Physical constants starting with "6" or "1/6" at various scales: mere coincidence or sixfold symmetry in spacetime ?

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Abstract: The variety of physical constants starting with "6" or "1.6" seems to postulate the existence of a sixfold symmetry in spacetime, a fundamental property found in the geometry of the so-called "flower-of-life". Further, a formula bridging the cosmic and the Planck scales through the fine-structure constant is also presented.

1. Introduction

"*This universe is full of peculiar coincidences*" as per the words attributed to astrophysicist Martin Reeves [1]. Listing them all would certainly be a tedious and lengthy undertaking. Nevertheless, the subtle interplay of these "coincidences" is likely at the source of our physical universe, and the perception by observers of an anthropic principle [2] is proof of their manifestation.

In particular, the variety of physical constants, considered fundamental or not, and coincidentally starting with "6" or "1.6" at various scales is intriguing. It is even stranger when realizing that 1.6 can be regarded as the reciprocal of 6 as shown in (1), therefore unifying the two values. This relationship culminates indeed with the golden ratio, as per (2). Should it be reminded at this point that 6 is the first perfect number in number theory? [3].

$$6^{-1} \quad = 1.66 \quad \times 10^{-1} \tag{1}$$
$$6.18^{-1} = 1.618 \times 10^{-1} \tag{2}$$

2. A miscellany of physical constants starting with "6" or "1.6"

In Fig.1 is graphically reported a non-comprehensive list of physical constants representative of this category. These constants, considered fundamental or not, are expressed in SI base units. They are also tabulated in Annex 1 at the end of the document.

Figure 1: A selection of physical constants commencing with "6" (right) or "1.6" (left) expressed in SI base units. The physical dimensions of planet earth obey this peculiarity.
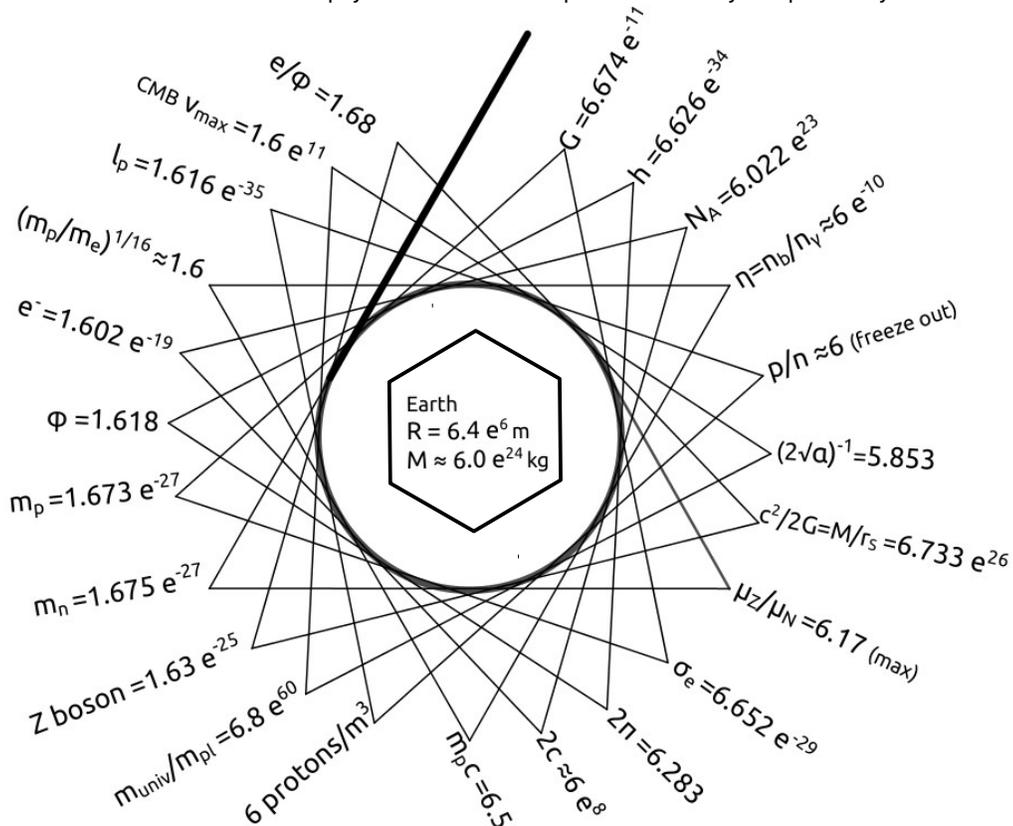
3. Other examples of interest or curiosity

