



Philosophy of Science (PHIL 235)

Tuesday/Thursday 9:30-10:50, 200 Pettigrew

Bates College, Winter 2014

Professor William Seeley, 315 Hedge Hall

Office Hours: 11-12 T/Th

Course Description:

Scientific inquiry stands out, at least in theory, as the model par excellence for how we ought to go about acquiring knowledge about the world. What is it about the sciences that grounds this intuition? This course looks into the foundations of scientific inquiry from a range of perspectives. The aim of this project is to evaluate the goals and practices that shape our intuitions about the modern scientific enterprise. The course is loosely divided into five sections dedicated to exploring the distinction between theories and observations, evaluating related philosophical questions about the confirmation of theories, exploring the debate between realists and anti-realists, evaluating the status of natural laws and their role in explanations, discussing the nature of the inter-relationships between theories couched at different levels of analysis like physics and chemistry or neuroscience and psychology, and finally evaluating the challenge to standard models for scientific explanations raised by research in the sociology of science. Along the way we will introduce and evaluate a range of positions that have come to define the field: *logical empiricism*, *historicist approaches*, a range of *realist* and *ant-realist* positions, and finally the debate between *cognitivist* and *social constructionist* positions.

Course Goals:

The goals of this course are threefold. Our primary goal will be to understand of the basic concepts and principles that define the philosophy of science as a field. This lens will serve as a methodological tool for evaluating scientific practice. Finally, along the way we will discuss and reinforce some basic principles of critical reasoning, both as foundational elements of the practice of science and as they relate to our own writing (and reading) practices.

Requirements:

Students will be asked to complete two take-home exams before the midterm (15% each), a 6-8 page writing assignment after the midterm (30%), and a cumulative take-home final exam (40%). **CLASS PARTICIPATION IS A REQUIREMENT.** Attendance is a minimum requirement for class participation. Therefore, excessive absences will affect a student's final grade (attendance is factored in at +/- 10% of the final grade).

Texts:

- Martin Curd and J. A. Cover (eds.), *Philosophy of Science: The Central Issues* (Norton & Company, 1998). **(CC)**
- *Ronald N. Giere*, *Explaining Science: A Cognitive Approach* (University of Chicago Press, 1988). **(ES)**
- Electronic resources and pdf files on LYCEUM. **(LYCEUM)**

Assignments:

All assignments are to be handed in hard copy in my mailbox **AND in the dropbox** provided on LYCEUM on the day that they are due. I will not grade assignments that have not been handed in both places.

All due dates are listed on the schedule of readings at the end of the syllabus

- **First Take-Home Exam (15%)** – Theory, Observation, and Confirmation
- **Second Take-Home Exam (15%)** – The Realism/Anti-Realism Debate
- **6-8 page paper (30%)** – Please write an 1800-2400 word paper on one of two topics to be distributed on LYCEUM. Your paper should be double-spaced in 12 point font with 1" margins. The purpose of this paper is to demonstrate your understanding of the structure of a standard debate within the literature and that you can synthesize material from the syllabus into a coherent position.
- **Cumulative Take-Home Final Exam (40%)**

Miscellaneous Notes and Guidelines:

Moral behavior is the grounds for, and the framework of, a healthy society. In this regard it is each of our responsibility as an individual within the community of our classroom to act responsibly. This includes following the rules and guidelines set out by the College for academic behavior. Plagiarism is a serious matter. It goes without saying that each of you is expected to do his or her own work and to cite EVERY text that is used to prepare a paper for this class. In general philosophy papers are NOT research papers. Your papers should not involve any outside research and you should be able to manage your final papers using only material from the syllabus, assigned supplemental readings, and class discussion.

As a general rule, I ask that you not use the internet for your research except as assigned in class.

The assignments are designed to give students a chance to stretch their legs a bit with the material and give me a chance to assess your understanding of the material. These papers should offer a philosophical defense of your take on the issue at hand. But this does not mean that they are a free forum for opinions. Make sure that your papers set out the philosophical issues germane to the question and that your responses address the relative virtues and shortcomings of theoretical positions discussed in class.

