



## Introduction to the Philosophy of Science

Wednesdays, 14–16h

Max-Kade-Auditorium 1

*Syllabus from 8 May 2022*

The lecture introduces students to the philosophy of science by looking at the most important problems and debates: What are sciences, and how are they related to philosophy? How do scientific explanations work? Are there laws of nature? What roles do objectivity, rationality and other values play in scientific practices? And does science discover what is real?

The lecture is organised around five topics:

- (1) *Sciences, Philosophy and History*: What are sciences, how are they related to philosophy and what role does history play?
- (2) *Explanations, Interventions and Experiments*: How do scientific explanations work? How do scientific practices represent and intervene in whatever they study? What are experiments and why are they so central?
- (3) *Objects, Values and Laws*: What are the components of scientific theories? Are there natural laws? Are “real sciences” value-free?
- (4) *Realism, Anti-Realism and Relativism*: Is reality what scientific practices discover? Is there progress towards truth?
- (5) *Philosophical Issues in the Sciences*: Specific sciences pose specific philosophical problems, for example: What are numbers? What is Life? Are social sciences and humanities categorically distinct from natural sciences?

### General Reading

Okasha, Samir (2016): *Philosophy of Science. A Very Short Introduction*. 2nd ed. Oxford: Oxford University Press.

Bortolotti, Lisa (2008): *An Introduction to the Philosophy of Science*. Cambridge: Polity.

Oreskes, Naomi (2021): *Why Trust Science?* Princeton, N.J./Oxford: Princeton University Press.

Rosenberg, Alexander and Lee McIntyre (2020): *Philosophy of Science. A Contemporary Introduction*. 4th ed. New York/London: Routledge.

*Assessment tasks*: LAS Students must (a) give a short (10min) presentation of one core text or (b) write two short response paper to given questions about another core text. Only if students have completed either (a) or (b) during the term are they eligible for (c) the final written exam.

- (a) The short presentation is intended to open up the discussion in class and should answer three questions:
  - (i) What is the main argument in the text? How can we express its main thesis?
  - (ii) How does the argument work?
  - (iii) Where do you see problems? Identify where you find an argument hard to understand and/or why you think an argument is inconclusive.

Please be aware that you should *reconstruct* the argument, not retell the text. Since you will not have time to include every detail, you must decide what is important and what is not. It is far better if we discover in the discussion that we do need some of the left-out passages than if you try to cramp everything into the presentation.

- (b) Each week, we will upload three questions for next week’s workgroup session. You can freely decide which of those you answer in a response paper (two pages max), but you must answer two of them during the semester. The response paper must be sent in one day before the session in which the corresponding text is discussed (so: Thursday night at the latest), so that the workgroup discussion can draw on your response paper.
- (c) The final exam will be a written exam on **27<sup>th</sup> July 2022, 14–16h**. Further information about the exam will be given in the lecture.

*Philosophy students* can earn 3 ECTS by attending the lecture and writing a short essay (2-3 pages) at the end of the term (due by **29<sup>th</sup> July 2022**). They are free to join the workgroups as well but do not have to. A list of essay questions will be provided; if you want to write about a topic of your own choosing, please contact me before you start.

