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JABEZ CURRY STREET

1906—1989

A Biographical Memoir by

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JABEZ CURRY STREET was a boldly innovative experimental physicist whose discoveries in cosmic rays influenced decisively the course of high-energy physics. His crucial single discovery was the clear identification of a new fundamental particle, now called the muon. His cosmic-ray research was interrupted by World War II, during which Street, as a member of the Radiation Laboratory at MIT, made major contributions to the development of RADAR and LORAN, the global radio navigation system. After his return to Harvard he added the development and use of particle beams from high-energy accelerators to his research program. As a teacher of physics he brought simplicity of concept and his enthusiasm to graduate and undergraduate students.

Street was born on May 5, 1906, in Opelika, Alabama, to Anne Dunklin and Jabez Curry Street. In 1927 he received his bachelor of science degree in electrical engineering at the Alabama Polytechnic Institute. Street worked from 1927 to 1928 at the Brooklyn Edison Power Company. In the fall of 1928 he entered the master's program in physics at the University of Virginia, where Jesse W. Beams had just arrived from Yale. Beams persuaded Street to enter the doc-

toral program and supervised his thesis, "The Fall of Potential in Electrical Discharges," which he completed in 1931.

Street then became a research fellow at the Bartol Research Laboratory in Swarthmore, Pennsylvania. Working with W. F. G. Swann and using an ion chamber for the measurement of cosmic radiation, he joined a pioneering investigation of the nature of cosmic radiation originating in outer space and its secondary radiation products. He also worked with Thomas H. Johnson, using Geiger counters and vacuum tube circuits as "telescopes" to determine that the incoming particles were deflected by the earth's magnetic field and therefore were electrically charged. Later Dr. Johnson moved their apparatus to the higher and lower latitudes of Mexico City to show there was an east-west effect, with the west intensity being greater, corresponding to positively charged particles being a dominant component of the primary cosmic radiation. Street's and Johnson's experiments were of great importance since, at the time, there was heated debate as to whether the primary cosmic rays were charged particles or uncharged photons.

Street continued his experimental research at Harvard, where he arrived as an instructor in 1932. It had become clear that the cloud chamber was key to resolving the debate on the nature of cosmic radiation; a charged particle creates a visible track in a cloud chamber, and the addition of a magnetic field allows measurement of its charge and momentum. With a series of grants from the Milton and Whiting funds and the help of his colleague Harry R. Mimno, as well as research associates and graduate students, Street designed and built a large electromagnet and cloud chamber for his research. This was a straightforward task for Street, who, like a number of physicists of his generation, benefited from his earlier training in electrical engineering. In 1934-35 Street assembled the electromagnet and cloud

chamber, which contained absorbing sheets to study the properties of cosmic-ray showers.

The observations that Street and Edward C. Stevenson made with the cloud chamber in this new magnet convinced them that the most penetrating cosmic rays must be something entirely new to physics. Earlier experiments by B. Rossi, Street, R. H. Woodward, Stevenson, C. D. Anderson, and S. H. Neddermeyer had indicated the presence in cosmic rays of particles too penetrating to permit identifying them as electrons if the quantum theory of their interaction with matter were valid. Street and his associates with the new detector system efficiently and brilliantly conceived and executed a series of experiments that yielded two important results. First, they showed that cosmic-ray showers were in accord with quantum mechanical theories of the interaction of radiation and matter and, second, that the most penetrating cosmic rays were previously unknown positive and negative particles. In 1937 the case was clinched by Street and Stevenson's picture of a curved track from which the mass of the new particles could be deduced. It was much larger than the electron mass and smaller than the proton mass. This new particle, now called the muon, was the first discovered member of what proved to be a whole new family of elementary particles.

In the fall of 1940 Street closed down his cosmic-ray experiments to join the Radiation Laboratory at MIT, where he developed the "bootstrap," a pulser for a high-voltage magnetron. As head of the navigation division he made important contributions to the development of the global radio navigation system LORAN. His knowledge of LORAN led to an appointment at a critical time as associate director of the British branch of the Radiation Laboratory. Street proved to be an outstanding research administrator. He could listen to proposals, ask astute questions until he had a full

understanding, and then make wise decisions as to whether a project should be pursued. On his return from Britain he assumed the position of head of the ground and ship division and remained at the Radiation laboratory until the end of the war.

In 1945 Street returned joyfully to teaching and cosmic-ray research at Harvard. Initially he resumed his studies of cosmic rays with his new graduate students, William Whittemore, Earle Fowler, Rodney Cool, Ann Chamberlain Birge, Robert Carter, and George Nonnemaker. They used the cosmic-ray cloud chamber at Harvard and a new cloud chamber in a deep mine for further cosmic-ray studies, including observations of the density effect for cosmic-ray muons. During the next few years as a result of the availability of new technology (and increased funding!) the search for new particles shifted from the study of cosmic rays passing through a cloud chamber to the study of the interactions of high-energy particles, which were produced with a new generation of particle accelerators and which passed through a cloud chamber or later a bubble chamber. Street played an active role in the development of the Brookhaven National Laboratory with its Cosmotron and later in the creation of the Cambridge Electron Accelerator Laboratory with its 6-GeV electron synchrotron. As founding member of the Cambridge Bubble Chamber Collaboration, Street contributed to their studies of the production and decay of many of the new particles. Street was elected to the National Academy of Sciences in 1953.

A superlative experimenter, Street was also a fine teacher. His explanations were lucid, and he emphasized the role of simple but decisive experiments. Delivered with a southern accent, his lectures had a special appeal and were greatly appreciated. With Wendell H. Furry and Edward M. Purcell he wrote a textbook that grew out of their Harvard under-

graduate teaching. Street's graduate students also felt his enthusiasm and encouragement and his respect and concern for the individual student. As one of his graduate students recalled: "With Curry we felt that we were indeed on the point, at the leading edge of the discovery of new physics. It was important, it was exciting, and a lot of the time it was fun. We were truly lucky." Another of Street's graduate students from the 1940s recalled "Professor Street's very serious dedication to general politeness to women . . . long before such consciousness-raising issues were generally observed. . . . He was incensed by any carelessly made remarks. . . . [There were] times when he demanded immediate and complete apology."

Curry Street and his wife Leila frequently entertained students, colleagues, visiting scientists, and friends in their Belmont home. These gatherings were memorable for delicious food, cordial and stimulating conversation, and, on occasion, live performances by a string quartet of the chamber music the Streets loved.

Street brought wisdom, fairness, and courtesy to his roles as university administrator. He served as chairman of Harvard's physics department (1955-60), acting director of the Cambridge Electron Accelerator (1962-63), and science advisor to the dean of faculty of the College of Arts and Sciences at Harvard (1966-72).

Street married Leila Tison in 1939. He was the father of a daughter, Caroline Street Trickey, an artist, homemaker, and mother of three children, of Charleston, South Carolina, and a son, Curry Tison Street, a violinist and composer, of Boston.

Once Street spoke of the changes that people undergo and display as they age. He said people simply become "more so" of what they were previously. A colleague described him as "humane and wise." These qualities marked Street through-

out his life, and to the end he was "more so." He died on November 7, 1989.

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