Towards a synthesis of two cosmologies: the steady-state flickering Universe

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A gravitation/electricity symmetry gives directly the Hubble radius (within its 4% indetermination), while a "black atom" model confirms the time-invariance of the radius of a critical steady-state Universe. This refutes the Primordial Big Bang model and permits to apply the *holographic principle* to the invariant Hubble sphere, with the extension to a *holophysics principle*, introducing a tachyonic scanning in a critical steady-state flickering Universe. This suggests a transient validity of the Big Bang approach, announcing a reconciliation of the two main cosmologies. Several main fine-tuning relations are shown to be of a holophysical character, i.e. a topological conservation involving the main physical lengths. The elimination of light speed from the interaction formulae defines both a timescale 13.7 Gyr (within 1% of the so-called age of the Universe, which is interpreted rather as the temporal regeneration constant of the steady-state model) and, within 10^{-4} uncertainty of G, the coherent cosmic oscillation period 9600.61(3) s. The latter is shown to be intrinsically connected by holophysics with the redshift periodicity 71.7 km/s and the Wolf solar period 11.05 years. The flickering concept opens the door for a cosmic interpretation of particle physics; for instance, the parity violation would be tied to a scanning chirality.

Keywords: cosmology, steady-state model, coherent cosmic oscillation, holographic principle, holophysics principle, fine tuning, c-free physics, scanning physics.

1. Introduction: a reconciliation of two rival models

Two cosmological models, both based on a *cosmological principle*, were rivaling during decades (Kragh, 1996). For the "steady-state" model, it is the *perfect cosmological principle* (PCP) of Bondi and Gold (1948), stating a temporal invariance of all cosmic quantities, such as the Hubble radius, the temperature and the material and energy mean densities. The second one, the Primordial Big Bang model, uses the *restricted cosmological principle* and assumes only a *spatial* mean invariance of the above quantities, admitting thus their variation with time. In short, the first model is permanent, while the second has a global evolution. This article proposes that the two models could be reconcilable if one admits a rapid succession of the Big-Bang-Big-Crunch process, i.e. a flickering Universe, where the PCP is applied to the time means of physical quantities, rapidly fluctuating in fact. This idea is supported by the fundamental "energy-frequency" association of the standard quantum theory ($\nu = E_U/h$, where E_U is the total energy of the observable Universe; other notations are usual). Thus, the new model could ultimately unify micro- and macro-physics.

2. Correcting defects of the standard Primordial Big Bang cosmology

The Primordial Big Bang model has been widely accepted, mainly due to mathematical reasons (instead of real physical ones, see Section 12), and suffers from three basic defects. Firstly, it tries to explain the Big from the Small; this is a "reductionist" point of view, describing the Universe simply as "an ensemble of interacting particles". In particular, the "standard particle model" is even unable to integrate gravitation, not to speak of such "emerging phenomena" as biologic ones. The string theory integrates gravitation, but is incapable to define an unique Universe, meeting, in particular, with the "hierarchy problem" of the interactions. This article, by contrast, clearly connects the main physical quantities of microphysics and cosmology using, specifically, the elementary method of *three-fold* dimensional analysis and the electricity/gravitation symmetry, and including a "black atom" elementary model, which directly reconciles quantum physics to relativity (Sections 4 and 7).

Secondly, the standard cosmology is based on *local differential equations*, implying an "initial conditions problem", and free parameters determinable by empiric measurements only. Thus, any precise correlation (*fine tuning*) between the implicated dimensionless numbers is considered as "a problem". In particular, the two "temporal large number problems": why the present Universe age, compared with a typical nuclear time, is of the order of electricity/gravitation strength ratio 10^{40} in a hydrogen atom, – while, compared with the Planck time, it is about 10^{60}, and, compared with the *cosmic microwave background* (CMB) timescale, it is $\sim 10^{30}$ (see Davies, 1982)? There are also: the "time invariant large number problem" (why the observable Universe atomic number is about 10^{80}?), the "cosmological value problem" (why the expansion is accelerating *at the present epoch*?), the "antimatter problem" (why there is no antimatter?) and the "flatness problem" (why the mean cosmic energy is critical?), being tied to the hidden mass and dark energy conundrums. It has been also emphasized that any modifications of the parameter values would suppress favourable conditions for *life*, so a Multiverse was introduced to attribute those correlations to chance. But it is simpler to assume that any conspicuous relation between cosmical quantities and microphysical ones fights for their temporal invariance, i.e. for PCP. This article introduces a new general principle replacing differential equations by global ones. In particular, it is shown that the "holophysical principle", with its 2D-3D scanning mode, is capable to explain the observed criticality (or "flatness") of the observable Universe, and also the main temporal fine tuning relations. Moreover, this principle directly combines some "strange" observations, unexplicable by modern physics and standard cosmology (Sections 5, 6 and 10).

The third defect is that standard cosmology is based on a 4D c-space-time where the speed c is *essential* as a fundamental parameter. This speed however is far too small for quantum cosmology. This implies, in particular, the so-called "horizon problem" due to "paradoxical" quasi-homogeneous character of the CMB (less than 10^{-5}): various remote regions of space could not have been connected with each other in the initial Primordial Big Bang (before the addition of the *ad-hoc* inflation, which introduces a "transient equivalent speed" $\sim 10^{60}c$). But the existence of the Doppler-free "coherent cosmic oscillation" (Section 3) refutes the standard c-space-time concept. This article shows that the Hubble half-radius is given by the elementary c-free analysis (Section 4), and that the above oscillation period is directly given by a simple elimination of c between the gravitational and weak interaction constants, once more confirming PCP, but now with the 10^{-4} accuracy of the gravitation constant G. A symmetrical extension to electricity gives the so-called Universe age *twice*; it is thus interpreted as the time regeneration constant of the steady-state model (Sections 9 and 10).

