

Chapter 17, Section 1 (Pages 538–545)

# The Scientific Revolution

## Big Idea

The Scientific Revolution gave Europeans a new way to view humankind's place in the universe. As you read, use a table like the one below to chart the contributions of scientists to a new concept of the universe.

Copernicus	
Kepler	



## Read to Learn

### Causes of the Scientific Revolution (page 538)

#### Determining Cause and Effect

*How did the study of Greek influence the way Europeans viewed Aristotle?*

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In the Middle Ages, educated Europeans relied on a few ancient authorities, especially Aristotle, for their scientific knowledge. During the Renaissance, humanists studied Greek as well as Latin. This gave them access to other ancient authorities, such as Ptolemy, Archimedes, and Plato. This in turn let them know that some ancient thinkers had disagreed with Aristotle. This and other developments encouraged new ways of thinking. Technical problems that required careful observation and accurate measurements, such as calculating the weight that ships could hold, stimulated scientific activity. The invention of new instruments, such as the telescope and the microscope, made fresh discoveries possible. Above all, the printing press helped spread new ideas quickly and easily.

Explorers began to search for scientific discoveries instead of wealth and glory. James Cook used a chronometer, which calculated the precise location of a ship, to map Australia's coastline. He also discovered that eating fresh fruit prevented scurvy.

Mathematics played a key role in the scientific achievements of the sixteenth and seventeenth centuries. The foundation for trigonometry was laid. The decimal system was introduced and a table of logarithms was invented. This made calculation easier. Many great thinkers were also great mathematicians who believed that the secrets of nature were written in the language of mathematics.

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# Read to Learn

## Scientific Breakthroughs (page 540)

### Drawing Conclusions

*How did the Catholic Church try to block progress in scientific thought?*

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The ancient astronomer Ptolemy had constructed a **geocentric** model of the universe that placed Earth at the center. All the heavenly bodies but Earth were made of light.

In 1543 Nicolaus Copernicus published his theories, which said that the Sun was the center of the universe (it was **heliocentric**) and that the planets revolved around it. Johannes Kepler supported this model when he used detailed astronomical data to confirm it.

Galileo Galilei was the first European to make regular observations of the heavens by using a telescope. He discovered that the heavenly bodies were not made of light, but composed of material substance, as Earth was.

The Church ordered Galileo to abandon the Copernican idea his research supported. However, most astronomers had accepted the heliocentric conception of the universe by the 1640s. Then Isaac Newton defined three laws of motion. Part of his argument was the **universal law of gravitation**. This law stated that every object in the universe was attracted to every other object by a force called gravity.

## Women's Contributions (page 543)

### Making Inferences

*How did keeping scholarship as the domain of men help to restrict the rights of women?*

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Many women contributed to the Scientific Revolution, even though scholarship was the domain of men. Margaret Cavendish, had no formal education in the sciences, but she wrote a number of works on scientific matters, some of which criticized the idea that humans were masters of nature.

Between 1650 and 1710, women made up 14 percent of all German astronomers. The most famous female astronomer, Maria Winkelmann, was rejected for the position of assistant astronomer at the Berlin Academy. Though she was well-qualified, she was a woman and did not have a university degree. Scientific work was considered to be mainly for males.

## Philosophy and Reason (page 544)

### Determining Cause and Effect

*How did the Scientific Revolution influence the Western view of humankind?*

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The Scientific Revolution influenced the Western view of humankind. French philosopher René Descartes developed a system of thought called **rationalism**. He believed that the mind and the body, indeed all matter, were separate. Matter could therefore be viewed as dead, or inert, and could be investigated by the mind.

Francis Bacon created the **scientific method** for learning about nature. He taught that scientists should use **inductive reasoning**—starting with detailed facts and then proceeding toward general principles. Scientists were to observe natural events, propose explanations, and use systematic observations and organized experiments to test the explanations.

### Section Wrap-up

*Answer these questions to check your understanding of the entire section.*

1. What is the main difference between the geocentric and heliocentric models of the universe?

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2. What force did Newton identify?

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### Expository Writing

*Explain Francis Bacon's scientific method.*

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