

HPSC0004 Philosophy of Science 1

Course Syllabus

2022-23 session | Dr Rory Jubber & Prof. Emma Tobin
rory.jubber@ucl.ac.uk & e.tobin@ucl.ac.uk

Course Information

This is an introductory module in the philosophy of science. The course is divided into two parts: (1) the epistemology of science and (2) the metaphysical issues in the sciences. The first part of the course will focus on several central problems regarding the nature of scientific knowledge: how do scientists know if current scientific theories are true? Is science progressive? How do scientists test their theories and how are theories confirmed? Can science and pseudoscience be distinguished? How are sciences distinguished from one another? These questions will be discussed in the light of examples from science. The second part will focus on the realism/anti-realism debate, the status of scientific theories, the laws of nature and causation. Towards the end of the course we will also consider some of the overlap between social and ethical issues and the sciences.

During the course of discussing these problems, you will study some of the major positions that have been taken about scientific knowledge both in the history of philosophy and in the 20th century: Inductivism (Bacon), Logical Empiricism (Ayer and Quine), Falsificationism (Popper), Incommensurability (Kuhn) and Relativism (Feyerabend).

Philosophy of Science 1 will provide you with the background knowledge that you will need for other Philosophy courses that you will take in later years. You do not need prior knowledge of philosophy or science to do this course.

Basic course information

Course website:	http://www.ucl.ac.uk/sts/staff/tobin/HPSC1003
Moodle Page:	HPSC0004
Assessment:	--Essay 1 (1000 words – 50%); Essay 2 (2,500 Words 50%)
Timetable:	www.ucl.ac.uk/sts/hpsc
Prerequisites:	No prerequisites
Required texts:	[See moodle for UCL reading List)
Course tutor(s):	Dr Rory Jubber (Lecturer) Prof. Emma Tobin (Lecturer)
Contact:	rory.jubber@ucl.ac.uk e.tobin@ucl.ac.uk
Office location:	22 Gordon Square, Room [1.1]
Office hours:	

Schedule

Week	Lectures
1	Lecture 1 Introduction: Demarcation Lecture 2 Proving I: Empiricism
2	Lecture 3 Proving II: Verificationism Lecture 4 Proving III: The Problem of Induction
3	Lecture 5 Falsificationism I: Popper and Falsificationism Lecture 6 Falsificationism II: Problems for Popper
4	Lecture 7 Historicism I: Kuhnian Normal Science, Revolution & Incommensurability Lecture 8 Historicism II: Feyerabend and Anarchic Science
5	Lecture 9 Realism and Anti-Realism I: Are Theories True? The No Miracles Argument Lecture 10 Realism and Anti-Realism II: Will Theories Ever be True? The Pessimistic Meta-Induction
6	Reading Week
7	Lecture 11 Realism and Anti Realism III: Are Theories Only Empirically Adequate? Lecture 12 Scientific Theories I: The Structure of Scientific Theories
8	Lecture 13 Scientific Theories II: Is Truth Limited? Idealisation Lecture 14 Scientific Theories II: Hypotheses, Evidence and Inference
9	Lecture 15 Metaphysics of Science I: Explanation & Laws of Nature Lecture 16: Metaphysics of Science II: Causation
10	Lecture 17: The Pragmatic Turn in Philosophy of Science Lecture 18: Science, Values and Ethics
11	Lecture 19: Feminist Science Lecture 20: Conclusion

Assessments

Summary

	Description	Deadline	Word limit	Deadline for Tutors to provide Feedback
Essay 1: Critical Review (50%)	Critical Review	Monday 27/02/2023	1000	27/03/2023
Essay 2: (50%)	Essay	Tuesday 02/05/2023	2500	30/05/2023

Essay topics will be posted separately on moodle during term 2.

Assignments:

Essays must be submitted via Moodle by 17:00 on the essay due date.

In order to be deemed 'complete' on this module, students must submit both essays and sit the exam. For assessment generally you will need to master the content of the lectures, the required readings, and any other specified readings for essays.

