

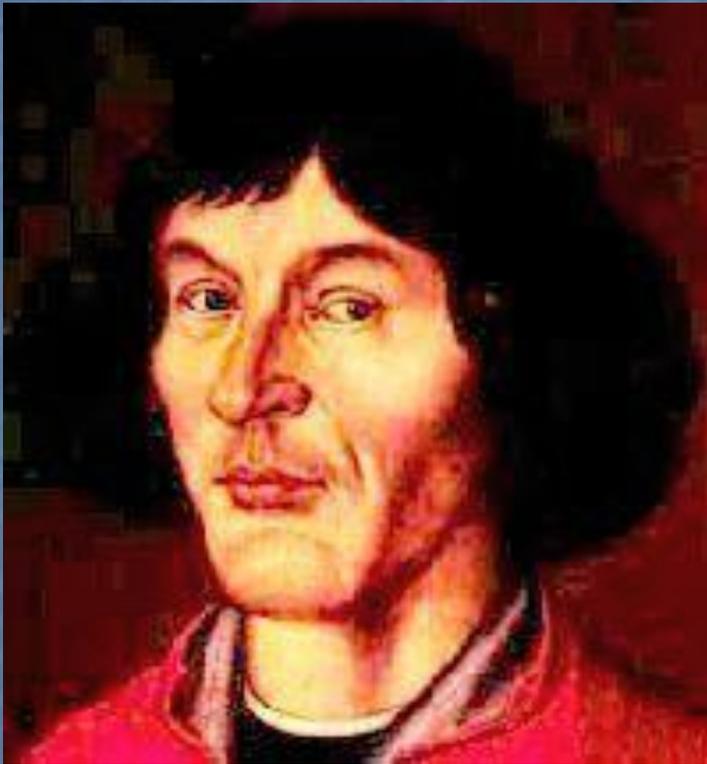
# The Scientific Revolution

## Key Concepts



## II. Scientific “Revolutionaries”

# A. Copernicus (1473-1543)



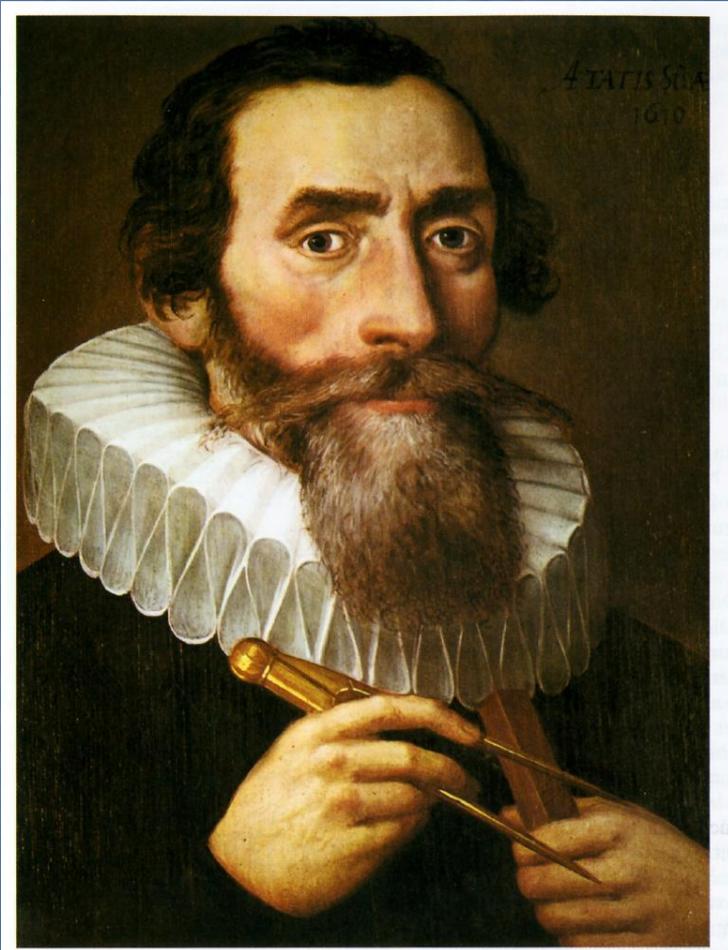
- Aim to glorify God
- Heliocentric view – sun is the centre of the solar system
- Earth and the planets moves around the sun
- Earth rotates around its axis – 24 hours
- One year – around the sun
- *On the Revolutions of the Heavenly Spheres* - written in the 1520s but not published until 1543

