

PHL 327, Philosophy of Science  
T,R 2 to 3:15 (HUMB 136)  
Office Hours: T,R 11am to 12:30pm, and by appt  
Email: poston@southalabama.edu  
Course Webpage:

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**Course Description:** The philosophy of science is the examination of questions and issues that arise from the methods and results of science, questions and issues that are not themselves answerable by scientific methods. This course will focus on the nature of the scientific method. What *is* the scientific method? We will begin by investigating proposals about the difference between science and pseudoscience. This is known as *the demarcation issue*. We will then turn to Pierre Duhem's observation that there are no *crucial experiments* in physics. Duhem's thesis is called *the ambiguity of falsification*. We will examine the arguments and issues surrounding the *underdetermination of theories* by experimental data. Then we will examine *the Kuhnian Revolution*. Thomas Kuhn wanted to know what explained scientific consensus, especially in the case in which there were viable competing theories. He studied the history of the science and discovered that the selection and subsequent support for one theory over its rivals was not clearcut. Kuhn's work stresses the significant of *contextual (or subjective) values in science*. We shall examine some of these issues. Our next major topic will be to gain a better appreciation of the *challenge of induction*. We will investigate Hume's problem of induction, Popper's views about corroboration, and finally the grue problem. Our final section will attempt to draw together these various threads on the nature of scientific methodology by presenting the Bayesian view. Bayesianism is a subtle and sophisticated view about the nature of scientific inference. Our goal will be to understand in some detail how Bayesianism works and also the promises and perils of a Bayesian methodology of science.

### Objectives:

1. To explore the philosophical issues raised by natural science.
2. To become acquainted with some major philosophers of science & major themes in the philosophy of science.
3. To develop the students' writing skills.
4. To develop the students' critical thinking skills. Such skills include being able to understand complex issues, detect presuppositions, evaluate arguments, and form reasoned judgments in both philosophy and everyday life.

### Text:

*Philosophy of Science: The Central Issues* 2nd edition. Martin Curd, J.A. Cover, & C. Pincock (eds.) (W.W. Norton & Company, 2013)

**Evaluation:** All written assignments should be emailed to me before class the day it is due. Please email the document as a pdf, doc, or pages. I will return the document to you with comments. If you don't know how to display comments, talk to me after class and I'll show you how to do this.

1. Reading Summaries 25%
2. Quizzes 10%
3. Oral Midterm 10%
4. Final Exam 20%
5. Argumentative Paper 20%
6. Attendance & Participation 15%

## Reading Summaries

A reading summary consists of (i) *a statement of the author's thesis*, that is, what he is arguing for or against. Occasionally this may include more than one statement. Also, sometimes you will have to paraphrase the author's thesis. Reading summaries also include (ii) a sketch of the author's main argument for his thesis. In the remainder of the summary (remember you have *at most* 500 words) explain the rationale of the major premises and any problems you see with the author's argument.

Some of our readings will be challenging. However, it should develop the skill to state the main thesis of the article. For instance, if an article is on Bayesianism you should be able to determine whether the author is in favor of Bayesianism or against it. In cases where you don't know what the article is getting at, just say that and try to explain some of the sources of your bafflement.

These summaries are intended to encourage you to wrestle with these readings and to develop the hard one skill of taking something complex and simplifying it into digestible nuggets. Each essay is central to the development of the philosophy of science and deserves careful scrutiny. Writing on an article forces you to be clear about your reaction to the article and your sense of what the author has accomplished. These summaries are also intended to improve your ability to write on and explain complicated issues.

There will be 10 article summaries (500 word limit). They will be graded as follows:

- 4 = good
- 3 = decent
- 2 = poor
- 1 = extremely poor
- 0 = didn't turn one in

## Quizzes

We will have 10 quizzes, some may be unannounced. The quizzes will cover aspects of our reading and lectures. For instance, I may ask you to explain the difference between cognitive and contextual values. Or I might ask you to give a form of Bayes' theorem. These quizzes are intended to test your comprehension of basic and central elements in the readings. If you do the reading, come to class, and get the basics then you should do well on these quizzes.

## Midterm

We will talk about this when the date approaches.

## Final Exam

The final exam will be cumulative. It will include both an objective part—multiple choice, true/false, and short answer—and an essay section.

