

Philosophy of Science

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Topic 1: Verification and Falsification

Essay title:

“Is Popper’s criterion of ‘falsifiability’ for a scientific statement any improvement on the logical positivists’ ‘Verifiability’ criterion? Does either survive Quine’s criticism?”

Core Reading

J. Ladyman, *Understanding Philosophy of Science* (Routledge, 2002). Chapter 3 (pp. 62-92).

M Schlick, “Positivism and Realism”, *Erkenntnis III* (1932-3), in German; English translation in M. Schlick, *Philosophical Papers vol. II (1925-36)* (Reidel, 1979). Reprinted in R. Boyd, P. Gasper, J.D.Trout (eds.), *Readings in the Philosophy of Science* (MIT, 1991), pp. 37-56; in O. Hanfling (ed.), *Essential Readings in Logical Positivism* (Blackwell, 1981), pp. 83-109; and in A. Ayer (ed.), *Logical Positivism* (Free Press, 1959), pp. 82-107.

C. Ray, “Logical Positivism”, in W. Newton-Smith (ed.), *A Companion to the Philosophy of Science*, pp. 243-251.

K. R. Popper, *The Logic of Scientific Discovery* (Hutchinson, 1959), chapter I (pp. 27-48) and chapter IV (pp. 78-92).

W.V.O. Quine, “Two Dogmas of Empiricism”, *Philosophical Review* 60 (1951), pp. 20-43. Available on TDNet. Reprinted in W.V.O. Quine, *From a Logical Point of View* (Harvard, 1953), in M Curd and J.A.Cover (ed.), *Philosophy of Science: the central issues* (W.W.Norton, 1998), pp. 280-301) and in A.P. Martinich (ed.), *The Philosophy of Language*, 4th edition (Oxford, 2001) pp. 47-60 (and in dozens of other anthologies on philosophy of science, language etc. – it’s without question the most reprinted and cited short paper of the 20th century.)

I. Lakatos, *Philosophical Papers*, volume I (Cambridge, 1978), Chapter 1, section 2 (pp. 10-46) and Appendix (93-102).

W.V.O.Quine, *Pursuit of Truth*, revised edition (Harvard, 1990), chapter 1: Evidence (pp. 1-23).

Further Reading

A. Ayer, introduction to A. Ayer (ed), *Logical Positivism* (Free Press, 1959), pp. 1-31.
A broader exegesis of logical positivism.

P. Duhem, *The Aim and Structure of Scientific Theory*, tr. Philip. P. Wiener (Princeton, 1954), pp. 180-95 and 208-218, reprinted in (Princeton, 1954), pp. 180-95 and 208-218, reprinted in M. Curd and J.A. Cover (ed.), *Philosophy of Science: the central issues* (W.W.Norton, 1998).
Duhem's version of Quine's criticism.

M. Curd and J.A. Cover (ed.), *Philosophy of Science: the central issues* (W.W.Norton, 1998), commentary on the Duhem-Quine thesis sections 1-2 (pp. 355-373).

Exegesis of the threat to falsification in Duhem and Quine's work.

W. Newton-Smith, *The Rationality of Science* (Routledge, 1981). Available online via eBooks at <http://oxford.etailer.dpsl.net> (Athens registration required). Chapter 2, sections 1-4.

Two critical exegeses of Popper.

O. Hanfling (ed.), *Essential Readings in Logical Positivism* (Blackwell, 1981).
More detail on the logical positivists.

Topic 2: Kuhn's picture of science

Essay title:

“To what extent does Kuhn's model of scientific revolutions undermine the idea of science as a rational, truth-seeking enterprise?”

Core Reading

J. Ladyman, *Understanding Philosophy of Science* (Routledge, 2002). Chapter 4 (pp. 93-128).

This is a textbook presentation of Kuhn's ideas, with some discussion of them.

T. S. Kuhn, *The Structure of Scientific Revolutions*, 2nd edition (Chicago, 1970), especially chapters 2-6, 10-12, and postscript (but read the whole book if you can).

T. S. Kuhn, “Objectivity, Value Judgement, and Theory Choice”, in T. S. Kuhn, *The Essential Tension* (Chicago, 1977), pp. 320-339. Reprinted in M Curd and J.A. Cover (ed.), *Philosophy of Science: the central issues* (W.W.Norton, 1998), pp. 102-118.

W. Newton-Smith, *The Rationality of Science* (Routledge, 1981). Available online via eBooks at <http://oxford.etailer.dpsl.net> (Athens registration required). Chapter 5 (and chapter 7 if you have time).

E. McMullin, “Rationality and Paradigm Change in Science”, in P. Horwich (ed.), *World Changes* (MIT Press, 1993).

Further Reading

M. Curd and J.A. Cover (ed.), *Philosophy of Science: the central issues* (W.W.Norton, 1998), commentary on Rationality, Objectivity and Values in Science sections 1-2 (pp. 210-253).

