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“A Hubble Eclipse: Lemaître and Censorship”

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The definitive year of 1927

We have before us (Figure 1) two empirical determinations of the slope in the (radial velocity, distance) diagram. One is forever remembered and referenced; the other empirical determination, by G. Lemaître (1927), invariably lies Shrouded in the Night.

The solid line in the left hand panel of Figure 1 is based on observational data presented and discussed in the seminal 1927 paper by G. Lemaître, wherein he computes an expansion rate of 625 km/s /Mpc.

Two years later, Hubble (1929) published the famous right hand panel, and the name “Hubble constant” and “Hubble diagram” are forever entrenched in the astronomical literature and in Encyclopaedias. But why? Does not Figure 1 attest otherwise, to the *Lemaître constant* and to the *Lemaître velocity-distance relation*?

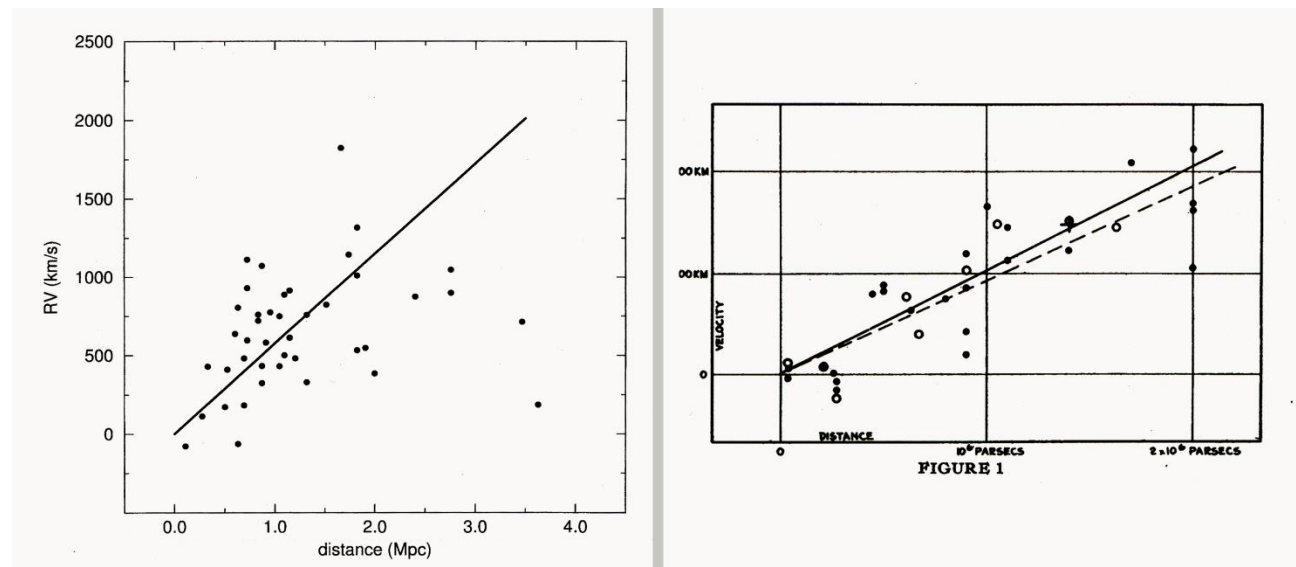


Figure 1 Left hand panel: The data used by Lemaître (1927) to yield the first empirical value of the rate of expansion of the Universe (625 km/s/Mpc), now known as the ‘Hubble’ constant. The diagram is reconstructed by H. Duerbeck and is used with permission. Right hand panel: The radial velocity –distance diagram published by Hubble, two years later, in 1929, with a “best slope” of 530 km/s/Mpc.

What is not widely known, is that a dramatic censorship occurred when the Lemaître (1927) paper was translated from the journal “Annales de la Société scientifique de Bruxelles” into English. An excellent book has appeared on this theme, entitled “Discovering the Expanding Universe” (Nussbaumer and Bieri, 2009). Professor Nussbaumer graciously sent me a copy of the original Belgian paper in 2009, and the sectors censored out in the English translation appear in Figure 2.

