The Philosophy of Science (124)

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Course Description

Philosophy of science is applied epistemology and applied metaphysics. It is theory of scientific knowledge and scientific method, including elements in philosophy of language, philosophy of mathematics, and metaphysics. It deals with metaphysical questions – about space, time, causation, ontology, necessity, truth – as they arise across the board in the special sciences, not just in physics. Questions of method include questions of the theory-observation distinction, testability, induction, theory confirmation, and scientific explanation. They also include theory-change, whether inter-theoretic reduction, unification, or revolutionary change. They are at once questions about scientific rationality, and connect in turn with decision theory and the foundations of probability. They connect also with metaphysics, particularly realism: theory-change, scepticism, fictionalism, naturalism, the under-determination of theory by data, functionalism, structuralism, are all critiques of realism. The subject also includes the study of major historical schools in philosophy of science. The most important of these is logical positivism (later logical empiricism), that dominated the second and third quarters of the last century. In fact, some of the most important current schools in philosophy of science are broadly continuous with it, notably constructive empiricism and structural realism. The syllabus for this subject is the same as part A for paper 106. (From the *Course Handbook*)

**General Introductions**

1. Godfrey-Smith, P. 2003. *Theory and Reality*. University of Chicago Press.

1. Hacking, I. 1983. *Representing and Intervening*. Cambridge University Press.
2. Kuhn, T. 1996. *The Structure of Scientific Revolutions*. University of Chicago Press, 1996 (3rd edition).
3. Ladyman, J. 2002. *Understanding Philosophy of Science*. London: Routledge.
4. Salmon et al. *Introduction to the Philosophy of Science*. London: Hackett
5. Van Fraassen, B. 1980. *The Scientific Image*. Oxford University Press.

**Useful Collections of Essays**

1. Lange, M. 2003. *Philosophy of Science: An Anthology*. London: Blackwell.
2. Papineau, D. 1996. *The Philosophy of Science*. Oxford University Press.

Tutorial Reading List

**Tutorial Structure**

1. Each week you will be asked to write a brief essay on a specified question.
2. You must **email** the completed essay to me and **to your tutorial partner** by **10 AM** they day before your tutorial.
3. During the tutorial, we will focus on one person’s essay. One of you will be asked to briefly present the feedback on the essay you have read. The individual presenting will rotate.
4. I will provide written marks and feedback on your essay.
5. Please be sure to read your partner's essay before the tutorial and be prepared with questions or comments on it.
6. If you are unable to complete your essay on time or unable to attend tutorial, please notify both your tutorial partner and me as soon as possible. Please arrive to tutorials on time.
7. You do NOT need to do all of the primary reading for each week

Week 1: The Problem of Induction

**Question**: Are we justified in making predictions about the future on the basis of past observations? Why or why not?

*Primary Reading*

1. Hume, D. *An Enquiry Concerning Human Understanding*, Sections IV and V.
2. Ladyman, J. 2002. *Understanding Philosophy of Science*, OUP. Chapters 1 and 2.
3. Goodman, N. 1955. *Fact, Fiction and Forecast*. Cambridge, MA: Harvard University Press. Chapter 3.
4. Papineau, David, ‘Reliabilism, Induction and Scepticism’. *The Philosophical Quarterly*, 42(166): 1–20.

*Additional Reading*

1. Cleve, James van, 1984. ‘Reliability, Justification, and the Problem of Induction’ *Midwest Studies In Philosophy*: 555–567
2. Foster, John, 2004. *The Divine Lawmaker: Lectures on Induction, Laws of Nature and the Existence of God*, Oxford: Clarendon Press. Lecture 1.
3. Lange, Marc, 2011. ‘Hume and the Problem of induction’, in Dov Gabbay, Stephan Hartmann and John Woods (eds.), *Inductive Logic*, (*Handbook of the History of Logic*, Volume 10), Amsterdam: Elsevier, pp. 43–92.
4. Okasha, S. ‘Does Hume’s Argument against Induction Rest on a Quantifier-Shift Fallacy?”, *Proceedings of the Aristotelian Society*, 105: 237–255.
5. Reichenbach, H. *Experience and Prediction: An Analysis of the Foundations and the Structure of Knowledge*, Chicago: University of Chicago Press. Sections 38-43.
6. Salmon,W. 1963. ‘On Vindicating Induction’ *Philosophy of Science*, 30(3): 252–26
7. Salmon, Wesley C. 1953. ‘The Uniformity of Nature’ *Philosophy and Phenomenological Research*, 14(1): 39–48

Week 2: Theory and Observation

**Question:** What is the most plausible way to distinguish theoretical entities from observable entities?

*Primary Readings*

1. Hacking, I. 1983. *Representing and Intervening,* CUP. Chapters 10 and 11.
2. Hanson, N. 1958. *Patterns of Discovery*. CUP. Chapter 1.
3. Maxwell, G ‘The Ontological Status of Theoretical Entities’, in H. Feigl and G. Maxwell (eds.) Minnesota Studies in the Philosophy of Science Vol. III, University of Minnesota Press 1962; pp. 3-27.
4. Carnap, R ‘Theories as partially interpreted formal systems’, in B.A Brody (ed.) Readings in the Philosophy of Science, Prentice Hall 1970; pp.190-99.

