

## ***HPSC 2003 Topics in Philosophy of Science***

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This course is a continuation of HPSC 1003 Philosophy of Science, intended for students that have completed that course or received similar introduction to philosophy of science elsewhere. Three major topics will be explored in some depth: realism and antirealism about scientific theories; scientific explanation; and laws of nature. After this course you should possess a fairly well-rounded view of the field, as well as a set of skills that will allow you to work further on your own.

**Lectures: (TERM 2) Tuesday** 11.00-1.00 in Cruciform Foyer 102, Seminar Room 2.

**Office hour (TERM 2): Monday and Thursday** 13.30–14.30 in room 3.2, 22 Gordon Square. Outside office hour I receive only by appointment. Please send me an email to arrange for an appointment.

**Assessment** is by a written examination (60%) in term 3, and one long essay (3,000 words, contributing 40% of the final mark) in term 2. **Please note that you must submit both the essay and sit the exam in order to complete this course unit.** For assessment you will need to master the content of the lectures, all required readings, and any other specified further readings for the essay.

### **Essay**

- 1. The deadline for the essay is 6 March at midnight. You must submit the essay both in Moodle (via Turn-it-In) and a hard copy. The hard copy must be completed with a signed coursework cover sheet (available online at the end of the STS Student Handbook, see: [http://www.ucl.ac.uk/sts/study/bsc/documents/sts\\_student\\_handbook.pdf](http://www.ucl.ac.uk/sts/study/bsc/documents/sts_student_handbook.pdf)) and be left in my p-hole. I consider the date of Moodle submission the official submission date, i.e. the one I use to apply penalties for late submission.**
- 2. It is essential that you submit your essay on time. If, however, you do not, penalties apply for late submissions as outlined in the STS student handbook, namely:**
  - Loss of 5 marks for work submitted less than 24 hours late.
  - Loss of 15 marks for work submitted between 1 and 7 days late.
  - Loss of all marks (work is graded 0) if submitted more than 7 days late.

These rules are statutory and non-negotiable.

3. All final versions of the essay must be word processed. Penalties for over-length coursework apply as described in the STS Student Handbook.
4. Please feel free to discuss your essay topic with me. Suggested essay topics are at the end of this syllabus.
5. The essay *must* explore topics in greater depth than in class lectures. Consequently, *neither* class notes *nor* required readings should play a prominent role in your essay. You should focus instead on *further readings* and also feel free to use material not on the reading lists. The essay *must* have the full scholarly apparatus of footnotes and a bibliography.
6. **Please note that the essay should NOT provide an overview or a summary of the topic. Try to be as much as possible focussed in answering the essay question, and to articulate your answer by considering the main thesis, possible objections to it and possible replies to those objections. The aim of a philosophy essay is to help you develop critical and argumentative skills by 1. giving an accurate description of the main philosophical thesis, 2. being able to give a fair and not-question-begging criticism of it in the light of the literature, and 3. being able to identify the strengths and weaknesses of the view in question and possible ways of defending it (even if you personally may think that it is untenable). Put yourself in the shoes of your philosophical opponent or, vice versa, play the ‘devil’s advocate’ for the philosophical view that you tend to sympathise with --- in both cases, challenge yourself to think rigorously and clearly.**

**Reading materials:** The textbook for this course, in which you can find most of the required readings and many of the further readings, is Martin Curd and J. A. Cover (eds.) (1998) *Philosophy of science: the central issues* (New York and London: W.W. Norton & Company). This is an anthology of classic readings, with helpful introductions, notes and commentary by the editors. It is available for purchase at Waterstone’s, and several copies are also in the UCL Libraries. Any reading not included in the above textbook are available in the UCL Science Library and/or Main Library, if not available online in Moodle.

## SOURCES FOR BACKGROUND AND GENERAL REFERENCE

### Introductory textbooks

- A. F. Chalmers (1982) *What is this thing called science?* (Milton Keynes: The Open University Press), ch. 1-8
- Carl. G. Hempel (1966) *Philosophy of Natural Science* (Englewood Cliffs: Prentice-Hall)
- Peter Kosso (1992) *Reading the Book of Nature* (Cambridge: Cambridge University Press).