# B. Tycho Brahe (1546-1601)



- Arrogant Danish nobleman – received Hven as his domain
- Uraniborg – very sophisticated observatory
- Remained an Aristotelian - Earth in the centre. Sun moved around Earth but the planets moved around the sun...
- Discovered comet shooting right through crystalline spheres

# C. Johannes Kepler (1571-1630)



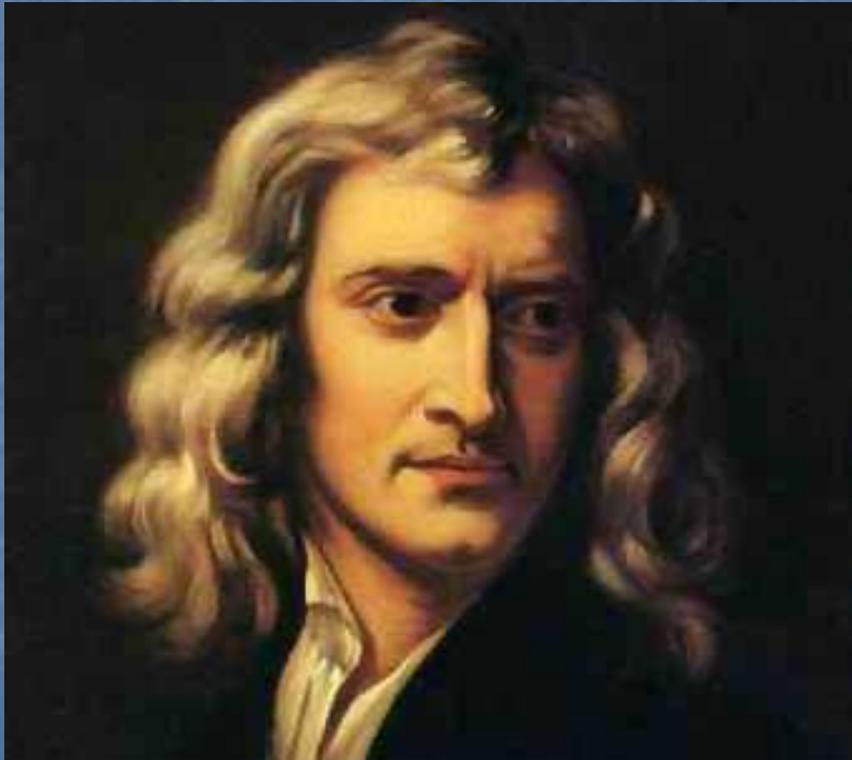
- Student of Brahe
- Supported the Copernican view
- Planetary motion conforms to mathematical formulas
  1. Elliptical orbits
  2. Speed of the planet increases with the distance to the sun
  3. "Harmonic Law"

# D. Galileo Galilei (1564-1642)



- Professor of Mathematics
- Early practitioner of the experimental method
- Mathematical formula for acceleration of falling objects
- His discoveries using the telescope (x30) – mountains on the moon, rings of Saturn, satellites of Jupiter...
- *Dialogue on the Two Great Systems of the World* 1632
- Copernican - Inquisition 1633 (“...but it does move”)

# E. Isaac Newton (1642-1727)



- Blends inductive and deductive methods
  - Argues for a universe governed by natural laws – Three laws of motion
- First law:** The velocity of a body remains constant unless the body is acted upon by an external force.
- Second law:** The acceleration  $\mathbf{a}$  of a body is parallel and directly proportional to the net force  $\mathbf{F}$  and inversely proportional to the mass  $m$ , i.e.,  
$$\mathbf{F} = m\mathbf{a}.$$
- Third law:** The mutual forces of action and reaction between two bodies are equal, opposite and collinear.
- *Principia; Mathematical Principles of Natural Philosophy* (1687)

