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Hubble's Law Interpreted by Acceleration Doppler Effect and Wu's Spacetime Reverse Expansion Theory

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Abstract: *Hubble's Law is an experimental result that can be applied to a star with linear relation between recessional velocity and Redshift, subject to that the star is at more than 5 billion light years away and is moving away from earth at an acceleration speed faster than the light speed. Although Acceleration Doppler Effect can be used to derive Hubble's Law, an imaginary Dark Energy is suggested to explain the acceleration together with an expansion theory of the universe to support the super fast moving speed. To avoid these problems, a Spacetime Shrinkage model is proposed and a Spacetime Reverse Expansion Theory is successfully derived to interpret Hubble's Law.*

Keywords: *Hubble's Law, Dark Energy, Doppler Effect, Acceleration Doppler Effect, Universe Expansion, Wu's Spacetime, Yangton and Yington, Wu's Pairs, Spacetime Shrinkage, Reverse Expansion*

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I. Acceleration Doppler Effect

The Doppler Effect can be proven easily in the Non-Inertia Transformation process with the signal source traveling at a constant speed [1] either towards or away from the observer such as that of sound propagation. However, the photon emission from the light source is an Inertia Transformation process [2], and the Redshift and Blue shift are observed only when the wavelengths of light change with the acceleration speed of the light source. I call this phenomenon "Acceleration Doppler Effect" [2].

Since the ground observer is always stationary to the light origins of all photons that emitted from a moving light source (star), the Vision of Light [3] of each photon observed by the ground observer is the same as that observed at the light origin of the photon in the Absolute Space System [1].

The star can either move toward or away from the observer on earth. Assuming it takes time t for a photon travelling between the star and earth. V_o is the speed of the star at the beginning, V_t is the speed of the star at time t and a is the constant acceleration of the star in time t. S is the distance of the star traveling from the light origin in time t. P is the distance of the photon traveling in the ejection direction from the light origin to earth in time t, $V_o t$ is the distance of the photon dragged by the star in time t and D is the distance between the star and the photon when it reaches earth at time t. Also λ_1 is the wavelength, ν_1 is the frequency and C_1 is the light speed of the photon from the star observed on earth. Zeroshift, Blueshift and Redshift phenomena resulted from the Acceleration Doppler Effect (Fig. 1) can thus be derived by mathematics as follows:

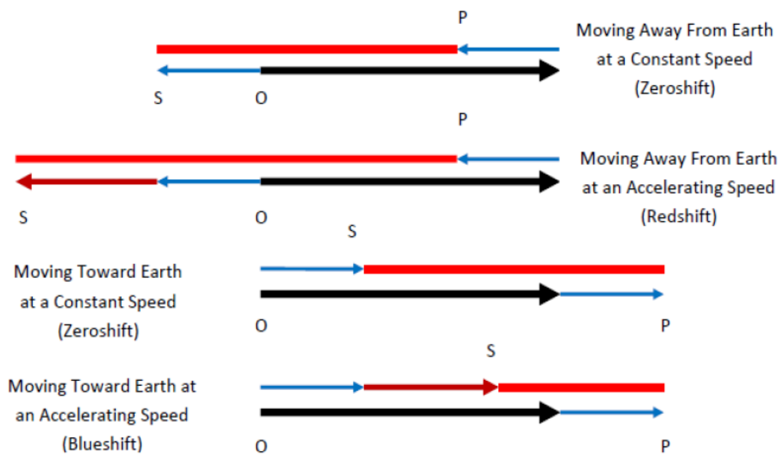

Fig. 1 Zeroshift, Redshift and Blueshift caused by Acceleration Doppler Effect.

A. Zeroshift

When the light source (star) either moves toward or away from the observer on earth at a constant speed (V_o = Vt and a = 0), Zeroshift can be detected.

