PL 260: Introduction to Philosophy of Science

Spring of 2012, Juniata College

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Office Hours: MWF: 10-11, TTh 11-12

Required Texts
4. More than 30 handouts on P drive from the following books (you are required to print and compile them as a reading folder for yourself, and to bring the folder to classes for reference and discussion)
   (4) Theodore Schick, Jr. (ed.), *Readings in the Philosophy of Science: from positivism to postmodernism*, Mayfield 2000 [Schick]
   (7) Y. Balashov and A. Rosenberg (eds.), *Philosophy of Science: contemporary readings*, Routledge 2002 [Balashov].

Orientation

In this course, we will lay out some central philosophical problems raised by natural sciences. Our goals are to develop an understanding of the nature of scientific inquiry and to develop your ability of philosophical thinking about scientific knowledge. For the current semester, in part I and II, we will trace the development of contemporary philosophy of science from logical positivism to the science wars, that is, the current hot debate of the status of science in a democratic society. The questions at stake are: Is scientific knowledge a social construction out of cultural, social, political, religious, or ideological backdrops in which scientists live (postmodernism and social constructionism) or an objective description of the reality out there (modernism and neo-modernism)? More specifically, we will ponder over the questions like: Is scientific knowledge superior to other types of knowledge? Is science rational and objective? And what, if any, counts as rationality in science? Is scientific knowledge value neutral? Is science gender biased? In part III, we will explore two most significant standard issues discussed by philosophers of science, i.e., scientific realism and scientific explanation. The questions to be answered are: What is the metaphysical status of the things which science investigates? Is it ever legitimate to regard a scientific theory as true or an objective representation of reality? What counts as a legitimate scientific explanation? What does a scientific theory really explain?
Course Objectives

- Acquiring an overview of several central problems and perspectives in the philosophy of science.
- Learning analytic and critical thinking skills essential to conduct scientific research.
- Learning how to uncover some deep philosophical presuppositions underlying many scientific theories and practice.
- Acquiring a set of reading, writing, and oral discussion skills that will allow you to engage our philosophical texts in an interesting and deep manner.
- Acquiring and demonstrating the ability to analyze philosophical texts in a variety of ways, including: (a) the ability to discuss course readings in basic terms; (b) the ability to identify major concepts, positions, and arguments; (c) the ability to demonstrate overall comprehension of course texts; (d) the ability to explain material clearly, accurately, precisely; (e) the ability to draw insightful connections between issues and ideas; (f) the ability to present alternative perspectives fairly and sympathetically; (g) the ability to evaluate critically claims and to defend rationally a wide range of views.
- Becoming a scientist with humanistic spirit and a humanist with a scientific mind.

Course Evaluation

1. Attendance, Preparation, and Participation (10 %)
   - Class attendance is mandatory. ONE point will be taken off for each lecture you miss without an official excuse. Your first absence is automatically excused. More than FOUR unexcused absences will result in the lowering of your course grade up to one full letter grade (10 points). Anyone with More than SIX unexcused absences will receive an “F” for the course.
   - Whenever possible, our class will proceed in seminar-format. This means that class time will be devoted to lecture/discussion, with emphasis on class discussion. (a) It is essential for you to do the assigned readings faithfully before each class. If you don’t finish an assigned reading, you might be asked to either leave the classroom to finish your reading or hand in a reading report (about 2 pages) summarizing the reading assignment missed. (b) Needless to say, your active participation in class discussion is an indispensable part of the success of our course. Active participation in all activities (such as asking questions, participating in class discussion, etc.) of classes will definitely boost your course grade.

2. Pop quizzes and small group discussions (10 %): there will be some pop quizzes with sole purpose to make sure that you finish the required readings (taking a few minutes to finish at the beginning of selected classes). We will have many formal small group discussions based on the questions posted by the instructor (grades are based on group performance).

3. One class presentation (10 %): you will participate in ONE two-person class presentation on the reading materials assigned for the day. Each presentation shall last about 15 minutes and be followed by class discussion for another 5-10 minutes. Nothing as formal as a paper is required; rather, be prepared to give a summary of the major points in the readings, and raise a few provocative questions to get class discussion rolling. Please check the sign-up sheet on P drive and let me know your choice (we will reserve 17 slots for possible presentations).

