Fine-tuning excludes the Multiverse Hypothesis and confirms Coherent Cosmology, Eddington's and String Theories

F. M. Sanchez, M. Grosmann, D. Veigel, R. Veysseyre, C. Bizouard

Fine tuning relations using Eddington number 137 connect with the Fermi coupling constant, the muon mass, the electron magnetic moment and the G value, compatible within 10^{-7} with G deduced from the Coherent Cosmology. The tachyonic Bosonic String Theory is confirmed by c-free analysis, with emphasis on a 30 dimension Space. This confirms Eddington's rehabilitation and the exclusion of the Multiverse hypothesis.

The Eddington's number 137 has a fundamental property: it appears as a Monster Prime in the series of the maximal primes appearing in the numerator of the harmonic series: 3,11,5,137,7,11, showing a symmetry between the 11 supergravity dimensions and the 4 of space-time:

$$137 = 11^2 + 4^2$$

Since Riemann series are tied to the prime number distribution, it is strange that mathematicians have not point out the primes appearing in the Harmonic series, since it is the single pole. It seems that the basic precept '*all occurs in the pole*' was forgotten in this case. As ancient Egyptian used only fractions of type 1/n, they were certainly aware of this particular number 137. Indeed the fifth harmonic series $s_5 = 137/60$ appears in the Ptolemaic approximation for π: $377/120 = 2 + s_5/2$.

Recall that the electrical constant characterizes the force $\hbar c/al^2$ between two l - distant elementary charges, appearing central in Atomic Physics and in many fine-tuning relations [2]. It is strange that physicists focused on only one property, the appearance of its fifth power in the Hydrogen hyper-fine spectra, and call its inverse the 'fine-structure constant'. It is strange that Eddington's Theory was rejected as soon as a appeared to be different from 137. The present article shows that 137 plays a central role in electro-weak connexion.

In particular, Atiyah argues that the constant defined by:

$$\Gamma = \gamma a/\pi \approx 25.1780972522(55)$$

would help the heavy QED calculations. *This leads presently to an intense polemics, a majority of theoreticians arguing that Atiyah, like Eddington, is becoming a crackpot with age*. The present article settles the debate. Indeed a simple computer study shows that 137 and the Euler-Mascheroni constant γ enter the relation:

$$G_F/m_e c^2 \approx (\pi \lambda\!\!\!^{-}_e/2\gamma 137a)^3$$

where $\lambda\!\!\!^{-}_e \equiv \hbar/m_e c$ is the reduced electron radius, and $G_F \equiv (\hbar c)^3/E_F^2 \approx 1.4358509(7) \times 10^{-62}$ Joule × m^3 is the Fermi coupling constant, corresponding to the Fermi energy $E_F = F m_e c^2 \approx 292.806161(6)$ GeV ≈ 573007.33(25) $m_e c^2$ [3].

Admitting the above relation, this defines $F = E_F/m_e c^2 \approx 573007.3652$, inside its 2.5 10^{-7} indetermination. Now the latter enters another fine tuning relation, induced by the Kotov Coherent Cosmic Oscillation [4], implying the muon, proton and Hydrogen masses: $E_F/m_e c^2 \approx m_\mu^2 \sqrt{(m_p m_H)}/a m_e^3$. This corresponds to a muon mass 206.7682869 m_e, inside its 2 × 10^{-8} measurement range. The a-priori probability of such correlations are estimated, by looking for the number of solutions obtained by extending the indetermination range by a factor 10^6, keeping a maximal exponent to 3, to be respectively 2 × 10^{-5} and 10^{-6}.

