

Dorothy Hodgkin



Dorothy Hodgkin was a pioneering scientist, a peace activist, a mother of three and a Nobel Prize winner. Here we look at her Life in Science.



Dorothy Hodgkin was born in Cairo, Egypt in 1910. Her father was employed by the education service and also worked as an archaeologist. Her mother shared his enthusiasm for archaeology and was also a botanist and talented illustrator.

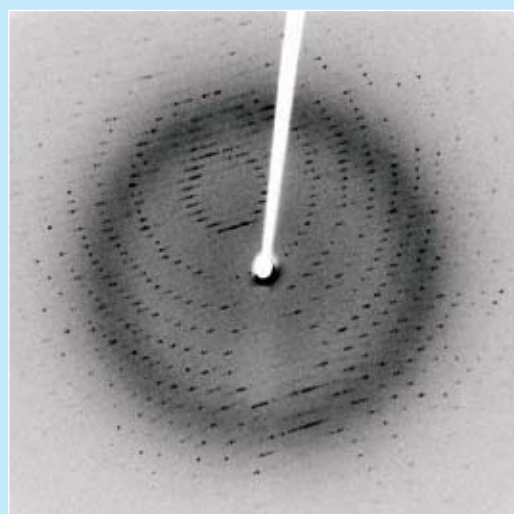
Dorothy was four when the First World War broke out. Her parents left her and her three sisters in England with relatives and returned to Egypt. After the war, her mother decided to stay at home and educate her children, which was a very happy time for Dorothy.

She began to study chemistry at school at the age of 10. She was one of only two girls who joined the boys' chemistry class as girls usually studied domestic science and physiology where the boys did pure science. The first lesson was in growing crystals. Dorothy enjoyed it so much that she set up a little lab at home and, with the help of the

local chemist who sold her all sorts of chemicals, began growing them for herself. This was to form the basis for her future career.

After school, Dorothy studied Chemistry at Oxford University. Her father was not very keen on her studying Chemistry, but encouraged by her mother she stuck with her choice. After gaining her degree she went on to Cambridge to study for a further degree (a 'doctorate'). She chose to go into the new field of X-ray crystallography and was one of the first to apply it to biological molecules.

Box 1 Crystal structure



The X-ray diffraction pattern produced by a complex crystalline substance similar to insulin

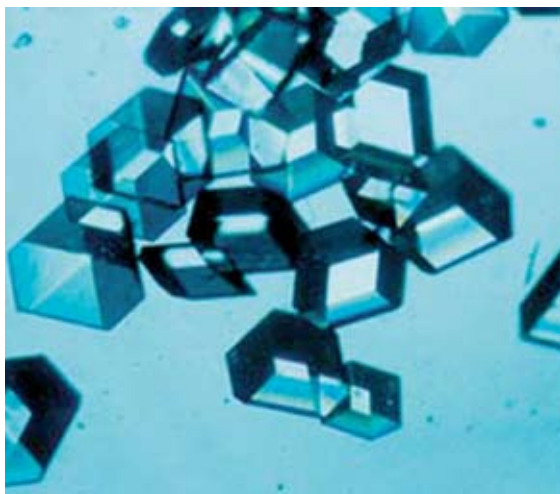
X-ray crystallography is the method used to determine the arrangement of atoms within a crystal. The first step is to grow a good quality crystal. A beam of X-rays is then fired at it and scattered into many different directions. From the angles and intensities of these reflected beams the crystallographer can calculate a 3-dimensional picture of the density of the electrons in the crystal. From this electron density, the positions of the atoms in the crystal can be worked out. As many different materials can form crystals it is useful in many fields of science.

A few years later, Dorothy returned to Oxford and continued to work on finding the structure of biologically important molecules. The molecules that she concentrated on were huge and without computers to do all the necessary calculations it was a very slow process to find their structure.

Dorothy always chose difficult and very time consuming projects. During the Second World War she was given some of the new and exciting antibiotic penicillin. Up to that point the drugs which were available for fighting infections were limited and there was much hope that penicillin would be a breakthrough. Initial trials were very positive, but without knowing the structure it would be difficult to synthesise (make artificially). It took 4 years, but Dorothy solved the puzzle of the structure in 1946, paving the way for mass production of the drug.

In 1953, Dorothy was one of the first people to see the model of DNA constructed by Francis Crick and James Watson. The structure of that, too, was solved with the help of X-ray crystallography (although that work was done by Rosalind Franklin).

The molecule insulin is the one for which she is best known. She considered solving the structure of it her greatest scientific achievement. She was first given some in 1934 and it fascinated her because it has such a wide-ranging effect on the body. At that time, however, X-ray crystallography techniques had not been developed far enough to be able to solve such a large and complex structure. Along with many colleagues she spent years improving and refining the processes until 35 years later in 1969 she finally resolved the structure.



