# The Pumping Heart

## INTRODUCTION


You now know the ingredients that cells need to release energy—oxygen and nutrients. How do these essential ingredients get to the cells? How are the waste products—carbon dioxide and water—carried away?

Your circulatory system does the job. What powers your circulation? It's a special type of double-action pump—known as the heart.

In this lesson, you will use a model to explore how the heart works. You will also identify the most important structures of this organ. As usual, Peppi and Bollo will be on hand to help make things clearer.

## DR. WILLIAM HARVEY CLOSES THE LOOP

It was the most important moment of Dr. William Harvey's life. The year was 1616, and he was about to deliver a most surprising message to his colleagues at London's Royal College of Physicians.

On that day, Harvey proposed that humans have a closed circulatory system. Blood recirculates around our bodies, he said. Time after time, the same blood moves out of the heart to the body, back to the heart, out to the lungs, and back to the heart. The blood remains confined within the circulatory system. What is so surprising about this? Nothing at all if you're living in the 21st century. But Harvey knew that his demonstration would raise some eyebrows. In presenting his hypothesis, he went against 1500 years of medical tradition.


Dr. William Harvey

Earlier physicians believed that human bodies were constantly producing enormous quantities of new blood. Harvey had a different idea, and he based his conclusions on direct evidence. He dissected human cadavers and exposed the hearts of living animals. He watched how things worked. His hypothesis that blood recirculates was based on a mathematical calculation.

He began by estimating how much blood was forced out of the heart with each beat. His guess was about 2 ounces. Multiplication took care of the rest. If 2 ounces of blood are ejected with each beat, and the heart beats 72 times a minute, that's 144 ounces of blood a minute. Multiply that by 60, and you get 8640 ounces (about 60 gallons) of blood flowing through the heart every hour!

Sixty gallons of blood would weigh more than 420 pounds. It's obvious that an average human being has far fewer than 60 gallons of blood. For Harvey, the logical conclusion was that blood does not just move from the heart outward to all parts of the body—it circulates back to the heart.