A slightly higher-level critical discussion of Kuhn.

H. Sankey, “Kuhn's changing concept of incommensurability”, *British Journal for the Philosophy of Science* 44 (1993), pp. 759-774. Available online via TDNet.

Reviews the development of Kuhn's thought since his book; argues that the notion of “incommensurability” between theories has changed drastically in Kuhn's work.

M. Malone, “Kuhn reconstructed: Incommensurability without Relativism”, *Studies in the History and Philosophy of Science* 24 (1993), pp. 69 *et seq.*

Topic 3: Explanation

Essay titles (suggested – choose one):

“What is the best analysis of scientific explanation? What are its weaknesses?”

“What is the Deductive-Nomological theory of explanation? How effectively does it describe scientific explanation, and how can it be improved or replaced?”

“Is explanation merely a pragmatic notion?”

Core Reading

J. Ladyman, *Understanding philosophy of science*, (Routledge, 2002), pp.196-208.

C. Hempel, “Aspects of scientific explanation”. Essay 12 of his *Aspects of Scientific Explanation* (Collier-McMillan, 1970). Esp. sections 1, 2, and 3.1-3.5.

B. van Fraassen, *The Scientific Image* (Clarendon Press, 1980), Ch. 5. Partially reprinted in Ruben, D-H. (ed.) , *Explanation* (Oxford, 1994).

D.Lewis, “Causal Explanation”, in his *Philosophical Papers, Vol. II* (Oxford University Press, 1986). Reprinted in Ruben, D-H. (ed.) , *Explanation* (Oxford, 1994).

M. Friedman, “Explanation and Scientific Understanding”, *Journal of Philosophy* 71 (1974) 5-19

P. Railton, “Probability, Explanation and Information”, *Synthese* 48 (1981), pp. 233-56. Reprinted in Ruben, D-H. (ed.) , *Explanation* (Oxford, 1994).

Further Reading

P. Kitcher and W. C. Salmon, “van Fraassen on Explanation”, *Journal of Philosophy* 84 (1987) pp. 315-330. Reprinted in Ruben, D-H. (ed.) , *Explanation* (Oxford, 1994).

P. Achenstein, “Can there be a model of explanation?”, *Theory and Decision* 13 (1981), pp. 201-227. Reprinted in Ruben, D-H. (ed.) , *Explanation* (Oxford, 1994).

D. H. Ruben (ed.) *Explaining Explanation* (Routledge, 1990). Ch. 1, Ch. 4-7. An extract is reprinted in Curd and Cover (eds), one of the anthologies on my “general reading”.

P. Kitcher, “Explanatory Unification and the Causal Structure of the World”, in *Scientific Explanation* (Minnesota Studies in the Philosophy of Science, Volume 13) ed. by Kitcher and Salmon (1989), pp. 410-505.

N. Cartwright, "The truth doesn't explain much", *American Philosophical Quarterly* 17 (1980). Reprinted in revised form in N. Cartwright, *How the Laws of Physics Lie* (Oxford, 1983) pp. 44-53

and/or

N. Cartwright, "The simulacrum account of explanation", in N. Cartwright, *How the Laws of Physics Lie* (Oxford, 1983) pp. 143-162.

Topic 4: Induction and confirmation

Essay title:

“What is the paradox of the ravens, and what lesson should we draw from it?”

Core readings:

M. H. Salmon *et al*, *Introduction to the Philosophy of Science*, Ch.2 Part III, New Jersey: Prentice-Hall, 1992.

C. Hempel, “Studies in the Logic of Confirmation”, reprinted in C. Hempel, *Aspects of Scientific Explanation*, New York: The Free Press (1965).

D. Gillies, *Philosophy of Science in the 20th Century*, Ch.2,3., Blackwells 1993.

N. Goodman, *Fact, Fiction, and Forecast*, Ch.3, Cambridge: HUP.

Further reading:

C. Glymour, *Theory and Evidence*, Ch.1-3, Princeton: PUP (1980).

W. V. Quine, “Natural Kinds”, reprinted in W. V. Quine, *Ontological Relativity and Other Essays*. 1969.

R. Carnap, “Inductive Logic and Inductive Intuition”, reprinted in I. Lakatos (ed), *The Problem of Inductive Logic*, Amsterdam: North-Holland (1968).

K. Popper, *The Logic of Scientific Discovery*, Ch.1-5.

H. Putnam, “Probability and Confirmation”, reprinted in H. Putnam, *Mathematics, Matter and Method: Collected Papers Vol.1*, Cambridge: CUP.

