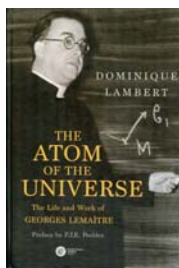


The Atom of the Universe

The Life and Work of Georges Lemaître

Dominique Lambert

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Cosmology textbooks shortchange the pioneering Belgian priest Georges Henri Lemaître (1894–1966). They describe the Friedman-Robertson-Walker metric, which underpins the application of general relativity to cosmology. They show Edwin Hubble’s redshift–distance relation, which describes the local expansion of the universe. They recount Albert Einstein’s “blunder,” the introduction of λ , the cosmological constant. And sometimes they recount Fred Hoyle’s caustic coining of “Big Bang” as an epithet: a cosmic ricochet that has prevailed over his own steady-state vision. Yet all of those were discovered, rediscovered, or least presaged by Lemaître. That’s what you get for publishing in French.

The Atom of the Universe: The Life and Work of Georges Lemaître is an exhaustive account of the cosmologist, mathematician, priest, and legendary faculty member at Belgium’s Université Catholique de Louvain—the same university from which author Dominique Lambert received his doctoral degrees in physics and philosophy. Although Lemaître possessed an enduring religious faith, it was coupled to his sharp and clearly articulated sense that physical phenomena, including observations related to the origin of the universe, cannot test the validity of religious belief. That is a useful reminder for both atheists and popes.

PHYSICS TODAY readers may find the details of Lemaître’s religious training less fascinating than his uncanny knack for being in the right place at the right time for the intellectual adventure of cosmology. He took courses from Arthur Eddington at the University of Cambridge in 1923 and thus was an early student of Einstein’s general relativity theory. By 1924 he was pursuing his PhD with Harlow Shapley, who had developed methods for measuring distances in the Milky Way based on Henrietta Leavitt’s work on Cepheid variables. That work prepared Lemaître to understand what he heard at the January 1925 meeting of the American Astronomical

Society in Washington, DC. It was there that Henry Norris Russell famously read Hubble’s “Cepheids in Spiral Nebulae,” the paper that established the existence of distant galaxies distinct from the Milky Way.

By 1927 Lemaître had worked out the basics of a time-dependent universe in general relativity (as Alexander Friedman had done before) and footnoted the empirical linear relation that today we call Hubble’s law, which links velocity and distance. That was before Hubble’s 1929 publication of his eponymous plot of galaxy distances (in hand since 1925) and velocity (determined by Vesto Melvin Slipher’s redshifts as published in Eddington’s 1923 book on general relativity).

Lambert would have us believe that Lemaître’s publishing his paper in French in a Belgian journal was not a disadvantage. But the evidence is clear that the Anglo-Saxon scientific world was not paying close attention to the *Annales de la Société scientifique de Bruxelles*. The fascinating story of the English publication (which occurred with Eddington’s help) is told here, including the interesting detective work carried out by Mario Livio and described in the November 2011 issue of *Nature*. Lemaître himself did the translation and left out the velocity–distance footnote because, by 1931, when Eddington arranged for the work to appear in the *Monthly Notices of the Royal Astronomical Society*, Hubble had much better data.

With its rich use of archival material and careful attention to Lemaître’s academic life at Louvain, *The Atom of the Universe* is both broader and thicker than John Farrell’s *The Day Without Yesterday: Lemaître, Einstein, and the Birth of Modern Cosmology* (Thunder’s Mouth Press, 2005), which focuses on Lemaître’s encounters with Einstein and his contributions to cosmology. Like Farrell, Lambert recounts Lemaître’s ongoing dialog with Einstein, in peripatetic conversations at Caltech, about the cosmological constant

“little lambda.” Eavesdropping journalists in 1933 rendered the discussion as one about a “little lamb” that followed them to school one day on their walks.

Lemaître’s interpretation of λ is almost shockingly modern: “Everything happens as though the energy in *vacuo* would be different from zero . . . we associate a pressure $p = -\rho c^2$ to the density of energy ρc^2 of vacuum. This is essentially the meaning of the cosmological constant λ .” That is more or less what we say today about the origin of the accelerating universe.

Lemaître was a significant player in the formative years of relativistic cosmology. There’s no question that his contributions are undervalued—not primarily out of ignorance or linguistic bias, but because by the mid 1930s he stopped doing original research in cosmology and devoted himself to other aspects of academic life and to matters of faith. He had no school of students to build on his contributions. If you don’t cite your own work, and if you don’t have any students to do it, who will?

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The Human Side of Science

Edison and Tesla, Watson and Crick, and Other Personal Stories behind Science’s Big Ideas

Arthur W. Wiggins and Charles M. Wynn Sr
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The *Human Side of Science: Edison and Tesla, Watson and Crick, and Other Personal Stories behind Science’s Big Ideas* is an attempt to introduce nonscientists to the world of science. To that end, authors Arthur Wiggins and Charles Wynn Sr must confront one of the most stubborn problems in science outreach: how to make scientific subjects appealing to those whose interests lie elsewhere. There are approximately as many solutions to that problem as there are popular-science authors—restricted vocabulary lists, whimsical framing devices, drawing parallels with art and literature, and many more.