Abstract

The Quantization of the third Kepler’s Law leads as a special case to the Arthur Hass formulation of the Hydrogen radius, 3 years before Bohr. A second case identifies with the Gravitational Molecule model, leading to the Universe critical mass of the steady-state cosmology with its single parameter 13.812 Giga- light-years. It introduces both the external Cosmos and the DNA bi-codon mass which symmetries the formulation. A third case involving only this mass gives the double of the Kotov Length, revealing non-local cosmology, and connecting with the One-Electron Cosmology, confirming the $G$ value to $10^{-8}$, compatible with the BIPM’s one, but larger ($1.7 \times 10^{-4}$) than the official value. The critical condition is identified with an holographic 2D-1D relation, breaking the Planck wall by the factor $10^{61}$ and specifying the external Cosmos. The gravitational part $3/10$ of the critical mass is very close to the Eddington Number times the neutron mass, suggesting that black matter is matter-antimatter vibration in quadrature, and that the dark energy must be replaced by the 5th force of the steady-state model. A special holographic relation involving the Lucas Number gives the cosmic temperature consistent with the measured value. Several relations show outstanding connections with the Number Theory. Newton could have guessed some of these points, especially the topological symmetry between $G, c$ and $\hbar$. February 2022

1 Quantization of the Kepler laws

Physics is supposed to be based on known mathematics, where a multiplication is the generalization of addition [12]. However, practice has shown since Newton that different physical quantities can be multiplied, but that their addition is not meaningful. There is a flagrant paradox here, which is blurred if we postulate that the ultimate equations of Physics concern ratios, like in the Kepler’s 3rd law:

$$\left(\frac{T_n}{T_1}\right)^2 = \left(\frac{L_n}{L_1}\right)^3,$$
where the first orbit of period $T_1$ and semi-major axis $L_1$ are not yet defined. Considered as the Diophantine equation $X^2 = Y^3$ where unknowns $X$ and $Y$ are, by definition, natural numbers $n$, it has an immediate solution:

\[
T_n = n^3 T_1 \\
L_n = n^2 L_1 .
\] (2)

The invariant $L_n^3/T_n^2$ is homogeneous to $Gm_G$, where $G$ is Newton’s gravitational constant, and $m_G$ is a mass. The term $L_n^2/T_n$ is proportional to $n$, suggesting the existence of the quantum $\hbar$ for the orbital angular momentum.

Indeed the Kepler’s second law (historically the first) involves that the orbital angular momentum per unit mass $\tilde{\hbar}$ is a constant. Thus we have

\[
L_n^3/T_n^2 = Gm_G \\
L_n^2/T_n = n\hbar/m_h .
\] (3)

With $V_n = L_n/T_n$, this implies the generalized Bohr relation $m_h L_n V_n = n\hbar$, defining for $n = 1$ a generalized Bohr radius $L_1 = \hbar/m_h V_1$.

From (3), any mass pair $(m_G, m_h)$ is thus associated to a series of Keplerian orbits $(L_n, T_n, V_n)$ checking the quantum laws

\[
L_n = \frac{(L_n^2/T_n)^2}{L_n^3/T_n^2} = n^2 \frac{\hbar^2}{Gm_G m_h^2} ,
\] (4)

\[
V_n = \frac{L_n^2/T_n}{L_n^3/T_n^2} = \frac{Gm_G m_h}{n\hbar} ,
\] (5)

\[
T_n = \frac{L_n}{V_n} = n^3 \frac{\hbar^3}{G^2 m_G^2 m_h} .
\] (6)

If, for $n = 1$ we impose $V_1 = c$ and $m_h = m_G$, we obtain from (5) that $m_h$ or $m_G$ is the Planck mass

\[
m_P = \sqrt{\hbar c/G} \approx 2.1763 \times 10^{-8} \text{ kg} .
\] (7)

The simplicity of this relation results from the fact that the ratio of the topological parts of $G$ and $\hbar$ is homogeneous to a speed. Then, consistent length $L_1$ and time $T_1$ are respectively the Planck length $l_P = \hbar^2/(Gm_h^2) = 1.6163 \times 10^{-35} \text{ m}$ and the Planck time $t_P = \hbar^3/(G^2 m_P) = 5.3915 \times 10^{-44} \text{ s}$, and (5) confirms $V_1 = c$ as the largest velocity, whereas (4) and (6) put forward $l_P$ and $t_P$ as lower physical boundaries.

