

The Scientific Revolution



AP WORLD HISTORY NOTES
CHAPTER 16
RELIGION AND SCIENCE (1450-1750)

The Scientific Revolution



- Intellectual and cultural transformation
 - Began in Europe
 - Mid-1500s to early 1700s
- Knowledge acquired through: careful observations, controlled experiments, the formulation of general laws, and mathematical expressions
- No more reliance on: the authority of the Bible, the Church, the speculations of ancient philosophers, or the received wisdom of cultural tradition



The Question of Origins: Why Europe?



Cambridge University in England

- 12th and 13th centuries = Europeans developed a legal system that gave a measure of independence to a variety of institutions
 - Ex: the Church; towns and cities; workers' guilds; professional organizations; universities
- Independence for universities = scholars had the freedom to pursue their studies without interference from the Church or political authorities
- Most of the major figures in the Scientific Revolution = trained in or affiliated with these universities

Why Not the Islamic World?



- Focus in colleges/universities = Quranic studies and religious law
 - Science was studied outside the formal system of higher education
- Religious scholars = viewed science and philosophy with suspicion
 - To them = Quran holds all the wisdom
 - Science might challenge the Quran
 - Science and philosophy lead to uncertainty and confusion



Why Not China?

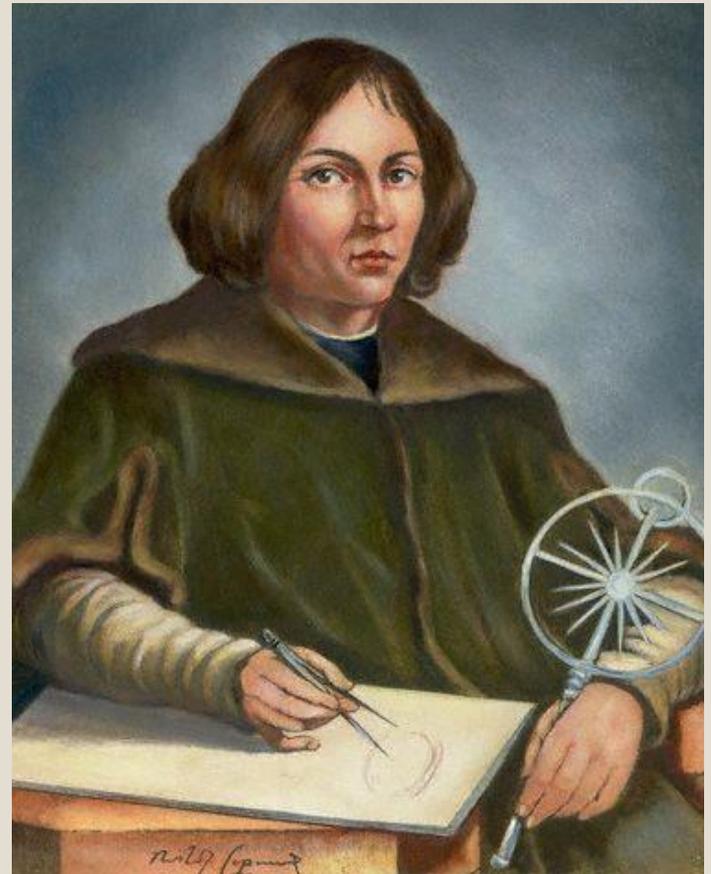


- Chinese education = focused on preparing males for the civil service examinations
 - Focused on classical Confucian texts
- Chinese authorities = did not allow independent institutions of learning where scholars could pursue their studies freely

