**X-ray crystallography** [**http://invigorate.royalsociety.org/ks3/crystal-clear/ambition.aspx**](http://invigorate.royalsociety.org/ks3/crystal-clear/ambition.aspx)

* [Who was Dorothy Hodgkin?](http://invigorate.royalsociety.org/ks3/crystal-clear/ambition.aspx#hodgkin)
* [What is x-ray crystallography?](http://invigorate.royalsociety.org/ks3/crystal-clear/ambition.aspx#xray)

Go to <http://trailblazing.royalsociety.org/> and see if you can find Dorothy Hodgkin!

At first, the new technique of X-ray crystallography was used for reasonably simple molecules, and for materials that formed crystals easily.

Dorothy Hodgkin had bigger ambitions.  She realised that by understanding the structure of complicated biological molecules - molecules used by the body - you could begin to understand how they worked, and even begin to make them artificially.

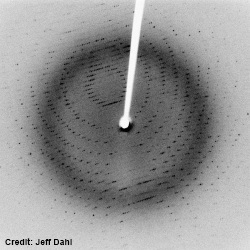
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| **Key fact: X-ray crystallography can be used to study many different types of molecule.** |



Dorothy Hodgkin was such an important scientist that she features on one of the **Royal Society's 350th anniversary stamps.**

This [**audio slideshow**](http://news.bbc.co.uk/1/hi/sci/tech/8668708.stm) from the BBC describes some of Dorothy Hodgkin's life and work.

**So how does X-ray crystallography work?**

When X-rays shine on a crystal, they bounce off in different directions.  When the X-rays bounce off, they form regular patterns because the crystal is made of molecules that are lined up in the same way.  These X-rays show up as bright spots on photographic film, creating complex patterns that scientists decipher.

When there were no computers, the first scientists (known as 'crystallographers' because of what they study) would have to measure distances between the bright spots on the photographic film.  They would have to perform many calculations to work out how these related to the position of each atom in the material.

Within ten years of X-ray crystallography being developed, scientists had worked out the structure of many different crystals, including salt and diamonds.  If the molecules being studied were very complicated, the process could take a very long time. In the 1940s and 1950s very simple computers started to be used to do some of the particularly complicated maths.

Today, crystallographers use computers to work out the structure of the most complex molecules.  They can start with an idea of what shape the molecule is and use a computer to reproduce the patterns they expect from the X-ray crystallography.  They can then compare this with what they actually see when they use X-ray crystallography with their molecule.  If the pattern they predicted with the computer program is wrong they change the computer program slightly and keep going until the two pictures - predicted and real - match.

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| **Key fact: Combining X-ray crystallography with modern computing techniques allows scientists today to study really complicated molecules** |