# F. René Descartes(1596-1650)



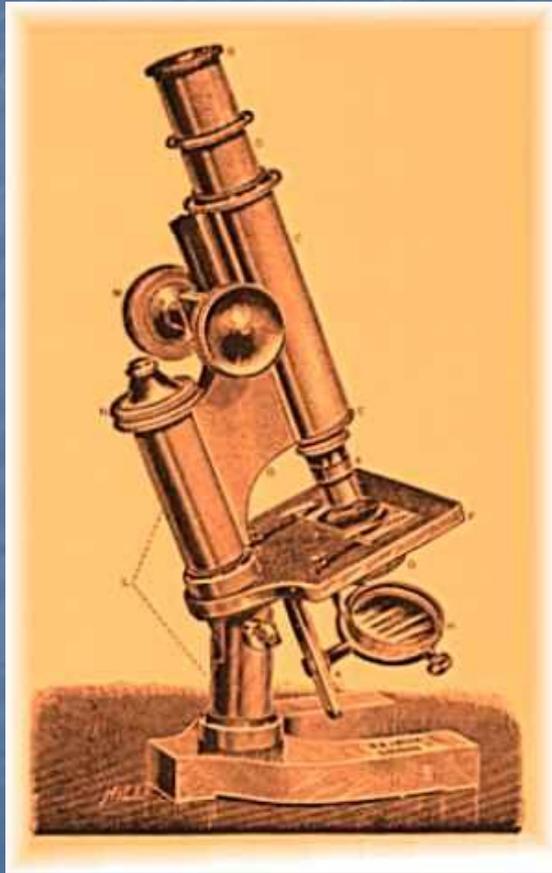
- French philosopher and mathematician
- Cogito ergo sum (I think, therefore I am")
- Reason, not tradition is the source of all knowledge
- Deductive reasoning

# G. Francis Bacon (1561-1626)



- Father of the Scientific Revolution
- The Inductive Method
  1. Observe an object or phenomenon
  2. Develop a theory that explains the object or phenomenon
  3. Test the theory with experiments

# III. Causes of the Scientific Revolution



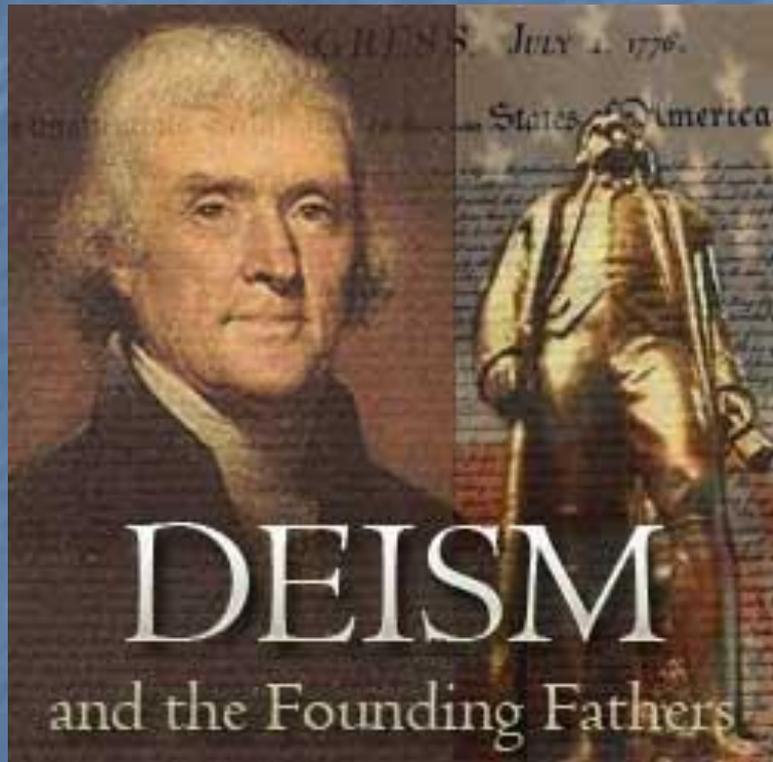
- Medieval Intellectual Life and Medieval Universities
- The Italian Renaissance
- Renewed emphasis on mathematics
- Renaissance system of patronage
- Navigational problems of long sea voyages
- Better scientific instruments

# IV. Consequences of the Scientific Revolution



- Rise of the "Scientific Community"
  - Royal Society of London (1662)
  - Academy of Royal Sciences (1666)
- The modern scientific method
- A universe ordered according to natural laws

# IV. Consequences of the Scientific Revolution (cont)



- Laws discovered by human reason
- “De-Spiritualized” and de-mystified the Universe
- Mechanical View of the Universe
- Deistic View of God

# The Enlightenment

“Siècle de Lumière”

“The Century of Light”

# I. What was it?



- Progressive, Rationalistic, Humanistic worldview
- Emerged out of the Scientific Revolution and culminated in the French Revolution
- Spokesmen = Rising Middle Class
- Paris = Center of Enlightenment
- Optimism about mankind's abilities

