

EQUATIONS OF MOTION OF THE UNIVERSE: INCREASING SEPARATION IN THE COSMIC FLOW

32 AA M. D. Earl 2023

The separation distance of galaxies in the cosmic flow increases with time in accord with the exponential nature of cosmic expansion. All proper galaxies move at light speed with respect to a stationary universe, per the H/L law, and the distance between them is a function of time. A method for understanding this increasing separation is to determine the positions of two galaxies before and after some time interval Δt .

Figure 32-1. Before displacement time interval Δt :

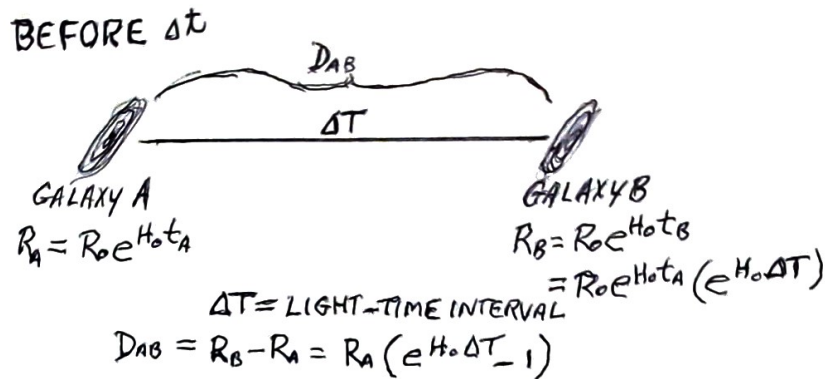


Figure 32-1. shows two proper galaxies, A and B at their initial positions. ΔT is the Light-Time interval between the two galaxies, which represents the time necessary for light to traverse the distance between the two. Because both galaxies are moving at proper speed with respect to a stationary universe, relative velocity also may be calculated at the new positions.

Figure 32- 2. After displacement time interval Δt :

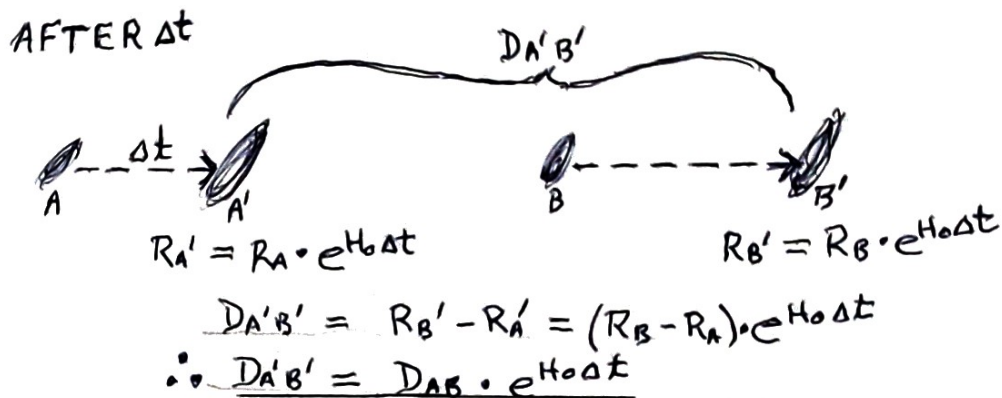


Figure 32-2. shows the positions of the galaxies after some common time interval Δt during which both galaxies displace. This time should not be confused with the Light-Time interval ΔT between the galaxies, where $D_{AB} = R_A(e^{H_0 \Delta T} - 1)$. A calculation of the new distance, $D_{A'B'}$, can be compared with the original separation D_{AB} , showing that after some time increment Δt , any distance expands by a factor of $e^{H_0 \Delta t}$.