more general in the blocked article, finally published in Cambridge as the Holic Principle[23], of diophantian character, with exponents identified to a numer of dimensions. In particular the simplest diophantine equation:

$$T^2 = L^3 = n^6 \quad \Rightarrow \; L = n^2 \qquad (1.1)$$

is the third Kepler law if T is a time ratio and L a length one, and,with n a whole number, gives the correct distributions of orbits in the Bohr atom. This favors the 3D space, but associates a dimension 2 for time, as confirmed below.

Since some years, Holography is considered as the hope for unblocking theoretical physics[24,25], but no-one remarked the liaison with the necessary coherence of the involved waves, a well-known fact in practical holography, which leads now to the following Coherence Principle.

1.7.1. Coherence Principle

We introduce in this article a decisive Coherence Principle stating that each phenomena is associated with a unique frequency, the latter being more basic than the energy concept itself.

This article shows that this principle explains the lacking factor 2 in the above prediction. So, the mysterious Parameters of physics are no longer 'free': the simplest hypothesis is that they are merely optimal basis for huge numbers computation. This is supported in the present article, with

profound consequence on the universality of Intelligent Life, because musical characteristic numbers, as well as biological constants, appear clearly in the cosmic relations.

1.7.2. Holographic and quantum formalisms

The holographic formalism is the same as the basic quantum one. Indeed, it needs a coherent wave U: it is diverging, spherical and mono-frequency and characterized, like a quantum unitary operator, by:

$$UU^* = 1 \tag{1.2}$$

where U^* is the converging (or conjugate) wave, the temporal inverse of U. By interfering with an informed wave A, coherent with U (meaning there is only one frequency involved), this creates, in a suitable medium that could be identified with the quantum vacuum, a hologram:

$$(U + A)\,(U + A)^* = 1 + UA^* + AU^* + AA^* \tag{1.3}$$

When excited back by the time inverted wave U* , this generates the reverse wave A^*, explaining the two steps (emission-absorption) process evoked above, leading to an oscillation. The other terms vanishes because of no phase matching in a 3D medium, which could be identified with the quantum vacuum, and also because

$$AA^* << 1 \tag{1.4}$$

This article states clearly that a tachyonic vaccum, associated with an external Grandcosmos, has an energy density 10^{120} times the Universe one, *resolving the most mysterious enigma of modern physics.*

But a computer is sequential, while ordinary holography is parallel. Therefore, the General Quantification Principle implies a holo-scanning process, which explains directly the Critical Condition[13]. Moreover, DNA properties are connected with parameters, suggesting the DNA chain to be a 1D scanning hologram[25]. Thus, the 'junk DNA', the apparently useless part (98%) of the DNA chain would have also a holographic meaning. This is an example of how 'coherent unification' concerns all Science, with no longer any so-called 'exact-soft' separation.

2. Invariant Universe radius, Coherence Principle and Grandcosmos

The observation of such a striking phenomenon as the *non-Doppler Coherent Cosmic Oscillation*[12] (CCO) is associated in the present article with a ``*Tachyonic Principle"* : the world is divided in two parts, the *c*-visible one and a weakly interacting tachyonic one, where the speed of particles is always superior to *c*, but inferior to a superspeed *C*. *Note that the relativity theory authorizes these two domains.*

2.1 *c*-free formulation analysis

Any *c*-free relation has its counterpart in the tachyonic domain. Indeed, from *c*-free formulation analysis, one of the authors[13] proposed for years that the following length can be considered as a canonical Universe radius: $R_U \equiv cT_U$, where T_U *is the unique parameter* of a critical steady-state Universe[4,5]. Indeed, the following T_U value is compatible with the 0.3% defined so-called ``Universe age'' $T_{\Lambda CDM} \approx 13.80(4)$ Gyr of the Λ–CDM model[11], with $\lambda\!\!\!^{-}_e \equiv \hbar/cm_e$:

$$R_U \equiv cT_U \equiv 2a_G\lambda\!\!\!^{-}_e \equiv 2\hbar^2/Gm_Hm_pm_e \approx 13.816(2)\ \text{Glyr} \tag{2.1.1}$$

where notations are usual, involving the masses of electron, proton and Hydrogen. Note that the radius associated to the redshift law is called 'Hubble length' by mainstream terminology, while Lemaître was the first to propose the linear redshift law, as detailed below.

2.2. The redshift radius is the radius of a one-atom star

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*, a fact nobody has realized during nearly a century. The following calculation of a star radius is given by P.C.W. Davies[26].

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

$$k\theta + \mathrm{N}^{2/3}\hbar^2/m_e R^2 \sim GMm_p/R \qquad (2.2.1)$$

with $\mathrm{N} = M/m_p$. At low density (large R), the term is small, so the temperature 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

$$Gm_p^2\mathrm{N}/R \sim \mathrm{N}^{2/3}\hbar^2/m_e R^2 \qquad (2.2.2)$$

is greatest. This occurs for

$$R \sim 2\hbar^2/Gm_p^2 m_e \mathrm{N}^{1/3} \qquad (2.2.3)$$

which is, for N going to unity, the redshift radius (2.1.1), apart a hydrogen/proton mass ratio. *So the redshift radius is present, since decades, in the astrophysical textbooks.*

2.3. The symmetry Atom-Universe.

Eq (2.1.1) is also the gravitational version (apart the 2 factor, justified below) of the classic relation giving the corrected Bohr radius

$$r_B = a(m_H/m_p)\lambda\!\!\!^{-}_e \quad ; \quad a \approx 137.036 \qquad (2.3.1)$$

where a is replaced by a bare gravitational constant tying two hydrogen atoms:

$$a_G^{(0)} \equiv \hbar c/Gm_H^2 \qquad (2.3.1)$$

Note that a general form $\hbar^2/Gm^3$, with m subatomic mass, had been *established* by Eddington (1946) for the Universe radius, but with no emphasis on the absence of *c, because he used, as a majority of theorists, a special unity system with c = 1.* We use:

$$a_G \equiv \alpha_G^{-1} \equiv \hbar c/Gm_H m_p \qquad (2.3.2)$$

the *inverse* of the usual notation α_G, in harmony with Eddington approach, who has justified the whole number 137 for the ``electric parameter'' $a \equiv \alpha^{-1}$. So:

$$R_U = 2a_G\lambda\!\!\!^{-}_e \tag{2.3.3}$$

Note that a_G is very close to 2^{127}, with a deviation 0.6% which will be explained below:

$$a_G \approx 2^{127} \tag{2.3.4}$$

This is the last term of the *Combinatorial Hierarchy*[27], for which the three first terms: 3, 7, and 127, amounts to 137, the Eddington's value for a.

2.4. The Coherence Principle gives the 2 factor

. The factor 2 in (2.1.1) is explained by the *Coherence Principle* in a cosmic Thomson-Rutherford model of a gravitational Hydrogen molecule, because the frequencies associated with E_{kin} and $-E_{pot}$ are equalized to the unifying frequency nf:

$$mv^2/2 = \hbar c/a_G r = hnf \tag{2.4.1}$$

(with n whole number and fundamental frequency f being the inverse of the electron revolution period $2\pi r/v$ on a fundamental orbit).

By this very method, using a instead of a_G, the atom *diameter* has been calculated by Haas (see Hermann[28]) three years before Bohr. As far as the radius is concerned, that result was too large by a factor 2, but it is here applied successfully to cosmology. This Coherent Principle will be dramatically confirmed in Sect. 3 and 4. This deviation from the virial theorem call for a modification of classical dynamics in the cosmical range which will be studied apart, probably tied to a repulsive gravitation at cosmic distance. Let us stress here that such a gravitational repulsion at cosmic distance would reestablish a kind of symmetry with electricity which is either attractive or repulsive.

2.5. The Grandcosmos Principle

So *the Universe can be considered as a huge gravitational Coherent Hydrogen Molecule, with a radius given by the Coherence Principle, showing a spectacular symmetry electricity-gravitation, suppressing the factor 2 which enters the virial theorem.* The invariant recession radius R_U is a *fundamental* gravitational radius (n = 1) of an observable Universe immersed inside an external Grandcosmos[13] (n > *1*) of radius R_{GC}, suggesting a *superspeed* $C \equiv cR_{GC}/R_U$, and *manifesting itself by the cosmic microwave background (CMB), with no more need for a thermostatic agent (such as iron whisker) for justifying the steady-state model.*

The Grandcosmos has another, more direct, *thermodynamic* justification. In a steady-state cosmology there is no more general evolution, and a recession of galaxies is needed to avoid thermal death, with a Grandcosmos sending back new neg-entropic (negative entropic) material. Therefore, there is no more ``ex-nihilo'' (out of nothing) matter creation, considered generally as a defect of this cosmology. The Grandcosmos concept is far more justified than the Multiverse[3] one, since the origin of the latter, the cosmic application of the anthropic principle[8,9] is ruled out by the matching of Eq. (2.1.1) with observation, confirmed in this article by a number of apparently independent relations producing also the so-called Universe age in its 0.3 % imprecision.

The Tachyonic Principle is compatible with a quasi non-local character of quantum physics. Indeed, a *strict* non-locality is ruled out because infinity is not measurable and, thus, cannot enters physics[13]. This means the superspeed C is very large, but not infinite: this would explain dephasages from one quasar to another in the CCO observations[12].

3. Quantum energy, Eddington number and baryon density

3.1. Resolution of the main large number correlation

Adding the critical condition $\Omega = 1$, or $M_U = R_U c^2/2G$ to Eq. (2.1.1), this means the following coherent (or double) equation[25], with the reduced electron mass $m_e' = m_e m_p/m_H$:

$$\hbar c/Gm_e m_p = R_U/2\lambda\!\!\!^{-}_H = (M_U/m_e')^{1/2} \quad ; \quad \Omega = 1,\ T_U = R_U/c \approx 13.816(2)\ \text{Gyr} \qquad (3.1.1)$$

This is in exact correspondence, including the 2 factor, with the Eddington[7] statistical formula, with his own notations $R_0/2\sigma = N^{1/2}$. Eddington could not recognize the identification, $\sigma = \lambda\!\!\!^{-}_H$ and $N = M_U/m_e'$, because of the error of about a 8 factor on the former galactic redshift length measurement, as detailed in the discussion below.

