CHAPTER 14 - NEW DIRECTIONS IN THOUGHT AND CULTURE
IN THE SIXTEENTH AND SEVENTEENTH CENTURIES

CHAPTER SUMMARY

The sixteenth and seventeenth centuries witnessed one of history's most significant intellectual developments, a sweeping change in man's view of the universe. A proud, earth-centered picture of the universe gave way to one in which the earth was only one of many planets orbiting around the sun--itself only one of millions of stars. Because their scientific view of mankind's place in the larger scheme of things had been transformed, men began to rethink moral and religious matters as well. The new scientific methods and concepts were deemed so impressive that ever since, science has been the measuring stick of all knowledge.

The first figure in the new movement was Nicolaus Copernicus, a Polish astronomer in the early sixteenth century. Copernicus was dissatisfied with the traditional, Ptolemaic astronomical system. To account for the observable, non-circular patterns of the planets, Ptolemaic thinkers had to make many clumsy adjustments in their systems. For the sake of mathematical elegance, Copernicus preferred to place the sun in the center of the universe.

To Copernicus' concern for mathematics, an English thinker, Francis Bacon (1561-1626), added a desire for scientific thought to conform to empirical observation. Only an amateur scientist, Bacon decried reverence for intellectual authority and advocated innovation, change and a close examination of empirical evidence. Science had to have a practical purpose and should aid the human condition.

Together, Copernicus' mathematical astronomy and Bacon's empirical method provided the key to the scientific revolution. Tycho Brahe (1571-1630), assembled astronomical data which the German Copernican, Johannes Kepler (1571-1630), used to suggest that the orbits of planets were not circular but elliptical. His contemporary, the Italian Galileo Galilei (1564-1642), provided more support for the theory by publishing the first telescopic observations of the heavens. Nature, said Galileo, was totally subject to mathematical laws, a belief for which the Catholic Church condemned him in 1633. The Frenchman René Descartes (1596-1650) believed that deduction and rational speculation could be used to explain the world fully. Baconian empirical observation and induction won more prestige, however, thanks to its use by Isaac Newton (1642-1727). Newton explained the movement of all physical objects in the universe through mutual attraction, or gravity. His discoveries provided a new belief for the view that the natural universe was a realm of law and regularity, subject to mathematical explanation. The new science provided a new basis for religion. Just at a time when Europeans were tiring of irrational wars of religion, they found grounds for believing in a rational god.

The new science by no means swept away all other thought. Traditional beliefs and fears retained their hold on popular culture and resulted in an outbreak of witch panics in the second half of the sixteenth and early seventeenth centuries. The chapter then discusses witchcraft and witchhunts in Early Modern Europe. An estimated 70,000 to 100,000 people were sentenced to death for harmful magic and diabolical witchcraft. Most (about 80%) of these victims were older women, spinsters or widows who were insecure, non-productive and rather vulnerable to accusation. This may have been because of a general fear by men that women were beginning to break away from their control, or that women, as midwives, were responsible for the death of children and spouses during birth. The witch hunts were the result of a general belief in the powers of magic, a belief which died with the rise of a more scientific worldview in the seventeenth century.

The Scientific Revolution is reflected in the works of the great writers and philosophers of the seventeenth century, who knew that they were living in a period of transition. Some embraced the new science completely, some tried to straddle the two ages, still others opposed the new developments that seemed to threaten traditional morality and had made the universe less mysterious and the Creator less loving than before. The chapter then gives a focused account of the lives and works of Margaret Cavendish and Maria Winkelmann, who creatively contributed to the Scientific Revolution even though women were generally excluded from formal participation in scientific societies and universities.

French thought can be represented by Blaise Pascal (1623-1662), a mathematician, scientist and philosopher. Pascal believed that faith and divine grace were more necessary for human happiness than reason and science. An even more controversial religious thinker, Baruch Spinoza (1632-1677) argued that everything exists in God and cannot be conceived apart from him, a position condemned as pantheism but applauded by many late thinkers as the basis of rational religion.

The most original political philosopher of the age was Thomas Hobbes (1588-1679). An enthusiast for the new science, Hobbes advocated a commonwealth tightly ruled by law and order, free from the dangers of anarchy (Leviathan, 1651). A less original, but more influential political thinker was John Locke (1632-1704). Locke opposed Hobbes and denied the argument that rulers were absolute in their power; man's natural state was one of perfect freedom and equality. If a ruler failed in his responsibilities toward his subjects, he violated the social contract and could be replaced. Locke's philosophy came to be embodied in the Glorious Revolution of 1688-1689.
KEY POINTS AND VITAL CONCEPTS

1. **The Scientific Revolution**: This term is something of a misnomer, for unlike most revolutions, the Scientific Revolution was neither rapid, nor did it involve large numbers of people. The "revolution" was the work of a few men employing either of two major methods: the imposition of small changes on existing models of thought; or the desire to ask new kinds of questions and to use new methods of investigation.

2. **The Scientific Revolution and the Church**: Many of the major figures of this intellectual revolution had to deal with a church which resisted radical ideas that would jeopardize theological doctrine. For years before his condemnation by the Catholic Church, Galileo Galilei had contended that scientific theory and religious piety were compatible. Baruch Spinoza championed freedom of thought, but also believed that everything exists in God and cannot be conceived apart from him. Such teaching ran the danger of portraying the world as eternal and human actions as unfree and inevitable--divine fatalism. The limitations of science and reason were cautioned by Blaise Pascal who argued that reason could not in itself explain the existence of God; but it is more reasonable to believe that God exists and that belief results in the improvement of one's life.

SUGGESTED FILMS

*The Majestic Clock Work*. BBC Time-Life. Ascent of Man Series. 52 min.