

## ***Chapter 6***

# **THE SCIENTIFIC VIEW OF THE WORLD**

## **6.27 THE EMERGENCE OF A SCIENTIFIC CULTURE: BACON AND DESCARTES**

### *Study Questions*

1. Why is the history of science an important part of modern history?
2. In what sense did science become modern in the seventeenth century?
3. How did Francis Bacon and Ren Descartes attack earlier methods of seeking knowledge? What did they expect to be the results of the scientific method?
4. Explain the nature of Bacon's inductive method. What was his major weakness as a scientist?
5. Describe how the emphasis on the usefulness of knowledge became the other main element in the Baconian tradition.
6. Describe Descartes' contributions to mathematics. What is meant by Descartes' method of systematic doubt and Cartesian dualism?

### *Key Discussion Sentences*

1. The seventeenth century has been called the century of genius.
2. The scientific revolution of the seventeenth century had repercussions far beyond the realm of pure science.
3. Science in time provided Europe with a new faith in itself.
4. Bacon and Descartes helped develop the scientific view of the world and emphasized the use of scientific knowledge for practical purposes.

### *Identifications*

Deductive method	Leonardo da Vinci	<i>The Advancement of Learning</i>
Inductive method	Montaigne	<i>The New Atlantis</i>
Empiricism	<i>Instauratio Magna</i>	<i>Discourse on Method</i>
<i>Cogito ergo sum</i>	<i>Novum Organum</i>	

## 6.28 THE ROAD TO NEWTON: THE LAW OF UNIVERSAL GRAVITATION

### *Study Questions*

1. Describe the early scientific advances and contributions made in the field of Botany, anatomy, and physiology in the seventeenth century.
2. Compare the Ptolemaic conception of the universe with that of Copernicus. How did Kepler further develop the Copernican theory?
3. What did Galileo's observations tell him about the nature of the heavenly bodies? Why were these views upsetting to his contemporaries?
4. How did Newton build upon the work of his predecessors? What was his supreme achievement?
5. What advances were made in the practical and applied sciences in the seventeenth and eighteenth centuries? In what sense was the study of science becoming institutionalized?
6. Discuss the impact of the scientific revolution on the world of thought. What were the implications of the scientific discoveries for traditional religious beliefs, for political theory, and for society?
7. How do the illustrations on pp. 243, 244, and 249 add to one's understanding of the intellectual activities of this age?

### *Key Discussion Sentences*

1. It was in physics and astronomy that the most astonishing scientific revolution of the seventeenth century took place.
2. Although Newton and other scientists continued to believe in the existence of God, the old feeling of dependency on divine powers and judgments lost much of its force.

3. New scientific knowledge contributed to the expansion of Europe's colonial empires as well as the growing internal power of European governments.
4. The physical universe revealed by science became a model on which many thinkers hoped to refashion human society.
5. The revolution accomplished from Copernicus to Newton has been called the greatest spiritual adjustment that the early modern centuries had to make.

### *Identifications*

Vesalius	Sir Isaac Newton
Galileo	William Harvey
Nicholas Copernicus	Leeuwenhoek
Heliocentric theory	<i>Mathematical Principles of Natural Philosophy</i>
<i>On the Revolutions of the Heavenly Orbs</i>	Tycho Brahe
John Kepler	

## 6.29 NEW KNOWLEDGE OF HUMAN BEINGS AND SOCIETY

### *Study Questions*

1. What impact did knowledge of other parts of the world have on Europe and on European thought? How did this new knowledge contribute to the growing force of skepticism?
2. Describe the new sense of evidence that appeared in this age. How did it reveal itself in law? How did it help end the witchcraft persecutions?
3. How was the new sense of evidence reflected (a) in historical scholarship and (b) in religious scholarship?
4. Describe Baruch Spinoza's thinking during his life-time.
5. Explain the significance of John Locke's writings (a) on religion and religious toleration and (b) on the nature of learning and knowledge. What were the implications of his views for social action? How were his ideas applied outside his own country?

### *Key Discussion Sentences*

1. The growing involvement with other cultures undermined the old Europe and its ideas, just

- as Europe was undermining the old cultures beyond the oceans.
2. Exposure to the variety of human manners and customs led to a new sense of the relative nature of human institutions.
  3. The new views of humanity and of nature began to undermine the old certainties of European life, particularly Christianity.
  4. There was much skepticism about history in the seventeenth century.
  5. The most profoundly disturbing of all thinkers of the age was Baruch Spinoza.
  6. In his writings, John Locke summarized many of the intellectual trends of his lifetime and exerted an immense influence on the future.

### *Identifications*

Pierre Bayle

*Letter on Toleration*

Numismatics

Jean Mabillon

Archbishop James Usher

Richard Simon

Gregorian calendar

Palaeography

Edmund Halley

*Reasonableness of Christianity*

Chronology

*Essay Concerning the Human Understanding*

Biblical criticism

### *Map Exercises*

1. Study the maps on p. 255 in your text, The Growth of Geographical Knowledge. What do the four panels reveal about advances in geographical knowledge from the sixteenth to the eighteenth century?