- Alexander Bird (1998) *Philosophy of science* (McGill Queen's University Press).
- James Ladyman (2002) *Understanding Philosophy of Science* (New York: Routledge)
- Alan Musgrave (1993) *Common sense, science and scepticism: a historical introduction to the theory of knowledge* (Cambridge: Cambridge University Press).
- Anthony O'Hear (1989) *An Introduction to the philosophy of science* (Oxford: Clarendon Press).
- Y. Balashov and Alex Rosenberg (2002) *Philosophy of science: contemporary readings* (New York: Routledge).

### More advanced texts with general relevance to this course

- Stas Psillos (1999) *Scientific realism: how science tracks truth* (New York: Routledge).
- Ian Hacking (1983) *Representing and Intervening* (Cambridge: Cambridge University Press).
- Nancy Cartwright (1983) *How the laws of physics lie* (Oxford: Clarendon Press).
- Peter Lipton (1991) *Inference to the best explanation* (New York: Routledge)
- Wesley Salmon (1989) *Four decades of scientific explanation* (Minneapolis: University of Minnesota Press).
- Bas van Fraassen (1980) *The scientific image* (Oxford: Clarendon Press).

### Anthologies

- R. Boyd, P. Gasper, and J. D. Trout (eds.) (1991) *The Philosophy of Science* (Cambridge, Mass.: MIT Press).
- P. M. Churchland and C. A. Hooker (eds.) (1985) *Images of science* (Chicago: University of Chicago Press).
- J. Leplin (ed.) (1984) *Scientific Realism* (Berkeley: University of California Press).
- D. Papineau (ed.) (1996) *The Philosophy of Science* (Oxford: Oxford University Press).
- F. Weinert (1995) *Laws of nature. Essays on the philosophical, historical and scientific dimension* (De Gruyter: Berlin).
- J. W. Carroll (ed.) (2004) *Readings on laws of nature* (Pittsburgh: University of Pittsburgh Press).

### References

- *The Oxford Companion to Philosophy* ed. By Ted Honderich (Oxford: Oxford University Press, 1995)
- *Routledge Encyclopedia of Philosophy* ed. By Edward Craig (London: Routledge, 1998). At <http://www.rep.routledge.com/browse-articles?authstatuscode=200>
- *Stanford Encyclopaedia of Philosophy* at <http://plato.stanford.edu/>

- *A Companion to the Philosophy of Science* ed. by W. H. Newton-Smith (Blackwell Publishing).

## Syllabus

### **PART I: Scientific realism, antirealism, and experimental realism**

#### **Unit 1. What is scientific realism? The “no miracle” argument and pessimistic meta-induction (10 and 17 January)**

##### Required readings

- Hilary Putnam (1978) “What is realism?” in *Meaning and the Moral Sciences* (London: Routledge). Reprinted in J. Leplin (ed.) (1984) *Scientific realism* (Berkeley: University of California Press), pp. 140-6 only.
- Larry Laudan “A confutation of convergent realism”, in Curd and Cover, pp. 1114-1135.

##### Further readings

- Kuhn, T. S. (1982) ‘Commensurability, comparability, communicability’, *Proceedings of the Philosophy of Science Association Biennial Meeting, 1982*, vol. 2 Invited papers and symposia [download from JSTOR *Philosophy of science* — see also related articles in the same symposium]. Reprinted in Kuhn (2000) *The road since structure* (Chicago: University of Chicago Press), pp. 33-57.
- Philip Kitcher (1993) *The Advancement of Science* (Oxford: Oxford University Press), ch. 5 pp. 127-149 only.
- Bain, J. and Norton, J. D. (2001) ‘What should philosophers of science learn from the history of the electron?’, in J. Z. Buchwald and A. Warwick (eds.) *Histories of the electron. The birth of microphysics* (Cambridge, MA: MIT Press).
- Psillos, Stathis (1996) “Scientific realism and pessimistic Induction”, *Philosophy of Science* **63**, S306-S314.
- Worrall, J. (1994) ‘How to remain (reasonably) optimistic: scientific realism and the ‘luminiferous ether’’, *Proceedings of the Philosophy of Science Association Biennial Meeting, Contributed Papers* (1994), vol. 1, pp. 334-42

#### **Unit 2. What is anti-realism? Bas van Fraassen’s constructive empiricism (17 and 24 January)**

### Required readings

- Bas van Fraassen “Arguments concerning scientific realism” in Curd and Cover, pp. 1064-1087.
- Alan Musgrave “Realism versus constructive empiricism”, in Curd and Cover pp. 1088-1111.