3. Coherent cosmic oscillation violates the standard c-space-time

A long series of dramatic precise measurements violates the standard c-space-time: the absence of any measurable Doppler effect (apart from *the time-invariant dephasing of one source to the other, ruling out a local bias effect*) of the "coherent cosmic oscillation" of a few active galactic nuclei with $\sim 1\%$ mean amplitude and precisely measured period 9600.63(3) s, see Fig. 1 (the standard error is indicated in brackets). This observation undermines the very foundation of physical c-kinematics, but would illustrate an extreme case of the fundamental non-local character of quantum physics.

The fact that the Sun, among other sources, oscillates with the identical period $t_0 = 9600.61(3)$ s, strongly confirms the universality of the phenomenon (see Fig. 2 and Brookes et al., 1976; Severny et al., 1976; Grec et al., 1980; Scherrer and Wilcox, 1983). The t_0 oscillation possessing a stable, over decades, initial phase supports therefore a concept of a coherent cosmic wave like "an absolute clock". The timescale t_0, which is equal to the c-free "gravito-weak" timescale t_{Gw} (Section 10) with the remarkable relative uncertainty 10^{-4}, happens to be also a "synchronizing", or the best-commensurable, period for pulsations of δ Sct stars and for axial rotation of the major bodies of the Solar system – ten largest asteroids and six rapidly spinning planets (excluding the Sun and slow rotators Mercury, Venus and Pluto). Statistically, it is also found to be the most "characteristic" period for revolution of close binaries of our Galaxy (Kotov, 2009a). Much puzzling, the *spatial scale* ct_0 happens to be the most "resonant" one for the planetary distances in the Solar system (taking into account π-factor for the five inner orbits; Sevin, 1946; Kotov, 2009b).

4. Hubble length is given by a c-free gravitation/electricity symmetry

The proportionality between *dimensionless* redshifts of galaxies and their (moderate) distances implies that what is measured really is the Hubble length $R_H = 1.28(5) \times 10^{26}$ m (Nakamura et al., Particle Data Group, 2010). For a long time it was known to be related to a sub-atomic mass m; however, as the cosmologists considered to be pertinent only the "Hubble parameter" $H_0 \approx c/R_H$, they have not noticed the absence of c in the formula $R_H \sim \hbar^2/Gm^3$. This relation, we *emphasized* (Sanchez and Bizouard, 2008; Sanchez et al., 2009), is given by a c-free dimensional analysis operating in the elementary three-fold domain (mass, length, time). This is at once an elementary resolution of the above main "large number problem", which roots are concealed in an *assumed* temporal variation of R_H. This justification is far better and simpler than the anthropic one (Carr and Rees, 1979), and is confirmed by the following considerations.

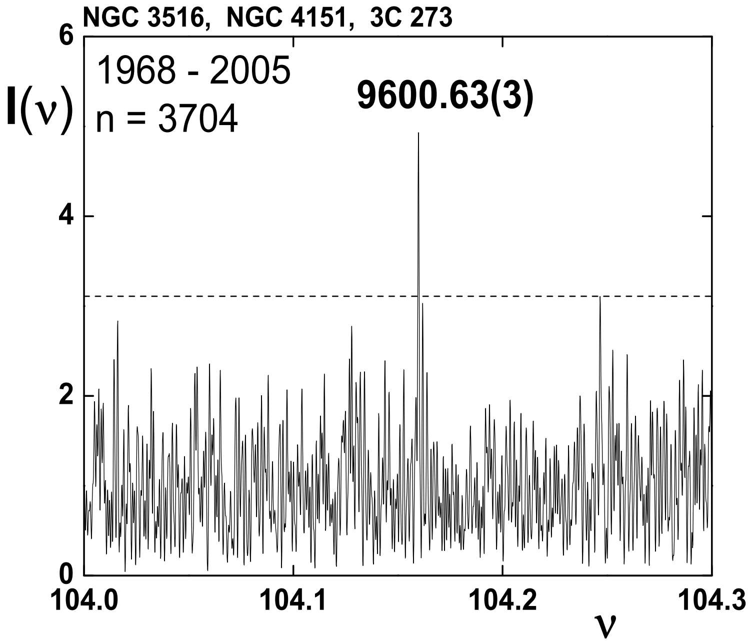

FIG. 1: Power spectrum of luminosity variations of the nuclei of the Seyfert galaxies NGC 3516 and NGC 4151 and quasar 3C 273 (observations 1968–2005 with the total number of measurements $n = 3704$; three individual power spectra were normalized, than averaged). The test frequency ν is expressed in microHz, the power $I(\nu)$ is in arbitrary units and the dashed line corresponds to a 3σ C.L. (same in Fig. 2). The highest peak corresponds to a period of 9600.63(3) s (C.L. $\approx 5\sigma$; after Kotov et al., 2011).

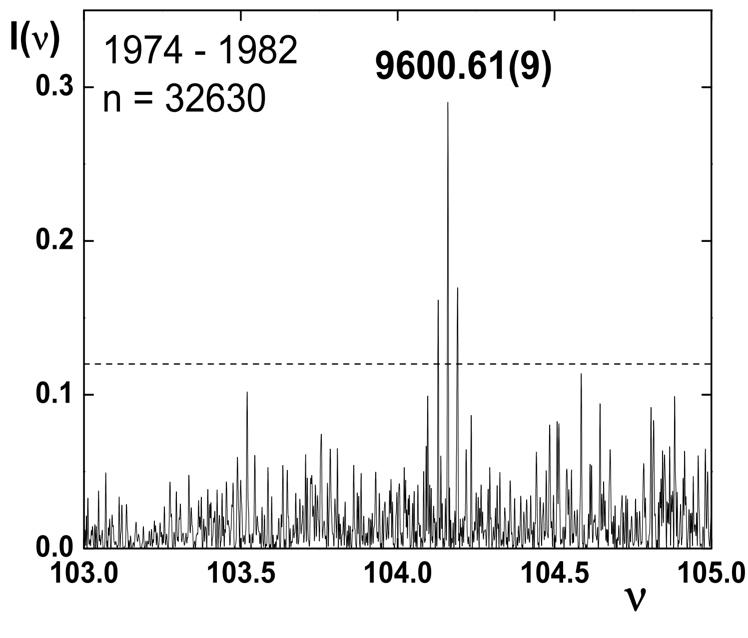

FIG. 2: Power spectrum of global oscillations of the Sun. The number n of line-of-sight photospheric velocity measurements with 5-minute integration time is equal to 32630. The observations were made in 1974–1982 during 473 days; the main peak corresponds to period 9600.61(9) s with C.L. $\approx 6\sigma$ (after Kotov, 2009a).