Now, the three first terms of the Combinatorial Hierarchy [5] are the Mersenne numbers 3, 7, 127, whose sum is 137, so giving the above first order of the electrical constant. The following (final) term 2^{127}-1, a prime number famous in number theory, gives the first order of the gravitational coupling, whose optimal form results from the gravitational Hydrogen molecule model [6] $a_G = \hbar c/Gm_p m_H$. Computer analysis shows the following symmetrical expression for the deviation, with $n \approx 1838.68366089(17)$ the neutron/electron mass ratio:

$$(2^{127}/a_G)^{1/2} \approx F(a/\pi)^4(\gamma/4n)^3$$

exhibiting a symmetry between a and π. This corresponds to:

$$G \approx 6.6754538 \times 10^{-11} \ \ kg^{-1}m^3s^{-2}$$

very close (10^{-7}) to the optimal value deduced from Coherent Cosmology [5], and compatible with the very elaborate BIPM measurement [6], in its 2.5×10^{-5} indetermination. This is at several sigmas from the tabulated Codata value, which results unwisely from a mean between discordant measurements.

Now, with this value of G, the mass ratio proton-electron $p \approx 1836.15267389(17)$ and the mass ratio Hydrogen-electron $H \approx 1837.15264726(17)$, *the computer indicates a 10^{-9} correlation*:

$$(2^{127}/a_G)^{1/2} \approx d_e(H/p)^3$$

where $d_e \approx 1.00115965218091(26)$ is the anomalous electron magnetic moment. This writes:

$$(aF/\pi d_e)^{1/3} \approx 4\pi n'/\gamma a$$

where $n' = nH/p$ *is* the principal value of the neutron mass by respect to the electron effective mass in the Hydrogen atom. Note the 0.12 % proximity of the above number with the fifth fractional development of π: 292.6345909, itself approaching $n/2\pi$ to $3.4\ 10^{-6}$.

Such relations are unbelievable for reductionist people, arguing that since neutron is composite, it cannot enter simple relations. The same argument is presented for the theoretical dependence of a with other constants g and g'. But analysis shows that the holistic point of view is pertinent: apart the number 137, the term a^a appears also in musical number analysis [8], confirming that *a is an optimal calculation basi*s. Such transcendental formulas are surprising for theorists which forget that beauty is the root of Science.

The famous Lucas-Lehmer primality test uses the series of whole numbers $N_{n+1} = N_n^2 - 2$, starting from $N = 4 = u_3 + 1/u_3$, with $u_3 = \sqrt{3} + 2$, belonging to the Diophantine generators $u_n = \sqrt{n} + \sqrt{(n+1)}$. One shows that $N_n \approx u_3\text{^}(2\text{^}q)$, and for q = 9:

$$u_3\text{^}(2\text{^}9) \approx (2\times(137^2 + 48))^8 \approx a^a$$

defining a to 39 ppm. Also, with the Pell-Fermat generator $u_1 = 1 + \sqrt{2}$:

$$a^a \approx u_1\text{^}(3\times(2^8 - 1))$$

defining a to 0.3 ppm. So the number a^a establishes a connexion between u_1 and u_3, two of the simplest arithmetics generators. *This opens a new research in pure mathematics.*

The number π appears as a calculation basis in the Riemann series of even order. So, it is natural to consider the ratio π/e. This leads to the discovery of the incredible relation:

$$(2/3)(2a_G)^3 \approx (a/137)^{1/2}(\pi/e)^p$$

which defines the above G value to 4×10^{-8}. Now, since a_G is tied to the Universe horizon radius by $2a_G = R/\lambda\!\!\!^{-}_e$, the factor 2 coming from the number 2 of Hydrogen atoms in the Hydrogen molecule [6], *the Universe volume enters this formula,* which favors $R = 2a_G\lambda\!\!\!^{-}_e = 2\hbar^2/Gm_pm_Hm_e \approx 13.812$ Glight-year, by respect to $R' = 2\hbar^2/Gm_N^3 = RpH/a^3$ where $m_N = am_e$ is the Nambu mass, central in Particle Physics, and which look simpler since $R'/2$ is obtained by *elimination of c between the electron classical radius and the Planck length*. It is shown that this corresponds to a global coherence condition in the Critical Universe considered as a sequential C-connected Universe, where C is a tachyonic speed, far exceeding c. It has been assumed that R' is the holographic trace of a Grandcosmos behind, whose radius exceeds R by the ratio C/c, and whose volume, with length unity the bare Hydrogen radius $r_H = a\,\lambda\!\!\!^{-}_e$ exhibits the central term a^a [6]:

$$V_{GC}/r_H^{\,3} \approx a^a/\pi \approx (1/\ln 2)^p$$

This sustains the hypothesis that the Grandcosmos is the source of the Cosmic Microwave Background, as confirmed below. *This is the Absolute Frame that Relativity Theory is unable to define*, so cannot define what is a Galilean frame, as it cannot really explain Foucault pendulous or Sagnac experiment.