## II. Key Ideas



- Distrust of Tradition and Revealed Religion
- Scientific method could be applied to society as well
- Society can get better as risks are taken
- Man is naturally good
- Good life is on earth

# III. An Attack on the Old Regime

# A. The World of the Old Regime



- Built on tradition
- World of hierarchy, privilege and inequality
- Allied with the Church
- Challenged by the reform impulse of supporters of the Enlightenment

## B. Conflict with the Capitalistic Middle Class



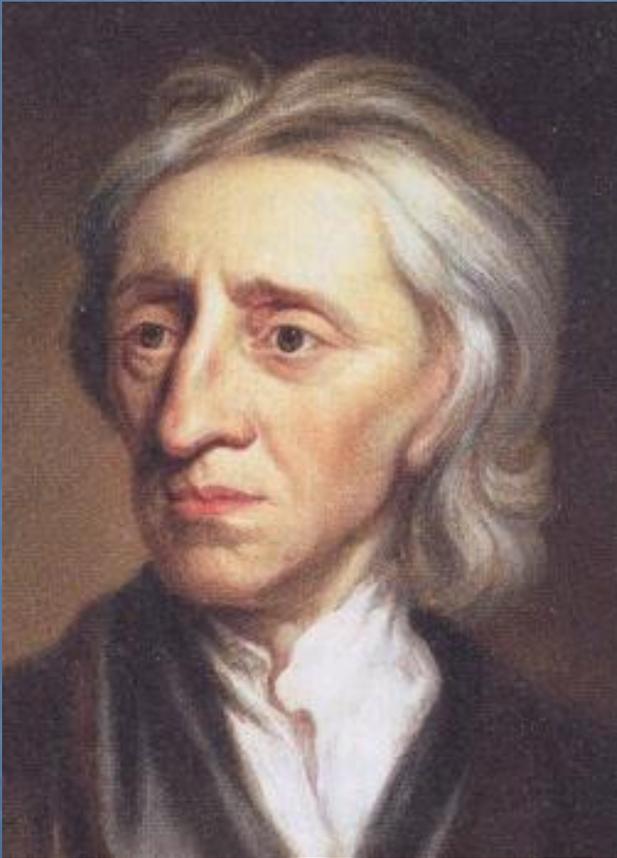
- Support for the Middle Class social order against the traditional social order
- Size and increasing power of the Middle Class
- New notion of wealth
- Tension and discord created by the Middle Class

# C. Popularization of Science



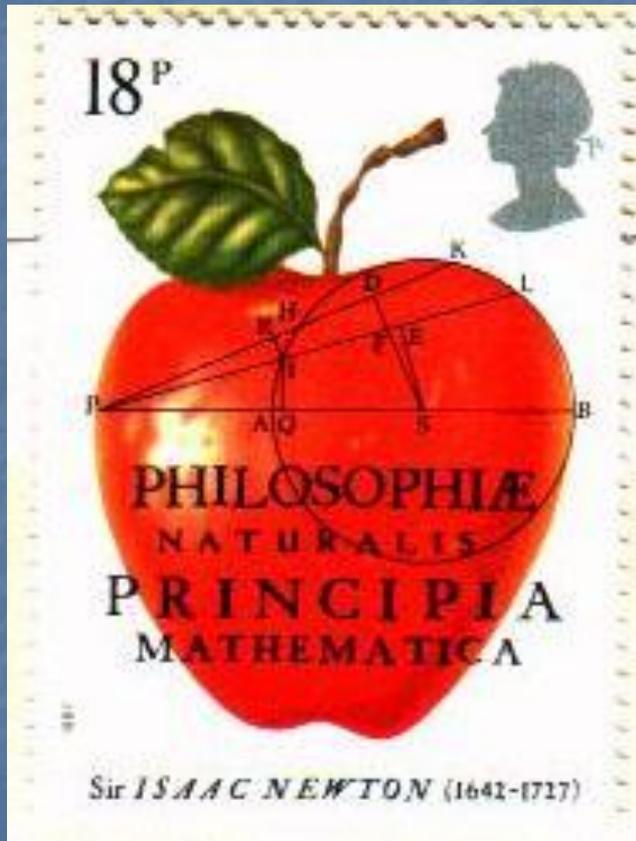
- The popularity of science in the 17<sup>th</sup> and 18<sup>th</sup> centuries
- The Scientific Revolution promised the comprehensibility of the workings of the universe

