

# Introduction to the Philosophy of Science

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Philosophy 225, Scott Hall 101

W 9:50-11:10, F 2:50-4:10

Office hours: W 11:30-12:30 and by appt, 106 Somerset, 5th floor, room 510

## Course Description

Empirical science is an incredibly successful area of inquiry. In physics, biology, economics, and many other areas of science, we have learned a staggering amount about the world. In spite of this success – or perhaps, in part, because of it – science has been subjected to lots of criticism. Politicians, the humanities, the general public, and scientists themselves have criticized it: they have questioned scientific methods of inquiry, the objectivity of scientific investigation, the kind of knowledge achieved by various fields of science, and more.

In this course, students will explore philosophical questions concerning science and various criticisms of it. How, exactly, do scientific theories get confirmed? What distinguishes science from pseudo-science? Is science objective? What justifies inductive reasoning as it is used in science? What makes something a law of nature? Do the entities posited by scientific theories actually exist? As we explore these general issues, we will touch upon issues that are specific to various sub-fields of science: we will explore philosophical questions relating to biology, feminist science, quantum mechanics, and more.

## Course Requirements

1. Participation (50 points).
  - Students are expected to ask questions, and occasionally work together in small groups.
  - Each student is required to attend office hours at least once. Email me if you are busy during my scheduled office hours, and we will find a different time to meet.
  - See the course website for the rubric I will use to grade participation.
2. One short-answer paper, two drafts (50 points per draft).
  - 100-125 words.
  - Due date: Feb 8 (first draft), Feb 22 (second draft).
  - Closer to the due date, a detailed description of this assignment will be posted to the course website.
3. Final paper, two drafts (100 points per draft).
  - 1000-1200 words.
  - Due dates: April 12 (first draft), May 3 (second draft).
  - Closer to the due date, a detailed description of this assignment will be posted to the course website.

## Goals for the Course

By this course's conclusion, you should be able to

- describe several key issues in the philosophy of science,
- construct arguments in support of your views,
- present views that differ from yours in a fair and charitable manner,
- write clearly, and
- discuss complex philosophical ideas respectfully.

## Plagiarism and Academic Integrity

Please adhere to the Rutgers University policies on plagiarism and academic integrity. Penalties for violations of these policies can be severe: they include an automatic failing grade for the course, and possibly worse. A comprehensive overview of those policies can be found at <http://academicintegrity.rutgers.edu/academic-integrity-policy/>.

## Accessibility

This class should be a great, fun, and educational experience for everyone. And of course, everyone deserves equal access to all educational opportunities at Rutgers. Disabled students are encouraged to speak with me if that would be helpful, and to avail themselves of the services provided by the Office of Disability Services: <https://ods.rutgers.edu/>.

## Schedule

Many readings will be drawn from the course textbook “Philosophy of Science: The Central Issues”, by Martin Curd and J. A. Cover. Other readings will be posted to the course's website.

This schedule is preliminary, and subject to change. Announcements about changes in the readings—whenever they occur—will be made in class, and only later added to the syllabus.

### 1. Introduction

- Jan 23: no reading.

### 2. Confirmation: how do scientific theories get confirmed?

- Jan 25: D. Gillies, “The Duhem Thesis and the Quine Thesis”.
- Jan 30: C. G. Hempel, “Studies in the Logic of Confirmation (I)”. (Sakai)
- Feb 1: W. Salmon, “Rationality and Objectivity in Science or Tom Kuhn Meets Tom Bayes” (pp. 551-569).
- Feb 6: J. Earman, “Success Stories”. (Sakai)

- Feb 8: C. Glymour, “Why I Am Not a Bayesian”.
  - Due: short-answer paper, first draft.
- Feb 13: catch-up.
- 3. The demarcation problem:** what distinguishes science from pseudo-science?
  - Feb 15: K. Popper, “Science: Conjectures and Refutations”.
  - Feb 20: I. Lakatos, “Science and Pseudoscience”.
  - Feb 22: P. R. Thagard, “Why Astrology is a Pseudoscience”; M. Ruse “Creation-Science Is Not Science”.
    - Due: short-answer paper, second draft.
  - Feb 27: catch-up.
- 4. Objectivity and subjectivity:** are scientific facts objective or subjective?
  - Mar 1: H. Longino, “Values and Objectivity” (pp. 170-180).
  - Mar 6: S. Crasnow, “Feminist Philosophy of Science: Values and Objectivity”. (Sakai)
  - Mar 8: K. Okruhlik, “Gender and the Biological Sciences”.
  - Mar 13: catch-up.
- 5. Induction:** what justifies inductive inferences in science?
  - Mar 15: D. Hume, “Section IV: Sceptical Doubts concerning the Operation of the Understanding”, N. Goodman, “The New Riddle of Induction” (pp. 59-66). (Sakai)
  - Mar 20: N. Goodman, “The New Riddle of Induction” (pp. 66-83). (Sakai)
  - Mar 22: N. Goodman, “Prospects for a Theory of Projection” (pp. 87-98). (Sakai)
  - Mar 27: catch-up.
- 6. Laws of nature:** what makes something a law?
  - Mar 29: F. I. Dretske, “Laws of Nature”.
  - April 3: T. Maudlin, “The Metaphysics Within Physics” (pp. 5-21). (Sakai)
  - April 5: B. Loewer, “Humean Supervenience”. (Sakai)
  - April 10: H. Cartwright, “Do the Laws of Physics State the Facts?”.
  - April 12: catch-up.
    - Due: final paper, first draft.
- 7. Realism and idealism:** what do scientific theories say about the world?
  - April 17: G. Maxwell, “The Ontological Status of Theoretical Entities”.
  - April 19: B. van Fraassen, “Arguments Concerning Scientific Realism” (pp. 5-21).
  - April 24: I. Hacking, “Experimentation and Scientific Realism”.
  - April 26: J. R. Brown, “Explaining the Success of Science”.
  - May 1: catch-up.
  - May 3: catch-up.
    - Due: final paper, second draft.