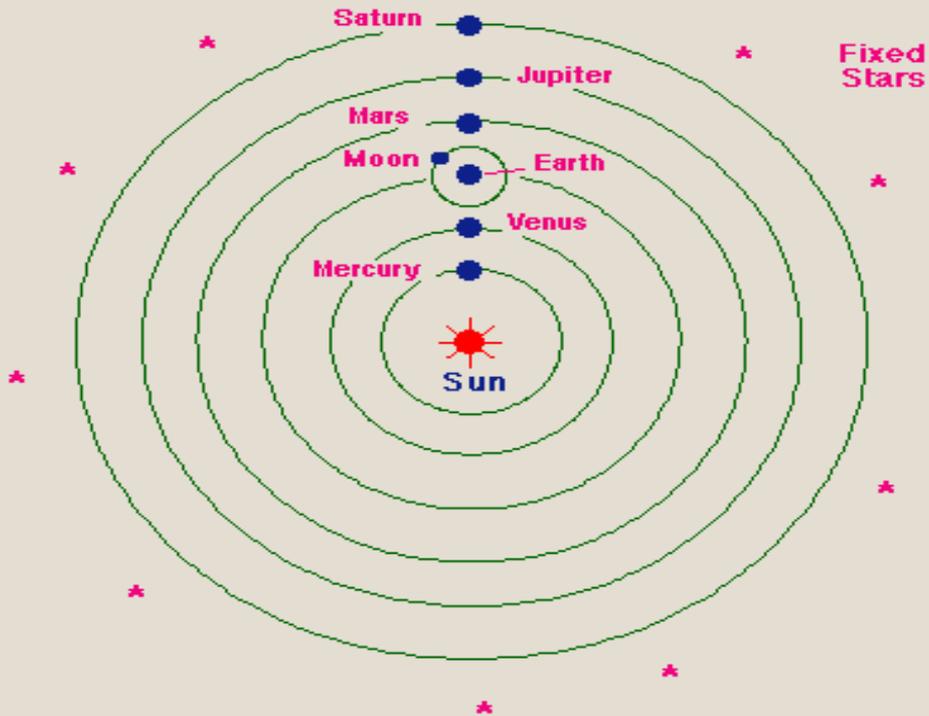
Nicolaus Copernicus



- Polish astronomer
- Started his career at University of Krakow in Poland in 1492
- At the forefront of the Scientific Revolution
- Started at a time when few people dared to question old beliefs and superstitions