Criteria for assessment

The departmental marking guidelines for individual items of assessment can be found in the STS Student Handbook.

Aims & Objectives

Aims:

To teach students the basic foundational thinkers and topics in philosophy of science, which will provide the bedrock for more advanced courses in Years 2 and 3.

To provide students with a critical awareness of the core foundational topics in the philosophy of science.

Objectives:

Students will be able to evaluate the key philosophical accounts of many core topics in the philosophy of science, including epistemology of science and metaphysics of science.

Students will be able to write philosophically cohesive essays, where philosophical theories are explained and arguments for them critically evaluated.

Students will be able to discuss philosophical arguments systematically and present these to their peers.

Course expectations

Students are expected to watch two asynchronous lectures per week, participate in the moodle forum and attend one onsite seminar at UCL (Students will be allocated to seminar groups).

Students should read the core readings in advance of each lecture. They will be expected to actively participate in seminar discussion and activities.

For important policy information

Please refer to the HPSC Syllabus Supplement available in Moodle.

READING LIST

General Introductions:

- Curd and Cover, (2012) *Philosophy of Science: The Central Issues* (New Second Edition), Norton & Co (*Highly Recommended: This text is both an Anthology of readings and an Introduction*)
- Bird, A. (1998) *Philosophy of Science*, London & New York: Routledge.
- Chalmers, A. (1978) *What is this thing called Science?* Berkshire, Open University Press,.
- Okasha, Samir. (2002) *Philosophy of Science: A very short Introduction*, Oxford: Oxford University Press.
- Ladyman, James. (2002) *Understanding Philosophy of Science* London: Routledge. Introduction.

Lecture Readings:

WEEK ONE

Lecture 1- Introduction: Demarcation

Required Reading:

- Sven Ove Hansson. "Science and Pseudoscience", *Stanford Encyclopedia of Philosophy*

Further Reading:

- Ruse, M. "Creation-Science is Not Science", Curd and Cover: 37-46. Lakatos, I. "Science and Pseudoscience", *Curd and Cover*: 20-26.
- Thagard, P. R. "Why Astrology is a Pseudoscience": *Curd and Cover* 27-36. Brian Leiter, *The Demarcation Problem in Jurisprudence: A New Case for Skepticism*, 32 OJLS 1 (2011). (See below)
- [Robert T. Pennock \(2011\). Can't Philosophers Tell the Difference Between Science and Religion? Demarcation Revisited.](#) *Synthese* 178 (2):177-206.
- [Robert L. Morris \(1987\). Parapsychology and the Demarcation Problem.](#) *Inquiry* 30 (3):241 –251.

Lecture 2 – Proving I: Empiricism

Required Reading:

- [Hume, D. 1777 \[1975\]. Sections 2, 3, 4 \(part 1\) in *Enquiry Concerning Human Understanding*.](#)
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- L.A. Selby-Bigge (ed.), Clarendon Press; also <<http://www.davidhume.org/texts/ehu.html>>

Further Reading:

- James Ladyman: "Understanding Philosophy of Science, Chapter 1.
- [Markie, Peter, "Rationalism vs. Empiricism", *The Stanford Encyclopedia of Philosophy* \(Summer2015 Edition\), Edward N. Zalta \(ed.\), URL = <<http://plato.stanford.edu/archives/sum2015/entries/rationalism-empiricism/>>.](#)
- [C. D. Broad. 1926. "An address delivered at Cambridge on the occasion of the Bacon Tercentenary", <<http://www.ditext.com/broad/bacon.html>>.](#)
- Lane, R. 1999. [Why Bacon's Method is Not Certain](#). *History of Philosophy Quarterly* 16 (2):181 -192.

