EQUATIONS OF MOTION OF THE UNIVERSE:

PERCEIVED $H_o c$ DECELERATION OF PECULIAR OBJECTS

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Most galaxies conform to the Hubble/LeMaitre relationship. A precept of the exponential expansion theory (XPXP) is that it occurs on all scales. But it goes unrealized.

After consideration, it should be recognized that most motion that we observe is peculiar. Not until the improved technology of the space program have anomalous effects of XPXP begun to appear.

The exponential expansion is easily observable only in the Hubble flow, where the solution to the differential equation of the Hubble/Lemaitre Law, e^Hot, is significant. Only recently has evidence appeared in the form of inexplicable "anomalies" in the velocity and position of space probes during flybys and deep space explorations. The inability of the standard model to explain these anomalies is the result of non-exponential (inertial) mathematics.

The mathematical methods of relativity must be abandoned to successfully explain an XPXP universe. Only with an understanding of XPXP math can a comparison be made between the two models. It is contended that the very basis of special relativity, the inertial calculations of Lorentz et.al., are incorrect, and therefore make relativity an approximation at best. As such, those well-versed in the principles of relativity are actually at a disadvantage when grasping the principles of XPXP. It should be expected that a stubborn resistance to such a new concept will be seen in those who have substantially dedicated their lives to the principles of relativity.

That being said, visualizing interactions within an XPXP universe is difficult, because we are so attuned to our inertial roots.

PECULIAR MOTION:

The mathematical form for position, velocity and acceleration of peculiar motion differs from that of both proper expansion and light. The information below shows the position and velocity for light, the proper flow, and peculiar motion relative to a universal "rest frame". To simplify, the expansion is described positively and in one direction.

This leads to these positions and velocities :

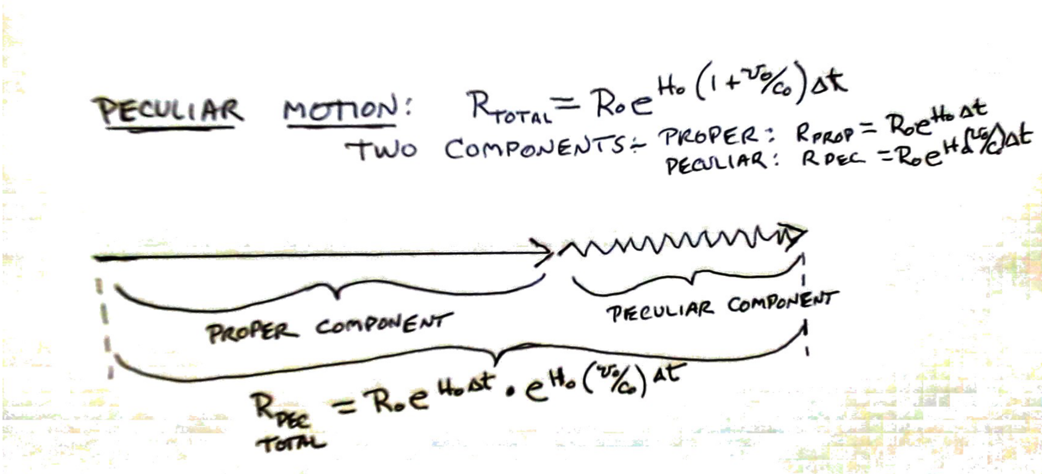
	POSITION	VELOCITY
Proper motion:	$R_0 e^{H_o t}$	$H_o R_0 e^{H_o t}$
Light motion:	$R_0 e^{2H_o t}$	$2H_o R_0 e^{2H_o t}$
Peculiar motion (total)	$R = R_0 e^{H_0(1+v_0/c_0)t}$	$H_0 R_0 (1 + v_0/c_0) e^{H_0(1+v_0/c_0)t} = (H_0 R_0 + v_0)\, e^{H_0(1+v_0/c_0)t}$ where v_0 and c_0 are constants
—		
Peculiar motion (peculiar component)	$R = R_0 e^{H_0(v_0/c_0)t}$	$H_0 R_0 (v_0/c_0) e^{H_0(v_0/c_0)t}$

The form of the exponent for peculiar motion and the illustration of figure 51-1 shows that the total peculiar motion for an object is comprised of two components. A peculiar object must expand with the universal expansion (the proper component) while simultaneously moving relative to the proper background expansion at a rate less than light speed (the peculiar component). A proper observer therefore sees a peculiar object moving away from him/her. As previously shown, actions in an XPXP universe are multiplicative:

$$R_0 e^{H_O(1)t} e^{H_O(v/c)t}$$

Where the first component describes the universal expansion and the second component is peculiar, as in Figure 51-1:

Figure 51-1



The universal expansion acceleration is greater than that of a peculiar object moving at a velocity less than light speed is found by taking the second time derivative for each expression, shown below. The peculiar object moves with respect to the flow, but with a lower acceleration. The calculation suggests that only large distance and time measurements will show a discrepancy, on the order of 10^-10 m/sec² because vo is insignificant relative to co.

