the general science journal

An Additional Note on the "A Simple Way to Show Space-Time Expansion"

Pavle I. Premović
Laboratory for Geochemistry, Cosmochemistry and Astrochemistry,
University of Niš, pavleipremovic@yahoo.com, Niš, Serbia

According to the standard cosmology, nearby and distant galaxies[1] recede from the Earth because the Universe is constantly expanding. Premović [2] denoted galaxies that formed before the Earth with BE (or before the Earth) and those before its birth with AE (or after the Earth). All distant galaxies belong to the BE-type and all nearby to the AE-type.
Premović [2] has shown that light emitted by a BE galaxy at a distance D_G will travel to the Earth as long it has been the birth of the Earth, i. e. during a time equal to A_E. In equation form,

$$D_G = cA_E$$

where c ($\approx 3\times10^8$ m sec^{-1}) is the speed of light (in a vacuum). He also showed that the clock on the BE galaxy would run slower than an identical clock on Earth. In the language of relativity, there is the relative time dilation between the identical clocks in the frames of reference of the Earth and the BE galaxy. This implies that the Earth formation observed at a cosmological distance (i.e., with a significant cosmological redshift) appears to take longer than it would if it occurred on the Earth. In other words, the farther away a galaxy is, its time flow is slower. This is an example of a phenomenon called cosmological time dilation (or cosmic time dilation)[2].

The age of the Earth (about 4.55 Gy) is known from various radiometric "clocks".[3] We will consider one of these "clocks", the conversion of uranium (U) isotopes (U^{238} and U^{235}) to lead (Pb) isotopes (Pb^{206} and Pb^{207}). In order to determine the age of Earth, Earth scientists have analyzed very ancient rocks of various origins (including extraterrestrial rocks: meteorites fragments and lunar samples) for these isotopes. They radiochemically determined the time interval between the formation of these rocks and their present time. This time interval will be longer for an observer of the galaxy thus the age of the Earth.

[1] We define nearby galaxies as those whose redshift z_G is from 0.001 to 0.1 (or $0.001 \leq z_G \leq 0.1$) and distant galaxies with $z_G > 0.1$. Of course, there is no sharp line between nearby and distant galaxies [1].
[2] I was not aware of that term until the evening of February 9, 2022, when, by a happy coincidence, I came across it while wandering with Google's "Advanced Search".
[3] The best estimate for Earth's age of 4.55 Gy is based on the radiometric dating of fragments from the Canyon Diablo iron meteorite.

References

[1] P. I. Premović**,** *Nearby and distant galaxies: a brief note*. The General Science Journal, August 2024.
[2] P. I. Premović**,** *The age of the "megamaser" galaxies in the Big Bang Universe*. The General Science Journal, December 2021.