

STUDENT SHEET

Theories from evidence: Darwin as an empiricist

Biography Briefing Sheet

Florence Nightingale 1820-1910

Born into a wealthy British family, Florence Nightingale was inspired by her religious beliefs to enter nursing and to dedicate her life to help people in poverty. Her most famous work took place during the Crimean War (1853-56), in which she applied new ideas about infectious diseases to reduce the appalling death rate among wounded soldiers. However, it was Florence Nightingale's later work that was more significant in saving far more lives and had a long-lasting impact on military wounded and hospital patients throughout the world.

Florence Nightingale realised that it was politicians who made decisions about how army medical care was set up. Rather than presenting stories and impressions, Florence Nightingale applied her mathematical skills and studied medical statistics – she was tutored by the inventor of the subject, William Farr. It was through the use of objective evidence, presented in clear diagrams rather than long, opinion-based reports, that Nightingale was able to persuade British politicians to reform military healthcare, both in battle and at home.

Florence Nightingale is credited with developing a form of the pie chart, which she used to show seasonal sources of patient mortality in the military field hospital



Florence Nightingale © Library of Congress

she managed. Nightingale's commitment to 'dry' reports (i.e. the data only), surprised her in demonstrating that, even in peacetime, soldiers were dying at twice the rate of civilians, and that the main cause of death in Turkey in the Crimean War had been poor sanitation, and not inadequate food and supplies, as had previously been thought.

STUDENT SHEET

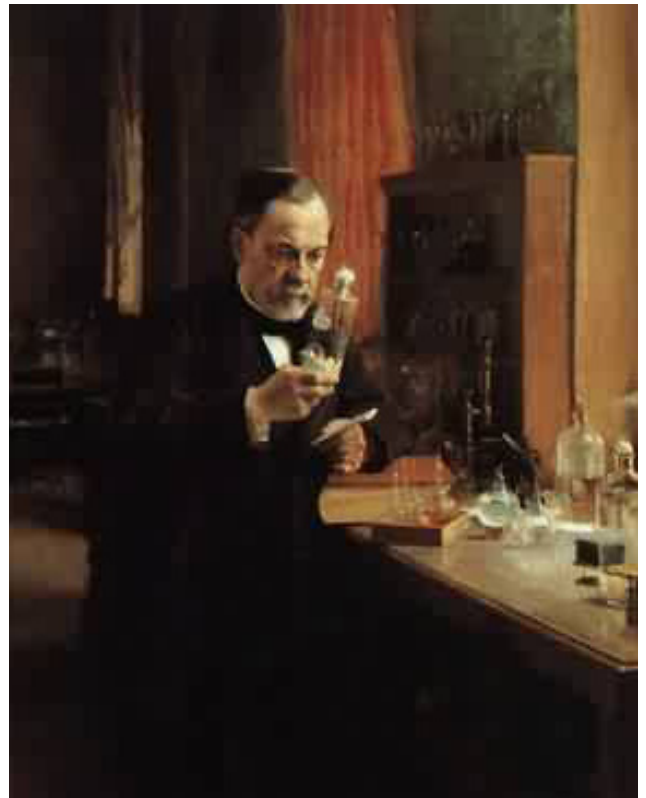
Theories from evidence: Darwin as an empiricist

Louis Pasteur
1822-1895

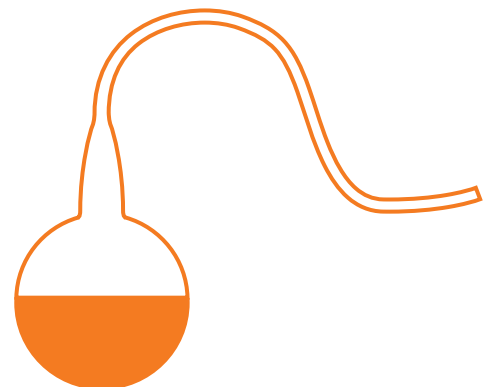
Louis Pasteur, the son of a college headmaster, grew up in the town of Arbois in the Jura department in eastern France. He is chiefly remembered for his technique for preventing foods – milk and wine in particular – from spoiling (pasteurisation). But arguably his most important work was the demonstration that micro-organisms such as bacteria do not arise spontaneously from non-living matter, but can occur only from living material. Pasteur demonstrated how the idea of **spontaneous generation**, an idea dating back to the Ancient Greeks, was wrong.

