Frederick Reines Biography

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Biography

Reines was born in Paterson, New Jersey, on March 16, 1918. He did his undergraduate work at the Stevens Institute of Technology and earned his Ph.D. in theoretical physics from New York University in 1944. After graduation, he worked at the Los Alamos Scientific Laboratory on nuclear weapons research. He left Los Alamos in 1959 to become head of the physics department at Case Institute of Technology. In 1966, Reines moved to the University of California at Irvine where he became professor of physics and dean of physical sciences.

Reines is best known for his discovery of the neutrino in the mid-1950s. The neutrino is a tiny particle with no electrical charge and very little mass. It was predicted in the early 1930s by Wolfgang Pauli as a way of explaining the apparent violation of the conservation of energy during beta decay. The neutrino originated, therefore, as a "gimmick" for dealing with a difficult phenomenon that had no other explanation. Physicists were long uncertain as to whether such a particular actually existed.

In collaboration with Clyde L. Cowan, Jr., Reines set out to detect the elusive little particle. The search was particularly difficult because neutrinos interact with matter only rarely. In fact, the vast majority produced in space pass through the earth without interacting with a single atom. The task faced by Reines and Cowan was to design and experiment in which the probability of detecting a neutrino was maximized.

In order to do so, they made use of nuclear reactors at the Savannah River Nuclear Power facility. Reines designed and built a detection system that focused on one particular neutrino reaction and that ignored the many other reactions that would be taking place simultaneously.

In 1956, the experiment proved successful and existence of the neutrino was conclusively demonstrated. Since 1956, Reines has been working on neutrinos produced naturally by cosmic rays. The research makes use of huge underground vats of perchloroethylene. For this experiment, Reines has developed sophisticated detection systems that can sort out neutrinos from other subatomic particles produced by cosmic rays.