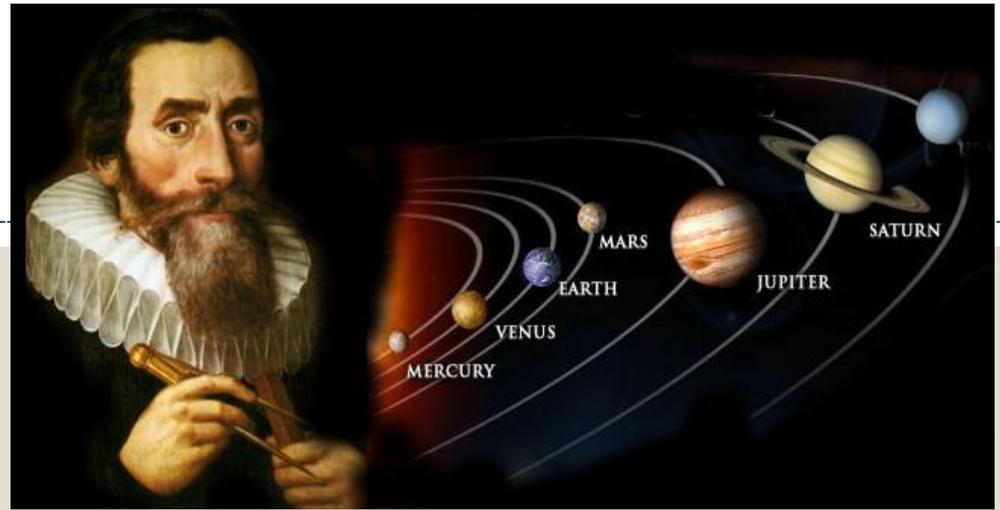


Nicolaus Copernicus



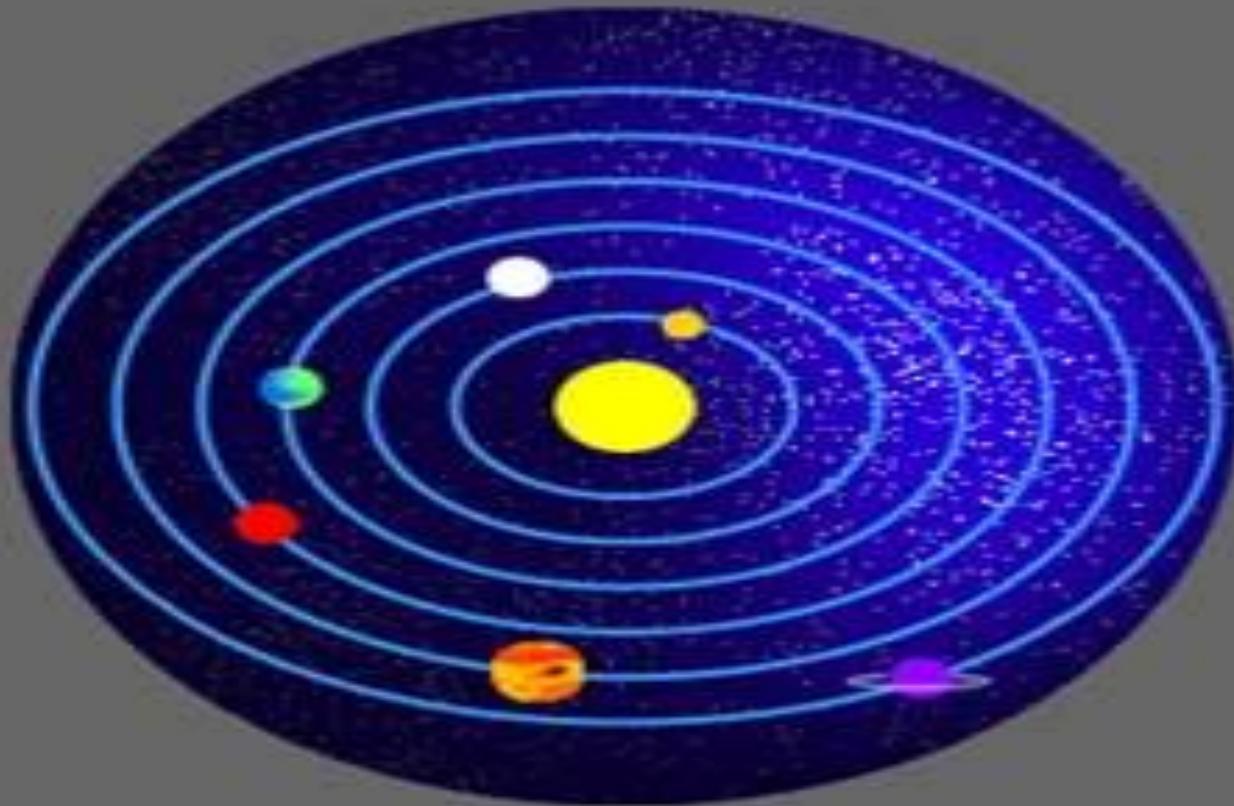
- Believed the Earth was round & that it rotated around the sun
- Said the sun, not the Earth, was the center of the universe
- Challenged the idea that the Earth was unique and at the center of God's attention

Johannes Kepler

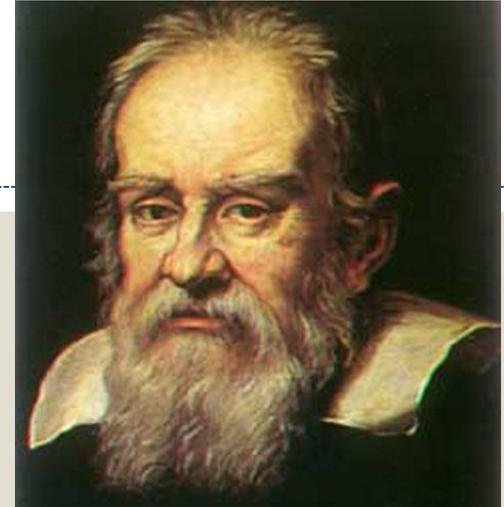


- German astronomer & mathematician
- Protestant
- Used math formulas to show that the planets revolved around the sun
- Planets moved in **ellipses** = ovals
- Planets don't always travel at the same speed - move faster as they approach the sun

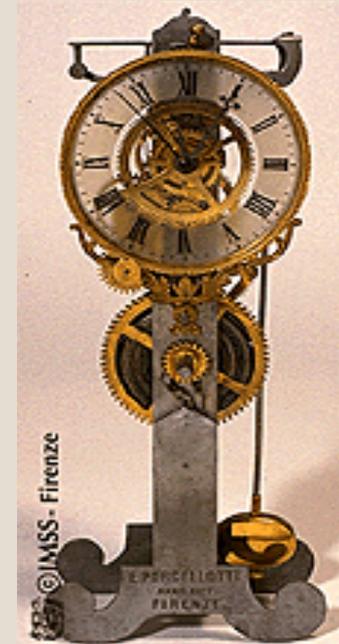
Johannes Kepler



Galileo Galilei



- Italian mathematician
- Improved the telescope to make it more powerful
 - Observed: sunspots, mountains on the moon, Jupiter's moons
- Created the pendulum clock
- 1636 = published ideas on physics, astronomy, etc.
 - Book banned by the Catholic Church

