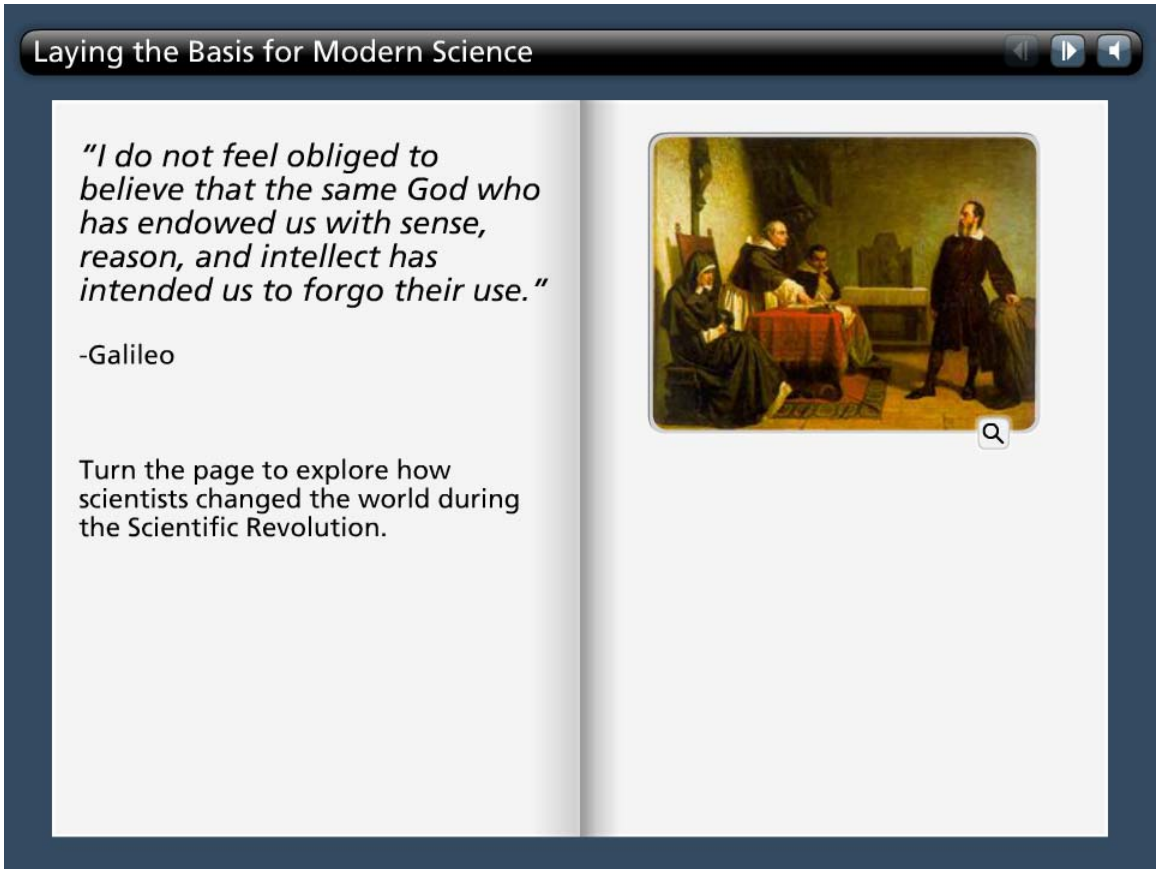
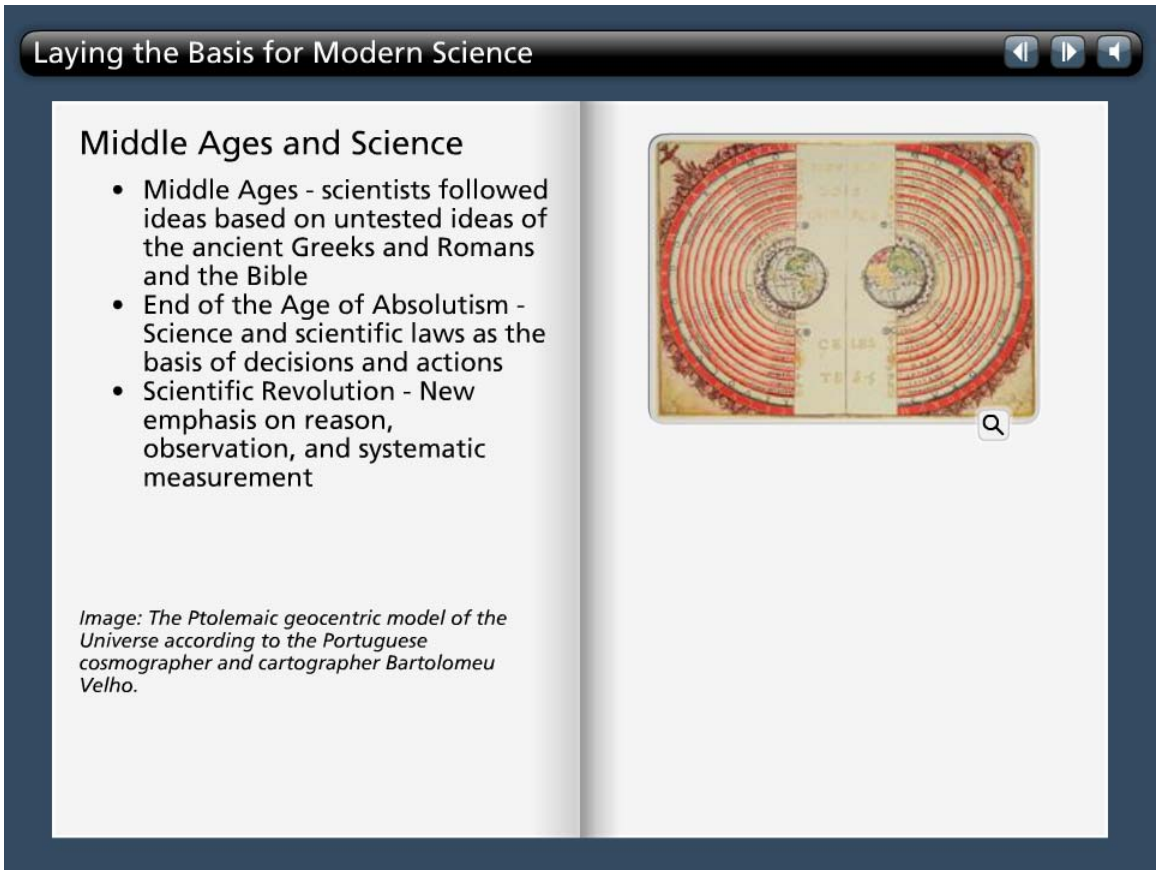
Module 5: The Scientific Revolution and the Enlightenment
Topic 1: The Scientific Revolution