3.1 With 1.6

➤ $\dfrac{\pi}{2} = 1.57$; $\dfrac{5}{\pi} = 1.59$; $\exp\!\left(\dfrac{1}{\sqrt[4]{\varphi}+1}\right) = 1.5999$; $\sqrt[4]{10^3\,\alpha} = 1.64$ $\qquad$ (3)

3.2 With 6

➤ $\sqrt{\displaystyle\prod_{n=1}^{9} n} = 6.02\text{x}10^2$; $\sqrt{\displaystyle\sum_{n=1}^{9} n} = 6.708$ $\qquad\qquad$ (4)

➤ $\Lambda(t_0) = -6.7\ \text{x}10^{-52}\ \text{m}^{-2}$

This is the cosmological constant numerical value found at [4-5] using a critical density $\rho_c = 8.6\text{x}10^{-27}\ \text{kg/m}^3$. The currently reported ΛCDM value is $\Lambda(t_0) = 1.088\text{x}10^{-52}\ \text{m}^{-2}$ [6].

➤ $\rho_{disk} = 6.6\ \text{x}10^{-24}\ \text{g/cm}^3$

Which is the local disk density around galactic center reported at [6].

3.3 The fine-structure constant bridging the cosmic and Planck scales.

When attempting to bridge the cosmic scale to the Planck scale with the fine-structure constant, one may end up with the peculiar formula (5). From this formula, we can extract the ratio Cosmic/Planck, which in turn provides easy access to the "universe" mass (6) and radius (7). This formula was constructed after realizing that the simple ratio $(37/27)\text{x}10^2 = 137.037037\ldots$ was a very close approximation to α^{-1}.

$$3^{-3}\left[\log_{10}\!\left(\frac{\text{Cosmic Scale}}{\text{Planck Scale}}\right)\right]^2 = \alpha^{-1} \qquad\qquad (5)$$

$$\Rightarrow \left(\frac{\text{Cosmic Scale}}{\text{Planck Scale}}\right) = 6.72\ \text{x}10^{60}$$

$$\left(\frac{M_{univ}}{m_{pl}}\right) \Rightarrow M_{univ} = 1.46\ \text{x}10^{53}\ \text{Kg} \qquad (6)$$

$$\left(\frac{R_{univ}}{2\pi\,l_p}\right) \Rightarrow R_{univ} \approx 6.8\ \text{x}10^{26}\ \text{m} \qquad (7)$$

In these formula, m_{pl} is the Planck mass and l_p is the Planck length. The numerical value for the mass found in (6) is exactly the mass of the observable universe reported by the ΛCDM concordance model [7]. On the other hand, the radius found in (7) is 1.6 times the value estimated by the Standard model ($4.4\text{x}10^{26}$m) [7]. In formula (7) was used the circumference of a spherical hypothetical Planck particle with radius l_p as the Planck scale in denominator.

From the two numerical values found at (6) and (7), a density of baryonic matter ρ_B equal to $4.6\text{x}10^{-28}$ kg/m^3 is extracted for a cubic universe in (8). Likewise, considering a percentage of ~5% for baryonic matter density in vacuum, a total density for the vacuum ρ_{vac} equal to $9.2\text{x}10^{-27}$ kg/m^3 is deduced in (9). This value is in very good conformity with latest cosmological parameters from the ΛCDM model [6].

$$(6)+(7) \longrightarrow \rho_B = M_{univ} / (R_{univ})^3 = 4.6\ \text{x}10^{-28}\ \text{kg/m}^3 \qquad\qquad (8)$$

If $\rho_B \approx 5\%$ then $\rho_{vac} = 9.2\ \text{x}10^{-27}\ \text{kg/m}^3$ $\qquad\qquad$ (9)

If we considered the Planck scale invariable in Eq. (6), we could conclude that the fine-structure constant might be drifting over time to accommodate an expanding cosmic scale. In fact, recent evidence suggesting a constant drift of the fine-structure constant and other fundamental constants over time has triggered much interest [9].

