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Hubble's Law Derived from Wu's Spacetime Shrinkage Theory and Wu's Spacetime Reverse Expansion Theory versus Universe Expansion Theory

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Abstract: *Stars that are more than 5 billion light years away from earth obey Hubble's Law having linear relations between redshift, recessional velocity and proper distance. Although Acceleration Doppler Effect can be used to derive Hubble's Law based on a superfast acceleration speed and an imaginary Dark Energy for the interpretation of the universe expansion theory. Wu's Spacetime Shrinkage Theory based on the shrinkage of the diameter l_{yy} (Wu's Unit Length) and circulation period t_{yy} (Wu's Unit Time) of Wu's Pairs – the building blocks of the universe due to the aging of the universe is successfully used to derive Hubble's Law without acceleration and Dark Energy. Because of these reasons, Wu's Spacetime Reverse Expansion Theory is proposed for a better explanation of Cosmological Redshift and Hubble's Law.*
Keywords: *Hubble's Law, Dark Energy, Doppler Effect, Acceleration Doppler Effect, Cosmological Redshift, 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]. Both Redshift and Blue shift are observed only when the wavelength of light changes with the acceleration speed of the light source. This phenomenon is called "Acceleration Doppler Effect" [2].

For a star far away from earth, the ground observer is considered stationary to the light origins of all photons that emitted from the light source (star). Therefore, 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.

The light source (star) can either move toward or away from the observer on earth. Assuming it takes time t for a photon travelling between the light source and earth. V_o is the speed of the light source (star) at its beginning, V_t is the speed of the light source (star) at time t and a is the constant acceleration of the light source (star) in time t. S is the distance of the light source (star) traveling from the light origin in time t. P is the distance of the photon traveling from the light origin to earth in time t, V_ot is the distance of the photon dragged by the light source (star) in time t and D is the distance between the light source (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 light origin observed either on the light origin or earth.

OS = **S** = Distance between light source and light origin = Motion of light source away from light origin.
SP = **D** = Distance between light source and photon = Vision of light observed from light source.
OP = **P** = Distance between photon and light origin = Vision of light observed from light origin and ground.

$$\mathbf{OP} = \mathbf{OS} + \mathbf{SP}$$
$$\mathbf{P} = \mathbf{S} + \mathbf{D}$$
$$\mathbf{D} = \mathbf{P} - \mathbf{S}$$

Also,

$$\mathbf{OP} = \mathbf{P} = \mathbf{C}t + \mathbf{V_0}t$$

Where **C** is the Absolute Light Speed, $\mathbf{V_0}$ is the initial moving speed of light source from light origin and t is time.

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

$S = -(V_ot + ½ at^2)$
$P = Ct - V_ot$
$D = P - S = Ct + ½ at^2$
Therefore,
$\lambda_1 = D/\nu t = (Ct + ½ at^2)/\nu t = (C + ½ at)/\nu > \lambda$
$C_1 = P/t = (Ct - V_ot)/t = C - V_o < C$

$\nu_1 = C_1/\lambda_1 = (C - V_o)/((C + ½ at)/\nu) < \nu$

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 observed.

II. Hubble's Law

The discovery of the linear relationship between Redshift and distance for stars more than 5 billion years away, coupled with a supposed linear relation between recessional velocity and Redshift yields a straight forward mathematical expression for "Hubble's Law" (Fig. 1) [4] as follows:

$$V = H_0D$$

Where

- V is the recessional velocity, typically expressed in km/s.
- H0 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).

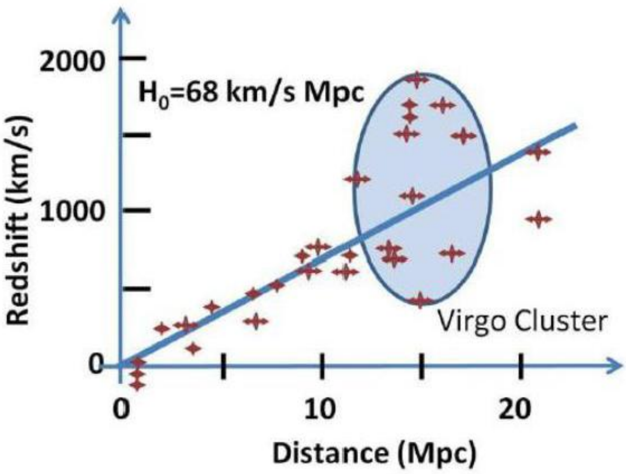

Fig. 1 Hubble's Law – the linear relationship between Redshift and distance.

