

PHIL 5350/6350: Seminar in Philosophy of Science

Spring 2018 T / 2:00PM-5:00PM CTHIB 406

Melinda Bonnie Fagan
Department of Philosophy

This course treats central issues in general philosophy of science, including scientific method, inductive inference, laws of nature, explanation, experiment, and realism/anti-realism. We begin with issues prominent from the inception of philosophy of science as a distinct field of inquiry: the nature of theories, the problem of induction, and challenges to logical empiricism. We then examine Kuhn's influential *Structure of Scientific Revolutions*, which marks a watershed for philosophy of science, highlighting the limits of traditional logical analysis. Philosophy of science today occupies a heterogeneous 'middle ground' between formal analysis and empirical study of science in context. In the second half of the course, we will examine a number of important topics in this area, focusing on recent work but also including some classic texts.

Required Texts (at campus bookstore):

[1] Godfrey-Smith, Peter (2003) *Theory and Reality*. Chicago: University of Chicago Press.

[2] Kuhn, Thomas K. (2002) *The Structure of Scientific Revolutions*, 50th anniversary edition. Chicago: University of Chicago Press.

[3] Hacking, Ian (1983) *Representing and Intervening*. Cambridge: Cambridge University Press.

Additional course readings posted on Canvas (organized by week).

Contact Information:

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Office Hours: Wednesday 2-4pm and by appointment

To set up an appointment, please stay after class or send an email. For most issues, it is more efficient to meet in person. (Note: please use your campus email account.)

Teaching and Learning Methods: Primarily seminar discussion, with short lectures as needed. Students are expected to read assigned texts or view materials carefully before class, and come to class meetings prepared to discuss key issues and ideas. Course outcomes will be achieved by individual reflection, followed by discussion, and then articulation of ideas in writing.

Grading and Evaluation:

The grading scale for this course is as follows:

≥100	A+	88-89	B+	78-79	C+	68-69	D+	0-59	F
93-99	A	83-87	B	73-77	C	63-67	D		
90-92	A-	80-82	B-	70-72	C-	60-62	D-		

Each requirement contributes a number of points toward the overall grade, corresponding to the percentage stated. There is no grading curve.

PHIL 6350 Requirements and Grading:

Participation (10%)

Thoughtful participation in class discussions is a vital part of the course. I recommend that you read each article, chapter or section at least twice: once to get the overall gist (the key claims and arguments), then again to work through details. On the second reading, make a note of anything that seems confusing or questionable to you; be prepared to raise these issues in class discussion.

Presentation (15%)

One presentation on selected readings (schedule TBA: make selections by week 3). Summarize and critically examine one of the course readings for that week, segueing into general discussion of points raised (approx. 45-60 min). Your grade will depend on both the quality of your summary and critique, and your leading of class discussion.

Final paper (75%)

Seminar paper due 1 week after last class meeting (April 24). Late papers will be accepted only in cases of legitimate grounds for extension.

PHIL 5350 Requirements and Grading:

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2. *Presentation (5%)*

One presentation on selected readings (schedule TBA: make selections by week 3). Summarize and critically examine one of the course readings for that week. Your summary should be ~2-3 minutes, describing the main issues and arguments in the assigned reading. This should be followed by a short critical discussion, in which you assess those issues and arguments (~3 minutes). Last, take questions from the audience.

3. *Position papers (15% each)*

Four short papers (~6pp, typewritten and double-spaced in a 12 point font) on key issues from course readings and discussion. Each paper should be a focused examination of a specific issue in that week's readings. Papers should demonstrate a clear grasp of issues from assigned readings, but also include an argument for your own position. Any quotations or paraphrased material must be credited and cited in an academic style. Papers are due at the beginning of class for the appropriate week; late papers will be accepted only in cases of excused absence, and must be turned in at or before the next class meeting. Useful guidelines for philosophical writing are available at: <http://www.jimpryor.net/teaching/guidelines/writing.html>

4. *Essay exam (25%)* The last class meeting will be an in-class essay exam (4/17). The exam will consist of essay questions on major topics discussed in class. A list of topics and sample questions will be distributed in advance. Make-up exams will be given only in cases of excused absence, and must be completed within a week of the exam date.