# D. A New World of Uncertainties



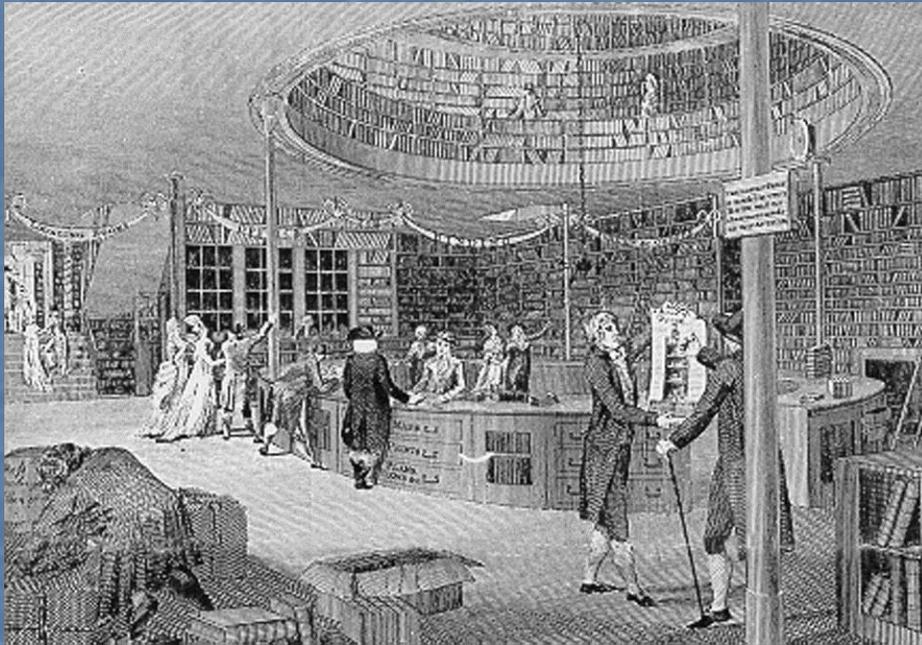
- The Idea of Progress
- The anti-religious implications of the Enlightenment
- The relativity of truth and morality
- John Locke's New Psychology
  - *Essay Concerning Human Understanding* (1690)
  - "Tabula Rasa"

# IV. The Philosophes



- 18<sup>th</sup> century French intellectuals
- Interest in addressing a broad audience
- Committed to reform
- Celebrated the scientific revolution
- The "Mystique of Newton"
- Science applied to society

# V. The Problem of Censorship



- The attempt of the Old Regime to control new thinking
- Publishers and writers hounded by censors
- Over 1000 booksellers and authors imprisoned in the Bastille in the early 1700's
- Battling censorship

# VI. The Role of the Salon



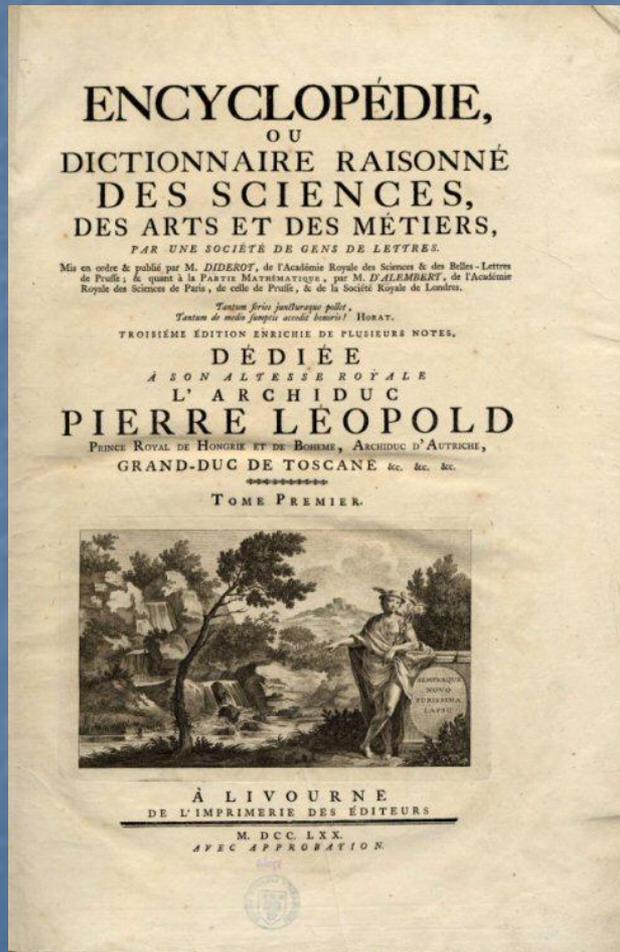
- Protection and encouragement offered by French aristocratic women in their private drawing rooms
- Feminine influence on the Enlightenment
- Madame Geoffrin

