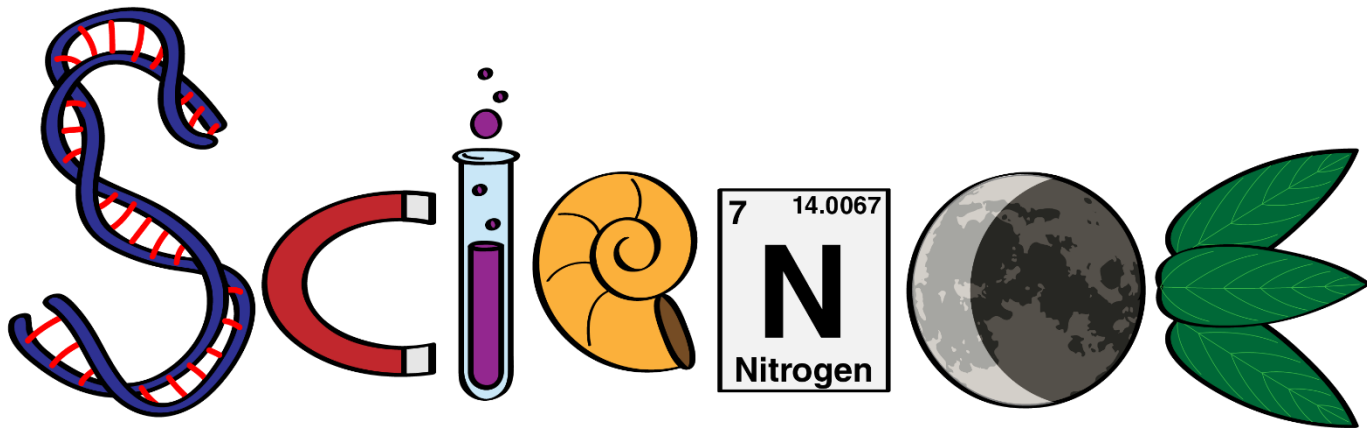# PHIL 265
Philosophy of Science

Fall 2016

University of Alberta
Sep. 1, 2016

Science

- What is science?
- How would you like to define it?
- What is special about science?
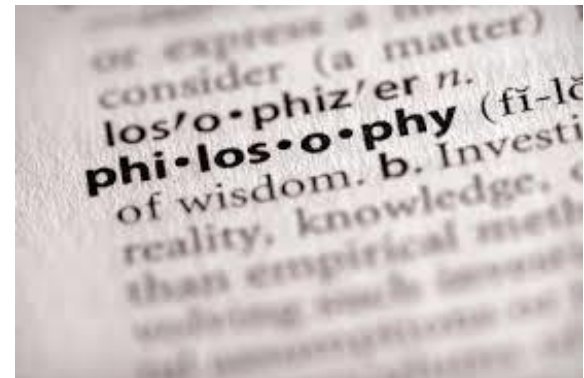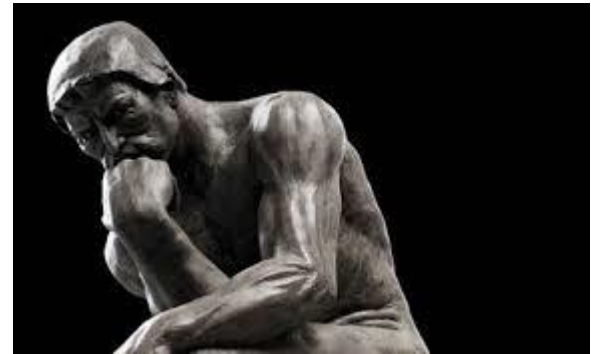- Why is it important?

Philosophy

- Philosophical questions
  - General
  - Significant
  - Controversial
  - Disagreements cannot be settled by referring to facts or empirical sciences

Philosophy

- Pure:
  - Metaphysics (Ontology)
    - Reality/Existence
  - Epistemology
    - Knowledge
  - Axiology
    - Values
  - Methodology
    - Reasoning/Methods

- Applications:
  - Philosophy of mathematics
  - Philosophy of religion
  - Philosophy of science

Science

- **All disciplines**
  - Natural sciences
    - Physics, chemistry, biology
  - Social sciences
    - Economics, geography, archeology, history, anthropology, linguistics, education, psychology, sociology, political science, …
  - Humanities
    - Philosophy, literature, religious studies, cultural studies, fine arts (music, drama, dance, …), …

Philosophy of science

- The philosophical study of science
  - Is scientific knowledge superior to other forms of knowledge?
  - How and to what extent does science arrive at valid knowledge?
  - What is the scientific method?
  - What is a law of nature?

More questions

- Is there a scientific method that guarantees valid knowledge? Is the same method used across history and scientific disciplines?

- How does evidence confirm or disconfirm theories?

- What is scientific objectivity?

- How are observations and experiments interpreted?

- What is the nature of theoretical revolutions? Does knowledge grow in a progressive fashion?

Yet more questions
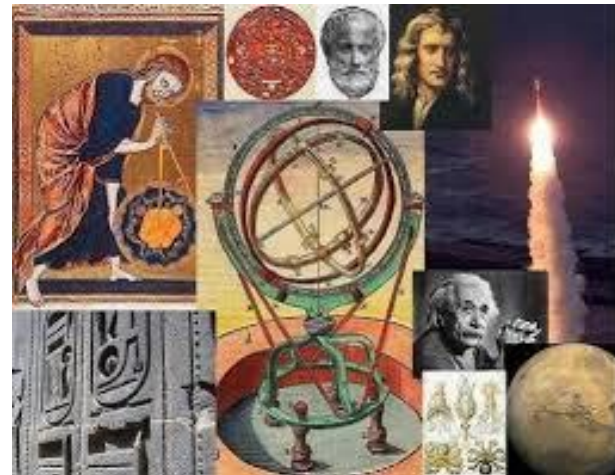
- What is the structure of a scientific theory?

- What role do mathematical models play?

- Can biology be reduced to molecular biology? Can all disciplines be reduced to physics? Is there some other unity of science?

- Is there a logic of discovery? (Or, is there only logic of justification?)

Descriptive vs. normative

- Does philosophy of science just describe how various practices claiming to be science work, without making any value judgments about what is real science?

- Or does philosophy somehow come up with a normative account of what is genuine science, and then uses this definition of science to judge some practices as science and others as pseudoscience?

History of science

- One way to test philosophical claims about the nature of science is to evaluate them against key episodes in the history of science, such as:
  - Copernicus (astronomy)
  - Galileo (mechanics)
  - Lavoisier (chemistry)
  - Darwin (biology)
  - Curie (radioactivity)
  - Einstein (physics)
  - James Watson, Francis Crick, … (molecular biology)

General vs. specialized

- Most philosophers work in one of:
  - philosophy of physics
  - philosophy of biology
  - philosophy of cognitive science
  - philosophy of social sciences, …

- Methodological or conceptual issues arising within a scientific field, such as:
  - the nature of time and space in relativity theory
  - units of selection debate in evolutionary biology
  - how to infer cognitive architecture in psychology, …

Science vs. non-science

- Science
  - Understanding
  - Explaining
  - Predicting

- What distinguishes science from other ways of understanding, explaining, and predicting the world?

Demarcation problem

- What distinguishes science from pseudoscience?
- Real science vs. apparently scientific claims
  - Astronomy vs astrology
  - Experimental psychology vs psychoanalysis

Scientific method

- Theory/hypothesis
- Experiment/observation
- Confirmation/disconfirmation

- The slogan:

"Science is derived from the facts."