Finally, the reading list for this class is arranged to allow us some flexibility in discussion so that we can spend more time on issues of interest to the class. Assigned readings that we do not directly cover in class should be treated as supplemental readings. I will also occasionally upload supplementary materials to LYCEUM for students interested in pursuing particular issues beyond class discussion.

Schedule of Readings:

Topic 1: Theory, Observation, & Confirmation

Carnap	from <i>An Introduction to the Philosophy of Science</i> (LYCEUM)
Popper	Science: Conjectures and Refutations (CC)
Duhem	Physical Theory and Experiments (CC)
Hempel	Empiricist Criteria of Cognitive Significance (LYCEUM)
Kuhn	The Nature and Necessity of Scientific Revolutions (CC)
Kuhn	Objectivity, Value Judgment, and Theory Choice (CC)

Topic 2: Realism / Anti-Realism

van Fraassen	Arguments Concerning Scientific Realism (CC)
Musgrave	Realism versus Constructive Empiricism (CC)
Laudan	A Confutation of Convergent Realism (CC)
Hacking	Experimentation and Scientific Realism (CC)
Fine	The Natural Ontological Attitude (CC)

Topic 3: Laws & Explanation

Hempel	Two Basic Types of Explanation (CC)
Salmon	Counterexamples to the D-N/I-S Models (LYCEUM)
Kitcher	Explanatory Unification (LYCEUM)
Salmon	Why ask 'Why'? (LYCEUM)
Ayer	What Is a Law of Nature? (CC)
Dretske	Laws of Nature (CC)
Cartwright	Fundamentalism vs. the Patchwork of Laws (LYCEUM)
Cartwright	The Reality of Causes in a World of Instrumental Laws (LYCEUM)

Topic 4: Science and the Laboratory: Constructive Realism and the Sociology of Science

Giere	Theories of Science (ES)
Gottfried-Smith	The Challenge from Sociology of Science (LYCEUM)
Knorr-Cetina	The Ethnographic Study of Scientific Work (LYCEUM)
Latour & Woolgar	<i>Laboratory Life: The Construction of Scientific facts</i> (excerpt)
Latour	Literature (LYCEUM)
Latour	Laboratories (LYCEUM)
Keller	Feminism and Science (LYCEUM)
Giere	Models and Theories (ES)
Giere	Constructive Realism (ES)
Giere	Scientific Judgements (ES)

Bibliography: supplementary or alternative readings are listed in [square brackets].