III. Hubble's Law and Acceleration Doppler Effect

Although Hubble's Law is an experimental result, it can be proved by Acceleration Doppler Effect [5]. According to the mathematics in the derivation of Redshift in Acceleration Doppler Effect, where a star is moving away from earth at a constant acceleration speed a, D is the distance from the star to earth, P is the distance from the earth to light origin, S is the distance from light source to light origin,

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

For stars more than 5 billion years away, the acceleration ½ at becomes much bigger than C (in other words, V is much bigger than C). Therefore,

$D/t = ½ at$

Because

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

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

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

Therefore,

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

Also,

$V = V_0 + at$

$at » V_0$

$V = at$

Therefore,

$$V \propto (\lambda_1 - \lambda)/\lambda$$

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, $(\lambda_1 - \lambda)/\lambda$ is the redshift, V is the velocity of the star moving away from earth and D/t is the proper distance.
Because both V and D/t are proportional to $(\lambda_1 - \lambda)/\lambda$
Therefore,

$$V = kD/t$$

Also,

$$V = H_0D$$
$$H_0 = k/t$$

Where k is a constant and H_0 is Hubble's Constant.
For those stars they separated from earth at the same time, both t and $H_0 = k/t$ are constants and V-D curve becomes a straight line. Also, when the universe gets older, t is bigger, H_0 is smaller, and V-D curve becomes flat with a smaller slope [6]. Furthermore, for those stars more than 5 billion light years away, 1/t becomes small and converges to a constant, so as H_0. As a result, redshift is proportional to both D and V, which obeys Hubble's Law (Fig. 1).

IV. Wu's Spacetime Shrinkage Theory

According to the Five Principles of the Universe [7], through the aging of the universe, Wu's Pair (Yangton and Yington circulating pair) [8] – the building block of the universe is getting smaller and eventually Yangton will recombine with Yington to destroy each other such that everything will go back to Nothing.
As a consequence, Spacetime $[x, y, z, t](l_{yy}, t_{yy})$ is shrinking because the diameter of Wu's Pair l_{yy} (Wu's Unit Length) is getting smaller due to the aging of the universe, also the period of the circulation of Wu's Pair t_{yy} (Wu's Unit Time) is shrinking at 3/2 power of l_{yy} according to Wu's Spacetime Theory [9]. This is named "Wu's Spacetime Shrinkage Theory".

V. Hubble's Law and Wu's Spacetime Shrinkage Theory

Although Hubble's Law can be used to explain the expansion of the universe and derived successfully from the Acceleration Doppler Effect, it is hard to believe that a star can move faster than light speed and with an acceleration backed up by a mysterious Dark Energy. To avoid these problems, a model based on Wu's Spacetime Shrinkage Theory is proposed to interpret Hubble's Law. 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 the present earth, which causes redshift and obeys Hubble's Law.

Figure 2 shows a schematic diagram of the visions of star on earth. In the beginning (when photon is emitted from the star), the distance between the star X and earth is the multiplication of the Normal Unit Length L_i and the Amount of Normal Unit Length M_i. At the final stage (when the photon reaches the earth), the distance of the star X becomes the multiplication of the Normal Unit Length L_f and the Amount of Normal Unit Length M_f. The distance of the star X stays the same. But the vision of the star D_E (vision of light) moves from initial distance M_iL_f to the final distance M_fL_f observed on earth. Because M_fL_f is much bigger than M_iL_f, D_E is approximately equal to the distance X between the star and earth (Fig. 2).

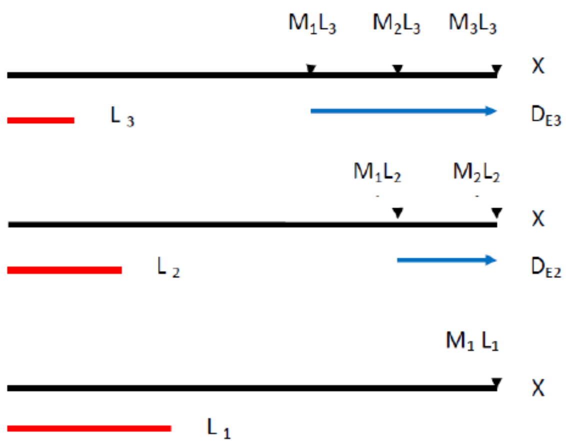

Fig. 2 The distance of a star measured by a shrinking ruler on earth.