Note that the corresponding term in the above symmetry micro-macrophysics involves $r_B/\lambda\!\!\!^{-}_H$, which is close to *s*, the mass ratio[29] Boson BEH/electron (Brout-Englert-Higgs), about $134 \times m_p/m_e$, as detailed in section 11.

3.2. A dramatic relation implies weak bosons

A symmetrized relation from a Carr and Rees's[3] one involving the weak bosons gives:

$$R_U \approx \lambda\!\!\!^{-}_H(\lambda\!\!\!^{-}_e{}^2/\lambda\!\!\!^{-}_W\lambda\!\!\!^{-}_Z)^4 \approx 13.817(5)\ \text{Glyr} \qquad (3.2.1)$$

The pertinence of this relation will be confirmed below.

3.3 The Coherence Principle applies also between quantum and classic energies

We show now here that, adding critical condition with Eq(1), this means also, according again to the Coherence Principle, an equipartition of the total energy $M_U c^2$ between a classic part and a quantum one:

$$M_U c^2/2 = p_{cir}{}^2/2m_e' \qquad (3.3.1)$$

with the classical reduced electron mass

$$m_e' = m_e m_p/m_H \qquad (3.3.2)$$

where, using the de Broglie relation:

$$p_{cir} = h/\lambda_{cir} \qquad (3.3.3)$$

with

$$\lambda_{cir} = 2\pi R_U/N^{(eq)}, \qquad N^{(eq)} = 2N_H^{(eq)} = 2M_U/m_H \qquad (3.3.4)$$

the total *equivalent* number of protons plus electrons in the R_U-radius Universe, - in conformity with the basic Eddington's symmetry between proton and electrons[7]. Note that $N_H^{(eq)} = M_U/m_H$ is the 'atomic number of Universe', this does not mean they are *this* number of Hydrogen atoms: here m_H is used as a unit mass (the usual 'Dalton' of chemists). This leads to:

$$M_U c^2/2 \equiv 2(\hbar N_H^{(eq)})^2/m'_e R_U{}^2 \qquad (3.3.5)$$

Now, replacing $N_H^{(eq)}$ by N_{Ed}, the Eddington's Number[7] 136×2^{256} of hydrogen atoms, one gets the energy:

$$2(\hbar N_{Ed})^2/m'_e R_U^2 \approx M_U c^2 \times 0.0450 \quad (3.3.6)$$

which reveals a relative energy density

$$(N_{ed}/N_H^{(eq)})^2/2 \approx 0.0450 \quad (3.3.7)$$

compatible with the tabulated[30] relative baryon density $\Omega_b \approx 0.045(3)$. *As shown in the following section,* $N_{ed}/N_H^{(eq)} \approx 3/10$, *compatible with the observed mass density* Ω_m *so:*

$$\Omega_b \approx \Omega_m^2/2 \approx 9/200 = 0.0450 \quad (3.3.8)$$

This is an unnoticed relation between material, essentially dark matter, and baryon densities.

4. The Galilean critical steady-state Universe has a coherent energy $3E_U/10$ compatible with Eddington's energy

4.1 The Eddington Coherent Energy gives also the redshift timescale

In a Galilean Universe, the strictly linear redshift law, with its associated speed

$$v(r) = cr/R_U \quad (4.1.1)$$

permits direct integration of elementary kinetic energy

$$dE_{kin} = v^2 dm/2 \quad (4.1.2)$$

with

$$dm = 3r^2 dr M_U/R_U^3 \quad (4.1.3)$$

between $r = 0$ and R_U, giving the *non-relativistic* kinetic energy:

$$E_{kin} = (3/10)M_U c^2 \quad (4.1.4)$$

Now, the *classical* gravitational potential energy is given by the well-known expression

$$E_{pot} = -(3/5)GM_U^2/R_U \quad (4.1.5)$$

and the equality between absolute values of these two energies (the above C*oherence Principle* again) implies confirmation of the critical radius formula $R_U = 2GM_U/c^2$.

$$E_{kin} = -E_{pot} \quad => \quad \Omega = 1 \quad (4.1.6)$$

Now, extending the Coherence Principle, by using the Eddington's energy $E_{Ed} = N_{Ed} m_H c^2$:

$$E_{kin} = -E_{pot} = E_{Ed}, \quad (4.1.7)$$

this leads *again,* in terms of the basic period $t_{Ed} = h/E_{Ed}$ and the full Planck time $t_P = \sqrt{(Gh/c^5)}$, to a value compatible with the so-called Universe age $T_{\Lambda CDM} \approx 13.80(4)$ Gyr,

$$T_{Ed} = 20t_P^2/3t_{Ed} \approx 13.794 \text{ Gyr} \approx (m_p/m_n)\, 13.817 \text{ Gyr} \approx 2\hbar^2/Gcm_H m_n m_e \quad (4.1.8)$$

with a deviation factor, relative to (2.1.1), compatible with the neutron-proton mass ratio.

4.2. The gravitational deuterium model

This correction factor (m_p/m_n) is simply explained by assuming the Eddington's approach is associated with a gravitational coherent Deuterium atom instead of an Hydrogen molecule, so leading to the replacement of the proton mass by the neutron one in (2.1.1). Note that the neutron is not considered as an essential particle in Particle Physics, due to its instability in free space. But this is completely misleading in steady-state cosmology, because this instability provides the basic mechanism to repopulate the Universe with new galaxies, compensating the ones flowing out of the redshift sphere[4].

The coefficient 7/10 *for the lacking energy is now explained as being a trivial time-invariant constant*: indeed, it is compatible with the so-called ``*present day* dark energy'' density $\Omega_\Lambda \approx 0.73(3)$ of the official ΛCDM model[30]. The fit is better with the most recent estimation[10] (Planck 2013): $\Omega_\Lambda \approx 0.692(10)$.

In the Λ-CDM model, the redshift timescale and the Universe age are close to each other, but distinct. The above results predict that they are *identical and invariant*, corresponding to the *true* recession constant

$$\text{redshift invariant} \approx 70.792 \text{ km s}^{-1} \text{ Mpc}^{-1} \tag{4.2.1}$$

Note that this is a very difficult measurement, and there are *numerous abnormal redshifts*[31,32] whose possible origin is discussed in Sect. 11. *Indeed, the most recent results are in high tension with the supernovae type 1a value*[10].

4.3. A specified value for G

In Eq (4.1.8) T_U is proportional to G while in (2.1.1) it is inversely proportional to G. Their equalization corresponds to the following value:

$$G = (\hbar c/m_H)/(10N_{Ed} m_e m_n/3)^{-1/2} \approx 6.6753172 \times 10^{-11} \text{ kg}^{-1}\text{m}^3\text{s}^{-2} \tag{4.3}$$

at $+2\sigma$ the tabulated value $G = 6.6738(8)$ $\text{kg}^{-1}\text{m}^3\text{s}^{-2}$. A similar deviation has been already observed in the study of the Cosmic Coherent Oscillations, recalled in Section 6. *In the following, we will use this new G value.*

4.4. Synthesis of the two models

In resume, the gravitational Hydrogen molecule and deuterium atom models lead to the following relations:

$$\hbar c/G m_e m_p = R_U/2\lambda\!\!\!^{-}_H = (M_U/m_e')^{1/2} \quad ; \quad R_U/\lambda\!\!\!^{-}_p = (40N_{Ed} m_n/3m_e)^{1/2}$$

$$\Rightarrow \quad \Omega = 1, \quad G \approx 6.67532\times10^{-11} \text{ kg}^{-1}\text{m}^3\text{s}^{-2} \quad , \quad R_U \approx 13.8125 \text{ Glyr} \tag{4.4.1}$$

The corresponding value is, with $t_e = \hbar/m_e c^2$ and $t_n = \hbar/m_n c^2$:

$$T_{Ed} = (40N_{Ed} t_e t_n/3)^{1/2} = 13.793 \text{ Gyr} \tag{4.4.2}$$

and, with $t_p = \hbar/m_p c^2$, this gives the G-free value:

$$T_U = (m_n/m_p) T_{Ed} \approx t_p (40N_{Ed} m_n/3m_e)^{1/2} \approx 13.81255 \text{ Gyr} \tag{4.4.3}$$

4.5. The junction between Eddington's 136 and *a*

We recall that the Eddington's theory[7] was abandoned after the measurement of *a* appeared to be (slightly) different from the whole number 137 = 136 + 1. Now, introducing the Eddington's proton mass[7]

$$m_{\mathrm{Ed}} = p_{\mathrm{Ed}} m_{\mathrm{e}} \tag{4.5.1}$$

with $p_{\mathrm{Ed}} = 1847.599459$, the ratio of the roots of the equation

$$10x^2 - 136x + 1 = 0 \tag{4.5.2}$$

one observes that using

$$\mathrm{N'_{Ed}} = a \times 2^{256} \tag{4.5.3}$$

where 136 is replaced by *a,* one gets a very close value

$$R_U \approx (40\mathrm{N'_{Ed}}\lambda\!\!\!^{-}_{\mathrm{e}}\lambda\!\!\!^{-}_{\mathrm{Ed}}/3)^{1/2} \approx 13.81253 \ \ \mathrm{Glyr} \tag{4.5.4}$$

This shows that the deviation $2^{127}/a_{\mathrm{G}}$ shows the two following values:

$$2^{127}/a_{\mathrm{G}} = 2^{128}\lambda\!\!\!^{-}_{\mathrm{e}}/R_{\mathrm{U}} \approx m_{\mathrm{p}}/(m_0 m_{\mathrm{n}})^{1/2} \approx (m_{\mathrm{Ed}}/m'_0)^{1/2} \tag{4.5.5}$$

with:

$$m_0/m_{\mathrm{e}} = 40 \times 136/3 \tag{4.5.6}$$

$$m'_0/m_{\mathrm{e}} = 40 \times a/3 \tag{4.5.7}$$

This means:

$$a/136 = m_{\mathrm{n}} m_{\mathrm{Ed}}/m_{\mathrm{p}}^2 \tag{4.5.8}$$

This formula is so precise (3.45 ppm) that it cannot be fortuitous. It is remarkable that it is deduced from cosmological considerations. This proves one more that the Eddington's Fundamental Theory was on a right way. So the scientific community has lost nearly a century, wondering about such futilities as the Multiverse or parallel non-interacting Universes, instead of simply admitting Eddington's Theory.

