

THE EXPANDING UNIVERSE: LOST (IN TRANSLATION) AND FOUND

Mario Livio

Space Telescope Science Institute, Baltimore, MD

Physicists sometimes tend to ignore the history of their subject. After all, who cares who discovered what, as long as the discoveries are made widely known? In a few cases, however, discoveries are of such magnitude, that understanding the path that had led to such insights, including the correct attribution, can be of great value. There is very little doubt that the discovery of the expansion of the universe falls into this category, even if for no other reason than the fact that the expansion suggests that our universe had a beginning.

During the past few months, a passionate debate has flared up about who actually deserves the credit for discovering the cosmic expansion.¹⁻⁴ In particular, a few articles raised the suspicion that some not-so-kosher censorship practices may have been applied in the 1920s to ensure Edwin Hubble's priority on the discovery.^{3,4}

Here are, very briefly, the background facts that are most relevant for this debate.

By February of 1922, astronomer Vesto Slipher had measured the redshifts for 41 galaxies.⁵ In a book published in 1923, Arthur Eddington⁶ listed those redshifts and noted that: "The great preponderance of positive [receding] velocities is very striking; but the lack of observations of southern nebulae is unfortunate, and forbids a final conclusion." In 1927, the Belgian priest and cosmologist Georges Lemaître published a remarkable paper (in French) whose title read (in its English translation): "A Homogeneous Universe of Constant Mass and Increasing Radius Accounting for the Radial Velocity of Extra-Galactic Nebulae." This paper was published in the relatively obscure *Annals of the Scientific Society of Brussels*.⁷ In it, Lemaître first discovered dynamic solutions to Einstein's general relativity equations, from

which he derived what is now known as “Hubble’s Law”—the fact that the velocity of recession is linearly proportional to the distance. But Lemaître went beyond mere theoretical calculations. He actually used the velocities of the galaxies as measured by Slipher (and published by Strömberg⁸), and the distances as determined from brightness measurements by Hubble⁹ in 1926, to determine the rate of expansion of the universe. For the numerical value of that rate, today called the *Hubble constant*, Lemaître obtained 625 km/s/Mpc. Recall that Hubble obtained a value of about 500 in 1929.¹⁰ Lemaître also discussed the fact that the accuracy of the distance estimates available at the time seemed to him to be insufficient to assess the validity of the linear relation he discovered.

Based solely on what I have described so far, I think most people would agree that it would seem only fair to credit the discovery of the expanding universe and of at least the tentative existence of a Hubble Law to Lemaître, and the detailed confirmation of that law to Hubble and Milton Humason, given their subsequent truly meticulous observations, that extended Slipher’s velocity measurements to greater distances. Here, however, is where the plot really thickens.

The English translation of Lemaître’s 1927 paper was published in the *Monthly Notices of the Royal Astronomical Society* in March 1931.¹¹ However, *a few paragraphs from the original French version were deleted!* In particular, the paragraph that described “Hubble’s Law” and in which Lemaître used the 42 galaxies for which he had distances and velocities to derive a value for the Hubble Constant of 625 km/s/Mpc, was missing.

Also missing were one paragraph in which Lemaître discussed the possible errors in the distance estimates, and footnotes, in one of which he remarked on the interpretation of the proportionality between the velocity and distance, as resulting from a relativistic expansion. In

the same footnote, Lemaître also calculated two possible values for the Hubble Constant, of 575 and 670, depending on how the data were grouped.

The fact that these paragraphs are missing from the translation has been known for quite some time, although not widely. Peebles¹² noted that: “It is curious that the crucial paragraphs describing how Lemaître estimated H [the Hubble Constant] and assessed the evidence for linearity were dropped from the 1931 English translation.”

Who translated Lemaître’s paper? And why were these paragraphs deleted in the English version? Canadian astronomer Sydney van den Bergh speculated³ that whoever did the “selective” editing may have done so to prevent Lemaître’s paper from undermining Hubble’s priority claim. “Picking out part of the middle of an equation must have been done on purpose,” he concluded. South African mathematician David Block went even further.⁴ He suggested that Hubble himself might have had a hand in this cosmic “censorship” to ensure that credit for the discovery of the expanding universe would go to himself and the Mount Wilson Observatory, where he made the observations. Historian of science Robert Smith, who also believes that most of the credit for discovering the expanding universe should go to Lemaître,¹³ suggested that the paragraphs may have been deleted as part of the regular editorial process, by the editor of the *Monthly Notices*.

As someone intimately involved with Hubble’s namesake—the *Hubble Space Telescope*—I became very intrigued by this “whodunit” mystery, and I decided to investigate it more carefully.

To that effect, I started by obtaining a copy of the original letter sent by the editor of the *Monthly Notices* at the time, astronomer William Marshall Smart, to Georges Lemaître, concerning the translation of Lemaître’s 1927 paper. In that letter, Smart asked Lemaître whether he would allow his 1927 paper to be reprinted in the *Monthly Notices*, since the Royal

Astronomical Council felt that the paper was not as well known as its importance deserved. The most important paragraph in the letter reads:¹⁴

“Briefly—if the Soc. Scientifique de Bruxells [in the annals of which the original paper was published] is also willing to give its permission—we should prefer the paper translated into English. Also, if you have any further additions etc. on the subject, we would glad[ly] print these too. I suppose that if there were additions a note could be inserted to the effect that §§1 – n are substantially from the Brussels paper + the remainder is new (or something more elegant).

