EQUATIONS OF MOTION OF THE UNIVERSE:

42AA M.D. Earl 2023

XPXP REDSHIFT AND PECULIAR λ SHIFT

The wavelength of light (and all electromagnetic radiation) increases as it propagates through space. In the XPXP model, light moves at light speed relative to the proper expansion of the universe, which is itself moving at light speed with respect to a stationary universe. This relationship produces the effect that a proper observer measures light speed as having a constant value. During the propagation of a light wave through space, the length of the wave increases relative to the proper XPXP frame.

The result is that a light wave received at a distance from a source has lengthened during its flight, and this lengthening is detectable as a "shift" toward the red. This property provides a valuable method for measuring the universe. But a valid exponential mathematical expression for a light wave is derived by applying exponential principles, rather than inertial principles currently used.

Because the wavelength shift appears to correspond to the Doppler effect we see on earth, the expansion or contraction of light waves is attributed to the Doppler effect in the λCDM model, and is associated with the relative speed of the galaxy. In the Doppler math, the relative velocity of the source and detector affects the wavelength received by the detector. For extreme velocities, an expression for a "relativistic Doppler shift" has been formulated (using the Lorentz gamma) to determine velocities of more distant galaxies.

XPXP principles for light and its exponential movement must describe the change of light wavelength (and therefore frequency) at the detector. According to the XPXP model, the expansion of light waves is twofold.

First, because wavelength is a distance measurement, and it increases as a function of the propagation time interval during which the wave moves between the emitter and the detector, it causes the proper redshift. The λCDM Doppler effect is a function of relative velocity; in XPXP the travel time determines the effect. The time interval between proper galaxies is unchanging (shown previously), and accounts for the cosmic redshift. It predicts that the universe will look the same in the future as it does now. On the contrary, the standard model predicts that the galaxies will recede to darkness in the distant future.

Second, a shift in wavelength toward the blue or red in XPXP is seen as an effect of peculiar motion, evidenced because of relative motion of the source and detector. An example of such a peculiar shift occurs in the arms of spiral galaxies. The light-time interval of these galaxies determine the redshift of the galaxy as a whole, while the movement of the stars in the arms will be continuously changing relative to the galaxy, creating a blue or red shift. This is because the peculiar motion of the stars change the light-time interval. Peculiar movement represents an exponential vo/co time adjustment, to be shown below.

LIGHT AND PROPER MOTION:

As light propagates through space, it expands, but at a rate that exceeds the proper expansion of the Hubble flow. We observe light moving at "light speed" from our properly-moving frame of reference (also moving at "light speed"). The relationship between light and proper motion has been derived previously.

Light speed relative to a stationary universe = $2H_o R_0 e^{2H_o t}$

Proper velocity relative to a stationary universe = $H_o R_0 e^{H_o t}$

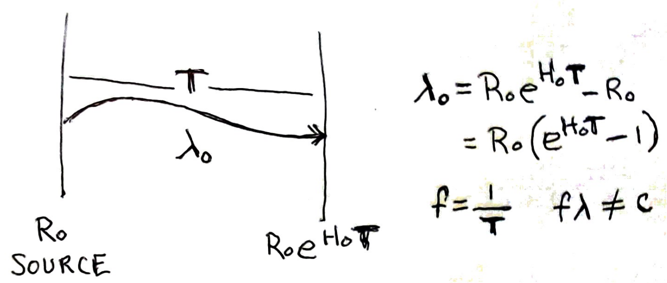
Light speed relative to the proper flow = $H_o R_0 e^{H_o t}$

In these expressions for motion, **t** determines distance, velocity and acceleration. During a time interval, the properties of both proper motion and light increase.

Proper and peculiar expansion rates are governed by an expansion factor **e^Hot** , wherein Ho is the universal exponential expansion (Hubble) constant. Light, however, has an exponential expansion constant of 2Ho, and therefore an expansion factor of **e^2Hot** . This is the mathematical result derived by assuming that light is viewed as moving at light speed by a proper observer (shown previously). This also mathematically explains a constant measurement of light speed from either a proper or peculiar frame.

The wavelength of light increases **<u>with respect to the cosmic flow</u>**, causing the universal redshift. A redshift is the resulting effect of the light-time difference between two positions in the proper flow and is unchanging (shown previously). The XPXP wavelength increase differs from the relativistic Doppler calculation which is currently used to determine the velocity and distance of remote galaxies.

FIGURE 42-1. Creation of a light wave from the perspective of a proper observer.