The pertinence of p_{Ed} is confirmed by the following formula implying the CCO length $l_{\mathrm{cc}} = ct_{\mathrm{cc}}$, with $P = m_{\mathrm{Pl}}/m_{\mathrm{e}}$:

$$(R_{\mathrm{U}}/l_{\mathrm{cc}})^3 \ \mathrm{N'}_{Ed} \approx 4\,(P^4/p_{\mathrm{Ed}}^3)^{3/2} \quad ; \quad R_U \approx 13.812 \ \mathrm{Glyr} \tag{4.5.9}$$

$$2\pi R_{\mathrm{U}}/l_{\mathrm{cc}} \approx (\mathrm{m}_p/\mathrm{m}_H)^2\, p_{\mathrm{Ed}}\, P^{1/2} \quad ; \quad R_U \approx 13.812 \ \mathrm{Glyr} \tag{4.5.10}$$

This proves definitely the pertinence of the Eddington's approach of $a \approx 137.036$ from the value 136. This indicates that, firstly, *there is an hidden mathematics* (otherwise the physical parameters would be recognized as known mathematical constants) and, secondly, *this special mathematics has an inductive character,* instead of the deductive one generally used (for this misleading reason, the Eddington theory was abandoned as soon as *a* was measured to be different from 137).

5. Holophysics Principle, Critical Condition and holo-scanning Universe

The Holophysics Principle[13] implies that Holographic conservations are fundamental. It is the case of the critical condition, which is verified now in the % range by the standard cosmology[30]. Indeed, with $\lambda\!\!\!^{-}_M \equiv \hbar/Mc$ and $\lambda\!\!\!^{-}_m \equiv \hbar/mc$ (so a particle of mass m is associated with a whole large number $N_m \equiv M_U/m$, with $M_U \equiv R_U c^2/2G$, the critical mass of the sphere of radius R_U), the Bekenstein-Hawking entropy[33] of the Universe writes:

$$\pi(R_U/l_{Pl})^2 \equiv 2\pi R_U/\lambda\!\!\!^{-}_M \equiv 2\pi N_m R_U/\lambda\!\!\!^{-}_m \tag{5.1}$$

The third term is an extension to any particle of mass m introducing a multi-linear holographic term, generating a whole spherical surface by rotation of circles[13]. For sufficiently large N_m, this is an approach continuity: *a need for quasi-continuity could be the basic reason for a so large cosmos*. So, the second 1D holography is associated with a scanning process. A particle of mass m has a frequency F_U/N_m, where $F_U \equiv M_U c^2/h \approx 1.193 \times 10^{103}$ Hz is the universe vibrating frequency. According to the Resonance Principle, N_m would be a large whole number. With the full Planck time $t_P = (Gh/c^5)^{1/2}$, the vibrating period is

$$t_U \equiv 1/F_U \equiv 2t_P^2/T_U \approx 0.838 \times 10^{-103} \text{ s} \tag{5.2}$$

We proposed[13] that it corresponds to a matter-antimatter oscillation, *resolving once for all the dilemma of the apparent absence of antimatter.* The above scanning process being oriented, this explains the parity violation in Particle Physics and Biology.

Another consequence of the critical condition is that (2.1.1) implies:

$$m_{Pl}^4 \equiv Mm_H m_p m_e . \tag{5.3}$$

This formula shows a spectacular appearance of the Plank mass $m_{Pl} \equiv (\hbar c/G)^{1/2} = 2.17651(13)\times10^{-8}$ kg, which – contrary to the Planck's length $l_{Pl} \equiv (\hbar G/c^3)^{1/2}$ and the Planck's time $t_{Pl} \equiv l_{Pl}/c$ – has no *direct* meaning in standard cosmology. An interpretation of (5.3), implying an extra-dimension of *cosmic* string scale, was given[13]. So, while (5.1) describes the scanning of a circle of radius R_U, (5.3) is related to a scan inside the corresponding disk.

6. The cosmic oscillations confirms the vibrating Universe

6.1. A simple c-free analysis gives the CCO period

There are two well-known cosmic phenomena: the redshift phenemena and the CMB. But, as recalled above, there is another one, so striking that it is ignored by many scientists as being impossible: the *non-Doppler coherent cosmic oscillation* (CCO) with unique period $t_{cc} \approx$ 9600.606(12) s, found in the Sun and several active galactic nuclei. *This is a direct manifestation of the above Tachyonic Principle.*

By application of this Tachyonic Principle, the celerity c was eliminated[13] from the energies of three interactions, characterized by the electric coupling a, the gravitational one a_G and the weak one. The latter is $a_w = a_F^2 = \hbar^3/m_e^2 c G_F$ (Carr and Rees[3]), with the Fermi constant[30] $G_F \approx 1.4358505(7)\times10^{-62}$ J m^3, corresponding to $a_F \approx 573007.4(3)$. With $t_e \equiv \hbar/m_e c^2$, this defines the timescale[13]:we identify with t_{cc}:

$$t_{Gw} \equiv t_e\sqrt{(a_G a_w)} \equiv t_{cc} \tag{6.1.1}$$

the corresponding value for G is, with $E_{cc} \equiv \hbar/t_{cc}$:

$$G \approx E_{cc}^2 \lambda\!\!\!^{-}_e{}^4 / G_F m_p m_H \approx 6.67543 \times 10^{-11}\ \mathrm{kg^{-1}m^3s^{-2}} \qquad (6.1.2)$$

at 17 ppm from the value (4.3).

6.2. The same c-free analysis gives about the Universe Cycling period

Also the following timescales are favored by the same c-free analysis:

$$T_{Gwe} \equiv t_{Gw} a a_w \approx 13.6885\ \mathrm{Gyr} \qquad (6.2.1)$$

$$T_{ewG} \equiv t_e (a a_w)^{1/2} a_G / H^2 \approx 13.732\ \mathrm{Gyr} \qquad (6.2.2)$$

This implies the following relation between the parameters, with $P \equiv m_{Pl}/m_e$,

$$P \approx a^{1/2} a_w n^3 \qquad (6.2.3)$$

where the neutron ratio $n \equiv m_n/m_e$ shows better fit (0.01%) than $H \equiv m_H/m_e$. Such a dramatic correlation between physical constants is completely overlooked by mainstream physics.

The above timescales are sufficiently close to T_U to conclude that, since both timescales t_{Gw} and T_{Gwe} are produced by invariant physical constants, T_U cannot be any longer considered as the Universe age, representing rather a Universe Cyclic period, as confirmed below.

6.3. The Oscillation Formula

By eliminating $a_G = T_U/2t_e$, from Eqs (2.1.1) and (6.1.1), one obtains a decisive 'Oscillation Formula':

$$T_U \equiv 2t_{cc}^2/t_{eF} \approx 13.81225\ \mathrm{Gyr} \qquad (6.3.1)$$

with the Fermi electronic period

$$t_{eF} \equiv t_e a_w \equiv \hbar \lambda\!\!\!^{-}_e{}^3 / G_F \qquad (6.3.2)$$

defined by the reduced electron Compton wavelength $\lambda\!\!\!^{-}_e \equiv \hbar/cm_e$. Thus, the most direct formulation of CCO correlation is this *temporal* relation, favoring the *vibrating Universe* hypothesis. As a result, the above period T_U is now better defined than radius R_U of (2.1.1). Thus, G would be defined in the ppm range[13]. Taking into account the G-value of the section 4, in the following, a conservative value

$$G \approx 6.6754(2)\ \mathrm{kg^{-1}m^3s^{-2}} \qquad (6.3.3)$$

will be used instead of the official one $6.6738(8)\ \mathrm{kg^{-1}m^3s^{-2}}$.

6.4. Confirmations of Cyclic Universe

The periodic character of T_U is confirmed by the fact that two simple combinations of T_U and t_{cc} give characteristic timescales. Firstly:

$$(t_{cc}^2 T_U)^{1/3} \approx 10.8\ \mathrm{yr} \qquad (6.4.1)$$

close to the classic (but yet unexplained) Wolf period of the Sun, and, secondly, a timescale of

$$(t_{cc} T_U^2)^{1/3} \approx 400000\ \mathrm{yr} \qquad (6.4.2)$$

which is an unexplained climatic cycle. One must conclude that these two cyclic phenomena might have a cosmic origin. Note that the last timescale is of order a galaxy cluster *c*-transit.

6.5. Successful 2004 prediction on the Fermi mass value.

The essential formula (6.1.1) contains the G-free term $m_F/(m_p m_H)^{1/2}$, where m_F is the Fermi mass. In 2004, in a Conference in College de France organized by Pecker, the following property of this ratio was noted:

$$m_F/(m_p m_H)^{1/2} \approx (m_{mu}/m_e)^2/a \qquad (6.5.1)$$

where appears the muon mass, known in 2004 with accuracy 30 ppb, while the Fermi mass accuracy was 9 ppm, corresponding to the ratio $a_F \equiv m_F/m_e \approx 573009(5)$. Admitting (6.5.1), this permitted to propose the value, with $m_N \equiv a m_e$, the Nambu mass:

$$a_F \equiv (m_p m_H)^{1/2}(m_{mu}/m_e)^2/m_N \approx 573007.325(35) \qquad (6.5.2)$$

8 years later, in the 2012 PDG[30], a gain of precision of a factor 36 was published

$$a_F \ \{\text{PDG 2012}\} \approx 573007.33(16) \quad (0.25 \text{ ppm}) \qquad (6.5.3)$$

So among the gain 300 of precision annonced by (6.5.2), a factor 36 has been confirmed. This proves that simple relations connect the physical parameters, completely unexpected by the standard model of particle physics. It is revealing that the above example is deduced from a cosmological study. This is an example of the very important Inductive Principle, which is the practical basis of physics: *one can learn something without the need to know everything.*

6.6. The Factorization Relation

Now the following outstanding relation, with $W = m_W/m_e$, $Z = m_Z/m_e$:

$$t_{cc}/t_e \approx a a_F W Z n^2 \qquad (6.6.1)$$

inside the 0.02% precision of W, proves that the physical parameters are calculation basis. Indeed this factorization of a Large Number in a product of smaller ones recalls the decomposition of a number in its prime factors.