Personally and also on behalf of the Society I hope that you will be able to do this.”

My immediate reaction was that the text of Smart’s letter was entirely innocent, and it certainly did not suggest (to me at least) any intent of extra editing or censorship. Still, David Block somehow inferred from it an entire series of hints for a conspiracy.⁴ First, Block decided that the “§§1 – n” should be read as “§§1 – 72” [since the way the symbol “n” was written, it could be read as “72”]. Second, Block interpreted the text as saying that Lemaître was given freedom to translate *only* paragraphs 1–72 of his paper. Third, Block claimed that Lemaître was told by Smart that Hubble’s observational result of 1929 is “something more elegant.” Finally, Block concluded that paragraph 73 was precisely Lemaître’s equation determining the value of the Hubble constant, and that this was the reason why the permission to translate covered only paragraphs 1–72.

Unfortunately, I did not find the evidence for any of these claims convincing at all. Ignoring for the moment the question of whether the “n” should be read as “72” or not, all that Smart’s letter really says [in my humble opinion], is that, should Lemaître decide to add new material to his paper (which he was given permission to do), then the new manuscript would

simply indicate that paragraphs 1 and up to a certain number are from the original text, while the rest is the addition, or something to that effect, put more elegantly. There is certainly no censorship, nor any reference to a more elegant result by Hubble. As to the number of the paragraph mentioned, clearly “n” makes much more sense since it is just given as a place-holder for the end of Lemaître’s article. [A careful examination also reveals that the alleged number “2” does not resemble the number “2” that appears later in Smart’s letter.]

While I was fairly convinced in the correctness of this non-conspiratorial interpretation of Smart’s letter, the two main mysteries of who translated the paper and who deleted the paragraphs remained unresolved. In an attempt to definitively answer these questions, I decided to explore the matter further by scrutinizing all of the Royal Astronomical Society Council’s minutes and the *entire* surviving correspondence from 1931. After going through many hundreds of irrelevant documents (which, by the way, did not contain Smart’s original letter to Lemaître) and almost giving up, I have discovered two crucial documents. First, in the minutes of the Council from February 13, 1931, it is reported that:¹⁵ “On the motion of Dr. Jackson it was resolved that the Abbé Lemaître be asked if he would allow his paper “Un Univers Homogène de Masse Constante et de Rayon Croissant,” or an English translation thereof, to be published in the Monthly Notices.” This, of course, was the decision mentioned in Smart’s letter to Lemaître. Second, I found Lemaître’s response to Smart’s letter,¹⁵ dated March 9th, 1931. The letter reads:

“Dear Dr. Smart

I highly appreciate the honour for me and for our society to have my 1927 paper reprinted by the Royal Astronomical Society. I send you a translation of the paper. I did not find advisable to reprint the provisional discussion of radial velocities which is clearly of no actual interest, and also the geometrical note,

which could be replaced by a small bibliography of ancient and new papers on the subject. I join a french text with indication of the passages omitted in the translation. I made this translation as exact as I can, but I would be very glad if some of yours would be kind enough to read it and correct my english which I am afraid is rather rough. No formula is changed, and even the final suggestion which is not confirmed by recent work of mine has not be modified. I did not write again the table which may be printed from the french text.

As regards to addition on the subject, I just obtained the equations of the expanding universe by a new method which makes clear the influence of the condensations and the possible causes of the expansion. I would be very glad to have them presented to your society as a separate paper.

I would like very much to become a fellow of your society and would appreciate to be presented by Prof. Eddington and you.

If Prof. Eddington has yet a reprint of his May paper in M.N. I would be very glad to receive it.

Will you be kind enough to present my best regards to professor Eddington.”

This clearly puts an end to all the speculations about who translated the paper and who deleted the paragraphs—Georges Lemaître himself did both!

Lemaître’s letter also provides an interesting insight into the scientific psychology of (at least some of) the scientists of the 1920s. Lemaître was not at all obsessed with establishing priority for his original discovery. Given that Hubble’s results had already been published in 1929, he saw no point in repeating his more tentative earlier findings again in 1931. Rather, he preferred to move forward and to publish his new paper,¹⁷ “The Expanding Universe,” which he

did. Concerning Lemaître's request to join the Royal Astronomical Society, that request was also eventually granted. Lemaître was officially elected as an Associate on May 12, 1939.

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Acknowledgements I am deeply indebted to Liliane Moens from the Archives Georges Lemaître for sending me a copy of the letter of W. M. Smart to G. Lemaître. I am equally indebted to the RAS librarian, Peter Hingley, and the Editor-in-Chief of *MNRAS*, Bob Carswell, for allowing me to search through the RAS documents and correspondence.