Lecture 16:
The Beginnings of Modern Science and Philosophy

I. INTRODUCTION
A. Introduction

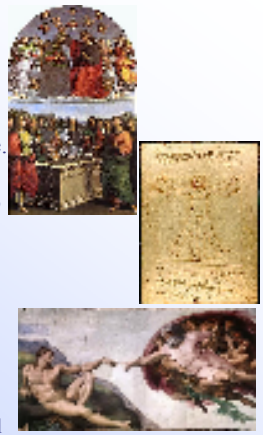
- The Renaissance
  - From French meaning "rebirth
- It was a cultural movement that spanned roughly the 14th to the 17th century.
  - It beginning in Italy in the late Middle Ages and later spread to the rest of Europe.
- The term is used loosely to refer to this historic era and the cultural movement.
  - Traditionally, the Renaissance is viewed as a bridge between the Middle Ages and the Modern era.

I. INTRODUCTION
A. Introduction

- As a cultural movement, it encompassed:
  - learning based on classical sources,
  - the development of linear perspective in painting,
  - gradual but widespread educational reform.
    - The influence of the cultural movement affected literature, philosophy, art, politics, science, religion, and other aspects of intellectual enquiry.
  - For us, the Renaissance indicates an interest in human beings, their activities, abilities, and capabilities.
    - We will explore Renaissance Art, Humanism, and Science and then spend some time with Rene Descartes.

I. INTRODUCTION
B. Renaissance Art

- Renaissance Art
  - Renaissance art evolved realistic linear perspective.
    - Part of a wider trend towards realism which also involved studying light, shadow, and, famously human anatomy.
  - There was renewed desire to depict the aesthetics of nature.
    - Seen in works by DaVinci, Michelangelo, and Raphael



II. RENAISSANCE HUMANISM
A. Introduction

- Renaissance Humanism
  - Humanism was not a philosophy per se, but rather a method of learning.
    - Humanism is the movement to recover, interpret, and assimilate the language, literature, learning and values of ancient Greece and Rome.
    - Above all, humanists asserted the genius of man and the unique and extraordinary ability of the human mind.
  - Renaissance Humanism v. Medieval Scholasticism
    - Medieval scholastics focused on resolving contradictions between authors of ancient texts, but humanists would appraise them through a combination of reasoning and empirical evidence.

II. RENAISSANCE HUMANISM
A. Introduction

- Renaissance Humanism
  - Humanist scholars shaped the intellectual landscape throughout the early modern period.
    - Moved from more God-centered interests to more human centered interests
      - Political philosophers such as Niccolò Machiavelli and Thomas More revived the ideas of Greek and Roman thinkers, and applied them in critiques of contemporary government.
      - Theologians, notably Erasmus and Martin Luther, challenged the Aristotelian status quo, introducing radical new ideas of justification and faith.
  - In terms ideas relevant to psychology, humans assumed to have reliable sensory systems, reasoning powers, and ability to enjoy

II. RENAISSANCE HUMANISM
A. Introduction

- Renaissance Humanism had a focus on
  - Individualism
    - The concern for human potential and achievement. The individual has the power to make a positive effects.
  - Personal religion was the desire for a less formal, ritualistic religion,
    - Emphasis on religion experienced personally rather than imposed upon people by the church
  - Intense interest in the works of the early Greek and Roman poets, philosophers, and politicians.
    - Desire to read and study originals, not interpretations
    - Marsilio Ficino founded a Platonic academy in Florence

II. RENAISSANCE HUMANISM
A. Introduction

- Renaissance Humanism had a focus on
  - Anti-Aristotelian sentiment was prevalent among humanist scholars
    - Wanted to stop the Church's practice of strict adherence to Aristotelian science and philosophy as the prime authority with the Bible.
    - The combination of Aristotle's philosophy and Christian theology, had created a complex set of rules, regulations, and beliefs that required blind acceptance to be a Christian.
  - This seem to be a movement to reinvigorate science which was Aristotle's goal as an empiricist.

II. RENAISSANCE HUMANISM
B. Francesco Petrarch

- Francesco Petrarch (1304 - 1374)
  - Many historians argue that his writings mark the beginning of the Renaissance.
    - Petrarch wanted a freeing of the human spirit from the medieval traditions.
    - Principally attacked Scholasticism
    - Believed the classics should be studied directly as works of humans and not interpreted or embellished by other humans.