## 6.30 POLITICAL THEORY: THE SCHOOL OF NATURAL LAW

### *Study Questions*

1. In what sense did Machiavelli attempt to adopt a scientific view in *The Prince*? In what way was his analysis not scientific?
2. Define natural law and natural right. How, according to natural law philosophy, was natural law to be discovered?

3. Why did some thinkers try to create an international law or “law of nations”?
4. Explain how the philosophy of natural law was used to justify both absolutist and constitutional government in the seventeenth century. Compare and contrast the political theories of Thomas Hobbes and John Locke.
5. How did Locke justify the English Revolution of 1688? How did he make it seem modern and forward-looking?
6. How could some of Locke’s philosophical observations and conclusions be used to bolster less progressive views?

*Key Discussion Sentences*

1. Political theory can never be strictly scientific, but was affected by the scientific view.
2. The seventeenth century was the classic age of the philosophy of natural right and of natural law.
3. On the basis of natural law some thinkers tried to create international law.
4. Locke’s writings converted the English Revolution of 1688 into an event of universal meaning.
5. Both Locke and Hobbes, and the whole school of natural law, held that government was based on a kind of contract.

*Identifications*

*The Prince*

Samuel Pufendorf

*Two Treatises of Government*

Hugo Grotius

*Leviathan*

John Locke

GENERAL ESSAY QUESTIONS FOR CHAPTER 6

1. Why has the seventeenth century been called the century of genius? Explain with reference to (a) advances in science and scientific thought, (b) new ways of thinking about human beings, society, and politics, (c) new geographical knowledge, and (d) changed ideas about religion and the universe.

2. Why did the scientific revolution of the seventeenth and eighteenth centuries call for a spiritual readjustment and a questioning of traditional beliefs? How did it lead to the reassessment of attitudes derived from (a) the Middle Ages, (b) the Renaissance, and (c) the Reformation?
3. How did ideas derived from science influence ideas of natural law and natural rights?

## GENERAL DISCUSSION PASSAGES FOR CHAPTER 6

1. Science, purely as a form of thought, is one of the supreme achievements of the human mind, and to have a historical understanding of human intellectual powers, one must sense the importance of science, as of philosophy, literature, or the arts. (pp. 233–234)
2. In the modern world ideas have a way of passing over from science into other domains of thought. Many people today, for example, in their notions of themselves, their neighbors, or the meaning of life, are influenced by ideas which they believe to be those of Freud, or Einstein—they talk of repressions or relativity without necessarily knowing much about them. (p. 234)
3. In the coming together of knowledge and power arose the far-reaching modern idea of progress. And in it arose many modern problems, because the power given by scientific knowledge can be used for either good or evil. (p. 238)
4. For Bayle, as for Montaigne, no opinion could justify burning your neighbor at the stake. (p. 252)
5. History, like the law, depends on the discovery and use of evidence. The historian and the judge must answer the same kind of question—did such-and-such a fact really occur? (p. 254)
6. A common system of dating is a great aid to thinking of human history as an interconnected whole. (p. 257)
7. Locke's environmentalist philosophy became fundamental to liberal and reforming thought in later years. It seemed that the evil in human actions was due to bad social institutions and that an improvement in human society would improve human behavior. (p. 259)
8. Political theory can never be strictly scientific. Science deals with what currently exists or has existed. It does not tell what ought to exist. Political theory is in a sense more practical than science. It is impossible in human affairs to escape the word "ought," or to stop

thinking about possible changes in social and political systems. (p. 260)

9. Machiavelli observed that successful rulers behaved as if holding or increasing power were their only object and that they regarded all else as means to that end. Though governments did in fact continue to behave for the most part as Machiavelli said, most people refused to admit that they ought to. (p. 260–261)
10. The idea of natural law underlies a good deal of modern democratic development, and its decline over the last century has been closely connected with many of the troubles of recent times. (p. 261)
11. Philosophers of natural law said that human beings are rational animals. And they assumed that all human beings have, at least potentially and when better enlightened, the same powers of reason and understanding. (p. 261)
12. By the twentieth century it was widely thought that the human mind was not especially rational but was motivated by unconscious drives or urges or instincts and that human cultural differences were so fundamental that people of different nationalities or classes could never expect to see things in the same way. Challenged by such theories of human irrationality and cultural difference, the older philosophy of a universal natural law lost its hold on many minds. (pp. 261–262)
13. Events in England, as explained by Locke, and as seen in other countries and even in England and its colonies through Locke's eyes, launched into the mainstream of modern history the superb tradition of constitutional government, which has been one of the principal themes in the history of the modern world ever since. (p. 266)
14. By 1700, at the close of the “century of genius,” some beliefs that were to become characteristic of modern times had clearly taken form, notably a faith in science, in human reason, in natural human rights, and in progress. These ideas were eventually to revolutionize Europe, America, and the world. They were also in subsequent years to be modified, amended, challenged, and even denied. But they are still very much alive today. (p. 266)