SAMPLE

Famous Astronomers: Georges Lemaitre

The Father of the Big Bang

Aira Astralis

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Conclusion

This free sample contains the Introduction and Chapter 1. The complete book contains the full contents above.

Introduction

Georges Lemaitre was born in Charleroi, Belgium, on 17 July 1894, and died in Leuven on 20 June 1966, and between those two dates he did the work that this volume tells: the priest and physicist who, a decade before anyone had heard of a Big Bang, derived the expansion of the universe from Einstein's equations, connected it to the observed recession of the galaxies, and then went one step further and asked what the expansion implied about the beginning of everything.

The bare facts of the career are strange enough to bear repeating at the outset. He was a civil engineering student when the First World War interrupted him and turned him into an artillery officer, decorated for service under fire. He emerged from the war and made a decision almost no one makes: he took holy orders in 1923 and, in the same stretch of years, studied theoretical physics at Cambridge under Arthur Eddington and then at the Massachusetts Institute of Technology, completing a doctorate in 1927, the year he published the paper that should have made him famous immediately. He spent his career as a professor at the Catholic University of Louvain, teaching physics and, in his research, founding physical cosmology as a working discipline rather than a philosophical conversation.

The 1927 paper, published in French in the Brussels scientific society's Annals, did three things at once that no one else had done together. It took the equations of general relativity, which Einstein had bent into a static universe with the help of an invented constant, and solved them honestly for a universe that changes with time. It showed that the solution predicted that galaxies should recede from one another at speeds proportional to their distances. And it compared that prediction with the observed velocities and distances and estimated the constant of proportionality, two years before Edwin Hubble published the same relation from Mount Wilson. The paper appeared in a journal few leading physicists read, in a language the Anglophone center of the field did not trouble itself with, and it sat for years while the world credited the discovery elsewhere.

This volume follows the man, the physics, and the strange priority of that silence. It follows the primeval atom, his 1931 hypothesis that the universe began in the disintegration of a single heavy particle, a proposal he made in the pages of Nature and described with a candor that still reads as modern: the beginning of the universe, he insisted, was a question for physics, not for apologetics, and he spent as much energy keeping the theologians out of his equations as he did keeping the physicists in them.

The final fact of the story is the one the world has only recently written into the textbooks. In 2018 the International Astronomical Union asked its members to vote on renaming the law connecting distance and velocity the Hubble-Lemaitre law, and the vote carried. The man who had been a footnote to his own discovery for ninety years received his name on the law he had derived first, and the gesture closes a circle: the universe is expanding, the expansion had a beginning, and both of those statements were put into the language of physics by a Belgian priest in a journal his colleagues almost never opened. The chapters that follow tell how that happened, what it cost him, and why the cost was paid, quietly, without complaint, in full.

One more piece of framing belongs at the front, because the geography matters more than the reader might expect. Cosmology in the 1920s was presumed to live in Berlin, Cambridge, and Pasadena, in the countries that owned the big telescopes and the big equations, and the century's most consequential cosmological paper instead came out of Belgium, a small country rebuilding itself from a war, published by a society in Brussels best known for its congresses and its chemistry. The volume's account keeps that setting in view on purpose: the expanding universe was not discovered at the summit of the scientific establishment but in its provinces, by a man the establishment had never heard of, in a language the establishment did not read, and the fact is not a curiosity but a lesson, one this book will return to when the establishment takes four years to open the journal.

A last instruction to the reader, before the chapters begin. The story that follows has a recurring rhythm, and knowing it in advance will keep the account's turns from feeling like misfortune: Lemaitre says something true, the truth is ignored, the evidence accumulates elsewhere, and the field arrives, years late, at the position he staked out first. The pattern will repeat with the expansion, with the origin, with the cosmological constant, and with the name on the law, and each repetition is worth watching, because the pattern is not one man's bad luck but the ordinary weather of science, the way a big truth actually gets in. The reader who finishes this volume will know one founder's whole journey through that weather, from the Charleroi coal country to the hyphen in the textbooks.

Chapter 1: The Discovery of Georges Lemaitre

The discovery of Georges Lemaitre, in the sense this series gives the word, is the story of how a particular mind came to hold a particular truth: the long apprenticeship before the 1927 paper, and the unusual shape of the life that produced it. The making begins in Charleroi, an industrial town in the coal belt of Belgium, where he was born in 1894 into a devout family of the provincial middle class, the eldest of four children, a boy who took to mathematics the way other boys took to the local football pitch, early and completely.