II. RENAISSANCE HUMANISM
B. Francesco Petrarch

- Francesco Petrarch
  - Petrarch desired a more personal religion based on the Bible, personal faith, and feelings.
    - Taught that God wanted humans to use their capabilities to actualize potential, and thus make the world better.
  - Skepticism toward all dogma paved the way for the development of modern science.

II. RENAISSANCE HUMANISM
C. Giovanni Pico

- Giovanni Pico (1463 - 1494)
  - He is famed for events of 1486.
    - At age of 23, he proposed to defend 900 theses on religion, philosophy, natural philosophy and magic against all comers.
  - This was basis for *Oration on the Dignity of Man* which has been called the "Manifesto of the Renaissance
    - It is a key text of Renaissance humanism.

II. RENAISSANCE HUMANISM
C. Giovanni Pico

- Giovanni Pico
  - Pico proposed that humans only have capacity for change
    - Can choose instinctual, sensual lives and become brutish
    - Or exercise rationality and intelligence and become more angelic and Godlike.
  - Argued that all philosophical views were reconcilable
    - Ultimately in agreement and all should be studied and assimilated into the Christian worldview.

II. RENAISSANCE HUMANISM
D. Desiderius Erasmus

- Desiderius Erasmus (1466 - 1536)
  - Opposed fanatic belief in anything.
    - Criticized the classics, claiming that anything created by humans was inherently imperfect.
      - Attacked all forms of superstitions
  - Desired people to take lessons from simple life of Jesus instead of the pomp and circumstance of the Church.

II. RENAISSANCE HUMANISM
D. Desiderius Erasmus

- Desiderius Erasmus
  - Was generally critical of excesses of all kinds, both within the Catholic Church and the protestant religions.
  - He wrote *The Praise of Folly*
  - He attacked the church, philosophers, and nobility.
  - His criticisms may have led to Martin Luther's actions.

II. RENAISSANCE HUMANISM
E. Martin Luther

- (1483-1546)
  - Insisted on an intensely personal religion (each person is answerable only to God)
    - Deemphasized ritual and church hierarchy.
  - Initiated the Reformation in 1517 by nailing Ninety-Five Theses to the door of the church in Wittenberg.
    - Had progressive ideas about sex and marriage.

II. RENAISSANCE HUMANISM
E. Martin Luther

- No free will as humans are servants to the will of God.
  - God is the only one who knows why evil exists.
- Led Protestantism
  - Denied the authority of the Pope
    - Each person had the right to interpret the Bible for himself or herself.
- Early Protestantism was grim, austere, and unforgiving.
  - It insisted on accepting the existence of God on faith alone; to understand Him through reason was foolish.

II. RENAISSANCE HUMANISM
F. Michel de Montaigne

- Michel de Montaigne (1533-1593)
  - Famous for his ability to merge serious intellectual speculation with casual anecdotes
    - His autobiography and his volume *Essais* contains some of the most widely influential essays ever written.
    - Montaigne had a direct influence on writers including Descartes, Emerson, Nietzsche, Rousseau, Asimov, and perhaps Shakespeare.

II. RENAISSANCE HUMANISM
F. Michel de Montaigne

- Michel de Montaigne
  - Also proposed an extreme form of skepticism
    - Human rationality caused most of human problems
      - Animals lack rational powers, therefore are superior to humans.
    - Rejected science as a means to attain reliable knowledge because scientific "truth" is in constant flux.
      - Sensations are illusory
  - Didn't share optimism expressed by other Renaissance humanists.

III. RENAISSANCE SCIENCE
A. Challenges to the Church

- Renaissance Humanism challenged church orthodoxy, as did the emergence of science.
- Upheavals in arts and humanities were mirrored in the sciences.
  - Renaissance saw significant changes in the way the universe was viewed and the methods with which philosophers sought to explain natural phenomena.[
  - The most significant development was a *process* for discovery, the scientific method.

III. RENAISSANCE SCIENCE
A. Challenges to the Church

- Once questioning of "truths" began, escalated rapidly
  - Church scholars attempted to show that contradictions were only apparent.
  - Attempted to censor the challenges, but could not curb the tide of inquiry and challenge
- The scientific method focused on empirical evidence and the importance of mathematics
  - The new scientific method led to great contributions in the fields of astronomy, physics, biology, and anatomy.