3.4 The holographic 6-cube

Coincidentally, the 6-cube is the only cube presenting holographic properties, as the number of squares at the surface of the cube corresponds exactly to the number of $1x1x1$ cubes in the volume (6^3). A holographic universe would therefore necessarily present such a structure. The expansion of this cubic universe is indicated with opposing arrows along the edges of each face.
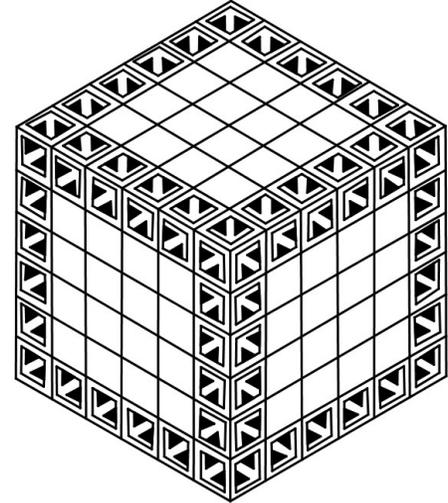
Figure 2: The holographic 6-cube and it's expansion in spacetime symbolized by the arrows at the edges.

4. From the Big Split of the primal cosmic Substance, to a sixfold symmetry in the fabric of spacetime

As briefly summarized in paragraphs 1-3, the impressive variety of physical constants, whether considered fundamental or not, and starting with 6 or 1.6 at various scales, is very likely indicative of a sixfold symmetry in spacetime.

"Active"   **"Passive"**
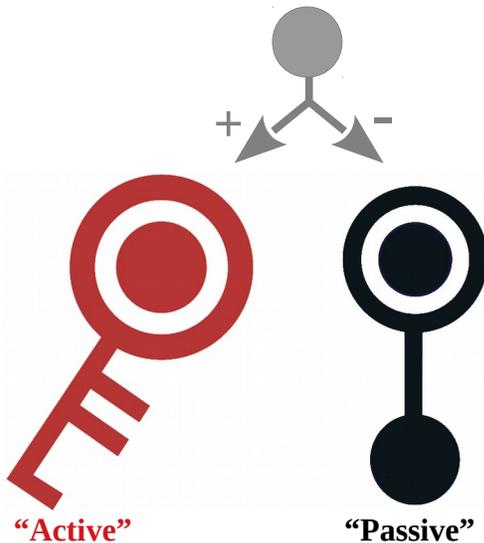
Figure 3: Representation of the initial split of the primal cosmic Substance.

It has been demonstrated at [4-5] that the initial self-division of the primal cosmic Substance into two daughter substances bearing respectively positive ("active") and negative ("passive") energy densities, provides the seeding and nucleation for spacetime expansion and for the transparency process. The two substances are schematically represented in Fig.3.

The expansion process, without inflation, is concomitant to the emergence of 3 other ingredients leading to the formation of a 5-component vacuum, with 2 positive and 3 negative energy densities [4-5]. The emergence of the 3 ingredients results from further self-divisions and recombinations of the two daughter substances in Fig.3.

Further, the expansion mechanism is concluded to proceed from the expansion of a fluid within another fluid, via radial movement of the wave function wavefront as depicted in Fig.4 and Fig.5. During this process, temperature inequalities in the wavefront resulting from the friction and drag force between the two fluids are the causality for the anisotropies measured today.

In Fig.4 below is depicted the initial self-division of the primal cosmic Substance into 2 daughter substances. This initial scission called the **Big Split** and described in [4-5] is not in a 1:1 ratio, but is indeed driven by the golden ratio. The expansion thereforth initiated is represented by the radial motion of the wave function wavefront in orange color (only 50% is represented but it is understood that it's in fact a $360°$ spherical process). The little symbol at the top right side of Fig.4 featuring the number 6 is of utmost importance, as it symbolizes the sixfold symmetry at the end of the self-division process and expansion of spacetime.

Likewise, Fig.5 exquisitely summarizes the spacetime expansion process initiated by the self-division of the primal Substance and climaxing with the sixfold symmetry in the fabric of spacetime.