### Further readings

- Grover Maxwell “The ontological status of theoretical entities” in Curd and Cover, pp. 1052-1063.
- Peter Lipton (2004, 2<sup>nd</sup> ed.) *Inference to the best explanation* (London: Routledge), ch. 4.
- Paul Churchland (1985) ‘The Ontological Status of Observables: in praise of the Superempirical Virtues’, in P. M. Churchland and C. A. Hooker (eds.) *Images of science* (Chicago: University of Chicago Press), pp. 35-47.
- Van Fraassen, Bas (1985) ‘Empiricism in the Philosophy of Science’, in P. M. Churchland and C. A. Hooker (eds.) *Images of science* (Chicago: University of Chicago Press), pp. 245-368.

## **Unit 3. Between realism and antirealism: Ian Hacking’s experimental realism (31 January)**

### Required readings

- Ian Hacking “Experimentation and scientific realism” in Curd and Cover, pp. 1153-1168.
- David Resnik “Hacking’s experimental realism” in Curd and Cover pp. 1169-1185.

### Further readings

- Hacking, I. (1983) *Representing and Intervening* (Cambridge: Cambridge University Press), ch.10.
- Hacking, I. (1989) “Extragalactic reality: the case of gravitational lensing”, *Philosophy of Science* **56** pp. 555-81. Download online from JSTOR: <http://www.jstor.org/action/showBasicSearch>

- Shapere, Dudley (1982), “The concept of observation in science and philosophy”, *Philosophy of science* 49: 485-525. Download online from JSTOR <http://www.jstor.org/action/showBasicSearch>
- Ian Hacking “Do we see through a microscope?” in P. Churchland and C. A. Hooker *Images of science*, pp. 132-52, with a reply from Bas van Fraassen pp. 297-300.
- Massimi, M. (2004), “Non-defensible middle ground for experimental realism: why we are justified to believe in colored quarks”, *Philosophy of Science* 71, 36–60. Download online from JSTOR: <http://www.jstor.org/action/showBasicSearch>

#### **Unit 4. The deductive-nomological model of scientific explanation (7 February)**

##### Required readings

- Carl G. Hempel “Two basic types of scientific explanation” in Curd and Cover , pp. 685-94.
- Carl G. Hempel “The thesis of structural identity” in Curd and Cover pp. 695-705.

##### Further readings

- Carl G. Hempel “Inductive-statistical explanation” in Curd and Cover pp. 706-16.
- Peter Railton “A deductive-nomological model of probabilistic explanation”, in Curd and Cover pp. 746-764.
- W. Salmon “Four decades of scientific explanation”, reprinted in P. Kitcher and W. Salmon (eds.) *Scientific explanation*, Minnesota Studies in the Philosophy of Science Vol. XIII, see especially Sections 0, 1, and 2, pp. 3–60 [Short Loan Collection].

#### **READING WEEK (13–17 February): NO LECTURES**

#### **Unit 5. Alternative models of scientific explanation: causation, unification, and pragmatics (21 and 28 February)**

##### Required readings

- W. Salmon (1992) “Scientific explanation” in Salmon, Earman (eds.) *Introduction to the Philosophy of Science* (Indianapolis: Hackett Publishing Company), pp. 7–41.
- P. Kitcher (1981) “Explanatory unification”, *Philosophy of science* 48, pp. 507-31.

