



# James Chadwick

1891 - 1974

Awarded the Nobel Prize for Physics in 1935

**It is known that everything is made up of trillions of incredibly tiny particles called *atoms*.**

By 1911, Ernest Rutherford had shown that an atom has a heavy central part, called the *nucleus*. This contains the sub-atomic particles named *protons* and *neutrons*. Lighter particles called electrons orbit around it. Each proton has a positive electric charge, the electron has a negative one. **Neutrons are the same size as protons but they have no electrical charge at all.**

The famous British physicist James Chadwick determined the existence of neutrons and for this discovery he was awarded the Nobel Prize in 1935.

Chadwick was born in Bollington, Cheshire, near Manchester. He was the eldest of the four children of Anne Mary and John Joseph Chadwick. His father had a laundry business. After attending Manchester Secondary School he went to the local university to study mathematics but by mistake he was admitted to physics! Being so shy, Chadwick did not make known the mistake and decided to continue with physics. After graduating he went to Cambridge and started research into atomic structure under Rutherford.

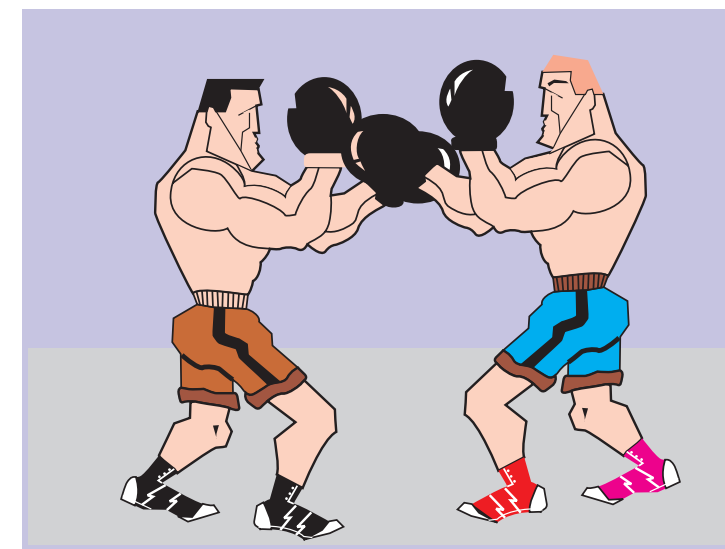
In 1913 he was awarded an 1851 Exhibition Scholarship which enabled him to go to Germany to study radioactivity with Hans Geiger. While he was in Germany, World War I began and Chadwick was interned as a foreign enemy and confined for more than four years in a civilian prison camp. He suffered from cold and hunger but was permitted, with the help of the German physicists, Planck, Nernst, and Meitner, to carry out some experiments. On his return to Britain in 1919 he received a scholarship at Cambridge and continued to work with Rutherford on the alpha - particle experiments and soon afterwards they discussed the concept of the neutron.



*He was interned  
for 4 years in Germany  
as an enemy alien*



*He had  
an argument  
with Rutherford*



From 1923 to 1935 Chadwick was an assistant director of research at the Cavendish Laboratory. It was during this period, in 1932, that he made his discovery. He investigated the radiation given off when beryllium is bombarded by alpha-particles (helium nuclei). He proposed that alpha-particles knock 'neutrons' out of the nuclei of beryllium atoms and that these neutrons in turn knock protons out of the paraffin. Energy measurements confirmed his suggestion. Performing the same experiment with other targets he calculated the mass of the neutron. This discovery was of great importance for the investigation of nuclear structure because the neutron, being uncharged, can penetrate deep into atoms.

Chadwick's relationship with Rutherford was very close and friendly but in the early 1930s some disagreement between them arose. Chadwick believed that the cyclotron particle accelerator would become an essential tool for nuclear research, and he wanted a cyclotron at Cambridge but Rutherford refused it. In 1935, Chadwick left Rutherford and accepted the Lyon Jones chair at the University of Liverpool. Soon he had his cyclotron and this made the department there a leading centre for atomic physics. He spent most of World War II in America as head of the British mission to the Manhattan project on the development of the atomic bomb. He was knighted in 1945. He also received many scientific honours and awards.

Chadwick was tall and slender with dark hair and a swarthy complexion. By nature he was shy and reserved but full of kindness. He had a deep voice and a dry sense of humour. Chadwick married Aileen Stewart-Brown from Liverpool in 1925, and they had twin daughters. At the end of his life they lived in Cambridge near their children.