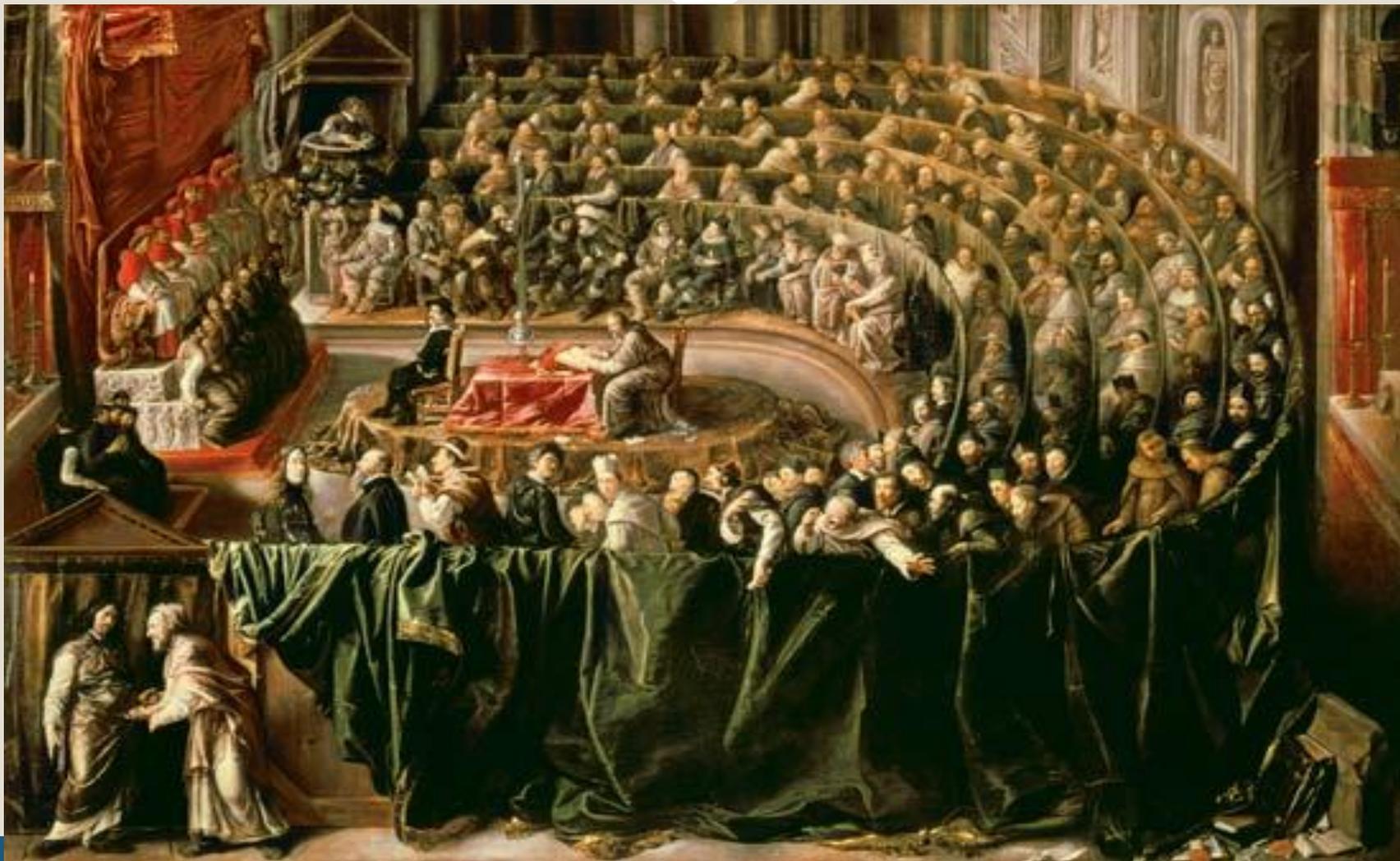


Galileo Galilei

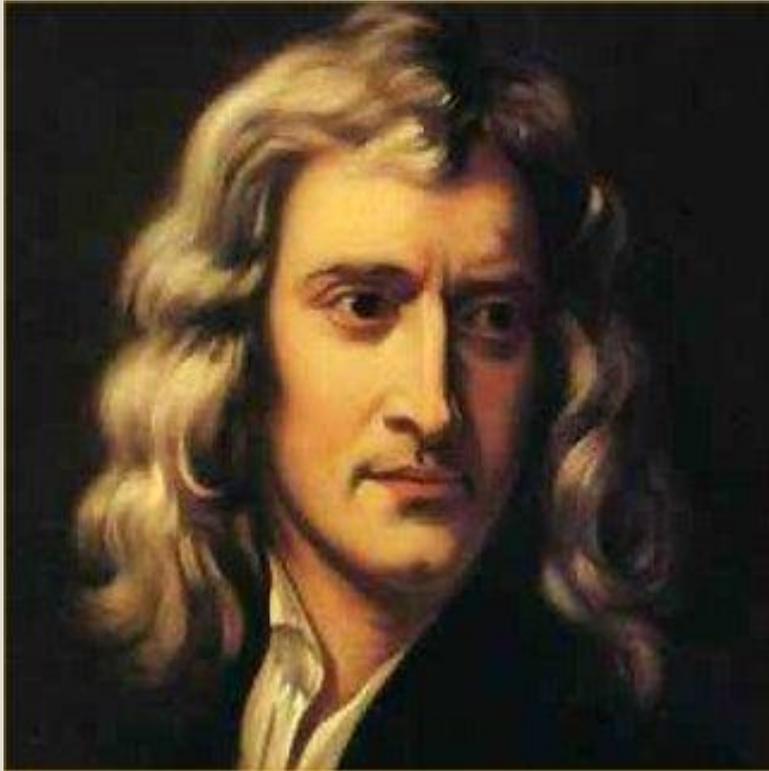


- Faced heated opposition by the Catholic Church
- Placed under house arrest for 50 years
 - Where he made most of his discoveries & achievements

Trial of Galileo



Sir Isaac Newton



- British scientist
- Below average student at Cambridge University
- Explored the most complicated mathematics of his day
- Studied Copernicus & Galileo

Sir Isaac Newton



- 1665 = plague closed his university & he was forced to go home to his family
- Sitting in his garden one day, he saw an apple fall -- helped him develop his theory of gravity
- 1687 = published theories about gravity
 - Prevents objects from flying off the Earth; also holds the solar system together



Sir Isaac Newton



$$\int_a^b f(x) dx = F(b) - F(a)$$

- Formulated modern laws of motion and mechanics
- Developed **calculus** = system of math that calculates changing forces or quantities
- Proved that math can be used to explain the universe

Francis Bacon



- English philosopher
- Truth found through investigation & evidence
- Helped develop **scientific method**
 1. Observe
 2. Make hypothesis
 3. Test hypothesis
 4. Conclusion

