Scientific Revolution Notes (Spielvogel Chapter 16)

Note: This chapter covers a vast period of time we already covered. Don't get confused.

I. Causes/Antecedents
  A. Humanism – Look to ancients (Classical Civs.)
    i. since they contradict each other, which is right?
    ii. There were some math genius in the old days
  B. Artists – accurate depictions of nature & humanity
  C. Technical needs – innovation necessary for exploration
  D. Magic?
    i. Debate among scholars (see pages 440 – 441)
    ii. most scientists were into alchemy & magic (called the "Hermetic tradition" because historians want to sound fancy)

II. Astronomy
  A. Geocentric – prevailing idea (from Ptolomy [2nd century AD], Aristotle, & Christian theology)
  B. Nicolaus Copernicus (1473-1543)
    i. mathematician who invented heliocentric theory
    ii. initially attacked by protestant reformers (esp. Luther)
  C. Brahe and Kepler
    i. Brahe was a Danish nobleman who was given an island near Copenhagen. He built a fancy castle on it, and used it to collect astronomical observations for 20 years.
    ii. Kepler was Brahe's assistant.
    iii. Mathematician with magical interests who came up with laws of planetary motion
      a) planets orbit the sun in elliptical orbits
      b) speed of a planet increases when it is closer to the sun
      c) for planets, the larger the orbit, the slower the velocity
  D. Galileo Galilei (1564 – 1642)
    i. proved the heliocentric theory with a telescope
    ii. condemned by the Inquisition, kept studying, and ultimately placed under house arrest
    iii. proved that a state of uniform motion is as natural as a state of rest
  E. Sir Isaac Newton (1643 – 1727)
    i. seemed like a normal kid until they shut down Cambridge (where he was a student) because they were afraid of a plague outbreak
      a) invented calculus (culmination of centuries) & started working on universal gravitation
    ii. *Mathematical Principles of Natural Philosophy* (called *Principia*)
      a) explains universe in terms of mechanics
      b) introduced three laws of motion
      c) explained how planets move in their orbits (explains what others found)

III. Medicine
  A. balance of humors approach – dominated middle ages
    i. comes from 2nd century Greek physician Galen, who would explain physiology while an assistant illustrated his points by dissecting a cadaver
    ii. thought that illness came from imbalance of natural "humours" in the body
    iii. contraries cure
  B. Paracelsus (1493-1541)
    i. arrogant – changed his name to Paracelsus ("greater than Celsus," the famous ancient

physician), couldn't hold down a job, see primary document quote on p. 450
ii. thought that people were small replicas of the universe – problems come from imbalance in chemistry and can be treated by chemical mixtures
a) like cures like

C. Andreas Vesalius (1514-1464)
i. suggested practical research to understand anatomy

D. William Harvey (1578-1657)
i. laid the foundation for modern physiology by describing motion of heart & blood

IV. Women in scientific revolution

A. In England/France – mostly informally trained (upper class); Germany had a tradition of family craft production, and therefore allowed women to be scientists (esp. astronomers [1/7] and entomologists)
i. querelles des femmes – centuries-long "arguments about women" – where do they belong, what is their role, etc.?
ii. Science of the period generally "proved" that women were inferior
a) science tends to find whatever it wants to find

B. Margaret Cavendish (1623-1673)
i. scientific critic, esp. criticized attempts to master nature

C. Maria Sibylla Merian (1647-1717)
i. illustrator/entomologist who described insects of Surinam

D. Maria Winkelmann (1670-1720) – wife of Germany's foremost astronomer, discovered a comet

V. Rationalism

A. René Descartes (1596-1640) – Wrote the *Discourse on Method*
i. suggested only accepting philosophies based on reason
ii. began with the supposition that he, himself, exists: "I think, therefore, I am."
iii. secondly concluded the "Cartesian dualism" – mind & matter are separate
a) Westerners began to see themselves as their minds, rather than as a whole organism

VI. Scientific Method

A. Francis Bacon (1561-1626)
i. suggested rebuilding scientific theory from the ground up, based on deductive reasoning, moving from specific things to general things
ii. thought science should be practical

VII. Science & Religion in the 1600s

A. science was initially an outgrowth of religion & mysticism – early scientists saw them as complements to each other, not opponents
i. religious people were the initial attackers of science, not vice versa (Galileo)
ii. evolved into separate systems of thought

B. Benedict de Spinoza (1632-1677)
i. Monism – God *is* the universe, not merely the universe's creator. We are all a part of God. Nature is not for use, but we are all a part of it.

C. Blaise Pascal (1623-1662)
i. Felt that Christianity should be independent of reason – people should join because the world of nature could never reveal God
ii. Pascal's Wager – Pascal said that belief in God is sensible, because if you believe and there is no God, you are out nothing; if you don't believe and there is a God, you are in trouble.