# VII. Diderot's *Encyclopedia*



- Ultimate strength of the philosophes lay in their numbers, dedication and organization
- Written between 1751-1772
- Attempted to illustrate all human knowledge
- Problems with publication
- Emphasis on practical science

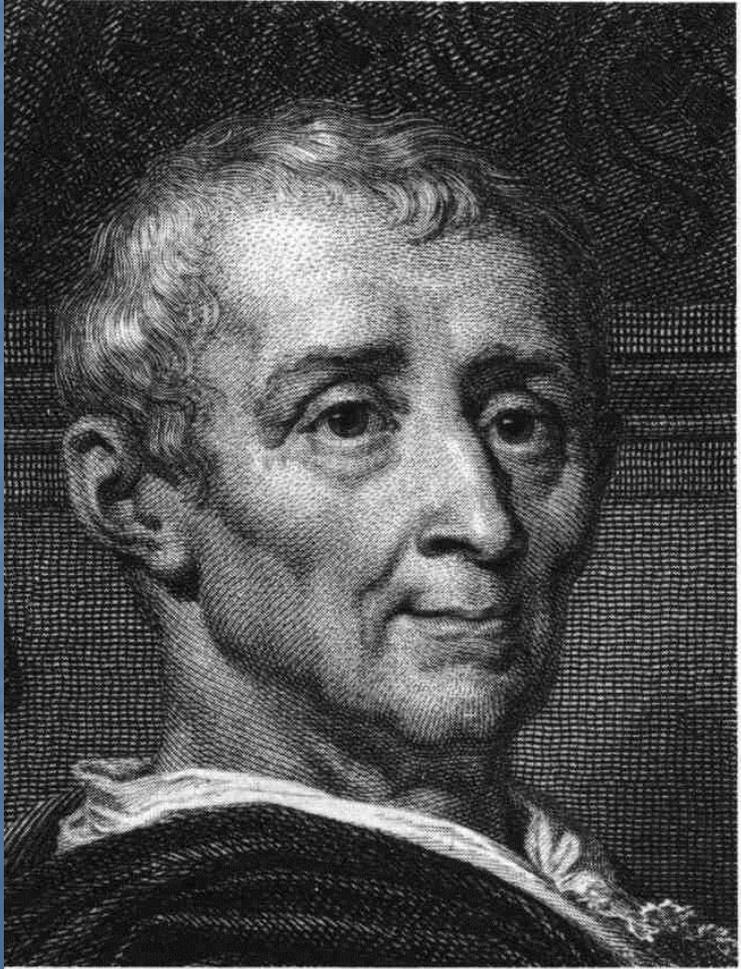
# VII. Diderot's *Encyclopedia* (cont)



- Desire to change the “general way of thinking”
- Greater knowledge leads to human progress
- Emphasized moderation and tolerance
- Human nature can be molded
- Inalienable rights and the social contract
- Knowledge improves goodness

