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V. J. FRENKEL

LEMAÎTRE, GEORGES (b. Charleroi, Belgium, 17 July 1894; d. Louvain, Belgium, 20 June 1966), *astrophysics, cosmology*.

Georges Lemaître was the oldest son of Joseph Lemaître, a factory owner, and Marguerite Lanny, the daughter of a brewer. His parents were devout Catholics and in 1904 sent him to a Jesuit school in Louvain, where he received education in religion, humanities, and classical languages. Attracted by the exact sciences, he enrolled at the Catholic University of Louvain in 1911, where he studied engineering. Lemaître served as a soldier in the Belgian army during World War I and received several military honors. After the war he returned to the University of Louvain, where he changed from engineering to mathematics and physics. He received his doctorate in 1920. In 1927 he was appointed professor at the university, a position he kept until his retirement in 1964.

Parallel with his scientific career, Lemaître had an ecclesiastical career in the Catholic church. After

theological studies he was ordained as an abbé in 1923 and later he obtained the rank of monseigneur. From 1960 until his death he served as president of the Pontifical Academy of Sciences in Rome. Lemaître published several theological works. He believed that religion and science should not be mixed, although they would ultimately lead to the same truth. Lemaître believed that God would hide nothing from the human mind, not even the physical nature of the very early universe. This epistemic optimism, derived from his Christian belief, may have helped him in formulating the first scientific creation cosmology.

Lemaître's scientific career began in 1923, when he received a traveling fellowship. He went to Cambridge and studied under Eddington, under whose influence he specialized in the theory of general relativity. In 1924 and 1925 he continued his postgraduate studies in the United States, at Harvard and MIT. During his stay in the United States, he attended the American Astronomical Society conference in Washington, at which Hubble's discovery of the Cepheid variables in the Andromeda nebula was announced. He became increasingly occupied with cosmology and, while at MIT in 1925, suggested a modification of de Sitter's cosmological theory. Lemaître's model was nonstatic and included a red shift caused by the Doppler effect. After his return to Louvain, he developed his theory further, and in 1927 he published a new cosmological theory that combined the advantages of the earlier theories of Einstein and de Sitter. Lemaître showed that the field equations of general relativity allowed an expanding universe and derived a velocity-distance relation. Although Lemaître's universe was expanding, in 1927 Lemaître's theory did not involve a creation or a definite age. The basic equation of Lemaître's theory was nearly the same as the one found by Alexander A. Friedmann in 1922, but Lemaître had been unaware of Friedmann's work.

Lemaître's paper went unnoticed until 1930, when he called Eddington's attention to it. Eddington strongly endorsed Lemaître's work and had it translated into English. In 1931 Lemaître moved from obscurity to fame. He suggested that the world might have originated from just one quantum of enormous energy and later the same year he developed this scenario into the hypothesis of the primeval atom. According to Lemaître's "fireworks theory of evolution" the world started as a super-radioactive disintegration of the primeval atom. During the 1930's he published several expositions of this idea, the first example of a big bang cosmology. He believed

that it could be put to observational tests and that the cosmic rays were remnants of the original super-radioactive disintegration.

In order to decide whether the cosmic radiation is of cosmogonic origin, Lemaître engaged in the 1930's in an extensive examination of the orbits of charged particles in the geomagnetic field. This work, done in collaboration with Manuel Sandoval Vallarta, was seriously criticized by Fredrik Störmer, the dean of the field. The idea of the primeval atom also had consequences regarding the formation of galaxies and clusters of galaxies. Lemaître studied these consequences in several papers and believed that they were supported by astronomical observations.

Lemaître's work was primarily in cosmology and astrophysics, but he also worked in other fields. He was an able mathematician who liked to deal with classical mathematical problems such as the three-body problem, and he was very interested in the computational problems of astronomy.

Lemaître favored a simple and direct approach to the study of the universe and emphasized physical ideas rather than mathematics. He did not believe that cosmology could be made a deductive science and disliked tendencies of mysticism or apriorism. During the 1930's Eddington, Edward Milne, and others developed cosmological theories which were based upon a priori principles and rational thought. Lemaître was opposed to these rationalist cosmologies and also to the later steady state theory, which he criticized for being founded on philosophical rather than scientific reasoning.

Lemaître received many awards and honors. In 1934 he received the Osborne Mendel Medal (U.S.A.) and the Prix Franqui (Belgium) and in 1953 the first Eddington Medal (England).

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HELGE KRAGH

LEVERETT, FRANK (*b.* Denmark, Iowa, 10 March 1859; *d.* Ann Arbor, Michigan, 15 November 1943), *glacial geology*.

Leverett was the eldest child of Ebenezer Turner Leverett and Rowena Houston Leverett, descendants of English emigrants who settled in the Massachusetts Bay Colony in the mid seventeenth century. He was educated in Denmark, Iowa, first in the public schools and later at the Denmark Academy. Upon completion of these studies in 1878, at age nineteen, he took a teaching position in the public schools in Denmark. From 1880 to 1883 he served as instructor in natural sciences at the Denmark Academy. This appointment proved to be a turning point in Leverett's career, for during these years he became interested in geology, frequently leading his students to fossiliferous localities in nearby Pennsylvanian strata. During this time he also fulfilled college language requirements in Latin and Greek that would permit him to continue his education.

Though he never again engaged in full-time teaching, Leverett maintained close ties with the academic community through his position as staff lecturer at the University of Michigan. He spent the academic year 1883–1884 at Colorado College, Colorado