Now, the ratio $2R/R'$ shows the property, to 4 ppm:

$$R/\lambda\!\!\!^{-}_e \approx e^{-3^2\times5\times7}\,(2R/R')^{2\times3\times5\times7}$$

implying a Space of 210 dimensions, predicted long ago by the Holic Principle [6]. Now, the ratio $\ln p/\ln a$ is close to this canonical ratio $2R'/R$ [3], so

$$a^2\hat{}a^3 \sim p\hat{}p^2$$

showing a combinatorial geometric significance.

The essential critical condition $R = 2GM/c^2$, where M is the total equivalent Universe mass is explained by a 1D-2D-3D Holographic Resonant Conservation implying the Universe wavelength $\lambda\!\!\!^{-} = \hbar/Mc$, *smaller than the Planck length by a factor about* $C/c \approx 10^{60}$. This means the Machian relation:

$$M = m_P^4/m_pm_Hm_e \approx (10/3)N_{Ed}\,m_n \sim E_v/C^2$$

where $m_P = (\hbar c/G)^{1/2}$ is the Planck mass, $N_{Ed} = 136 \times 2^{256}$ the Eddington Large Number, and E_v the vacuum quantum energy, so resolving *the central enigma in present-day physics: why the vacuum quantum energy is about the* 10^{120} *times the Universe on*e. From the critical relation $R = 2GM/c^2$ and the classical energy of a homogeneous ball $E = 3GM^2/5R$, one obtains $E = (3/10)Mc^2$. So The trivial gravitational factor 10/3 corresponds to the misleading 'black energy' of the standard cosmology which needs complete re-interpretation. The fact that *Eddington predicted correctly the effective mass 3M/10 is probably the most remarkable prediction of all times*. Moreover, the antimatter problem is resolved by admitting that Universe is subjected to a 10^{104} Hz matter-antimatter oscillation. Black Matter would be simply a quadrature oscillation [6].

In their famous paper [2] Carr and Rees recognize that the three constants *a, p* and a_G suffice to explain the basic features of galaxies, stars, planets and the everyday world. But they absurdly call $Gm_p^2/\hbar c$ the 'gravitational fine structure constant', as if a correction of 10^{-40} would have any sense. They add: '*However, one of the scale in Fig.1, that associated with the Universe, cannot be explained directly from known physics: it is apparently a coincidence that the present age of the Universe is of the order of* α_G^{-1} *times the electron timescale.* This is misleading for the following reasons: firstly, in their Fig. 1, only lengths are considered, not times. Secondly, what is measured directly in the galaxy recession is a length, that of the Universe horizon radius. Thirdly, Eddingron's theory gives a statistical explanation (using this third pillar of physics, forgotten in favor of

Relativity and Quantum Physics). Finally, the length-formula is simpler than the time-formula, since c disappear (this was not noticed by Eddington, since he worked with $c = 1$).

But the Carr and Rees paper has the merit to underline the relation: $a_G \approx W^8$, where W is the mass ratio boson W/electron. Now, in its 10^{-3} experimental indetermination, one observes the more symmetrical relation, implying also Z, the neutral weak boson;

$$R/\lambda\!\!\!^{-}_H \approx (WZ)^4$$

Note that $R/2\lambda\!\!\!^{-}_H$ plays a central role in the definitive resolution of the so-called Large Number Problem, which shows that the Eddington 'reference mass' is the effective electron mass [6]. This milits for a Single-Electron Cosmology, or the Black Atom Model, which precises the rough estimation $a \sim \ln a_G$, considered correctly as central by Carr and Rees.