Three years before the famous Bohr's article, Arthur Haas has given a correct estimation of a hydrogen atom radius (see Hermann, 1971). He equalized the two energy formulae of the Thomson's model, $m_e v^2/2$ and e^2/r, with the Planck energy form $h\nu$. *Eliminating the speed* v by $\nu = v/2\pi r$, one obtains for a radius of the electron orbit: $r = 2\hbar^2/m_e e^2 \equiv 2r_0$, exactly twice the Bohr radius. (We use the r_0 symbol instead of a_0, since $a \equiv \alpha^{-1}$ is reserved for the inverse coupling constant.) Here we note that while the electric energy between two elementary charges is e^2/L, the main element of the gravitational energy in the Universe is that between two atoms of hydrogen, the most numerous component: Gm_H^2/L (L is the distance between charges, or particles). A substitution of e^2 by Gm_H^2, where a parallel is seen between the charge quantification and the grossly matter's one, results in the length

$$R \equiv \frac{2\hbar^2}{Gm_H^2 m_e} \approx 1.31 \times 10^{26}\ m \approx R_H. \tag{1}$$

This suggests a time-invariance of R_H, favouring the steady-state cosmology of Bondy, Gold and Hoyle, which had predicted the existence of a homogeneous CMB and its correct temperature (Hoyle et al., 2000) with much better precision than the initial Primordial Big Bang model. The steady-state model has predicted also an exponential law of galactic recession, with a time constant R_H/c; indeed, an expansion acceleration has been observed (Riess et al., 1998; Perlmutter et al., 1999).

5. The holophysics principle

The Hoyle's (1948) version of the steady-state Universe predicted also its "flatness", recently confirmed by observation (Spergel et al., 2007). The corresponding critical character of the observable Universe, with the total mass $M \equiv Rc^2/2G$, and taking into account (1), writes:

$$Mm_H^2 m_e \equiv m_{Pl}^4, \tag{2a}$$

where $m_{Pl} \equiv (\hbar c/G)^{1/2}$ is the Planck mass. Thus, the 2 factor of (1) disappears in (2a); hence, the latter expression could have a fundamental coefficientless *algebraic* meaning. Indeed, introducing the mass $m_l \equiv m_{Pl}^2/M$, defined by $R/2 \equiv GM/c^2 \equiv \hbar/m_l c$, one can read (2a) as the identity

$$m_{Pl}^2 \equiv m_H^2\ \frac{m_e}{m_l}, \tag{2b}$$

which can be identified with the famous Randall and Sumdrum's (1999) relation $m_{grav}^2 = m_{grav}^{2+n} V_n$ (under the troublesome standard redefinition $\hbar = c = 1$) for the extradimension number $n = 1$, the "extradimensional volume" $V_1 = R/2$ and the "higher dimensional gravity scale" $m_{grav}^{2+1} = m_H^2 m_e$ (on the left: 2 is associated with a hydrogen atom and 1 stands for electron). This suggests that the supplementary dimension could be interpreted as a *linear scanning of length* $R/2$; therefore, that hidden dimension has a cosmical nature, it is not a "compact" one.

Now, the 2 factor is essential for the following *geometric* consideration. Introducing the Universe's reduced wavelength $\lambda_M \equiv \hbar/Mc$, the critical condition can be written as:

$$\pi \left(\frac{R}{l_{Pl}}\right)^2 \equiv 2\pi\ \frac{R}{\lambda_M} \equiv 2\pi N_m\ \frac{R}{\lambda_m}, \tag{3a}$$

where $N_m \equiv M/m$ is the equivalent number of particles of mass m. One immediately recognizes the Bekenstein-Hawking entropy in (3a), where $l_{Pl} \equiv (\hbar G/c^3)^{1/2}$ is the Planck length. Thus, the standard "holographic principle" (see Besso, 2002) can be applied to the whole Universe in a 2D-1D fashion; this has not been discovered earlier due to supposed variability of $R_H \approx R$. The extension to any particle of mass m introduces a multi-linear holographic term, generating a whole spherical surface by rotation of circles for sufficiently large N_m. The latter represents, in this *holophysics principle*, an equivalent number of particles of mass m or, ultimately, a large quantum whole number. This rotational scanning, together with the above linear one, may generate the half Hubble sphere. Indeed, applying (3a) to electrons with $N_e \equiv M/m_e$, on the basis of (1) and (2a) one infers the simple relation:

$$\frac{\hbar c}{Gm_H m_e} \equiv \frac{R}{2\lambda_H} \equiv \left(\frac{M}{m_e}\right)^{1/2} \approx 3.11 \times 10^{41}, \tag{3b}$$

which is both the resolution of the two above main "Large Number Problems" and a version of the central, but forgotten, Eddington's (1932) cosmic statistical formula. Noting that $\lambda_H^2 \lambda_e \sim 3r_e^3/4$, one gets from (3a) also:

$$\pi \left(\frac{R}{l_{Pl}}\right)^2 \approx \frac{2\pi}{3} \left(\frac{R}{r_e}\right)^3 \tag{3c}$$