4. Four essays [ 70 % ]: you will write four essays. The requirements and prompts will be provided later.
   - Essay one on logical positivism or Popper due on 2/10 (4-5 pages; 15%)
   - Essay two on Kuhn due on 3/2 (5-6 pages; 17%)
   - Essay three on science and value due on 4/4 (5-6 pages; 18%)
   - Essay four on realism or explanation due on 5/2 (7-8 pages; 20%)
   - A late essay will result in a grade penalty (3 points out of 100 points scale for each day delayed).
Course Outline

Week 1 (1/16-20)
1. **Introduction: What is philosophy of science?**
   - **M:** Self-introduction and course requirements
   - **W:** (a) Godfrey-Smith, ch. 1; (b) A. Rosenberg, “Why Philosophy of Science?” (handout from Rosenberg)

   **Part I: From Logical Positivism to Kuhn: classic theories**
   - **F:** P. Machamer, “A Brief Historical Introduction to the Philosophy of Science” (handout from Machamer)

Week 2 (1/23-27)
2. **Logical Positivism/Empiricism**
   - **M:** (a) H. Feigl, “The Positivist View of Science” (1949, handout from Castell); (b) Godfrey-Smith, 2.1-2.3
   - **W:** A. J. Ayer, “The Elimination of Metaphysics” (1952, handout from Schick); (b) Godfrey-Smith, 2.4-2.6
   - **F:** Underdetermination of Theory by Evidence: (a) review GS, 2.4; (b) P. Duhem, “Physical Theory and Experiment” (1954, handout from Schick); (c) D. Gillies, “The Duhem Thesis and The Quine Thesis,” (handout from Curd)

Week 3 (1/30-2/3)
   - **M:** Theory–ladenness of observation: (a) N. Hanson, “Seeing and Seeing As” (1969, handout from Balashov); (b) N. Hanson, “Observation” (1958, handout from Klemke); (c) Godfrey-Smith, 10.3.
   - **W:** Continue with logical positivism

3. **Karl Popper on Falsification and Demarcation**
   - **F:** (a) K. Popper, “Science: Conjectures and Refutations” (1957, handout from Klemke); (b) Godfrey-Smith, 3.1-3.2, 4.1-4.3

Week 4 (2/6-10)
   - **M:** Godfrey-Smith, 4.4-4.6

4. **Thomas Kuhn on Scientific Revolutions**
   - **W:** (a) on two images of science, paradigms and normal science : Kuhn, preface, ch.1-3; (b) Godfrey-Smith, 5.1
   - **F:** (a) on paradigms and normal science: Kuhn, ch. 4-5; postscript, sect. 1-3. (b) Godfrey-Smith, 5.2-5.3
   - ★ **Essay one on logical positivism or Popper due (2/10)**

Week 5 (2/13-17)
   - **M:** (a) on scientific crisis: Kuhn, ch. 6-8; (b) Godfrey-Smith, 5.4-5.5
   - **W:** (a) on scientific revolutions: Kuhn, ch. 9&10; (b) Godfrey-Smith, 6.1-6.2, 6.4
   - **F:** (a) on scientific revolutions: Kuhn, ch. 11&12; (b) Godfrey-Smith, 6.3, 6.5

Week 6 (2/20-24)
   - **M:** on progress, rationality, and incommensurability: Kuhn, ch. 13,  postscript-1969, sections 5-7
   - **W:** continue with Kuhn; optional: X. Wang, “A reconstruction of Kuhn’s taxonomic interpretation of incommensurability” (handout)

5. **After Kuhn’s Structure**
   - **F:** (a) I. Lakotos, “Falsification and the Methodology of Scientific Research Programmes” (1970, handout from Kourany); (b) Godfrey-Smith, 7.1-7.2

Week 7 (2/27-3/2)
M: (a) Godfrey-Smith, 7.3; (b) L. Laudan, “Dissecting the Holist Picture of Scientific Change” (1984, handout from Kourany)

W: (a) P. Feyerabend, “An Argument Against Method” (1978, handout from Klee); (b) P. Feyerabend, “How to defend Society against Science” (1974, handout from Klemke); (c) Godfrey-Smith, 7.4-7.6

F: Godfrey-Smith, 7.7

† Essay two on Kuhn due (3/2)

Week 8 (3/5-9)  Spring Break!

