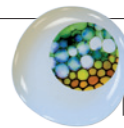


# COMMENT

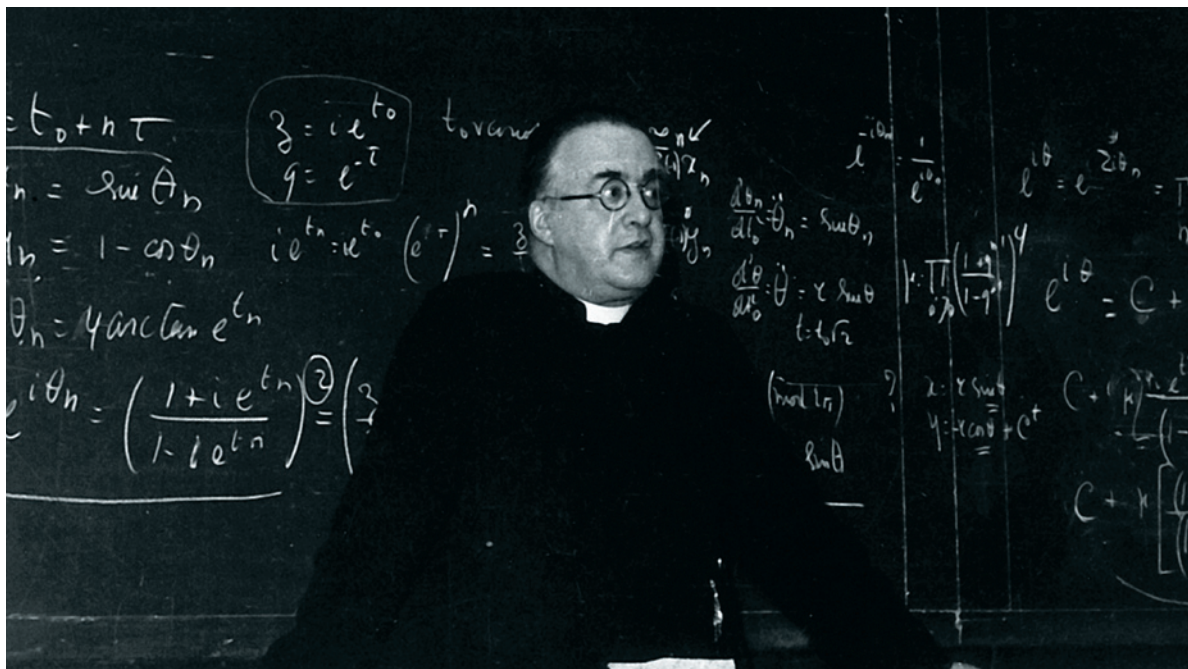
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Georges Lemaître giving a lecture at the Catholic University of Louvain in Belgium.

ARCHIVES GEORGES LEMAÎTRE/CATHOLIC UNIV. LOUVAIN/TECLIM

## Mystery of the missing text solved

A discovered letter explains the loss of key paragraphs during the translation of one of Georges Lemaître's papers about the expanding Universe, shows **Mario Livio**.

A passionate debate has flared up in recent months about who deserves the credit for one of the most profound discoveries of our time: that our Universe is expanding, and so had a beginning<sup>1-3</sup>. The American astronomer Edwin Hubble, who tracked the expansion in the velocities and distances of scores of distant galaxies during the 1920s, is usually cited. But a few articles have raised the suspicion that someone censored a key paper by the Belgian priest and cosmologist Georges Lemaître to ensure Hubble's priority<sup>2,3</sup>.

There is little doubt that Lemaître deserves the credit for proposing an expanding Universe. But the censorship charges tarnish Hubble's genuine achievement of confirming and extending the idea. As someone intimately involved with Hubble's namesake — the Hubble Space Telescope — I became intrigued by this 'whodunnit' mystery, and decided to investigate. As a result, I unearthed

**NATURE.COM**  
Edwin Hubble in translation trouble:  
[go.nature.com/hca654](http://go.nature.com/hca654)

a letter from Lemaître that, to my satisfaction, ends the debate.

Here are the background facts. By February 1922, American astronomer Vesto Slipher had measured the redshifts (frequency shifts indicating relative motions) for 41 galaxies (then known as nebulae) in the northern sky. Listing them in his 1923 book *The Mathematical Theory of Relativity*, British physicist Arthur Eddington noted that: "The great preponderance of positive [receding] velocities is very striking." But he added that a lack of observations of southern nebulae prevented him from drawing further conclusions.

In 1927, Lemaître published, in French, a remarkable paper in the relatively obscure *Annals of the Scientific Society of Brussels*<sup>1</sup>. It was entitled (in its English translation): 'A homogeneous Universe of constant mass and increasing radius accounting for the radial velocity of extra-galactic nebulae'. In it, Lemaître reported his discovery of dynamic solutions to Einstein's general relativity equations, from which he derived what ▶

► is now known as Hubble's law — that the velocity at which a galaxy appears to recede is proportional to its distance from us.