P. Feyerabend, *Against Method*

M. Redhead, “On the Impossibility of Inductive Logic”, *British Journal for the Philosophy of Science*, 36, pp.185-191.

R. Swinburne, *An Introduction to Confirmation Theory*, Ch.1-3, London: Methuen.

- B. Van Fraassen, "The Problem of Old Evidence", in D. Austin (ed), *Philosophical Analysis*, Dordrecht: Kluwer (1988).
- I. Lakatos, "Changes in the Problem of Inductive Logic", in I Lakatos (ed), *The Problem of Inductive Logic*, Amsterdam: North Holland (1968).
- J. Mackie, "The Paradox of Confirmation", *British Journal for the Philosophy of Science*, 13, pp.265-77 (1963).

Topic 5: Scientific Realism

Essay title:

“Does either the underdetermination of theory by data or the pessimistic meta-induction succeed in undermining the plausibility of scientific realism?”

Core Reading

J. Ladyman, *Understanding Philosophy of Science* (Routledge, 2002). Chapter 5 (pp. 129-161).

and/or

D. Papineau, introduction to D. Papineau (ed.), *The Philosophy of Science* (Oxford, 1996), pp. 1-20.

L. Laudan, “A Confutation of Convergent Realism”, *Philosophy of Science* 48 (1981). Reprinted in M Curd and J.A.Cover (ed.), *Philosophy of Science: the central issues* (W.W.Norton, 1998), pp. 1114-1135, and in D. Papineau (ed.), *The Philosophy of Science* (Oxford, 1996), pp. 107-138.

W. V. Quine, “On Empirically Equivalent Systems of the World”, *Erkenntnis* 9 (1974), pp. 313-328.

W.H. Newton-Smith, “Underdetermination of Theory by Data”, in W. H. Newton-Smith (ed.), *A Companion to the Philosophy of Science* (Blackwell, 2000), pp. 532-536.

S. Psillos, *Scientific Realism* (Routledge, 1999), chapters 4 (the positive case for realism), 5-6 (the case against the pessimistic meta-induction), and 8 (the case against underdetermination of theory by data).

Further Reading

general:

J. Leplin, “A theory’s predictive success can warrant belief in the unobservable entities it postulates” and A. Kukla and J. Walmsley, “A theory’s predictive success does warrant belief in the unobservable entities it postulates”, both in C. Hitchcock (ed.), *Contemporary Debates in Philosophy of Science* (Blackwell, 2004), pp. 115-148.

D. Deutsch, *The Fabric of Reality* (Penguin, 1997), chapter 1 (pp. 1-31).

S. Psillos, “The present state of the scientific realist debate”, *British Journal for the Philosophy of Science* 51 (2000), 705-728.

J. Leplin, *A Novel Defence of Scientific Realism* (Oxford, 1997)

on underdetermination:

L. Laudan, "Demystifying Underdetermination", in C. W. Savage (ed.), *Scientific Theories*, vol. 14, *Minnesota Studies in the Philosophy of Science* (University of Minnesota Press, 1990); reprinted in M. Curd and J.A. Cover (ed.), *Philosophy of Science: the central issues* (W.W. Norton, 1998), pp. 320-354.

L. Sklar, "Saving the Noumena", *Philosophical Topics* 13 (1982), pp. 49-72. Reprinted in D. Papineau (ed.), *The Philosophy of Science* (Oxford, 1996), pp. 61-81.

A. Kukia, "Non-empirical theoretical virtues and the argument for underdetermination", *Erkenntnis* 41 (1994), pp. 157-70.

Topic 6: Constructive empiricism

Essay title:

“Does constructive empiricism provide a viable alternative to scientific realism?”

Core Reading

J. Ladyman, *Understanding Philosophy of Science* (Routledge, 2002). Section 6.2 (pp. 185-195).

B. van Fraassen, *The Scientific Image* (Clarendon Press, 1980). Chapters 1-4 (pp. 1-92).

A. Musgrave, “Realism versus Constructive Empiricism”, in P. M. Churchland and C. A. Hooker (eds.), *Images of Science* (Chicago, 1985) pp. 197-221. Reprinted in M. Curd and J.A. Cover (ed.), *Philosophy of Science: the central issues* (W.W. Norton, 1998), pp. 1088-1113.

S. Psillos, *Scientific Realism* (Routledge, 1999), chapter 9.

J. Leplin, “Surrealism”, *Mind* 96 (1987), pp. 519-524. Available online via TDNet.

Further Reading

G. Maxwell, “The ontological status of theoretical entities”, pp. 3-15 of H. Feigl and G. Maxwell (eds.), *Scientific Explanation, Space and Time*, vol 3 of *Minnesota Studies in the Philosophy of Science* (Minnesota, 1962). Reprinted in M. Curd and J.A. Cover (ed.), *Philosophy of Science: the central issues* (W.W. Norton, 1998), pp. 1052-1063.