2 Haas-Bohr electric radius versus Haas-Sanchez’s gravitational radius

The canonic Planck energy form $n\hbar V_n/L_n$ writes in a form analog to that of Arthur Haas [6, 7, 8, 9]:

\[
n \frac{n\hbar V_n}{L_n} = m_h V_n^2 = \frac{Gm_h m_G}{L_n} .
\] (8)
\[ \frac{n \hbar V_n}{L_n} = m_e V_n^2 = \frac{\hbar c}{a L_n} . \]  
\[ (9) \]

The identification means that the atomic case correspond to the following special values:

\[ m_{\hbar} = m_e \]
\[ m_G = m_p^2 / m_N \]  
\[ (10) \]

where \( m_N = a m_e \) is the Nambu mass.

Arthur Haas had based its calculation three years before Bohr, by equating three forms of energy. The first one being the Planck’s relation \( E = n h \nu \).

Thus, Hass used without calling it a Coherence Principle, essential in practical holography. This implies the quantization of the angular momentum of the electron orbit in the hydrogen atom:

\[ m_e L_n V_n = n \hbar . \]
\[ (11) \]

For \( n = 1 \), one obtains the bare Hass-Bohr radius \( r_{HB} \), while the corrected one \( (r_B) \) takes into account the effective mass:

\[ r_{HB}/\lambda_e = \frac{a h}{m_e c} \]
\[ r_B/a \lambda_e = 1 + 1/p \approx H/p \]  
\[ (12) \]

where \( \lambda_e = h/(m_e c) \) is the Electron Compton wavelength.

This Coherence Principle (9) was extended to the gravitational Hydrogen molecule model : three-bodies orbiting on a circle of radius \( R \) (hydrogen atom, proton,electron). The latter bearing the kinetic energy, while the formers are tied by the gravitational energy: [13, p.391]:

\[ \frac{n \hbar V_n}{L_n} = m_e V_n^2 = \frac{G m_p m_H}{L_n} = \frac{\hbar c}{a_G L_n} . \]  
\[ (13) \]

corresponding to the identification:

\[ m_{\hbar} = m_e \]
\[ m_G = m_p m_H / m_e \]  
\[ (14) \]

Note that \( m_G \) is close to the DNA bi-codon mass \( m_{bc} \) [13]. With the choice \( m_b = m_G = m_{bc} \), the central formula \( h^2/(G m^3) \) leads to the double of the Kotov length, confirming that the Kotov Non-Doppler oscillation is tied to the cosmic non-locality.

So, the bicodon mass is central in this formulation, as confirmed by the Topological Axis. This suggests that the DNA molecule would be a time-line hologram, which, traversed by an electric current, would emit organizing signals in the metabolism.

So the electric coupling constant \( a \) is replaced by the gravitational coupling constant \( a_G = m_p^2 / m_p m_H \), which present a stunning numerical property: \( a_G \approx \)

3
2^{127} - 1 (0.56 %), the Lucas Large Prime Number, the most famous number of Arithmetics, which is also the last term of the Combinatorial Hierarchy, while the sum of the three first terms is 137, the Eddington’s evaluation for a, which is discussed in the Conclusion.

For \( n = 1 \), \( L_1 \) is the Haas-Sanchez gravitational radius \( r_{HS} \):

\[
r_{HS} = a_G \lambda_e = \frac{h^2}{G m_e m_p m_H}
\]  

(15)

where the speed \( c \) is eliminated: for this reason a precise approximation was guessed by \( c \)-free "dimensional analysis", from the ternary symmetry Electron-Proton-Neutron.