WEEK TWO

Lecture 3 - Proving II: Verificationism

Required reading

- [Ayer, A. J. 1952. "The Elimination of Metaphysics" \(Chapter 1\) in *Language, Truth and Logic*, Dover Publications Inc,](#) (click "view online"):

Further reading

- [Ayer, A. J. 1952. "Introduction" in *Language, Truth and Logic*, Dover Publications Inc,](#) (click"view online"):
- Ayer, A.J. 1936. "The Principle of Verifiability", in *Mind*, 45:199-203.
- Ladyman, James. (2002) *Understanding Philosophy of Science* London: Routledge.
Chapter 2. Okasha, S. "Verificationism, Realism and Skepticism", in *Erkenntnis* 55:371-385

Lecture 4 – Proving III: The Problem of Induction

Required reading

- [Russell, B. 1998. "On Induction" \(Chapter 6\), in *The Problems of Philosophy*, OUP.](#)
- [Hume, D. 1738, \[1888\]. "Of the Inference from the Impression to the Idea" \(Book I, Part III, section VI\), in *Treatise of Human Nature*, L. A. Selby-Bigge \(ed.\), Clarendon Press.](#)

Further reading

- Ayer, A. J. 1952. "The Function of Philosophy" (Chapter 2), in *Language, Truth and Logic*, Dover Publications Inc,
- Goodman, N. 1979. "The New Riddle of Induction" (Chapter 3) in *Fact Fiction Forecast*, Harvard University Press, Cambridge Mass.
- Papineau, D. 1992. 'Reliabilism, Induction and Scepticism', in *The Philosophical Quarterly*, 42(166):1-20. (see Readings folder)
- [Vickers, John, "The Problem of Induction", *The Stanford Encyclopedia of Philosophy* \(Spring 2016 Edition\), Edward N. Zalta \(ed.\), URL =<<http://plato.stanford.edu/archives/spr2016/entries/induction-problem/>>.](#)

WEEK THREE

Lecture 5 – Falsificationism I: Popper and Falsificationism

Required Reading

- Popper, K. (1963) 'Science, Conjectures and Refutations' *Conjectures and Refutations*, London:Routledge and Kegan Paul: 33-39 in Curd and Cover: 3-10

Further Reading:

- Popper, K. [1976. A Note on Verisimilitude.](#) *British Journal for the Philosophy of Science* 27(2):147-159.
- Grünbaum, A. 1976. ['Is the Method of Bold Conjectures and Attempted Refutations Justifiably the Method of Science?'](#), *British Journal for the Philosophy of Science* 27: 105-136.
- Mellor, D.H. 1977. ['The Popper Phenomenon'](#), *Philosophy* 52: 195-202.
- [Thornton, S. 2015. "Karl Popper", *The Stanford Encyclopedia of Philosophy* \(Winter 2015 Edition\), Edward N. Zalta \(ed.\), <<http://plato.stanford.edu/archives/win2015/entries/popper/>>.](#)
- [Jeffrey, R. C. 1975. Probability and Falsification: Critique of the Popper Program.](#) *Synthese* 30(1-2):95 - 117.
- [Jones, G. & Perry, C. 1982. Popper, Induction and Falsification.](#) *Erkenntnis* 18 (1):97 - 104.
- Chalmers, A. 1978. *What is this thing called Science?* Berkshire: Open University Press.Chapter 5-7.
- Popper, K. 1959. *The Logic Of Scientific Discovery.* New York: Basic Books.
- Popper, K. 1963. *Conjectures and Refutations*, London: Routledge and Kegan Paul.

Lecture 6 – Falsificationism II : Problems for Popper

Required reading

- Ladyman, J. 2002. “Falsificationism” (Chapter 3) in *Understanding Philosophy of Science*, Routledge. *****ESPECIALLY SECTIONS 3.4 & 3.5*****

