

Growing Benefits of Scientific Thinking

MODERN SCIENTIFIC THINKING

This depends on the following:

1. Observation and exact measurement + careful recording
2. Careful reasoning
3. Experiments to check any theories that have been developed
4. Publishing details for benefit of others

HARVEY AND BLOOD'S CIRCULATION 1628

William Harvey measured the blood pumped by each heartbeat to prove that blood circulated. He also showed that blood went from the heart to the lungs and then back to the heart again to be pumped to the rest of the body. His use of careful experiment and measurement impressed other workers.

1747 JAMES LIND SHOWS HOW TO STOP SCURVY

Scurvy is caused by lack of Vitamin C and it usually affected sailors on long voyages. Some captains stopped it by taking on fresh fruit and vegetables but there were a number of "cures". Lind tested all the so-called cures on men with disease. Only the two who had lemon juice recovered. In 1747 he published details of his findings and slowly his belief that fruit juice could stop scurvy was accepted.

EDWARD JENNER AND VACCINATION 1796

By listening to an old wives' tale that milkmaids never caught smallpox and having the courage and the ruthlessness to give a young boy cowpox and then to attempt to give him smallpox Jenner found a way of stopping people catching smallpox by giving them cowpox. He could have made a fortune by keeping his methods secret. When the Royal Society refused to publish his findings, he paid to have his book published.

PASTEUR AND KOCH AND THE GERM THEORY OF DISEASE 1865 AND 1878

Pasteur was a chemist, not a doctor and it was his work for the brewing industry that made him suspect that microbes caused decay and illness. Careful experiment showed that the microbes floating on dust in air could make things go bad. He could not prove that microbes caused human diseases.

Koch was a German doctor and a very careful and determined scientific researcher. In 1872 he began his search. He stained microbes so that he could see them and photograph them down his microscope. In 1878 Koch was able to show the microbes causing blood poisoning. He carried out careful tests to prove it was the microbes that he suspected which caused the disease.

1880s MORE VACCINATIONS TO STOP DISEASE

It was an accident that led to the breakthrough but it was careful testing which proved the theory that weakened germs could protect the body against stronger germs. The chickens which had received the weakened chicken cholera germs and a control group which had not been previously inoculated were injected with strong chicken cholera germs. Only the chickens which had been previously inoculated lived. In 1881 Pasteur arranged a public demonstration to show that cattle injected with a weak culture of anthrax would not develop the disease when injected with germs from a strong culture. Again some of the animals

injected with strong germs had not earlier received an injection of weakened germs and again they died.

BEHRING AND ANTITOXINS 1891

Behring expected that diphtheria germs put into the blood of animals which had recovered from the disease would be killed. They were not, He suspected that the microbes were producing a toxin (poison) and thought that the toxins were being neutralised. He tested and proved his theory by injecting a serum made from the blood of animals which had recovered from the disease into a girl who was dying. The girl recovered.

EHRlich AND THE DISCOVERY OF SALVARSAN 1909

Ehrlich was testing dyes to see if any could kill the syphilis germ. He insisted that the dyes were tested again after there was no success. One of his team found out that the 606th compound was effective after all.

1930 SULPHONAMIDE DRUGS

In the 1930s scientists did more work on dyes. A dye which came from coal tar was found to be effective against many of the germs causing blood poisoning. After further tests on sulphonamide compounds it was found that some of them could kill the germs for other diseases such as pneumonia, scarlet fever and pneumonia.

FLEMING AND PENICILLIN 1928

Fleming discovered a mould growing in a culture of staphylococcus germs. He noticed a clear area of jelly around the mould. He suspected the mould was killing the germs. He planted colonies of various germs around the mould and found that it killed many of them. He could not turn the mould-juice into a long-lasting drug. He published his findings when he realised that he could get no further. In 1939 Florey and Chain began research again. Florey went to America and a way was found of growing the mould at depth. The drug could be mass-produced.