3 Cosmological meaning of the Haas-Sanchez’s gravitational radius and the cosmological background

With a value of about 0.65 \( 10^{26} \) m or 6.8 Gly, the Haas-Sanchez’s gravitational radius is a cosmological distance. Actually, the Hubble radius \( R_0 = c/H_0 \), where \( H_0 \) is the Hubble constant, is precisely \( 2r_G = 1.31 \times 10^{26} \) m in the uncertainty affecting \( H_0 \) (see Table 2). As the Hubble radius is believed to be variable, this implies that the present approach favors the steady-state cosmology, obeying the critical condition \( R = 2G M/c^2 \), so, identifying \( R/2 = r_{HS} = GM/c^2 \):

\[
M = \frac{(hc)^2}{G^2 m_e m_p m_H} = \frac{m_p^4}{m_e m_p m_H}.
\]

(16)

The Planck length \( l_P = \sqrt{Gh/c^3} \) intervenes as well in the micro-macrophysical connection. As noticed in the first section, \( l_P \) can be obtained from relation (4) with \( m_G = m_h = m_p \): \( l_P = h^2/(G m_h^3) \), so that using (??) and (16) the ratio \( r_G/l_P \) writes

\[
\frac{r_G}{l_P} = \frac{m_p}{m_e m_p m_H} = \frac{M}{m_p}.
\]

(17)

While \( a_G = r_{HS}/\lambda_e \approx 2^{127} \), we notice that \( r_G/l_P \approx 3^{127} (3\%) \) and \( \approx \Phi^{290} \) within \( 2 \times 10^{-4} \), where \( \Phi \) is the Golden number. As whole powers of the Golden Number define whole numbers, this confirms the present approach.

The Universe radius \( R = 2r_G \) implies a stunning perimeter-surface holographic relation with the Planck area \( l_P^2 = G h/c^3 \),

\[
2\pi \frac{R}{\lambda_e} = 4\pi \frac{\lambda_p \lambda_H}{l_P^2},
\]

(18)

where \( \lambda_H \) is the reduced wavelength of the hydrogen atom. This can be extended to a volume holographic relation involving the reduced wavelength of the Cosmological Background (CMB) \( \lambda_{CMB} = h c / T_{CMB} \):

\[
2\pi \frac{R}{\lambda_e} = 4\pi \frac{\lambda_p \lambda_H}{l_P^2} = \frac{4\pi}{3} \left( \frac{\lambda_{CMB}}{\lambda_H} \right)^3,
\]

(19)
where $\lambda_{H_2}$ is the reduced wavelength of the Dihydrogen molecule $H_2$, leading to:

$$T_{CMB} \approx \left( \frac{8Gh^4}{3\lambda_p^4} \right)^{1/3} \frac{1}{k} \approx 2.729K. \quad (20)$$

which is once more, apart the holographic factor $8/3$, a $c$-free dimensional analysis, giving the energy $kT_{CMB}$ from the constants $G, h, \lambda_p$ leading to the CMB temperature of the at milli-degree level. Moreover, by considering, instead of $a_G$, the Large Lucas Prime Number $N_L = 2^{1227} - 1$, the Wyler approximation for the Proton-Electron mass ratio appears, leading to a new holographic expression (the area of a 4D sphere):

$$N_L \approx 2\pi^2 \lambda_{CMB}^3 / \lambda_e \lambda_H^2 \Rightarrow T = hc / k\lambda_{CMB} \approx 2.7258205 \quad (21)$$

which is compatible with the measured value, showing the central role in Physics of the Lucas Number, the most famous large Prime Number.

From (16) $M = m_P^2 / [m_e m_p (m_p + m_e)]$ introducing the reduced mass of an electron orbiting around a proton, namely $m'_e = m_e m_p / (m_e + m_p)$, so that $M / m'_e = m_P^2 / (m_e m_p)$. This relation is completed by the relation $m_P^2 / (m_e m_p) = hc / (G m_e m_p) = \tau_G / \lambda_H$ according to (22). Finally we get the double relation

$$\frac{m_P^2}{m_p m_e} = \left( \frac{M}{m'_e} \right)^{1/2} = \frac{m_P}{\lambda_H}, \quad (22)$$

expressing the double large number correlation in the Eddington’s form.