Further reading

- Duhem, P. 1906, [1954]. “Physical Theory and Experiment” (Part 2, chapter 6), in *The Aim and Structure of Physical Theory*, Princeton University Press, P. Weiner (trans.).
- Gillies, D. 1993. “The Duhem Thesis and the Quine Thesis” (Chapter 5), in *Philosophy of Science in the Twentieth Century: Four Central Themes*, Blackwell.
- Lakatos, I. 1965 “The methodology of scientific research programmes”, in I. Lakatos and A. Musgrave (eds) *Criticism and the Growth of Knowledge*, Cambridge: Cambridge University Press.
- Quine, W.V.O. 1951. “Two Dogmas of Empiricism”, in *The Philosophical Review*, 60(1):20-43.
- Stanford, K. 2016. "Underdetermination of Scientific Theory", *The Stanford Encyclopedia of Philosophy* (Spring 2016 Edition), Edward N. Zalta (ed.)

WEEK FOUR

Lecture 7 – Historicism I : Kuhnian Normal Science, Revolution, and Incommensurability

Required Reading:

- Kuhn, T. 1962. Chapters 2 and 7 and 9, in *The Structure of Scientific Revolutions*, University of Chicago Press

Further Reading:

- Kuhn, T. “Logic of Discovery or Psychology of Research?”, in *Criticism and the Growth of Knowledge*, edited by I. Lakatos and A. Musgrave, London: Cambridge University Press: 1–23
- Bird, Alexander. (2000) *Thomas Kuhn* Chesham: Acumen.
- Bird, Alexander. (2004) ‘Thomas Kuhn’, *Stanford Encyclopedia of Philosophy*.

- Bird, Alexander. (2005) 'Naturalizing Kuhn' *Proceedings of the Aristotelian Society* 105: 109-127.
- Chalmers, A. 1990. "Theories as structures: 2. Kuhn's paradigms" (Chapter 8), in *What is this thing called Science?* Open University Press, Berkshire.
- Hoyningen-Huene, P. (1989), *Die Wissenschaftsphilosophie Thomas S. Kuhns: Rekonstruktion und Grundlagenprobleme*, translated as Hoyningen-Huene, P. (1993) *Reconstructing Scientific Revolutions: Thomas S. Kuhn's Philosophy of Science*, Chicago: University of Chicago Press.
- Bird, A. 2000. "Normal and Revolutionary Science" (Chapter 2), in *Thomas Kuhn*, Acumen. Kuhn, T. 1970 [1996]. Chapters 7, 8, 10 in *The Structure of Scientific Revolutions*, University of Chicago Press.
- Darden, L. 1976. "Reasoning in Scientific Change", in *Studies in the History and Philosophy of Science* 7:127-169
- Kuhn, T. 1970 [1996]. Chapters 7, 8, 10, in *The Structure of Scientific Revolutions*, University of Chicago Press.
- Kuhn, T. 1982. "Commensurability, Comparability, Communicability", *Proceedings of the Biennial Meeting of the Philosophy of Science Association II*: 669-688.

Lecture 8 – Historicism II: Feyerabend and Anarchic Science

Required Reading:

- Feyerabend, P. *Against Method*, excerpts from Ch's 1, 2 and 18

Further Reading

- Chalmers, A. (1978) *What is this thing called Science?** Berkshire, Open University Press,.*Chapter 10.
- Feyerabend, Paul. (1975) *Against Method*, London, Verso.
- Laudan, L. (1989) 'For Method: or, Against Feyerabend', in J.R.Brown & J.Mittelstrass (eds.), *An Intimate Relation*. Dordrecht:Kluwer.
- Meynell, Hugo. (1978), 'Feyerabend's Method', *The Philosophical Quarterly*, 28(112):242–252.
- Preston, John (2006) 'Paul Feyerabend' *Stanford Encyclopedia Online*. (On Moodle)
- Munévar, G. & Lamb, D. (eds.), (2000) *The Worst Enemy of Science? Essays in Memory of Paul Feyerabend*, New York, Oxford University Press.

