

The New Science of The Seventeenth Century

Doubt thou the stars are fire,
Doubt that the sun doth move,
Doubt truth to be a liar,
But never doubt, I love.
-William Shakespeare, *Hamlet*, II, 2.

- I. Introduction
 - a. The scientific revolution
 - i. Heliocentricity
 - ii. A new mathematical physics
 - iii. New method of inquiry
 - iv. Science as a distinctive branch of knowledge
 - v. Natural philosophy—the philosophy of nature
- II. The Intellectual Origins of the Scientific Revolution
 - a. Medieval antecedents
 - i. Artists and their observations of the natural world
 - ii. The magnetic compass
 - iii. The printing press
 - iv. Gunpowder
 - v. A fascination with light (optics and lens grinding)
 - vi. A natural world created by God
 - b. The Renaissance
 - i. Humanists placed low value on science
 - ii. More interested in classical antiquity and the authority of the ancients
 - iii. Arabic translations of Greek classics
 - iv. Rediscovery of Ptolemy and Archimedes
 1. The universe as machine
 - c. Voyages of discovery
 - i. Travelers' accounts of foreign lands
 - ii. Attacking the authority of the ancients
- III. Nicolaus Copernicus (1473–1543)
 - a. Copernican system
 - i. The earth moved and was not the center of the planetary system
 - ii. The earth rotated on its axis and orbited the sun
 - b. Believed he had restored a pure understanding of God's plan but was troubled by its implications
 - c. New problems and inconsistencies
 - d. *On the Revolutions of the Heavenly Spheres* (1543)
- IV. Tycho Brahe (1546–1601)
 - a. Not a Copernican
 - i. Planets orbited the sun, the whole of which orbited a stationary earth
 - b. A champion of observation
 - c. Observed the appearance of a new star (nova) in 1572

- d. Built his own observatory
- V. Johannes Kepler (1571–1630)
 - a. Three laws of planetary motion
 - i. Planets travel in elliptical orbits
 - ii. Speed of the planets vary with their distance from the sun
 - iii. Magnetic forces keep the planets in orbital motion
 - b. *Cosmographic Mystery* (1596)
 - c. *New Astronomy or Celestial Physics* (1609)
 - d. *The Harmonies of the World* (1619)
 - e. Broke down the distinctions between the heavens and the earth
 - i.
- VI. Galileo Galilei (1564–1642)
 - a. Built his own telescope in 1610
 - b. Observed the features of the moon, the moons of Jupiter, and sun spots
 - c. A challenge to heavenly perfection
 - d. *The Starry Messenger* (1610)
 - e. Controversy with the church
 - i. 1616: the Inquisition declares heretical the proposition that the earth moves
 - ii. Copernicus's *De Revolutionibus* is placed on the Index of Forbidden Books
 - iii. *A Dialogue Concerning the Two Chief World Systems* (1632)
 - iv. Inquisition banned the book
 - v. Galileo ordered to stand trial in 1633
 - vi. Recanted his beliefs and placed under house arrest for life
 - f. Legacy
 - i. Suggested universal laws of motion
 - ii. The new science moves out of Italy to northwest Europe
- VII. Issac Newton (1642-1727)
 - a. Accepted into the Royal Society of London (1672) for work on nature of light.
 - b. *Mathematical Principles of Natural Philosophy or Principia*, 1697
 - i. Universal law of gravitation
 - c. Dies a National hero and buried at Westminster Abbey
 - d. Work translated into French by Emilie Du Chatelet and popularized by Voltaire.