<b>Sessions</b>				
<b>#</b>	<b>Date</b>	<b>Topic</b>	<b>Required Reading</b>	<b>Further Reading (Optional)</b>
1	27.4.2022	Four Ideas of Science and an Overview	Francis Bacon (2009 [1620]), "The Inductive Method" Galileo Galilei (2009 [1623]), "Tradition and Experience"	Peter Machamer (2002), "A Brief Historical Introduction to the Philosophy of Science"
2	04.05.2022	Scientific Explanation, Vol. 1: Troubles with Induction	Wesley C. Salmon (2017 [1967]), <i>The Foundations of Scientific Inference</i> , 1–11 and 54–56.	Carl G. (Hempel 1998 [1962]), "Two Basic Types of Scientific Explanation"
3	11.05.2022	Logical Empiricism vs. Critical Rationalism	Naomi Oreskes (2021), <i>Why Trust Science?</i> , 15–28.	Samir Okasha (2016), <i>Philosophy of Science</i> , 1–15. Karl R. Popper (2002 [1963]), "Science: Conjectures and Refutations"
4	18.05.2022	Puzzles, Paradigms & Scientific Revolutions: Thomas Kuhn's Challenge	Thomas S. Kuhn (1998 [1962]), "The Nature and Necessity of Scientific Revolutions"	Thomas S. Kuhn (1970 [1962]), <i>The Structure of Scientific Revolutions</i> .
5	25.05.2022	After Kuhn: The Slow Demise of the Demarcation Question & Its Sudden Return	Naomi Oreskes (2021), <i>Why Trust Science?</i> , 28–49.	Alexander Bird (2013), "The Historical Turn in the Philosophy of Science"
6	01.06.2022	Scientific Explanation, Vol. 2: Natural Laws and Causation	Nancy Cartwright (1998 [1980]), "Do the Laws of Physics State the Facts?"	Alexander Rosenberg and Lee McIntyre (2020), <i>Philosophy of Science. A Contemporary Introduction</i> , 56–73.
7	08.06.2022	<b>PENTECOST BREAK – NO LECTURE &amp; NO WORKGROUPS</b>		
8	15.06.2022	Experiments, Models and Metaphors	Emily Martin (1991), "The Egg and the Sperm"	Steven Shapin (1988), "The House of Experiment in Seventeenth-Century England"
9	22.06.2022	"If you can spray them, they are real..." Realism, Anti-Realism & the Rest	Ian Hacking (1998 [1982]), "Experimentation and Scientific Realism"	Arthur Fine (1998 [1984]), "The Natural Ontological Attitude"
10	29.06.2022	Life, Numbers and Human Nature: Philosophical Issues of Special Sciences	Carl Sagan (2010), "Definitions of Life" Carol E. Cleland and Christopher Chyba (2010), "Does 'Life' have a definition?"	Mark A. Bedau and Carol E. Cleland (2010), <i>Definitions of Life</i>
11	06.07.2022	Sciences, Humanities & Values	Helen Longino (2008), "Values, Heuristics, and the Politics of Knowledge"	Lorraine Daston and Peter Galison (2007), <i>Objectivity</i>

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12	13.07.2022	The Authority of Scientific Knowledge	Jerome de Ridder (2014), "Science and Scientism in Popular Science Writing"	Massimo Pigliucci and Maarten Boudry (eds.) (2013), <i>Philosophy of Pseudoscience</i>
13	20.07.2022	Philosophy of Science: Contemporary Challenges and Future Issues	Open Discussion in the Workgroups, Q&A for the Exam	---
14	27.07.2022	Written Exam	---	---