7. Special Holographic conservations

The above succesful application of the Coherence Principle confirms the following holographic conservations[13] on the redshift sphere of invariant radius R_U. Indeed, Eq. (2.1.1) can be written as the holographic conservation 1D-2D: $2\pi R_U/\lambda\!\!\!^{-}_e \equiv 4\pi \lambda\!\!\!^{-}_H \lambda\!\!\!^{-}_p / l_{Pl}^2$. The above identification $t_{Gw} = t_{cc}$ means the following 4D term, with $l_{cc} \equiv c t_{cc}$, where $\lambda\!\!\!^{-}_F \equiv \lambda\!\!\!^{-}_e / a_F$. A search for a 3D term as a function of a hydrogen molecule wavelength $\lambda\!\!\!^{-}_{H2}$, – since the analysis started with a pair of hydrogen atoms, – shows up the CMB reduced wavelength $\lambda\!\!\!^{-}_{CMB} \equiv \hbar c/k\theta_{CMB}$:

$$2\pi R_U/\lambda\!\!\!^{-}_e \equiv 4\pi \lambda\!\!\!^{-}_H \lambda\!\!\!^{-}_p / l_{Pl}^2 \approx (4\pi/3)(\lambda\!\!\!^{-}_{CMB}/\lambda\!\!\!^{-}_{H2})^3 \approx ((\lambda\!\!\!^{-}_F l_{cc})^{1/2}/\lambda\!\!\!^{-}_e)^4 \qquad (7.1)$$

This defines an Universe radius in function of $\lambda\!\!\!^{-}_{CMB}$, by using rather the proton wavelength:

$$R_{hol} \approx \lambda\!\!\!^{-}_e \, (16/3)(\lambda\!\!\!^{-}_{CMB}/\lambda\!\!\!^{-}_p)^3 \approx 13.875 \text{ Glyr} \qquad (7.2)$$

There is a discrepancy about 0.45 %, which is compatible with half that of the preceeding Section, between Eqs (6.2.1) and the basic (4.4.3). So, one considers the length:

$$R_U \approx (R_{Gwe}R_{hol}^2)^{1/3} \approx 13.812 \text{ Glyr} \tag{7.3}$$

which is also compatible with the following value, directly defined from CMB and CCO data, with the electron classical radius $r_e \equiv \lambda\!\!\!^{-}_e/a$, and $\lambda_{CMB} = hc/k\theta_{CMB}$:

$$R_U/2l_{cc} \approx (\lambda_{CMB}/r_e)^2(l_{Pl}/\lambda\!\!\!^{-}_e)^{1/2} \quad , \quad R_U \approx 13.812 \text{ Glyr} \tag{7.4}$$

Now, the canonic holographic relation[13]: $l_{cc}^3 \approx R_U^2 r_e/2 \approx R_U^3 l_{Pl}^2/(3r_e^2)$ has a dramatic prolongation involving the Grandcosmos: $l_{cc}^3 \approx R_{GC} l_{Pl} r_e/\sqrt{3}$, permitting a direct elimination of $l_{Pl}^2/3$, leading to $R_U \approx 13.813$ Glyr, close to the above value and tied also to l_{cc} and r_e, so that:

$$2l_{cc}^4 m_p^2/R_U r_e m_H^2 \approx (R_{GC}r_e^2)^{2/3} \ , \quad R_U \approx 13.813 \text{ Glyr} \tag{7.5}$$

where the correction m_H/m_p, the Hydrogen/proton mass ratio, has been applied, calling for further study.

8. The black atom model, the Nambu radius and the Inverted Anthropic Principle

8.1. The simplest model of all

The *black atom* model[13] considers a hydrogen atom which is immersed inside a black hole of radius R_{ba}, limiting electron trajectories. Equating the corrected Bohr radius r_B with the mean radius of the spheres of radii $n\lambda\!\!\!^{-}_e$, – each with a probability proportional to n^2, with n whole number superior to 1, but limited by $R_{ba}/\lambda\!\!\!^{-}_e$, – one gets $r_B/\lambda\!\!\!^{-}_e = \Sigma(1/n)/\Sigma(1/n^2)$. Therefore, with the Euler constant γ, the radius

$$R_{ba} = \lambda\!\!\!^{-}_e \exp[(\pi^2/6 - 1)r_B/\lambda\!\!\!^{-}_e + 1 - \gamma] \approx 1.49236604 \times 10^{26} \text{ m} \approx 15.775 \text{ Glyr} \tag{8.8.1}$$

is found to be very close (0.25%) to $(R_U R_N)^{1/2}$, where $R_N \equiv 2\hbar^2/Gm_N^3$ is the ``Cosmic Nambu radius'' ($m_N \equiv am_e$ is the Nambu mass, of central, yet unexplained, importance in particle physics). It is the double of the radius corresponding to an elimination of c between the classical electron radius $r_e = \hbar/cm_N$ and the Planck length $l_{Pl} \equiv (\hbar G/c^3)^{1/2}$. This "black atom relation" can be approximated by

$$a/\ln(2a_G) \approx (\pi^2/6 - 1)^{-1} \tag{8.8.2}$$

This makes precise the rough relation

$$a \sim \ln(a_G) \tag{8.8.3}$$

justified by basic theoretical considerations, see Carr and Rees[3].

So, the Universe can be approximated by this black atom model, as well as the above gravitational Deuterium atom and Hydrogen Molecule ones. This is a manifestation of the Ambivalence Principle: *several different models can work simultaneously*. Ignorance of this principle explains also why the physics community is attached in a dogmatic manner to the PBB model, although it is clearly refuted for many years[13].

8.2. The Nambu cosmic radius and Grancosmos

The presence of two cosmic radius, R_U and R_N, could appear as a weakness, but the sphere of radius R_N can be interpreted as the holographic representation of the Grandcosmos behind. So the radius of the latter is defined by the Bekeinstein-Hawking entropy[33] of the R_N sphere:

$$\pi(R_N/l_{Pl})^2 \equiv 2\pi R_{GC}/l_{Pl} \tag{8.2.1}$$

This defines, in its turn, the superspeed:

$$C \equiv R_{GC}/R_U \approx 2.082 \times 10^{69}\,\mathrm{m\,s^{-1}} \tag{8.2.2}$$

The fundamental importance of the 'Nambu cosmic radius' R_N is confirmed by the following relation, using the Wien CMB wavelength:

$$4\pi(R_N/\lambda_{WCNB})^2 \approx e^{137.035(1)} \approx e^{\alpha} \tag{8.2.3}$$

This expression, *with its holographic form*, casts doubt on the usual statistical interpretation of the thermal black body radiation, - a question linked probably with the quantum unitary conservation in a black hole disintegration[33] and the basic holographic formalism (Section 1). In other words, *the cosmos would be seen as a perfect computer, without any loss of information.*

8.3. The Wien CMB wavelength

Note that the above wavelength shows singularity, by the relations precise to 0.1%:

$$\lambda_{WCNB}/l_{Pl} \approx \pi^{64} \approx a_G/a^3 \tag{8.3.1}$$

while $R_U/\lambda\!\!\!^{-}_e \approx 2a_G$ is close to $\pi^{155/2}$. Eliminating a_G, this shows that:

$$a \approx \pi^{9/2}/2^{1/3} \tag{8.3.2}$$

precise to 8 ppm. This confirms that an hidden mathematics is at work, where π is a calculation basis, as manifest in the Riemann series.

8.4. Musical relations and Inverse Anthropic Principle

Note that the following correlations implies the natural bases 2 and 3:

$$R_U/\lambda\!\!\!^{-}_e \approx 2\text{^}(2\text{^}7) \tag{8.4.1}$$

$$R_N/\lambda\!\!\!^{-}_e \approx (3\text{^}3)\text{^}(3\text{^}3) \tag{8.4.2}$$

The deviation of the first one (0.56%) has been related above with Eddington's theory, but the second one is far more precise (0.03%). Note that the approximation:

$$R_N/\lambda\!\!\!^{-}_e \approx (3\text{^}3)\text{^}(3\text{^}3) \approx (4/3) \times 2\text{^}(2\text{^}7) \tag{8.4.3}$$

corresponds to the third musical scale, $2^{1/41} \approx 3^{1/65}$ in the classification of Jeans[34], listing the optimal divisions ot the octave: 5, 12, 41, 53, 306. Note that the forth one, corresponding to the Indian music can be written

$$6^{128} \approx (16/3)^{137} \approx (1+1/\sqrt{2})R_{GC}/\lambda\!\!\!^{-}_e \tag{8.4.4}$$

Moreover, the large number implied by the fifth scale shows the following singularity:

$$2^{485} \approx 3^{306} \approx 137^{137/2} \tag{8.4.5}$$

this writes:

$$3^{1836/3} \approx 137^{137} \tag{8.4.6}$$

where 137 and 1836 are the integer values of a and p. This is an obvious approximation of the formula giving the optimal base e:

$$x^{1/x} \text{ maximal} \quad => \quad x = e \tag{8.4.7}$$

for e approximated by 3, which is so the best integer base (a classic result of computer theory). The fact that the physical parameters are connected to theses fundamental bases means the Universe seems to be an optimal computer. Moreover, the implication of the musical scales implies that the human brain is also a computer using the same multi-base process as the Universe one. *This is an inversion of the Anthropic Principle*: the Cosmos uses human to follows its computer program. The usual Anthropic Principle states that the Cosmos serves the human, and it is known that it is an inversion of correct scientific way.