Pasteur supported an idea that others were starting to believe at the time, known as **germ theory**. Germ theory stated that micro-organisms were the cause of disease. Pasteur wanted to convince the public of this model of the role of micro-organisms in infectious diseases and used a now-famous experiment to do so. He boiled nutrient broth in vessels and exposed the broth to air through a filter that would allow only the gas through (no dust or small particles). Nothing grew in the vessels unless the vessels were broken.

Pasteur's experiment led to the abandonment of the spontaneous generation model and led to an acceptance that micro-organisms were the cause of disease.



Louis Pasteur



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.

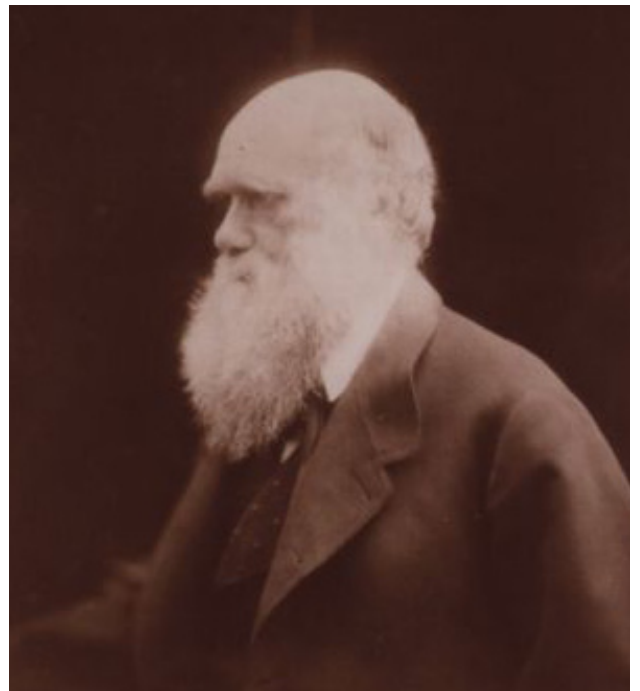
STUDENT SHEET**Theories from evidence: Darwin as an empiricist****Charles Darwin
1809-1882**

Charles Darwin was the son of a prosperous country doctor in Shrewsbury, England. As a boy he loved the countryside and its creatures but he had trouble settling on a career. He abandoned medical school in Edinburgh, and was sent to Cambridge University to prepare for life as a vicar.

At university Darwin met some of the most brilliant naturalists of the day and, in 1831, he acquired a berth on the naval survey vessel *HMS Beagle* for a world voyage. During the five-year journey Darwin kept a scientific field journal, covering biology, geology and anthropology, with detailed notes and observations on the indigenous animals, plants, birds and insects of the places he visited, including Brazil, Chile, Peru, the Galapagos Archipelago, Tahiti, New Zealand and Australia.

Back in London, and later at his new home at Down House in Kent, he gradually came to understand how individual species could change; how evolution could work – although it took him over 20 years to feel ready to publish his ideas.

For the rest of his life he continued working – to defend his theory and to understand its implications, and he published further



Portrait of Darwin © Julia Margaret Cameron

books – on orchids, earthworms and the expression of emotions, among others. Darwin understood that it was not enough simply to convince others through intelligent argument, but that he had to provide evidence to support his ideas. Darwin collected and catalogued an enormous collection of animal, plant and geological specimens in order to win support for his controversial theory.