Philosophy 35a: Philosophy of Science

Fall 2018
M, W, Th: 9:00-10:00 am
Location: TBD

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Course Description
What is the aim of scientific investigation? Is the aim to explain why the phenomena under investigation behave as they do? Is the aim to allow us to predict how such phenomena will behave? What is a scientific theory and how does scientific evidence serve either to confirm or disconfirm a theory? How does science change and progress? What explains the enormous success of science over the last three centuries or so? To what extent might science be hampered or damaged by various forms of bias or discrimination?

This course will explore answers to these and other fundamental questions about the nature of scientific theories and scientific enquiry. The course will be divided into four parts:

1) What is scientific evidence? What is inductive evidence? Why should we take our observations to provide evidence about what unobserved things are like? Should we?
2) How does science change or progress? What are scientific revolutions and why do they occur?
3) What is scientific realism? What are the arguments for and against scientific realism?
4) What should we make of feminist critiques of science? Is, can, or should, science be “value-free”? When, if ever, do moral or political values legitimately play a role in scientific practice?

The class will not presuppose any special background in philosophy or in the sciences, though those with a strong background in either philosophy or the sciences are welcome! We’ll encounter examples and case studies from a wide range of sciences, from physics to psychology. We’ll also consider examples from the history of science, including accepted scientific claims, like Kepler's laws about planetary motion, and claims that have been dismissed, like Kepler’s view that the planets stay in their orbits because the sun acts as a giant magnet.

Learning Goals
The class will aim to develop the full range of skills that are important in philosophy. A focus on learning to write clear, concise, tightly argued philosophical prose is the single most important goal. However, a number of other skills are important as well. These include:

- Analyzing philosophical arguments
- Asking philosophical questions, in writing and in conversation
- Thinking critically about specific scientific claims or findings
- Thinking about the nature of scientific enquiry, in part by reflection on one's own participation in some kind of scientific investigation.

**Requirements**

Students will be required to write two short essays of 3-4 pages. This will be worth 40% of the final grade. In addition, students will be required to spend approximately 4 hours over the course of the semester working on one or more Citizen Science projects (see below). A reflection journal (see below) will give students the opportunity to think about how the experience working on these projects relates to issues in the philosophy of science. This will be worth 20% of the grade. A final paper of 4-6 pages will be a revision of one of the two short papers and will count towards 30% of the grade. Attendance and participation will comprise the remaining 10% of the grade.

**Reflection Journal**

You will be asked to turn in four “reflections” over the course of the semester. These should be approximately 300-500 words in length (approx. 2-3 pages) and should reflect on the relevance (or, perhaps, lack of relevance) of the class material to some specific scientific issue that interests you. At least one of the four reflections should describe your work on a Citizen Science project and the relevance to questions asked by philosophers of science to that project. The other reflections might concern a science book you’ve read, your research in the lab or something you are learning in a class (if you are a science student), a study you are interested in, a documentary you’ve seen, some issue of public concern (i.e. debate about global warming and global warming denial), etc.

Your first reflection should describe why you are interested in philosophy of science: what questions about science interest you and what questions do you hope to think more about? Is your interest in philosophy of science primarily an interest in philosophy or an interest in science (or both)? This is due on 1/22.

**Citizen Science**

Philosophy of science is more fun and more productive if we actually have some real science to talk about. I’m going to ask everyone in the class to participate in a Citizen Science project of your choice. You should plan to spend about four hours on a project or a combination of projects. It should be something that you are interested in, so if you don’t like doing it, pick something else! At least one of your four reflections should describe your project and think about the relevance of the course
material to this project. The reflection on the project will be my way of confirming that you actually worked on the Citizen Science project.

To find a project, visit websites like Zooniverse.org or the Wikipedia “list of citizen science projects” page.

**Grading**

Late papers will be deducted one third of a grade (e.g. from a B to a B-) for each day they are late. No assignments will be accepted more than one week late. If you need an extension on an assignment, perhaps because you have work due in other classes on the same day or for personal reasons, please ask me. I am willing to grant short extensions, *provided you ask for them at least a full day in advance.* If you are unable to complete an assignment on time because of an unexpected illness, please let me know as soon as possible.