8.5. Direct connections implying Biology and Chemistry

In fact tenants of the anthropic Principle has not seen that some biologic constants are closed to physical ones. For instance, consider the nucleotides masses, in Dalton units (1 Da ≈ 1.008 m_H). They are: for adenine $m_{ad} \approx 313.2$, for thymine $m_{th} \approx 304.0$, for guanine $m_{gu} \approx 329.2$, for cytosine $m_{cy} \approx 289.2$. These masses enters the following 0.1% relation[13]:

$$m_{ad} + m_{th} \approx m_{gu} + m_{cy} + 1 \approx m_H^2/3m_e \tag{8.5.1}$$

As each codon of the DNA chain is composed of 3 couples from the dual choice AT or GC, this means the codon mass is about an invariant, close to m_H^2/m_e. Moreover, the mean nucleotide mass is close to the Fermi mass, to 2%:

$$m_H^2/6m_e \approx m_F \tag{8.5.2}$$

These relations seem to confirm that the very definition of a mass is related to a number of information channels (Holophysics Principle), and that a DNA chain would be a scanned 1D hologram. So, in harmony with the Coherence Principle, a living organism would be driven by a single frequency organizing wave. Without this hypothesis, biology is not comprehensible.

Moreover, with the mammal temperature $\theta_{mam} \approx 310$ K, and the triple point temperature of Hydrogen $\theta_H \approx 13.83$ K, Oxygen $\theta_O \approx 54.33$ K, and water $\theta_{H2O} \approx 273.15$ K, there are the 1% precise relations[25]:

$$\theta_H \times \theta_O \approx \theta_{H2O} \times \theta_{CMB} \tag{8.5.3}$$

with the factor $j \equiv 8\pi^2/\ln 2 \approx a - e^{\pi}$, which appears in the canonical form $(R_U/r_B)^{1/2} \approx e^{j/e}$, one observes:

$$\theta_{mam}/\theta_{CMB} \approx j \tag{8.5.4}$$

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

$$(R_N l_{Pl})^{1/2} \approx \lambda_{H2O} \tag{8.5.5}$$

$$(R_U l_{Pl})^{1/2} \approx \lambda_{mam} \tag{8.5.6}$$

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.

9. Coherence Analysis, Grandcosmos and vacuum energy

9.1. The general Coherence condition

Indeed, several authors have advanced the hypothesis that the laws of physics result from a calculation process[35]. This "Computation Hypothesis" (CH) is sustained by the dramatic properties of cellular automates[36]. In fact, the existence of energy conservation favors directly such an hypothesis. Moreover, Gerard 't Hooft has shown that quantum field theory can be adapted to deal with a deterministic cellular automaton[37]. This suggests that behind the so-called 'indeterminacy' of quantum physics, a deterministic process is at work.

This is connected with the following 'coherent analysis', where numerical coefficients are omitted first for simplicity. Consider the sphere of radius R_U. 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 $ƛ_m \equiv \hbar/cm$. The total mass is limited by the critical condition $M_U = R_U c^2/2G$, so the number N_{obs} of observers is limited to the value $R_U ƛ_m/l_{Pl}^2$. 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 a black hole or the Universe, but, for the latter, the galaxy recession prevents such a collapse. Calling d the mean distance between observers, eliminating

$$N_{obs} \sim (R_U/d)^3 \tag{9.1.1}$$

this means:

$$(R_U l_{Pl})^2 \sim ƛ_m d^3 \tag{9.1.2}$$

This general condition will be applied in the following four ways.

9.2. The global Coherence condition

With the global coherence condition $ƛ_m \sim R_U$, one gets $N_{obs} \sim (R_U/l_{Pl})^2$, the Bekenstein-Hawking entropy, and:

$$d \sim (R_U l_{Pl}^2)^{1/3} \sim 10^{-15} \text{ m} \sim r_e \tag{9.2.1}$$

a result also obtained by Ng[38], but where 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 value 10^{-15} m has no signification in the standard R_U-variable scheme, but of course, it is close to both the nuclear scale and the classic radius of electron 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_U. The resulting holographic conservation

$$N_{obs} \sim (R_U/l_{Pl})^2 \sim (r_e/l_{Pl})^3 \qquad (9.2.2)$$

have be shown to be of central importance[13].

9.3. The field Coherence condition

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

$$\lambda\!\!\!^{-}_m \sim d \sim (R_u l_{Pl})^{1/2} \sim 10^{-4} \text{ m} \qquad (9.3.1)$$

of order the CMB wavelength, but with a significant departure which has been interpreted above, in the end of section 8, in liaison with an identification of some cosmic parameters with biological ones.

9.4. The One-observer condition

Now with $N_{obs} \sim 1$, or the condition $d \sim R_u$, one gets

$$\lambda\!\!\!^{-}_m = \lambda\!\!\!^{-}_M = \hbar/cM_U \sim 10^{-95} \text{ m} \qquad (9.4.1)$$

this is the Universe wavelength, of central importance in the above Section 5. The standard limitation of length to the Planck's one is toppled, as well as the standard limitation of the 'Holographic Principle'.

9.5. The Special Coherence condition

With the condition $d \sim l_{Pl}$, one gets:

$$\lambda\!\!\!^{-}_m \sim R_u^2/l_{Pl} \sim 10^{87} \text{ m} \sim R_{GC} \qquad (9.5.1)$$

a length of order the Grandcosmos radius. Admitting it is closed by a critical condition with a superspeed C, the uniformity of equivalent material density with the Universe means $C/c = R_{GC}/R_U$. So the energy density in Grandcosmos is $(C/c)^2 \sim 10^{120}$ larger than the universe one. It is largely undetected, apart in the Casimir effect[39], which have been partially checked[40], but predicted by quantum theory, see below the description of what is considered the greatest problem of modern physics. From above relations, one gets a 1D-3D holographic correlation were the following simple numerical factors appears neatly:

$$(R_u/r_e)^3 \approx (4m_p/3m_H)^2 R_{GC}/l_{Pl} \quad , \quad R_u \approx 13.812 \text{ Glyr} \qquad (9.5.2)$$

So the Grandcosmos existence as well as its radius value are validated. This is confirmed in the following.

10. Dramatic confirmations, in search for an explanation

10.1 The Central Correlation:

The ratio $S \equiv N_{ph}/N_H$ of photons and hydrogen atom populations is a central cosmologic parameter. A dramatic Central Correlation[13] is the following, involving the equivalent number of Hydrogen atoms, with the energy density of the neutrino field (CNB) taken into account:

$$(2S^{(eq)})^{1/2} \equiv (2N_{ph}/N_H^{(eq)})^{1/2} \approx u_c/(u_{CMB}+u_{CNB}) \equiv u_c/u_{CMB}\delta \qquad (10.1.1)$$

The equivalent number of Hydrogen atoms is, from Eq. (1): $N_H^{(eq)} \equiv M/m_H \approx R_U\lambda\!\!\!^{-}_H/2l_{Pl}^2$, while $N_{ph} = 8\xi\{3\}(R_U/\lambda\!\!\!^{-}_{CMB})^3/3\pi$, with $\xi(3) \approx 1.2020569$ a non-analytic Riemann term. From standard three-family statistics: $\delta - 1 \equiv u_{CMB}/u_{CNB} \equiv 3\times(7/8)\times(4/11)^{4/3} \approx 0.68132$. With $u_c = 3c^4/(8\pi GR^2)$ and $u_{CMB} = (\pi^2/15)\,\hbar c/\lambda\!\!\!^{-}_{CMB}{}^4$, this writes:

$$R_U \approx (x^4\lambda\!\!\!^{-}_{CMB}{}^{11}\lambda\!\!\!^{-}_H)^{1/6}/\,l_{Pl} \approx 13.796 \text{ Glyr} \qquad (10.1.2)$$

where $x = [(32\xi\{3\}/3\pi)^{1/2}8\pi^3\delta/45]^{-1/2} \approx 0.231105$, compatible with the "weak mixing angle"[30]. This illustrates how cosmic consideration help to correlate particle physics data.

Now, concerning the real ratio S, taking into account that $N_H \approx 9N_H^{(eq)}/200$, (see Sect.3), one notes the following property: the length $2S\lambda\!\!\!^{-}_e$ is close (0.3%) to the mean value of the Wien wavelengths of the CMB and CNB fields:

$$2S\lambda\!\!\!^{-}_e \approx \lambda\!\!\!^{-}_{mean} \equiv (\lambda\!\!\!^{-}_{CMB}\lambda\!\!\!^{-}_{CNB})^{1/2} \qquad (10.1.3)$$

10.2 The Symmetric Correlations:

One observes:

$$R_U \approx (\lambda\!\!\!^{-}_e\lambda\!\!\!^{-}_{CNB})^2/(l_{Pl}\lambda\!\!\!^{-}_{CMB})^{3/2} \approx 13.799 \text{ Glyr} \qquad (10.2.1)$$

confirming the neutrino field, with

$$\lambda\!\!\!^{-}_{CNB}/\lambda\!\!\!^{-}_{CMB} \equiv (11/4)^{1/3} \qquad (10.2.2)$$

Now considering the mean value $\lambda\!\!\!^{-}_{mean}$, one notes:

$$m_{Pl}^4 \equiv Mm_Hm_pm_e \approx m_N(\pi/3)(m_eR_U/\lambda\!\!\!^{-}_{mean})^3 \quad , \quad R_U \approx 13.812 \text{ Glyr} \qquad (10.2.3)$$

with the Nambu mass $m_N \equiv am_e$. Note that the full mean wavelength obeys:

$$(\lambda_{mean}/\lambda\!\!\!^{-}_{CMB})^3 \equiv (2\pi)^3\sqrt{(11/4)} \approx 3r_B/\lambda\!\!\!^{-}_e \qquad (10.2.4)$$

to 3×10^{-5}, showing a connection between the canonic ratio 11/4 and a, whose Eddington's approximation 137 is equal to $4^2 + 11^2$, respectively the dimensions of the space-time (4) and the supergravity space (11).

