EMBODIMENTS of XPXP: (shorts)

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The distribution of matter in the cosmos creates expansions with differing characteristics, although all are created through the same expansion principles developed from the H/L Law. These expansions appear to be vastly different, but

Three XPXP embodiments addressed here are: 1. the galactic flow, 2. concentrated matter, and 3. spiral galaxies.

1. **GALACTIC FLOW** :(unrecognized on a local level because e^Hot ~ 1)

The simplest form of XPXP is the cosmic flow, the motion of the galaxies as described in the the Hubble/LeMaitre (H/L) law.

The H/L law is an exponential growth equation.

Ho is constant, the H/L law shows a universe which is eternally exponentially accelerating. where where R= Ro e^Hot, V_R = HoRo e^Hot and A_R=Hoc e^Hot.

Ho(universal) = $$Ho = \frac{\sqrt{G_E \rho_0}}{3}$$

Since the matter and space of the cosmos expand (exponentially) equally, the density in the expression for H is constant, therefore H (universal)= constant. But if H is not constant, other embodiments of the expansion are created.

2.CONCENTRATED MATTER : The accretion of matter creates masses such as planets and stars that exponentially expand with characteristics very different than the cosmic flow, although obeying the same principles.

Internally, the expansion is governed by an H wherein the exponential expansion of matter is less than that of the spatial expansion. This causes a decreasing density, therefore an exponentially modified H until reaching the surface. A constant internal radial velocity is the result.

$$\rho = \frac{M_0 e^{Ho\, t}}{V_0 e^{3Ho\, t}} = \rho_0 \Big/ e^{2Ho\, t} \quad H\,(\text{internal}) = \sqrt{\frac{G_N M_0}{R_0 e^{2Ho\, t}}} \quad v_R = \sqrt{\frac{G_N M_0}{R_0}}$$

This is the Newtonian orbital velocity and indicates that the radial velocity at all internal positions is constant.

Externally to the surface, the matter of the expansion remains a constant

Mo, while the spatial expansion continues to expand with the cube of the radius. This produces a character of the expansion which we call gravitation, having a reducing radial velocity where:

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

SPIRAL GALAXIES : Because the star velocities in spiral galaxies increase linearly with the distance from the center, the expansion within the Bulge of spiral galaxies replicates that of the cosmos. The size of galaxies are determined by the amount of matter available. But unlike concentrated matter, where a surface might form, stars do not interact and are free to move. Externally, an exponential matter distribution produces a spatial expansion with a constant radial velocity. It is seen that the general XPXP equation accounts for both the internal and external character of spiral galaxies.

Internally (within the bulge) the expansion is governed by a constant coefficient H from the origin to a proposed "virtual surface". (consistent with the cosmic expansion):

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

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

Other than G_E and G_N, the terms in these expressions are local values.

Externally (beyond the Bulge)**:** The stars form an exponential distribution that counteracts the exponential field decrease found surrounding concentrated matter. The radial velocity becomes a constant, agreeing with astronomical observations.

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

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

The exponential expression for the mass after the bulge indicates that the mass increases, but at a rate less than the volume. The character of the expansion is thereby distinguished from Newtonian gravitation. (constant radial velocity)