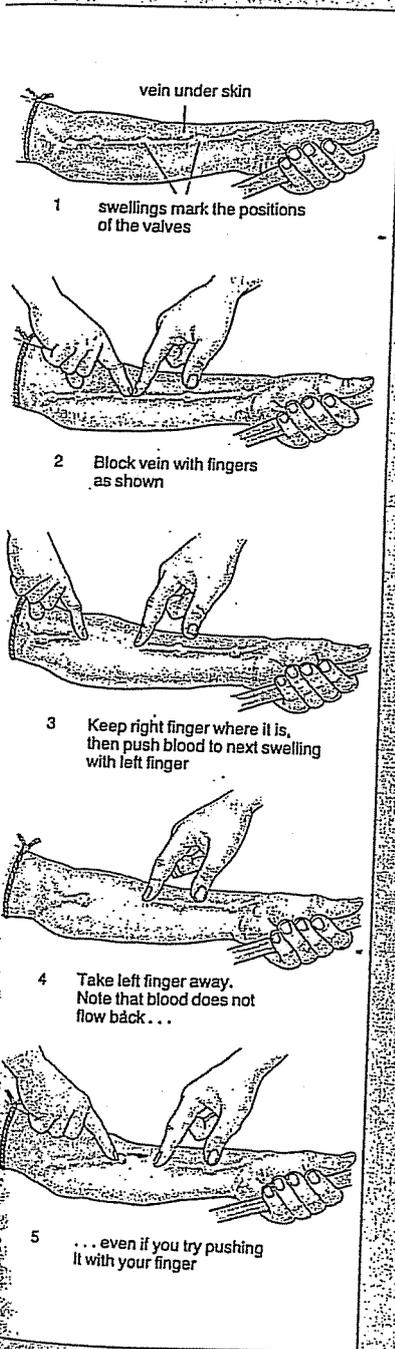


# How the circulation was discovered



Picture 1: Harvey's famous experiment showing that blood flows towards the heart in the veins.

Some of the best experiments are very simple. A simple, but clever, experiment led William Harvey to discover the circulation of the blood in the early 1600s.

Harvey was Charles I's doctor. At that time scientists thought that blood seeped out of the heart to the various parts of the body, and then back again in the same vessels – rather like the tide flowing in and out of an estuary. This 'ebb and flow' theory was put forward by a Greek physician called Galen in the second century AD and it was still believed at the time of Harvey.

But Harvey had a different idea. He thought that the blood circulated round the body, flowing away from the heart in the arteries, and back to the heart in the veins.

Harvey's experiment is illustrated in picture 1. Study it carefully. The experiment shows that blood flows in only one direction in the arm vein – towards the heart. The valves stop the blood flowing in the other direction.

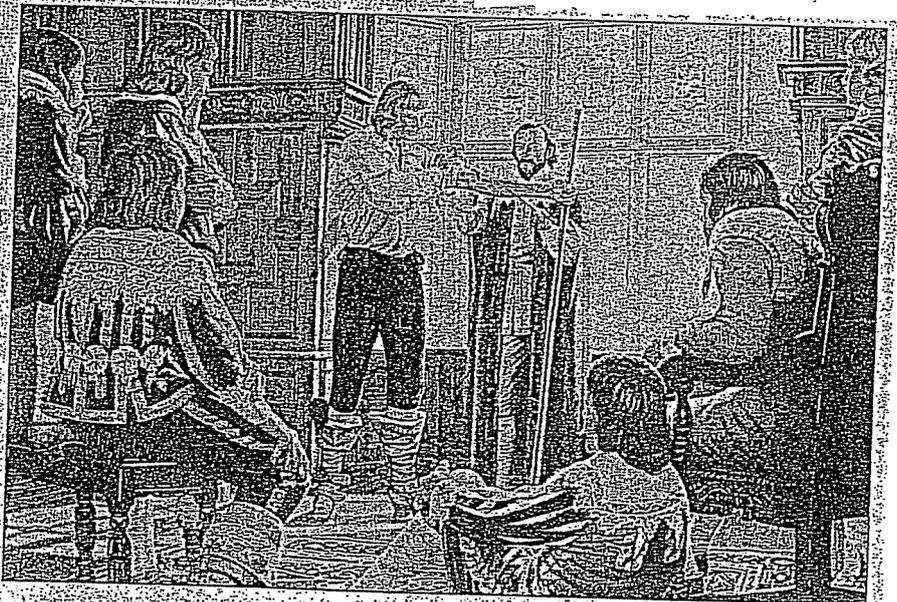
Picture 2 shows Harvey demonstrating this experiment to some young doctors in London. Try the experiment yourself, on a friend. But be careful; tying a band round the arm can be dangerous, so do the experiment only when your teacher is present.

This is only one of many experiments which Harvey did. He also dissected animals, studied the heart and blood vessels, and made calculations on the flow of blood. All his observations supported the idea that blood is pumped by the heart into the arteries and returns in the veins.

However, he never discovered the connection between the arteries and veins, namely the capillaries. He predicted that such a connection must exist, but he never found it.

Harvey has been called the father of modern medicine. He saw the human body as a machine, obeying the laws of physics and chemistry in the same way that non-living things do. At that time most people believed that the human body was created by God and obeyed special laws. The heart was the seat of the soul, not just a pump. Some of Harvey's patients were so upset by his ideas that they went to other doctors. Even his fellow scientists were critical, particularly as the final piece of evidence – the capillaries – was missing.

The capillaries were discovered seven years after Harvey's death by an Italian scientist, Marcello Malpighi. Malpighi used a microscope to examine the webbed foot of a frog. There before his eyes were the capillaries, with the blood flowing through them. Although the microscope was invented during Harvey's lifetime, he never used it in his work.



Picture 2: William Harvey showing his experiment to a group of young doctors at the Royal College of Physicians.

1. How did people believe blood moved around the body before William Harvey [2]
2. Who had proposed this idea? When? [2]
3. What was Harvey's theory? [2]
4. What problem was there with Harvey's idea? [1]
5. What did he predict the existence of to overcome this? [1]
6. What objection did some of his patients have? [2]
7. Name another scientist and their idea who had to overcome similar objections. [2]
8. Who discovered the 'missing link' in the circulation? How? [3]