Middle Ages and Science



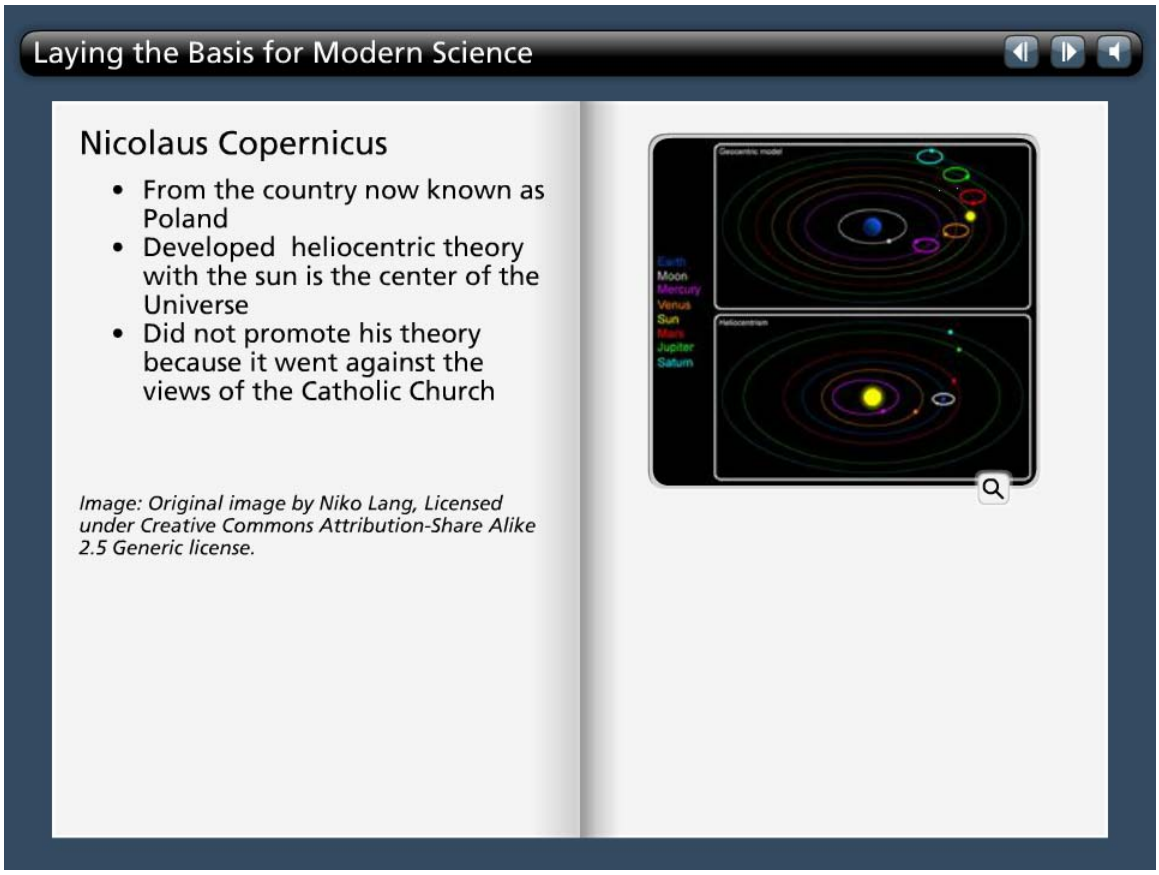
Narration

During the Middle Ages, many scientists followed old ways of thinking which were based on the Bible and the work of the ancient Greeks and Romans. However, few people actually tested the ideas proposed by these two sources.

Toward the end of the Age of Absolutism, the idea that science and scientific laws should be the basis of our decisions and actions started to become popular in Europe. These ideas replaced established ideas about how religion should be the basis for all decisions and actions in the world.

The new emphasis on reason, observation, and systematic measurement became known as the Scientific Revolution. Many of the theories that were developed during the Scientific Revolution overturned some of the most basic beliefs of society. It was not easy for scientists to convince leaders that their discoveries were true, and some even had to risk their lives to do so.

