Neutrino Encyclopedia Article

Neutrino

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The neutrino, whose symbol is the Greek letter *nu*, is a neutral massless particle that is created during beta decay and travels at the speed of light. Its existence was suggested to explain missing **energy** and angular momentum when a beta particle was emitted from a radioactive element. Wolfgang Pauli suggested in 1930 that beta decay must involve a third particle that would be neutral, have negligible rest **mass** and a spin of one-half. Enrico Fermi named this particle the *neutrino*, Italian for little neutral one, and its existence was accepted without further evidence. It was not until 1953 that Frederick Reines and Clyde Cowan devised an experiment to detect the neutrinos that should be produced by the **nuclear reactions** taking place in a nuclear reactor. They succeeded, and Reines was awarded the 1995 Nobel Prize in Physics for that work.

Discoveries in the field of physics during the second half of the Twentieth Century have led to the development of a new classification system for atomic and **subatomic particles** that is based on their interactions. Under this system, the neutrino is classified as a lepton, the category for light particles (*lepton* is derived from a Greek word meaning light) with a spin of one-half that interact via the weak nuclear force but do not respond to the strong force. Because they interact with **matter** only via the weak force, neutrinos are hard to detect. Nevertheless, they have been detected on earth and in space. A very important source of neutrinos turned out to be supernovae: studies on SN1987 show that most of the energy of the supernova was emitted as neutrinos. The core of the exploding star was converted to neutrons during the explosion when protons and electrons were forced together in reverse beta decay, producing the neutrinos.