PART VII SCIENCE AND SPLENDOR: THE SEVENTEENTH CENTURY

Chapter 20 The Consolidation of Modernity

1. Many of the tendencies we recognize as modern were part of the institutions and daily life of 1650.
2. Literature, painting, and sculpture increasingly depicted secular subjects.
3. The centralized state with a bureaucracy, standing army, and a system of taxation was the dominant form of government.
4. Elaborate trading networks fostered and served a world-wide market for goods.
5. To meet the demand of this expanding and complex economic system, the Europeans developed the national bank and the *joint-stock* company.
6. The *Scientific Revolution* eventually made possible immense material improvements in the human condition.

I. The Thirty Years' War and Its Aftermath

1. The Thirty Years' War (1618–1648) was one of the bloodiest in modern times.
2. The German Catholic campaign of the Counter-Reformation triggered its outbreak.
3. Bohemian Protestants reacted to the suppression of their faith by the Catholic king who was also king of Austria.
4. The war, fought with mercenary armies, gradually spread to the whole empire.
5. The *Peace of Westphalia* reestablished the rule that each prince in the empire could determine the religion of his state.
6. The war halted the advance of the Counter-Reformation and marked the end of Spain's influence in European politics.
7. It was the last European war fought over religion.

II. The Scientific Revolution

1. By 1700 a radical change was taking place in European attitudes about the relationship among humanity, God, and nature—thanks to dazzling progress made in the scientific realm.
2. By the sixteenth century, the scientific writings of the ancients had been absorbed.
3. The Europeans embraced the idea that all physical objects could be reduced to numbers which differed significantly from the medieval approach.
4. The change from a finite, Earth-centered universe to one in which the Earth revolved around the sun marked a profound change in orientation of humanity's place in the universe.
5. Cooperation between scholars and skilled workers led to the creation of new instruments for observing and calculating nature's handiwork.

A. Copernicus (1473–1543) and Kepler (1571–1630)

1. Copernicus was a Polish priest and astronomer.
2. His *On the Revolution of the Heavenly Bodies* was dedicated to the Pope.
3. Copernicus' innovation was to make the sun the center of the universe instead of the Earth.
4. The theory was only a hypothesis that was not proven without decades of diligent observation of planetary motion.

5. The theory and its proof elevated the status of mathematics as a scientific tool.
6. Kepler determined that the path of the Earth around the sun was an ellipse.

B. Galileo (1564–1642)
1. Galileo was both a discoverer and promoter of the Scientific Revolution.
2. Using a self-made telescope, Galileo was the first to see that Jupiter had two moons.
3. Galileo developed new modes of thinking about and methods for describing and predicting the motion of objects.
4. Galileo was imprisoned by the Inquisition and then placed under house arrest until his death.
5. Galileo was allowed to continue his research on motion during his confinement.
6. His book, *Discourse On Two New Sciences*, served as the foundation of modern physics.

C. Bacon (1561–1626)
1. Like Galileo, Bacon was both a scientist and a gifted writer.
2. Bacon developed a new approach to science called "empiricism."
3. Empiricism relies on observation and experience in determining truth.
4. Bacon's approach was limited because it did not include a hypothesis as a prerequisite to observation.
5. Nevertheless, his critique of existing methods and his promotion of scientific rigor helped forge a new attitude toward the study of nature.

D. Descartes (1596–1650)
1. Applying mathematics to the study of nature led to dramatic discoveries.
2. Descartes asserted that the universe of extended matter could be reduced to mathematical equations.
3. Descartes systematically applied the principle of doubt to all knowledge, which led him to conclude, "I think, therefore I am."

E. Newton (1642–1727)
1. Working on Descartes theory that all matter was subject to mathematics, Newton developed his own theory of how all motion in the universe could eventually be mathematically described.
2. Newton's theory of universal gravitation postulated that every body in the universe exerted a force of attraction to every other object proportionate to its mass and distance from an object.
3. Newton applied his theory to explain the motion of the planets around the sun, and the moon around the Earth.

F. Other Scientific Discoveries and their Effects
1. Newton's work marked the highpoint of the seventeenth century Scientific Revolution.
2. Other important advances include Harvey's discovery of the circulation of blood, van Leeuwenhook's invention of the microscope, and Boyle's Law on the action of gases.
3. Scientists became less isolated and started forming communities like the Royal Society of London.
4. These institutions helped disseminate information and make advances known to the public.

5. The effects of the Scientific Revolution included anxiety caused by the challenge science posed to traditional religious understanding.

III. Economic Life

1. The birth of modern capitalism came about in the late sixteenth and early seventeenth century.
2. There are two types of capitalism, commercial and industrial.
3. The huge amounts of silver coming from the new world led to higher prices, which spurred investment.
4. Though Spain was the source of the silver through its new world holdings, its economic policies strangled economic development.
5. The other southern European power, Italy, had prospered in the sixteenth century.
6. Italy had been the economic center of Europe, but there was a shift of economic influence to Northern Europe in the seventeenth century.
7. England and Holland (both Protestant) used joint-stock companies to attract investors.
8. These financial instruments allowed the British and Dutch to predominate in financing business ventures in the New World.

IV. The Age of Absolutism

1. While there were many practical restraints on the prerogatives of European monarchs, there were no legally set limits or alternative bodies of institutional authority.
2. In 1650 it was believed that an absolute monarch was the only answer to powerful tendencies toward decentralization that a centralized state had to grapple with.
3. Holland was seen as an exception, owing to its small size and high population density.
4. In order to maintain absolute political power, the monarchs granted economic concessions and privileges to the nobility and the upper bourgeois.
5. This system eliminated internal strife but contributed to international rivalries.

A. Hobbes (1588–1679)

1. Hobbes' *Leviathan* attempted to develop a political theory that emulated the dominant tendencies of the industrial revolution.
2. Hobbes went into exile when the anti-royalists temporarily prevailed in England culminating in the execution of Charles I.
3. Hobbes' motive in writing *Leviathan* was to prevent revolutions.
4. Hobbes viewed people as isolated selfish beings that would be best served by surrendering their freedom to an all-powerful state.
5. Although his work was designed to support monarchy, Hobbes was shunned by monarchs, who based their power on divine right and rejected his scientific justification for absolutism.
6. Hobbes' views earned him the epithet "the Monster of Malmesbury."

B. Locke (1632–1704)

1. Locke sided with Parliament against James II, who wanted to establish an absolute monarchy in England.
2. In his work, *Essay Concerning Human Understanding* (1690), Locke asserted that human beings were to a great extent products of their environment.
3. He advocated a state with limited power governed by elected representatives.

4. Locke's political theories strongly attracted Americans seeking to establish their own government in the following century.