A1. In case the light source (star) moves away from the observer on earth,

$S = V_o t$

$P = Ct – V_o t$

$D = P + S = Ct$

Therefore,

$$\lambda_1 = D/\nu t = Ct/\nu t = C/\nu = \lambda$$
$$C_1 = P/t = (Ct – V_o t)/t = C - V_o < C$$
$$\nu_1 = C_1/\lambda_1 = (C – V_o)/ \lambda < \nu$$

When the light source (star) moves away from the observer on earth at a constant speed, the wavelength maintains unchanged, but both frequency and light speed become smaller. Zeroshift can be detected.

A2. In case the light source (star) moves toward the observer on earth,

$S = – V_o t$

$P = Ct + V_o t$

$D = S + P = Ct$

Therefore,

$$\lambda_1 = D/\nu t = Ct/\nu t = C/\nu = \lambda$$
$$C_1 = P/t = (Ct + V_o t)/t = C + V_o > C$$
$$\nu_1 = C_1/\lambda_1 = (C + V_o)/ \lambda > \nu$$

When the light source (star) moves toward the observer on earth at a constant speed, the wavelength maintains unchanged, but both frequency and light speed become bigger. Zeroshift can be detected.

B. Blueshift

In case the light source (star) moving toward the observer on earth at a constant acceleration speed,

$S = – (V_o t + ½ at^2)$

$P = Ct + V_o t$

$D = S + P = Ct – ½ at^2$

Therefore,

$$\lambda_1 = D/\nu t = (Ct – ½ at2)/\nu t = (C – ½ at)/\nu < \lambda$$
$$C_1 = P/t = (Ct + V_o t)/t = C + V_o > C$$
$$\nu_1 = C_1/\lambda_1 = (C + V_o)/((C – ½ at)/\nu) > \nu$$

When the light source (star) moves toward the observer on earth at a constant acceleration speed, the wavelength becomes smaller, both the frequency and light speed become bigger, and thus Blueshift can be detected.

C. Redshift

In case the light source (star) moving away from the observer on earth at a constant acceleration speed,

$S = V_o t + ½ at^2$

$P = Ct – V_o t$

$D = S + P = Ct + ½ at^2$

Therefore,

$$\lambda_1 = D/\nu t = (Ct + ½ at^2)/\nu t = (C + ½ at)/\nu > \lambda$$
$$C_1 = P/t = (Ct – V_o t)/t = C – V_o < C$$
$$\nu_1 = C_1/\lambda_1 = (C – V_o)/((C + ½ at)/\nu) < \nu$$

When the light source (star) moves away from the observer on earth at constant acceleration speed, the wavelength becomes bigger, both the frequency and light speed become smaller, and thus Redshift can be detected.

II. Redshifts

According to the Acceleration Doppler Effect, Redshift occurs whenever a light source (star) moves away from earth at an acceleration speed such as that observed in a spiral galaxy [4]. However, there are another two Redshifts in the universe. Gravitational Redshift [5] [6] and Cosmological Redshift [6] [7]. Gravitational Redshift, induced by Einstein's General Relativity [8], could be explained as a result of the large size and longer period of Wu's Pairs caused by a massive gravitational field [2]. Cosmological Redshift on the other hand discovered by Hubble [9], under the assumption of the expansion of the universe, could also be interpreted as a result of the large size and longer period of Wu's Pairs. However, it is caused by the aging of the universe rather than the massive gravitational field.

III. Hubble's Law

The discovery of the linear relationship between Redshift and distance, coupled with a supposed linear relation between recessional velocity and Redshift yields a straight forward mathematical expression for "Hubble's Law" (Fig. 2) [9] as follows:

$$V = H_0D$$

Where

- V is the recessional velocity, typically expressed in km/s.
- H_0 is Hubble's constant and corresponds to the value of H (often termed the Hubble parameter a value that is time dependent and can be expressed in terms of the scale factor) in the Friedmann equations
- Taken at the time of observation denoted by the subscript "$_0$". This value is the same throughout the universe for a given comoving time.
- D is the proper distance (which can change over time, unlike the comoving distance, which is constant) from the galaxy to the observer, measured in mega parsecs (Mpc) the 3-space defined by given cosmological time. (Recession velocity is just V = dD/dt).

