

Theories from evidence: Darwin as an empiricist

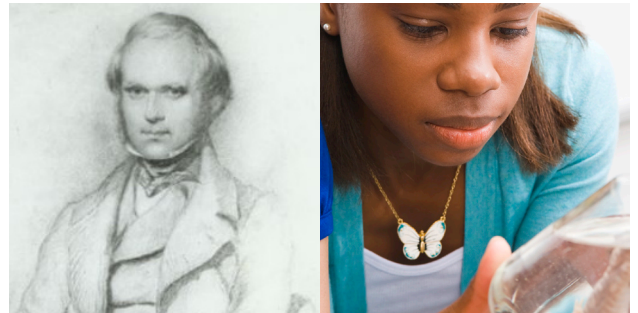
We often assume that if we ask people to do something new or to believe something different, we are expected to give a reason.

A child wanting to prove that she has been doing her homework may show her parents her book with the work completed. When we study science, we make reference to experiments and how these provide likely explanations whether an idea (or hypothesis) is right. For much of human history many of the hypotheses about how things worked were based on pure reasoning and discussion. Some were, and still are, based on religious or supernatural explanation. Empiricism, however, is a philosophical approach that was developed in the seventeenth century and can be defined as:

*'knowledge limited to what may be tested
(confirmed or validated) by observation.'*

Other approaches to understanding the universe are known as metaphysical, including ideas based on faith, intuition and pure reasoning.

Empiricism stresses the role of experience and evidence gathered through our senses to form ideas. By the time Charles Darwin was developing his big ideas, an evidence-based approach to science was becoming well established. This activity looks at the ideas of three nineteenth-century scientists who used empirical methods to support their ideas.



Portrait of Darwin © The John Murray Collection
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Materials

- the biography briefing sheet
- pen and paper
- tape recorder or computer that can record voice, if available
- If possible, access to a library, an encyclopaedia or books about the three scientists, access to the internet.

STUDENT SHEET

Theories from evidence: Darwin as an empiricist

Activity

You have been asked to produce an outline script for a short radio programme on empiricism in science. In particular your radio editor has asked you to describe how three nineteenth-century scientists used experiments or gathered data to support theories that changed the world. The scientists are **Florence Nightingale**, **Louis Pasteur** and **Charles Darwin**. The editor wants this broadcast to form part of a series of short features, called *Modern Ideas*.

You have two minutes of airtime to fill and your audience will want to be entertained as well as being informed. Your editor has told you that your radio item should achieve the following:

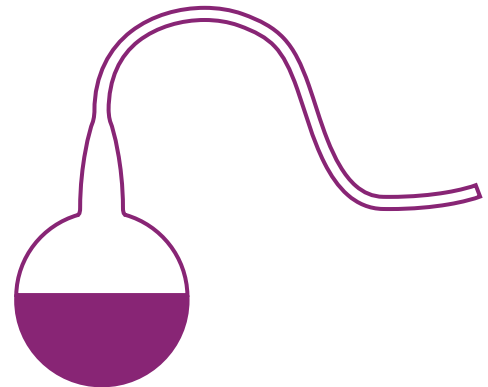
- 1 Select a contemporary issue in which the use of evidence is contested, or where evidence from different points of view are being compared. (Hint: think about decisions that are being made by your government or at local level, where there are different perspectives.)
- 2 Form a link to a time when evidence was less important in the affairs of people's lives and use this link to contrast how we now use evidence and observation to support one idea over another.

- 3 Link back to the three nineteenth-century scientists' stories.

- 4 Draw their experiences together.

If you have access to some kind of voice recorder, you may be able to record your item. If not, simply write out what you would say and read it to the class. Each class member should give two scores between 1 and 5 for each presentation, based on the following:

- how well they have met the editor's request (1-4 above)
- how clear and entertaining and well written the radio presentation is



Pasteur's curved neck flask prevented particles from entering the growth medium. This experiment challenged the widely accepted view at the time, that life could generate spontaneously.

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Discussion Points

- 1** What were the ideas that each of the following managed to convince others about during their lives:
 - a. Florence Nightingale
 - b. Louis Pasteur
 - c. Charles Darwin
- 2** Which of them do you feel had the greatest challenge in encouraging people to change their views about the world, and why?
- 3** Apart from science, in which other activities in our lives do we require observable evidence in order to influence our beliefs or opinions? In which aspects of our lives do we tend not to draw on empirical evidence? (For example, decisions made without referring to objective data).

Further work

- 1** Find out some more about the history of empiricism and how modern science took on this philosophical approach.
- 2** Discuss what might have happened had scientists, technologists and engineers not based their ideas on an empirical, evidence-led approach:
 - a. in identifying HIV as the cause of AIDS
 - b. in identifying the link between climate change and carbon dioxide
 - c. in establishing the link between cigarette smoking and cancer