### Full Biography

- Bacon, Francis (2009 [1620]): The Inductive Method. In: Timothy McGrew, Marc Alspectorkelly and Fritz Allhoff (eds.), *Philosophy of Science. An Historical Anthology*. Malden, MA: Wiley-Blackwell, 190–193.
- Bedau, Mark A. and Carol E. Cleland (eds.) (2010): *The Nature of Life: Classical and Contemporary Perspectives from Philosophy and Science*. Cambridge: Cambridge University Press.
- Bird, Alexander (2013): The Historical Turn in the Philosophy of Science. In: Martin Curd and Stathis Psillos (eds.), *The Routledge Companion to Philosophy of Science*. London/New York: Routledge, 79–89.
- Cartwright, Nancy (1998 [1980]): Do the Laws of Physics State the Facts? In: Martin Curd and Jan A. Cover (eds.), *Philosophy of Science. The Central Issues*. New York/London: W. W. Norton & Company, 895–877.
- Cleland, Carol E. and Christopher Chyba (2010): Does “life” have a definition? In: Mark A. Bedau and Carol E. Cleland (eds.), *The Nature of Life: Classical and Contemporary Perspectives from Philosophy and Science*. Cambridge: Cambridge University Press, 326–339.
- Daston, Lorraine and Peter Galison (2007): *Objectivity*. New York: Zone Books.
- de Ridder, Jeroen (2014): Science and Scientism in Popular Science Writing. In: *Social Epistemology Review and Reply Collective* 3 (12), <https://social-epistemology.com/2014/11/03/science-and-scientism-in-popular-science-writing-jeroen-de-ridder/>.
- Fine, Arthur (1998 [1984]): The Natural Ontological Attitude. In: Martin Curd and Jan A. Cover (eds.), *Philosophy of Science. The Central Issues*. New York/London: W. W. Norton & Company, 1186–1208.
- Galilei, Galileo (2009 [1623]): Tradition and Experience. In: Timothy McGrew, Marc Alspectorkelly and Fritz Allhoff (eds.), *Philosophy of Science. An Historical Anthology*. Malden, MA: Wiley-Blackwell, 135–137.
- Hacking, Ian (1998 [1982]): Experimentation and Scientific Realism. In: Martin Curd and Jan A. Cover (eds.), *Philosophy of Science. The Central Issues*. New York/London: W. W. Norton & Company, 1153–1168.
- Hempel, Carl G. (1998 [1962]): Two Basic Types of Scientific Explanation. In: Martin Curd and Jan A. Cover (eds.), *Philosophy of Science. The Central Issues*. New York/London: W. W. Norton & Company, 685–694.
- Kuhn, Thomas S. (1970 [1962]): *The Structure of Scientific Revolutions*. 2nd, enlarged ed. Chicago: University of Chicago Press.
- (1998 [1962]): The Nature and Necessity of Scientific Revolutions. In: Martin Curd and Jan A. Cover (eds.), *Philosophy of Science. The Central Issues*. New York/London: W. W. Norton & Company, 86–101.
- Longino, Helen E. (2008): Values, Heuristics, and the Politics of Knowledge. In: Martin Carrier, D. O. N. Howard and Janet Kourany (eds.), *The Challenge of the Social and the Pressure of Practice: Science and Values Revisited*. Pittsburgh, PA: University of Pittsburgh Press, 68–86.

- Machamer, Peter (2002): A Brief Historical Introduction to the Philosophy of Science. In: Peter Machamer and Michael Silberstein (eds.), *The Blackwell Guide to the Philosophy of Science*. Malden, MA: Blackwell, 1–17.
- Martin, Emily (1991): The Egg and the Sperm: How Science Has Constructed a Romance Based on Stereotypical Male-Female Roles. In: *Signs* 16 (3), 485–501.
- Okasha, Samir (2016): *Philosophy of Science. A Very Short Introduction*. 2nd ed. Oxford: Oxford University Press.
- Oreskes, Naomi (2021): *Why Trust Science?* Princeton, N.J./Oxford: Princeton University Press.
- Pigliucci, Massimo and Maarten Boudry (eds.) (2013): *Philosophy of Pseudoscience. Reconsidering the Demarcation Problem*. Chicago, Ill.: University of Chicago Press.
- Popper, Karl R. (2002 [1963]): Science: Conjectures and Refutations. In: *ibid.*, *Conjectures and Refutations: The Growth of Scientific Knowledge*. London/New York: Routledge, 43–86.
- Rosenberg, Alexander and Lee McIntyre (2020): *Philosophy of Science. A Contemporary Introduction*. 4th ed. New York/London: Routledge.
- Sagan, Carl (2010): Definitions of Life. In: Mark A. Bedau and Carol E. Cleland (eds.), *The Nature of Life: Classical and Contemporary Perspectives from Philosophy and Science*. Cambridge: Cambridge University Press, 303–306.
- Salmon, Wesley C. (2017 [1967]): *The Foundations of Scientific Inference. 50th Anniversary Edition with an Introductory Essay by Christopher Hitchcock*. Pittsburgh, PA: University of Pittsburgh Press.
- Shapin, Steven (1988): The House of Experiment in Seventeenth-Century England. In: *Isis* 79 (3), 373–404.