with 1.6% precision. Here $r_e \equiv \lambda_e/a$ is the classical electron radius, close to a nuclear radius, with $\lambda_e \equiv \hbar/m_e c$ the reduced Compton wavelength of electron. (The corresponding mass is the Nambu mass $m_N \equiv \hbar/cr_e \equiv am_e$, of central importance in particle physics; Nambu, 1952. We define quite generally a topological connection, involving several main physical lengths, as "holophysical"; here a disk area and a half-sphere volume.) It is indeed the case of the following 5D expression (Sanchez et al., 2011):

$$\frac{R}{\lambda_e} \approx s_4^5, \tag{3d}$$

where $s_4 \equiv 2\pi^2 a_0^3$ is the area of a 4D sphere of radius $a_0 = r_0/\lambda_e$, i.e. a dimensionless atom radius. This strongly supports therefore the pertinence of a 5D space-time. (The relation (3d) is accurate within the suspicious 2σ on G, see Section Q, pp. 4247, in Mohr and Taylor, 2005, which describes the mutually inconsistent measurement experiments, from which the CODATA value for G was derived.)

6. Special holophysical relations

With the reduced Compton wavelength of atomic hydrogen, $\lambda_H \equiv \hbar/m_H c$, Eq. (1) may be written in a simple *holophysical* form:

$$2\pi \frac{R}{\lambda_e} \equiv 4\pi \left(\frac{\lambda_H}{l_{Pl}}\right)^2 \equiv 4\pi \left(\frac{P}{H}\right)^2, \tag{4a}$$

and, with $P \equiv \lambda_e/l_{Pl}$ and $H \equiv \lambda_e/\lambda_H$, one observes a dramatic symmetrization (within 1% uncertainty):

$$\pi \left(\frac{R}{\lambda_e}\right)^2 \approx \frac{4\pi}{3} (PH)^3. \tag{4b}$$

The elimination of R/λ_e between the two above relations leads to (1% uncertainty):

$$3P \approx H^7. \tag{4c}$$

Now the Davies's (1982) "star fine-tuning" (avoiding most stars to be red dwarfs or giant blues) reads: $3P^2 \approx (a^2 H)^6$, – meaning, with the reduced Rydberg wavelength $\lambda_{Ryd} \equiv 2a^2\lambda_e$, the following holophysical relation (1% uncertainty):

$$4\pi \frac{\lambda_e}{l_{Pl}} \approx \frac{4\pi}{3} \left(\frac{\lambda_{Ryd}}{2\lambda_H}\right)^6, \tag{4d}$$

suggesting a connection with the 6D space of string theory. With (4c), this results in (0.1% uncertainty):

$$PH \approx a^{12}, \tag{4e}$$

and

$$\pi \left(\frac{R}{\lambda_e}\right)^2 \approx \frac{4\pi}{3} \left(\frac{r_0}{\lambda_e}\right)^{36} \equiv \frac{4\pi}{3} a^{36}, \tag{4f}$$

a holophysical character in a 36D space. The last expression, precise to 1%, directly relates gravitation to electricity as well as Section 4. The following section shows third way, even more direct, for this connection.

7. The black atom model

We recall here the basic quantum point of view presented in Sanchez et al. (2009). Namely, let us consider a hydrogen atom. In any global cosmic theory, the latter cannot be really thought as "isolated". So, this single atom may be imagined as that located at the center of a R-radius black hole, with the corresponding quantum electron trajectories limited by R. Let us imagine also a plane filled by electron circular "potential trajectories" of radii $r_n = n\lambda_e$, n being an integer limited by $N = R/\lambda_e$. (According to the logic of quantum mechanics, electrons are thought to be distributed at spheres of radii r_n around atom center, but they all collapse instantly to a plane circular orbits at the very moment of the reduction of their quantum wave function being "viewed", or "recognized", by an outer observer, other atom or just by another "object".)

The electron velocities v_n are given by the quantum relation $\hbar = m_e v_n r_n$ with $v_n = c/n$. Thus, the first trajectory, $n = 1$, must be omitted. Further, with the classical *spherical* probability r_n^{-2} for each trajectory, this gives the mean radius $< r >$ close to the *Bohr's one*, r_0. Indeed, the summations from 2 to N lead to:

$$\frac{< r >}{\lambda_e} \equiv \frac{\sum n^{-1}}{\sum n^{-2}} \approx 136.9 \approx \frac{r_0}{\lambda_e} \equiv a \tag{5}$$

with 0.1% relative precision; here $\sum n^{-1} = ln(R/\lambda_e) + \gamma - 1$, with the Euler constant $\gamma = 0.577215...$, and $\sum n^{-2} = \pi^2/6 - 1$. This model is limited to a plane, like that for the historic Bohr's (1913) plane atomic model. This confirms also, with 0.1% precision, the rough theoretical estimate $a \approx ln\ a_G$ (see Carr and Rees, 1979; the definition of a_G is given below). *This is the simplest argument for the critical state of the observable Universe.*

It is very intriguing that the essential term R/λ_e is very close, within 0.6%, to the remarkable large number 2^{128} which appears in the Eddington's (1946) theory. One must conclude therefore that the relation (5) is an example of "a quantum holism" where microphysics and cosmology are directly connected with each other by quantum mechanics.