But Lemaître went beyond theoretical calculations in the paper. He determined the rate of expansion of the Universe using the velocities of the galaxies measured by Slipher (and published<sup>5</sup> by Gustaf Strömberg, a Swedish astronomer at the Mount Wilson Observatory in California), and the distances to them as determined from brightness measurements published by Hubble<sup>6</sup> in 1926. For the value of that rate, today called the Hubble constant, Lemaître obtained 625 kilometres per second per megaparsec. Lemaître also commented in the paper that the accuracy of the distance estimates available at the time was insufficient to assess the validity of the linear relation he had discovered.

Two years after Lemaître's paper appeared, Hubble published a paper<sup>7</sup> entitled 'A relation between distance and radial velocity among extra-galactic nebulae'. In it, he and his assistant, Milton Humason, used improved distances (in part based on better stellar distance indicators, such as Cepheid variables and novae) and velocities taken mainly from Slipher, to establish the existence of Hubble's law, and to determine a value for the Hubble constant of 500 kilometres per second per megaparsec.

On the basis of this story, it would seem fair to credit the discovery of the expanding Universe and the tentative existence of a Hubble law to Lemaître; and the detailed confirmation of that law to Hubble and Humason, given their subsequent meticulous observations, which extended Slipher's velocity measurements to greater distances. But here the plot thickens.

## LOST IN TRANSLATION

The English translation of Lemaître's 1927 paper was published in the *Monthly Notices of the Royal Astronomical Society* in March 1931 (ref. 8). However, during the process, a few paragraphs from the original French version were deleted, notably the one in which Lemaître described Hubble's law and derived the expansion rate.

Also missing were a paragraph in which Lemaître discussed errors in the distance estimates, and footnotes, in one of which he interpreted the proportionality between the velocity and distance as resulting from a cosmic expansion. In the same footnote, Lemaître calculated two possible values for the Hubble constant, of 575 and 670, depending on how the data were grouped.

That these paragraphs are missing from the translated paper has been known for some time, although not widely. Cosmologist Jim Peebles at Princeton University in New Jersey, noted in a volume on Lemaître in 1984 that: "It is curious that the crucial paragraphs describing how

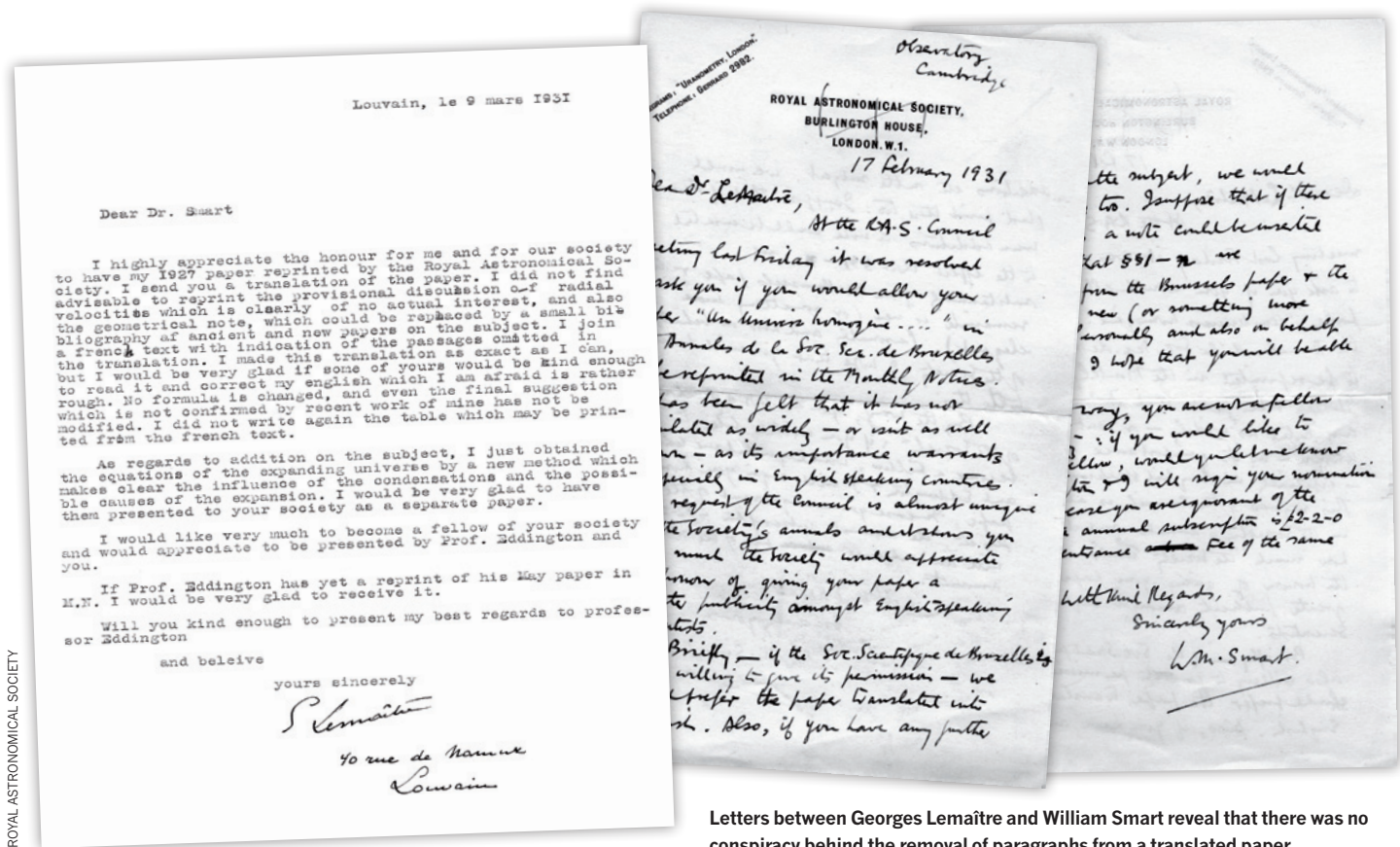
**"This clearly ends speculation about who translated the paper and who deleted the paragraphs."**