Nicolaus Copernicus

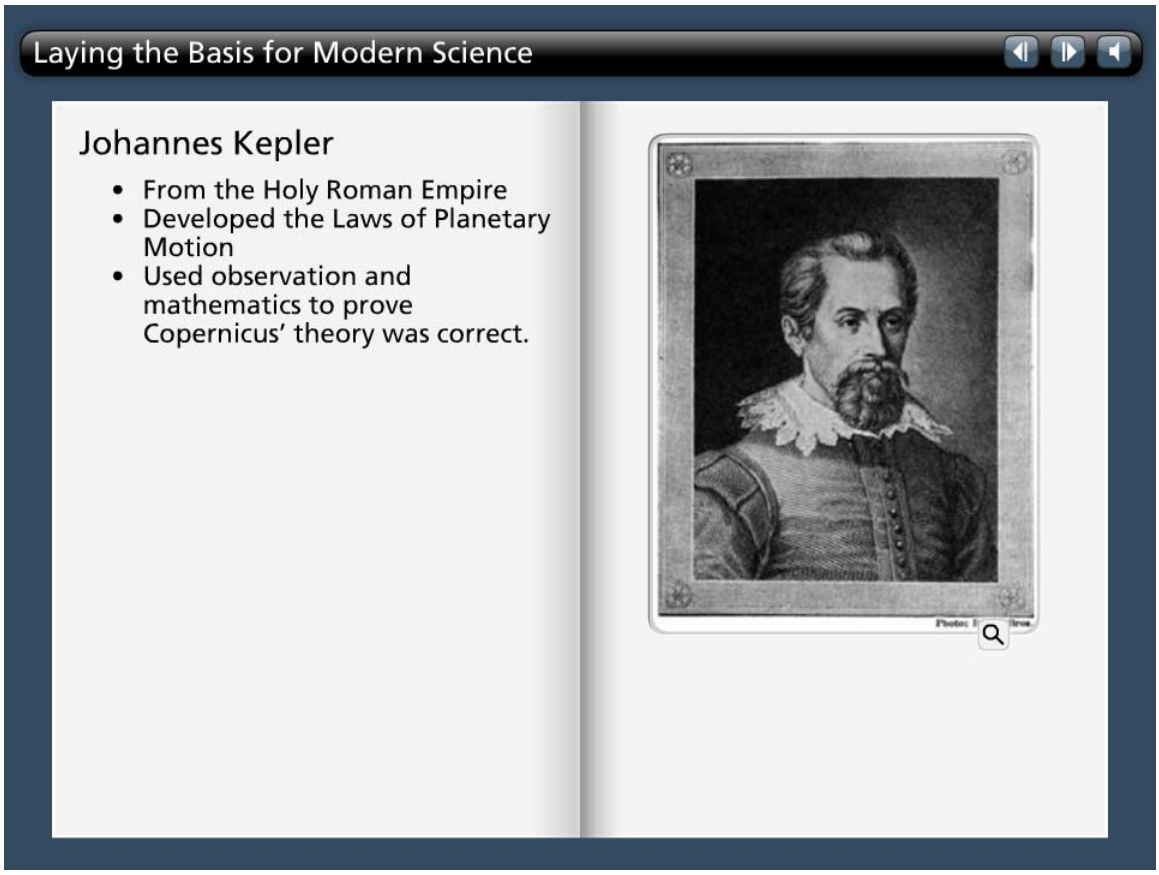


Narration

Early scientists believed that the Earth was the center of the universe. This is known as the geocentric theory.

After studying planetary motion for 30 years, Nicolaus Copernicus came to believe that the Sun was the center of the Universe. In 1543, he published his book, *On the Revolutions of the Heavenly Bodies*, which presented a heliocentric theory. His heliocentric theory proposed that the Earth and the other planets revolved around the Sun. This was in conflict with the Catholic Church's position that the Earth was the center of the Universe. Copernicus' heliocentric model challenged a 2,000 year old view of the Universe.