8. Three dimensionless interaction constants

The well-known study of Carr and Rees (1979) defines a "gravitational coefficient" $Gm_p^2/\hbar c$ by analogy with the "fine structure constant" $\alpha \equiv e^2/\hbar c$; they were guided by the electro-gravitational symmetry "e^2–Gm_p^2", i.e. by the same symmetry as that in Section 4, but implying a couple of protons. Here we define *a purely gravitational* (no electric contribution) coefficient by a symmetric choice:

$$a_G \equiv \alpha_G^{-1} \equiv \frac{\hbar c}{Gm_p m_H} = 1.6919(2) \times 10^{38}. \tag{6a}$$

While the central relation of Carr and Rees, $a_G \sim a^{20}$, shows a discrepancy of 3×10^5, that of (4f) is only 1.017; therefore, it is a real "fine tuning". From (4e), this definition of a_G appears to rely on the proton mass:

$$\frac{m_p}{m_e} \approx \frac{a^6}{a_G^{1/4}} \approx 1836.09(5), \tag{6b}$$

nearly within 10^{-4} indetermination of G. With λ_e as a length unit, the electricity/gravitation symmetry gives

$$\frac{r_0}{\lambda_e} \equiv \alpha^{-1} \equiv a, \tag{6c}$$

$$\frac{R}{2\lambda_e} \approx \alpha_G^{-1} \equiv a_G. \tag{6d}$$

Note *(a)* the proximity of $a \approx 137.0360$ to 137, the Eddington's whole number, *(b)* a_G to 2^{127} (0.6%), and *(c)* the Parker-Rhodes combinatorial hierarchy for integers $x_n = 2^{x_{n-1}} - 1$ (with $n = 1, 2, ...$ and $x_0 = 2$), defining the series: 3, 7, 127, $2^{127} - 1$, with the sum 137 of the first three terms (see Noyes and McGoveran, 1989; Bastin and Kilmister, 1995). This gives third interpretation of the factor 2 in (1), now of arithmetic type.

A "weak fine structure constant" α_w was originally introduced by Carr and Rees:

$$a_w \equiv \alpha_w^{-1} \equiv \frac{\hbar^3}{G_F c m_e^2} \equiv \left(\frac{m_F}{m_e}\right)^2 = 3.28340(2) \times 10^{11}, \tag{7a}$$

where $m_F \equiv (\hbar^3/cG_F)^{1/2} = 5.21976(4)\times10^{-25}$ kg is the Fermi mass defined by the Fermi constant $G_F \approx 1.43584(1)\times 10^{-62}$ J m^3. The constant a_w appears in a remarkable relation, permitting the so-called "primordial nucleosynthesis" to produce appreciable helium abundance: $(m_e c^2)^6 \sim GG_F^{-4}\hbar^{11}c^7$, – which can be stated as

$$P \equiv \frac{m_{Pl}}{m_e} \sim a_w^2. \tag{7b}$$

With a factor of $H^{1/2}$, it is also the more stringent "supernovae condition" (Davies, 1982). On the basis of (7b), Carr and Rees deduced: $a_G \sim W^8$, – with the help of the relation $a_w \sim aW^2$, where W is the charged boson mass ratio m_W/m_e. Introducing the neutral boson ratio Z, we observe very precisely: $a_w \approx a^{1/2}WZ$, and another dramatic cosmic connection:

$$(WZ)^4 \approx \frac{a_w^4}{a^2} \approx 2\frac{P^2}{H} \approx \frac{R}{\lambda_H}. \tag{7c}$$

With its 10^{-4} uncertainty for the boson relation and 0.3% precision for the interaction constants one, this triple relation merits the name "fine tuning", while (7b) does not really (with discrepancy by 4.51 factor). Since $(R/\lambda_H)^2$ is the ratio of (3a) and (4a), apart a factor of 4, – this could mean that the weak bosons, or their supersymmetric counterparts, play a central role in cosmology, being real candidates for the missing mass and/or dark energy (Sanchez et al., 2009).

The fourth interaction constant, the strong one, also enters holophysical relations and combinatorial hierarchy (Sanchez et al., 2011); being poorly determined, however, it is not considered here.

9. *c*-free analysis gives timescale 13.7 Gyr twice

The *holophysics principle* implies an existence of tachyonic celerities, leading to the following *c*-free analysis. For every distance L between interacting particles, the electric and gravitational canonic energies are $E_e = \hbar c/aL$ and $E_G = \hbar c/a_G L$, respectively; by similarity, the weak interaction energy $E_w = \hbar^3/a_w m_e^2 cL^3$ (with L^3 given by dimensional analysis). Therefore, c can be directly eliminated by considering the *gravito-weak* energy $E_{Gw} = (E_G E_w)^{1/2}$. Taking into account the (6c)–(6d) symmetry, we choose $t_e \equiv \lambda_e/c$ for a time unit. This defines the gravito-weak time $t_{Gw}(L) \equiv \hbar/E_{Gw}(L)$:

$$\frac{t_{Gw}(L)}{t_e} = (a_G a_w)^{1/2} \left(\frac{L}{\lambda_e}\right)^2. \tag{8a}$$

By virtue of the electricity/gravitation symmetry, one gets the *c*-free electro-weak timescale ratio

$$\frac{t_{ew}(L)}{t_e} = (aa_w)^{1/2} \left(\frac{L}{\lambda_e}\right)^2. \tag{8b}$$

The setting $L/t_{ew}(L) = \lambda_e/t_e \equiv c$ permits a *c*-elimination by substituting L/λ_e into (8a) by $t_{ew}(L)/t_e$ from (8b):

$$\frac{t_{Gew}(L)}{t_e} = (a_G a_w)^{1/2}\ aa_w \left(\frac{L}{\lambda_e}\right)^4. \tag{9a}$$

The above compound interaction term defines a timescale

$$t_{Gwe} \equiv t_e(a_G a_w)^{1/2}\ aa_w \approx 13.69 \text{ Gyr}, \tag{9b}$$

i.e. the so-called "Universe age" of the standard cosmology, 13.69(13) Gyr. Therefore, this timescale could be considered as the "exponential time constant" of the galaxy recession in a steady-state cosmology, where the interaction constants are *strictly* time-invariant. Permuting gravitation and electricity defines the timescale $t_{ewG}(L)$, given by $t_{ewG}(L)/t_e = (aa_w)^{1/2} a_G a_w\,(L/\lambda_e)^4$. For $L = (\lambda_H\lambda_F)^{1/2}$, where $\lambda_F \equiv \hbar/m_F c$, one gets *the same timescale*

$$t_{Gwe} \approx t_e(aa_w)^{1/2}\ \frac{a_G}{H^2} \approx 13.7 \text{ Gyr}. \tag{10}$$

