PHIL 412 / 510 – Philosophy of Science

Fall Term 2011

Tue, Thu 2:00–3:20 pm, Assiniboia Hall 2-02A

Instructor:	Ingo Brigandt
E-mail:	brigandt@ualberta.ca
Phone:	780-492-3307 ext. 12 (voicemail only)
Office:	3-49 Assiniboia Hall
Office hours:	Mon, Wed 2:10–3:00 pm, and by appointment
Website at	https://eclass.srv.ualberta.ca

A. Course overview and aims

The aim of this class is to give an advanced overview of most major topics in contemporary philosophy of science. To this end, we will read and discuss influential articles from the primary literature written in the last decades, grouped around several core topics.

We start out with various issues pertaining to the *confirmation* of theories by evidence, including the problem of induction, Popper's falsificationism, confirmation holism (the Duhem-Quine problem), Kuhnian incommensurability, Bayesian confirmation theory, and the underdetermination of theory by evidence. The next basic topic is *realism* vs. antirealism, where we cover arguments for realism, van Fraassen's anti-realism (constructive empiricism), and the pessimistic meta-induction. After a short discussion of the nature of scientific *laws*, we move to the next topic—*explanation*. To be discussed are the Hempel-Oppenheim model (originally widely accepted but then criticized and abandoned), Salmon's statistical relevance model, the related issue of intertheory reduction, and causal-mechanistic accounts as the most recent approaches to scientific explanation (which have also been used to go beyond the reduction–antireduction dichotomy). The class concludes with a look at scientific practice, uncovering a vital and recent perspective in philosophy of science. In contrast to the past idea that only the context of justification (confirmation)—but not the context of discovery—can be subject to rational analysis, nowadays discovery and experimental practice in science are an important object of philosophical study. Furthermore, social features of scientific organization and practice are an important factor in the production of scientific knowledge, making epistemic as well as social values (and the role of research within society) germane to philosophical assessments of science.

B. Prerequisites

The class is organized such that background knowledge in philosophy of science is not required, though interests in philosophy of science (or science) are desirable. Formal prerequisites: to take the class as an undergraduate (PHIL 412), you must have previously completed two philosophy classes (including one class at the 200-level or higher) or obtain my permission.

C. Required texts

The required readings consist of journal articles and book chapters, and are listed below in Section H. A substantial part of the readings can be accessed online via our course website.

D. Course requirements

- Term paper(s) 70%
- Oral presentation 20%
- Participation 10%

Term paper(s) (70%): You must write **either one long term paper**, worth 70% of credit, **or two short term papers**, each of which is worth 35% of credit. An electronic version of the long term paper is due on Sunday, December 11 at noon. If you choose the short paper option, an electronic version of the first paper is due on Tuesday, October 25 at noon, and the second one is due on December 11 at noon.

Approximate length of a long paper: 4000–5000 words if you are an undergraduate student (signed up for PHIL 412); 5000–7000 words if you are a graduate student (PHIL 510).

Approximate length of each short paper: 2000–2500 words if you are an undergraduate student; 2500–3500 words if you are a graduate student.

I am happy to provide comments on term paper drafts. In the case of the long paper and the 2nd short paper, I guarantee comments if you send me an electronic draft by December 4.

Oral presentation (20%): Every student has to give one oral presentation. Your task as a presenter is to briefly summarize this meeting's readings (highlighting points that you find particularly relevant) but primarily to start the discussion by having prepared some questions (e.g. about problematic issues in the readings). I ask you to (a) prepare a short handout and email me a draft in advance so that I can provide comments, and to (b) make copies of the final version for the whole class, so that everyone has a summary of your presentation. You may give your presentation using PowerPoint (and use a printout of the slides as a handout).

Participation (10%): Attendance and active participation is important for this class. It is the responsibility of each student to come to class prepared to actively engage in discussion. Each of you will probably have picked up different points from the readings or have questions or objections, so please share them! You can also obtain participation credit by starting topics and replying to posts at the discussion forum on our website.

E. Academic integrity and plagiarism

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards and to uphold the policies of the university in this respect. Students are urged to familiarize themselves with the Code of Student Behaviour (http://tinyurl.com/CodeofStudentBehaviour) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the university. For a summary please see http://www.governance.ualberta.ca/en/StudentAppeals/DontCheatsheet.aspx

The Code of Student Behaviour defines plagiarism as follows:

> No Student shall submit the words, ideas, images or data of another person as the Student's own in any academic writing, essay, thesis, project, assignment, presentation or poster in a course or program of study.