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Figure 4: Initial self-division of the primal cosmic Substance leading to two daughter components that will provide the seeding and nucleation for expansion and further divisions / recombinations, leading to the 5 vacuum ingredients described in [4-5]. Also depicted is the wave function wavefront driving the expansion. The number "6" symbolizes a sixfold symmetry following the initial self-division and vacuum expansion. The values R_o and R_F are respectively the current and final radius of our "local" universe.
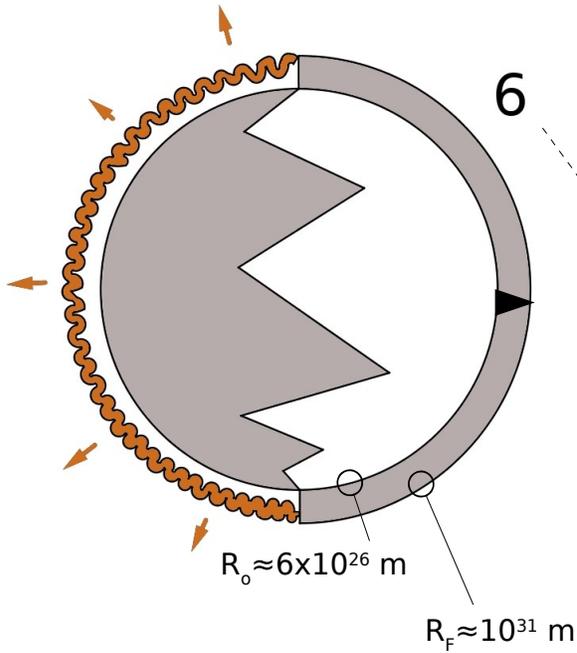
Figure 5 (right): This outstanding depiction provides a concise picture of the stepwise process leading to a sixfold symmetry in the fabric of spacetime: self-division of the primal cosmic Substance, expansion, and emergence of the six intertwined "cells".

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$R_o \approx 6 \times 10^{26}$ m

$R_F \approx 10^{31}$ m
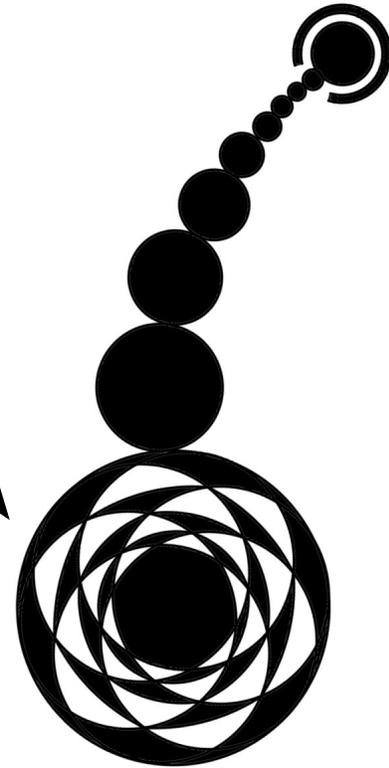
The two following depictions in Fig.6 and Fig.7 illustrate further some of the key cosmological steps that led to the emergence of our "physical" universe, the latter being embedded in a hidden sixfold symmetry.

Figure 6: Stemming from the initial self-division of the primal cosmic Substance, the two daughter substances collaborate in sequential steps, eventually causing the emergence a sixfold symmetry in the fabric of spacetime.
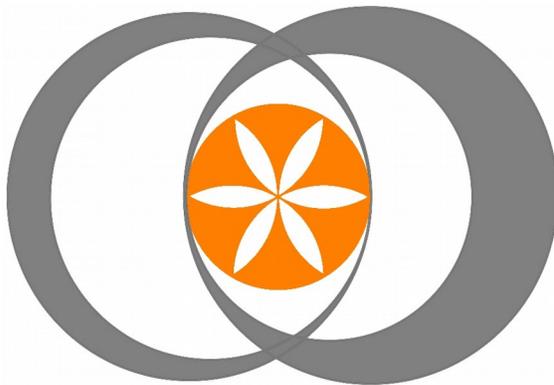
Figure 7: The sixfold symmetry is clearly revealed in this representation of the stretching of the fabric of spacetime.

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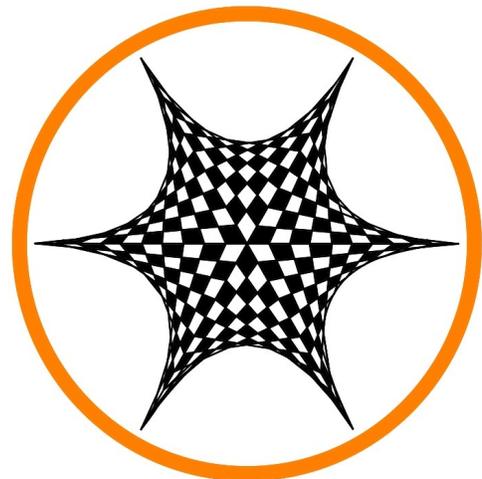
5. A "cellular" universe bearing a sixfold symmetry. An astonishing link to the geometry of the legendary "flower of life".