## Argumentative Paper

You shall formulate a thesis statement, argue for it, and defend it from possible objections. Your discussion should manifest a good understanding of the relevant literature—you'll gain this understanding from our readings and class discussion. I will give you a list of topics. Before you begin writing confirm your topic with

me. If you would like to pursue a different topic than one I have given then discuss it with me. The paper shall be no more than 2000 words. Use footnotes with standard documentation practices (e.g., MLA).

#### Statement of Grading Criteria:

**A** : the essay adequately states and defends an argument, and answers the counterexamples and counter arguments suggested by the lectures and the readings; it shows knowledge of the topic, is well structured and well written.

**B**: the essay contains an argument, it shows a satisfactory knowledge of the subject, but it does not account for all the counter examples and counter arguments suggested by the readings and the lectures. The main claims are not adequately supported by textual evidence.

**C**: The essay states an argument or thesis, but its supporting premises are missing, or incorrect, or not sufficiently specific. It is not well structured and it is poorly written

**D**: The essay makes no serious attempt to frame an argument or defend a thesis. It simply describes the readings or lectures, and includes several errors. It fails to address the question posed, it lacks structure, and it is poorly written.

**F**: The essay completely ignores the questions set, or it contains very serious errors in reasoning, and shows no knowledge of the subject. /The essay is incomprehensible due to errors in language and usage./ The essay violates the requirements of academic integrity

#### Attendance & Participation

Attendance and participation are crucial. Each lecture will introduce new concepts. Moreover, this class is a mix of lecture and discussion. The lectures will not only set the context for the readings, but also explain the arguments and ideas supporting various positions. The task of evaluating these arguments and ideas, though, will be a joint venture. As a result, we will spend much of our time discussing the reasoning behind certain positions. The participation grade measures the quality of your input. But if you don't attend you can't participate. I will keep track of attendance using USAonline. I'll drop the lowest attendance & participation score.

#### Electronic devices

Studies indicate that laptops and cell phones negatively affect both the users themselves and also the students around them in the classroom. They disrupt the classroom atmosphere and my teaching. Hence, no laptops are allowed. No phones (and related devices) should be used; don't even have them out. Because it is disruptive to good philosophical dialogue, if I see you with your cellphone out I will count you as absent. (If you are waiting for an emergency call, let me know ahead of time, and you can excuse yourself from class for the call.)

## Analytical Outline

- I. Demarcation
  - A. Day 1 (Falsification)
    - 1. Popper & Kuhn
  - B. Day 2 (The historical & social character of science)
    - 1. Lakatos & Thagard
  - C. Day 3 (Creation Science)
    - 1. Ruse & Laudan
- II. The failure of crucial experiments in science
  - A. Day 4 (The ambiguity of falsification)
    - 1. Duhem “Physical Theory and Experiment”
  - B. Day 5 (Holism & the dogmas of empiricism)
    - 1. Quine “Two Dogmas of Empiricism”
  - C. Day 6 (The Duhem-Quine thesis)
    - 1. Gillies “The Duhem Thesis and the Quine Thesis”
  - D. Day 7 & 8 (Underdetermination)
    - 1. Laudan “Demystifying Underdetermination”
- III. The Kuhnian Revolution
  - A. Day 9 (the problem of scientific consensus)
    - 1. Kuhn “The Nature and Necessity of Scientific Revolutions”
  - B. Day 10 (subjective factors in reaching consensus)
    - 1. Kuhn “Objectivity, Value Judgment, and Theory Choice”
  - C. Day 11 (rationality & non-empirical virtues)
    - 1. McMullian “Rationality and Paradigm Change in Science”
  - D. Day 12 (rationality & rule change)
    - 1. Laudan “Kuhn’s Critique of Methodology”
- IV. The challenge of induction
  - A. Day 13 (Hume’s problem)
    - 1. Lipton “Induction”
  - B. Day 14 (Corroboration)
    - 1. Popper “The Problem of Induction”
    - 2. Salmon “Rational Prediction”
  - C. Day 15 (Inductive Criteria)
    - 1. Hempel “Criteria of Confirmation and Acceptability”
  - D. Day 16 (The grue problem)
    - 1. Goodman “The new riddle of induction”
  - E. Day 17 (Abduction & Grue)
    - 1. Harris & Hoover “Abduction and the new riddle of induction”
  - F. Day 18 (Quine on Grue)
    - 1. Chihara “Quine and the confirmational paradoxes”
  - G. Day 19 (Lessons of Grue)
    - 1. Godfrey-Smith “Goodman’s Problem and Scientific Methodology”
- V. Bayesianism to the rescue
  - A. Day 20 & 21 (The Bayesian cast)
    - 1. Salmon “Rationality and Objectivity in Science”
  - B. Day 22 (Bayesianism & the Duhem Problem)
    - 1. Howson & Urbach “The Duhem Problem”
  - C. Day 23 (Experimental Statistics)
    - 1. Mayo “A Critique of Salmon’s Bayesian Way”
  - D. Day 25 (Normativity & Science)
    - 1. Chalmers “The Bayesian Way”
  - E. Day 25 (Bayesianism as Therapy)
    - 1. Horwich “Therapeutic Bayesianism”