The engineering turn came at the University of Louvain, where he entered in 1911 to study civil engineering, a choice that tells as much about the mind as any later one: he wanted the mathematics that builds things, the calculus of structures and strains, and he was, by every later account, a builder in that sense his whole life. The First World War interrupted the studies in the way it interrupted a generation, and Lemaitre enlisted in the Belgian army as an artillery officer, serving in the front lines for four years, directing fire and calculating trajectories under bombardment, decorated with the War Cross and further cited for gallantry. The war gave him a working intimacy with ballistics and calculation under pressure, and it gave him something else the biographies all note: a firsthand conviction that the world's machinery could be understood, because he had spent four years using that machinery to terrible effect.

The double vocation announced itself immediately after the armistice. He returned to Louvain, completed a doctorate in mathematics and the sciences by 1920, and began the seminary path in parallel, entering the Maison Saint-Charles in Malines in 1920 and being ordained a Catholic priest in 1923. The ordination is the fact that outsiders find most remarkable and that Lemaitre himself treated as entirely unremarkable: he had concluded, as he later said plainly, that he had a vocation to the priesthood and a vocation to science and saw no reason to choose between them, the two truths coming, in his settled metaphor, from the same author along different roads.

The scientific apprenticeship then took him abroad with a speed that shows how seriously the Belgian church and university took him. In 1923, the year of his ordination, he went to Cambridge as a research student in astronomy, working with Eddington, who was then the most influential theoretical astronomer alive and who gave the young priest both mathematical rigor and a first immersion in the problems of stellar dynamics and the relativistic models of the universe that Eddington was one of the few people alive to understand. From Cambridge he moved to the United States, working at Harvard and at MIT, where he completed a second doctorate in 1927, and

where he visited the American observatories, meeting Vesto Slipher, whose spectrograms of the spiral nebulae contained the velocities that would become the observational half of everything Lemaitre would prove, and seeing at firsthand the astronomical culture of the New World that was about to overtake Europe's.

The discovery itself then happened with astonishing speed. Back at Louvain as a lecturer in 1925, he took the problem Eddington had posed, the reconciliation of the relativistic models with the observed motions of the nebulae, and solved it by a move of great simplicity: he treated the universe as homogeneous and isotropic, as the relativists were learning to do, but he let the radius change with time and did not stop it. The result, published in 1927 in the Annals of the Scientific Society of Brussels, was the expanding universe, complete with the velocity-distance relation and an estimated value of the constant, derived from Einstein's field equations and compared honestly with Slipher's velocities and Hubble's distances.

Einstein, meeting him at the Solvay Conference in Brussels that year, told him, in the conversation Lemaitre would recall for the rest of his life, that his mathematics was correct but his physics was abominable. The world of physics agreed with Einstein, briefly, and the discovery waited four more years to be noticed at all.

The chapter's honest close is that the discovery of Georges Lemaitre was also a discovery about institutions: the truth had been published, in a correct solution, in a journal the center did not read, and the center did not know the truth until circumstances made it impossible to miss. The apprenticeship that made the paper possible, the seminary and the artillery, the Cambridge and the American observatories, all of it arrives at 1927; what follows in the rest of this volume is the long history of the world catching up to a man who was, in the matter of the expanding universe, simply and provably first.

The family and the landscape deserve their paragraph in the making, because biographers keep returning to both. He was born into a devout Catholic household of the professional class, the father a glassworks solicitor in a town whose skyline was the furnace and the slag heap, and the boy's precocity in mathematics was early enough and deep enough that his schooling became a matter of moving him to where the teaching could keep up. The devoutness and the industry of the region both went in: the vocation announced itself in childhood piety, the mathematics in childhood puzzles, and the two grew side by side through the Jesuit college at Charleroi and the university years, arriving at ordination and doctorate as twin results of a single development rather than a midlife division.

The American interlude also deserves a second paragraph, because the journey's yield was larger than a degree. He crossed in 1924 to work at Harvard College Observatory and MIT, in the years when the American observatories were assembling the data that would decide cosmology, and he used the trip as a reconnaissance: the lectures he heard and gave, the astronomers he met, Shapley among them at Harvard, the spectrograms of the nebulae whose velocities were becoming the field's deepest puzzle, all of it traveling home with him. The 1927 paper's comparison with observation was not a library afterthought: it was built from the connections and the data of the American year, and the making of Lemaitre is thus also the story of a Belgian who went looking for the numbers and found them before the numbers' owners knew what they meant.

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ABOUT THE AUTHOR

Aira Astralis is a science writer specializing in astronomy and space exploration. Her work spans the full breadth of humanity's relationship with the cosmos -- from the earliest naked-eye observations to the engineering marvels of modern space missions.

Her books are built on a foundation of primary sources: peer-reviewed research, mission archives, and direct engagement with the scientific community. She writes for readers who want to understand not just what we know about the universe, but how we came to know it.

She believes that the most important frontier is not out there but in the gap between what scientists discover and what the public understands. Her books exist to close that gap.