ELIMINATIVE MODEL OF RADIAL REDSHIFT

R. Garner-Tetlow

The concept of vacuum energy challenges some basic assumptions of astronomy.

The following equations are uncontroversial:

for speed v, Newton's gravitational constant G, mass M, radial distance r,

$$v = \sqrt{\frac{2GM}{r}}$$

for mass M, radius r, energy E, speed of light c, energy density ρ:

$$\frac{M}{r} = \frac{E}{rc^2} = \frac{\rho}{c^2}$$

for the Boltzmann constant k, speed of light c, Planck constant h, Newton gravitational constant G, and area A and entropy S of a region of space manifesting vacuum energy:

$$S = \frac{\pi A k c^3}{2hG}$$

and for area A and radius r of a sphere:

$$A = 4\pi r^2 \ .$$

However, together these equations imply that if space contains vacuum energy of density ρ_{vac} and entropy S, there will be a speed equivalence, varying with distance, expressible by:

$$v = \sqrt{\frac{4\pi^2 k c \rho_{vac} r^2}{hS}}$$

Thus, if vacuum energy is present, the gravitational field of a body will have a finite range - a distance beyond which a reference-frame maintaining a constant distance from the body becomes equivalent to a reference-frame moving at a speed beyond that of the body's escape velocity.

Furthermore, since the possible distance separation is unlimited, the speed-equivalence is free to assume equivalence to relativistic speeds. In the simplest cases, relativistic speeds produce the relativistic effects of length contraction and time dilation given by the Lorentz factor γ:

$$l'=l/\gamma \qquad t'=\gamma t$$

$$\gamma=\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$$

where l is proper length, l' is observed length, t is proper time. t' is observed time.

Substitution of the above vacuum energy expression into the Lorentz factor allows certain phenomenological changes at astronomical distances to be explained, without recourse to the usual expanding universe theory:

apparent crowding of galaxies with distance r:

$$r'=r\sqrt{1-\frac{4\pi^2 k\rho_{vac}r^2}{hcS}}$$

increased time measure t associated with supernova light curves with distance:

$$t'=\frac{t}{\sqrt{1-\frac{4\pi^2 k\rho_{vac}r^2}{hcS}}}$$

radial redshift z:

$$z = \frac{1}{\sqrt{1 - \frac{4\pi^2 k \rho_{vac} r^2}{hcS}}} - 1$$

Because the redshift here depends not only on distance r but also on the ratio ρ_{vac}/S, "anomalous redshifts" can be accommodated. Reports of redshift periodicities may be explainable as being due to lines of sight intersecting patterned bands of constructive and destructive interference produced by gravitational waves, with the ordered structure being imposed onto the energy density and entropy of the vacuum.