University policies:

- *The Americans with Disabilities Act*: The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.
- *Addressing Sexual Misconduct*: Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).
- *Drop/Withdrawal deadlines*: The last day to drop classes is Fri., Jan 19; the last day to withdraw is Fri., March 2. Please check the academic calendar for more information pertaining to dropping and withdrawing from a course. Withdrawing from a course and other matters of registration are the student's responsibility.
- *Standards of Academic Conduct*: In order to ensure that the highest standards of academic conduct are promoted and supported at the University, students must adhere to generally accepted standards of academic honesty, including but not limited to refraining from cheating, plagiarizing, research misconduct, misrepresenting one's work, and/or inappropriately collaborating. For more information, see: <http://regulations.utah.edu/academics/6-400.php>
- *Accommodation Policy* (Sections O and Q): <http://regulations.utah.edu/academics/6-100.php>

Course policies:

- *Advising*: see <<http://philosophy.utah.edu/undergraduate/contact-advisor.php>>
- *Attendance and punctuality*: Success in this course requires showing up. Regular attendance is expected of everyone enrolled (see <http://regulations.utah.edu/academics/6-100.php>, Section O). Participation in discussion obviously requires attendance, so absences reduce this portion of your grade. In addition, many ideas and arguments relevant to the written assignments will be discussed in class. So absence puts one at a serious disadvantage. If you miss more than two classes consecutively, please see me asap to catch up on material you've missed. If you are absent on a day that an assignment is due, you will need to show that the absence is excused (due to illness, emergency, or similarly unavoidable circumstance) before handing in that assignment. If you are aware of any scheduling conflicts with class meetings, please see me asap so accommodations can be made in advance. For details on accommodations other than scheduling,

see Section Q of the Accommodations Policy (<http://regulations.utah.edu/academics/6-100.php>). Punctuality is also expected. Arriving late to class will result in a lower participation grade for that day.

- *Deadlines*: All written material is due in class, hard-copy, at the beginning of the class meeting. Exceptions can be made only for excused absence situations. Plan ahead, and start early!
- *Electronic etiquette*: Please turn off all electronic devices during class, except those required for note-taking and to access texts.
- *Food and drink*: Please do not bring food and drink to class.
- *Plagiarism*: “Plagiarism” means the intentional unacknowledged use or incorporation of any other person's work in, or as a basis for, one's own work offered for academic consideration or credit or for public presentation. Plagiarism includes, but is not limited to, representing as one's own, without attribution, any other individual's words, phrasing, ideas, sequence of ideas, information or any other mode or content of expression (see ‘Student Code’). Proper acknowledgment means using a citation to indicate where you make use of another person’s words or ideas. Citations may be in footnotes, or inserted in the main text; in either case, they should include the author surname and publication date. A bibliography with full citation information should appear at the end of your essay or paper (see course handouts for details and format). If you are unsure how to correctly cite a source or have questions about how the Student Code applies to written work, please consult me or an academic advisor.
- *Scheduling accommodations*: Absences due to participation in officially sanctioned University activities, government obligations, and religious obligations are excused, as a matter of university policy (see <http://regulations.utah.edu/academics/6-100.php>, Section O). If you have any scheduling conflicts with assignment due dates for these reasons, please let me know asap so accommodations can be made in advance.
- *Student code*: The Student Code (see: <http://regulations.utah.edu/academics/6-400.php>) applies throughout the course. If you have specific questions about its application in this course, consult me asap.
- *Student names and personal pronouns*: Class rosters are provided to the instructor with the student’s legal name as well as “Preferred first name” (if previously entered by you in the Student Profile section of your CIS account). While CIS refers to this as merely a *preference*, I will honor you by referring to you with the name and pronoun that feels best for you in class, on papers, exams, etc. Please advise me of any name or pronoun changes so I can help create a learning environment in which you, your name, and your pronoun will be respected.
- *Wellness*: Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student’s ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at www.wellness.utah.edu or 801-581-7776.

Schedule of Topics and Readings:¹

Week 1 Introduction

- 1/9 PGS Ch1 'Introduction' (1-18)
Einstein (1919) 'What is the theory of relativity?'
Oppenheimer (1956) 'Analogy in science'

Recommended (optional): Einstein (1922) 'Geometry & experience' (starts on p.15)

Week 2 Classic theories of science

- 1/16 Nagel (1961) 'Reduction of theories' (346-361 only)
Oppenheim and Putnam (1958) 'Unity of science as a working hypothesis'
PGS Ch2 'Logic plus empiricism' (19-37)
Popper (1963) 'Conjecture and refutation' (43-54 only)

Recommended for PHIL 6350: Stadler (1998) 'Vienna Circle'
Longino (1990) 'Evidence and hypothesis'
Friedman (1953) 'The methodology of positive economics'

Week 3 Problems of induction

- 1/23 PGS Ch3 'Induction and confirmation' (39-56)
Popper (1959) 'The problem of induction,' (1963) 'Conjecture and refutation' (55-78)
Norton (ms) 'The material theory of induction stated and illustrated'

