

8. THE NEW UNIVERSE FIXED BY THE EQUIVALENCE PRINCIPLE

Table of Contents

[8.1 The Current Cosmological Models. 1](#)

[8.2 Particle Expansion Vs Universe Expansion. 3](#)

[8.3 The Average Density of the Universe. 4](#)

8.1 The Current Cosmological Models

The same as in the case of the field equation of general relativity, the earlier cosmological models have been conceived on the base of “local” concepts that are not well defined for “nonlocal” cases. The errors are larger when the differences of G field potentials between the objects and the observer are appreciable. Then it is reasonable that they may have similar kind of errors.

After the discovery of the Hubble red shift, it was thought that such phenomenon is due to a universe expansion. In this way, the differences of velocity between the bodies and the observers would increase with and with distances. According to Doppler effect, such velocity differences would correspond to some red shift proportional to the distances. Thus most people actually assumes that the universe was born after a huge explosion, called the “*Big-Bang (BB)*”, after which the universe has been permanently expanding itself. In this way all of the bodies of the universe would be moving with respect to each other with velocities proportional to the distances between them. This would produce, according to Doppler effect, a red shift proportional to the distances.

In cosmology, the same as in classical physics and the same as in the above case of gravity, some fundamental postulate has also been tacitly presumed. Curiously, all of them were made up from the very beginning of such theories. In the case of the theories of universe expansion, the obvious postulate is:

“PARTICLES DON’T EXPAND IN THE SAME PROPORTION AS THE UNIVERSE”.

Why ?

Of course, this is a strong *postulate* that has never been fairly proved[1]. Such postulate is as fundamental as that of assuming that the mass of a body does not changes after a change of velocity.

This kind of assumption stands out in the case of *the raisin pie* analogy currently used for the universe expansion. Such analogy does not take into account that:

If the raisins do expand in the same proportion as the pie, then any relative distance within the pie does not change at all.

Most people do not realize that even in this simple analogy there is hidden assumption in that the raisins do not expand in the same way as the pie.

In the case of the universe, *the hidden postulate is that “particles do not expand in the same proportion as the universe”*. This means to assume that there are parts of the universe that do not expand in the same proportion as the other ones. If this were so, *the local physical laws would change with the time*.

Notice that *this tacit postulate is equivalent to assume that the EP would be violated just for the case of universe expansion*. This is of course a very fundamental assumption that should be fairly verified before making any work on that line.

Grossly, according to the nature of matter fixed by Explicit Equivalence Principle, it is expected that a universe expansion should expand the wavelengths of all of the wavelets, in just the same proportion. Since the well-defined number of wavelengths fixes the sizes and distances between the bodies, then the distances between are bounded to be expanded in the same proportion as the universe. Then all of them, bodies and stationary radiation’s, should change in just the same proportions, i.e., *a uniform universe expansion can not change any ratio between the distances*.

In more detail, according to wave continuity, during universe expansion, all of waves and wavelets, in particles and between them, should be expanded in the same proportion with respect to their original states. In particular, the NL wavelengths of the radiation’s traveling within the particles and between them, and their corresponding wavelets, should be expanding themselves in the same proportion. Thus, in the average, the ratios between them should not depend on the absolute state of expansion of the universe. In other terms, the equivalence principle must also come true even for the case of universe expansion.

Notice that the implicit assumption on the invariability of the particles, after universe expansion, seems to be also the result of current concepts inherited from the classical physics. Because classically, “it was arbitrarily assumed that the relative properties of bodies do not change after changes of velocity and relative positions (potentials) with respect to other bodies”.

8.2 Particle Expansion Vs Universe Expansion

Let us find whether these hidden postulates of the Big-Bang models can be true, according to the Equivalence Principle and the experiments.

If such implicit postulate were true, then it would be possible to find a strictly invariable standard body that could be used as a base for a strictly invariable reference frame.

According to nonlocal mass-energy conservation, *a universe expansion would not change the total mass-energy of the system.* Then, according to E4.2, the average NL mass-energies of a distant body, $m_{r^*}(r)$, moving with respect to the hypothetically invariable standard, should not change with the time.

