Zero-energy space cancels the need for dark energy

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A detailed analysis of a dynamic solution of the zero-energy condition of gravitation and motion in Einstein's original proposal of spherically closed space shows a precise match to the luminosity–redshift relation of Ia supernovae without dark energy, accelerating expansion, or additional parameters. In such a solution, Einstein's static 4-sphere is allowed to contract or expand instead of being forced to be stationary by means of a cosmological constant, the original formulation of dark energy. In spherically closed space the zero-energy condition determines the mass density and the development of the expansion velocity of space, allowing the derivation of predictions to cosmological observables like the angular size distance, the magnitude, the surface brightness of distant objects, and the orbital velocities in the vicinity of black holes in closed mathematical forms — all with excellent fit with observations without a cosmological constant, dark energy, or accelerating expansion.

In his lectures on gravitation in early 1960's Richard Feynman stated:

"If now we compare this number (total gravitational energy $M_{\square}^2G/R$) to the total rest energy of the universe, $M_{\square}c^2$, lo and behold, we get the amazing result that $GM_{\square}^2/R = M_{\square}\, c^2$, so that the total energy of the universe is zero. — It is exciting to think that it costs nothing to create a new particle, since we can create it at the center of the universe where it will have a negative gravitational energy equal to $M_{\square}c^2$. — Why this should be so is one of the great mysteries—and therefore one of the important questions of physics. After all, what would be the use of studying physics if the mysteries were not the most important things to investigate".

and further

"One intriguing suggestion is that the universe has a structure analogous to that of a spherical surface. If we move in any direction on such a surface, we never meet a boundary or end, yet the surface is bounded and finite. It might be that our three-dimensional space is such a thing, a tridimensional surface of a four sphere. The arrangement and distribution of galaxies in the world that we see would then be something analogous to a distribution of spots on a spherical ball."

Combining Feynman's "great mystery" of zero-energy space to the "intriguing suggestion of spherically closed space" leads to the concept of Dynamic Universe describing space as a spherically closed structure expanding in the direction of the radius in the fourth dimension — expansion that was unexpected at the time the general relativity was formulated. It was just to prevent the dynamics of spherically closed space that made Einstein to add the cosmological constant to the theory.

A dynamic solution of spherically closed zero-energy space shows the rest energy of matter as the energy of motion mass possesses due to the expansion of space in the fourth dimension and binds the velocity of light in space to the velocity of expansion in the fourth dimension. The time-like fourth dimension of relativity theory becomes replaced by a geometrical fourth dimension showing the direction where zero-energy space propagates the distance $dR_4 = c \cdot dt$ in time differential dt — and thereby creates momentum $\mathbf{p}_4 = m\mathbf{c}_4$ in the fourth dimension for mass at rest in space.

An analysis of the conservation of the total energy in zero-energy space leads to a system of nested energy frames with hypothetical homogeneous space as the universal reference to any local frame in space. Velocity in a local frame becomes related to the local reference at rest. The local kinetic energy becomes related to the rest energy available in the local frame and the gravitational energy due to a local mass center becomes related to the gravitational energy due to the total mass in space. The holistic relativity in zero-energy space is a direct consequence of conserving the zero-energy balance in space. In local frames, the zero-energy approach leads to essentially the same predictions as do the special and general relativity theories, but without relying on modified metrics, Lorentz transformation, the relativity principle, or the equivalence principle. At the cosmological scale, however, the predictions derived from the zero-energy assumption are different — eliminating the need for dark energy or adjustable parameters for consistency with observations.