Quantum Resonances in Perfect Cosmology

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Abstract

As predicted, the "Universe breakers" galaxies is a one more confirmation of the Perfect Cosmology (steady-state model). Moreover, the main cosmological parameters show quantum resonances using the large Lucas and Eddington numbers. This confirms that matter is a matter-antimatter oscillation and dark matter a quadrature one. This confirms also the BIPM G value, larger by 1.7×10^{-4} than the official one.

1 Universe breakers in Perfect Cosmology

The JWST observes heavy galaxies in the far-field [6]. This is exactly what was predicted: *"The very large infra-red telescopes will show in the very far field old galaxies instead of expected young ones. Then no artifice, such as inflation, dark energy, multiverse ..., will not save the standard evolutionary model, based on the imperfect cosmological principle"* [19]. Indeed, this is one more observation, this time decisive, confirming the steady-state model [3], [9]:

1. The thermal background, with correct estimate of its Temperature [9], as detailed below. The standard interpretation, a thermal equilibrium cooled by the so-called expansion of space, contradicts one of Sakarov's three conditions for a separation matter-antimatter: the exit from thermal equilibrium [15].

2. The critical flatness of the Universe. It is a consequence of the Holographic Principle, but breaking the "Planck wall", so illuminating the huge vacuum energy dilemma [19].

3. The acceleration of galactic recession. It is a consequence of the single-parameter steady-state model, predicting an exponential recession with time constant R/c, where R is the *invariant Hubble radius.*

2 Perfection beats Evolution

Modern cosmology has seen two major theories confront each other: the one supporting the Permanence of the Universe, opposed to the now official thesis of its evolution. The idea of the "Universe expansion" results from an application of differential equations, which was expressly forbidden by Poincaré in cosmology, since the observed Universe is unique [12]. So the general relativity applies only in *local* physics.

Their main difference is that Permanence is based on a single parameter, whereas modern cosmology is now based on several parameters. The first thing to do, therefore, is to examine whether this single parameter of Permanence is related to the universal constants, whose constancy is, according to Poincaré [13], the very foundation of physics. This was attempted at the epoch of the discovery of galactic recession, which defines the "Hubble radius" of the visible Universe. However, as measurements of galactic distances were greatly underestimated at the time, this research was unsuccessful.

The steady-state ("perfect") cosmology [3], [9] is based on the "Perfect Cosmological Principle", which assumes homogeneity in both Space and Time. The Restricted Cosmological Principle assumes only spatial homogeneity and therefore allows for the famous "expansion of the Universe", and its associated Big Bang, which don't stand up to 3 minutes of pure scientific analysis.

3 The 3-Minutes Formula $H = c/R \approx \dfrac{70.8\ \mathrm{km/s}}{\mathrm{Mpc}}$

. In September 1997, in the light of modern measurements, the author discovered that, since the speed c is far too slow to ensure cosmic coherence, its replacement by the product of the masses of the three main particles of Atomic Physics (electron, proton, neutron) in the Planck calculation for a length unity, determine the half Hubble radius $\hbar^2/Gm_em_pm_n$ (sealed envelope, March 1998, Académie des Sciences, Paris, French Wikipedia, "analyse dimensionelle"), so giving a Hubble radius 13.8 billion light-years. The author therefore concluded that Perfect Cosmology is the correct one, with the exponential time constant commanding the accelerated galactic recession $t = R/c = 13.8$ billion years (no longer the age of the Universe), corresponding to the Hubble constant $H = 70.8(km/s)/Mpc$.

The factor 2 eliminates in the critical mass of the visible Universe, given simply by $M = Rc^2/2G = m_P^4/m_em_pm_n = 8.80\ 10^{53}$ kg, which gives at last a role to Planck's mass $m_P = \sqrt{\hbar c/G} = 21.7$ microgram, an enigma in particle physics.

No one took this discovery seriously. Only Jean-Claude Pecker considered this calculation, and finally agreed to publish it in 2006, *nine years later* [16]. It was the first article to put forward the value of 13.8 billion light-years, whereas the accepted value at the time was 13.7, a value still used by some today.

Pecker published it despite Jayant Narlikar's opposition. This latter author was a proponent of perfect cosmology, but like many others, he put his faith in certain observations that seemed to refute perfect cosmology. Indeed, this theory is so predictive that all it takes to refute it is to observe *a single variation in a main astrophysical quantity.* Narlikar proposed a mixture between the two theories ("quasi-steady-state model"), which is much more complicated than the author's synthesis, which introduces the concept of a blinking Universe in a permanent Bang of construction-deconstruction, thus restoring the matter-antimatter balance.

Strange as it may seem, the most difficult and controversial measurement in the history of science, the Hubble constant, was resolvable by an elementary and inescapable calculation of pure physics, enlighting also the nagging question of Quantum Gravitation.

