

EMBODIMENTS of XPXP:

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The distribution of matter in the cosmos produces expansions with differing characteristics, although all are created through the same expansion principles developed from the Hubble/Lemaitre (H/L) Law. Although these expansions appear to be vastly different, an analysis shows that they are mathematically consistent with the XPXP model. Such things as dark matter and dark energy have been invented only to force agreement with the standard model.

The nature of the cosmic exponential expansion is determined by the

coefficient H_0 , which is a constant, $H_0 = \frac{\sqrt{G_E \rho_0}}{3}$ for the free cosmic expansion of the galaxies derived from the H/L Law (see previous work). The product of H_0 and R is the time derivative of $R e^{H_0 t}$ and gives the radial velocity of the expansion at any position and time. Looking at H_0 , ρ is the only term in the expression which may vary to create a variable H . H_0 is constant for the universe, but is this coefficient always constant? Other distributions of matter should be examples of exponential expansion... and they are. These are embodiments of the of the exponential expansion in which the H is not constant. The most interesting embodiment is gravitation, which seemingly appears to be an attraction.

The density in the expression for H_0 is the combined effect of the exponential expansion of the mass and the exponential expansion of the space that the mass induces. Since both the mass and volume increase by $e^{3H_0 t}$ in the cosmic H_0 , the exponentials cancel, resulting in a constant H_0 . In all embodiments, the spatial volume continues to exponentially expand, so that $R = R_0 e^{H_0 t}$ and $V \sim R^3$. But locally, matter may be limited, and expansion of that matter may be inhibited by adjacent exponentially expanding matter. The density in the expression for H defines the nature of the expansion. A constant cosmic density suggests that both the matter and the surrounding space increase exponentially with R^3 .

Three XPXP embodiments addressed here are: 1) the galactic flow, 2) concentrated matter, and 3) spiral galaxies. It must be recognized that the expansion constant for all XP expansions may be expressed in two ways: with the familiar Newtonian constant, G_N , or with the universal expansion constant G_E , because $G_E = 12\pi G_N$. These expressions are used interchangeably throughout, hopefully clarifying the calculations.

EMBODIMENT 1: GALACTIC FLOW , XPPX OF THE COSMOS:

The simplest evidence of XPPX is the cosmic flow; the motion of the galaxies as described in the the Hubble/LeMaitre (H/L) law. The H/L law reduces to an exponential growth equation (shown previously). At a local level, the expansion is unrecognized because $e^{H_0 t}$ approximates 1 (when t is small). Because of this, earthly laws only approximate the laws of the XPPX theory.

The Hubble flow of the universal galaxies is produced by an equivalent exponential expansion of matter and volume, resulting in a constant universal density and therefore a constant universal H_0 . It invokes a “free expansion”, in which the radius, velocity, and acceleration of the galaxies are exponentially increasing. H_0 has been derived previously, and differs from H_0 of Schwarzschild et al. It is determined that:

$$H_0 = \frac{\sqrt{G_E \rho_0}}{3}$$

Because H_0 is constant, the H/L law suggests a universe which is eternally exponentially accelerating. where radial values are:

$$R = R_0 e^{H_0 t}, v_R = H_0 R_0 e^{H_0 t}, A_r = H_0^2 R_0 e^{H_0 t}$$

For the galactic flow, mass density is constant:

$$\rho = \frac{M_0 e^{3H_0 t}}{V_0 e^{3H_0 t}} = \frac{M_0}{V_0}$$

$$H_0 = \frac{\sqrt{G_E \rho_0}}{3} = \sqrt{\frac{G_E M_0 e^{3H_0 t}}{9V_0 e^{3H_0 t}}} = \sqrt{\frac{G_E M_0}{9V_0}} = \sqrt{\frac{G_N M_0}{R_0^3}}$$

$$v_R = H_0 R_0 e^{H_0 t} = \sqrt{\frac{G_N M_0}{R_0^3}} R_0 e^{H_0 t} ===== \sqrt{\frac{G_N M_0}{R_0}} e^{H_0 t}$$

radial velocity

$$\text{REM: } G_E = 12\pi G_N$$

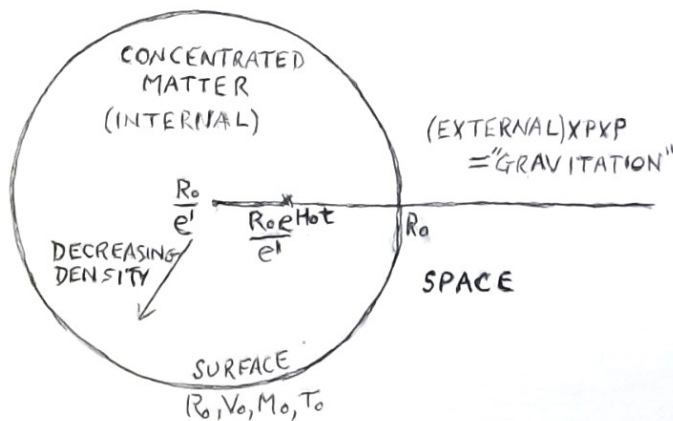
EMBODIMENT 2. “GRAVITATION” - XPPX OF CONCENTRATED MATTER :