However, due to the homogeneous expansion of the universe, “every NL distance r^{ik} between the galaxies i and k should increase in the same proportion, after the same NL time interval dt ”. Thus, the same must hold for the typical NL radius R .

$$\frac{dr^{ik}}{r^{ik}} = \frac{dR}{R} = Hdt \quad \text{E8.1}$$

Thus, for a uniform universe expansion, the intergalactic distances (r^{ik}) and the typical distance (R) must change in the same proportion. Thus, the ratios r^{ik}/R must remain constant during universe expansion. From this fact and E5.15 and E8.1, the change of nonlocal perturbation rate $z(i)$ occurring at the observer place ($r^* = i$), after the NL time interval dt , is:

$$dz(i) = G^U d \left\{ \sum_{k=1}^{\infty} \frac{M(r^k)}{r^{ik}} \exp - \frac{r^{ik}}{R} \right\} \cong -G^U \left\{ \sum_{k=1}^{\infty} \frac{M(r^k)}{r^{ik}} \exp - \frac{r^{ik}}{R} \right\} \frac{dr^{ik}}{r^{ik}} = - \frac{dr^{ik}}{r^{ik}} \quad \text{E8.2}$$

Thus from E8.1 and E8.2,

$$dz(i) = - \frac{dr^{ik}}{r^{ik}} = -Hdt_{r^*} \quad \text{E8.3}$$

This result is rather straightforward from the wave properties of matter and wave continuity. According to E5.16, this global decrease of the NL perturbation rate of the space is equivalent to an increase of the NL G potential. From E5.5 and E8.3, *this one would produce a gravitational expansion of the standard model*, equal to:

$$\frac{d\lambda(0,i)}{\lambda(0,i)} = d\phi(i) = -dz(i) = \frac{dr^{ik}}{r^{ik}} = Hdt \quad \text{E8.4}$$

Then it may be concluded that,

If the galaxies of the universe where running away from each other, the global increase of the G potential would produce a gravitational expansion of the particles the same proportion as the

intergalactic distances.

This brings out a chain of other conclusions. For example:

- 1. It would be not possible to find a standard particle model or a reference frame that does not expand in the same proportion as the rest of the universe.*
- 2. The universe expansion cannot increase the relative distance between particles because particles and any system of them should expand themselves in identical proportion.*
- 3. The relative velocities of the particles cannot change due to universe expansion because the relative distances do not change after universe expansion.*
- 4. The Hubble red shift cannot increase with the time during a uniform universe expansion, because the relative distances remain unchanged.*
- 5. The universe age is not directly related to the Hubble red shifts because the last one does not change with the time.*
- 6. The temperatures would not change due to uniform universe expansion just because the relative values of both the local velocities and the kinetic energies would remain unchanged.*
- 7. Since every relative property remains unchanged, the local physical laws cannot change due to uniform universe expansion.*
- 8. The EP also holds for the case of universe expansion.*
- 9. Only an absolute kind of universe expansion can exist but this one would not have local effects.*
- 10. For real observers, the universe would look like if the expansion were frozen throughout the time, indefinitely.*
- 11. The true age and lifetime of the universe and of its celestial bodies is, apparently, unlimited.*
- 12. The universe would remain, indefinitely, in kind of steady state.*

This new cosmological context, with unlimited age and lifetime, makes a contrast with the rather uncomfortable conventional context. In it, the evolution times of the celestial bodies must fit within the relatively small universe age currently derived from the Hubble red shift.

It is important to realize that for long time, the global context of the Big-Bang models have been causing serious problems in both Cosmology and Astrophysics.

8.3 The Average Density of the Universe

According to the nature of matter fixed by the Explicit Equivalence Principle, the average density of matter in it fixes the average background of random phase wavelets in the universe. Such background is the one that fixes all of them, the average dielectric and gravitational properties of the space, altogether with the *eigen-frequencies* of the particle models.

Consequently, it is simple to prove that the average wavelet density coming mostly from the long-range

universe fixes the G constant. This value depends, essentially, on the Hubble red shift.