Therefore,
$X = M_f L_f$
$D_E = M_f L_f - M_i L_f = (M_f - M_i) L_f$
$D_E = M_f L_f (M_f - M_i)/M_f$

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

Because
$M_i L_i = M_f L_f = X$
$M_i/M_f = L_f/L_i$
Therefore,
$D_E = X (1 - L_f/L_i)$
And

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

Because
$L \propto l_{yy} \propto \lambda$
$(L_i - L_f)/L_i = (\lambda_i - \lambda_f)/\lambda_i$
Therefore,

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

Because
$X = C_i t$ (t is the time duration from initial stage to final stage)
$\lambda_i = C_i/\nu_i$
Therefore,

$$D_E /(\lambda_f \nu_i)\, t = (\lambda_i - \lambda_f)/\lambda_f$$

Because $\nu_i = t_{yyi}^{-1} = l_{yyi}^{-3/2}$, for a star 5 billion light years away ($t \rightarrow \infty$), l_{yyi} gets very big, but ν_i ($= l_{yyi}^{-3/2}$) becomes very small and converges to a constant. Also, D_E is approximately equal to X (distance between the star and earth). Therefore,

$$D/t \propto (\lambda_1 - \lambda)/\lambda$$
$$D/t \propto (l_{yy1} - l_{yy})/l_{yy}$$

Where D 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 generated in the initial stage on the star. λ is the wavelength and l_{yy} is the Wu's Unit Length of the photon generated at the final stage on the present earth. $(l_{yy1} - l_{yy})/l_{yy}$ is named "Wu's Spacetime Shrinkage Factor".
Also, the velocity of the reverse expansion V can be represented by

$$V \propto (-dL/L)/dt$$

Because
$-dL/L = L\, dL^{-1}$
Also,
$L \propto l_{yy} \propto \lambda$
Therefore,

$$V \propto (\lambda\, d\lambda^{-1})/dt$$
$$Vt \propto \lambda_f (1/\lambda_f - 1/\lambda_i)$$
$$Vt \propto \lambda_f /\lambda_i (\lambda_i - \lambda_f)/\lambda_f$$

Because
$\lambda_i = C_i/\nu_i$
$C_i t = X$
Therefore,

$$V \propto \nu_i (\lambda_i - \lambda_f)/\lambda_f$$

Because $\nu_i = t_{yyi}^{-1} = l_{yyi}^{-3/2}$, for a star 5 billion light years away ($t \rightarrow \infty$), l_{yyi} gets very big, but ν_i ($= l_{yyi}^{-3/2}$) becomes very small and converges to a constant. Therefore,

$$V \propto (\lambda_1 - \lambda)/\lambda$$
$$V \propto (l_{yy1} - l_{yy})/l_{yy}$$

Where V is the velocity of the reverse expansion. λ_1 is the wavelength and l_{yy1} is the Wu's Unit Length of the photon generated in the initial stage on the star. λ is the wavelength and l_{yy} is the Wu's Unit Length of the photon generated at the final stage on the present earth.
Because both D/t and V are proportional to $(\lambda_1 - \lambda)/\lambda$, therefore,

$$V = k/t\, D$$

And

$$V = H_0 D$$
$$H_0 = k/t$$

Where k is a constant and H_0 is Hubble's Constant.
As a result, Hubble's Law can also be derived from Wu's Spacetime Shrinkage Theory. Because of this reason, instead of explained by the expansion of the universe due to the Acceleration Doppler Effect, Hubble's Law can also be interpreted by Wu's Spacetime Shrinkage Theory due to the aging of the universe. This is named "Wu's Spacetime Reverse Expansion Theory" [5].

Wu's Spacetime Reverse Expansion Theory Versus Universe Expansion Theory

During Wu's Spacetime shrinkage process, the potential energy of Yangton and Yington circulating pairs can be converted to their kinetic energy with no need of external energy. Also, the distance between the star and earth remains unchanged at all time. There are no such things as that the star is undergoing acceleration and moving at a speed faster than the light speed. Because of these reasons, it is believed that Wu's Spacetime Reverse Expansion Theory based on Wu's Spacetime Shrinkage Theory is more realistic than Universe Expansion Theory in explanation of Cosmological Redshift and Hubble's Law. In other words, it is believed that Wu's Spacetime on earth is actually shrinking instead of that the universe is expanding and accelerating.

VI. Conclusion

Although Acceleration Doppler Effect can be used to derive Hubble's Law based on a superfast speed and an imaginary Dark Energy for the interpretation of the universe expansion theory, Wu's Spacetime Shrinkage Theory based on the shrinkage of the diameter l_{yy} (Wu's Unit Length) and circulation period t_{yy} (Wu's Unit Time) of Wu's Pairs – the building blocks of the universe due to the aging of the universe is successfully used to derive Hubble's Law without Dark Energy. Because of these reasons, Wu's Spacetime Reverse Expansion Theory based on Wu's Spacetime Shrinkage Theory is proposed for a better explanation of Cosmological Redshift and Hubble's Law.

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