The accretion of matter creates masses such as planets and stars that exponentially expand with characteristics that appear very different from the

character of the cosmic flow. But they obey the same XPXP principles. Because these “local” expansions are matter-dependent, the nature of the expansions differ according to the positions and amounts of matter available.

Internal expansion of a concentrated mass: The expansion within concentrated matter is governed by a non-constant H wherein the exponential expansion of the matter is less than that of the spatial expansion. It is proposed that the expansion of adjacent matter within concentrations produces an interaction which prevents free expansion of the matter. It is also suggested that some matter is transformed to energy in the process, creating internal heat in stars and planets etc. It may be noted that isolated masses, such as Pluto, have shown evidence of volcanism even though there has been enough time for such objects to “cool off”. The internal expansion within masses also accounts for an outwardly decreasing density, thereby modifying H until reaching the surface. Mathematically, a constant internal radial velocity is the result, as shown below.

Figure 93-1 Concentrated matter...internal



For concentrated masses:

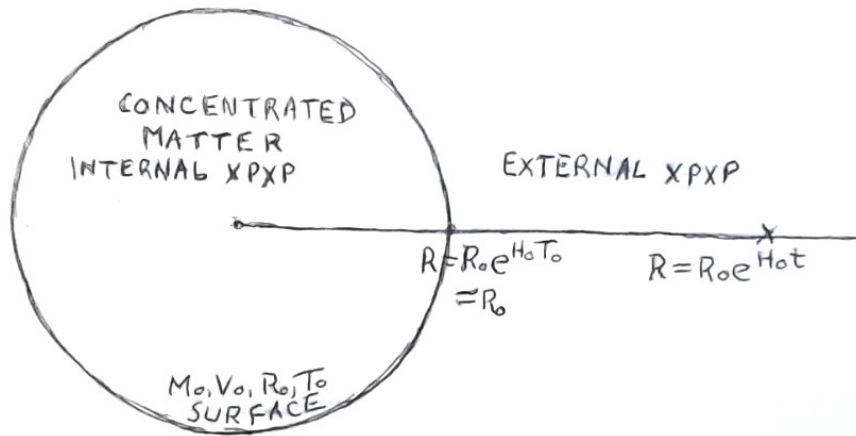
$$\rho = \frac{M_0 e^{H_0 t}}{V_0 e^{3H_0 t}} \quad H \text{ (internal)} = \sqrt{\frac{G_E M_0 e^{H_0 t}}{9R_0^3 e^{3H_0 t}}} = \sqrt{\frac{G_N M_0}{R_0^3 e^{2H_0 t}}}$$

$$v_R = H R_0 e^{H_0 t} = \sqrt{\frac{G_N M_0}{R_0^3 e^{2H_0 t}}} R_0 e^{H_0 t} = \sqrt{\frac{G_N M_0}{R_0}}$$

This internal radial velocity is constant, and equals the Newtonian circular orbital velocity at the surface. The matter available ends at the surface, thereafter a significant change in the expansion occurs, as shown below.

Beyond the surface of a concentrated mass, (Figure 93-2) the matter in the expansion remains a constant M_0 (additional matter is not present beyond the surface), while the spatial expansion continues with the cube of the radius.

Figure 93-2 Concentrated matter...external



This is **GRAVITATION**. The mass inducing the expansion beyond the surface is a constant M_0 , producing an H which is not constant:

$$\rho = \frac{M_0}{V_0 e^{3H_0 t}} \quad H(\text{external}) = \sqrt{\frac{G_E M_0}{9V_0 e^{3H_0 t}}}$$

$$v_R = H \cdot R = \sqrt{\frac{G_E M_0}{9V_0 e^{3H_0 t}}} \cdot R_0 e^{H_0 t} = \sqrt{\frac{G_N M_0}{R_0 e^{H_0 t}}}$$

This is the XPXP expression for the conventional Newtonian gravitational orbital velocity for a position R in the spatial field surrounding a concentrated mass.

