The Cosmic Coincidence

Astronomical observation reveals a shift towards the red end of the light spectrum of starlight from more distant sources. A red shift in the light spectrum also occurs if sources are in recession. The red shift of starlight at twice the distance is thus interpreted as twice as much recession.

Most astrophysicists believe the universe expands. Whether it does is here beside the point, which is with regard to cosmic coincidences.

The rate of expansion is according to the Hubble constant, designated by the letter H. Some estimates render an expansion rate of about 70 kilometers per second at a distance of one million parsecs away from us. Dividing 70 kilometers per second by one million parsecs renders a value of 2.28×10^{-18} cycles per second. Multiplying this value by light speed ($c = 3 \times 10^{10}$ centimeters per second) renders an acceleration of 6.85×10^{-8} centimeters per second per second.

The numerical value of the gravitational constant G is 6.67×10^{-8}. Thus at the surface of one gram of mass with a radius of one centimeter the gravitational acceleration is 6.67×10^{-8} centimeters per second per second. The numerical value of Hc is 1.03 times the numerical value of the gravitational constant:

$$\frac{Hc}{G} = \frac{6.85 \times 10^{-8}}{6.67 \times 10^{-8}} = 1.03$$

The equation above is not dimensionally consistent. The dimensions of Hc are those of acceleration, as would be the gravitational constant multiplied by mass per distance squared.

One ratio of grams per centimeters per centimeters that fits the criteria of the last equation is the proton mass per twice the product of the nuclear radius and the electron radius. Hence

$$Hc = \frac{Gm_p}{2r_n r_e} = 6.84 \times 10^{-8} \text{ centimeters per second per second}$$

$$H = 2.23 \times 10^{-18} \text{ per second}$$

$$C = 3.0 \times 10^{10} \text{ centimeters/second}$$

$$G = 6.67 \times 10^{-8} \text{ centimeters cubed per gram times seconds squared}$$

$$r_n = 2.88 \times 10^{-12} \text{ centimeters}$$

$$r_e = 2.82 \times 10^{13} \text{ centimeters}$$

Another coincidence is the diameter of the atomic nucleus times the Hubble constant divided by light speed equals the ratio of the gravitational force to charge of the proton and electron masses.

$$\frac{H(2r_n)}{c} = \frac{Gm_p m_e}{e^2}$$

Hence

$$H = \frac{Gm_p}{2cr_n r_e} = \frac{Gm_p m_e c}{(2r_n)e^2}$$

$$= \frac{1}{cr_n r_e} = \frac{m_e c}{r_e e^2}$$

Hence

$$\frac{e^2}{m_e r_e} = c^2$$

For the cosmic connection let c be the observable limit for cosmic distance R such that

$$HR = c \qquad R = \frac{c}{H} = 1.32 \times 10^{28} \text{ cm}$$

Let the observable cosmic mass be M such that its Newtonian potential is

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

The observable cosmic mass is thus

$$M = \frac{Rc^2}{G} = \frac{(1.32\times10^{28})(9\times10^{20})}{6.67\times10^{-8}} = 1.78 \times 10^{56} \text{ grams}$$

$$\frac{M}{R^2} = \frac{1.78\times10^{56}}{(1.32\times10^{28})^2} = 1.02 \text{ grams per centimeters per centimeters}$$

In the calculation the numerical value of R was rounded off to a slightly higher value whereas the numerical value for M was rounded off to a slightly lower value. The ratio is thus more to 1.03, the same as for Hc per G.

This ratio is the cosmic coincidence.

Note: Usually the escape velocity, as for a gravitational field of mass M, is the square root of 2GM/R, but twice R cancels twice GM/R. Twice R is reasonable in that observable cosmic distance can theoretically be measured as from light sources in opposite directions. That is to say it is possible nearby sources move relatively towards us at near light speed as

opposite to distant sources moving away from us at near light speed.

Posted 2/09/09 by Bob Ticer