4 The Holographic Background Resonance

The 3 minute formula may be written in a 1D-2D-3D holographic form involving the wavelength of the hydrogen molecule $\lambdabar_{H_2}$:

$$2\pi\frac{R}{\lambdabar_e} = \pi\frac{\lambdabar_p\lambdabar_H}{l_P^2} \approx (4\pi/3)(\frac{\lambdabar_{CMB}}{\lambdabar_{H_2}})^3 \ \frac{1}{1.006166896} \tag{1}$$

The deviation is at 2 ppm from $\pi/\sqrt{10m_H/m_n}$, implying the mass ratio neutron/hydrogene. But the deviation from the Lucas Number is much more specific, implying the Wyler's form $6\pi^5$ [21], so we take it for defining T_{CMB}:

$$N_L = (4/3)(\frac{\lambdabar_{CMB}}{\lambdabar_{H_2}})^3 \ \frac{6\pi^5}{H} \quad \Rightarrow \quad T_{CMB} \approx 2.72582 \text{ Kelvin} \tag{2}$$

This Large Lucas number $N_L = 2^{127} - 1$ is the forth term of the Catalan sequence (OEIS A007013), and the last one in the Combinatorial Hierarchy [2] which is very close to $R/2\lambdabar_e$. The study of deviations leads to, with the Babylonian value $\pi_{Bab} = 25/8$:

$$N_L = 2\pi\frac{\lambda_{CMB}}{\lambdabar_e} \ \pi(\frac{\lambda_{CMB}}{\lambdabar_H})^2 \ \approx \ \frac{R}{2\lambdabar_e} \ \frac{\pi}{\pi_{Bab}} \ \frac{a}{137\beta} \qquad (0.28 \text{ ppm}) \tag{3}$$

a kind of symmetric holographic factorization of the prime number N_L [19].

This definitely confirms the BIPM measurement of G and our specified value $G \approx 6.675454 \times 10^{-11} kg^{-1}m^3s^{-2}$, much larger (70 σ !) than the official value 6.67430(15) [8], initially determined by averaging incompatible measurements, then recklessly confirmed by haphazard measurements.

5 The dark energy density 7/10

It is logical that Physics should be based on Arithmetics, since the latter is the foundation of Mathematics [20]. Eddington was a pionner in this domain, associating the electric constant with the electric constant $a \approx 137.0359991$ to the number 137 [4].

The gravitational energy of a homogeneous ball of radius R and mass M is:

$$E_G = -\frac{3}{5} \ Mc^2 \tag{4}$$

For the critical sphere of the Universe, this is written:

$$E_G = -\Omega Mc^2 \quad ; \quad \Omega = \frac{3}{10} \quad ; \quad M_G = -E_G/c^2 = \Omega M \tag{5}$$

There is thus a natural separation of the 7/10 part of the Universe's mass, almost compatible with the measured dark energy rate 0.685(7) [8]. On the other hand, the nominal non-relativistic kinetic energy of the ensemble exponential recession of galaxies would be [19]:

$$E_{cin} = \Omega Mc^2 \tag{6}$$

so that the Universe would obey:

$$E_G + E_{cin} = 0 \tag{7}$$

a classical relationship. However, the real Universe shows a tiny baryonic population, asking for the following explanation.

6 The baryonic density

With the optimized 3-minute formula $R = 2GM/c^2 = 2\hbar^2/Gm_e m_p m_H$ [19], the total energy of the Universe is written:

$$E = Mc^2 = \frac{Rc^4}{2G} = \frac{1}{m_e}\left(\frac{\hbar c^2}{G\sqrt{m_p m_H}}\right)^2 = \frac{1}{m_e}\left(\frac{\hbar M}{\sqrt{m_p m_H} R/2}\right)^2 \quad (8)$$

According to Eddington, the ratio $N_H = M/m_H$ must be integer, which introduces the following resonance relationship:

$$E = Mc^2 = \frac{1}{m_e}\left(\frac{h}{\lambda_{N_H}}\right)^2 \; ; \; \lambda_{N_H} = \frac{\pi R}{N_H\sqrt{H/p}} \quad (9)$$

Since the observed baryonic rate is compatible with $\Omega^2/2 = 0.045$ [8], we introduce the gravitational baryonic energy E_b:

$$E_b = -(\Omega^2/2)E = \frac{1}{2m_e}\left(\frac{i\hbar}{\lambda_{N_H}/\Omega}\right)^2 \quad (10)$$

which is the canonical quantum form of energy, where resonance involves the mass $M_G = \Omega M$, which intervenes by its square, so the "anti-matter" solution is also appropriate. More precisely, this introduces the imaginary mass iM_G. Assuming that matter is in fact a very fast matter-antimatter vibration [18], this means that the vibration of this mass is in phase quadrature with the baryonic one, preventing it from any non-gravitational interaction: *this is the simplest explanation for dark matter.*

7 The Eddington's Large Number Resonance

With the optimized G value [19], compatible with BIPM measurements [14], and noting $P^2 = \hbar c/Gm_e^2$, the ratio $m_G/m_H = \Omega P^4/H^2 p$ is very close to Eddington's large number $N_E = 136 \times 2^{256}$:

$$\frac{M_G}{m_H} = \frac{\Omega M}{m_H} = \frac{\Omega P^4}{H^2 p} = \delta N_E \; ; \; \delta \approx 1.001337195 \quad (11)$$

This deviation δ can be attributed to the above circular quantum resonance, but using a rational value of π. Indeed, we observe that $\delta \times \pi \approx 3 + 20/137 = 431/137$ (61 ppm). The triples of 20 and 137, the numbers 60 and 411 are the 10th and 11th order numbers in the OEIS A000285 series, which emerges from Hecke's algebras [11]. The first terms of this generalized Fibonacci-type series are 1,4,5,9 showing the dimensions of time (1), space-time (4), Kaluza (5) and string space (9). This number 9 being the square of 3, all terms of this series of order 3 (mod 4) are divisible by 3, the space dimension.

