

# Holography and Cosmology

F. M. Sanchez, M. Grosmann

A Fundamental Holographic Principle 2D-1D-3D is applied to the Grandcosmology invariant horizon. Taking account of the Eddington's Fundamental Theory, this leads to an aesthetic justification of the Universes vastness, with a  $10^{-6}$  precision double large number correlation: the Primordial Bang model and associated anthropic principles are refuted. The sweeping of a single electron-positron couple in a tachyonic bath explains at last the  $10^{122}$  discrepancy between quantum world and the visible Universe.

## Introduction

Dualities between spaces of different dimensions have been coined 'Holographic Relations' by several theorists [1]. Strictly speaking, this is of course a misuse of language since usual holography is a 2D-2D wave transformation, the restitution of volume being only a visual impression. For a total  $4\pi$  holography, a whole volume *area*-information is stored on another 2D surface (the hologram). The number of informations is roughly equal to the ratio of the scene *area* to the square of the wavelength. In particular, a black-hole entropy  $\pi(R_{\text{hor}}/l_p)^2$  has been defined, playing a central role in the black hole thermodynamics, where  $R_{\text{hor}}$  is the horizon radius and  $l_p \equiv (\hbar G/c^3)^{1/2} \approx 1.6164 \times 10^{-35}$  m is the Planck length.

Poincaré has predicted that differential equations will be unadapted to cosmology [2]. So, they must be replaced by global equations, in particular 'holographic' ones in the generalized sense they connect spaces of different dimensions.

## The Fundamental Holographic Principle

Albeit the critical condition in standard cosmology is the same as in a  $M$ -massive black hole:  $R/2 = GM/c^2$ , the above Bekeinstein-Hawking entropy cannot be applied *directly* to the Universe horizon  $R$ , because *in standard cosmology*, it is a variable length. Some contorted attempts use general relativity differential equations, so in contradiction with the above Poincaré's advice [3].

Now, *the horizon radius being a constant* in Grandcosmology [2] (for which the background radiation is supposed to be an invariant field coming from a Grandcosmos, and not a all a fossil radiation), *one may postulate the following Fundamental Holographic Principle*. With the Universe wavelength  $\lambda_M = \hbar/Mc \approx 3.9989 \times 10^{-11}$  m ('holon' particle of mass  $M$ ), the above critical condition writes as the holographic correspondence 2D-1D for the Bekeinstein-Hawking entropy:

$$\pi(R/l_p)^2 = 2\pi R/\lambda_M \quad (1)$$

With the equivalent number of neutrons  $M/m_n = N_n = (10m_H/3m_p)N_{Ed}$ , where  $N_{Ed} = 136 \times 2^{256}$  is the Eddington's Number [4], and the factor  $10/3$  is justified by basic *non-relativistic* energy considerations [3], this entropy extends to:

$$\pi(R/l_p)^2 = 2\pi R/\lambda_M = N_n 2\pi R/\lambda_n \quad (2)$$

this is a *quasi-3D* term, produced by the *sweeping of the enormous number  $N_n$  of circles*. This is the justification of the vastness of the Universe: *a large number permits to approach continuity* (the standard explanation involves a  $10^{-120}$  precision in initial conditions, and is called 'strong anthropic principle'). This corresponds to  $R \approx 13.813 \times 10^9$  lightyear, and a Hubble constant  $70.791 \text{ km s}^{-1} \text{ Mpc}^{-1}$ .

Now the new space quantum  $\lambda_M$  is about  $10^{-61} l_p$ : indeed, the Gamma Ray Burst observations [5] seem to exclude the Planck length  $l_p$  as a space quantum, a common assumption of several theories. Grandcosmology assumes that tachyons exist, but with a maximal speed value  $C$  about  $10^{61} c$ , explaining at last the  $10^{122}$  discrepancy between the vacuum quantum energy and the Universe one [2].