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? Canadian astronomer Sidney van den Bergh speculated earlier this year that whoever did the 'selective' editing may have done so to prevent Lemaître's paper from undermining Hubble's priority claim<sup>9</sup>. David Block, a

mathematician at the University of the Witwatersrand in Johannesburg, South Africa, suggested<sup>8</sup> further that Hubble might have had a hand in this cosmic censorship, to ensure that credit would go to himself and to the Mount Wilson Observatory, where he made the observations. Historian of science Robert Smith at the University of Alberta in Edmonton, Canada, who also believes that most of the credit for discovering the expanding Universe should go to Lemaître, has suggested that the paragraphs may have been removed as part of standard editorial practice by the editor of the *Monthly Notices*.

Wanting to find out more, I examined original documents linked to the paper. With the help of Liliane Moens from the Archives Georges Lemaître in Louvain, Belgium, I obtained a copy of the letter sent by the then editor of the *Monthly Notices*, astronomer William Marshall Smart, to Georges Lemaître, concerning the translation and publication



Letters between Georges Lemaître and William Smart reveal that there was no conspiracy behind the removal of paragraphs from a translated paper.



of his earlier manuscript. Smart asked Lemaître whether he would allow his 1927 paper to be reprinted in the *Monthly Notices*, because the Royal Astronomical Council felt that the paper was not as well known as it should be. The most important paragraph in the letter reads:

*“Briefly — if the Soc. Scientifique de Bruxells 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.”*

In my view, Smart’s letter seems innocent; there is no suggestion of extra editing or censorship. Still, Block inferred from it hints of a conspiracy<sup>3</sup>. Block proposed that the handwritten “§§1–n” should be read as “§§1–72”, indicating freedom to translate only paragraphs 1–72 of his paper; where paragraph 73 was Lemaître’s equation determining the value of the Hubble constant. Block also claimed that Lemaître was effectively being told by Smart that Hubble’s observational result of 1929 is “something more elegant”.

I was not convinced by these claims: “n” makes more sense as a simple place-holder for the end of Lemaître’s article, and the shape of the alleged number “2” does not match the same numeral that appears later. Nevertheless, the mysteries of who translated the paper and who deleted the paragraphs remained unresolved.

### CRUCIAL EVIDENCE

To definitively answer these questions, I obtained permission from Royal Astronomical Society librarian Peter Hingley, and Bob Carswell, the editor-in-chief of *Monthly Notices of the Royal Astronomical Society*, to scrutinize all of the Royal Astronomical Society Council’s minutes and the entire surviving correspondence from 1931. Eventually, I discovered two crucial documents.

First, in the minutes of the council from 13 February 1931, it is reported that<sup>10</sup>: “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, dated 9 March 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*



Edwin Hubble at work in California’s Mount Wilson Observatory in 1937.

*would be very glad to receive it.*

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

This clearly ends speculation about who translated the paper and who deleted the paragraphs — Georges Lemaître did both himself.

Lemaître’s letter also provides an insight into the scientific psychology of (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 been published in 1929, Lemaître saw no point in repeating his own more tentative earlier findings in 1931. Rather, he preferred to move forward and to publish his new paper, ‘The expanding Universe’, which he did later that year<sup>11</sup>. Lemaître’s request to join the Royal Astronomical Society, at Smart’s invitation, was eventually granted; he was elected as an associate on 12 May 1939. ■

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