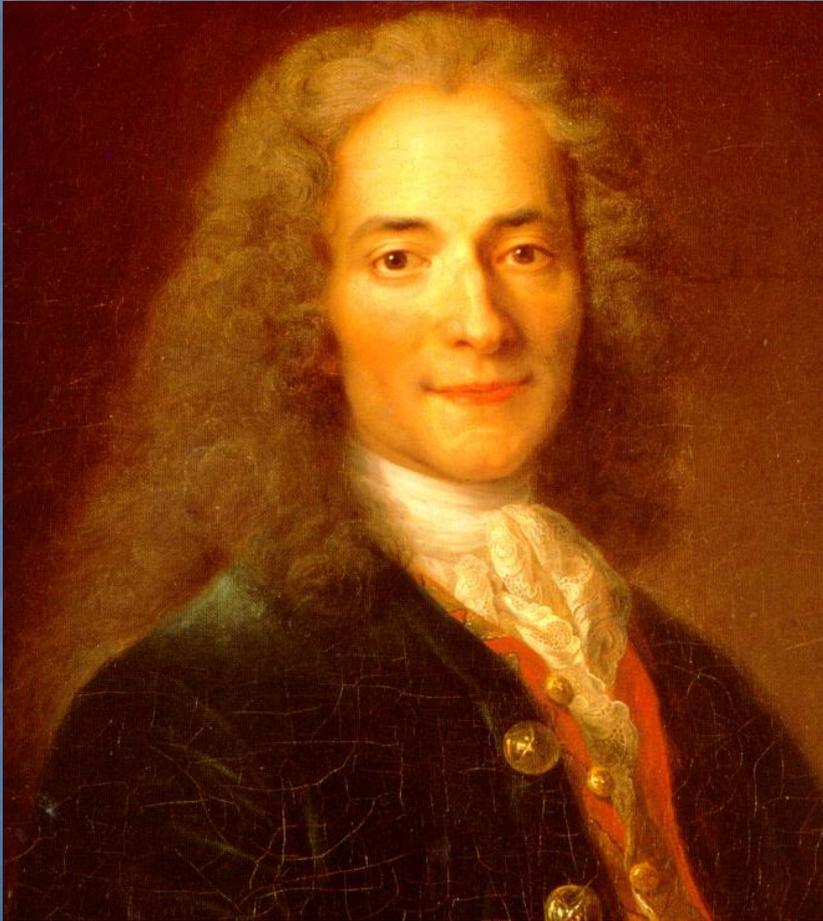
# VIII. Famous Enlightenment Thinkers

# A. Baron de Montesquieu (1689-1755)



- *The Spirit of the Laws* (1748)
- Despotism could be avoided if political power were divided and shared by a diversity of classes
- Power must check power
- Admires British government
- French parlements must be defenders of liberty
- Influence in the US

## B. Voltaire (1694-1778)



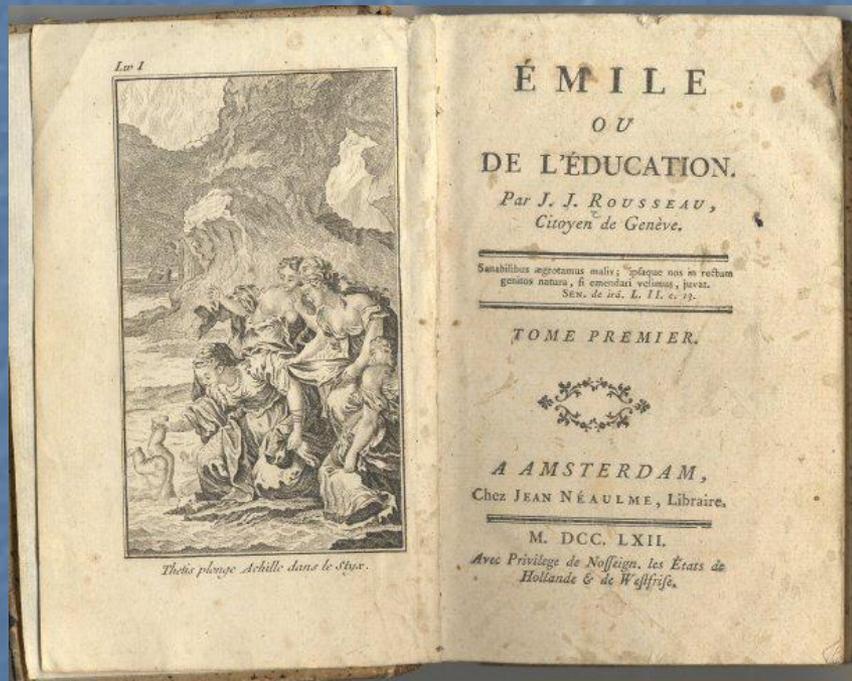
- Enthusiasm for English institutions
- Reformer not a revolutionary
- Admirer of Louis XIV
- Relationship with Frederick the Great
- “Ecrasez l’infame”

# E. Jean-Jacques Rousseau (1712-1778)



- His life
- Turns his withering critique of the Old Regime increasingly on the Enlightenment itself
- Rather than liberation, rationalism and civilization destroys the individual
- Man by nature was solitary, good and free

# E. Rousseau (cont)



- Civilization represents decay, not progress
- *Emile*—protect children from too many books
- *The Social Contract* (1762) and the “General Will”
- Civilized man is an alienated man
- Transitional intellectual figure