

Newton vs. Einstein

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Introduction

This paper demonstrates that the redshift of galaxies and quasars is due to a “gravitational braking” of light and not to a so-called expansion of the universe. It shows further that the velocity of any material body in movement with respect to “the cosmological background” will progressively decrease and eventually cancel out. Moreover, any movement is absolute and independent of an observer, and the GRT gives here erroneous results.

Redshift within the context of General Relativity

We reproduce hereafter parts of a chapter relating to “Stars of Uniform Density” taken from Steven Weinberg’s book *Gravitation and Cosmology* (1972).

“General relativity finds an interesting application to one other class of stable stars, those consisting of incompressible fluids... These stars are of interest, not because they actually exist, but because they are simple enough to allow an exact solution of Einstein’s equations, and because they set an upper limit to the gravitational red shift of spectral lines from the surface of any stars. The red shift is given by the relation

$$1 + z = \left(1 - \frac{2MG}{R}\right)^{-1/2} \quad (1)$$

and the structure of the Einstein’ equations imposes the absolute upper limit $4/9$ to MG/R , which means that z of the light signals leaving those stars is always less than 2.

However, there is no theorem that limits the red shifts of light signals from the interior of static spherically symmetric bodies. For instance, a light signal from the center of a transparent uniform star would have a red shift given by the relation

$$1 + z = \left[\frac{3}{2} \left(1 - \frac{2MG}{R}\right)^{1/2} - \frac{1}{2} \right]^{-1} \quad (2)$$

z becoming infinite as MG/R approaches the maximum value $4/9$. In those relations, M and R are respectively the mass and the radius of the star, and G is the gravitational constant divided by c^2 .”

Remarks

We replace the mass M of the star by $(4/3)\pi R^3 d_y$ where d_y is the density of the star, and we replace G by G/c^2 . MG/Rc^2 then becomes $(4/3)\pi GR^2 d_y/c^2$. For any density d_y , we may replace $4\pi G d_y/3$ by a constant K^2 , which gives

$$\frac{GM}{Rc^2} = \frac{K^2 R^2}{c^2}$$

For a stable star of radius R whose density is the same as the mean density of the universe (the value 2×10^{-29} g/cm³ is often used), $K = 2.36 \times 10^{-18}$ /sec and $1/K = 4.23 \times 10^{17}$ sec or 1.34×10^{10} years, which is analogous to the Hubble time.

Let us remember that for General Relativity, the radius of such a star is limited by the relation

$$\frac{MG}{Rc^2} < \frac{4}{9} \quad \text{or} \quad \frac{K^2 R^2}{c^2} < \frac{4}{9}, \quad \text{i.e.} \quad \frac{KR}{c} < \frac{2}{3},$$

which means that the maximum radius of such a star is $2c/3K$, or about 9 billion light-years.

Let us also observe that relations (1) and (2) become respectively

$$1 + z = \left(1 - \frac{2R^2}{R_0^2}\right)^{-1/2} \quad (3)$$

and

$$1 + z = \left[\frac{3}{2}(1 - 2R^2/R_0^2)^{1/2} - \frac{1}{2}\right]^{-1} \quad (4)$$

for stars of density 2×10^{-29} g/cm³ and $R_0 = c/K$.

With the help of equation (4), we may express R in terms of z and R_0 :

$$\frac{R^2}{R_0^2} = \frac{(z+2)(3z+3)}{2(1+z)^2} \quad (5)$$

We conclude from these remarks that for General Relativity, a light signal coming from the center of a “stable”, i.e. not contracting nor expanding, star whose radius is less than c/K undergoes a “gravitational braking” and a corresponding loss of energy which is expressed by a redshift given by relation (4). We observe also that the constant K is similar to the Hubble constant. We shall investigate hereafter if relation (4) is compatible with the cosmological data.

What can we learn from Classical Mechanics?

We admit that the universe is Euclidian, homogeneous, isotropic and spherical, and that its radius R_u is much larger than the radius $R_0 = c/H$ of the “observable” universe (c is the speed of light and H the Hubble constant). In fact, we consider that R_u is as big as we want it to be (a simple definition of infinity).

We isolate from this universe a sphere of radius R . Gauss’s theorem tells us that a body situated at the center of the sphere and having a velocity V moves away from the

center to a distance R according to relation $V = KR$ (6). At the distance R from the center, its velocity cancels out.