The library has a general website on plagiarism: http://www.library.ualberta.ca/guides/plagiarism. See in particular the section on "Avoiding Plagiarism" (sidebar on the left, among "Resources for Students").

F. Course website

The course has a website at https://eclass.srv.ualberta.ca. Some of our assigned readings can be accessed from this site, and I use it to post presentation handouts and additional material. The site also contains a discussion board. Let me know if you audit the class (or upon login do not see PHIL 412/510 under 'My Courses'), so that I can add you to the list of online participants.

G. Schedule of classes

Sep 8	**Introduction.**
Sep 13	**Confirmation 1.** Goodmann, *Fact, Fiction, and Forecast*, Chapter 3, Sections 1 and 3–5.
Sep 15	**Confirmation 2.** Popper, *The Logic of Scientific Discovery*, Chapter 1, Sections 1–4, 6 and 8.
Sep 20	**Confirmation 3.** Duhem, *The Aim and Structure of Physical Theory*, Part II, Chapter 6, Sections 1–3 and 8–10.
Sep 22	**Confirmation 4.** Quine, "Two dogmas of empiricism," Sections 1–3 and 5–6.
Sep 27	**Confirmation 5.** Sober, "Testability."
Sep 29	**Confirmation 6.** Kuhn, *The Structure of Scientific Revolutions*, pp. 92–117.
Oct 4	**Confirmation 7.** Salmon, "Rationality and objectivity in science or Tom Kuhn meets Tom Bayes."
Oct 6	**Confirmation 8.** Laudan, "Demystifying underdetermination."
Oct 11	**Realism 1.** van Fraassen, *The Scientific Image*, Chapter 2, Sections 1–4 and 6–7 (skip p. 22 and pp. 35–38).
Oct 13	**Realism 2.** Musgrave, "Realism versus constructive empiricism," pp. 197–215
Oct 18	**Realism 3.** Laudan, "A confutation of convergent realism."
Oct 20	**Laws of nature 1.** Dretske, "Laws of nature."
Oct 25	**Laws of nature 2.** Earman, *A Primer on Determinism*, Chapter 5, Sections 1–4, 10 and 12. **1st short term paper due at noon**
Oct 27	**Explanation 1.** Salmon, "Scientific explanation," Sections 1.1–1.9. Hempel and Oppenheim, "Studies in the logic of explanation," Sections 1–4.
Nov 1	**Explanation 2.** Salmon, "Scientific explanation," Sections 1.10–1.17.
Nov 3	**Theory reduction 1.** Nagel, *The Structure of Science*, Chapter 11, Sections I, II.3 and III.2 (i.e., pp. 338–345, 351–358, 361–364).
Nov 8	**Theory reduction 2.** Fodor, "Special sciences (or: the disunity of science as a working hypothesis)."
Nov 10	**No class. Fall term class break**

Nov 15	**Explanation 3.** Woodward, "What is a mechanism?" Bechtel, "Mechanism and biological explanation," Section 2.
Nov 17	**Explanation 4.** Darden, "Relations among fields: Mendelian, cytological and molecular mechanisms."
Nov 22	**Scientific practice 1.** Weber, *Philosophy of Experimental Biology*, pp. 127–30 (intro to Chapter 5) and Chapter 3.
Nov 24	**Scientific practice 2.** Bloor, *Knowledge and Social Imagery*, Chapter 1.
Nov 29	**Scientific practice 3.** Longino, *The Fate of Knowledge*, Chapter 4 and pp. 128–136 of Chapter 6.
Dec 1	**Scientific practice 4.** Kourany, *Philosophy of Science after Feminism*, Chapter 3.
Dec 6	**Wrapping up.**

Dec 11 Long term paper / 2nd short term paper due at noon

H. Bibliography of readings

Bechtel, W. (2011) "Mechanism and biological explanation." *Philosophy of Science* 78: 533–557.

Bloor, D. (1976) *Knowledge and Social Imagery*. London: Routledge and K. Paul.

Darden, L. (2005) "Relations among fields: Mendelian, cytological and molecular mechanisms." *Studies in History and Philosophy of Biological and Biomedical Sciences* 36: 349–371.

Dretske, F. (1977) "Laws of nature." *Philosophy of Science* 44: 248–268.

Duhem, P. (1954) *The Aim and Structure of Physical Theory*. Princeton: Princeton University Press.

Earman, J. (1986) *A Primer on Determinism*. Dordrecht: D. Reidel.