The sixfold symmetry of spacetime appears related to the common geometrical representation of what is known as the "seed of life", which is depicted in Fig.8. The extension of that geometrical pattern leads further to the legendary "flower of life" shown in Fig.9. The latter structure has been the subject of numerous interpretations, including linkage to the structure of spacetime itself. As a matter of fact, it carries an intrinsic sixfold symmetry, which suggests a "cellular" partition of spacetime where every spherical cell is surrounded by 6 other cells, and each cell currently being the size of our observable universe, 10^{26}-10^{27} m.

Obviously, the emergence of the "seed of life" structure from a central spherical unit could spatially replicate, giving rise to successive layers of spherical units on increasing radii, where the number of cells in each layer is a multiple of 6 (6,12,18,24...). Likewise, the total number of spheres can be calculated using formula (10), in which n is the circular layer number.

$$N_{tot} = 1 + \sum_{0}^{n} 6n \qquad (10)$$

with n=layer number=0,1,2..,n
therefore N_{tot} = 1, 7, 19, 37, 61, ...

How far can or does the extension actually go, or in other words, what is the number of circular layers? In its traditional presentation, the flower of life geometry is depicted with 3 complete layers (n=0,1,2) and 2 other implied but uncompleted layers (n=3,4), which would give a total of 61 cells. The representation in Fig.9 is depicted with 4 layers (37 cells). It maybe the present configuration given the magnitude of expansion of the universe reached today.

6. Cells as interweaved bubbles of positive and negative energy densities

Of special interest is the likelyhood that the 6 cells arranged around an hexagonal geometry represent two sets of 3x3 units alternately dominated by positive and negative energy density, as depicted in Fig.10. In regards to Riemannian geometry, and in accordance with the bimetric model of J.P Petit [10-11] and P. Marquet [12], these cells might accommodate worldlines for positive and negative mass particles respectively. This sixfold symmetry structure of spacetime is the product of the "active" daughter substance (top left) stemmed from the initial self-division of the primal cosmic Substance, as described in paragraph 4.

Figure 10: Topology of a 3x3 structure embedded in the sixfold symmetry of the "flower of life", stemming from the expansion of the central unit. The whole process is generated by the "active" substance on the top left hand-side, itself derived from the initial self-division of the primal cosmic Substance.

Figure 8: The legendary "seed of life" might well be a graphical representation of one unit of the sixfold symmetry in the fabric of spacetime.
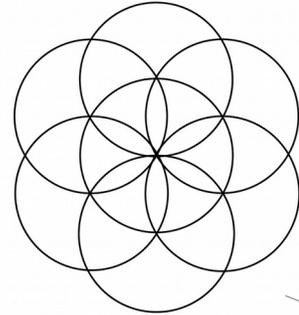
Figure 9: The legendary "flower of life", as a spatial extension of the "seed of life". This incomplete graphical representation of the sixfold symmetry might be the fabric of spacetime at present time t_o
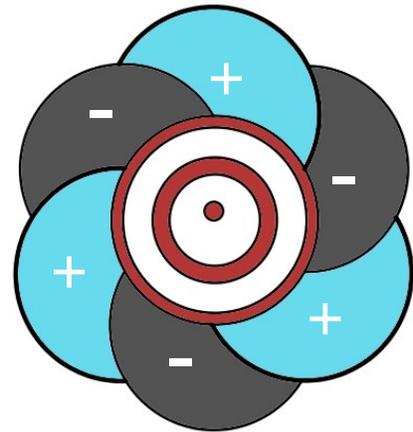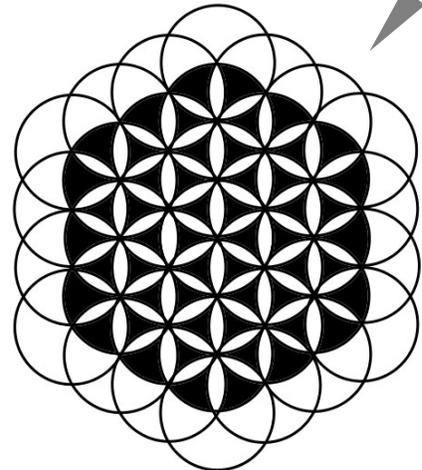
7. The rhombille tiling embedded in the "flower of life"

Of noticeable interest is the outstanding fitting of the rhombille tiling in the "flower of life" geometry. In other words, the tessellation of the fabric of spacetime could be carried out using rhombi whose diagonals are in ratio 1:√3, while still preserving the sixfold symmetry.

