William Harvey

1578 – 1657

An amazing story about blood and the body

What would William Harvey tell us if we could travel through time and ask him about his medical discoveries?

I was born in Folkestone, Kent, so close to the sea I could smell it. Elsewhere in the country though, things did not smell so great. Waste was usually left in the streets or dumped in the rivers, while inside homes, fleas, lice and rats flourished but a lot of people didn't. These were difficult conditions and people weren't expected to have long lives.

Medical knowledge was limited when I was young. We didn't know about viruses, germs or bacteria, so people held lots of different ideas about why people became ill and we used different types of herbal remedies and animal products to help make people feel better. For example, burns might be treated with snail slime and tobacco juice might be poured onto the scalps of people who had head lice. Some of our remedies worked, but sadly many didn't.

After finishing university, I set off on an adventure through Europe. I travelled around France and Germany before settling in Padua in Italy. I enjoyed living there and enrolled in their respected university. While there, I worked with Hieronymus Fabricius, who was a well-known doctor of the time. I became fascinated with his work on **anatomy**. Fabricius carried out many public **dissections** of animal and human bodies. These allowed students of medicine to develop a better understanding of how different systems of the body work.

My interest in blood particularly grew and grew. For 1500 years, doctors and the Church had been following the teachings of Galen, a famous 3rd Century Roman doctor. Galen described how our body contained four different fluids called humours: blood, yellow bile, black bile and phlegm. It was believed that if these were not kept in perfect balance, then the patient would become sick. Because of this, blood-letting was a popular treatment. By cutting the skin and letting the blood flow out of the body, it was believed that the sickness would also flow away. I questioned this theory and wanted to understand how and why blood flowed around the body.

I worked hard with Fabricius and learnt all I could. Our experiments involved carrying out dissections on thousands of creatures in order to study their anatomies. As gruesome as this was, we didn't have any reference books with diagrams, so we needed to learn first-hand.

Fabricius had discovered the existence of **valves** in our **veins** but wasn't sure what they were they for. I built on his ideas and focused my attention on how blood flows around the body. But I began to realise that understanding anatomy was not enough; I wanted to learn how to solve medical problems. I returned to the University of Cambridge and continued with my medical studies and joined the College of Physicians in 1604, when I was still only 26 years old. Five years later, in 1609, I became Physician in Charge at St Bartholomew's Hospital, London, one of the oldest hospitals in the UK. It was a difficult time to be a doctor as we had few drugs or other means of curing our patients. I spent most of my time diagnosing illnesses but my only available cures were blood-letting or surgery. I wanted to change this, but to do so I had to understand the human body better, and so I worked many hours carrying out dissections on bodies from the hospital. It wasn't the most pleasant work, but at that time it was the only way to learn about the body and how blood moves around it.

One area I focused my attention on was the difference between **arteries** and veins. Galen's theory was that blood was controlled in two separate systems: the liver made the blood that flowed in the veins and that the heart made the blood that flowed in the arteries. Through dissection I realised that this was a mistake and that the liver was not involved in pumping blood.

In one of my experiments I tied both the arteries and veins up in turn. I showed that when an animal's veins are tied up, the heart empties of blood, but when the arteries are tied, the heart swells up. This helped me realise the importance of the heart to the flow of all blood in the body.

In 1628, after years of further experiments and practice, I published a book on my findings. It was called *On the Motion of the Heart and Blood in Animals*. I outlined my conclusion that blood flows through the body in one complete circular system – not two separate ones. I demonstrated how the arteries carry blood containing oxygen and nutrients to the cells of the body, while the veins carry the blood from the cells back to the heart, where it is supplied with oxygen again. For this reason, blood flowing from the heart is bright red, while blood flowing back to the heart is a more deep purple-y red. Through my experiments I also showed that the valves in the blood vessels that Fabricius had discovered are needed to keep blood flowing in one direction around the body, making sure the system works properly.

Opinion was divided on whether to believe me or not. Galen had led the way for medical understanding for 1500 years and the Church held strong to his beliefs. However, because of my experiments and careful recording of my results, my ideas eventually gained acceptance as I was able to produce a great amount of evidence for them.

My work showed that through proper scientific experimentation you can put theories and beliefs to the test and further knowledge by supporting or disproving them with evidence. I made huge changes to our understanding of the role of blood and the way it flows around the body, paving the way for future doctors to build on my work and improve standards of care for the sick.

Glossary

Humours – the four bodily fluids wrongly believed to control the workings of the body, these were blood, phlegm, yellow bile and black bile

Anatomy – the structure of a living thing's body (human, animal or plant)

Diagnosis – a doctor's process of considering the evidence and judging what is wrong with a patient

Dissection – cutting up a body or plant to study its internal parts

Arteries – blood vessels that carry blood containing oxygen and nutrients to all parts of the body

Veins – blood vessels that carry blood without oxygen away from different parts of the body, back to the heart

Valve – a mechanism for controlling the flow of liquids. In blood vessels, these keep the blood flowing in one direction

Timeline

1578	William Harvey was born in Folkestone, England. He was the eldest of seven children
1597	Harvey graduated with a Bachelor of Arts and travelled through France and Germany to Italy in 1599. During his stay in Italy, he entered the University of Padua and studied Medicine. He met surgeon and researcher, Hieronymus Fabricius
1602	Harvey graduated as a Doctor of Medicine from the University of Padua. He then returned to England and entered the University of Cambridge. William obtained a Doctor of Medicine Degree and practised as a Physician in London
1604	He joined the College of Physicians at the University of Cambridge
1609	Appointed Physician in Charge at St Bartholomew's Hospital
1628	Harvey published *On the Motion of the Heart and Blood in Animals*
1654	Due to ill health, Harvey declined the appointment of President of the College of Physicians
1657	William died aged 79, at Roehampton, London

Exercises

1. Onion, garlic and honey were often used in Elizabethan medicine – and they often worked! Why would they be successful?

2. In William Harvey's time, he had to cut bodies open to see what they look like on the inside and work out how different organs work. His work helped us to gain a better understanding of the heart's function. Now we have textbooks and the internet to help us find out! Can you describe the function of these internal organs:

    - The lungs
    - The liver
    - The stomach

3. William Harvey explained how the heart pumped blood, full of oxygen around the body along the arteries; the blood without oxygen is then returned to the heart along the veins. Can you draw a diagram to show this? Use red to show the blood containing oxygen and purple or blue for the blood without.