Now, considering that *the celerity c is inadequate in Cosmology is exactly one must expect in a Coherent Universe, because c is far too small to interconnect a so vast Universe.* One of the author deduced the formula $R \sim \hbar^2/Gm^3$, where m is an atomic mass, in its 3 first minutes of its sabbatical year 1997-98, by applying the elementary 3-fold dimensional analysis, simply by discarding c as being a non pertinent cosmic speed. This has not been done before because theoreticians foolishly put $c = 1$ in the equations, mixing Length and Time in the all-Relativity spirit, forgetting the warning of Poincaré, the true discoverer of Relativity, against a too close identification Length-Time. Poincaré also claimed that Cosmology cannot be based on differential relations, because as the Universe is unique, one cannot define integration constants. More precisely, it is shown [6] that Relativity is a local concept, not applying at the Cosmic Scale: indeed the non-relativistic kinetic energy of the galaxies, receeding with the simplest exponential law of time constant R/c, is precisely the above $3Mc^2/10$. Note that this exponential law is equivalent with an *invariant* 'cosmological term' added in the GR equations. This means that, at a large scale, matter is repulsing other matter with a force proportional to length. This is not necessarily a reversal of gravitational law at large distance, it suffices that 'inverted repulsive matter' is, at cosmic scale, uniformly distributed. This would explain the large bulle-structure of the galaxy groups distribution. In a Permanent Cosmology, such a galaxy recession is necessary, to obeys the Second Principle; otherwise all the stars would have vanished long ago.

In resume, with $m^3 \approx m_p m_H m_e$ the c-free analysis $L\{\hbar,G,m\} = \hbar^2/Gm^3$ gives precisely half the Universe Horizon radius. Now the associated time is:

$$T\{\hbar,G,m\} = \hbar^3/G^2m^5 \approx 5.530 \times 10^{57} \text{ s}$$

by respect to the electron-time $t_e = \hbar/m_e c^2$, one observes:

$$T\{\hbar,G,m\}/t_e \approx f(30) = \exp(2^{30/4})$$

this is precisely (4 %) the lacking essential point n = 30 in the Topological Axis, for which the special string bosonic value n = 26 corresponds to the Universe, apart a factor 6:

$$R/\lambda\!\!\!^{-}_e \approx (2\pi^2 a^3)^5 \approx f(26)/6$$

precise to 0.056 % and -0.065 %, where $2\pi^2 a^3$ is the area of the 4-sphere of radius a. Now $f(30) = f^2(26)$, so implies a^{30}, meaning a 30D Space is really involved: *the rehabilitation of Bosonic String Theory [6] by the Topological Axis is confirmed*. It has been discarded because it induce tachyons. Of course, in Coherent Cosmology, this is an essential advantage. Note that n = 30 is the single solution of a Perimeter Equal to Area non-decomposable pythagorician triangle (12, 5, 13). The only other one, but decomposable, is the triangle 6,8,10, with perimeter = area = 24, which is the number of transverse dimensions in String Theory.

Now, comparing T with the Kotov Non-Doppler Cosmic Oscillation period $t_{cc} \approx 9600.60$ s, one

gets, to 0.8 %:

$$T\{\hbar,G,m\}/t_{cc} \approx O_M/\sqrt{2}$$

where O_M is the cardinal order of the Monster Group, the larger of the 26 sporadic groups, and of the 20 groups of the 'happy family'. Now the product of their 20 orders is, to 0.015 %:

$$(R/R')\ \Pi_{happy} \approx a^a$$

while the product of the 26 sporadic group orders connects (0.16 %) with the Grandcosmos radius R_{GC}:

$$(R/R')\ \Pi_{tot} \approx (R_{GC}/l_P)^3$$

This would mean that the totality of the 26 sporadic groups are implied in the determination of the physical parameters, called 'free parameters' in the Particle Physics Standard Theory, whose number is precisely about 26. Note that, generally, *the number of dimensions may be interpretable by a number of parameters.*