Insulin crystals, as required for X-ray studies

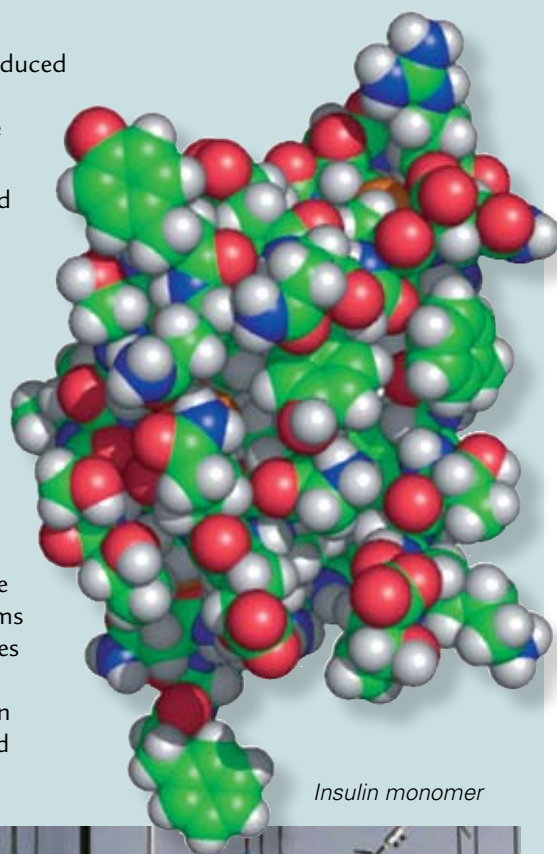
At the age of 24, Dorothy was diagnosed with rheumatoid arthritis. Even with this disability she achieved a huge amount in her chosen field. In 1964 she was awarded the Nobel Prize in Chemistry in recognition for her work. Aside from her scientific activities, Dorothy Hodgkin was a member of various international peace organisations. She died in 1994.

Vicky Wong is Chemistry editor of Catalyst

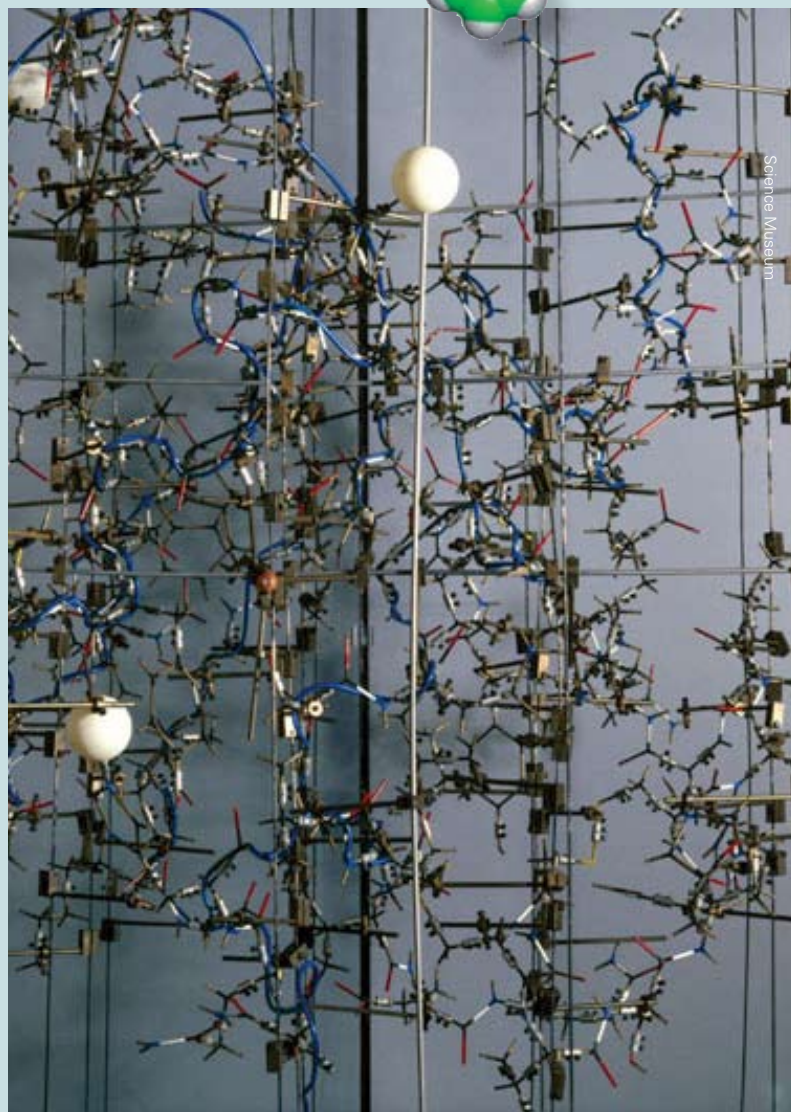
Box 2 Insulin

Insulin is a hormone produced by the pancreas. If not enough is made then the result is diabetes.

Dorothy Hodgkin worked out the structure of the insulin molecule over 35 years – below is her model which can be seen in the Science Museum. It consists of two peptide (amino acid) chains which are linked by bonds between two sulfur atoms. On the right is a space-filling model of the same molecule. The atoms are represented as spheres and are colour-coded: carbon (green), hydrogen (white), oxygen (red) and nitrogen (blue).



Insulin monomer



Science Museum