6AANA026 Philosophy of Science
Syllabus – Academic year 2013/4

Basic information

Credits: 15
Module Tutor: Eleanor Knox
Office: PB/A 704
Consultation time: 11:00-12:00 Wednesdays
Semester: 1
Lecture time and venue*: Tuesdays 9-10am, provisional room: K3.11.

*Please note that tutorial times and venues will be organised independently with your teaching tutor

Module description (plus teaching arrangements, aims and objectives)

This course will focus primarily on questions raised by twentieth century 'general' philosophy of science. Questions examined will include: What is science, and how do we differentiate science from pseudo-science? Do we choose theories rationally? Does science aim to tell us about the unobservable world, and, if it does, does it succeed? What do key scientific concepts, like explanation and natural law, mean? What is the relationship between the different levels of, or theories of, science?

Nb. Materials, including some readings and lecture notes, will be posted on the KEATS site for the module. Students should ensure they have access to this.

Assessment methods and deadlines

- **Formative assessment**: 2x1500 word essays
  - 1st formative essay due: 5pm Friday 8th November
  - 2nd formative essay due: 5pm Friday 20th December

  Unless otherwise specified by your module tutor, essays may address any of the questions suggested below, as long as the two essays are based on questions from different weeks. Any essays received past the deadline without prior permission or an extremely good excuse will not be accepted.

- **Summative assessment**: 1 x 2 hour exam in May or June

For both formative essays, please answer the questions exactly as asked. You must not write your own essay question unless you have explicit permission from both GTA and module tutor.
Books and Resources

Introductory Textbooks

- Peter Godfrey-Smith (2003), Theory and Reality: An Introduction to the Philosophy of Science, University of Chicago Press. – Excellent contemporary introduction. A relatively cheap paperback, so worth considering if you plan to buy any books for the course.
- M. H. Salmon et al (1992), Introduction to the Philosophy of Science Prentice-Hall. – Part one only.
- W. Newton-Smith (1981), The Rationality of Science, Routledge – available online here

Classic Texts
(Roughly in order of relevance to the module – Quine and Popper won’t be as extensively discussed as some others, but are very influential in the field)

- W.V. Quine (1990), The Pursuit of Truth, Harvard University Press.
- K. Popper (1959), The Logic of Scientific Discovery, Hutchinson Press
- A.J. Ayer (1946), Language Truth and Logic, Dover

Collections

- J. Leplin (1984), Scientific Realism, University of California Press.
- D. Papineau (1996), The Philosophy of Science, OUP.

Other Resources

- Stanford Encyclopedia of Philosophy - Please ensure you respect the Encyclopedia’s citation policy.
Lecture Schedule

- **Week One** (01.10.13): Background and Logical Empiricism
- **Week Two** (08.10.13): Evidence and Science: Induction and Confirmation
- **Week Three** (15.10.13): The Fall of Logical Empiricism: Popper, Quine and Kuhn.
- **Week Four** (23.10.13): Laws of Nature and the Unity of Science
- **Week Five** (29.10.13): Scientific Explanation

**READING WEEK – FIRST FORMATIVE ESSAY DUE 5pm Friday 8th November**

- **Week Six** (12.11.13): Relationships Between Theories: reduction and emergence (nb. This lecture will be rescheduled after consultation with students)
- **Week Seven** (19.11.13) Theory change and rationality
- **Week Eight** (26.11.13): Realism and Anti-Realism: the arguments
- **Week Nine** (03.12.13): Anti-Realism: constructive empiricism
- **Week Ten** (10.12.13): More Ways to be a Realist: theoretical, entity, and structural realism

**SECOND FORMATIVE ESSAY DUE 5pm Friday 20th December**

Detailed Lecture Outline (including suggested essay topics and readings):

Some notes on the readings:

- Required reading is just that – required! You should come to class having read this in detail and be able to give a summary of its content if asked.
- Although it’s not required, it’s highly advisable to be reading at least one additional text each week, and you will need to read several more when you come to write your essays.
- That said, there’s more material listed below than could reasonably be covered in a term; don’t feel that you should be on top of all the questions, or all the readings.
- Links to required reading will be posted on KEATS, or in some cases a copy of the book will be placed on reserve at the Maughan library.
- Some of the articles below have hyperlinks to online content – even where not linked, most journal articles are available online – [Google scholar](https://scholar.google.com) is a helpful resource.
- In case of (genuine!) difficulty obtaining any readings, please [email me](mailto:emailme@address.com).
Week One: Background and Logical Empiricism

Questions:

- What are the main features of the positivist conception of science? What difficulties does positivism face as an account of the content of scientific theories?
- Which – if any – kinds of sceptical scenario ought scientists to take seriously?