Fodor, J. A. (1974) "Special sciences (or: the disunity of science as a working hypothesis)." *Synthese* 28: 97–115.

Goodman, N. (1965) *Fact, Fiction, and Forecast*, 2nd ed. Indianapolis: Bobbs-Merrill.

Hempel, C. G. and Oppenheim, P. (1948) "Studies in the logic of explanation." *Philosophy of Science* 15: 135–175.

Kourany, J. A. (2010) *Philosophy of Science after Feminism*. Oxford: Oxford University Press.

Kuhn, T. S. (1970) *The Structure of Scientific Revolutions*, 2nd ed. Chicago: Chicago University Press.

Laudan, L. (1981) "A confutation of convergent realism." *Philosophy of Science* 48: 19–48.

Laudan, L. (1990) "Demystifying underdetermination." In: C. W. Savage (ed.) *Scientific Theories (Minnesota Studies in the Philosophy of Science, Vol. 14)*. Minneapolis: University of Minnesota Press, pp. 267–297.

Longino, H. E. (2002) *The Fate of Knowledge*. Princeton: Princeton University Press.

Musgrave, A. (1985) "Realism versus constructive empiricism." In: P. M. Churchland and C. A. Hooker (eds.) *Images of Science*. Chicago: Chicago University Press, pp. 197–221.

Nagel, E. (1961) *The Structure of Science: Problems in the Logic of Scientific Explanation*. New York: Harcourt, Brace and World.

Popper, K. (1959) *The Logic of Scientific Discovery*. New York: Basic Books.

Quine, W. V. (1951) "Two dogmas of empiricism." *The Philosophical Review* 60: 20–43.

Salmon, W. C. (1990) "Rationality and objectivity in science or Tom Kuhn meets Tom Bayes." In: C. W. Savage (ed.) *Scientific Theories (Minnesota Studies in the Philosophy of Science, Vol. 14)*. Minneapolis: University of Minnesota Press, pp. 175–204.

Salmon, W. C. (1998) "Scientific explanation." In: M. H. Salmon et al. *Introduction to the Philosophy of Science (A Text by Members of the Department for the History and Philosophy of Science of the University of Pittsburgh)*. Englewood Cliffs: Prentice Hall, pp. 7–41.

Sober, E. (1999) "Testability." (Presidential Address, Central Division of the APA) *Proceedings and Addresses of the American Philosophical Association* 73: 47-76.

van Fraassen, B. C. (1980) *The Scientific Image*. Oxford: Oxford University Press.

Weber, M. (2005) *Philosophy of Experimental Biology*. Cambridge: Cambridge University Press.

Woodward, J. (2002) "What is a mechanism? A counterfactual account." *Philosophy of Science* 69: S366–S377.

I. Further literature

Some relevant books that may be of interest to you (e.g., when writing term papers). They are **on reserve at Rutherford Library** for your convenience.

Godfrey-Smith, P. (2003) *Theory and Reality: An Introduction to Philosophy of Science*. University of Chicago Press. [Accessible and good overview of the major issues in philosophy of science] Q 175 G596 2003

Hacking, I. (1983) *Representing and Intervening: Introductory Topics in the Philosophy of Natural Science*. Cambridge University Press. [Classical introduction to the philosophy of science, focusing on issues surrounding realism. Second part introduces the new experimentalism and Hacking's entity realism.] Q 175 H1213 1983

Salmon, M. H. et al. (1992) *Introduction to the Philosophy of Science: A Text by Members of the Department of the History and Philosophy of Science of the University of Pittsburgh*. Prentice Hall. [Collection of articles summarizing the main issues, arguments, and positions in the philosophy of science.] Q 175 I633 1992

Curd, M. and Cover, J. A. (1998) *Philosophy of Science: The Central Issues*. Cambridge University Press. [Excellent anthology. Combines classical texts with commentaries summarizing the issues and providing background.] Q 175 P5129 1998

Balashov, Y. and Rosenberg, A. (2002) *Philosophy of Science: Contemporary Readings*. Routledge. [Another good anthology.] Q 175.3 P49 2002

Klemke, E. D. et al. (1998) *Introductory Readings in the Philosophy of Science*. Prometheus Books. [Another anthology.] Q 175 I62 1998

On reserve are only books covering several issues in philosophy of science, as for the various individual issues that we discuss (realism, or conceptual change, or explanation) there are many more books focusing on such a specialized topic. Ask me for pointers if you are interested in a particular topic.