Effectively, from E5.18, the average perturbation rate of the space results from integrating the contributions of consecutive shells of infinitesimal thickness:

$$z(U) = \int_0^R \frac{Gdm(r)}{r} \exp\left(\frac{-r}{R}\right) = \int_0^R \frac{G4\pi\rho(U)r^2 dr}{r} \exp\left(\frac{-r}{R}\right) = 4\pi G\rho(U)R^2 \quad \text{E8.5}$$

Since in this case $z(U)=1$, then all of them, the average density of matter in the universe, the Hubble constant and the G constant are related to each other by:

$$\rho(U) = \frac{1}{4\pi GR^2} \quad \text{E8.6}$$

From E8.6 and after assuming a Hubble constant of 75 [km per sec per mega parsec], the average universe density turns out to be 10^{-29} gm/cm^3 . Such density is of a higher order of magnitude than the density of luminous matter in the universe. Then it may be inferred that:

Only a small fraction of the universe is in luminous states. The rest of it should be in not luminous states

This result is consistent both with the new astrophysical context derived below, and with the high proportion of non visible bodies that have been indirectly detected by the dynamic effects of their G fields on observable bodies. This has normally called the *missing mass problem* of current theories in astrophysics. Here, *this is not a problem. To the contrary, this may bet a fair test for the present theory.*

From integration's of E8.5, up to spheres of arbitrary radii a , the relative contribution of matter existing within such spheres compared with that of the whole universe is:

$$\Delta z(U) = \frac{\Delta w(U)}{w(U)} = \frac{\Delta \phi(U)}{\phi(U)} = 1 - \left(1 + \frac{a}{R}\right) \exp\left[-\frac{a}{R}\right] \quad \text{E8.7}$$

The graph in Fig. 8.1 shows the values of z Vs r/R .

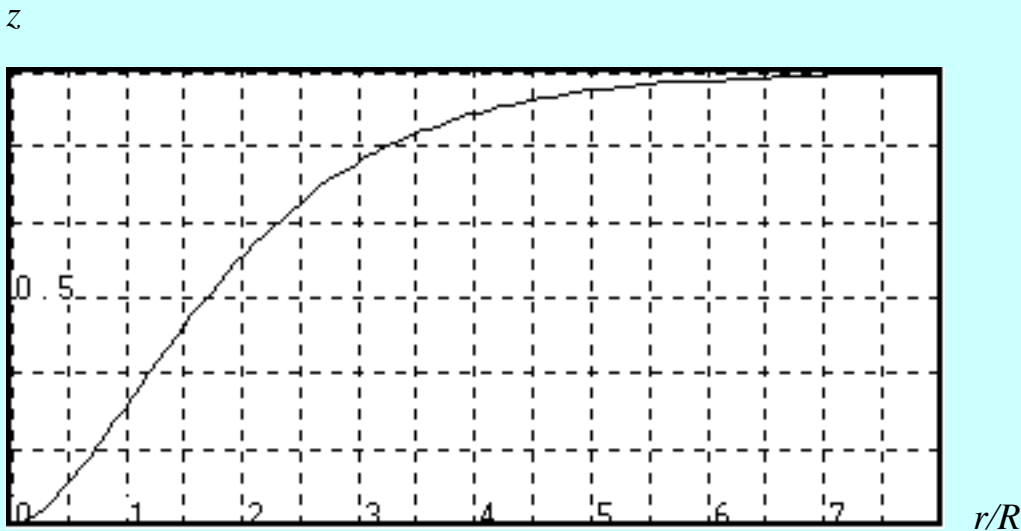


Fig. 8.1. Relative contributions of matter inside of spheres of increasing radius. They are compared with the net perturbation rate of the space produced by a universe of uniform density.

For example, for spheres of radii equal to R , $2R$, $3R$, $4R$, and $5R$, the contributions of matter within these radii would be about 26, 60, 80, 91 and 96%, respectively. Observe that the global properties of the space would be mostly fixed by the bodies and radiation's existing within $2R$. Then the *contributions of the relatively local inhomogeneities are extremely small compared with that of the rest of the universe*. This is accounts, in a rather obvious way, for

- The weakness of ordinary gravitational interactions,*
- The high isotropy of the free space properties,*
- The high isotropy of the low temperature radiation background.*

Below it is proved that the discovery of the low temperature radiation background²⁰, and of its high isotropy, turns out be a fair test for the new cosmic context fixed by the EEP.

[To the top of this page](#)

[To next Subject](#)

[1] During international meetings I have realized that most everybody assume, without fair proofs, that particles remain invariable during the changes of field potentials associated to the universe expansion