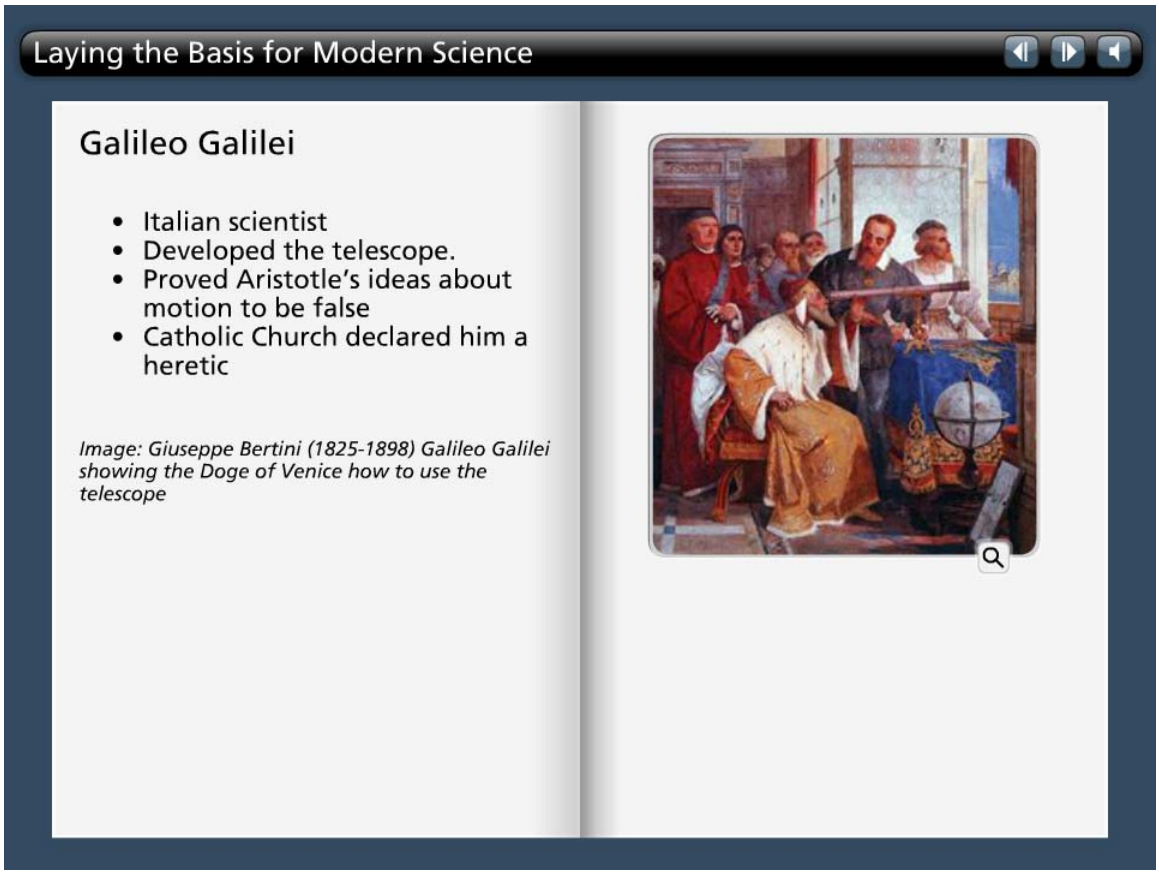
Johannes Kepler



Narration

For years, Johannes Kepler observed and recorded the movements of planets and stars. In the early 1600's, he developed the three laws of planetary motion. These laws supported the heliocentric theory, providing more evidence for Copernicus' views. Kepler proved that the planets orbited the sun in an elliptical path rather than a perfect circle.

