

Hubble Equation in a Non Inflationary Expanding Universe

John Van Egmond, Professional Engineer
Apartment 504 60 Park Avenue
Georgetown, Ontario, L7G 4Y9

ABSTRACT

A proposal made by the author that the velocity of matter in the early universe was not uniform. The outcome was a demonstrated fundamental reason for a type Hubble law. Work herein demonstrates that the Hubble constant could be in the range of 75 km/sec/pc at an age of about 4×10^{11} seconds and that other values are possible.

1. INTRODUCTION

In a previous paper (1) a model was proposed for the Kernel Universe which is characterized by non uniform velocity conditions behind the front face of the Universe. The constancy of the speed of light in a vacuum combined with results by Hubble provide a model for expansion of the universe resulting in a non Euclidean understanding of space and the universe. This paper will demonstrate a Hubble type relationship for the universe once the non uniform velocity field is adopted behind the front face of the kernel .

2. HUBBLE LAW

Hubble measured sky object velocity versus distance from earth and proposed a linear relationship. The theoretical basis was not fully understood but the law appeared reliable. Although the constant H has been reduced with time, it has not yet been rethought, so that we are still seeking a relationship $V=HD$. The values for H have been reduced with time, and some have speculated there is a gravitic well at the boundary of the universe, some 10 to 20 billion light years from the earth.

A. HUBBLE AS THE OBSERVER

The Hubble law $V=HD$, where V = velocity of matter, H the Hubble constant, and D the distance from an observer to an object in the sky appears quite precise, although the author thinks even that appearance should be questioned.. In part based the spreading of the universe in accord with the Hubble law models of the origins of the universe have been developed. The expanding universe model suggests that like the from the point of a raisin on a rising loaf of raisin bread, to the observer of the universe would see distance and velocity as valid. Not only is matter spreading, but the space around the matter is spreading.

B. MEASUREMENT

The constant H in the Hubble Law has seen a reported value decrease by an order of magnitude with further measurement over a period of about 70 years. Given the immense distances and times (which could be considered overlapping redundant statements) the measurements to derive the law though might be viewed as though at taken almost a single point in time along an almost "straight" line or even almost a point in space from the standpoint of the viewer, but over a period of 10 billion to 20 billion years from the point of view of the matter being viewed. Perhaps the measurements like any tangent measurement at close proximity may appear flat, a result understood in Euclidean and Fractal mathematics, that closeness changes the appearance. The suspicion is the Hubble law, if it exists at all, may be a non linear equation. In Table 1 are measured velocities and distances. Since in the model velocities are known at all times (less any losses to background radiation), the locations of the measured components, assuming a straight line velocity profile are presented in Table 1 and new values for the Hubble Law constant estimated. The outward acceleration may be only apparent acceleration based on our understanding of the matter being viewed.

3. VELOCITY IN THE KERNEL UNIVERSE

I have taken the assumption of a Big Bang at face value and let the Kernel Universe be the universe within it first few seconds or minutes are as commonly described, with a time boundary of 10^{43} seconds. It is

“commonly” assumed in the “Big Bang” that energy and matter were at a constant velocity of c and at a high degree of uniformity. This uniformity and speed of light are thought to be confirmed by the absence of large variations in the background energy between the estimated age limit of the universe (Hubble Limit) and the observer. The author perhaps overstates the assumption of constant velocity and uniformity.

A. NON UNIFORM VELOCITY

It was proposed in a former paper that the outward front of matter initially moved and still moves at the speed of light. It was also proposed that only the EM energy at the time of the Kernel Universe has moved out at that speed, and that most of that EM energy advances within a micro second to second of the front face of the universe. Further it was proposed that there was initially not a uniform of forming or velocity of expansion of matter within the kernel universe. The velocity if uniform in any respect was so only for a given radius or given locality (which seems suspect). Behind the front though matter moved at $a*c$, where a is a fraction depending on the distance behind the front face of the Kernel Universe. Except for minor losses of losses to heat, movement has continued outwards at c or a fraction thereof since the Kernel Universe. Based on this understanding the relationship $V = HD$ is an obvious and fundamental outcome. While we currently have no proof of absolute frame, we have likely assumed mistakenly because we live on the river or time and matter, that there is no fixed space within which the universe can expand forever, which is akin to a loaf on a train not knowing of the train or of other loaves in the oven.