**Schedule:** (This schedule is subject to change. Pay attention to current schedule on website)

	<b>Section</b>	<b>Reading Schedule</b>	<b>Summaries &amp; Quizzes</b>
Tuesday, January 13	Introduction	Introduction	
Thursday, January 15	Demarcation	Popper, Kuhn, Lakatos (C&C 3-26)	
Tuesday, January 20	Demarcation	Thagard, Ruse, Laudan, Ruse (C&C 27-51)	Quiz 1
Thursday, January 22	Crucial Experiments	Duhem (C&C 227-249)	Summary 1 due on Duhem
Tuesday, January 27	Crucial Experiments	Quine (C&C 250-270)	Quiz 2
Thursday, January 29	Crucial Experiments	Gillies (C&C 271–287)	Summary 2 due on Gillies
Tuesday, February 03	Crucial Experiments	Laudan (C&C 288-320)	Quiz 3 on Laudan
Thursday, February 05	The Kuhnian Revolution	Kuhn (C&C 79-93)	Summary 3 due on Kuhn
Tuesday, February 10	The Kuhnian Revolution	Kuhn (C&C 94-110)	Quiz 4 on Kuhn
Thursday, February 12	The Kuhnian Revolution	McMullin (C&C 111-143)	Summary 4 due on McMullin
Tuesday, February 17	Mardi Gras	Mardi Gras	
Thursday, February 19	The Kuhnian Revolution	Laudan (C&C 111-143)	
Tuesday, February 24	Review	Review	Review
Thursday, February 26	<b>Midterm</b>	<b>Midterm</b>	<b>Midterm</b>
<b>SPRING BREAK</b>		<b>SPRING BREAK</b>	
Tuesday, March 10	Induction	Lipton, Popper (C&C 390–411)	Summary 5 due on Lipton
Thursday, March 12	Induction	Salmon (C&C 412-423)	Quiz 5
Tuesday, March 17	Induction	Hempel (C&C 424-438)	
Thursday, March 19	Induction	Goodman (C&C 451-455)	Summary 6 on Goodman
Tuesday, March 24	Induction	Harris & Hoover “Abduction & the new riddle of induction”	Quiz 6
Thursday, March 26	Induction	Chihara “Quine and the confirmational Paradoxes”	Summary 7 on Chihara
Tuesday, March 31	Induction	Godfrey-Smith “Goodman’s problem and scientific methodology”	Quiz 7
Thursday, April 02	Bayesianism	Salmon (C&C 518-549)	Summary 8 on Salmon
Tuesday, April 07	Bayesianism	Salmon (C&C 518-549)	Quiz 8

Thursday, April 09	Bayesianism	Howson & Urbach (C&C 321-332)	Summary 9
Tuesday, April 14	Bayesianism	Mayo (C&C 550-564)	Quiz 9
Thursday, April 16	Bayesianism	Chalmers (C&C 565-578)	Summary 10
Tuesday, April 21	Bayesianism	Horwich (C&C 579-595)	Quiz 10
Thursday, April 23	Bayesianism	Sober "A Bayesian Primer on the Grue Problem"	Bonus Summary
Tuesday, April 28	Review	Review	Review
Thursday, April 30	Review	Review	Review
<b>Tuesday, May 5</b>	<b>Final Exam 1-3pm</b>	<b>Final Exam 1-3pm</b>	