The ratio $m_P / m_e$ in the former relation also corresponds to the mass of Universe $M$ compared to the typical mass of a star $m_\star$. Indeed, we have $m_\star = Mm_e / m_P = 3.68 \times 10^{30}$ kg, that is 1.84 solar masses. The number of Hydrogen atoms in such a star is

$$\frac{m_\star}{m_H} = \frac{M m_e}{m_p m_H} = \frac{m_P^3}{m_p m_H^2} \approx \left( \frac{m_P}{m_H} \right)^3 \frac{1}{2}, \quad (23)$$

where the third member was obtained by using (16). But, according to (23), this ratio is very close to $a_G^{3/2}$:

$$a_G^{3/2} = \frac{m_P^3}{(m_p m_H)^{3/2}} \approx \left( \frac{m_P}{m_H} \right)^3. \quad (24)$$

This confirms the central place of $a_G$ in Astrophysics. The number $a_G^{3/2}$ also characterizes the square of the human mass $m_{hum} (\approx 78.5$ kg) compared to that of an Hydrogen atom. In summary

$$a_G^{3/2} \approx \frac{m_\star}{m_H} \approx \left( \frac{m_P}{m_H} \right)^3 \approx \left( \frac{m_{hum}}{m_H} \right)^2 \approx \left( \frac{m_1 / m_e}{a} \right)^2 \quad (25)$$

where last member lets appear the kilogram $m_1$, specifying the Anthropic Principle, [3], which would becomes the Solo-Anthropic Principle, meaning we are alone in the Universe.

In this steady-state cosmological model, the Hubble constant $H_0 = c / R$ takes the value 70.3 (km/s) / Mpc, which is consistent with the most recent measures
Moreover, $R$ is compatible with $c$ times the so-called "Universe Age''.
This would mean that standard calculations are correct, but the interpretation
is false: there is a confusion between a distance and a time, a mistake often
provoked by the theoretical physicists' pet convention $c = 1$. Eddington used
also this command: it is why he did not realize that his correct formula for
the Universe radius eliminates the speed $c$.

In this light, we propose that the Big Bang is actually a Permanent Bang,
that is a stable oscillation between matter and antimatter at the frequency of
$7.5 \times 10^{10}$ Hz. That is the frequency associated with the matter wave of
the Universe with the reduced wavelength $d = h/Mc = 4 \times 10^{-96}$, that appears also
in the expression of the Bekenstein-Hawking entropy for a black hole of radius
$R$ [2]:

$$\pi \left( \frac{R}{l_P} \right)^2 = 2\pi \frac{R}{d}$$  \hspace{1cm} (26)

In standard Cosmology standard, that simple holographic relation was not ap-
plied to the critical radius of the Universe for two reasons: on one hand, it is
supposed to be variable, on the other hand its wavelength $d$ breaks the Planck
wall $l_P = 1.61 \times 10^{-35}$ m by a factor $10^{61}$.

Moreover, the standard model does not involve the gravitational energy of
the Universe, while it is well defined in the steady-state Cosmology [1, 10]:
$E_p = -(3/5)GM^2/R = -(3/10)Mc^2$. It was shown that the opposite quantity
$(3/10)Mc^2$ is also the non-relativist kinetic energy of an homogeneous critical
Universe expanding with velocity $v = R/c$ from $d = 0$ to $d = R$. Now,
expressing this energy in term of the mass energy of a neutron we find

$$\frac{3}{10} \frac{M}{m_n} \approx 136 \times 2^{256} ,$$  \hspace{1cm} (27)

namely the Eddington's large number [4] within 0.1 % (Table 2). Compared
to the mass energy of the Universe $Mc^2$, the ratio $3/10$ of the gravitational
potential energy is close to the one determined for the dark matter energy
(about 27% according to WMAP observations). So, the nature of the dark
matter must be directly connected with ordinary matter, the simplest being
that it is a matter-antimatter vibration in quadrature with the ordinary.

Moreover, the complementary factor 0.7 is identified with the rate of the
so-called official "dark energy", advantageously replaced by a repulsive force
between galaxies, proportional to the distance, which explains the acceleration
of the recession and the stability of the galaxy clusters. Indeed, with the simplest
law of recession [2, 1], where the distance $d$ is proportional to $e^{t/T}$ and depends
only on the parameter $T = R/c$, the repulsive force between galaxies with an
average mass $m$ of 1500 billions solar masses ($m \approx 3 \times 10^{12}$ kg) is
$F = m\ddot{d} = md/T^2$, which becomes greater than the mutual attractive force $Gm^2/d^2$ for
$d > (GmT^2)^{1/3} \approx 3.5$ millions light-years which is indeed the typical dimension
of a galaxy cluster.

