## The Scientific Revolution in Europe 1473–1794

During the Middle Ages, Europeans' understanding of the nature of the world around them was based on the writings of ancient classical philosophers such as Aristotle and Ptolemy. The Renaissance of the 15th and 16th centuries led scholars to examine these texts more closely. A new enthusiasm for knowledge, in addition to a greater belief in the abilities of humanity, led some to start making observations and formulating new theories. Central to this new spirit of inquiry was an insistence that theories should be based on experimental evidence and not on the authority of ancient sources. The Scientific Revolution of the 16th and 17th centuries changed the way Europeans saw the world and promoted the application of scientific methods of rational inquiry to all aspects of life.

1500

1550

1600

1650

1700

1750

1800

## LEADING SCIENTISTS 1473–1543 Nicolaus Copernicus, Polish priest and mathematician. He denies the medieval belief, inherited from the classical Greek astronomer Ptolemy (c. 90–168), that the Earth is the center of the universe and develops the revolutionary theory that the Earth and planets revolve around the Sun (heliocentric theory) in his *De revolutionibus orbium coelestium* (On the revolutions of the celestial spheres, completed 1530)

1561–1626 Francis Bacon, English philosopher. His Novum organum (1620) stresses the importance of proper scientific method: theories must be supported by proof acquired by experimentation and observation

1578–1657 William Harvey, English physician and anatomist. He discovers the circulation of the blood and describes the purpose of arteries, veins, and the heart in *De motu cordis et sanguinis in animalibus* (On the motion of the heart and blood in animals. 1628)

1596–1650 René Descartes, French philosopher and mathematician. Develops analytic geometry and other mathematical techniques useful in theoretical science. He believes that mathematical proof is the model for rational scientific inquiry. His best-known philosophical work, Meditationes de prima philosophia (Meditations on First Philosophy, 1641), emphasizes the importance of accepting only indubitable evidence

1627–1691 Robert Boyle, Irish physicist and chemist. He investigates the properties of air and develops a theory describing the relationship between the pressure and volume of gases (known as Boyle's Law). In *The Sceptical Chemist* (1661) he questions the accepted belief that the world is made up of just four elements (Earth, Air, Fire, Water) and argues that they can be broken down into more fundamental, chemical elements

1743–1794 Antoine-Laurent Lavoisier,
French chemist. In Traité élémentaire de
chimie (Elementary Treatise on Chemistry,
1789) he describes the constituent gases of
air (calling the two most significant oxygen
and nitrogen) and shows that combustion can
take place only in the presence of oxygen.
Develops the modern system for naming
chemical compounds and proposes that
matter is never destroyed in chemical
reactions (Law of Conservation of Matter).

nts14–1564 Andreas Vesalius, Belgian physician and anatomist. In his De humani corporis fabrica libri septem (Seven Books on the Structure of the Human Body, 1543) he describes human anatomy more accurately than the classical Greek scientist Galen (c. 130–201), whose works have been the standard reference throughout medieval Europe. His work brings a sentence of death from the Inquisition (Catholic Church tribunal) for immorality, but he is not executed

1564–1642 Galileo Galilei, Italian mathematician and scientist. The first to use telescopes for astronomy. He describes the surface of the Moon and the rotation of the moons of Jupiter. Also establishes basic laws of motion from experimentation. He is arrested by the Inquisition and forced to recant the endorsement of the heliocentric theory made in his Dialogo dei due massimi sistemi del mondo (Dialogue Concerning the two Chief World Systems, 1632)

1571–1630 Johannes Kepler, German mathematician and astronomer. Accepts the heliocentric theory after examining data gathered by the Danish astronomer Tycho Brahe (1546–1601). His Astronomia nova (New Astronomy, 1609) and De Harmonice mundi (Harmonies of the World, 1619) explain that the orbits of the planets are elliptical and not circular as Copernicus has suggested

**1629–1693 Christiaan Huygens**, Dutch physicist and astronomer. He proposes the wave theory of light, discovers the rings of Saturn, and builds the first reliable pendulum clock (originally an idea of Galileo's)

**1632–1723 Antoni van Leeuwenhoek**, Dutch biologist. He designs a powerful microscope and uses it to describe bacteria, protozoa, spermatozoa, and blood corpuscles

1642–1727 Issac Newton, English physicist and mathematician. One of the greatest theoretical scientists in history. He discovers the law of gravitation after studying Kepler's laws of planetary motion and formulates three laws of motion that form the basis of physics until the 20th century (called Newtonian mechanics). Also invents the reflecting telescope (uses a curved mirror to focus light) and develops the mathematical system known as calculus. Best-known work is *Philosophiae naturalis principia mathematica* (*The Mathematical Principles of Natural Philosophy*, 1687)