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Rainwater, Leo James

Rainwater, Leo James (1917-1986), American physicist and Nobel laureate in physics. Rainwater shared the 1975 Nobel Prize for physics with Danish physicists Ben Mottelson and Aage N. Bohr. The three physicists won the prize for work unifying two theoretical models of the atomic nucleus.

Rainwater was born in Council, Idaho. He graduated from the California Institute of Technology in 1939 with a bachelor's degree in physics. He received his doctoral degree from Columbia University in 1946 for work he did at Columbia for the Manhattan Project, the group of scientists who developed the atomic bomb (see Nuclear Weapons) during World War II (1939-1945). Rainwater became a professor at Columbia in 1952, and remained there, teaching and doing experimental work in physics, until he retired in 1986. Rainwater also served as director of the university's Nevis Cyclotron Laboratory from 1951 to 1953 and from 1956 to 1961.

In 1949 Rainwater started studying the fundamental structure of the center and largest part of an atom that holds the neutrons and protons, called the nucleus. At that time, there were two basic ideas about how the nucleus behaved. Danish physicist Niels Bohr (the father of Aage Bohr, one of the scientists with whom Rainwater shared the Nobel Prize) had formulated the liquid-drop model for the nucleus in 1936. This model describes the nucleus as a drop of liquid, capable of changing shape. The shell model was developed by the German American

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physicist Maria Goeppert-Mayer and German physicist J(ohannes) Hans Daniel Jensen in 1949. In this model, the particles (protons and neutrons) inside the nucleus (nucleons) move in concentric orbits around the center of the nucleus.

Both models had problems. The liquid-drop model helped explain nuclear fission, but could not explain other important nuclear phenomena. The shell model also offered explanations for some things and failed on others. Rainwater realized that he could solve the discrepancies produced by both models by thinking of the nucleus as oblong in some situations.

Rainwater justified his oblong nucleus by developing a model that drew from the shell model. He proposed that the outer orbit of particles in some nuclei did not have the right number of particles for the forces between the particles to balance each other and make the nucleus a sphere. Instead, it would be deformed by the forces of the particles in the inner orbits on the particles in the incomplete outer orbit. Mottelson and Aage Bohr confirmed Rainwater's theory in 1953, after using the model to calculate how a nucleus would behave in certain situations and comparing their results to experimental data.

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