



# 'SPLITTING THE ATOM'

Cockcroft and Walton, 1932

## 2. Disintegrating the Nucleus

Almost ten years before becoming the Director of the Cavendish Rutherford, working with Geiger and Marsden in Manchester, had discovered that every atom contains a compact nucleus at its centre. All the positive charge is contained in a roughly spherical region in the atomic centre with a diameter around 1000 times smaller than the atom.

He went on to see if these nuclei could be broken up. Marsden had bombarded several elements with alpha-particles and sometimes found that hydrogen ions were emitted with ranges four times that of the original alpha-particles, often called 'knock-on' protons. Rutherford suspected that the alpha-particles were knocking out particles from the nuclei which he had discovered, so began to perform his own experiments.

Rutherford was doing this research at the end of 1917, during the First World War. One day he was so engrossed in his work that he forgot to attend an important meeting of the war research committee. He explained his absence: 'I have been engaged in experiments which suggest that the atom can be artificially disintegrated. If it is true, it is of far greater importance than a war!'

By 1918 Rutherford, in Manchester, had carried out a number of experiments colliding different gases with energetic alpha-particles. The most remarkable result concerned the bombardment of nitrogen nuclei in which very fast protons were created. He interpreted the result as the disintegration of the nitrogen nucleus. He published his research in 1919, the year he became the Cavendish Professor. **In 1925 Patrick Blackett, using his automated cloud chamber, succeeded in showing that the fast protons in fact resulted from the transformation of a nitrogen nucleus into a rare isotope of oxygen, a genuine transformation of the elements.**

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Disintegration of Nitrogen into oxygen and a proton  
(photographed by P.M.S. Blackett in 1925)