4 The outer Cosmos

Let us recall that one of the arguments to refute the permanent cosmology was
the apparent absence of source for the background radiation. We show here
that this source is the outer Cosmos. In light of the above stunning relation, should we not consider that $T_{\text{CMB}}$ is actually constant, and that the observable Universe is in thermodynamic equilibrium with the outer Cosmos?

The series (4) implies the existence of an outer Cosmos of radius $R_C$. For the first term of that series, we have favored the half radius of the Universe $r_G$, with the mass combinations $m_G = m_e, m_h = \sqrt{m_p m_H}$. Now, we can consider "variants" for $r_G$, in particular the length $r_e^3/l_P^2$ obtained by eliminating $c$ between the classical electron radius $r_e = h/(am_e c)(\approx 2.918 \times 10^{-15}$ m) and the Planck length, which then corresponds in (4) to $m_G = m_h = am_e$ called the Nambu mass. The corresponding radius of Universe is

$$R_e = \frac{2 r_e^3}{l_P^2}$$  \hspace{1cm} (28)

and presents the ratio

$$\frac{R_e}{R} = u = \frac{bH}{a^3} \approx 1.310841$$  \hspace{1cm} (29)

We observe the proximity $u \approx e^{2/e^2} \approx ((e - 1)/\sqrt{H - \bar{p}})^{1/2}$ respectively to 1.6 ppm and 0.15 ppm.

To define the radius $R_C$ of the Cosmos we extend the holographic relation (26) where we substitute $R$ with $R_e$ in order to consider the sphere of radius $R_e$ as the hologram of the external Cosmos:

$$\pi \left( \frac{R_e}{l_P} \right)^2 = 2\pi \frac{R_e}{d} = 2\pi \frac{R_C}{l_P}$$ \hspace{1cm} (30)

This $R_C$ value connects with the CMB wavelength, prolongating the above relation Eq. (25): by the expression (0.5 ppm):

$$\frac{R_C/\lambda_e}{(\lambda_{\text{CMB}}/l_P)^3} = \frac{\lambda_e H/1pA^3}{N_L} \approx (pw/p)^4 135/2$$ \hspace{1cm} (31)

The standard Cosmology predicts a Neutrino background with temperature $T_{\text{CMB}} = T_{\text{CMB}} \times (4/11)^{1/3} \approx 1.946$ Kelvin, very difficult to detect. Now, the CMB photon number by Hydrogen atom is a central invariant in the standard model. The total CMB photon number is $N_{ph} = (\xi(3)/\pi)(R/\lambda_{\text{CMB}})^3$, while the total Hydrogen number is $A = R\lambda_h/2l_P^2$. But, by respect to energy, there is a domination of matter. So one must consider also the ratio between the critical density $u_{cr} = c^2 \rho_{cr} = 3c^4/8\pi GR^2$ and the total background energy density $u_{\text{CMB+CNB}} = yu_{\text{CMB}}$, with $y = 1 + (21/8)(4/11)^{4/3}$ and $u_{\text{CMB}} = ((\pi^2/15)hc/N_{\text{CMB}}^2$. Now one observes that these ratios are tied by an Eddingon’s type relation:

$$\sqrt{2N_{ph}/A} \approx u_{cr}/u_{\text{CMB+CNB}}$$ \hspace{1cm} (32)

leading to $T_{\text{CMB}} \approx 2.724$ Kelvin. This confirms the existence of the Neutrino background. Now assuming that the total background Photon + Neutrino is the result of an on-going Hydrogen-Helium transformation, producing $6.40 \times 10^{14}$ Joule for one kilogram of Helium, and that the Helium density is $0.25 \times \rho_{\text{bar}}$, with $\rho_{\text{bar}} = 0.045\rho_{cr}$, one gets $T_{\text{CMB}} \approx 2.70$ Kelvin. This rules out, one more time, the current Big Bang interpretation.
5 The Non-Doppler Oscillation and the G value

The above study shows the symmetry between the Hass-Bohr and Hass-Sanchez radiuses, by respect to the Electron Compton wavelength $\lambda_e = \hbar/m_e c$:

$$H_B = (aH/p)\lambda_e$$

$$r_{HS} = 2a_G\lambda_e$$

Now the parameters $a$ and $a_G$ are close to 137 and $2^{127} + 136$ which are the third and fourth (final) terms of the Combinatorial Hierarchy, based on the Mersenne-Catalan series $3, 7, 127, 2^{127} - 1 = N_L$. This means that $\lambda_e$ is a central length unit, as confirmed by the Topological Axis.

