

## 1.7

# Investigating the past — deciding how old something is

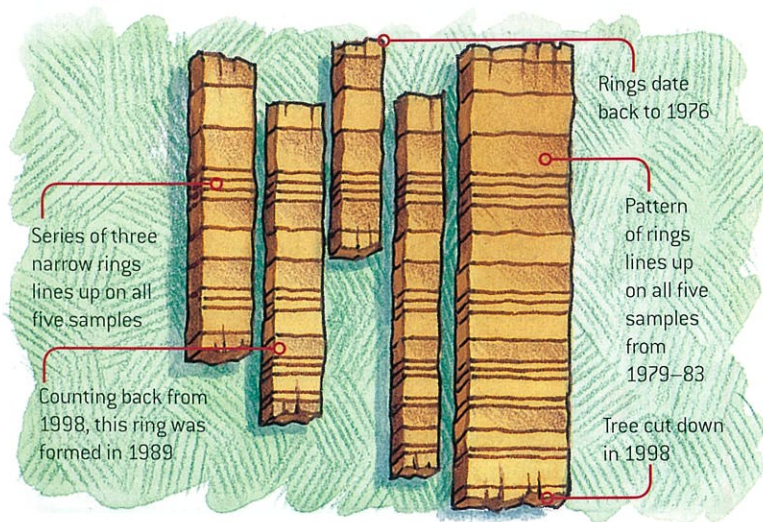
To gain an accurate knowledge of the past, we need to know how old the different sources are. With this information, historians and archaeologists can understand the order and the time period in which events happened. They can work out whether a particular object is real or a forgery. Today we have the benefit of many scientific techniques to test and confirm the age of an object.

## Tree-ring dating

People use tree-ring dating, or **dendrochronology**, to tell the age of wood. It is based on the fact that the timbers of a tree develop a new ring of growth each year. Rings are generally narrower when the weather has been poor and wider when it has been good. Tree rings and their widths form a pattern that is repeated on different trees of the same species. By comparing the pattern of rings found on an undated piece of timber with a pattern that has already been matched and dated, scientists can work out the age of a particular piece of timber in a specific region.

By working out the age of the timbers in a boat, fence, staircase or the interior of a church, experts can estimate the period when the particular object or building was constructed. All they need is a good cross-section sample of timber from the item they are studying.

**Source 1** Diagram showing how the ring patterns of different pieces of timber can be matched in order to obtain their ages



## Radiocarbon dating and the Shroud of Turin

The Shroud of Turin is a piece of linen cloth that many people believe is the burial cloth used for the body of Jesus Christ. The first recorded knowledge of the cloth's existence was in 1357 in the village of Lirey in France. The cloth appears to bear a negative image of a man who has been crucified.

The Shroud is one of the most famous objects to be tested by radiocarbon dating. Radiocarbon dating (also called carbon dating) relies on the fact that all living things absorb carbon. The radioactive carbon 14 forms a small part of this. After an organism has died and no longer absorbs carbon from the atmosphere, carbon 14 gives out radiation and gradually changes to nitrogen 14. This means that the amount of carbon 14 left in wood, bone, charcoal or a fossil can be used like a clock to measure long periods of time.

In 1988, scientists from three separate laboratories used radiocarbon dating to investigate the age of the Shroud. They all concluded that the cloth they examined was created at some time in the period from 1260 to 1390. If their findings were correct, then the Turin Shroud was a forgery.