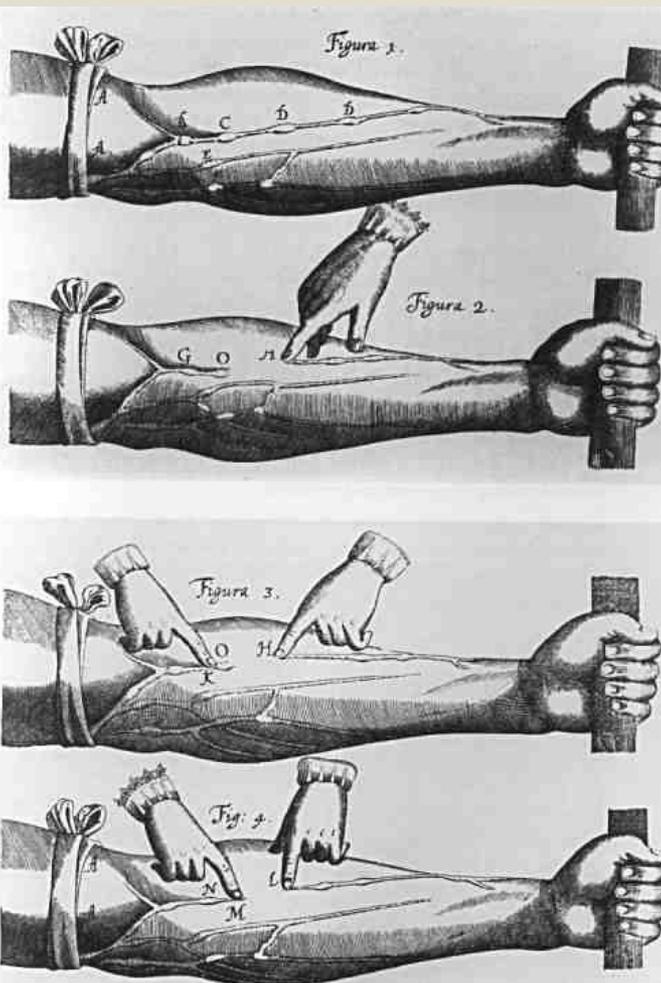
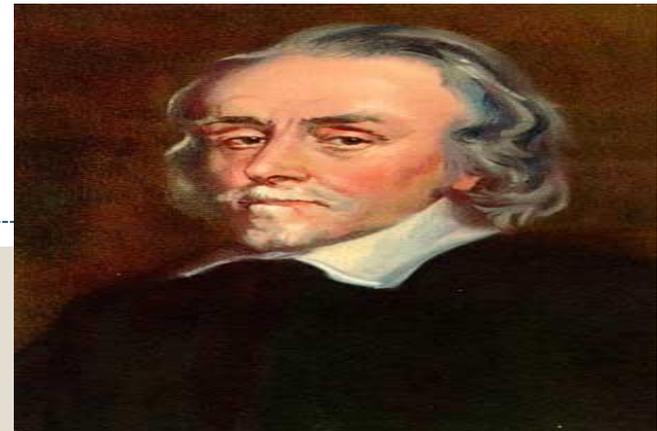
Rene Descartes



- French philosopher & mathematician
- Truth gained through mathematics and logical deduction (reason)
- Invented analytic geometry
- Famous quote = “I think, therefore I am.”



William Harvey

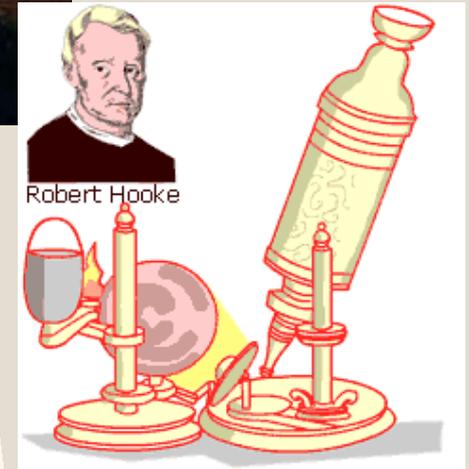
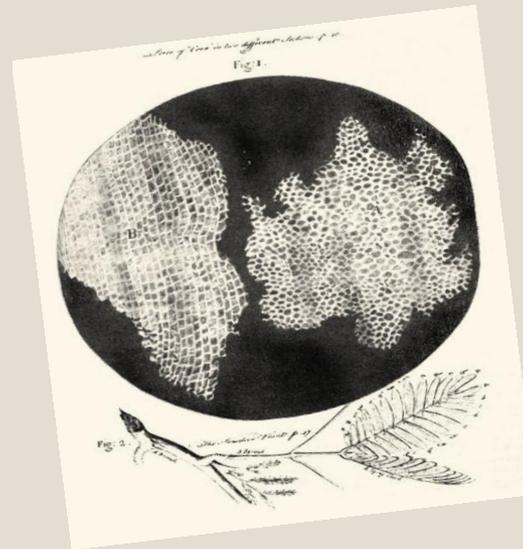


- English physician
- Concluded that blood circulates throughout the body, pumped by the heart and returning through the veins
- Before = people thought the liver digested food & processed it into blood

Robert Hooke



- English scientist
- Discovered the cell
- Used new microscope -- recognized cells in vegetable tissues



Robert Boyle



- Irish chemist
- Established chemistry as a pure science
- Proved air wasn't a basic element
- Defined what an element is = something that can't be broken down into simpler parts
- Challenged **alchemy** = trying to turn lead into gold

Joseph Priestley



- English chemist & clergyman
- Did experiments about the properties of air and discovered the existence of oxygen
- His studies on carbon dioxide led to his invention of carbonated drinks (like soda)