From (9b) and (10) one gets $H^2 \approx (aa_G)^{1/2}/aa_w$, which means (since $a_G^{1/2} \approx P/H$):

$$H \approx \left(\frac{P}{a_w a^{1/2}}\right)^{1/3} \approx 1838.68(4) \approx \frac{m_n}{m_e}, \tag{11}$$

i.e. the neutron/electron mass ratio, limited by G indetermination. The appearance of neutron in such basic cosmologic consideration could mean that the "regeneration matter", compensating the galaxy recession through the Hubble sphere, might be only neutrons, which, after disintegration with the timescale $t_n = 885.7(8)$ s, produce stable particles. This is confirmed by the comparison of the rates M/T and m_n/t_n, which results in the relation (within 0.1% indetermination of t_n):

$$\frac{M}{T} \approx \frac{m_n}{t_n}\left(\frac{\lambda_{CMB}}{l_{Pl}}\right)^2, \tag{12a}$$

where $M/T \equiv c^3/2G$ is the mass rate of the galactic recession in the steady-state model with $T \equiv R/c$, and the wavelength $\lambda_{CMB} \equiv hc/kT_{CMB}$ is associated with the CMB temperature $T_{CMB} = 2.725(1)$ K. The latter is observed to be compatible with the relation

$$\left(\frac{\lambda_{CMB}}{r_e}\right)^4 \approx P\,\frac{a_G}{a_w}, \tag{12b}$$

which shows that λ_{CMB} is tied to the *ratio* a_G/a_w in a fashion that completes those noted by Sanchez et al. (2009).

We recall also the 0.1% "central correlation" (Sanchez et al., 2009), relating the ratio of energies with the ratio of populations by an Eddington-type statistical formula (Eddington, 1932)

$$\frac{\rho_{nrel}}{\rho_{rel}} \approx \left(\frac{2n_{ph}}{N_H}\right)^{1/2}, \tag{13}$$

where $N_H \equiv M/m_H$ is the equivalent hydrogen number, n_{ph} is the CMB photon number in the observable Universe and ρ_{nrel} – the ordinary energy density, while the standard "relativistic energy" ρ_{rel} is the sum of the CMB and CNB energy densities. This suggests that the standard *cosmic neutrino background* with temperature T_{CNB} may really exist (CNB, not yet detected). This crucial point will be confirmed in the following section.

10. Holophysical singularities of the c-free gravito-weak timescale t_{Gw}

One observes that t_{Gw}, the gravito-weak compound interaction term of (8a), obeys the holophysical type of (4c):

$$3\,\frac{t_{Gw}}{t_e} \approx \left(\frac{a_F}{a}\right)^7 \tag{14a}$$

within 4×10^{-4}, where $a_F \equiv a_w^{1/2} \equiv m_F/m_e$. This implies two holophysical analogs of (4a) and (4b) with substitutions: P by t_{Gw}/t_e and H by a_F/a. Thus, P/H and PH are replaced by $at_{ew}/a_F t_e$ and $a_F t_{ew}/at_e$, respectively. These relations, assumed to be spatial and based on λ_e, introduce the lengths $l' = v' t_{ew}$ and $l'' = v'' t_{ew}$, with $v'v'' = c^2$ (classic phase-group relation), where the speed

$$v' = c\,\frac{a}{a_F} \approx 71.7\ km/s \tag{14b}$$

is the observed galaxy redshift periodicity (Croasdale, 1989). Eliminating $c \equiv \hbar/m_e\lambda_e$, one gets:

$$\hbar \approx m_F r_e v'. \tag{14c}$$

The natural quantum generalization of the above formula involves $n\hbar$, with n integer, introducing the speeds nv'; this might be tied to the observed redshift periodicity. The pertinence of (14a) is confirmed by noting that, on the basis of: $3Pa_F/H \approx (a_F/a)^7$, the deduced H ratio is (within the 10^{-4} G accuracy):

$$3P\ \frac{a^7}{a_F^6} \approx 1837.59(5) \approx \frac{(m_p m_n)^{1/2}}{m_e}. \tag{14d}$$

The scanning hypothesis is confirmed by the noting that $G_F/\hbar$ and $\hbar/m_F$, with the Fermi mass $m_F \equiv a_F m_e$, are respectively of dimensions L^2/T and L^3/T (here T and L are *conventional* symbols), with the connection:

$$\left(\frac{\hbar t_{Gw}}{m_F}\right)^{1/2} \sim \left(\frac{G_F t_{Gwe}}{\hbar}\right)^{1/3} \sim\ (\hbar G t_{Gw}^2 t_{Gwe})^{1/5} \sim\ \lambda_{CMB}, \tag{15a}$$

where $(t_{Gw}^2 t_{Gwe})^{1/3} \approx 10.8$ years $\approx t_{Wolf}$, the 11 years period of the Sun (Sanchez, 2006). It is confirmed by the following c-free expression:

$$(\hbar G t_{Gw}^3)^{1/5} \approx \left(\frac{G_F}{\hbar}\ t_{Wolf}\right)^{1/3} \approx \lambda_{Bal}, \tag{15b}$$