Required reading:

- Godfrey-Smith, Peter (2003), *Theory and Reality: An Introduction to the Philosophy of Science*, University of Chicago Press. Ch.2
- Schlick, Moritz (1948), *Positivism and Realism*, Synthese, volume 7, issue 1, p.478

Additional reading (week one):

- Psillos, Stathis (1999), *Scientific Realism: How Science Tracks Truth*, ch.1

Week Two: Evidence and Science: Induction and Confirmation.

Questions:

- Do either of the problems of induction (Hume’s or Goodman’s) pose a particular problem for scientific knowledge? If so, how?
- Does observation of a white swan confirm the hypothesis that all Ravens are black? If not, why not?
- Explain and evaluate the Bayesian view of how evidence supports a scientific theory.

Required reading:

- C. Hempel (1945), *Studies in the Logic of Confirmation*, Mind, vol.54 no.214 p.97
- Either:
- Or

Additional reading:

Week Three: The Fall of Logical Empiricism: Popper, Quine and Kuhn

Questions:
- Is all observation theory-laden in a way that undermines claims to scientific knowledge?
- Why are there so few logical empiricists around nowadays (or: what really killed logical empiricism?)?
- How well does Popper’s account of falsification capture the methodology of scientists?

Required reading (week 3):
- N. R. Hanson, Patterns of Discovery, Ch.1, 2.
- T. Kuhn, The Structure of Scientific Revolutions, Ch. 10.
- W. Newton Smith, The Rationality of Science, Ch.2.

Additional reading:
- Popper (1959), The Logic of Scientific Discovery, Ch.1-6, London: Hutchinson.
- D. Gillies, Philosophy of Science in the 20th Century, Part III.
- B. Van Fraassen, The Scientific Image, Ch.3.
- W.V. Quine, Two Dogmas of Empiricism, in From a Logical Point of View, Cambridge: HUP, 1980.

Week Four: Laws of Nature and the Unity of Science

Questions:
- Describe and evaluate one account of laws of nature.
- Do exceptionless, universal laws of nature really exist?
- What additional problems are raised by putative laws of nature that mention probabilities?

Required reading:

Additional reading:
- E. Nagel (1961), The Structure of Science, Ch. 4, (Routledge).
Week Five: Scientific Explanation

Questions:
- Describe and evaluate one account of scientific explanation.
- Is it plausible that all possible scientific explanations are captured by a single account? If not, why not? If it is, which account has this broad applicability?
- Can we make do without an account of explanation?

Required reading:
- Bas C. van Fraassen (1980), The Scientific Image (Oxford University Press, Oxford), Ch. 5.
- Either:
  - W. Salmon (1998), Causality and Explanation. (OUP) Ch.4
  - Or
  - M. H. Salmon et al (1992), Introduction to the Philosophy of Science (Prentice-Hall) Ch.1

Additional reading:
- Peter Godfrey-Smith, Theory and Reality, Ch. 13.
- Philip Kitcher and Wesley C. Salmon (eds.) (1989), Scientific Explanation (University of Minnesota Press, Minneapolis).

Week Six: Relationships Between Theories: reduction and emergence

Questions:
- How plausible is the claim that the special sciences can be `reduced’ to physics?
- What is Nagel’s account of reduction? Does it plausibly apply to any pairs of theories? If not, should it be jettisoned?

Required reading:
- Nagel, E (1961), The Structure of Science, (Routledge) Ch. 11
**Additional Reading (week 6):**


**Week Seven: Theory change and rationality**

**Questions:**

- In what sense, if any, are different paradigms ‘incommensurable’?
- What, if anything, is preserved when theories change?
- Does the existence of scientific revolutions threaten science’s claim to be a rational enterprise?

**Required reading:**


**Additional reading:**


**Week Eight: Realism and Anti-Realism: the arguments**

**Questions:**

- Does either the underdetermination of theory by data or the pessimistic meta-induction succeed in undermining the plausibility of scientific realism?
- Explain the difference between local and global forms of the ‘no miracles’ argument. How successful are they?

**Required reading:**

- Either:
  - Peter Godfrey-Smith (2003), *Theory and Reality*, Ch. 12
  or
  - J. Ladyman, Understanding Philosophy of Science Chapter 5 (pp. 129-161).
  or
Additional reading (week 8):


Week Nine: Anti-Realism: constructive empiricism

Questions
- What is constructive empiricism? How does it differ from, and is it preferable to, other forms of empiricism?
- Can the constructive empiricist satisfactorily distinguish observable from unobservable phenomena?

Required reading:

Additional reading:

Week Ten: More Ways to be a Realist: theoretical, entity, and structural realism

Questions:
- Which form of realism can best be defended?

Required Reading:
**Additional reading (week 10):**

- Ian Hacking, (1982), *Experimentation and scientific realism*, Philosophical topics. 13: 71-87