The wave of FIGURE 42-1. is produced in the cosmic flow, where:

$\lambda_0 = R_0\,(e^{H_0\tau} - 1)$ is the wavelength of light at the source.

τ is the period of the wave

$f = 1/\tau$ is the frequency of the wave

To simplify, the light emission begins at Ro where t = 0

From FIGURE 42-1, an expression for a base wavelength at the source is:

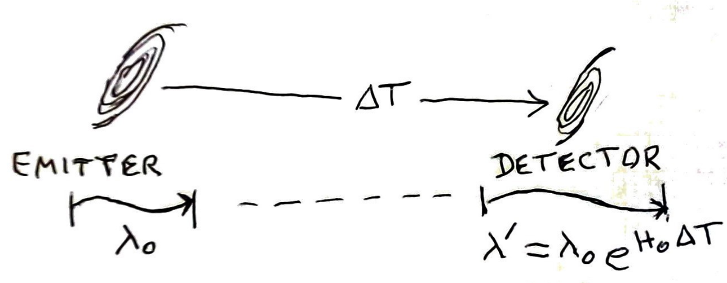
$$\lambda_0 = R_0\,(e^{H_0\tau} - 1)$$

Note that a Maclaurin approximation corresponds well with the current equation for light:

$$\lambda_0 \approx R_0\,(H_0\tau + 1 - 1) \approx H_0 R_0\,\tau \approx C_0\,\tau$$

After a wave is produced, it propagates at light speed relative to the proper frame, therein increasing by a factor of $e^{H_0\Delta t}$ where Δt is the "time of flight". A detector is located in the proper frame and detects the modified wavelength of: $\lambda' = \lambda_0\,e^{H_0\Delta t}$

FIGURE 42-2. Expansion of light wave



The expansion of a wave during its “flight” accounts for the cosmic redshift in an exponential universe, seen in FIGURE 42- 2 :

The λCDM model claims that, over sufficient time, the visible universe is increasing in volume and therefore the galaxies will eventually fade to obscurity. The XPXP universe refutes that notion, because the math indicates that <u>all</u> things are expanding exponentially, and the observer’s view of the universe will expand, causing a substantially unchanged universe over time.

Furthermore, the XPXP model appears to logically be an “expansion from within” and a “big bang” is improbable.

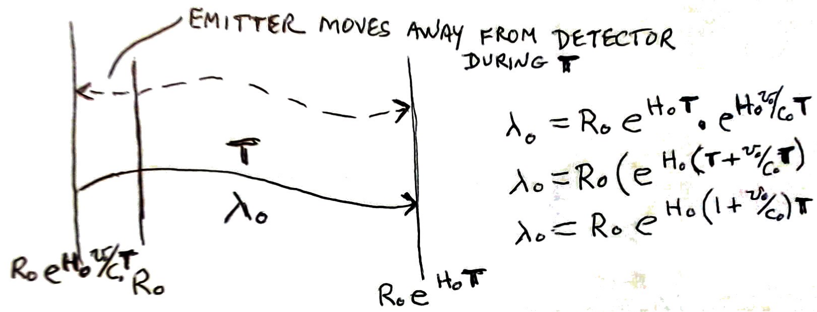
EXPONENTIAL RATIONALE FOR DOPPLER EFFECT

Consideration must be given for light transmission which occurs with the peculiar motion of the source or detector, or both. The cosmic expansion of light causes a cosmic redshift, expanding while moving relative to proper expansion. In a similar manner, peculiar motion will lengthen or shorten the wavelength. This movement more nearly corresponds to the Doppler effect, in that it is a function of relative motion. An explanation for these effects follows:

FIGURE 42-3. shows a difference between a wavelength produced by a proper source (as in FIGURE 42-1) and a wavelength produced by a source moving away peculiarly from the direction of the detector.

During τ, the source wave increases by $R_0 e^{H_0 (v_0/c_0)\tau}$, so that the wave now has the initial length of : $R_0 e^{H_0(1+(v_0/c_0))\tau}$ before beginning its expansion during its cosmic flight. The wave is lengthened (shifted to the red) as it is produced at the source, and thereafter expanded during flight.