Galileo Galilei



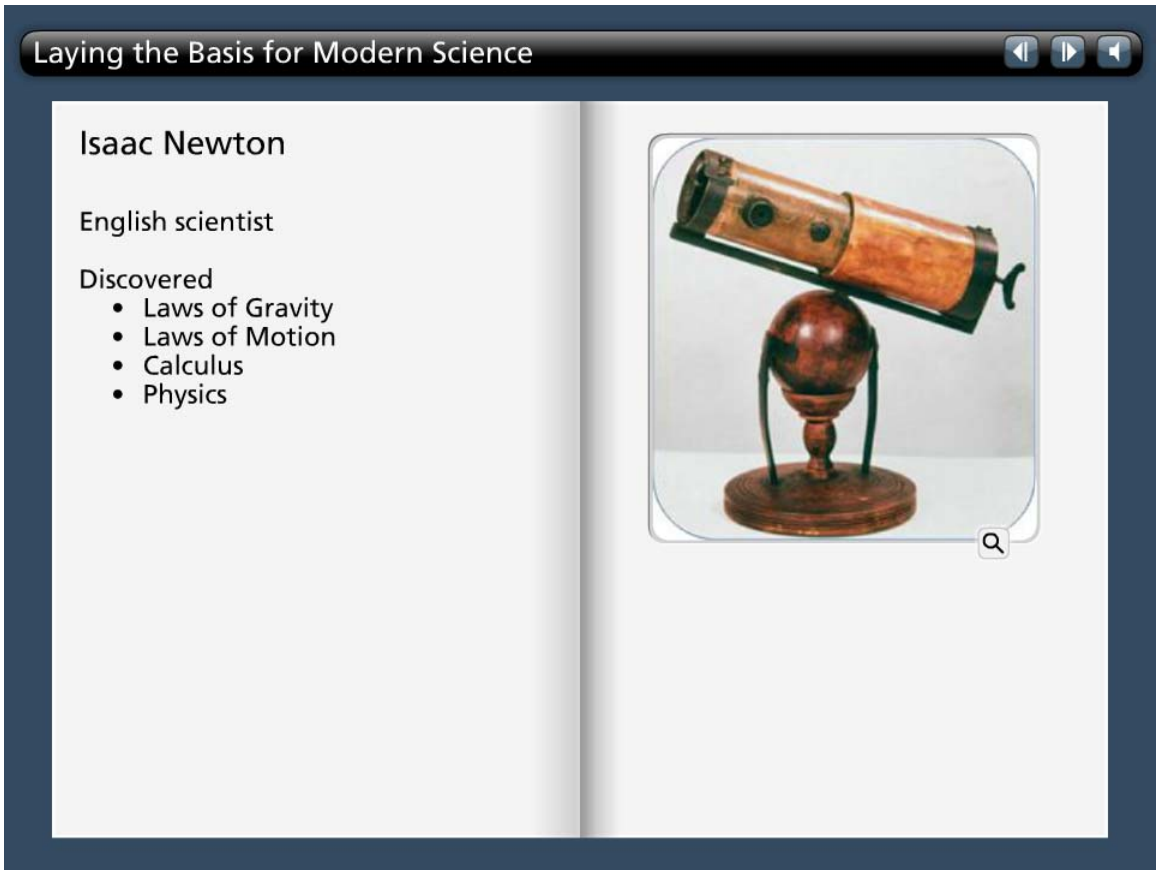
Narration

Galileo Galilei studied and tested Aristotle's ideas about motion. Using observation and reason, he was able to prove that many of Aristotle's ideas were false. According to legend, Galileo dropped different weights off of the leaning tower of Pisa to disprove Aristotle's theory that heavier objects fall faster than lighter objects.