Recommended for PHIL 6350: Hacking (1975) 'Induction' (Ch19 of *Emergence of Probability*)
Goodman (1983) 'The new riddle of induction'
Curd et al (2013) 'Commentary' (466-469, 472-484, 496-501)

Week 4 Observation

- 1/30 Hanson (1961) 'Observation'
PGS §10.3 'The theory-ladenness of observation' (155-162)
Hacking Ch10 'Observation' (167-185)
Bogen & Woodward (1988) 'Saving the phenomena'

Recommended for PHIL 6350:
Hacking Ch11 'Microscopes' (186-209)
Daston & Galison (1992) 'The image of objectivity'

Week 5 Kuhn's historical challenge

- 2/6 Kuhn (1962) *The Structure of Scientific Revolutions* (ChI-VIII)
PGS Ch5 'Kuhn and normal science' (75-86)
Hacking (2002) 'Introductory essay'

Recommended for PHIL 6350: Hacking 'Introduction: Rationality' (1-17)
Hacking Ch5 'Incommensurability' (65-74)

¹ There may be minor changes to the assigned readings as the semester progresses. Any such changes will be announced at least one week in advance, in class and by email announcement.

Week 6 Scientific revolutions and rationality

2/13 Kuhn (1962) *The Structure of Scientific Revolutions* (ChIX-XIII, Postscript)

PGS Ch6 'Kuhn and revolutions' (87-101)

Bird (2013) 'Thomas Kuhn' SEP

Recommended for PHIL 6350: Kuhn (1977) 'Objectivity, value judgment, and theory choice'

Longino (1990) 'Values and objectivity'

Week 7 Models and theories

2/20 Giere (1988) 'Models and theories' (skim physics details)

Giere (2004) 'How models represent reality'

PGS §12.7 'Representation, models and truth' (186-189)

Frigg (2010) 'Models and fiction'

Recommended for PHIL 6350:

Hacking Ch12 'Speculation, calculation, models, approximation' (210-219)

Downes (1992) 'The importance of models in theorizing: a deflationary semantic view'

Van Fraassen (1980) 'Models' (41-44)

Week 8 Explanation

2/27 PGS Ch13 'Explanation' (190-201)

Cartwright (2003) 'From causation to explanation and back'

Woody (2016) 'Re-orienting discussions of scientific explanation'

Recommended for PHIL 6350:

Hempel and Oppenheim (1948) 'Studies in the logic of explanation'

Friedman (1974) 'Explanation and scientific understanding'

Week 9 Laws of nature

3/6 Van Fraassen (1989) 'What are laws of nature?'

Hempel (1966) 'Laws and scientific explanation'

Cartwright (1983) 'The truth doesn't explain much'

Recommended for PHIL 6350: Cartwright (1983) 'Do laws of physics state the facts?'

Carnap (1974) 'The value of laws – explanation and prediction'

Van Fraassen (1989) 'What if there are no laws?' (183-189 only)

Week 10 Realism/anti-realism

3/13 Van Fraassen (1980) 'Arguments concerning scientific realism' (6-23)

PGS Ch12 'Scientific realism' (173-189)

Hacking 'Reals and representations' (130-146)

Psillos (1999) 'In defence of scientific realism' (70-97)

Recommended for PHIL 6350: Hacking Ch1-3 (21-57) 'What is scientific realism?'

Spring Break – no classes

Week 11 Experiment

3/27 Hacking Ch9 'Experiment' (149-166), Ch13 'The creation of phenomena' (220-232)
Hacking Ch16 'Experimentation and scientific realism' (262-275)
Roush (2017) 'The epistemic superiority of experiment to simulation'

Recommended for PHIL 6350: Duhem (1914) 'Experiment in physics'
Steinle (2002) 'Experiments in history and philosophy of science'

Week 12 The New Mechanical Philosophy

4/3 Machamer et al (2000) 'Thinking about mechanisms'
Craver (2007) Ch4 'The norms of mechanistic explanation'
Matthewson and Calcott (ms) 'Mechanistic explanation without mechanisms'
Franklin-Hall (ms) 'The emperor's new mechanisms'

Recommended for PHIL 6350:

Bechtel (2011) 'Mechanism and biological explanation'
Fagan (2015) 'Collaborative explanation and biological mechanisms'

Week 13 Interventionism

4/10 Woodward (2002) 'Causation and manipulation' (25-61)
Woodward (2008) 'Causation with a human face'
Strevens (2007) 'Review of Woodward, *Making Things Happen*'
Franklin-Hall (ms) 'The emperor's new mechanisms'

Recommended for PHIL 6350: Reutlinger (2012) 'Getting rid of interventions'

Week 14 Exam, final papers

4/17 In-class essay exam (PHIL 5350)