corresponding to the cycle t_{Wolf} of 11.05 years (here $\lambda_{Bal} \equiv 4\lambda_{Ryd}$ is the Balmer wavelength). On the basis of (1), (6c) and (9) we find: $t_F \equiv \hbar/m_F c^2 \equiv G_F^2 m_F^3/\hbar^5$, close to $t_{Gw}^3/t_{Gwe}^2 \approx t_e/2a$, i.e. half classical "tempon" r_e/c, of the order of the light time delay in a nucleus. With $l_{Gw} \equiv c t_{Gw}$, taking into account: $R \approx 3r_e^3/2l_{Pl}^2$ from (3c), – this means $l_{Gw}^3 \approx r_e R^2/2 \approx R^3 l_{Pl}^2/3r_e^2$, so that the half-sphere (3c) can be replaced by the following system of the two full-sphere holophysical relations:

$$2\pi\ \frac{l_{Gw}}{r_e} \approx \pi \left(\frac{R}{l_{Gw}}\right)^2, \tag{16a}$$

$$4\pi\ \left(\frac{r_e}{l_{Pl}}\right)^2 \approx \frac{4\pi}{3}\ \left(\frac{R}{l_{Gw}}\right)^3. \tag{16b}$$

The elimination of r_e shows that they are approximations of the more precise full-sphere Bekenstein-Hawking entropy in the 0.6% relation

$$4\pi \left(\frac{R}{l_{Pl}}\right)^2 \approx \left(\frac{R}{l_{Gw}}\right)^9; \tag{17}$$

this might be connected with the 9D space of the string theory.

The deviation of the scanning area $\hbar t_{Gw}/m_F$ from λ_{CMB} is itself very special in (15a):

$$t_{Gw}\frac{\hbar}{m_F} \equiv \lambda_e\ \left(\frac{\lambda_e c t_{Gwe}}{2}\right)^{1/2} \approx \frac{11}{4}\ \lambda_{CMB}^2\ , \tag{18}$$

where both the CMB reduced wavelength λ_{CMB} and the classic statistical coefficient $11/4 = (T_{CMB}/T_{CNB})^3$, defining the standard CNB temperature, appear. Note that the relation $\lambda_{CMB} \sim (R l_{Pl})^{1/2}$, containing (18), was published by Davies on the basis of the standard Primordial Big Bang cosmic dynamics approach. This fights, once more, for a reunion of the two main rival cosmologies.

The above c-free gravito-weak timescale

$$t_{Gw} \equiv t_e (a_G a_w)^{1/2} = 9601.5(5)\ s, \tag{19}$$

introduced by (8a) and demonstrating the above dramatic holophysical properties, is identified with *the best measured cosmic physical quantity* – the "cosmic coherent oscillation" period $t_0 = 9600.61(3)$ s (apart a positive 1.7σ deviation from G, the most badly measured universal constant; see Section 3).

11. Discussion

The question arises: "how such a simple treatment has not been done earlier, since a gravitation/electricity symmetry is strongly needed in theoretical physics?". The answer is triple: *(a)* the history of the very beginning of atom physics, the Haas's calculation of the atom radius, has been forgotten, *(b)* in spite of the clear non-local character of a wave associated with a particle, an *extended* quantity which collapses *instantaneously* into a *single point* when a particle is detected, the "maximal information celerity dogma" is still very strong: nobody tried to consider the pertinence of the c-free cosmology, and *(c)* nobody cared for a such significant physical quantity, as the Fermi mass, embedded in the "particle data group" definition of the weak Fermi coupling by a such odd mass unit, as GeV. One can add one more argument: in many expressions of physics and cosmology, – just for "convenience" of calculations, with no physical grounds, – the speed c was substituted by unity (as a result, e.g., the fact that c is missing in the earlier analogues of (1) has been ignored by theorists for decades).

A second question is: "why the Primordial Big Bang theory seems to receive so many confirmations?". The answer is that it was considered as a dogma; as a result, any contradictory observations were hardly criticized; for instance, the "redshift periodicity" 72 km/s and the "cosmic oscillation" phenomenon. Here we show, – see (14a,b), – they are tightly correlated with each other by the *holophysics principle*. The above *dogma* is so strong that it is plausible that other essential and conflicting observations would be simply rejected for publication. (The calculation of the Hubble half radius from the c-free dimensional analysis was rejected by the Orsay University in 1995, and by the French Academy in 1996, with the striking statement of the anonimous referee: "The Big Bang is authenticated". And these institutions have maintained their censorship years after the predicted galactic acceleration has been in fact confirmed: Riess et al., 1998; Perlmutter et al., 1999). Note that some previsions of the steady-state model, such as the homogeneity and the temperature of the CMB, an acceleration of expansion and criticality (Hoyle et al., 2000), have been already "well forgotten" by many textbooks. It is also the case for the pioneer work of Eddington, who was the first to propose a cosmic-microphysics unification.

This article proves the old traditional 3-fold dimensional analysis is much more efficient than the 2-fold one of relativity (where *time* is identified with *length*, and *energy* with *mass*). The pertinence of the scanning hypothesis is dramatically supported by the dimensionality of the Fermi constant (*energy* × *volume*), which allows to understand such dramatic correlation as (15a,b) which strongly suggests that the Wolf solar period has a true cosmic origin.

The so-called "Universe age", obtained *twice* by the elimination of c between the three main interaction constants, is interpreted as the time constant T of the exponential galactic recession law in the steady-state cosmology. This cosmic time constant is explicitly connected, at about 10^{-4} imprecision of G, with the neutron/electron mass ratio, see (11). Therefore, a neutron could be a "regeneration particle" of the steady-state model. This is a *necessity* of the model, since the mean density must remain invariant via compensation of the matter loss through the invariant Hubble sphere at the rate M/T. Merely this rate is connected by (12a) with the *intrinsic neutron rate*, and with participation of the CMB wavelength.