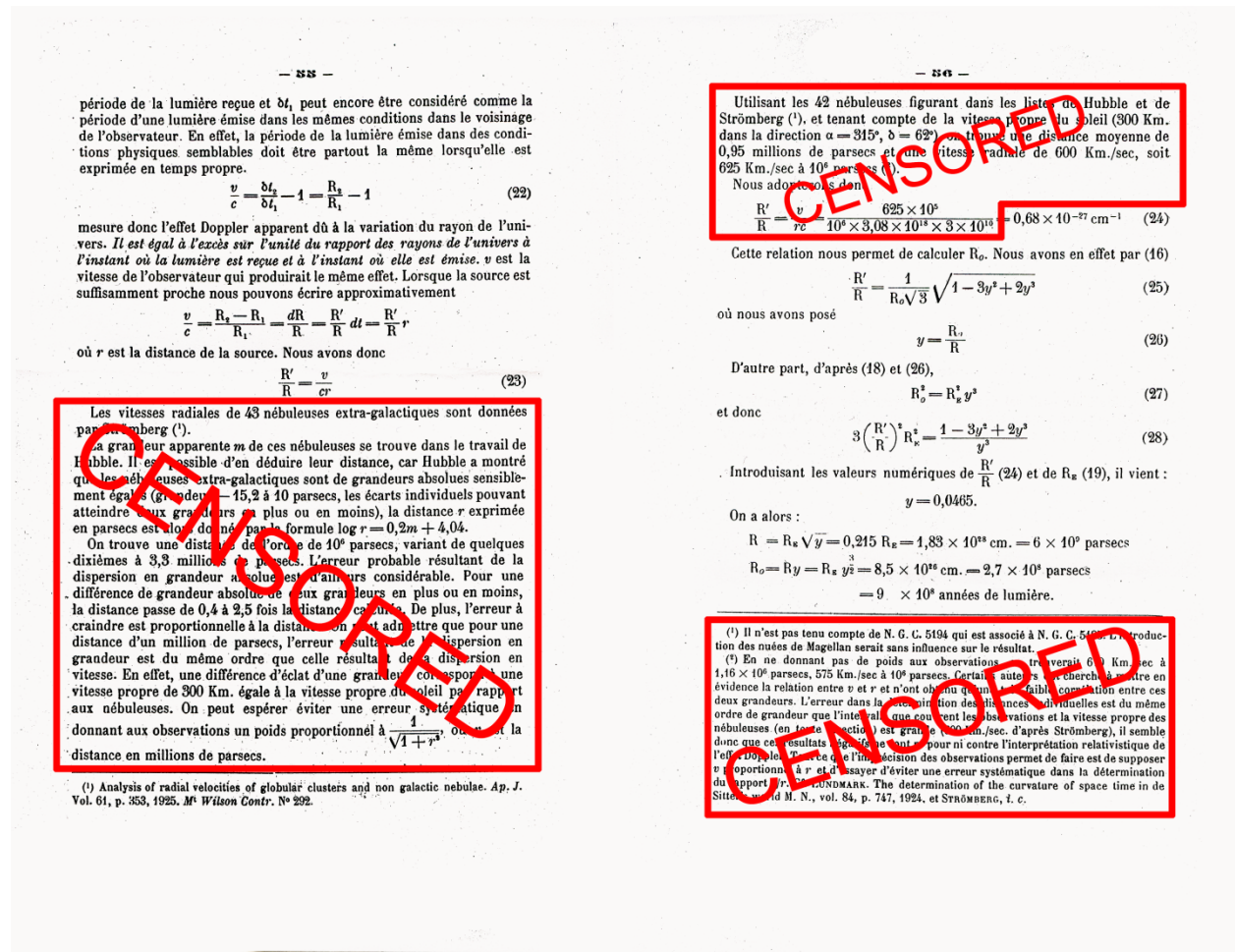


Figure 2 Sections in red, pertaining to the discussion and use of radial velocities of galaxies and their distances by Lemaître (1927) were meticulously and ingeniously censored in the English translation.

A fusion of theory and observation

The very title of the original 1927 paper indicates to the reader that the content will be a fusion of both theory and of observation:

“Un univers homogène de masse constante et de rayon croissant, rendant compte de la vitesse radiale des nébuleuses extra-galactiques” which is translated in the English tongue, thus:

“A homogeneous universe of constant mass and increasing radius **accounting for the radial velocity of extra-galactic nebulae**”

(emphasis in bold – mine).

Lemaître was not only an outstanding theoretical cosmologist, but he also had an excellent foundation in observational astronomy, writing about terms such as the effective temperatures of stars, trigonometric parallaxes, moving-cluster parallaxes, absolute bolometric magnitudes, dwarf branch stars, giant branch stars, and the like.

Not only does Lemaître derive a linear relationship between the radial velocities of galaxies and their distances in the above paper, but he is eager to determine the rate at which the Universe expands... a fusion of both the theoretical and observational arenas. In the censored English version, completely omitted is *all discussion* by Lemaître pertaining to his use of existing *observational data*. In the original version, Lemaître (1927) carefully uses the radial velocities of 42 extragalactic nebulae tabulated in Strömberg (1925), and he converts apparent magnitudes m into distance [$\log r = 0.2m + 4.04$] following Hubble (1926).

The actual value which Lemaître obtains in 1927 for the rate of expansion of the Universe (censored out by the translator) is 625 km/s/Mpc. Not only is that top paragraph carefully censored (see the top right paragraph in Figure 2), but alarmingly, equation (24) in the English translation also meticulously omits the value of 625 km/s/Mpc! In the English translation, there are only eight words between equation (23) and equation (24), with a complete suppression of the first empirical determination of Lemaître’s value of 625 km/s/Mpc in his original equation (24).