This article rehabilitates the Haas method, but shows that it applies in a simpler way to the Universe than to the atom, since the velocity $c$ does not intervene there. Hence the attention must be paid to the Doppler-free oscillation of some quasars, whose period is identified with the solar period $t_K$ of Kotov. It has been observed that this period, related to that of the electron, involves the elimination of $c$ between the above gravitational coupling $a_G$ and the electroweak coupling $a_w = \hbar^3/(G_F m_e^2 c)$ where $G_F$ is the Fermi constant:

$$t_K = t_e \sqrt{a_G a_w}.$$  \hspace{1cm} (34)

This relation is very accurate: it allows us to deduce a value of $G \approx 6.67545 \text{SI}$ compatible with that of the BIPM, thus disagreeing by $10^{-4}$ with the official value, taken inconsiderately as an average between incompatible measurements.

6 The Single Electron Cosmology

Wheeler remarked to Feynman [5], that the identity between electrons could mean that it is unique, and that the World is a sweep of a unique electron, able to go back in time as a positron. Feynman replied that in this case, there should be as much antimatter as matter, but, oddly enough, without involving the above matter-antimatter oscillation. Indeed, the single-electron Cosmology is relevant. Consider an electron sweeping concentric spheres of radius $r_n = n\lambda_e$ with $n$ varying from 2 to $N = R/\lambda_e$ (the orbit $n = 1$ is excluded because it implies the light velocity $\hbar/(m_e \lambda_e) = c$), the probability to intercept it at a given location of area $dS$ on those spheres is decreasing as $1/n^2$. This density probability leads to the average radius [13]

$$< r > /\lambda_e = \frac{\sum_{n=2}^{N} (1/n^2)n}{\sum_{n=2}^{N} 1/n^2} = \frac{\sum_{n=2}^{N} 1/n}{\sum_{n=2}^{N} 1/n^2} = \frac{\ln N + \gamma - 1}{\pi^2/6 - 1} \lambda_e \approx 136.905.$$  \hspace{1cm} (35)

This radius $< r >$ is thus identified with the Bohr radius, the precision reaching 28 ppm when we replace $R$ by $(RR_e)^{1/2}$, which confirms the importance of $R_e$ as a reduced holographic radius of the Cosmos. The radius corresponding to the corrected Bohr radius $r_B = a(1 + 1/p)\lambda_e$ is $R_1 \approx 0.997815(RR_e)^{1/2}$. 
Table 1: Predictions of Eddington (Fundamental Theory, 1945) and Sanchez (pli cacheté 1998) pertaining to the Hubble radius $R$ (INVARIANT) and the corresponding Hubble constant $R/c = 3.086 \times 10^{19}$, compared to official (VARIABLES) values starting from those recommended by the PDG (Particle Data Group, 1998,2002) and finishing by the one obtained by the Planck mission (2014).

<table>
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<th>Quantity</th>
<th>Value</th>
<th>Unit</th>
<th>Uncertainty (ppb)</th>
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<tr>
<td>Wien constant $w = \lambda_W / (\hbar c / (w kT))$</td>
<td>4.965 114 232</td>
<td>-</td>
<td>exact</td>
</tr>
</tbody>
</table>

There is a direct relation between the above mono-electron radius radius $R_1$ and the Kotov length $l_K = ct_K$:

$$\sqrt{(R_1 / l_K)} = 4 \pi Fp / p_W .$$

with $p_W = 6\pi^5$ the Wyler approximation of the Proton/Electron mass ratio $p$, this confirms the above determination of $G$ in the $10^{-8}$ domain, and rehabilitate the Wyler approach.
Figure 1: Measurements of the Hubble constant over the last 10 years, with their confidence intervals, whose discrepancies cause a major crisis in official cosmology. The 3 lowest values are those of the Planck mission (the European satellite launched in 2009). The value 73 is the one given by the type 1a supernovae which allowed to discover the acceleration of the galactic recession. The Lemaitre and Hubble estimates were wrong by a ratio of 8.9 and 7.6 respectively compared to our value 70.8, deposited in March 1998, in a sealed envelope at the Academy of Sciences.
Table 2: Predictions of Eddington (Fundamental Theory, 1945) and Sanchez (pli cachété 1998) pertaining to the Hubble radius $R$ (INVARIANT) and the corresponding Hubble constant $R/c\times$\,(Mpc/km $= 3.086 \times 10^{19}$), compared to official (VARIABLES) values starting from those recommended by the PDG (Particle Data Group, 1998,2002) and finishing by the one obtained by the Planck mission (2014).