10.3 The Hydrogen boson correlation:

Also, the canonic ratio $R_U/\lambda\!\!\!^{-}_H$ is related to u_c, u_{CMB} and the black body density $u_H' = (\pi^2/15)\,\hbar c/\lambda\!\!\!^{-}_H{}^4$ associated with the wavelength $\lambda\!\!\!^{-}_H$ of the hydrogen, considered as a spin 1 boson:

$$R_U/\lambda\!\!\!^{-}_H \approx u_H'u_{CMB}/u_c^2 \quad , \qquad R_U \approx 13.809 \text{ Glyr} \qquad (10.3.1)$$

10.4 The Superspeed quantum correlation:

With the quantification $\lambda = 2\,R_U/k$, k entire number, the energy associated with the hydrogen wave is $(hk/R_U)^2/8m_H$. Summing up k between 1 and N_{Ed}, one observes that the total quantum energy enters a dramatic relation involving the superspeed C (0.3%):

$$E_{H\sim} \equiv (h/R_U)^2N_{Ed}{}^3/(24m_H) \approx MR_UC/t_{cc} \qquad (10.4.1)$$

corresponding to

$$R_U \approx N_{Ed}\,(\pi^2 l_{Pl}^2 l_{cc} \lambda\!\!\!^{-}_H/3R_{GC})^{1/3} \approx 13.825 \text{ Glyr} \qquad (10.4.2)$$

10.5 The Superspeed vacuum energy correlation:

A major dilemma concerns the vacuum quantum energy based on the Planck limit l_{Pl}: it appears to be about 10^{120} times the Universe energy, a ratio of order $(C/c)^2$, as seen above. Now, to 0.3%: $MC^2 \approx \hbar c R^3/\varepsilon l_{Pl}^4$ with $\varepsilon \equiv \pi^4/30\xi(3) \equiv \langle E\rangle/k\theta \approx 2.701178$, where $\langle E\rangle$ is the mean photon energy of a black body with temperature θ:

$$R_U \approx (M_U C^2 \varepsilon l_{Pl}^4/\hbar c)^{1/3} = (\varepsilon/2)^{1/4}(R_{GC} l_{Pl})^{1/2} \approx 13.802 \text{ Glyr} \qquad (10.5.1)$$

The sligtht departure (0.1%) of Eqs (10.4.2) and (10.5.1) from the R_U value (2.1.1) are about opposite, with a mean value 13.813 Glyr.

10.6 The 'Forgotten power'-Grandcosmos correlation:

Coming back to the very origin of quantum mechanics, it was assumed that the electron in the Hydrogen atom do not radiate power. The latter would be[41]

$$\Pi_H = (m_e c^2)^2/(A\hbar) \qquad (10.6.1)$$

with

$$A \approx 3a^7/2 \qquad (10.6.2)$$

Firstly one notes:

$$A \approx 3a^7/2 \approx a_F^5 l_{cc}/R_U \quad , \quad R_U \approx 13.806 \text{ Glyr} \qquad (10.6.3)$$

Also, one observes:

$$A \approx 3a^7/2 \approx R_U^2 l_{cc}(2\pi l_{Pl})^4/3\lambda\!\!\!^{-}_e \quad , \; R_U \approx 13.813 \text{ Glyr} \quad ???????? \qquad (10.6.4)$$

The elimination of l_{cc} between (10.6.1) and (10.6.2), taking into account[13] that:

$$a_F^5 \approx 6(\lambda\!\!\!^{-}_{CMB}/\lambda\!\!\!^{-}_e)^3 \qquad (10.6.5)$$

leads to the holographic relation:

$$4\pi(\lambda\!\!\!^{-}_e/\pi l_{Pl})^2 \approx (4\pi/3)(2R_U/\lambda\!\!\!^{-}_{CMB})^{3/2} \quad , \quad R_U \approx 13.811 \text{ Glyr} \qquad (10.6.6)$$

This forgetten power must be compared with the recession power through the R_U-sphere, which is

$$\Pi_U = 3c^5/2G \qquad (10.6.7)$$

It is remarked that, within 0.4%:

$$N_H^{(eq)} \approx (R_{GC}\Pi_U/\lambda\!\!\!^{-}_e \Pi_H)^2 \qquad (10.6.8)$$

This means the temporal expression $T_U \approx 3\tau_H(a^7 T_{GC}/\tau_e)^{1/2}$, with $\tau_e \equiv Gm_e/c^3$, $\tau_H \equiv Gm_H/c^3$, $T_{GC} \equiv R_{GC}/c$. Now, the corresponding spatial expression is, with $r_{cd} \equiv Gm_H^2/c^2 m_e$, half the Schwarszchild radius of m_H^2/m_e, the latter mass being close to the DNA codon mass[13].

$$R_U \approx 3\,(a^7 r_{cd} R_{GC})^{1/2} \approx 13.752 \text{ Glyr} \qquad (10.6.6)$$

10.7 The 9D correlation:

A combination of the preceeding relations leads to:

$$R_U \approx 18\lambda\!\!\!^{-}_e{}^9/l_{cc}{}^3 l_{Pl}{}^5 \approx 13.809 \text{ Glyr} \qquad (10.7.1)$$

seemingly to imply a 9D space, like in string theory.

10.8 The Hydrogen and neutron basis correlations:

Now $2l_{cc}l_{Pl}^2$ have been found[13] to be about the cube of the DNA codon wavelength, $\lambda\!\!\!^{-}_{cd} \approx \lambda\!\!\!^{-}_H{}^2/\lambda\!\!\!^{-}_e$. This means $R_U/l_{Pl} \approx 12^2(m_H/m_e)^{18}$. The canonical term in the black body law: e^{β}-1 appears instead of 12^2, where $hc/kT\lambda_{Wien} \equiv \beta \equiv 5(1- e^{-\beta}) \approx 4.965114232$ is the reduced Wien constant:

$$R_U \approx l_{Pl}(e^{\beta}\text{-}1)H^{18} \approx 13.821 \text{ Glyr} \qquad (10.8.1)$$

while, in function of the Rydbergh wavelength, where $\lambda\!\!\!^{-}_{Ryd}{}^2/\lambda\!\!\!^{-}_e$ is of the order the CMB wavelength:

$$R_U \approx (\lambda\!\!\!^{-}_{Ryd}{}^2/\lambda\!\!\!^{-}_e)n^9 \approx 13.830 \text{ Glyr} \qquad (10.8.2)$$

This confirms that the parameters $H \equiv m_H/m_e$ and $n \equiv m_n/m_e$ are calculation basis[13]. Note that the term e^{β}-1 was already found to be essential[13]. In particular, looking for the powers of the BEH factor $s \approx aH$, one finds, to 0.04%:

$$R_{GC} \approx \lambda\!\!\!^{-}_e(e^{\beta}\text{-}1)(aH)^{18} \quad , \quad R_U \approx 13.806 \text{ Glyr} \qquad (10.8.3)$$

Direct analysis shows that, in function of the neutron mass and the corrected electron mass:

$$R_U \approx \lambda\!\!\!^{-}_e{}'(m_n/m_e{}')^{12}/\pi\sqrt{2} \approx 13.814 \text{ Glyr} \qquad (10.8.4)$$

The term e^{β}-1 appears also in the following relation involving the canonic statistical ratio 11/4:

$$R_{GC}/R_U \approx (e^{\beta}\text{-}1)^{1/2}(11/4)^{a\text{-}1} \quad , \quad R_U \approx 13.812 \text{ Gly} \qquad (10.8.5)$$

The appearance of the term a-1 confirms agin the Eddington's approach for a, from 136 to 137. The fact that this is an exponent favors the hypothesis of the existence of a Great Mathematical Theory involving the physical parameters, in harmony with the dramatic relation[13]:

$$a^a \approx (4/3)(\pi m_n/m_p)^2(R_{GC}/a\lambda\!\!\!^{-}_e)^3 \quad , \quad R_U \approx 13.812 \text{ Glyr} \qquad (10.8.6)$$

confirming the above selected G value. Considering now the ratio of the Grandcosmos tachyonic energy and the Universe one, one notes:

$$(R_{GC}/R_U)^5 \approx a^a 2a_w/\varepsilon \quad , \quad R_U \approx 13.809 \text{ Gly} \qquad (10.8.7)$$

where appears once more the black body constant ε, see Sect. 10.5. Its elimination leads to:

$$R_U \approx R_{GC}^3/l_{Pl}^2 a^a a_w \approx 13.837 \text{ Gly} \qquad (10.8.8)$$

This is sufficiently close to the main value (2.1.1) to conclude for a confirmation of both the Grandcosmos ands its tachyonic energy.

With $d \approx 1.00115965218$, the electron abnormal magnetic moment, central in the quantum theory of electricity, one notes:

$$(R_{GC}R_N/R_U\lambda\!\!\!^{-}_e)^{1/2} \equiv (R_N^3/2R_U\lambda\!\!\!^{-}_e l_{Pl})^{1/2} \approx 6(m_p d/m_e)^{15}, \qquad R_U \approx 13.812 \text{ Glyr} \qquad (10.8.9)$$

a formula following the Lenz-Wyler form $6x^5$.