While the standard *holographic principle* is recognized to be essential in theoretical physics, it was never applied in cosmology due to the supposed temporal variation of the Hubble length, – while the temporal invariance of atomic lengths has been grossly confirmed by astrophysical observations. In the Primordial Big Bang model, moreover, the Timely Large Number Correlation is a real problem, receiving an unique, but very crude, explication: the Universe age is of the order of a carbon-productive star, so that we live in a *specific cosmic epoch*. This application of the *anthropic principle* (see Barrow and Tipler, 1982) is a reminiscence of the pre-Copernician dogma, which taught we live in a *special cosmic place*. By the way, this is only a "coincidence by the order of magnitude", which cannot compete with the remarkable (double and symmetric) 1% relation (3b), directly deduced from the holophysics principle, being a generalization of the holographic one.

Indeed, the time invariance of the Hubble length permits to use, at last, the standard holographic principle in real cosmology, introducing a 1D holographic term (3a), and also the 3D Universe's sphere by a scanning process in a flickering Universe (*holophysical principle*). Naturally, trying to approach continuity from a fundamental scanning discontinuity, this model *involves large numbers into a big Universe*. More precisely, the exact formulation (3a) implies the Universe criticality (flatness). Thus, the so-called temporal "Large Number Problems" are shown in fact to be simple hints for holophysics, proving also to be powerful to analyse data.

However, the standard Primordial Big Bang cosmology is not completely ruled out, since the neutrino field clearly emerges in the decisive relations (13) and (18), the latter precising the Davies's relation, inferred from the Primordial Big Bang *dynamics*. Such picture might be realized and conceived, if the standard calculations operate with a particular timescale, which is much smaller than our ordinary one, – as in the case of a flickering Universe model, i.e. of a rapid Big-Bang-Big-Crunch oscillation. This is confirmed by the tight connection of (2b) with the Randall-Sumdrum's approach, based on general relativity equations, which receive here a true cosmical interpretation.

The scanning concept enlightens the relation between *space* and *time*. The idea of rapid circulation of an unique particle, presented firstly by Wyler, was objected by Feynman (1965): "there would be an equivalent amount of matter and antimatter". This problem disappears in the flickering Universe, with the simple hypothesis of a rapid matter-antimatter oscillation: this resolves an old enigma of the Primordial Big Bang model. By this way, particles could be associated with the scanning singularities, which *at last* could explain, e.g., electric charge, parity violation and CPT invariance; evidently, a scanning process might be chiral: *this is the first simple explanation of what is currently considered as an unresolvable mystery of Nature: the violation of parity.* Thus, the entities of the particle physics can be, in principle, described and explained by cosmology (not the inverse), which might also resolve the basic defect of reductionism: it must be replaced now by "holism". In particular, the Eddington's (1946) "fundamental theory", which has predicted an existence of the τ lepton (he called it the *heavy mesotron*) with correct order of its mass, – 30 years before the actual discovery, – must be re-evaluated. Indeed, his statistical cosmic formula (Eddington, 1932) enters the Large Number Problem resolution (3b), and has permitted also to discover our *central correlation* (13). Moreover, according to Salingaros (1985), 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). But one must note that the logic of the scanning process needs the intervention of a Grandcosmos, external to the Hubble Universe (Sanchez et al., 2009, 2011).

Thus, the apparently unexplicable phenomena, the *non-Doppler* coherent cosmic oscillation, receives a beginning of the explanation: it would be a beat-note of the fundamental flickering oscillations. Relations (15a,b) clearly shows the cosmic character of the Sun's cycle too: it might be another non-linear beat-note with a period of 11.05 years.

12. Conclusion. Physical analysis versus mathematical deduction, and some predictions

The domination of deductive mathematics in the post-modern science leads to a complete failure (Primordial Big Bang, Multiverse concept, no logic in particles, emerging phenomena and biology; see, for instance, Smolin, 2006). *This article proves clearly the complementarity between physical analysis and mathematical deduction from a-priori arbitrary axioms.* In particular, the catastrophic reductionist approach must be abandoned: the "standard model" of particle physics must be reinterpreted as well as the string scaling, which might be *cosmic* rather than "microscopic". The *Perfect* CP seems to be correct, with the meaning that the Universe has no longer any global evolution. Therefore, the important cosmic predictions arise: *(a)* the far-field galaxies, in average, could present the same features as near ones, with nearly identical physical characteristics and ages (notice, this is strongly supported already by the deep field views of the Hubble Space Telescope and other modern observations), *(b)* the existence of *young galaxies in the near field*, *(c)* the same cosmic temperature everywhere, *(d)* the Sun's Wolf cycle might be present everywhere with its *non-Doppler property* (Kotov et al., 2011), and *(e)* the physical constants would be really time invariants. In this respect, since several holophysical fine tuning relations are limited by the 10^{-4} imprecision of G, the more acute determination of the latter is keenly needed.

The scanning (sweeping) concept enlightens the relation between *space* and *time* and gives a physical sense to the Randall-Sumdrum extradimension (2b), interpreting it as a tachyonic scanning. Thus, the very nature of *time* must be revisited. In particular: a "time quantification" should be now seriously questioned, with an advance of the hypothesis about a *computing* Universe. The latter is strongly suggested by the relations (4e,f) demonstrating the large numbers in fact are special powers of small ones. They involve high dimensional mathematical spaces, such as 6D and 9D, typical for string theory and emerging neatly in (4d) and (17). Therefore, the dimensionless parameters could appear as *calculation basis in an optimal cosmic computer* (notice this study proves the relevance of the *inverse* coupling constants, meaning the importance of non-perturbation theories; Sanchez et al., 2011). One may state also that the *holophysics principle* would receive a clear explication, since *holography* itself is so far the most power technique to deal with information.

In fact, the above gravitation/electricity symmetry is clearly tied to the combinatorial hierarchy (Section 8). Both the latter and the present approach could be decisive for future theory which could be driven by diophantine equations, being probably in definite relation with the *unexplained* efficiency of the elementary 3-fold dimensional analysis (Sanchez, 1995). This, in turn, could result in a dramatic progress of computer software.

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