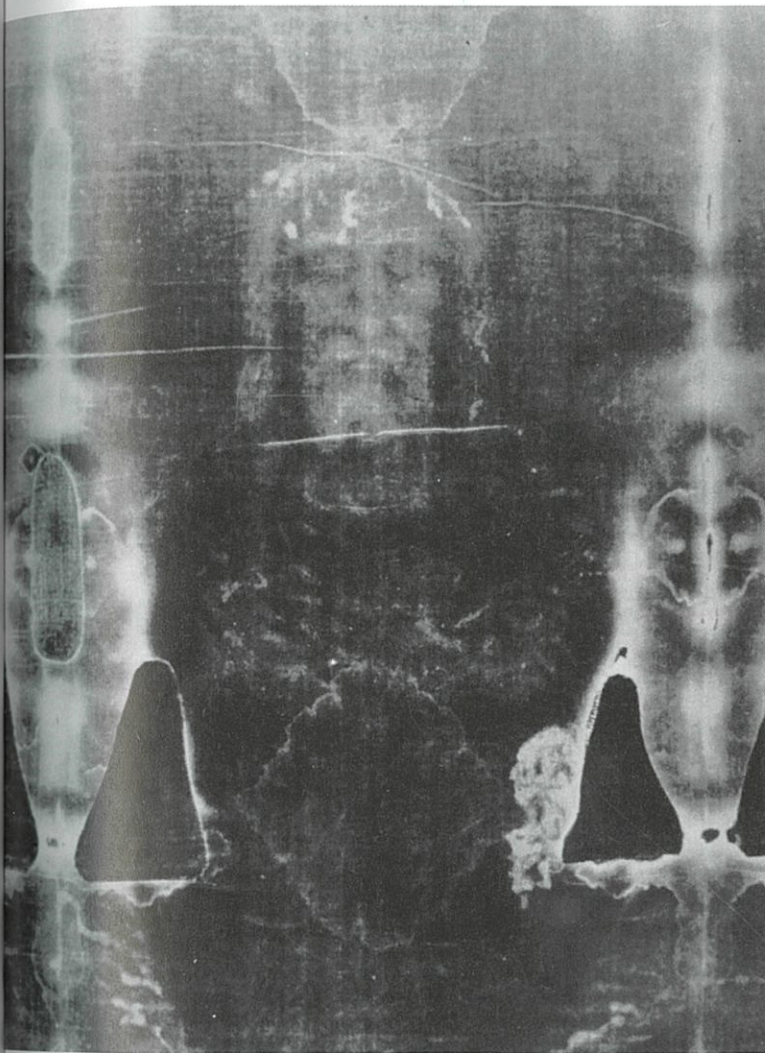
Radiocarbon dating is not foolproof, because:

- the material being tested may contain remnants of older or younger materials which can distort the results
  - dates can only be estimated as being plus or minus a certain number of years, and this error increases with the age of the object.

On 15 August 2008, Robert Villarreal, a chemist speaking on behalf of nine scientists at the Los Alamos National Laboratory (LANL), announced that the 1988 conclusion about the Turin Shroud was incorrect. He said this was because the samples of cloth scientists used all came from the same area of the Shroud. This piece of cloth was a mixture of old thread and 'new' thread from a repair done sometime in the 1500s. The investigation continues.



**Source 2** Photograph showing part of the negative image as it appears on the Shroud of Turin



**Source 3** A March 2008 comment from Christopher Ramsey, head of the Oxford Radiocarbon Accelerator Unit, which participated in the 1988 carbon 14 dating process

As yet there is no direct evidence ... to suggest the original radiocarbon dates are not accurate.

There is a lot of other evidence that suggests to many that the Shroud is older than the radiocarbon dates allow and so further research is certainly needed. It is important that we continue to test the accuracy of the original radiocarbon tests as we are already doing. It is equally important that experts assess and reinterpret some of the other evidence. Only by doing this will people be able to arrive at a coherent history of the Shroud which takes into account and explains all of the available scientific and historical information.

*Source:* Oxford Radiocarbon Accelerator Unit, <http://c14.arch.ox.ac.uk>

## Thermoluminescence dating

**Thermoluminescence dating** (or TL dating) is useful for dating stone and clay objects, such as pottery, which people have at some time heated or fired. Scientists heat the objects to very high temperatures and then measure the light energy they give off. The greater the amount of light an object gives off, the older it is.

This method is also useful for dating stones that have been used in fireplaces. The method works on the basis that crystals contained in clay and stone are released in the form of light when the objects are heated. By reheating the object and measuring the amount of light released, people can tell how much time has passed since the last time someone heated the object.

### ACTIVITIES

#### CHECK YOUR UNDERSTANDING

- 1 Explain why it is important for historians and archaeologists to have an accurate knowledge of the age of the sources they use.
- 2 Define dendrochronology and explain how it works.
- 3 Explain how carbon 14 can be used to help date organic materials.
- 4 Identify the types of object that can be dated using thermoluminescence dating. Explain how this method works.

#### USE THE SOURCES

- 5 Study the diagram in source 1. Describe what it tells you about the weather in this area in the period 1979–83.
- 6 Study the image shown in source 2 and then:
  - a write two to three sentences to describe what you see
  - b identify what the image is supposed to be
  - c explain why many people want to believe that the image is authentic and not a fake
  - d explain why people doubt the authenticity of this image.
- 7 Identify the parts of source 3 which show that the speaker is following the methods we expect of people who investigate the past.

**dendrochronology:** tree-ring dating, a method of telling the age of wood

**thermoluminescence dating:** a method of dating objects, which works on the basis that mineral crystals contained in clay and stone are released as light when heated. By reheating the object and measuring the amount of light it releases, it is possible to say how long ago it was last heated.