He is also credited with developing the telescope. He used this new tool as a way to observe the planets and stars. Galileo's telescope was used to give accurate descriptions of the moon and sun. The telescope would also help prove the heliocentric theory.

Some of the new ideas from the Scientific Revolution were not so readily accepted. Church leaders from both Protestant and Catholic churches believed that the heliocentric theory made Earth seem less important. Because Galileo was a Catholic living near the center of the Catholic Church in Rome, church leaders banned Copernicus' ideas and put Galileo on trial. They accused him of heresy. In 1633, Galileo was threatened with being burned at the stake and forced to recant, or take back, his ideas. He was placed under house arrest for the rest of his life.

Isaac Newton



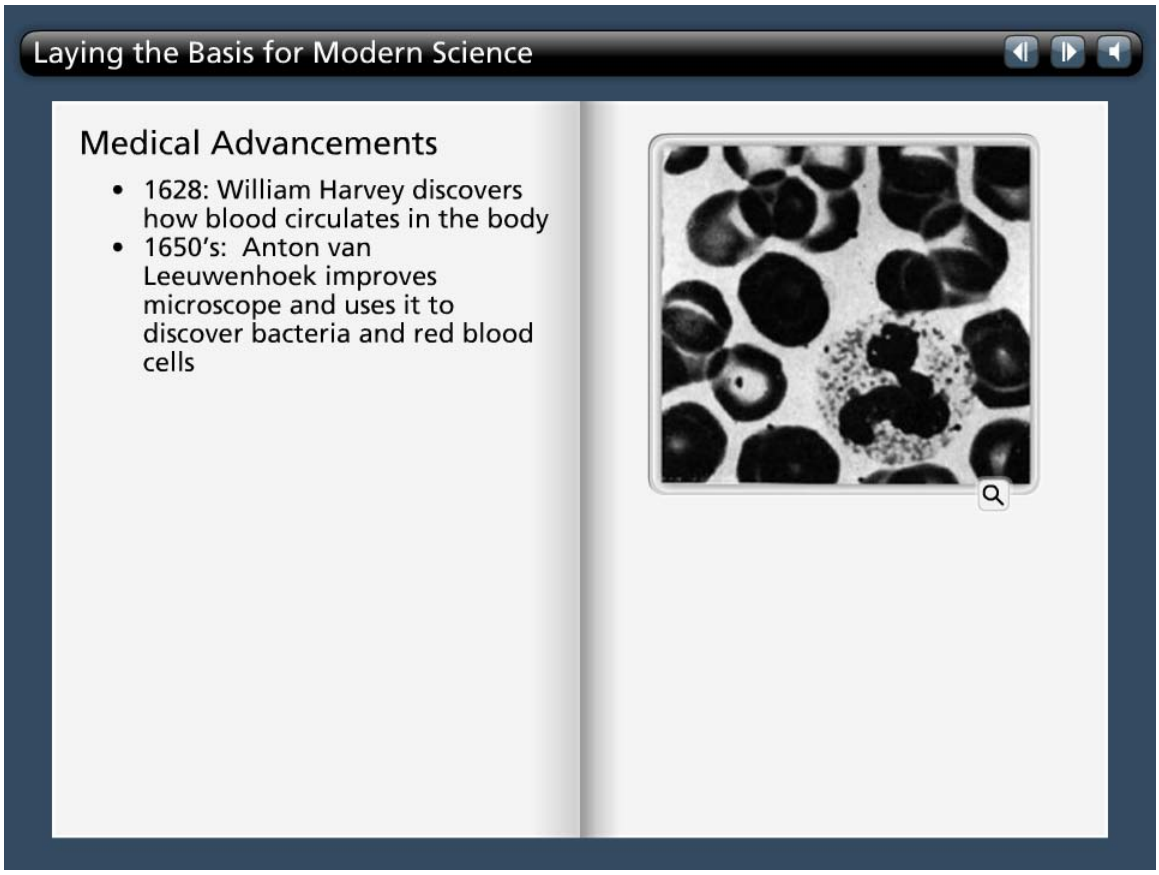
Narration

Isaac Newton was an English scientist who laid out the laws of gravity and the three laws of motion, which described how the physical world worked.

