Ernest T. S. Walton Biography

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Biography

Walton was born in Dungarvan, County Waterford, Ireland, on October 6, 1903. He earned a bachelor of arts degree from Trinity College, University of Dublin, in 1926, and master of science (1928) and master of arts (1934) degrees from the same institution. He received a scholarship to Cambridge University, from which he received a Ph.D. degree in 1931. He returned to Trinity College, Dublin, in 1934, where he was elected Erasmus Smith Professor of Natural and Experimental Philosophy and Head of the Department of Physics in 1947.

While a graduate student at Cambridge, Walton completed the research that led to a share of the 1951 Nobel Prize for physics (with John Cockcroft). The prize was awarded for Cockroft and Walton's development of a particle accelerating device that now carries their names.

Walton's interest in particle accelerators went back to the late 1920s. Like many other scientists, he recognized the inherent limitations of using particles from naturally-occurring radioactive materials to induce changes in atomic nuclei. Rutherford had been successful in producing the first nuclear transformations using alpha particles from naturally-radioactive isotopes. But alpha particles from such sources are too few in number and have too little energy to be used for most of the transformations that scientists want to study.

In 1928, Walton experimented with efforts to accelerate electrons in straight lines and in circles. Both methods failed because the high frequency sources needed for the machines were not available. Walton's methods were, however, to form the basis for a more successful linear accelerator and bevatron constructed in the 1930s and 1940s.

While working at the Cavendish Laboratory in Cambridge in 1929, Walton and Cockroft heard about speculations by G. Gamow, E. U. Condon, and R. W. Gurney that high energy particles have a small, but significant, probability of overcoming the electrical repulsion of an atom and entering its nucleus. In response to this hypothesis, the two scientists constructed a machine that could accelerate hydrogen ions (protons) to energies of 700,000 electron volts.

When these protons were used to bombard a lithium target, Walton and Cockroft found that large numbers of alpha particles were emitted. They concluded that protons had collided with lithium nuclei, causing them to break apart into two helium nuclei (alpha particles) as follows: 3Li7 + 1H1 ----> 2 2He2.

The 1951 Nobel Prize recognized both the development of the particle accelerator and the discoveries of nuclear reactions Walton and Cockroft made with it.