8 The helium density

Many hydrogen atoms are transformed into helium nuclei by the $r_f \approx 1/140.478$ yield fusion reaction. With helium mass density Y, their average effective mass is $m'_p = m_p/(1 - r_f Y)$, which corresponds to resonance using the π_{Arc}= 22/7 Archimedean approximation:

$$\frac{M_G}{m'_H} = \frac{\pi}{\pi_{Arc}} N_E \quad ; \quad \Rightarrow \quad Y \approx 0.24404 \tag{12}$$

compatible with the standard value [8].

9 The corrected Gold calculation

Thomas Gold's calculation [10] considering the Universe as a permanent nuclear fusion reactor is written, with $u_c = 3c^4/8\pi R^2$, $u_{rad}/u_{CMB} = \Delta = 1 + (3 \times 7/8)(4/11)^{4/3}$, where $N_{eff} = 3$, the basic value, instead of the corrected one 3.046 [5] and $u_{CMB} = (\pi^2/15)(k_B T_{CMB})^4/(\hbar c)^3$:

$$r_f Y u_c \Omega^2/2 = u_{rad} \, \frac{1}{1.062} \tag{13}$$

This deviation is compatible with $10/3\pi_\lambda$, implying a new quantum resonance with $\pi_\lambda = 113/36$. This means that the above relationship must be modified according to:

$$r_f Y u_c \Omega/2\pi_\lambda = u_{rad} \quad ; \quad \Rightarrow \quad T_{CMB} \approx 2.72582 \text{ Kelvin} \tag{14}$$

at 0.6 ppm of the above holographic temperature.

10 The Central Relation

The critical energy density of matter u_c exceeds that of the background radiation u_{rad}, but the opposite is true for the particle number ratio, which is a central parameter in official cosmology. Hence the "Central Relation" [19]:

$$\frac{2N_{ph}}{N_H} \approx (\frac{u_c}{u_{rad}})^2 \quad (7 \times 10^{-3}) \tag{15}$$

leading to the discovery of, with $\beta = 1/(H - p)$ and $N_{ph}^{int} = N_{ph}\Omega^2/2$, the number of photons in the "baryonic" zone of the Universe:

$$e^{15} \approx \frac{\beta \pi_{Arc}}{\Delta \pi} \frac{N_{ph}^{int}}{N_E} \frac{N_G}{N_E} \quad (0.24 \text{ ppm}) \quad \approx \quad 3570 \; \mathrm{p_G}/2\delta^{1/16} \quad (2.2 \text{ ppm}) \tag{16}$$

where $p_G = P/2^{127/2}$ and $3570 = (2{+}3{+}5{+}7)(\,2 \times 3 \times 5 \times 7) \approx \Phi^{2+3+5+7} - 1$, the antecedent of the 17th term of the Lucas series A000032 is the "Nombrol", central in particle physics [20]. Moreover, the Ptolemae approximation $\pi_{Pt} = 377/120$ shows:

$$\pi_{Pt} - 2 = \frac{1 + 1/2 + 1/3 + 1/4 + 1/5}{2} = \frac{137}{120} \approx \frac{p_G}{a^{3/2}\beta^2} \quad (0.3 \text{ ppm}) \tag{17}$$

which confirms the physical arithmetics [4] [17], which is the logical consequence of quantum physics [12].

11 Predictions

1. The study of old galaxies in the far field must be balanced by the one for baby-galaxies in the near field, especially the detailed study of the Arp galactic associations with different redshifts [1].

2. Check the Universe isothermy, putting an end to the 'Universe expansion" conundrum.

3. Resolve the tension around the *invariant* Hubble constant. In particular, theorists must explain why the standard cosmology deduces a so-called "Universe age" 13.8 billion years, so compatible with the invariant time-constant of the Perfect Cosmology.

4. Reconsider the observations that were thought to refute perfect cosmology.

5. The search for dark matter specific particles must be abandoned, since it is ordinary matter, but in a quadrature matter-antimatter oscillation.

6. The search for new supersymetric particles must stop also, since, as Eddington predicted [4], the Tau Lepton is one of these, he called "heavy mesotron".

7. The Big Bang gravitational wave detection by the future "e-lisa" space laser detector is vain [7], since there was no unique Big Bang at all, rather a Permanent Bang flickering Universe, [18], immersed in the Cosmos, far larger, but not infinite [17].

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