III. RENAISSANCE SCIENCE
A. Challenges to the Church

- Decline in Church's Authority
  - Directly related to rise in spirit of inquiry and empirical observation.
  - Church dogma replaced by that which it opposed the most: the direct observation of nature without theological consideration.

III. RENAISSANCE SCIENCE
B. Reawakening of Objective Inquiry

- Several factors contributed to the reawakening of the spirit of objective inquiry
  - Acceptance of reason and the examination of nature as a means of knowing God.
  - Work of the humanists recaptured the spirit of inquiry reflected in the classics, and in the human potential to act upon the world and change it for the better.
  - Other events contributed to the decline of Church authority and acceptance of objective study of nature.

III. RENAISSANCE SCIENCE
B. Reawakening of Objective Inquiry

- Several factors contributed to the reawakening of the spirit of objective inquiry
  - Exploration of Marco Polo from of central Asia and China (1271 - 1295).
  - Invention of moveable type by Gutenberg (1439)
  - Discovery of the New World by Columbus (1492)
  - Luther's challenge to Catholicism (1517)
  - Magellan's circumnavigation of the globe (1519 - 1522).

III. RENAISSANCE SCIENCE
C. Ptolemy

- Claudius Ptolemaeusm, known as Ptolemy, 90 - 168)
  - was a Roman mathematician, astronomer, geographer and astrologer.
  - Proposed a Geocentric system of the universe
    - Earth is the center of all heavenly bodies
    - Became part of Church dogma put man as center of the universe and creation.

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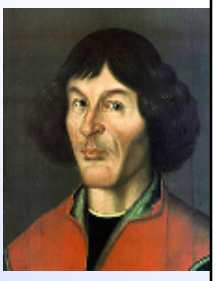
III. RENAISSANCE SCIENCE
D. Aristarchus of Samos

- Aristarchus of Samos (310 BC – 230 BC)
  - Greek astronomer and mathematician, born on the island of Samos, in Greece. He was the first Greek
  - Was the first man in general, to present an explicit argument for a heliocentric model of the solar system
    - placed the Sun, not the Earth, at the center of the universe.

III. RENAISSANCE SCIENCE
E. Nicolaus Copernicus

- Nicolaus Copernicus (1473 - 1543)
  - He was the first astronomer to formulate a *scientifically-based* heliocentric cosmology that displaced the Earth from the center of the universe.
    - *On the Revolutions of the Celestial Spheres* is regarded as the starting point of modern astronomy and the beginning of the Scientific Revolution.



III. RENAISSANCE SCIENCE
E. Giordano Bruno

- Giordano Bruno (1548 - 1600)
  - Italian philosopher and proponent of heliocentrism and the infinity of the universe.
    - Considered an early martyr for modern scientific ideas because he was burned at the stake as a heretic by the Roman Inquisition
    - His actual heresy was his religious not scientific beliefs.

III. RENAISSANCE SCIENCE
F. Johann Kepler

- Johann Kepler (1571 – 1630)
  - Accepted heliocentric position
    - It explained the universe in a simple mathematical harmony.
    - Proved many of the mathematical details of the Copernican system
    - Anticipated Newton's concept of gravity
  - Insisted that all mathematical deductions be verified by empirical observation.

III. RENAISSANCE SCIENCE
G. Galileo Galilei

- Galileo Galilei (1564[-1642)
  - Italian physicist, astronomer, mathematician, & philosopher
    - Achievements: Improvements to the telescope and resulting astronomical observations, and support for Copernicus' heliocentric cosmology
- Father of Modern Science
  - Explored kinematics: The motion of uniformly accelerated objects, taught in all physics classes.

III. RENAISSANCE SCIENCE
G. Galileo Galilei

- Galileo Galilei
  - Explained the *mathematical* reality that existed beyond the world of appearances
  - Corrected misconceptions about the world and heavenly bodies.
    - Used scientific observations to exemplify physical laws and then followed by using mathematical deduction to describe the law, and thus, the universe.

III. RENAISSANCE SCIENCE
G. Galileo Galilei

- Mathematical studies allowed for distinction of objective and subjective reality.
- Objective reality
  - Exists independent of an individual's perception
    - Includes what later would be called primary qualities, quantity, shape, size, position, and motion of objects.

III. RENAISSANCE SCIENCE
H. Isaac Newton

- Isaac Newton (1643 – 1727)
  - English physicist, mathematician, astronomer, natural philosopher, alchemist, and theologian.
    - Widely considered one of the most influential men in human history.
    - His1687 *Principia Mathematica*, is considered the most influential book in the history of science.
      - Lays the groundwork for classical mechanics.