Now an important point to distinguish Permanence from Evolution is the invariance of the background temperature $\theta_{CMB} \approx 2.7258$ Kelvin. Looking for the mass of a black hole having an Hawking temperature $\theta_H = \hbar c^3/8\pi k G m_H$ equal to θ_{CMB}, one finds, to 0.7 %:

$$m_{Hkg} \approx m_e\ (R/R')\ O_M/4\pi$$

which writes, by suppressing the 4π factor:

$$(R/R')\ O_M \approx \lambda\!\!\!^{-}_e \lambda\!\!\!^{-}_{CMB}/2l_P^{\,2}$$

This confirmation of Temperature Invariance comes in addition to those already noted [6], in particular the fact that the 1D-2D Holographic writing of $\hbar^2/Gm_em_B^2$ traduces an electron-baryon symmetry, while the extension to 3D exhibits the CMB wavelength $\lambda\!\!\!^{-}_C$ Moreover, th means fact that *c-free analysis starting from ħ,G and the energy* $k\theta_{CMB}$ *is close to* $\lambda\!\!\!^{-}_H$.

Moreover, the reduced Wien constant $\varpi = 5(1-e^{-\varpi}) \approx 4.965114245$ defining the Wien wavelength $\lambda_{Wien} = \lambda/\varpi = hc/\varpi kT$ enters a 40 ppb relation with n:

$$n \approx (\varpi(\pi/2)^2)^3$$

Now, the radius R' shows, to 0.1% :

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

The perfect holographic form of this relation casts *a serious doubt on the true incoherence of a thermal radiation, as in the problem of the information conservation in a black hol*e. One observes also that the half-volume of proton shows

$$(2\pi/3)(r_p/l_P)^3 \approx e^a$$

meaning an intervention of the cube l_P^3, while the standard holographic principle uses only the area l_P^2. Moreover, one observes that $a \approx e^{\varpi} - 2\pi$, suggesting a to be a trigonometric line. Indeed $\cos a \approx 1/e$. So, to 65 ppb :

$$a \approx 44\pi - \mathrm{Arccos}(1/e)$$

Another important Planck Law's number is the Riemann series $\xi(3) \approx 1.20205691$, or 'Apéry constant', with no analytic expression, but which gives the photon density $16\pi\xi(3)/\lambda^3$, where $\lambda = hc/k_B\theta$. The computer indicates, to 1.6 ppm:

$$\sqrt{a} \approx (16\xi(3))^3/\varpi^4$$

With our precise value [6] $\theta_{CMB} \approx 2.725828$ Kelvin, the number of photons in the visible Universe is $n_{ph} = (4\pi/3)(k_B\theta_{XMB}R/hc)^3 \approx 3.8400458 \times 10^{87}$, while the equivalent neutron number is $n_n = (10/3) \times 136 \times 2^{256} \approx 5.2492414 \times 10^{79}$. With the ratio $R_{GC}/R = C/c = P^3\, pH/a^6 \approx 6.9454957 \times 10^{60}$, the number of photons and equivalent neutrons in the Grandcosmos are respectively $N_{ph} = n_{ph}(C/c)^3 \approx \exp(621.949984)$ and $N_n = n_n(C/c)^3 \approx \exp(603.841903)$. One observe that the mean obeys:

$$\sqrt{(N_{ph}\, N_n)} \approx (n/6\pi^5)\, e^{n/3}$$

precise to 6 ppm on a number with 267 decimal digits.

Now, another decisive point is the invariance of the Universe mean mass density, which is tied to G by the critical condition: $\rho_c = 3c^2/8\pi GR^2 \approx 9.41198 \times 10^{-27}$ kg m^{-3}. Inserting instead the Fermi Constant in the c-free analysis leads to:

$$T\{\hbar, \rho_c, G_F\} = \hbar^4/\rho_c^{3/2} G_F^{5/2} \approx 5.4829\ 10^{57}\ \mathrm{s}$$

i.e. about the same time as above, which connects even more closely (0.04%) with $O_M/\sqrt{2}$. *This is interpretable as the lacking element in Coherent Computing Cosmology: the overall periodicity of History, in a completely deterministic Diophantine Grandcosmos.*

These are striking examples of the extreme precision of the fine tuning between physical parameters, to be compared with the large imprecision of Anthropic Principle arguments. This milits in favor of a Single Final Theory, refuting the Multiverse hypothesis.

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