WEEK FIVE

Lecture 9 – Realism and Anti-Realism I: Are theories true? The No-Miracles Argument

Required Reading:

- Musgrave, A "The Ultimate Argument for Scientific Realism", in Robert Nola (ed.), *Relativism and Realism in Science*, 253-291 (

Further Reading

- Putnam, H. "What is Realism?" *Proceedings of the Aristotelian Society*, New Series, Vol. 76,(1975 - 1976): 177-194.
- V. Fraassen, B.V. "Arguments Concerning Scientific Realism" in Curd and Cover: pp. 1060-1082. (On Moodle)
- Carrier, M. "What is Right with the Miracle Argument: Establishing a Taxonomy of Natural Kinds", in Curd and Cover: 1172-1190.

Lecture 10 – Realism and Anti-Realism II: Will theories ever be true? The Pessimistic Meta-Induction

Required Reading:

- Laudan, L. "A Confutation of Convergent Realism" in Curd and Cover, 1108-1128.

Further Reading:

- J. Saatsi. "On the Pessimistic Meta-Induction and two Fallacies in Curd and Cover 1129-1139. Psillos, S. (1996), Scientific Realism and the 'Pessimistic Induction', *Philosophy of Science*, Vol. 63, Supplement. Proceedings of the 1996 Biennial Meetings: S306-S314.

READING WEEK

WEEK SIX

Lecture 11 – Realism and Anti-Realism III: Are theories only empirically adequate?

Required reading

- Monton, B. and Mohler, C. 2014. "Constructive Empiricism", *The Stanford Encyclopedia of Philosophy* (Spring 2014 Edition), Edward N. Zalta (ed.), <<http://plato.stanford.edu/archives/spr2014/entries/constructive-empiricism/>>.

Further reading

- Rosen, G., 1994, "What is Constructive Empiricism?", in *Philosophical Studies*, 74(2): 143–178.
- Hacking, I., 1985, "Do We See Through a Microscope?", in Churchland and Hooker 1985
- Alspector-Kelly, M., 2001, "Should the Empiricist be a Constructive Empiricist?", *Philosophy of Science*, 68(4): 413–431.

Lecture 12 – Scientific Theories I: The Structure of Scientific Theories

Required reading

- Morgan M. and Morrison, M. (eds) 1999. "Introduction", in *Models as Mediators*, Cambridge University Press.

WEEK SEVEN

Lecture 13 – Scientific Theories II: Is Truth Limited? Idealisation

Required reading

- Elgin, C. 2004. “True Enough” in *Philosophical Issues*, 14:113-131

Further reading

- Cartwright, N. 1983. *How the Laws of Physics Lie*, Clarendon Press. Introduction.
- Weisberg, M. 2007. “Three kinds of idealisation”, in *The Journal of Philosophy*, 104:639-659

Lecture 14 – Scientific Theories III: Hypothesis, Evidence and Inference

Required reading:

- Barnes, Eric Christian (2018), Prediction Versus Evidence, *Stanford Encyclopedia of Philosophy*

Further reading:

- Scerri, E and Worrall, J. (2001) ‘Prediction and the Periodic Table’. In *Studies in History and Philosophy of Science*, 32, 407-452.

WEEK EIGHT

Lecture 15 – Metaphysics of Science I: Explanation and Laws of Nature

Required reading

- Hempel, C. “Two Basic Types of Scientific Explanation”, in Curd and Cover 657-666.
- Lipton, P. “Understanding without explanation” (chapter 3), in *Scientific Understanding*, deRegt, H., Leonelli, S. and Eigner, K. (eds), Pittsburgh University Press.
- Excerpt from Bird, A. (1998) *Philosophy of Science*, McGill Queens:Montreal, pp. 25-54. (OnMoodle)