You should come to class prepared, having done the readings in advance. *You should bring the texts with you to class!*

**Success in this 4 credit hour course is based on the expectation that students will spend a minimum of 9 hours of study time per week in preparation for class (readings, papers, discussion sections, preparation for exams, etc.).**

**Readings**

There are two required texts for the course. Additional readings will be posted on LATTE or distributed in class.

The required books are:
- Godfrey-Smith, Peter. *Theory and Reality: An Introduction to the Philosophy of Science.*
- Kuhn, Thomas. *The Structure of Scientific Revolutions.*

**Academic Integrity at Brandeis**

Academic integrity is central to the mission of educational excellence at Brandeis University. Each student is expected to turn in work completed independently, except when assignments specifically authorize collaborative effort. It is not acceptable to use the words or ideas of another person without proper acknowledgement of that source.

Violations of University policies on academic integrity, described in Section Three of Rights and Responsibilities, may result in failure of the course or on the assignment, or in suspension or dismissal from the University. *If you are in doubt about the instructions for any assignment in this course or about how to properly cite the sources you’ve used, it is your responsibility to ask for help.* If you have questions about academic integrity, please do not hesitate to ask me, refer to the Rights and
Responsibilities Handbook, or contact the office of Student Development and Conduct.

Please refrain from using any device with a screen during class. We will on occasion need to use our devices for research, to consult the readings for the day, and for other purposes. On these occasions, it is fine to use your phone, laptop, tablet, etc. Using them for purposes not immediately related to the class will seriously (and negatively) impact your participation grade!

**Tentative Schedule**

- **Introduction**
  - Logical Empiricism
  - Reading: Godfrey-Smith, Chapters 1 and 2.

**Part 1: Induction and Confirmation**

- Introduction to Part 2
  - Reading: Godfrey-Smith, Chapter 3

*(Reflection 1)*

- Hume and the Problem of Induction
  - Reading: David Hume, *Enquiry Concerning Human Understanding*, Section IV.

- The Ravens Problem and the New Riddle of Induction

- Introduction to Popper
  - Reading: Godfrey-Smith, Chapter 4; Popper, *The Logic of Scientific Discovery*, Chapter 1.

- Popper on Falsifiability

- Bayesianism
  - Reading: Godfrey-Smith, Chapter 14.

*(Reflection 2)*
Part 2: Science as a Social Institution

Kuhn and Normal Science
Reading: Godfrey-Smith, Chapter 5, Kuhn, *The Structure of Scientific Revolutions*, Chapter 1.

*Structure*
Reading: Kuhn, *Structure*, Chapters 2-4.

*Structure*
Reading: Kuhn, *Structure*, Chapters 5-7.

Kuhn and Revolutions
Reading: Godfrey-Smith, Chapter 6, reread 4.3 (Popper on Change).

*Structure*
Reading: Kuhn, Chapters 8-9.

*Structure*: Chapter X!
Reading: Kuhn, Chapter 10.

*Structure*
Reading: Kuhn, 11-end.

Post-Kuhnian Philosophy of Science
Reading: Godfrey-Smith, Chapter 7.

Post-Kuhnian philosophy of science: Lakatos, Laudan, Feyerabend
Reading: TBA

**PAPER 1 due.**
Post-Kuhnian philosophy of science
Reading: TBA

Part 3: Scientific Realism

What's Scientific Realism?
Reading: Godfrey-Smith, Chapter 12.

*(Reflection 3 due 4/1 by 5 pm)*

Van Fraassen: To Save the Phenomena

M. Devitt, Scientific Realism
Reading: Devitt, “Scientific Realism”
Part 4: Feminist Philosophy of Science: Values and Science

- Feminism and Science
  - Reading: Godfrey-Smith, Ch. 9

  *(Reflection 4)*

- Objectivity and Science

- Values and Science
  - Reading: Longino, Chs. 4-5

- Values and Science: a case study

**PAPER 2**

- Exam Period:
- Final paper (a rewrite of either paper 1 or paper 2) due.