Figure 11: Tessellation of the "flower of life" with rhombis
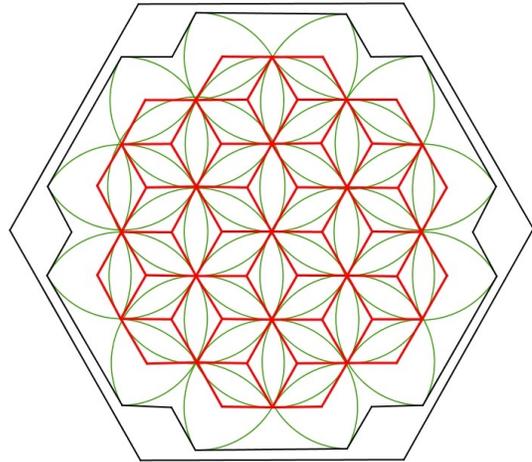
8. Conclusion

The sixfold symmetry in spacetime can no longer be ignored. Several critical physical constants as well as other important numerical values obtained in Physics acutely imply this structure. The implementation of these concepts may possibly require a new Physics. A number of questions may follow this paradigm. For example: how does the sixfold symmetry links to the presumption that every point in spacetime can be regarded as the center of a local universe, or a spherical cell ?

On a different perspective, it becomes evident that the "6 days" duration in the Book of Genesis may refer to this sixfold symmetry and the "cellular" structure of spacetime, commonly represented by the so-called "flower of life" geometry. As a matter of fact, time was still nonexistent at that particular "time". This iconic "flower of life" geometry seems to go back to prehistoric times, and was known on multiple continents. How did this ancient information originally came about, and who received it in the first place? Are Physics and sacred scriptures on a verge to merging again five centuries later?

9. References

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[10] J-P. Petit, G. d'Agostini, and N. Debergh; "Physical and Mathematical Cosnsistency of the Janus Cosmological Model"; Progress in Physics, vol 15, 2019, Issue 1, p38 (and Refs therein)

[11] N. Debergh, J-P. Petit, and G. d'Agostini; "On evidence for negative energies and masses in the Dirac equation through unitary time-reversal operator"; J. Phys. Commun. 2 (2018) 115012

[12] P. Marquet; "Twin Universes: a New Approach"; Progress in Physics, vol 15, 2019, Issue 2 (July), p64

Annex 1

Constant	SI Units	Comments
G	$kg^{-1}\,m^3\,s^{-2}$	Gravitation constant
h	$kg\,m^2\,s^{-1}$	Planck constant
N_A	mol^{-1}	Avogadro's number
η	Dimensionless	Asymmetry parameter
p/n	Dimensionless	Ratio proton to neutron @ freeze-out
$(2\sqrt{\alpha})^{-1}$	Dimensionless	Fine-structure constant derivative
$c^2/2G=M/r_S$	$Kg\,m^{-1}$	with r_S=Schwarzschild radius
μ_Z/μ_N	Dimensionless	Z-component of μ in units of the nuclear magneton
σ_e	m^2	Thomson cross section
2π	Dimensionless	2pi
2c	$m\,s^{-1}$	Twice the speed of light
$m_p c$	$kg\,m\,s^{-1}$	Proton momentum
e/φ	Dimensionless	Ratio exponential-to-golden mean
CMB ν_{max}	Hz	Peak frequency in the CMB spectrum
l_p	m	Planck length
$(m_p/m_e)^{1/16}$	Dimensionless	16th root of the ratio: proton mass-to-electron mass
e^-	Coulomb	Elementary charge
φ	Dimensionless	Golden ratio $(1+\sqrt{5})/2$
m_p	kg	Proton mass
m_n	kg	Neutron mass
Z boson	kg	Z boson mass
m_{univ}/m_{pl}	Dimensionless	Mass of the "observable" universe in Planck units
6 protons/m^3	m^{-3}	Density of the vacuum in proton number equivalent