- Rudolf Carnap, from *An Introduction to the Philosophy of Science* (New York: Basic Books, 1966), pp. 225-246.
- Karl Popper, "Science: Conjectures and Refutations," reprinted in Martin Curd and J. A. Cover (eds.), *Philosophy of Science: The Central Issues* (New York: W. W. Norton & Company, 1998), pp. 3-9.
- Pierre Duhem, "Physical Theory and Experiments," reprinted in Martin Curd and J. A. Cover (eds.), *Philosophy of Science: The Central Issues* (New York: W. W. Norton & Company, 1998), pp. 257-279.
- Carl G. Hempel, "Empiricist Criteria of Cognitive Significance," reprinted in Martin Curd and J. A. Cover (eds.), *Philosophy of Science: The Central Issues* (New York: W. W. Norton & Company, 1998), pp. 71-84.
- Thomas S. Kuhn, "The Nature and Necessity of Scientific Revolutions," reprinted in Martin Curd and J. A. Cover (eds.), *Philosophy of Science: The Central Issues* (New York: W. W. Norton & Company, 1998), pp. 86-101.
- Thomas S. Kuhn, "Objectivity, Value Judgment, and Theory Choice," reprinted in Martin Curd and J. A. Cover (eds.), *Philosophy of Science: The Central Issues* (New York: W. W. Norton & Company, 1998), pp. 102-118.
- Bas C. van Fraassen, "To Save the Phenomena," reprinted in Richard Boyd, Phillip Gasper, and J. D. Trout, *The Philosophy of Science* (Cambridge, MA: MIT Press, 1991), pp. 623-632.
- Alan Musgrave, "Realism versus Constructive Empiricism," reprinted in Martin Curd and J. A. Cover (eds.), *Philosophy of Science: The Central Issues* (New York: W. W. Norton & Company, 1998), pp. 1088-1113.
- Larry Laudan, "A Confutation of Convergent Realism," reprinted in Martin Curd and J. A. Cover (eds.), *Philosophy of Science: The Central Issues* (New York: W. W. Norton & Company, 1998), pp. 1114-1135.
- Ian Hacking, "Experimentation and Scientific Realism," reprinted in Martin Curd and J. A. Cover (eds.), *Philosophy of Science: The Central Issues* (New York: W. W. Norton & Company, 1998), pp. 1153-1168.
- Arthur Fine, "The Natural Ontological Attitude," reprinted in Martin Curd and J. A. Cover (eds.), *Philosophy of Science: The Central Issues* (New York: W. W. Norton & Company, 1998), pp. 1186-1208.
- Carl G. Hempel, "Two Basic Types of Explanation," reprinted in Martin Curd and J. A. Cover (eds.), *Philosophy of Science: The Central Issues* (New York: W. W. Norton & Company, 1998), pp. 685-694.
- Wesley C. Salmon, "Famous Counterexamples to the Deductive-Nomological Model," *Four Decades of Scientific Explanation* (Minneapolis, MN: University of Minnesota Press, 1989), pp. 46-50.
- Wesley C. Salmon, "Early Objections to the Inductive-Statistical Model," *Four Decades of Scientific Explanation* (Minneapolis, MN: University of Minnesota Press, 1989), pp. 58-60.
- Phillip Kitcher, "Explanatory Unification," reprinted in Richard Boyd, Phillip Gasper, and J. D. Trout, *The Philosophy of Science* (Cambridge, MA: MIT Press, 1991), pp. 507-531.
- Wesley C. Salmon: Why ask 'Why?': An Inquiry Concerning Scientific Explanation," reprinted in *Causality and Explanation* (New York: Oxford University Press, 1998), pp. 125-141.
- Fred I. Dretske, "Laws of Nature," reprinted in Martin Curd and J. A. Cover (eds.), *Philosophy of Science: The Central Issues* (New York: W. W. Norton & Company, 1998), pp. 826-845.
- Nancy Cartwright, "Fundamentalism vs. the Patchwork of Laws," reprinted in David Papineau (ed.), *The Philosophy of Science* (New York: Oxford University Press, 1996), pp. 314-326.
- Nancy Cartwright, "The Reality of Causes in a World of Instrumental Laws," reprinted in Richard Boyd, Phillip Gasper, and J. D. Trout, *The Philosophy of Science* (Cambridge, MA: MIT Press, 1991), pp. 379-386.
- Ronald N. Giere, "Theories of Science," *Explaining Science: A Cognitive Approach* (Chicago: University of Chicago Press, 1988), pp. 22-61.
- Peter Godfrey-Smith, "The Challenge from Sociology of Science," *Theory and Reality: An Introduction to the Philosophy of Science* (Chicago: University of Chicago Press, 2003), pp. 122-135.]
- Karin D. Knorr-Cetina, "The Ethnographic Study of Scientific Work: Toward a Constructivist Interpretation of Science," in Karin D. Knorr-Cetina and M. Mulkay (eds.), *Science Observed: Perspective on the Social Study of Science* (London: Sage Publications, 1983).
- Bruno Latour and Steve Woolgar, *Laboratory Life: The Construction of Scientific Facts* (Princeton, NJ: Princeton University Press, 1986).
- Bruno Latour, "Literature," *Science in Action* (Cambridge, MA: Harvard University Press, 1987), pp. 21- 62.
- Bruno Latour, "Laboratories," *Science in Action* (Cambridge, MA: Harvard University Press, 1987), pp. 63 -102.
- Keller, Evelyn Fox, "Feminism and Science," reprinted in Martin Curd and J. A. Cover (eds.), *Philosophy of Science: The Central Issues* (New York: W. W. Norton & Company, 1998), pp.279 - 288.
- Ronald N. Giere, "Models and Theories," *Explaining Science: A Cognitive Approach* (Chicago: University of Chicago Press, 1988), pp. 62-91.
- Ronald N. Giere, "Constructive Realism," *Explaining Science: A Cognitive Approach* (Chicago: University of Chicago Press, 1988), pp. 92-110.
- Ronald N. Giere, "Realism in the Laboratory," *Explaining Science: A Cognitive Approach* (Chicago: University of Chicago Press, 1988), pp. 111-140.
- Ronald N. Giere, "Scientific Judgement," *Explaining Science: A Cognitive Approach* (Chicago: University of Chicago Press, 1988), pp. 141-178.