This means the visible Univers is a tiny part  $10^{-122}$  of what is really occurring : the emptiness of Space is only an illusion, hiding a tachyonic active world, *which make Coherent the Universe* (the old signification of a *Kosmos*). In particular, it is shown that, inside the circle  $R$ , the mean planar spiraling radius of a single electron is tight to the atomic radius  $a\lambda_e$ , with  $a \approx 137.036$  [2]. So, *the whole Universe would be made of a single couple electron-positron, in a tachyonic bath*. This confirms the central role of the Topological Axis

[2], which rehabilitates String Theory, and en-lights the fact that the Large Number Correlation writes in the form, where  $m_e' = m_e m_p / m_H$  is the effective electron mass in the Hydrogen atom of mass  $m_H$  ( $m_p$  is the proton mass):

$$\hbar c/Gm_e m_p = (R/2\lambda_H) = \sqrt{(M/m_e')}$$
 (3)

So the Eddington's 'comparison particle' [4] is nothing else than the electron. Eddington could not have realized this, because, at his epoch, the estimation of the Hubble Constant was false by an order of magnitude. This is the definitive refutation also of the *weak Anthropic Principle* [6], tying a *so-called universe age* to the necessary time to produce carbon.

## Discussion

The compatibility between the neutron Eq.(2) and the electron Eq.(3) writes, with the Planck mass  $m_P \equiv (\hbar c/G)^{1/2}$ :

$$m_P^4/m_e m_H = M m_p \approx (10/3) N_{Ed} m_H m_n$$
 (4)

showing a  $2 \times 10^{-4}$  discrepancy for the optimized G-value [2]  $G \approx 6.6754532 \times 10^{-11} \text{ kg}^{-1}\text{m}^3\text{s}^{-2}$ , corresponding in the ppb range to the correlation, where  $m_F$  is the Fermi mass,  $\lambda_F$  its reduced wavelength, and  $r_H = a\lambda_e m_H / m_p$  the Hydrogen Atom radius:

$$2^{127} - 1 \approx (m_P m_F^2 / m_e m_p m_n) (r_H / a^2 \lambda_F)^3$$
 (5)

*This very symmetric relation corresponds to a factorization of the most famous prime number of History.*

Adopting this value leads to:

$$m_P^4/m_e m_p = M m_H \approx (10/3) N'_{Ed} m_p m_n$$
 (6)

with  $N'_{Ed} = N_{Ed}(a/137)^4$ , corresponding to an imprecision on  $G$  of  $2 \times 10^{-6}$ . This is a more symmetrical relation, involving a modification of the Eddington number, which is not illogical in the frame of arithmetical physics, where the whole number 137 must play a role.

## Conclusion

*The compatibility of the two approaches means the Primordial Bang model is out.* This standard model was only sustained by the censoring of controversial observations [2]. The introduction of a Multiverse, supported by an Anthropic Principle, is unnecessary, it is a monstrous violation of the Occam rule. Eddington's Fundamental Theory is completely rehabilitated. Moreover, it has predicted parity violation and Clifford algebras in height and nine dimensions, which appear now in String Theory [7]. Eddington has also predicted the Tau particle (he called 'Heavy Mesotron'), 35 years before its surprising discovery. *A reappraisal of Eddington's Fundamental Theory is an urgent necessity.*

## References

- [1] Bousso R., "The Holographic Principle", Review of Modern Physics, vol 74, p.834 (2002).
- [2] F.M. Sanchez. *Grancosmology* Vixra.org,1601.0011. Springer International Publishing AG 2017. A. Tadje et al. (eds.), *Quantum Systems in Physics, Chemistry, and Biology*, Progress in Theoretical Chemistry and Physics 30, pp. 375-407. DOI 10.1007/978-3-319-50255-7\_23.
- [3] Fisher W. and Susskind L. (1998) *Holography and Cosmology*, arXiv:hep-th/9806039v2
- [4] Eddington A.S., *The Fundamental Theory* (Cambridge, 1946)
- [5] Ackermann M. The Astrophysical Journal, 716:1178–1190, 2010 June Fermi Observations of GBR 090510
- [6] Carr B.J. and Rees M. J. , "The anthropic principle and the structure of the physical world", Nature 278, 605-612 (1979).
- [7] Salingaros N., Some Remarks on the Algebra of Eddington's E Numbers. Foundations of Physics, June

1985, Volume 15,6, pp 683–691.