B. HUBBLE LAW AS AN OUTCOME

If one accepts the premise of initial velocity within the universe behind the Kernel face being c or a fraction thereof, one can postulate in this universe a relationship $V=HD$ where D was the distance when the object emitted its light toward earth. Thus objects at 1 light, 1000 light years, one billion light years, and so on, but measured at the same instance conform to the relationship $V = HD$. The relationship of velocity and distance and time may then be laid out as in Table 2. The forming moments of the universe are proposed herein to be for an open expanding universe with no possibility for rebound with potential open age, and density will be less than the critical density, and decreasing “forever”. In this case the Hubble limit represents the original front of the Big Bang. Behind the Hubble limit, all visible matter at $a*c$ will remain visible beyond the Hubble limit but will never reach the limit as it too expands. Each successive front is represented by a bit of energy and matter concentrated locally. The gap between the first front and later fronts (that is slower materials) will expand while the matter endures, gravitational gradients becoming forever smaller as distance increase and as mass and energy become converted to background radiation. A Hubble law becomes “evident” at any given time of measurement (Table 2).

TABLE 1
AGE IN EXPANDING STANDARD AND KERNEL UNIVERSE MODELS
+ distances and like from standard texts and references (Zellick, Abell)

Object+	Virgo	Corona Borealis	Bootes	Hydra
Time Since light Left Star/Galaxy (years)+	$6*10^6$	$1.5*10^9$	$2.8*10^9$	$4*10^9$
V – Velocity Measured Today (a in $a*c$)	0.004	0.07	0.13	0.2
D - Apparent Distance (LY) (1917-01)	$6.34*10^6$	$1,440*10^6$	$2,749*10^6$	$3,960*10^6$
Estimated H in $V = HD$		$4.58*10^{-11}$	$4.58*10^{-11}$	$5.78*10^{-11}$
Estimated Age Of Universe (billion years)		22	22	17
Actual Velocity	0.004	0.07	0.14	0.2
Actual Distance when measured (LY)	$6.37*10^6$	$1,541*10^6$	$3,133*10^6$	$4,752*10^6$
Estimated H in $V=HD$		$4.29*10^{-11}$	$4.39*10^{-11}$	$3.71*10^{-11}$
Estimated Age of Universe (Billion yrs)		23	23	27

TABLE 2
VELOCITY DISTANCE RELATIONSHIPS AND HUBBLE LAW

Time (seconds) below	a in a*c below			H (km/sec/pc)
	0.99	0.35	0.1	
	Distance - speed from Kernel * time (pc) below			
1.0*10 ⁻⁴³	9.7 *10 ⁻⁵²	3.4 *10 ⁻⁵²	9.7 *10 ⁻⁵³	3 *10 ⁵⁶
6.0*10	5.8 *10 ⁻⁷	2.0 *10 ⁻⁷	5.8 *10 ⁻⁸	5 *10 ¹¹
1.0*10 ⁶	9.7 *10 ⁻³	3.4 *10 ⁻³	9.7 *10 ⁻⁴	3 *10 ⁷
1.0*10 ⁹	9.7 *10	3.4 *10	9.7 *10 ⁻¹	3 *10 ⁵
4.1*10 ¹¹	4.0 *10 ³	1.4 *10 ³	4.0 *10 ²	75
1.7 * 10 ¹⁵	1.7 *10 ⁷	5.9 *10 ⁶	1.7 *10 ⁶	1.7 *10 ⁻²

4. SUMMARY

A model is proposed of the few first moments of the universe in which the velocity of matter at the moment of formation on different fronts from the Kernel event varies and remains reflected in the velocity distribution to the present. A Hubble relationship becomes evident at any universe age. An outcome of the model is a separation of the EM and "all matter" fronts occurs as the matter moves at less than the speed of light. The separation of matter can then be predicted. The prediction is that by measuring H for different sky objects (as they appeared at different times) will give different Hubble constants which relate to time and the distance., in part because the time separation of the measured object and the center of observation.

5. ACKNOWLEDGEMENTS

The author acknowledges the inspiration provided by writers of such publications as Astronomy, Scientific American, and of professor Art Johns of the Physics Department of McMaster University in the 1970's.

References besides standard texts:

1. John Van Egmond, A non Inflationary Expanding Universe, Physics Review (submitted), 2000
2. G.O.Abell, D.Morrison, S.C.Wolf, Exploration of the Universe, Sixth Edition, 1993 Version, Saunders College Publishing.
3. M. Zellik, Astronomy, Eighth Edition,1997, John Wiley & Sons, Inc.