Philosophy of Mind: syllabus

Date	Readings / supplementary reading in [square brackets]	Assignments
01/07	What is philosophy of science?	
01/08	Carnap, <i>Introduction to Philosophy of Science: (excerpts)</i> . (LYCEUM)	
01/14	Popper, Science: Conjectures and Refutations: 3-9. (CC)	
01/16	Duhem, Physical Theory and Experiments: 257-279. (CC) [Gilles, The Duhem Thesis and the Quine Thesis. (CC)]	
01/21	Hempel, Empiricist Criteria of Cognitive Significance: 71-84. (LYCEUM)	
01/23	Kuhn, The Nature and Necessity of Scientific Revolutions: 86-101. (CC)	
01/28	Kuhn, Objectivity, Value Judgment, and Theory Choice: 102-118. (CC)	<i>1st Take-Home Exam Issued Monday morning on LYCEUM</i>
01/30	Van Fraassen, To Save the Phenomena: 1064-1087. (CC)	<i>1st Take-Home Exam due: Friday @ 5pm</i>
02/04	Musgrave, Realism versus Constructive Empiricism: 1088-1113. (CC)	
02/06	Laudan, A Confutation of Convergent Realism: 1114-1135. (CC)	
02/11	Hacking, Experimentation and Scientific Realism: 1153-1168. (CC)	<i>2nd Take-Home Exam Issued Monday morning on LYCEUM</i>
02/13	Fine, The Natural Ontological Attitude: 1186-1208. (CC)	<i>2nd Take-Home Exam due: Friday @ 5pm</i>
02/15-23	FALL RECESS	
02/25	Hempel, Two Basic Types of Explanation: 685-694. (CC) Salmon, Counterexamples to the D-N/I-S: 46-50; 58-60. (LYCEUM)	
02/27	Kitcher, Explanatory Unification: 507-531. (LYCEUM)	
03/04	Salmon: Why ask 'Why?': 683-705. (LYCEUM)	<i>6-8 page paper topics distributed</i>
03/06	Dretske, Laws of Nature: 826-845. (CC)	
03/11	Cartwright, Fundamentalism vs. Patchwork of Laws: 38-48. (LYCEUM)	
03/13	Cartwright, Reality of Causes...Instrumental laws: 38-48. (LYCEUM)	
03/18	Giere, Theories of Science: 22-61. (ES)	
03/20	Gottfried-Smith, The Challenge from Sociology of Science Knorr-Cetina, The Ethnographic Study of Scientific Work (LYCEUM) Keller, Feminism and Science: 279-288. (LYCEUM)	<i>6-8 page paper due: Friday @ 5pm</i>
03/25	Latour & Woodward, <i>Laboratory Life</i> (excerpt) (LYCEUM)	
03/27	Giere, Models and Theories: 62-91. (ES)	
04/01	Giere, Constructive Realism: 92-110. (ES)	<i>Take-Home Final Issued Monday morning on LYCEUM</i>
04/03	Giere, Scientific Judgments: 141-178. (ES) [Giere, Models and Experiments: 179-222. (CC)]	<i>Take Home Final Due April 9 at 12:30 – no late exams accepted.</i>