<table>
<thead>
<tr>
<th>Date</th>
<th>Source</th>
<th>Universe Age Gyr</th>
<th>Hubble radius Glyr m</th>
<th>Hubble constant km/s/Mpc</th>
</tr>
</thead>
<tbody>
<tr>
<td>1945</td>
<td>Nombre Eddington $N_K$</td>
<td>$N_K = 136 \times 2^{256} = (3/10),M/m_n$</td>
<td>13.8</td>
<td>70.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$R = M c^2/2G$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1927</td>
<td>Lemaître</td>
<td>1.6</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>1929</td>
<td>Hubble</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1956</td>
<td>Humason, Mayal and Sandage</td>
<td>540</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>1958</td>
<td>Sandage</td>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>$R = \frac{2h^2}{G m_p m_H}$</td>
<td>[13, p.391]</td>
<td>13.8</td>
<td>70.8</td>
</tr>
<tr>
<td></td>
<td><a href="http://holophysique.free.fr">http://holophysique.free.fr</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>PDG (Particle Data Group)</td>
<td>11.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>PDG</td>
<td>12 – 18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>Hubble Space Telescope</td>
<td>13.7</td>
<td>13.4</td>
<td>72 ± 8</td>
</tr>
<tr>
<td>2012</td>
<td>WMAP</td>
<td>13.8</td>
<td>13.5</td>
<td>72.3</td>
</tr>
<tr>
<td>2014</td>
<td>Planck mission</td>
<td>13.8</td>
<td>14.5</td>
<td>67.5</td>
</tr>
</tbody>
</table>

Appendix 1

Newton was aware that his attractive force would cause the collapse of the universe. Therefore, he relied on divine action to counterbalance the universal attraction. He had therefore anticipated the repulsive force causing the accelerated recession of the galaxies. Moreover, he had delayed the publication of his Principia, because he was trying to extend his theory to the microcosm. When Roemer met him at Cambridge in 1679 to announce his determination of the speed of light, he could have realized that this constituted a second universal constant, which was identified with the ratio of the topological units of his constant $G$ and the angular momentum induced by Kepler’s law of areas. So that a mass would emerge by the simplest ternary relation, the Planck mass, which is the ”hierarchical problem” in particle physics, but is closed both to the mass of an human ovocyte mass and a eye measurable dust.

Appendix 2

That invariability of the CMB temperature is reinforced by the following complementary relations Its Wien wavelength $\lambda_W$ enters the direct holographic relation involving this sphere of radius $R_e$ :

$$4\pi \left( \frac{R_e}{\lambda_W} \right)^2 \approx e^a.$$  \hspace{2cm} (37)

The strict equality implies $\lambda_W = \text{and } T = h c/(w k \lambda_W) \approx 2.727 \, K$ ($w$ is the Wien constant).
Moreover:

\[
\frac{\lambda_W}{l_P} = R R_e \left( \frac{l_P}{2\lambda_e^2} \right)^2 \rightarrow T \approx 2.727 \, \text{K} \quad (38)
\]

\[
\frac{\lambda_W}{l_P} \approx \pi^{64} \rightarrow T \approx 2.728 \, \text{K} \quad (39)
\]

confirming the symmetry between radius \( R \) and \( R_e \), and the central importance of the Compton wavelength of the Electron \( \lambda_e = \hbar/m_e c \), which is confirmed later.