Let us remember here that $K^2 = 4\pi d_\gamma/3$, and that K has the same characteristics as the Hubble constant. At any distance $r < R$ from the center, the velocity of the body is given by the relation

$$v = V \cos Kt \quad (7)$$

and the distance r is attained after the time t according to relation

$$r = R \sin Kt = \frac{V \sin Kt}{K}. \quad (8)$$

From the relations (7) and (8), we can express r in terms of v , or v in terms of r , with the help of relations

$$r = R \left(1 - \frac{v^2}{V^2} \right)^{1/2} \quad (9)$$

and

$$v = V \left(1 - \frac{r^2}{R^2} \right)^{1/2} \quad (10)$$

Relation (10) can also take the form $v = (V^2 - K^2 r^2)^{1/2}$, or

$$v^2 = V^2 - K^2 r^2 \quad (11)$$

It is interesting to note that $K^2 r^2$ corresponds to the square of a virtual velocity v_r acquired at the center of the sphere by a body initially at rest at a distance r from the center and virtually falling towards it. On the other hand, $K^2 r^2$ gives the real energy loss of a body having left the center with a velocity V . Indeed, for a body with mass m ,

$$\frac{mv^2}{2} = \frac{mV^2}{2} - \frac{mv_r^2}{2} \quad (12)$$

Redshift of a light signal coming from the center

We admit that the red shift is given by the non-relativistic relation $z = (v/c)/(1 - v/c)$. We admit also that the relevant velocity here is the velocity v_r of relation (12).

In fact, $v_r = Kr$ can be considered as a virtual velocity whose counterpart is the velocity Hr considered as real by the theory of the universe in expansion, thus

$$z = \frac{v_r/c}{1 - v_r/c} \quad (13)$$

Let us remember that the radius of the observable universe is the radius $R_0 = c/K$ (or c/H if we liken K to the Hubble constant). For the observable universe, $v_r = KR$, $c = KR_0$, and $v_r/c = R/R_0$. It follows from (13) that

$$z = \frac{R/R_0}{1 - R/R_0} \quad (14)$$

and

$$\frac{R}{R_0} = \frac{z}{1+z} \quad (15)$$

By the way, with the relativistic Doppler shift, $(1+z)^2 = (1+v/c)/(1-v/c)$, we would have obtained

$$(1+z)^2 = \frac{1+r/R_0}{1-r/R_0} \quad (16)$$

and

$$\frac{r}{R_0} = \frac{(1+z)^2 - 1}{(1+z)^2 + 1}$$

Finally, let us remember that relation (4) from general relativity imposes that for an object observed at a distance $r \geq 2r_0/3$ from the center, z becomes infinite. If we replace r/r_0 by $2/3$ in our relation (14), we obtain a maximum redshift of 2. Since this value is exceeded by a great number of galaxies and quasars, general relativity is at variance with the observed facts, and thus cannot be correct.

Conclusion

Using classical mechanics, we have demonstrated that an electromagnetic signal coming from the center of a “stable homogeneous star” having the density of our universe and a radius $R_0 = c/K$ undergoes a red shift in its travel, and that the relation between the distance covered by the signal and its red shift is given by relation (15) which is different from that established for an expanding universe. The existence of that relation is beyond doubt. If we admit the Cosmological Principle according to which all positions in the universe are essentially equivalent, we have also to admit that every point in the universe can be considered as the center of a sphere of radius R_0 , and consequently that the wavelength of any light or electromagnetic signal coming from any point of the universe will increase in proportion of the distance traveled according to relation (15). That position is as justified as that of the proponents of the theory of an expanding universe who consider that any point of the universe coincide with the center of the expansion.

As for us, we started from the hypothesis of a stable Euclidian universe, using the rules of classical mechanics. It follows on the one hand, that the theory of an expanding universe is superfluous, and on the other hand, that the theory of General Relativity that leads to a wholly different relation is here not only superfluous but also erroneous. Furthermore, the same way as an electromagnetic signal undergoes a red shift and thus a loss of energy owing to its interaction with the universe, any moving body having a rest mass loses a fraction of its kinetic energy in proportion of the distance it travels in the universe, in accordance to relation (12). This phenomenon is an absolute one, and does not depend on the presence of an observer.

References

Weinberg, Steven, 1972, *Gravitation and Cosmology*, John Wiley & Sons, Inc., pp 330-335.