P. Lipton, “Is the best good enough?”, *Proceedings of the Aristotelian Society* 93 (1993), pp. 89-104. Reprinted in D. Papineau (ed.), *The Philosophy of Science* (Oxford, 1996), pp. 93-106.

J. Ladyman, “What’s really wrong with constructive empiricism?: van Fraassen and the metaphysics of modality”, *British Journal for the Philosophy of Science* 51 (pp. 837-856).

P. M. Churchland and C. A. Hooker (eds.), *Images of Science* (Chicago, 1985).

Topic 7: Structural realism

Essay Title

What is structural realism? Does it improve on traditional realism, or is it just a variant on it?

Core reading

J. Ladyman, "Structural Realism?", *Stanford Encyclopedia of Physics*, <http://plato.stanford.edu/archives/fall2008/entries/structural-realism/>. Sections 1-3.

J. Worrall, "Structural Realism: the Best of Both Worlds?", *Dialectica* 43 (1989) pp. 99-124. Reprinted in D. Papineau, *The Philosophy of Science* (Oxford, 1996) pp. 139-165.

S. Psillos, "Is Structural Realism the Best of Both Worlds?", *Dialectica* 49 (1995), pp. 15-46.

J. Ketland. Empirical adequacy and ramsification. *The British Journal for the Philosophy of Science* 55 (2004): 409–424

Further reading

W. Demopoulos, and M. Friedman (1985 [1989]). Critical notice: Bertrand Russell's *The Analysis of Matter*: Its historical context and contemporary interest. *Philosophy of Science* 52: 621–639. Reprinted in C.W. Savage and C.A. Anderson, eds, (1989), *Rereading Russell: Essays on Bertrand Russell's Metaphysics and Epistemology*. *Minnesota Studies in the Philosophy of Science, Volume XII*. Minneapolis: University of Minnesota Press.

J. Worrall and E. Zahar, "Ramsification and structural realism". Appendix in E. Zahar, *Poincaré's Philosophy: from Conventionalism to Phenomenology*, pp. 236-251 (Chicago, 2001).

P. Cruse, "Ramsey sentences, structural realism and trivial realisation", *Studies in the History and Philosophy of Science* 36 (2005), pp. 557-576.

Topic 8: Laws of nature

Essay title:

"What is a law of nature?"

Core reading:

D. Lewis, *Counterfactuals* (Blackwell, 2001), pp. 72-77.

D. Lewis, 'New Work for a Theory of Universals', *Australasian Journal of Philosophy* (1983), (pp. 343-351 for background); pp. 365-368. Reprinted in his *Papers in metaphysics and epistemology* (CUP, 1999), pp.8-55.

D. Armstrong, *What is a Law of Nature?* (CUP), especially pp. 66-73 (critique of Lewis), 77-99 , 111-120 (funct. laws), 128-136 (prob. laws).

A. Bird, 'The Dispositionalist Conception of Laws', *Foundations of Science* 10 (2005), 353--370. DOI - 10.1007/s10699-004-5259-9 . Available online at <http://www.springerlink.com/content/727766u00716654t> .

Further Reading:

D. Lewis, Humean Supervenience Debugged (*Mind*, Vol. 103, Oct. 1994), especially section 3 & 4. Reprinted in his *Papers in Metaphysics and Epistemology* (CUP, 1999).

B. Van Fraassen, *Laws and Symmetry* (OUP, 1991), Part I. Available via Oxford Scholarship Online.

Chapters 3 and 5 are critiques of Lewis's and Armstrong's views respectively.

(There is an interesting symposium on this book in *Philosophy and Phenomenological Research* 53 (1993), with comments by Nancy Cartwright, David Armstrong, and John Earman, with van Fraassen's replies. All available on JSTOR. Links here:

<http://users.ox.ac.uk/~ball0402/teaching/phisci.html>)

Nancy Cartwright, "Do the Laws of Physics State the Facts?" *Pacific Philosophical Quarterly* 61 (1980): 75-84. Reprinted as Essay 3 in *How the Laws of Physics Lie* (OUP, 1983). Available via Oxford Scholarship Online.

J. Earman and J. Roberts (2005). Contact with the Nomic: A Challenge for Deniers of Humean Supervenience about Laws of Nature. Part I: Humean Supervenience, *Philosophy and Phenomenological Research* 71 (1), 1–22. doi:10.1111/j.1933-1592.2005.tb00428.x, and Part II: the Epistemological Argument for Humean Supervenience, *Philosophy and Phenomenological Research* 71 (2), 253–286. doi:10.1111/j.1933-1592.2005.tb00449.x