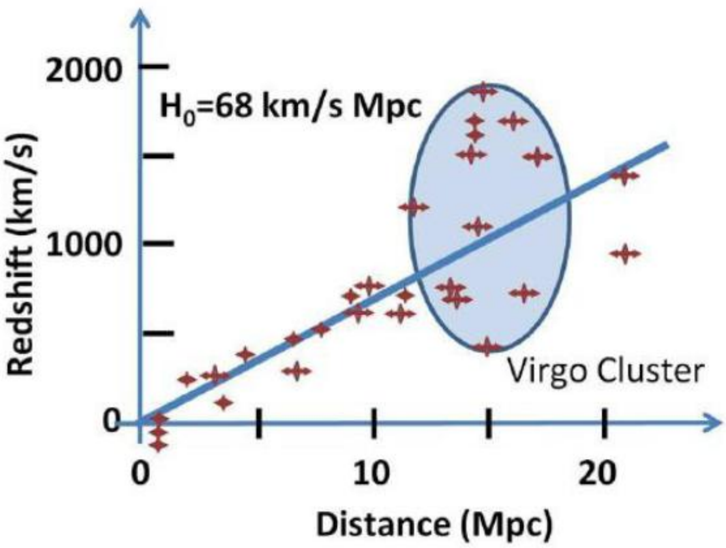

Fig. 2 Hubble's Law – the linear relationship between Redshift and distance.

Although Hubble's Law is an experimental result, we can derive it from Acceleration Doppler Effect. According to the mathematics in the derivation of Redshift in Acceleration Doppler Effect, where a star is moving away from earth at an acceleration speed,

Because

$\lambda_1 = D/\nu t = (Ct + ½ at^2)/\nu t = (C + ½ at)/\nu = \lambda + ½ at/\nu$

$(\lambda_1 – \lambda)/\lambda = (½ at)/C$

Therefore,

$$(\lambda_1 – \lambda)/\lambda \infty at$$

Because

$V = V_0 + at$

After a long time acceleration (more than 5 billion years), at is much bigger than V0, and V = at

Therefore,

$$V \infty (\lambda_1 – \lambda)/\lambda$$

Also,

$D = S + P = Ct + ½ at^2 = (C +½ at) t$

Again, after a long time acceleration (more than 5 billion years), ½ at becomes much bigger than C (in other words, V is much bigger than C), and D/t = ½ at

Therefore,

$$D/t \infty (\lambda_1 – \lambda)/\lambda$$

Where λ_1 is the wavelength of the photon emitted from the star observed on earth and λ is the wavelength of the photon on earth, V is the velocity of the star away from earth and D/t is the proper distance.

Because both V and D/t are proportional to $(\lambda_1 – \lambda)/\lambda$. Therefore,

$$V = kD/t$$

Where k is a constant.

For stars more than 5 billion light years away, 1/t becomes a constant and a Redshift obeying Hubble's Law can be observed.

1. Wu's Spacetime Reverse Expansion Theory

Even through Hubble's Law can be derived nicely from the Acceleration Doppler Effect, it is hard to believe that a star can move at a speed faster than light speed, even that a mysterious Dark Energy is proposed to back up the acceleration and a universe expansion theory is applied to explain the super fast speed. To avoid these problems, a model based on Wu's Spacetime Shrinkage Theory is proposed. Because of the shrinkage of the circulation period (t_{yy}) and orbital size (l_{yy}) of Wu's Pairs due to the aging of the universe, a photon emitted from a star more than 5 billion light years away has a larger wavelength than that on earth, which can cause Redshift following Hubble's Law.