Proper acceleration:

$$H_O{}^2 R_0 e^{H_O t} = H_O c_0 e^{H_0 t}$$

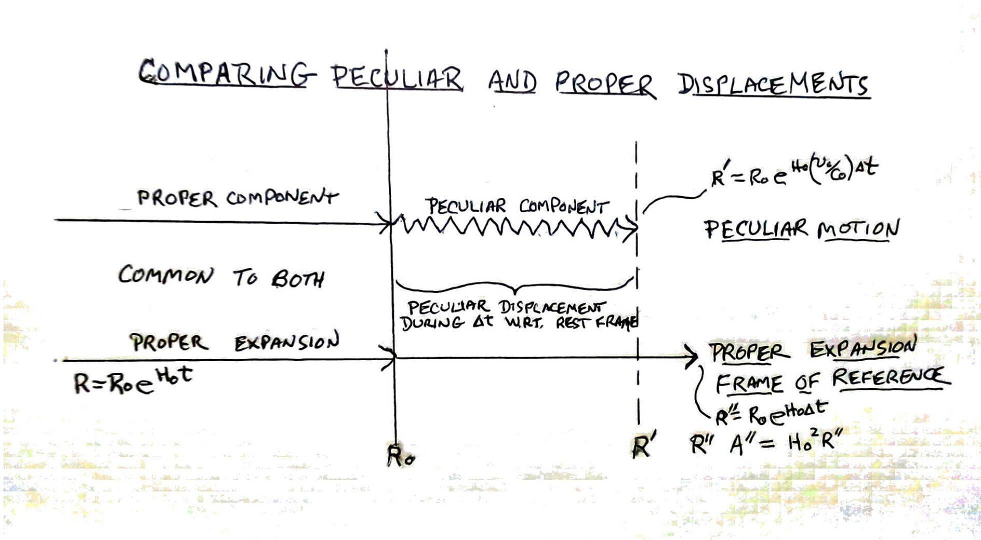
Peculiar acceleration : (component)

$$H_0 v_0 (v_0/c_0) e^{H_0(v_0/c_0)t} = (v_0^2/R_0) e^{H_0(v_0/c_0)t}$$

By comparing displacement from an arbitrary initial proper position, the motion of a peculiar object and the exponential expansion of the space that it occupies will indicate what appears to be a deceleration. Both the peculiar object and the space surrounding it are exponentially accelerating, but at different rates. Since a proper observer is also properly accelerating in an XPXP universe (but unaware of it), the peculiar object appears to be infinitesimally decelerating.

Currently, a distance measurement to a space probe is simply $c_0 \Delta t$, where c_0 is constant (speed of light), and the exponential expansion of space is unrecognized. The XPXP theory contends that $c_0 \Delta t$ is an approximation of the true distance since the spatial background expands as time progresses. For most intents and purposes, this approximation suffices, but more precise measurements require some exponential math (methods shown previously).

Figure 51-2.



In Figure 51-2, it can be seen that the proper expansion "common to both", may be disregarded. Therefore, by examining the peculiar component of the total peculiar motion with respect to the properly expanding frame, a comparison may be made.

The distance between Ro and R′ represents the peculiar displacement during the time interval Δt. It is the peculiar component of the total peculiar motion.

But, while the peculiar object is displacing, the proper frame is expanding, as represented by the distance from Ro to R".

The expectation, in the standard model, is that the peculiar object will reach R′ after a time interval of $(c_o/v_o)\ \Delta T$, where ΔT is the light-time distance to R′. ΔT does not change, since Ro and R′ are both proper positions, and it has been established that the light-time interval between proper galaxies is unchanging. The "time of flight" of the peculiar object also represents the time that R′ expands to a new position R". In the standard model, the calculation for the "time of flight" for the peculiar object is:

$$v_o\ \Delta T_{probe} = c_o\ \Delta T_{light}$$

$$\Delta T_{probe} = (c_o / v_o)\ \Delta T_{light}$$

The distance from R′ to R" is R′e^HoΔt. This indicates that the proper frame is accelerating (second time derivative) at $H_o c_0\, e^{H_0 t}$ compared to the acceleration $(v_o^2 / R_o)\, e^{H_0 (v_o/c_o) t}$ of the peculiar object. An observer in the proper frame would see a minuscule shortfall in the expected position of the peculiar object, interpreted as a deceleration of the peculiar object. This phenomenon is measurable only at large distances and speeds (such as in deep-space probes) and has yet to be recognized.

As an example (see figure 3), a stationary object located at position B is measured to be a distance D_{AB} by a light signal detected as being ΔT_{light} away from an observer at position A. The λCDM model considers the light-travel time to the object as constant, because the distance is determined using $D_{AB} = c \times \Delta T_{light}$, and the distance does not change. Accordingly, at some Δt later, the distance remains unchanged.

However, in the XPXP model, the framework of the space expands properly over time, so that D_{AB} increases to $D_{AB} \times e^{H_0 \Delta t}$ after Δt .

Because Δt is the time interval that the probe needs to arrive at the target in the λCDM model, where $\Delta t = (c_o / v_o)\ \Delta T_{light}$, it is less than the time necessary for the probe to actually reach the target.