The Hubble Eclipse

And now, some insight into the mindset of Edwin Hubble. He was fiercely territorial, as we see in a letter from Hubble to de Sitter, dated 21 August 1930, wherein Hubble writes:

“I consider the velocity-distance relation, **its formulation**, testing and confirmation, as a Mount Wilson contribution and I am deeply concerned in its recognition as such.” (emphasis, mine). Figure 1, however, attests otherwise, and Nussbaumer and Bieri (2009) respond as follows:

“... **the formulation** and its central place in cosmology was first given by Lemaître ... there is no justification to glorify Hubble’s publication of 1929 [as the] original discovery of the linear velocity-distance relationship...” (emphasis, mine).

Lemaître was eclipsed by Hubble. But herein lies a repeated pattern. To the public, the name of the late JH Reynolds (1874-1949) also lies Shrouded in the Night. The reason:

Hubble had a very selective methodology of not referencing earlier scientists who may have presented the original ideas.

Every student of galaxy morphology is taught that the classification of galaxies was the foresight and original work of Edwin Hubble. Even the “Hubble Atlas” bears testimony to that. What was not appreciated at the time was the pivotal role played by Mr John Reynolds in England. In our book entitled *Shrouds of the Night* (Block and Freeman, 2008) we reproduce a letter from Hubble to JH Reynolds, wherein Hubble urges Reynolds to develop a galaxy classification scheme. Reynolds rises to Hubble’s challenge, and his classification scheme is published in 1920 (Reynolds, 1920).

Six years later, Hubble publishes his definitive paper on galaxy classification, and throughout the globe, astronomers today still speak of the “Hubble galaxy classification scheme”.

As elucidated in our book, Hubble carefully studied Reynolds (1920) and pencilled in some handwritten comments. (For example, next to each of the Reynolds class II, III and IV are the Sa, Sb and Sc notations pencilled in by Hubble. I owe a great debt to the late Allan Sandage for showing me these notes in pencil, which he affirmed was the unmistakable handwriting of Edwin Hubble). Allan Sandage furthermore affirmed that the correspondence between Reynolds types and Hubble types is “one-to-one.”

Hubble (1926) appeared in print six years after Reynolds (1920), but the name of JH Reynolds is totally eclipsed by that of Hubble. And so it is too with the “Hubble tuning fork” diagram and the “Hubble luminosity profile”. A series of eclipses (Block and Freeman, 2008 and references therein; note that there is no tuning fork diagram in the paper by Hubble in 1926).

The Hubble eclipse fell on Lemaître too - discoverer of the expanding universe, and of its rate of expansion (see also an excellent and insightful discussion by Kragh and Smith, 2003). It is not known who censored out the crucial sections in the English translation, but what is abundantly clear to me is that this was absolutely deliberate – and in my opinion, is in complete harmony with other major eclipses perpetrated by Hubble.

The Lemaître Space Telescope?

One of Galileo’s masterful works was entitled “Sidereus Nuncius” – the starry messenger. I would applaud the appeal of John Farrell after this Conference, that a “Lemaître Space Telescope” be named after the starry messenger and priest from Belgium.

I allow Nussbaumer and Bieri (2009) to have the final word here regarding the legendary G. Lemaître:

“Even in his influential ‘The Realm of the Nebulae’ published in 1936, he [Hubble] avoided any reference to Lemaître. Was he afraid that a gem might fall from his crown if people became aware of Lemaître’s pioneering fusion of observation and theory two years before Hubble delivered the *confirmation?*” (italics, mine).

Acknowledgements

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References

- Block, D.L. & Freeman, K.C. 2008. *Shrouds of the Night* (Springer, New York)
- Hubble, E. 1926, *Extra-galactic nebulae*. ApJ, **64**, 321.
- Hubble, E. 1929. *A relation between distance and radial velocity among extra-galactic nebulae*. PNAS, **15**, 168.
- Kragh, H. & Smith, R.W. 2003. *Who discovered the expanding universe?* History of Science, **41**, 141.
- Lemaître, G. 1927. *Un univers homogène de masse constante et de rayon croissant, rendant compte de la vitesse radiale des nébuleuses extra-galactiques*. Annales de la Société scientifique de Bruxelles, Série A, **47**, 49 translated into English in MNRAS, **91**, 483.
- Nussbaumer, H. & Bieri, L. 2009. *Discovering the Expanding Universe*. CUP.
- Reynolds, J.H. 1920, *Photometric measures of the nuclei of some typical spiral nebulae*. MNRAS. **80**, 746.
- Strömberg, G. 1925. *Analysis of radial velocities of globular clusters and non-galactic nebulae*. ApJ, **61**, 353.

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