The relevance of the \( R_e \) radius, and thus that of the Cosmos, is validated by injecting (28) in (30):

\[
R_C = \frac{2 \pi^6}{l_P} = \left( \frac{r_e}{l_P} \right)^3 R_e . \quad (40)
\]

Let us recall that about thirty so-called "free" parameters remain unexplained in the standard model of particles, so that the current mathematics is incomplete, which is in line with Gödel’s analysis. But the radius of Cosmos verifies, with the Bohr radius \( r_B \):

\[
\frac{4\pi^2}{3} \left( \frac{R_C}{r_B} \right) \approx a^n \times (0.3\%) \approx \left( 2 + 3^{1/2} \right)^2 \times (2^n - 1) \quad (41)
\]

where \( 2 + 3^{1/2} \) is the generator of the Lucas-Lehmer series [11], and \( 1 + 1/2^{1/2} \) that of the Pell-Fermat equation. Now the product of the cardinals of the 20 sporadic groups of the Monster family is close to \( u \times a^n \), to within 0.015%. These relations suggest that \( a \) is a preferred basis for calculation. Number theory thus gives meaning to the electrical parameter \( a \approx 137.036 \).

The solution of the initial Diophantine Equation relies on the co-primality of the numbers 2 and 3, respectively assigned to the concepts of Time and Space. To the next pair of prime numbers (5, 7) it is therefore intuitive to assign the concepts of Mass and Field. Note that the pairs (2, 3) and (5, 7) are the basic solutions of the Pell-Fermat equation. The Diophantine solution then involves \( n^{210} \) instead of \( n^6 \). The number 210 is involved in the relation \( R/\lambda_e \approx (2/u)^{210} \times (0.3\%) \)

7 Conclusion

Thus article shows how pertinent may be the elementary logic, applied to the simplest Diophantine Equation, identified with the most famous Kepler’s Law. This permits to justify the bridge between micro-Physics and cosmology, by replacing the electric constant, close to 137 with the gravitationnal one, close to \( 2^{127} \).

Now these two numbers shows a logical connexion, not only in the solo-electronic cosmology, but also in a direct manner by considering the sums of the Catalan-Mersenne (OEIS A007013), which is limited to 4 terms by the Combinatorial Hierarchy:

\[
3, 7, 127, 170141183460469231731687303715884105727 = \text{Lucas Prime Number}
\]
This series is conform to human logic: the generalisation of addition is the multiplication, and another generalisation is the power, and then the power of power. Such a violent series stop at the 4th term, because the next one is simply too much. By contrast the Lucas Number, which exprims the Universe immensity is humanly conceivable, since Lucas was able to determine its Prime property.

Such a series proceeds from the most elementary logic, so was known by ancient Egyptians: the Hypostyle room of Karnak shows 134 = 7 + 127 columns. And the Egyptians used fractions only the inverse of integers, so they could not ignore the number 137 which appear in the 5th term of the harmonic series, the single pole of the Riemann series. It is stange that no mathematician soulign that 037 is an Arithmetic Monster: this article shows its connection with the Lucas-Lehmer and Pell-Fermat series.

Cette suite procède donc de la logique la plus élémentaire, qui donc était connue des Égyptiens, comme il est patent dans l’Hypostyle de Karnak qui exhibe 134 colonnes entre les deuxièmes et troisièmes pylônes, où 134 est effectivement la somme 7 + 127. Moreover, the community rejected the Eddington’s justification for 137. This means a fatal separation between Mathematicians and physicist. Only Michael Atiyah trued to connect 137 with 3 algebra, octonions, quaternions and real numbers, writing 137 = 2^7 + 2^3 + 2^9. This article brings additional information: le whole numbers defined by the whole powers of the Golden Number are important, as well as the number $3^{127}$, so that the ratio Planck/Electron mass is close to $(3/2)^{127}$. So this "herarchy problem" of Particle Physics must be tied to Number Theory.

In these most difficult questions, a dramatic Simplicity shows up: three universal copnstants gives directly a good approximation to the most difficult measure of Physics, the Hubble radius. There is so a compatibility between Physics and Human Logic. Ce calcul est élémentaire: il a pris les 3 premières minutes de mon année sabbatique à Orsay, en Septembre 1997, le temps de résoudre 3 équations linéaires à 3 inconnues, portant sur les exposants à affecter aux 3 catégories physiques intuitives Masse Longueur, Temps pour déterminer une longueur. Et pourquoi une longueur? parce que ce sont des longueurs qui sont mesurées dans la loi de linéaire de Hubble exprimant le pourcentage spectral en fonction de la distance. Donc ce qui compte, c’est la longueur définie par l’inverse de la pente de la droite. Il importe peu que cette loi s’infléchisse à très longue distance, ce qui est mesuré directement c’est la pente à l’origine.

Bibliography


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