10.9 The *a*-basis correlation:

Eliminating the common terms in (10.8.1) and (10.8.3), taking account[13] of $\lambda\!\!\!^{-}_e{}^2/\lambda\!\!\!^{-}_p l_{Pl} \approx a^{12}$, this leads to $R_{GC}/R_U \approx a^{30}$, and more precisely, with $B \equiv a^7/137$, $P \equiv m_{Pl}/m_e$, $H \equiv m_H/m_e$ and $C/c \equiv R_{GC}/R_U \equiv \Delta$, *the following relations, showing a proton-neutron symmetry*:

$$p \equiv m_p/m_e \approx B^5/\Delta \qquad ; \quad R_U \approx 13.812 \text{ Gly} \qquad (10.9.1)$$

$$n \equiv m_n/m_e \approx (PH/B)^5/\Delta \qquad ; \quad R_U \approx 13.812 \text{ Gly} \qquad (10.9.2)$$

meaning a precised relation from that already noted[13]:

$$a^{12} \approx Pn(p/H)^3 \qquad (10.9.3)$$

The high symmetry of the above relations would specifies the following value

$$G \approx 6.675464 \times 10^{-11} \text{ kg}^{-1}\text{m}^3\text{s}^{-2} \qquad (10.9.4)$$

permitting to specify the CCO period:

$$t_{cc} \approx 9600.58 \text{ s} \qquad (10.9.5)$$

Also, from (10.8.8) and (10.8.9):

$$(R_{GC}l_{Pl}/R_U\lambda\!\!\!^{-}_e)^2 \approx (\lambda\!\!\!^{-}_e{}^2/l_{Pl}\lambda\!\!\!^{-}_p)^3 \approx a^{36} \qquad (10.9.6)$$

Thus the reality of the Grandcosmos can hardly be discussed, being directly obervable by the CMB and directly involved in *several above precise approximations for R_U.* The last relation confirms that the Cosmos is a computer using the calculation basis *a*. A related holographic conservation has been noted[13]:

$$\pi(R_U\lambda\!\!\!^{-}_H/\lambda\!\!\!^{-}_n\lambda\!\!\!^{-}_e)^2 \approx (4\pi/3)(r_B/\lambda\!\!\!^{-}_e)^{36} \quad , \qquad R_U \approx 13.811 \text{ Glyr} \qquad (10.9.7)$$

Thus, the last term 2^{127} of the Combinatorial Hierachy (Bastin and Kilmister, 1995) gives a first approximation for a^{18}.

10.10. The acceleration correlation:

A black body is characterised by an acceleration[42]. Since the Universe and the Grandcosmos are assumed to be black bodies with the same temperture 2.7256 K, it must be looked for a singular relation involving their common CMB Unruh acceleration: $\gamma_{CMB} \equiv 2\pi c^2/\lambda\!\!\!^{-}_{CMB}$, Indeed, with the Planck acceleration $\gamma_{Pl} \equiv (c^7/\hbar G)^{1/2}$, one observes:

$$R_U \approx R_{GC}\,(\pi m_n \gamma_{CMB}/m_H \gamma_{Pl})^2 \approx 13.811 \quad \text{Glyr} \qquad (10.10.1)$$

where a correction involving the mass ratio neutron-Hydrogen has been applied.

10.11. The high power weak boson correlations:

As seen in the justified Eq(3.2.1), the weak boson ratios $W \equiv \lambda\!\!\!^{-}_e/\lambda\!\!\!^{-}_W$ and $Z \equiv \lambda\!\!\!^{-}_e/\lambda\!\!\!^{-}_Z$ appear with the forth power. Therefore higher powers are loooked for, in the hypothesis that these numbers are privilegied basis for computation. Indeed, one observes[13]:

$$(W^2/Z)^{12} \approx 2\pi R_U/l_{Pl} \qquad (10.11.1)$$

with the corresponding value for the badly measured $W \approx 157339$, $n \equiv m_n/m_e$, $p \equiv m_p/m_e$ and $H \equiv m_H/m_e$, and the Rydbergh reduced wavelength $\lambda\!\!\!^{-}_{Ryd} \equiv 2a^2\lambda\!\!\!^{-}_e$:

$$R_U \approx \lambda\!\!\!^{-}_{Ryd}\,(WZn^2)^2 \approx 13.813 \ \text{Glyr} \qquad (10.11.2)$$

$$R_U \approx \lambda\!\!\!^{-}_{Ryd} a_w^2 n^6/apH \approx 13.815 \ \text{Glyr} \qquad (10.11.3)$$

$$(Z^{12} l_{Pl}/R_U)^3 \approx (2/\pi)\,pH \quad , \quad R_U \approx 13.811(4) \ \text{Glyr} \qquad (10.11.4)$$

$$(W^{12} l_{Pl}/R_U)^3 \approx 4\pi\,(pH)^{1/2} \quad , \quad R_U \approx 13.812(4) \ \text{Glyr} \qquad (10.11.5)$$

This means

$$Z/W \approx (3\pi^3)^{1/36} \qquad (10.11.6)$$

showing how cosmic considerations help in connecting the physical parameters to geometric constant. The elimination of π between the above equations leads to the following holographic equation:

$$(4\pi/3)(2R_U/l_{Pl})^3 \approx \pi(W^{3/2}/Z)^{72} \qquad (10.11.7)$$

the special term $W^{3/2}/Z$ is connected with the so-called weak mixing angle $\sin^2\theta \approx 0.23116(13)$:

$$(W^{3/2}/Z)^{-1/4} \approx 0.23124 \qquad (10.11.7)$$

showing interconnections between the parameters of the standard model of particle physics.

10.12. The weak Grandcosmos correlation:

Direct analysis shows that:

$$(m_p/m_n)^{1/2}(R_U/a_F\lambda\!\!\!^{-}_e)^3 \approx 12R_{GC}/a\lambda\!\!\!^{-}_e \ , \ R_U \approx 13.812 \ \text{Glyr} \qquad (10.12.1)$$

giving a direct connection between Grandcosmos and weak interaction.

11. On the Eddington's Theory and BEH boson

The Eddington's Theory[7] *must be revisited.* While Eddington was one of the best specialists in both general relativity and quantum physics, his *quantum cosmology* was severely mocked,

especially his “hydrogen atom number” $N_{Ed} = 136\times2^{256}$, considered as “foolish numerology”, but actually so predictive, since, as shown above, *it corresponds precisely to the matter energy of the Λ-CDM cosmological model.*

Interestingly, Salingaros quoted[43]: “Eddington introduced chirality and mathematical tools (Clifford algebra of 8 and 9 dimensions) appearing in the most advanced theoretical concepts (5-dimension base space, supersymmetry and supergravity).” *This means, inversely, that these theories are in a right track: it is possible that integrating Eddington's Theory and the present cosmology would help for the deblockage of theoretical physics.*

In particular, by extending an electron-proton symmetry to the muon, Eddington predicted the tau lepton, calling it “heavy mesotron", with right order of mass, 35 years before its surprising discovery. But, as *the latter appeared as a lepton, this could be a precious indication towards supersymmetry.* Note the following extension of the 'combination relation'[13], with p the proton/electron mass ratio $p \equiv m_p/m_e$, $P \equiv m_{Pl}/m_e$, $s \equiv m_{BEH}/m_e$:

$$a\hat{}(2a^3) \approx p\hat{}p^2 \approx P^{2s} \tag{11.1}$$

where the BEH boson appears, by its mass ratio to electron: $s \equiv m_{BEH}/m_e \approx 134 \times m_p/m_e$. When applied to μ the muon/electron mass ratio and τ the tau/electron mass ratio, this enters a coherent series, confirming the Eddington's view, with $H \equiv m_H/m_e$:

$$2R_U/R_N \equiv 2a^3/pH \approx (pa_F/Hs)^{1/2} \approx (4\pi)^{1/6} \approx \ln p/\ln a \approx \ln\tau/\ln\mu \approx \ln s/\ln\tau \approx \ln s/\ln a - 1 \tag{11.2}$$

Note that the property $\ln\tau/\ln\mu \approx \ln s/\ln\tau$ was published by Maruani[44]. A more direct connexion between BEH boson and Eddington's theory is

$$r_B/\lambda\!\!\!^{-}_{BEH} \approx (\pi p')^2 \tag{11.3}$$

involving the above (see end of Sect.4) Eddington's ratio $p' \approx 1847.599$.

12. Discussion

The discovery of the recession acceleration brought much trouble to standard cosmology. It was simply forgotten that the steady-state model has predicted not only such an acceleration, but gave also a correct prediction for the CMB temperature, assuming it is the thermostated result of stellar radiation. In fact, this non-evolutionary model, by philosophical reasons, was rejected a-priori by a majority, which favored observations seemingly refuting it. In particular, when the CMB spectrum was found to obey the fundamental black body law, it was professed that this was a refutation of the steady-state model, since no thermostatic agent, such as iron whiskers, was found. *But we havz shown that it suffices to introduce an external Grandcosmos to play this thermostatic role.*

Instead of this logical simplification step, a majority tried to complicate the model, by exactly the same epicycle process as the old Ptolemaic one. First of all, by addition of “ad-oc” terms to the GR equations, in particular, a "cosmological constant" having a repulsive property. Some researchers introduced modified dynamics (Milgrom[45]) or modified dark matter (dipolar gravity, Blanchet[46]). Some even tried to reject the *cosmological principle*, which means a large-scale homogeneity, contrary exactly to the basis of the permanent model: a *perfect cosmological principle*, meaning homogeneity of time *also*, i.e. *without cosmic evolution.* The greatest epicycle was to add a monstrous inflation, simply forgetting the fundamental lesson of quantum physics: an energy is associated with a frequency, therefore, it is much simpler to suppose a rapidly *vibrating* Universe.

We have came back to the Galilean critical steady-state cosmology, for which the energy is naturally divided in 3/10 and 7/10 parts, in full agreement with the latest observations, performed in the frame of the current Λ–CDM model.

Instead of postulating the logical Tachyonic Principle and *c*-free analysis, the physics community – for resolution of the Large Number correlations – preferred to resort to time variation of the constants[6] and/or "anthropic principle"[3,8,9]. These deviations from the Eddington's approach and the above logic analysis resulted from a *double mistake*, considering those correlations as a "temporal problem", instead of a "spatial hint", indeed *it is a length* which is directly measured in the redshift law. For a majority, this was only "numerology", but this critics is now invalidated by the observed high precision level of correlations and the *dramatic prediction of the Eddington's energy which matches with precision the Λ–CDM material energy.*

Nowadays, *the period of a cosmic phenomena is precisely measured.* It is a non-Doppler one, i.e. a direct manifestation of the tachyonic counter-part of the visible Universe. But it is rejected by the community for which the limit *c* for interaction speed is an absolute credo, in spite of the recognized non-local character of quantum physics. This period is tighly connected to the Fermi constant, a fact published 7 years ago[13], proving that the connection with the tachyonic world implies the weak Fermi interaction.