- Van Fraassen “The pragmatics of explanation” in Boyd, Gasper and Trout (eds.) *Philosophy of science*, pp. 317–328

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Further readings

- M. Friedman (1974) “Explanation and scientific understanding”, *Journal of Philosophy* **71**, 1-19.
- P. Kitcher (1989) “Explanatory unification and the causal structure of the world” in P. Kitcher and W. Salmon (eds.) *Scientific explanation*, Minnesota Studies in the Philosophy of Science Vol. XIII, pp. 410–505
- Van Fraassen (1980) *The scientific image*, ch. 5.
- P. Humphreys (1989) “Scientific explanation: the causes, some of the causes, and nothing but the causes”, in P. Kitcher and W. Salmon (eds.) *Scientific explanation*, Minnesota Studies in the Philosophy of Science Vol. XIII, pp. 283–306 [Short Loan Collection].
- W. Salmon (1971) “Statistical explanation and causality”, pp. 75-96

**Unit 6. Interlude: David Hume and the problem of causation (28 February)**

Required readings

- D. Hume (1739/40) *A Treatise of Human Nature* Book I, Part III, sections I-VI, and XIV [7 copies available in the Main Library]

Further readings

- G. Strawson (1987) “Realism and causation” *Philosophical Quarterly* **37**, pp. 253-77.
- C. J. Ducasse (1966) ‘Critique of Hume’s Conception of Causality’, *Journal of Philosophy* **63**, p. 141-48
- J. A. Robinson (1962) ‘Hume’s two definitions of “cause”’, *Philosophical Quarterly* **12**, pp. 162-71
- T. Beauchamp and A. Rosenberg (1976) *Hume and the Problem of Causation* (Oxford University Press), ch. 1.

**Unit 7. Laws of nature. The Regularity Theory (6 March)**

Required readings

- J. W. Carroll “Laws of nature”, download online from <http://plato.stanford.edu/entries/laws-of-nature/> (very good overview of the topic as a whole --- see especially Sections 1, 2, 3 and 8).
- David Lewis (1973) *Counterfactuals* pp. 72-77. [Short Loan Collection] (a classic text for the regularity theory)

### Further readings

- A.J. Ayer “What is a law of nature?”, in Curd and Cover, pp. 808–825
- D. M. Armstrong (1983) *What is a law of nature?* (Cambridge: Cambridge University Press), ch. 1, 2, 5 (see also other interesting chapters 3 and 4 in the same book). [Short Loan Collection]
- Bas van Fraassen (1989) *Laws and symmetry*, (Oxford: Clarendon), ch, 3 [Short Loan Collection in Main Library]
- David Lewis (1994) “Humean supervenience debugged” *Mind* **103**, pp. 478–9 only [on the best-system analysis —download from JSTOR].
- Barry Loewer “Humean supervenience” in John W. Carroll *Readings on laws of nature* ch. 10. [Short Loan Collection]

\*\*\*\*No lectures on 13 March\*\*\*\*\*

### **Unit 8. Laws of nature. The Necessitarian Theory (20 March)**

#### Required readings

- Fred Dretske “Laws of nature” in Curd and Cover pp. 826-845.
- D. M. Armstrong (1983) *What is a law of nature?* (Cambridge: Cambridge University Press), pp. 77-92 and 99-107 only [Short Loan Collection].

#### Further readings

- Van Fraassen “Armstrong on laws and probabilities” in John W. Carroll (ed.) *Readings on laws of nature* (University of Pittsburgh Press), ch. 6.
- Bas van Fraassen (1989) *Laws and symmetry*, (Oxford: Clarendon), pp. 94-109. [Short Loan Collection in Main Library]
- J. Bigelow, B. Ellis, C. Lierse “The world as one of a kind” in John W. Carroll *Readings on laws of nature* ch. 8.
- M. Tooley “Laws of nature” in John W. Carroll *Readings on laws of nature* ch. 2.

#### **Suggested essay topics**

1. Is the success of science a guarantee of its truth? Discuss with reference to Laudan’s criticism.
2. Why, according to van Fraassen, should we expect a scientific theory to be empirically adequate as opposed to being true?
3. Why should we be realist about unobservable entities, according to Ian Hacking?
4. Why is the deductive-nomological model of scientific explanation such an important model? What does it tell us about the nature of scientific explanation?
5. How can the notion of causation enter into scientific explanations?