According to legend, after observing an apple fall from a tree, Newton theorized that the same force which pulled the apple to the ground also controlled the movements of planets. Over the next twenty years, he perfected his theory using mathematics to show that a single force called gravity keeps the planets in their orbits around the sun, thereby proving that the heliocentric model of the universe was correct.

Newton's most famous publication was *Principia Mathematica*. In this book, he stated his three laws of motion and gained international recognition for himself. He also is known for developing a new type of telescope and for his ideas about light obtained through the use of optical lenses.

Medical Advancements



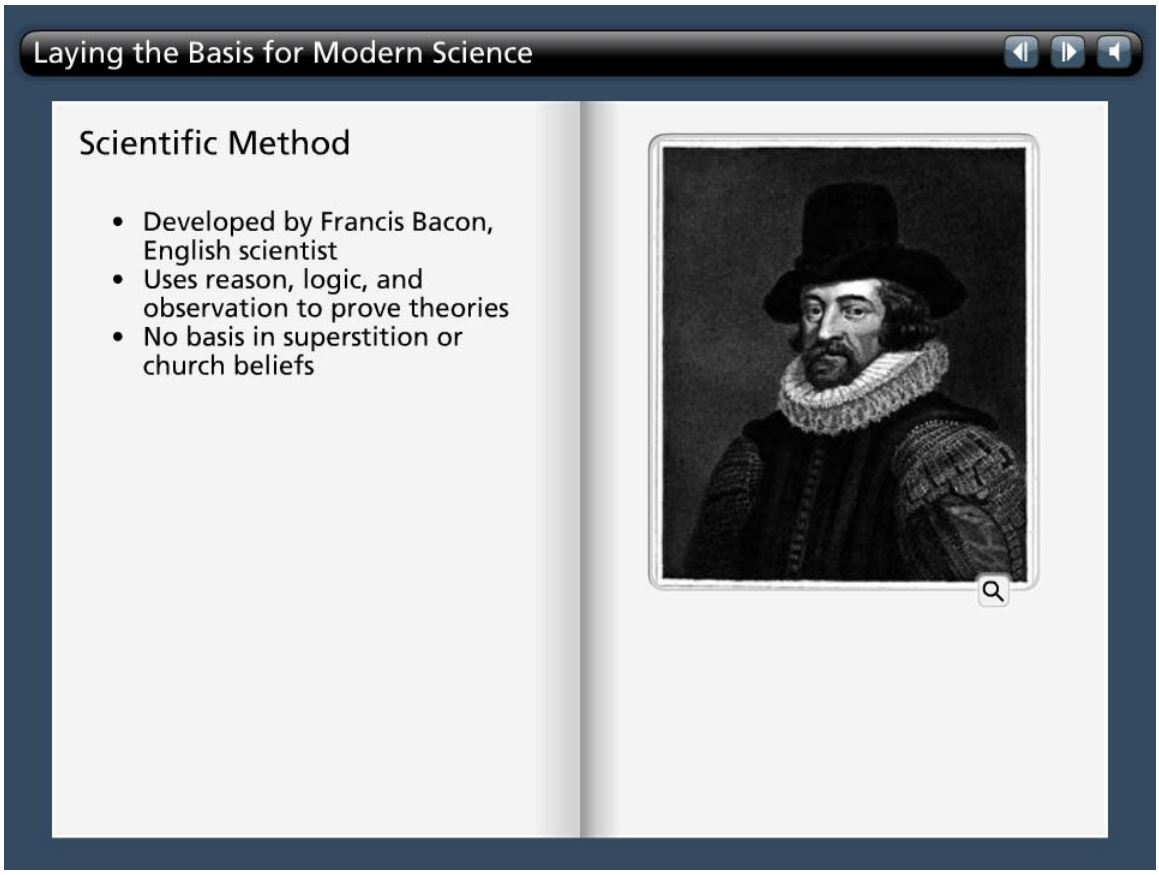
Narration

The Scientific Revolution also brought a number of medical advancements which laid the foundations for many of the techniques and technologies in use today.

William Harvey was an English scientist who was the first to accurately describe how the blood circulation system worked, with the heart acting as the pump which pushes blood through the body's veins and arteries.

Another contributor to the field of medicine was Anton van Leeuwenhoek, a Dutch inventor who perfected the microscope and was first person to see cells and microorganisms that cannot be seen with the naked eye.