If the radial velocity is differentiated, the acceleration is determined:

$$A_r = -\frac{G_N M_0}{R_0^2 e^{2H_0 t}}$$

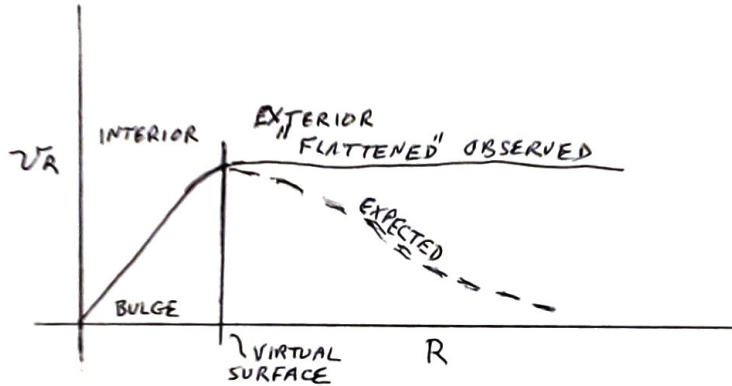
Which is the familiar negative inverse-squared expression for the Newtonian acceleration of gravity! The effect of the XPXP beyond the surface holds all the attributes that we recognize as gravity.

EMBODIMENT 3. XPXP OF SPIRAL GALAXIES :

Spiral galaxies are the most common form of galaxies. The stars of these galaxies usually form a somewhat spherical “bulge” and “arms” beyond that bulge.

Stars within the Bulge of spiral galaxies provide matter that induces an exponential expansion which substantially corresponds to that of the cosmos. It has been empirically determined that the velocity of stars within the bulge increase proportionally to R, the distance from the galactic center. A velocity vs. distance graph shows this direct proportionality. (See Figure 93-3)

Figure 93-3 The velocity/R curve for spiral galaxies



But, contrary to the cosmos as a whole, the available matter is limited. It is assumed that the movement of the stars within a galaxy do not appreciably interact with other stars, as evidenced by observation of star movements in our own milky way galaxy. At the position where a surface might form (as with concentrated matter), the freedom of movement of the stars produces a significantly different effect. Stars exist beyond the virtual surface. Rather than empty space creating a gravitational field, these stars provide external matter which create a spatial expansion having a constant radial velocity, shown below.

Within the Bulge of a spiral galaxy: (analogous to the cosmic expansion):

$$H_0 = \frac{\sqrt{G_E \rho_0}}{3} = \sqrt{\frac{G_E M_0 e^{3H_0 t}}{9V_0 e^{3H_0 t}}} = \sqrt{\frac{G_E M_0}{9V_0}} = \sqrt{\frac{G_N M_0}{R_0^3}}$$

$$v_R = H_0 R_0 e^{H_0 t} = \sqrt{\frac{G_N M_0}{R_0^3}} R_0 e^{H_0 t} ===== \sqrt{\frac{G_N M_0}{R_0}} e^{H_0 t}$$

Other than G_E or G_N , the terms in these expressions are values as determined by the galactic bulge density. The star velocities within the bulge exponentially increase until reaching the outer boundary of the bulge.

Beyond the Bulge in a spiral galaxy:

Because the stars at the boundary of the galactic bulge have freedom to move, the stars do not form a surface, as in concentrated masses. Additional matter for exponential expansion is provided by a distribution of stars beyond the bulge.

The mass of these stars exponentially increases with R, but is limited in quantity. The spatial volume increases with R³, ρ therefore decreases outwardly, producing a constant orbital velocity for the stars in the arms of the galaxy:

$$\rho = \frac{M_0 e^{H_0 t}}{V_0 e^{3H_0 t}} \quad H(\text{external}) = \sqrt{\frac{G_E M_0 e^{H_0 t}}{9V_0 e^{3H_0 t}}}$$

$$v_R = H \cdot R = \sqrt{\frac{G_E M_0}{9V_0 e^{2H_0 t}}} \cdot R_0 e^{H_0 t} = \sqrt{\frac{G_N M_0}{R_0}} = v_R$$

The exponential mathematics for the matter beyond the bulge indicates that the mass increases, but at a rate less than the volume does. This differs from the XPXP expression for gravity, which has a constant Mo. **The XPXP radial velocity of stars in the arms of spiral galaxies is therefore constant. “Dark matter” was invented in the standard model to account for the flattening of the velocity curve for spiral galaxies, because it has no other solution. XPXP proposes that dark matter is fictitious, and will never be found.**