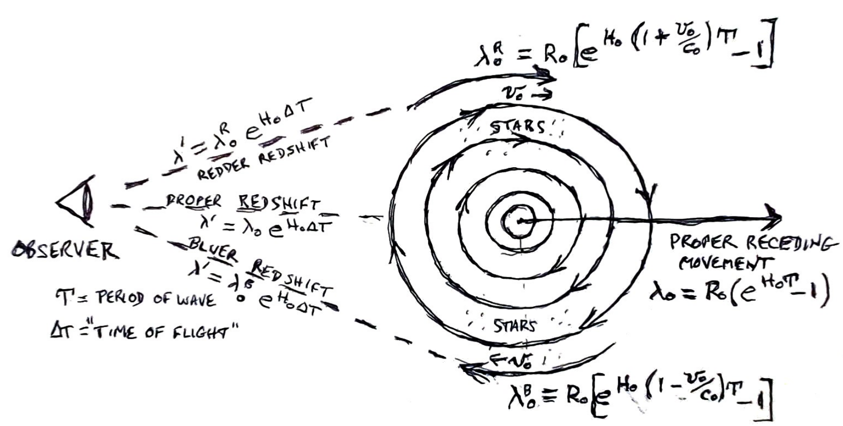
FIGURE 42-3. Peculiar source moves away from detector.



For a source moving toward the detector, (v_0 / c_0) is exponentially subtracted, resulting in a shortened wavelength, therefore a shift toward the blue. It can be seen that the cosmic redshift is dependent on the "time of flight", whereas the peculiar shift is dependent on the relative peculiar velocity.

An illustration of light waves emitted by a spiral galaxy is shown in FIGURE 42-4. The galaxy as a whole is red shifted according to the light-time distance to the galaxy. Stars on either side are moving peculiarly toward the observer (blue-shifted) or away from the observer (red-shifted). Through a similar analysis of the shifts in the arms, it was determined that the stars beyond the bulge of these galaxies unexpectedly moved at a constant velocity, therefore leading to "dark matter".

FIGURE 42-4. Stars rotating in a spiral galaxy



FINDING DISTANCE AND VELOCITY IN THE XPXP UNIVERSE

An understanding of the properties of XPXP light waves provides a simple method for distance and velocity measurement of remote galaxies.

STANDARD MODEL CALCULATIONS

The present-day methods of measurement in astronomy seem to be consistent, but are flawed in their approaches, which revert to their inertial roots. Parallax, Standard candles,etc. use a constant c as a coefficient for distance measures, and velocities are determined with standard or relativistic Doppler calculations. When examining these astronomical procedures, it is seen that all are incorrect in light of XPXP.

Astronomers presently compare an expanded wave from a galaxy with a known wave produced locally. By applying the relativistic Doppler effect, the speed of a distant galaxy is determined. A basic formula for relativistic <u>frequency</u> is:

$$freqency_{received} = \sqrt{\frac{c \pm v}{c \mp v}} freqency_{emitted}$$

where v = velocity of the galaxy and positive/negative is determined by the approach or recession of the galaxy.

The relativistic Doppler equation is then solved for v, and an associated distance is acquired by other means(e.g. luminosity).

The derivation of relativistic doppler shift is a calculation using the standard inertial math and logic of the λCDM model. It is therefore suggested that the relativistic Doppler shift is incorrect, and this is why the Hubble/LeMaitre law does not conform with the distance/velocity plot of known remote galaxies.

XPXP CALCULATIONS

The exponential math of the XPXP model is consistent and logical. It is seen that, during the time of flight of a light wave, the wave increases in length by a factor of $e^{H_0 \Delta t}$ so that $\lambda' = \lambda_0 e^{H_0 \Delta t}$ where Δt = "time of flight"
The distance between an observer in a proper position (at t = 0) to a galaxy is $R = R_0 e^{H_0 \Delta t}$. By measuring the "**z**" of a galaxy, the following calculation results in the XPXP distance.

$$\lambda' = \lambda_0 e^{H_0 \Delta t}$$

$$R = R_0 e^{H_0 \Delta t}$$

$$\frac{\lambda'}{\lambda_0} = \frac{R}{R_0}$$

$$z = \frac{\Delta\lambda}{\lambda_0} = \frac{\lambda' - \lambda_0}{\lambda_0} = \frac{\lambda'}{\lambda_0} - 1 = \frac{R}{R_0} - 1$$

$$z + 1 = \frac{\lambda'}{\lambda_0} = \frac{R}{R_0}$$

$$\frac{R}{R_0} = z + 1$$

$$R = R_0(z + 1)$$

The velocity of this galaxy is the derivative of R, which is:

$$H_0 R = H_0 R_0 e^{H_0 \Delta t}$$

Therefore, XPXP provides a consistent process for distance measurement of the galaxies of the universe. XPXP replaces the (incorrect) non-exponential mathematics of the λCDM model.