This calls for a synthesis of the two main cosmologies. They are no longer contradictory if one admits that the Universe is vibrating with the period $t_U = h/E_U$. Nowadays, what is generally called "quantum cosmology" is devoted only to the analysis of some hypothetical transient phenomenon, a primordial big bang (PBB) and associated inflation. A transient approach may be useful, not in the realm of a primordial event, but rather by considering the Universe vibrating in a kind of very rapid succession of inflation-deflations. Note that the inflation scenario of standard cosmology is more or less "ad-oc", with a timescale about 10^{-35} s, not very different of the Planck time 10^{-43} s, and a space expansion speed which attains in some models 10^{60} *c*; thus, it seems more logical to introduce directly the natural quantum period $t_U = h/E_U$, about 10^{-103} s. *Note that any finite timescale is more physical than the continuity concept.*

Moreover, this suppresses the antimatter asymmetry problem, since ordinaty matter now would be a matter-antimatter oscillation. With oriented scanning inflation, this explains also the origin of parity violation in particle physics and biology[13].

Assuming that what is called matter is in fact an oscillation "matter-antimatter" with frequency equal to an exact fraction (Resonance Principle) of the vibrating Universe frequency, this would mean that distant matter-antimatter vibration is π-dephazed relative to local one, possibly explaining a cosmic repulsive gravitation, able to explain the galactic recession. This would be connected with the strange reshift periodicities[47]. Interestingly enough, Milgrom[48] introduced recently BIMOND, with a 'repulsive twin matter'.

Thus, a redshift could be tied with such a change of phase. So, the redshift anomalies in the Arp's alignment of galaxies[31] could be a dephazed property of the *regeneration material*, the latter being an essential feature of steady-state cosmology. Note the presence of several types of abnormal redshifts has been already confirmed[32]. Therefore, *only real cosmic redshifts* must be taken into account in the determination of the recession time constant. This could explain why it does not coincide with the so-called age of the standard cosmology, and the high tension on this measurement[10]. *But, must probably, this tension is the first internal sign of the desagregation of the standard cosmological model.*

13. Conclusions: Principles of Coherent Cosmology

Apart the decisive confirmations of the Eddington's Theory, joined to a definite refutation of the Primordial Big Bang (replaced by a rapid inflation-deflation oscillation) and the resolution of

current enigma of modern cosmology (Large Number Correlations, quantum energy, dark energy, baryon density, antimatter, parity violation), the following general conclusions may be deduced.

13.1. The Holistic Principle

The abandon of reductionism, meaning a coming back to the old tradition of the Holistic Principle implies that cosmology would be the simplest of all scientific domains. We have shown it is really the case, since the most basic analysis technique, the *c*-free formulation analysis (known as the '3-fold elementary dimensional analysis') gives directly, apart a factor 2, the redshift radius (known as the 'Hubble length'). This was not seen before, during nearly one century, because of the reductionist '*c*-taboo'. Indeed, while the speed *c* is considered as the most basic fundamental constant, due to its importance in Relativity theory, this is the first constant to be eliminated in a cosmical formulation analysis. In fact, the value of *c* is far too small to connect a so vast Universe (for this reason, the PBB model was corrected by an inflation stage, to solve an 'horizon problem' in PBB scenario). *So, the reductionism taboo led to a 80 years lost in Science.* Indeed, while a Large Number Correlation was long time recognized, stating that the ratio of the Universe radius and the nucleon one is of order the electricity-gravitation force ratio in the Hydrogen atom, no-one proposed that the Universe was simply equivalent to a giant gravitational Deuterium atom, or a gravitational Hydrogen molecule, as we have shown in this article.

Eddington, with his formula that identify with ours, was close to reach this conclusion, but was blocked by the factor about 8 on the redshift measurement. This erroneous value was based on a single far galaxy which seemed to confirm the redshift radius value given by the Hubble's measurements of close galaxies, a number of which belong to the Local Group, which so do not obey the redshift law. *How the scientific communauty have made confidence to a single measurement*[49] *is a mystery of Science History. Also the disappearance of the decisive prediction of Lemaître concerning the redshift linear law is revealing a lack of rigor in the foundation of modern cosmology*[50].

This blockage of Cosmology means evidently a similar blockage in all scientific domains, which are now considered, due to the reductionist general approach, as separate disciplines. For instance, Schrödinger[51] in his famous book "What is Life" wondering what is the characteristics parameter of Life, concluded that temperature must be a decisive parameter. This is confirmed by the above cosmo-biologic relations. But he was unable to respond his central question : *"how can the events in space and time which take place within the spatial boundary of a living organism be accounted for by physics and chemistry?"*

From the above study it follows clearly that an organism must be driven by a unique frequency. In particular, the DNA chain *must* be a 1D line-hologram. Indeed the study of DNA vibrations is now an important research domain, but not considered from the coherent, or holographic, point of view.

But Holography[52] was discovered only 5 years after the Schrödinger question. This is another anomaly of Science. While waves are studied from centuries, how is it possible that holography was not recognized before (the history relates that Gabor discovered holography while waiting its turn in a tennis court). A detailed analysis of this affair is reported in a short monography[53].

13.2. Redshift radius invariance definitely proved. Not counting the dramatic black-atom cosmic radius, depending only of r_B and $\lambda\!\!\!^{-}_e$, we have shown five directly *justified* values for $R_U = cT_U$, *the unique parameter of the critical steady-state cosmology,* which are compatible with $T_{\Lambda\text{–CDM}} \approx$ 13.80(4) Gyr. They are:

1) Eq.(2.1.1), the *c*-free purely quantum one, giving a R_U formula inversely proportional to G,
2) Eq. (2.2.3), the limit for N = 1 of a N-atoms star, giving about the same formula
3) Eq. (3.2.1), a symmetric weak boson relation, giving a T_U formula independent of G,
4) Eq. (4.1.8), representing the Eddington's Energy, giving a T_U formula proportional to G,

5) Eq. (6.3.1), the decisive Oscillation Formula, associated with CCO, giving a T_U formula independent of G, but dependent on the weak coupling constant G_F, 100 times more precisely measured than G.

The best defined, with the simplest interpretation (a non-linear beatnote between CCO and electron Fermi vibration) is the fifth one: $T_U \equiv 2t_{cc}^2/t_{eF} \approx 13.81232$ Gyr. The *c*-free formula (6.1.1) gives t_{cc} and shows a symmetry gravitation-weak interaction.

The decisive relation (9.5) validates the Grandcosmos radius and Superspeed values. The Grandcosmos energy density is about 10^{120} times the Universe's one, resolving the main mystery of current physics. So a mass *m* corresponds not only to an energy mc^2 but also with a tachyonic energy mC^2.

Many more formulae for $R_U \equiv cT_U$, are found from *aesthetic or symmetry considerations, so open the way for further study*. The situation is somewhat comparable with the thirteen Perrin's formulae[54], which, exactly a century ago, showed up the Avogadro number, demonstrating by itself the quantification of matter. Here we observe rather a time quantification, since $t_U \approx 0.838\times10^{-103}$ s should be considered actually as a temporal quantum. Note that 12 of a total of 40 or so formula for R_U involves the Grandcosmos or the superspeed *C*.

13.3. Principles of Coherent Quantum Cosmology

All the following *Principles* (not independent from each other), which form the basis for the Coherent Cosmology[13] receive new decisive confirmations in the present article. They are, with $R_N = \hbar^2/(Ga^3m_e^3)$, and $t_P = (hG/c^5)^{1/2}$:

1. General Quantification P .: the physical laws are arithmetical ones, excluding any infinity (no continuum),
2. PCP:The laws of physics are the same everywhere and everytime: the steady-state cosmology,
3. Cyclic P.: all the events reproduce themselves with a periodicity $T_U = R_U/c \approx 13.812$ Gyr,
4. Ambivalence Principle: a physical phenomena can be explained by very different models,
5. Coherence P.: an unique frequency governs each phenomena, including DNA chain,
6. Resonance holoscanning P.: the universe with energy E_U is vibrating with a periodicity $t_U = h/E_U = 2t_P^2/T_U$, the period of the vibration matter-antimatter of each particle is a whole multiple of t_U.
7. Tachyonic P.: there is an invisible tachyonic world, with speed $C = cR_{GC}/R_U \approx 6.94\times10^{60}\ c$, associated with the quantum vacuum.
8. Holophysics P.: Holographic conservations are fundamental
9. Grandcosmos P.: an external thermostat is the source of the CMB, with radius $R_{GC} = R_N^2/2l_{Pl}$,
10. Computing Principle: the numerical constants are computation basis in a calculating Cosmos,
11. Harmonic Principle: numerical physical constants appears in musical numbers,
12. Inverted Anthropic P. Life helps cosmic computation, biological parameters are tied to cosmic ones.
13. Biophysics P. The biological and physical parameters are connected
14. Ultimate Mathematics Principle: the Nature uses an yet unkown optimal *inductive* mathematics.

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,* this study leads to dramatic observational predictions, *(a)* by selecting *the true cosmic redshifts*, the recession time must be identified with the period T_U (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 of the deep field views), *(c)* the existence of young galaxies in the near field (in this respect the observations of Arp must be revisited), *(d)* the identical CMB temperature everywhere, *(e)* the Wolf solar cycle $(T_U t_{cc}^2)^{1/3} \approx 11$ yr and the large climatic period, $(T_U^2 t_{cc})^{1/3} \approx 400000$ yr, might be present in other celestial objects (e.g., a cycle of 11.4 yr has been already detected[55] in the monstrous blazar OJ 287).

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