Further reading

- Bird, A. (1998), *Philosophy of Science*, London & New York: Routledge, Ch. 2.
- Bromberger, S., (1966), “Why Questions”, in *Mind and Cosmos: Essays in Contemporary Science and Philosophy*, R. Colodny, (ed), Pittsburgh: University of Pittsburgh Press. Curd & Cover (eds.) *Philosophy of Science: The Central Issues*, Norton & Company, 1998, Ch. 6.
- Hempel, C. (1965), *Aspects of Scientific Explanation*, New York, The Free Press. *
- Lloyd, E. and Anderson, C. 1991. “Empiricism, Objectivity and Explanation” in *MidwestStudies in Philosophy*, 18:121-131
- Psillos, S. (2002), “Explanation” (Part 3, pp. 215-293), in *Causation & Explanation*, Acumen.
- Hempel, C. 1998 [1962]. “Two Basic Types of Explanation” (pp.685-719), in *Philosophy of Science: The Central Issues*, Curd, M. and Cover, J. A. (eds), W. W. Norton & Company.
- Kitcher, P. (1981), “Explanatory Unification”, *Philosophy of Science*, 48: 507-531. (On Moodle)
- Woodward, J. (2003), “Scientific Explanation”, *Stanford Encyclopedia of Philosophy*.

Lecture 16 – Metaphysics of Science II: Causation

Required Reading:

- Psillos, S. "Regularity Theories" *The Oxford Handbook on Causation*, Edited by Helen Beebe, Christopher Hitchcock, and Peter Menzies
- Psillos, S. (2002), *Causation & Explanation*, Acumen, 137-211, Ch. 3.

Further Reading

- [Psillos, S. \(2007\) 'What is Causation?' in Beena Choksi and Chitra Natarajan \(eds.\) The epiSTEME Reviews: Research trends in Science, Technology and Mathematics Education, Macmillan India Ltd, pp.11-34, 2007](#)
- Beebe, H. (2006). 'Does Anything Hold the Universe Together? Synthese 149: 509–33.
- Okasha, S. "Philosophical Problems in Physics, Biology and Psychology", *Philosophy of Science: A Very Short Introduction*, Ch. 6.
- Strawson, G. (1987). 'Realism and Causation', *Philosophical Quarterly* 37: 253–77.

WEEK NINE

Lecture 17 - The Pragmatic Turn in Philosophy of Science

- James, W, (1907) *Pragmatism* Lecture 1.
- Currie, A. (2005) *Philosophy of Science and the Curse of the Case Study*. The Palgrave Handbook of Philosophical Methods (Daly ed).
- Chang, Hasok. "Scientific Pluralism and the Mission of History and Philosophy of Science" Inaugural Lecture

Lecture 18 - Science, values and ethics

Essential Reading:

- David B. Resnik: *Playing Politics with Science*, Chapter 2 Peter Machamer, Gereon Wolters (2004) *Science Values and Objectivity* Ch. 1

Recommended Reading:

- Adam Brigg, Carl Mitcham (2012) *Ethics and science: an introduction*

WEEK TEN

Lecture 19 - Feminist Science

Essential readings

- Longino, H. 1989. "Feminist critiques of rationality: critiques of science or philosophy of science?", in *Women's Studies International Forum* 12(3):261-9.

Recommended readings

- Anderson, E. 2015. "Feminist Epistemology and Philosophy of Science", *The Stanford Encyclopedia of Philosophy* (Fall 2015 Edition), Edward N. Zalta (ed.), <<http://plato.stanford.edu/archives/fall2015/entries/feminism-epistemology/>>.

- Crasnow, S., Wylie, A., Bauchspies, W. K. and Potter, E. 2015 "Feminist Perspectives on Science", *The Stanford Encyclopedia of Philosophy* (Summer 2015 Edition), Edward N. Zalta(ed.), <<http://plato.stanford.edu/archives/sum2015/entries/feminist-science/>>.
- Harding, S. 1986. Preface and chapter 1, in *The Science Question in Feminism*, Cornell University press. Harding, S. 1995. "Strong objectivity', a response to the new objectivityquestion', in *Synthese*, 104:331-349
- Longino, H. 1987. "Can there be a feminist science?", in *Hypatia* 2(3):51-64.
Longino, H. 1980."Introduction", in *Science as Social Knowledge*

Lecture 20 – Module Summation and Conclusion