Assuming X is the distance between the star and earth. In the beginning, the unit length on earth is L_i, which then gradually shrinks to L_f following the Spacetime Shrinkage Theory. Because the final distance M_fL_f between the star and earth is much bigger than the initial distance M_iL_f, therefore the total moving distance D_E of the star away from earth is about the same as the distance X between the star and earth (Fig. 3). Therefore,

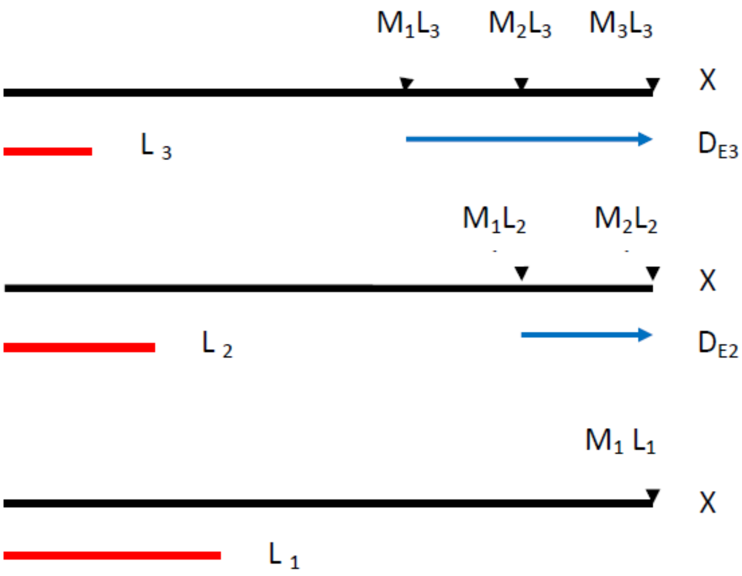

Fig. 3 The distance of a star measured by a shrinking ruler on earth.

$X = M_fL_f$

$D_E = M_fL_f - M_iL_f = (M_f-M_i)L_f$

$D_E = M_fL_f (M_f-M_i)/M_f$

$$D_E = X (1 - M_i/M_f)$$

Because

$M_iL_i = M_fL_f = X$

$M_i/M_f = L_f/L_i$

Therefore,

$$D_E = X (1- L_f/L_i) = X (L_i - L_f)/L_i$$

Because

$L \infty t_{yy} \infty \lambda$

$(L_i - L_f)/L_i = (\lambda_i - \lambda_f)/\lambda_i$

Therefore,

$$D_E = X (\lambda_i - \lambda_f)/\lambda_i$$

$$D_E (\lambda_i/\lambda_f)/X = (\lambda_i-\lambda_f)/\lambda_f$$

For a star more than 5 billion light years away from earth, $(\lambda_i/\lambda_f)/X$ becomes a constant and D_E is close to X.

Therefore,

$$D_E \infty (\lambda_1-\lambda)/\lambda$$

$$D_E \infty (l_{yy1} - l_{yy})/l_{yy}$$

This is named "Wu's Spacetime Reverse Expansion Theory". Where D_E is the distance between the star and earth, λ_1 is the wavelength and l_{yy1} is the Wu's Unit Length of the photon from the star, and λ is the wavelength and l_{yy} is the Wu's Unit Length of the photon on earth. $(l_{yy1} - l_{yy})/l_{yy}$ is named "Wu's Spacetime Shrinkage Factor".

In comparison, D_E $(\lambda_i/\lambda_f)/X$ in Wu's Spacetime Reverse Expansion Theory is equal to the proper distance D in Hubble's Law, which is a time dependent factor. For a star more than 5 billion light years away, (λ_i/λ_f) is getting smaller and X becomes extremely large, such that $(\lambda_i/\lambda_f)/X$ converges to a constant and Wu's Spacetime Reverse Expansion Theory becomes identical to Hubble's Law.

Because Hubble's Law goes well with Wu's Spacetime Shrinkage Theory and Wu's Spacetime Reverse Expansion Theory, also there is no need of dark energy, it is believed that Wu's Spacetime on earth is actually shrinking instead that the universe is expanding and accelerating.

IV. Conclusion

Acceleration Doppler Effect is used to derive Hubble's Law with an assumption that the acceleration is caused by a mysterious Dark Energy, and the unprecedented moving speed faster than the light speed is due to the expansion of the universe. To avoid these problems, a Spacetime Shrinkage model is proposed and a Spacetime Reverse Expansion Theory is successfully derived to interpret Hubble's Law.

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