*Additional Readings*

1. Achinstein, Peter, 1965, “The Problem of Theoretical Terms”, *American Philosophical Quarterly*, 2(3): 193–203
2. Azzouni, J., 2004, “Theory, Observation, and Scientific Realism,” *British Journal for the Philosophy of Science*, 55(3): 371-92.
3. Carnap, R. 1950. ‘Empiricism, Semantics, and Ontology’ *Revue Internationale de Philosophie*, 4: 20–4.
4. Chang, H., 2005, “A Case for Old-fashioned Observability, and a Reconstructive Empiricism,” *Philosophy of Science*, 72(5): 876–887
5. Godfrey-Smith, P. 2003. *Theory and Reality*. CUP Chapters 1-2, and 6.
6. Kuhn, T. 1996 *The Structure of Scientific Revolutions*. Ch. 10.
7. Papineau, D. 1978. *Theory and Observation*. OUP. Chapter 1.
8. Schlick, M. ‘The Foundation of Knowledge’ in A. J. Ayer (ed.) *Logical* *Positivism*.

Week 3: Underdetermination

**Question:** Do experiments leave theories underdetermined? If not, why not? If so, what is the most plausible way to choose between scientific theories?

*Primary Readings*

1. Ladyman, J. 2002. *Understanding Philosophy of Science*. OUP. Chapter 6 and Chapter 8.
2. Quine, W. V. 1951. ‘Two Dogmas of Empiricism’ in his *From a Logical Point of View.*
3. Laudlan, L. and Leplin, J. 1991: ‘Empirical Equivalence and Underdetermination’. *The Journal of Philosophy*. 88 (9): 449-472
4. Van Fraassen, B. 1980. *The Scientific Image*. OUP. Chapter 2

*Additional Readings*

1. Boyd, R 1973: ‘Realism, Underdetermination and a Causal Theory of Evidence’ *Nous* 7: 1-12.
2. Earman, J., 1993: ‘Underdetermination, Realism, and Reason’ *Midwest Studies in Philosophy*, 18: 19–38
3. Glymour, C. 2013: ‘Theoretical Equivalence and the Semantic View of Theories’ *Philosophy of Science* 80: 286–297
4. Hoefer, C. and Rosenberg, A. 1994: ‘Empirical Equivalence, Underdetermination, and Systems of the World’ *Philosophy of Science* 61 (4): 592-60
5. Kukla, A. 1993: ‘Laudlan, Leplin, and Empirical Equivalence and Underdetermination’ *Analysis* 53 (1):1 - 7
6. Newton-Smith, W. 2000: ‘Underdetermination of Theory by Data’, in his *A* *Companion to the Philosophy of Science*, London: Blackwell: pp.532-536.
7. Okasha, Samir, 2002: ‘Underdetermination, Holism and the Theory/Data Distinction’ *Philosophical Quarterly* 52.
8. Sklar, L., 1975: ‘Methodological Conservatism’ *Philosophical Review* 84: 384–400.

Week 4: Popper and Falsification

**Question:** Is an instance of falsification sufficient to refute a scientific theory? Why or why not?

*Primary Readings*

1. Ladyman, J. 2002. *Understanding Philosophy of Science*. OUP. Chapter 3.
2. Popper, K. 1934. *The Logic of Scientific Discovery*. London: Routledge. Chapters 1, 3-4, and 10.
3. Lakatos, I., 1970, ‘Falsification and the Methodology of Scientific Research Programmes’, in Lakatos & Musgrave (eds.) 1970.

*Additional Readings*

1. 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
2. Miller, D., 1974, ‘On the Comparison of False Theories by their Bases’, *The British Journal for the Philosophy of Science*, 25: 178–188
3. Popper, K. 1963. *Conjectures and Refutations*. Routledge. Chapter 10.
4. Putnam, H. 1979. ‘The Corroboration of Theories’ in his collected papers, volume 1.
5. Salmon, W. 1981: ‘Rational Prediction’ *British Journal for the Philosophy of Science:* 115-125.
6. Strawson, P. F. 1952. *Introduction to Logical Theory*. Methuen. Chapter 9 Part II (i.e. Sections 7-12).