Week 9 (3/12-16)

Part II: The Aftermath of Kuhnian Revolution: science and human values


6. Social Constructionism

W: (a) Godfrey-Smith, ch. 8; (b) Parsons, pp. 19-27; (c) B. Latour & S. Woolgar, “Facts and Artifacts” (Parsons, pp. 29-41)

F: S. Shapin & S. Schaffer, “Conclusion to Leviathan and the Air-Pump” (Parsons, pp. 43-56)

Week 10 (3/19-23)

M: (a) R. Klee, “The Sociology of Knowledge” (Parsons, pp. 57-77); (b) P. Gross & N. Levitt, “A Critique of Shapin and Schaffer” (Parsons, pp. 79-88).

7. Feminist Criticism of Science

W: (a) Godfrey-Smith, 9.1-9.3; (b) Parsons, pp. 93-101; (c) S. Harding, “Feminist Standpoint of Epistemology and Strong Objectivity” (Parsons, pp. 103-123)

F: (a) Godfrey-Smith, 9.4; (b) C. Pinnick, “Feminist Epistemology” (Parsons, pp. 125-140).

Week 11 (3/26-30)


8. The Science Wars

W: (a) Godfrey-Smith, 9.5; (b) Parsons, pp. 161-170; (c) J. Brown, “The Scenes from the Science Wars” (handout from Brown)

F: S. Weinberg, “Sokal’s Hoax and Selected Responses” (Parsons, pp. 209-240)

Week 12 (4/2-6)

Part III: Science, Reality, and Explanation

9. Science and Reality

M: (a) Godfrey-Smith, 12.1-12.3; (b) G. Maxwell, “The Ontological Status of the Theoretical Entities” (1962, realism; handout from Curd); (c) optional: Curd & Cover comment on Maxwell’s realism (handout from Curd)

W: (a) Van. Fraassen, “Arguments Concerning Scientific Realism” (1980, anti-realism; handout from Curd); (b) Godfrey-Smith, 12.4-12.6; (c) optional: Curd and Cover’s comments on Fraassen’s constructive empiricism (handout from Curd)

† Essay three on science and value due (4/4)

F: good Friday, no class

Week 13 (4/9-13)

M: (a) L. Laudan, “A Confutation of Convergent Realism” (1981, instrumentalism; handout from Curd); (b) Curd & Cover on Laudan’s instrumentalism (handout from Curd)

W: J. Brown, “Explaining the Success of Science” (1985, pro-realism; handout from Curd); (b) optional: Curd & Cover comment on Brown (handout from Curd)

F: (a) I. Hacking, “Experimentation and Scientific Realism” (1982, experimental realism; handout from Curd); (b) optional: Curd & Cover comment on Hacking’s experimental Realism (handout from Curd)
Week 14  (4/16-20)  
**M:** (a) A. Fine, “The Natural Ontological Attitude” (1984, nonrealism; handout from Curd); (b) Curd & Cover on Fine’s NOA (handout from Curd)  

**10. Scientific Explanation**  
**W:** (a) Godfrey-Smith, 13.1-13.2; (b) C. Hempel, “Two Basic Types of Scientific Explanation” (1962, D-N model; handout from Curd); (c) Curd & Cover’s comment on Hempel’s D-N model (handout from Curd)  
**F:** (a) C. Hempel, “Inductive-Statistical Explanation” (1965, I-S model; handout from Curd); (b) Curd & Cover’s comment on Hempel’s I-S model (handout from Curd)

Week 15 (4/23-27)  
**M:** Van Fraassen, “The Pragmatics of Explanation” (1977; handout from Klemke)  
**W:** (a) P. Kitcher, “The Unification Model of Scientific Explanation” (1989, handout from Klee); (b) Godfrey-Smith, 13.3  
**F:** Reserved for catch up

Week 16 (4/30)  
**M:** Final Reflections; optional: Godfrey-Smith, ch. 15.  
**W:** reading day  
*Essay four on realism or explanation due (5/2)*