

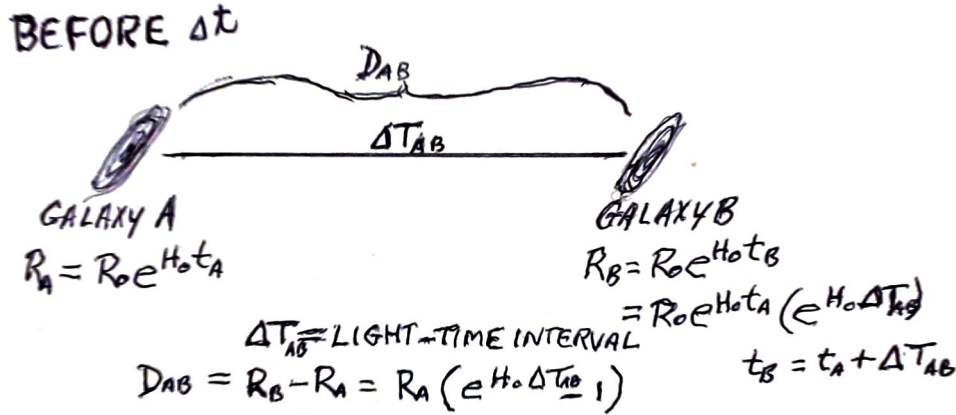
EQUATIONS OF MOTION OF THE UNIVERSE

TIME SEPARATION OF PROPER GALAXIES

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We have seen that the distance between galaxies in the proper flow increases with time. All proper galaxies move at light speed $c_0 e^{H_0 t}$ with respect to a stationary universe in accord with the Hubble/LeMaitre (H/L) Law. It may seem evident that, since the separation between galaxies increases, it will take light an increasing period of time to span the gap. The λ CDM model suggests this, and predicts a darkened sky in the distant future as the galaxies recede. But the math of the exponential expansion (XPP) tells a different story:

Figure 33-1. Initial positions of two galaxies - before displacement after Δt



D_{AB} = Initial distance between galaxies

ΔT_{AB} = Light-time interval between galaxies where $t_B = t_A + \Delta T_{AB}$

In Figure 33-1, because the proper galaxies are moving at (proper) “light speed”, ΔT_{AB} represents the initial light-time interval between galaxy A and galaxy B

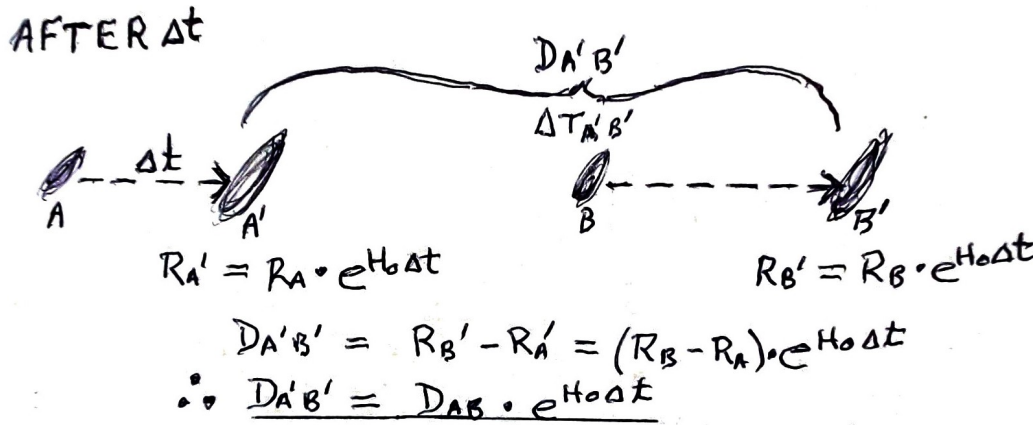
$$R_A = R_0 e^{H_0 t_A} \quad R_B = R_0 e^{H_0 t_B} \quad t_B = t_A + \Delta T_{AB}$$

$$R_B = R_0 e^{H_0 (t_A + \Delta T_{AB})}$$

$$D_{AB} = R_B - R_A = R_0 e^{H_0 t_A} \cdot e^{H_0 (\Delta T_{AB})} - R_0 e^{H_0 t_A} = R_0 e^{H_0 t_A} \cdot (e^{H_0 (\Delta T_{AB})} - 1) \quad \langle 1 \rangle$$

Equation [1] is an expression for the initial separation of the galaxies in terms of ΔT_{AB} . It will next be shown that the light-time interval between proper galaxies is unchanging, therefore the wavelength of light received by galaxies is unchanging.

Figure 33- 2. Both galaxies move to new positions after some Δt



Separation of galaxies after Δt :

$$\begin{aligned}
 D_{A'B'} &= R_{B'} - R_{A'} = R_0 e^{H_0 t_B} \cdot e^{H_0 \Delta t} - R_0 e^{H_0 t_A} \cdot e^{H_0 \Delta t} \\
 &= (R_0 e^{H_0 t_B} - R_0 e^{H_0 t_A}) \cdot e^{H_0 \Delta t} = D_{AB} \cdot e^{H_0 \Delta t}
 \end{aligned}$$

THE PROPER DISTANCE BETWEEN GALAXIES INCREASES BY A FACTOR OF $e^{H_0 \Delta t}$ AFTER Δt .

From figures 1 and 2, two expressions for $D_{A'B'}$, in terms of ΔT_{AB} and $\Delta T_{A'B'}$, are derived:

$$D_{A'B'} = R_0 e^{H_0 t_A} \cdot (e^{H_0(\Delta T_{AB})} - 1) \cdot e^{H_0 \Delta t} \quad [1]$$

$$\begin{aligned}
 D_{A'B'} &= R_{B'} - R_{A'} = R_0 e^{H_0 t_A} \cdot e^{H_0 \Delta t} \cdot e^{H_0(\Delta T_{A'B'})} - R_0 e^{H_0 t_A} \cdot e^{H_0 \Delta t} \\
 &= R_0 e^{H_0 t_A} \cdot e^{H_0 \Delta t} \cdot (e^{H_0(\Delta T_{A'B'})} - 1) \quad [2]
 \end{aligned}$$

Equating and canceling common terms in expressions [1] and [2]:

$$(e^{H_0(\Delta T_{AB})} - 1) = (e^{H_0(\Delta T_{A'B'})} - 1)$$

leading to:

$$\Delta T_{AB} = \Delta T_{A'B'}$$

for proper galaxies

THIS RESULT SHOWS THAT THE LIGHT-TIME INTERVAL BETWEEN PROPER XXP GALAXIES DOES NOT CHANGE !!!

A constant light-time interval between proper XPXP galaxies implies several important characteristics of universal motion, some of which are:

- T_0 , (the “Hubble Time”), is constant, because the light-time interval to the farthest (proper) galaxy is constant. The inverse of T_0 , is H_0 , and is therefore also constant. A constant cosmic H_0 is a fundamental tenet of the XPXP theory.

- The redshift of proper galaxies does not change because the shifted wavelength of light is a function of an unchanging ΔT . (see wavelength shifting)

- Galaxies will not “fade to darkness” in the distant future, as predicted by the λ CDM model.

- The observer and measuring devices are expanding concurrently with the cosmic expansion. XPXP suggests an eternal “expansion from within”, wherein all things exponentially expand on all scales, and no BIG BANG occurred.

- XPXP opens a new possibility for agreement of cosmic physics with quantum physics. An investigation of XPXP on the quantum scale seems to be a monumental task at present, but it is probable that expansion is consistent on all scales.