Scientific Method

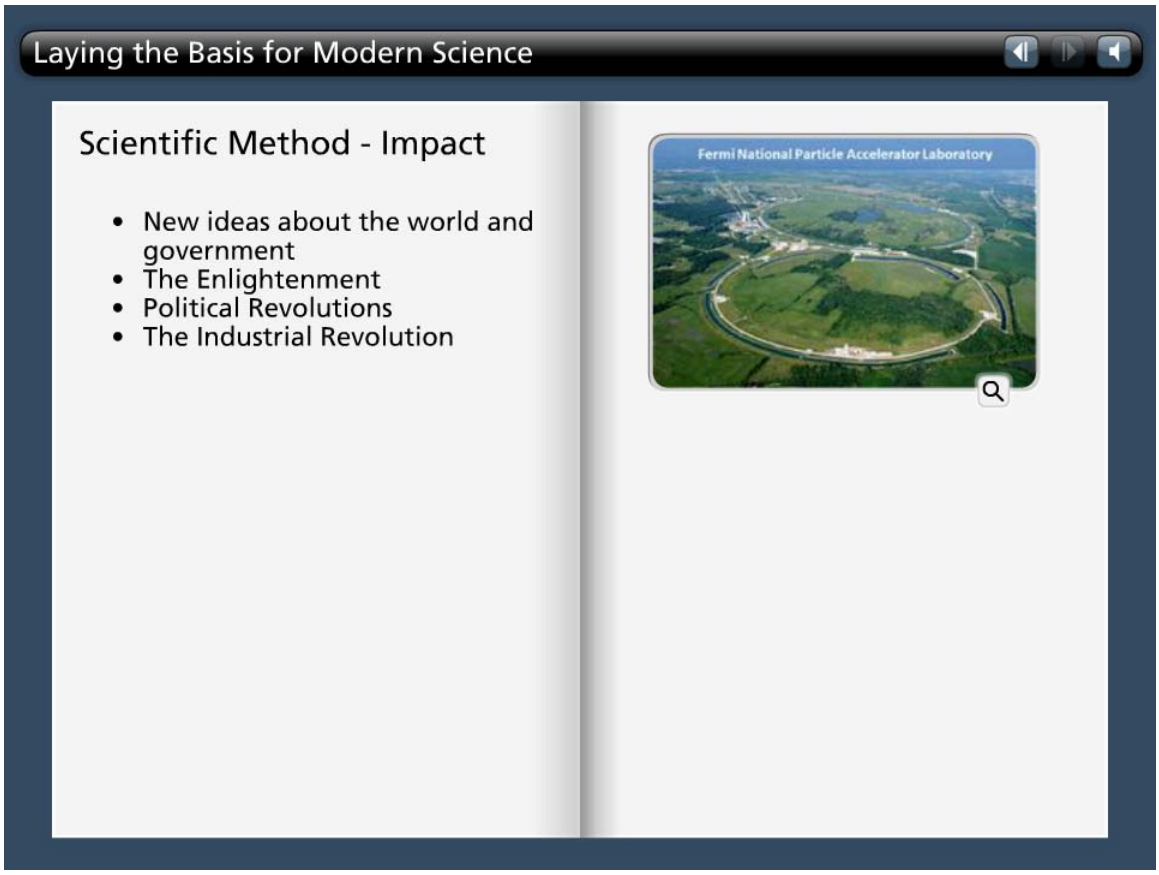


Narration

One of the major developments of the Scientific Revolution was the creation of a step-by-step process for scientists to use when testing their work.

In the 1600s, Francis Bacon developed the modern scientific method, a system that requires a scientist to create a hypothesis, test the hypothesis, and analyze the data that they collect in order to form conclusions. The scientific method also required scientists to test and challenge their findings to gain an accurate understanding of the world. New inventions like the microscope and telescope helped scientists follow the scientific method.

Scientific Method - Impact



Narration

The Scientific Revolution that took place in the 1500s and 1600s resulted in rapid advancements in science and technology that continue to this day. From that point on, scientists applied the scientific method in their pursuit of knowledge. This rational approach to the world opened the door for many of the ideas of the Enlightenment, including the application of scientific thinking to how governments should work.

The resulting new ideas led to revolutions in the Americas and Europe. In addition, Scientific Revolution thinkers inspired others to use reason and experimentation to develop new technologies. These new technologies resulted in the Industrial Revolution during the 1800s into the early part of the 1900s and the rapid pace at which technology advances today.