Gravitational density $\Omega = 3/10$ and boson density $\Omega^2/2$ in the Perfect Cosmology

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Abstract

Perfect cosmology (steady-state) is characterized by a single parameter, implying the critical condition $M = Rc^2/2G$, with an invariant Hubble radius R. This implies that the non-relativistic Universe gravitational energy is ΩMc^2, with $\Omega = 3/10$, whose quantum form implies the baryon density $\Omega^2/2 = 0.045$. Thus, the dark matter could be interpretated as an out of phase matter-antimatter oscillation.

1 Historics

Current cosmology is based on General Relativity, which works very well in local physics. But, as Poincaré had warned [3], cosmology cannot be based on differential equations. Thus, Bondi and Gold have introduced the steady-sate model [1], the cosmology based on the Perfect Cosmological Principle: homogeneity in both space and time, so excluding both the Universe expansion and the Big Bang model.

This perfect cosmology has predicted several crucial cosmological points:

1. The thermal backround with its correct temperature estimation[2] (details in section 5).
2. The critical character tying the Universe mass $M = Rc^2/2G$ with the invariant Hubble radius.
3. The (exponential) acceleration of the galaxy recession.

2 The Dark Energy density

The non-relativistic gravitational energy of an homogeneous ball of mass M and radius R is $E_G = (-3/5)\ Mc^2$, so for the critical case:

$$E_G = -\Omega\ Mc^2 \quad ; \quad \Omega = 3/10 \tag{1}$$

Moreover, the non-relativistic kinetic energy of the receeding galaxies**(author?)** is $E_k = \Omega Mc^2$, so that:

$$E_G + E_k = 0 \tag{2}$$

So, it is proposed that the complementary density 7/10 would be attributed to dark energy, indeed compatible with the current estimations.

3 The Baryon Density

The classival quantum form of the energy is, where m is the mass of a particle:

$$E = \frac{p^2}{2m} \tag{3}$$

With $\lambda = \hbar/p$, this writes:

$$E = \frac{1}{2m} \, (\frac{\hbar}{\lambda})^2 \tag{4}$$

With the resonance condition $\lambda = 2R/N$, with $N = M_g/m'$, where $m'$is the mass of a particle, we suppose the baryonic energy to be:

$$E_b = \frac{1}{m} \, (\frac{\hbar M_g}{2Rm'})^2 = \frac{\Omega^2}{2} \, E \tag{5}$$

where E is the canonical form:

$$E = \frac{1}{2m} \, (\frac{\hbar M}{Rm'/2})^2 \tag{6}$$

with m_e the electron mass and m' the proton mass, this corresponds to

$$R = \frac{2\hbar^2}{G m_e m_p^2} \approx 13.8 \text{ Giga lightyears} \tag{7}$$

The correlation with the official "universe age" 13.8 Giga-years could mean the official relativist theory is confusing time with length.

4 Back to Simplicity

Modern cosmology has seen two major theories come into conflict: the theory of the Permanence of the Universe, and the theory of its evolution. Their main difference is that Permanence is based on a single parameter, whereas modern cosmology is now based on up to 6 arbitrary parameters.

The first thing to do, therefore, was to examine whether the single parameter of Permanence was related to the universal constants, whose constancy is, according to Poincaré, the very foundation of physics. This was attempted with the discovery of galactic recession, which defines the "Hubble radius" of the visible Universe. However, as measurements of galactic distances are greatly underestimated, this research was unsuccessful.

The above expression for the Hubble radius was obtained in a reapraisal of cosmology in the 3 first minutes of the sabbatical year 1997-98, and deposited in n a closed draftin March 1998 at the Paris Acdemy/ The details are in the French Wikipedia, section 'analyse dimensionnelle".

5 The Gold prediction confirmed

In this perfect cosmology, a permanent appearance of matter is necessary to compensate for the loss of galaxies fleeing the sphere of the visible Universe, so that the average density is constant $\rho_c = 3/8\pi G t^2 \approx 9.41\ 10^{-27} kg/m^3$, with $t = R/c$ is the time constant of the exponential recession.

With the above "baryonic" density of the Universe $\Omega_b = \rho_b/\rho_{cr} \approx 0.045$, which contains the enormous proportion (by mass) $Y_{He} \approx 0.24$ of Helium, so the density of Helium is $\rho_{He} = \rho_c \times 0.045 \times 024 = 1.02\ 10^{-28} kg/m^3$.

Thomas Gold, one of the initiators of Perfect Cosmology, proposed that this Helium comes from Hydrogen following the weak nuclear reaction responsible for the sun's brilliance and whose energy yield is 1/140. He therefore proposed that a thermal equilibrium background corresponds to the energy $M_{He}c^2/140$. The energy density is therefore $\rho_{He}c^2/140 = 6.53\ 10^{-14}$ Joule/m^3. Identified with the thermal energy density $(\pi^2/15)(kT)^4/(\hbar c)^3$, this gives T = 3.0 Kelvin, close to the background temperature of 2.726 Kelvin. Taking into account the correction implied by neutrino radiation i.e. replacing $\pi^2/15$ by $\Delta\pi^2/15 \approx 1.106265503$ where $\Delta = \rho_R/\rho_{CMB} = 1 + (21/8)(11/4)^{4/3}$, leads to:

$$\Omega_b Y_{He} \frac{1}{140}\ \rho_c = \frac{\pi^2 \Delta}{15}\ \frac{(k_B T_{CMB})^4}{(\hbar c)^3}\ \Rightarrow T_{CMB} \approx 2.7 \text{ Kelvin} \quad (8)$$

becoming compatible with the measured temperature 2.726 Kelvin. One may conclude:

1 The temperature of the Universe is invariant: the next JWST challenge.

2. The radius of the visible Universe is really 13.8 billion light-years.

2. The above baryonic rate 0.045 is confirmed.

3. The spontaneous appearance of matter is neutrons, not quarks.

6 Conclusion: the nature of Dark Matter

In the above relation tying E_b with M_G, the latter intervenes by its square. This could mean that the dark matter is an out of phase oscillation matter-antimatter. This would explain its darkness.

Strangely enough, the hypothesis that matter in in fact such an oscillation was never proposed [4].

Bibliography

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