III. RENAISSANCE SCIENCE
H. Isaac Newton

- Science and Religion
  - Newton wrote more on religion than he did on science.
    - Saw the universe as a complex, lawful machine created by God who set in motion, after which He ceased involvement (Deism).
  - He believed in a rationally immanent world, but saw evidence of design.
  - He refused to take holy orders, and sacrament on his death bed

III. RENAISSANCE SCIENCE
I. Bacon

- Francis Bacon (1561 –1626)
  - Science based on induction.
    - Argued that science should only include facts of observation
    - Maintained that science should not include theories, hypotheses, mathematics, or deductive methods.
      - Proposed methods of agreement, difference, and concomitant variation.
  - Radical empiricism was later called positivism.

III. RENAISSANCE SCIENCE
I. Bacon

- Baconian Science
  - Generalizations made from many observations, noting their similarities and differences, and used to describe event classes
  - Science should:
    - Provide useful information and improve the world for mankind
    - Skinner and behavior analysis adopted the Baconian inductive method and the view that the main goal of science is to improve the human condition

III. RENAISSANCE SCIENCE
I. Bacon

- Baconian Science
  - Four sources of error that could hinder scientific investigation:
  - Idols of the cave
    - Personal biases
  - Idols of the tribe
    - Human nature biases
  - Idols of the marketplace
    - Too much influence of meaning assigned to words (verbal labels)
  - Idols of the theater
    - Blind allegiance to any viewpoint

III. RENAISSANCE SCIENCE
J. Rene Descartes

- Rene Descartes (1596- 1650)
  - He was a French philosopher, mathematician and scientist.
  - Was the father of modern Philosophy.
    - his *Meditations on First Philosophy* is a standard text in philosophy departments.
  - Descartes was also influential in math.
    - He is accredited as the father of analytical geometry.

III. RENAISSANCE SCIENCE
J. Rene Descartes

- Meditations
  - Sought to devise a system of explanation that could not be questioned
  - Deductive Method
    - Determine that which was certain and then deduce other certainties
    - Through self analysis, determined that some ideas are innate (natural components of the mind).
    - Innate ideas were unity, infinity, perfection, axioms of geometry, and God.

III. RENAISSANCE SCIENCE
J. Rene Descartes

- Philosophy
- By virtue of the validity of rational processes, knowledge gained through the senses could be accepted because God, being perfect, would not and could not deceive us.
  - Sensory information had to be analyzed rationally to determine its validity.
  - Was a rationalist, a nativist (innate ideas), and a phenomenologist (introspectively study the nature of intact, conscious experience).

III. RENAISSANCE SCIENCE
J. Rene Descartes

- Mind - Body
  - Descartes suggested that the body works like a machine.
    - It has the material properties and follows the laws of physics.
  - The mind was described as a nonmaterial entity.
    - Lacks material processes and does not follow the laws of physics.
  - Descartes argued that only humans have minds.

III. RENAISSANCE SCIENCE
J. Rene Descartes

- Mind - Body
  - Explained animals and humans employed mechanical principles.
    - Believed the nervous system was a set of hollow tubes connecting the sense receptors with cavities in the brain (the ventricles).
      - Contained animal spirits which flow through the nerves resulting in sensation and movement.
      - By explaining both animal and human behavior in terms of mechanistic principles and reflexes, he made the study of animals legitimate.

III. RENAISSANCE SCIENCE
J. Rene Descartes

- Mind - Body
  - In humans, the mind provided consciousness, free will, and rationality.
    - The nonphysical mind and the physical body can influence each other, thus he was a dualist and an interactionist.
  - He determined that the mind influenced the body at the pineal gland in the brain.
    - Mind ⇔ Body

III. RENAISSANCE SCIENCE
J. Rene Descartes

- Contributions to Psychology
  - The mechanistic explanations of behavior and many bodily functions
    - Could be said to have led to stimulus-response explanations and behaviorism.
  - The focus on the brain as an important mediator of behavior.
    - Description of the mind-body relationship provided others the opportunity to support or refute it.
  - Studied the bodies of animals as a means to understand the functioning of human bodies
    - Led to physiological and comparative psychology.
  - He paved the way for the scientific study of consciousness.