

The Metaphysics of Science: Scientific Essentialism and Causal Powers

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This is my model syllabus for a graduate seminar on the metaphysics of science, focusing on scientific essentialism and causal powers.

Course Overview

This is a graduate seminar on the metaphysics of science, a field of philosophical inquiry that has grown substantially in the last few decades, paralleling intensive interest in scientific realism. The central aim of the metaphysics of science is to examine metaphysical issues that are connected to a scientific conception of the world. The claim is *not* that the practice of science depends on having the correct metaphysical understanding of the world, but that there are assumptions made and concepts used in science that raise interesting and important metaphysical questions and issues.

These issues include the ontology of natural properties, causal powers, causation, the laws of nature, natural kinds, and modality. We will focus especially on contemporary readings in the metaphysics of science, especially on scientific essentialism and the nature of causal powers.

In the first third of the course, we will examine the thesis of scientific essentialism, as advanced by Brian Ellis. This view holds (among other things) that properties have their causal powers essentially, and that the laws of nature are essential. We will discuss natural kinds, the nature of dispositions and powers, laws of nature, and the background scientific realist view that scientific essentialism maintains.

After examining Ellis' view, in the middle third of the course we will pause to examine David Armstrong's categorialist view on properties and his truth-maker theory, and also discuss the claim that causal powers possesses a kind of intentionality. These foreshadow issues that we will emphasize in examining Alexander Bird's dispositional essentialism. We will look closely at Bird's analyses of dispositions and the laws of nature, his critique of the claim that dispositions possess intentionality, and his defense of dispositional essentialism against objections.

In the last third of the course, we will further examine the possibility of ungrounded dispositions or causal powers, which dispositional essentialism seems to require. We will also explore the possibility of accounting for modality in terms of causal powers rather than possible worlds. Lastly, before graduate student presentations, we will discuss some objections to an essentialist view of properties and laws, objections that we will have discussed previously, but will re-examine.

The general goals of this course are for you to become deeply acquainted with and increase your capacity to analyze concepts pertinent to the metaphysics of science, and to increase your ability to both critique and develop arguments pertaining to the metaphysics of science.

Course Grading

Besides being a good seminar participant (i.e., reading all assignments and participating in seminar discussion), you are required to do the following in this course: (i) write six

short critical response essays (5% each, for a total of 30% of your course grade); (ii) develop a 15-20 page seminar paper, in two drafts (5% for the first draft, 55% for the final draft), and (iii) present the main ideas and argument of your paper to the rest of the participants (10%). The critical response essays are expected to be about two pages long. The point of these is to analyze some concept, critique some argument, raise an interesting implication, etc. discussed in an assigned reading. (You may use one of these response essays as a basis for developing your longer essay.)

Course Materials

1. Several journal articles and book chapters available through the course website.
2. Alexander Bird, *Nature's Metaphysics: Laws and Properties*. Oxford: Oxford University Press, 2007.
3. Brian Ellis, *Scientific Essentialism*. Cambridge: Cambridge University Press, 2001.

Reading Schedule

This schedule is modeled on fifteen meetings, each approximately 2.5 hours long.

Meeting 1: Introduction and preliminary concepts

Brian Ellis, *Scientific Essentialism*, Ch. 1, "Concepts of Scientific Essentialism."

Meeting 2: Ellis on natural kinds and dispositions

Ellis, *Scientific Essentialism*, Ch. 2, "Natural Kinds."

Ellis, *Scientific Essentialism*, Ch. 3, "Powers and Dispositions."

Meeting 3: Ellis on realism and laws of nature

Ellis, *Scientific Essentialism*, Ch. 4, "Realism and Essentialism in Science."

Ellis, *Scientific Essentialism*, Ch. 6, "Theories of Laws of Nature."

Background reading:

Stathis Psillos, "Thinking about the Ultimate Argument for Realism." In C. Cheyne and J. Worral, eds., *Rationality and Reality*. Springer. 2006, pp. 133-56.

Meeting 4: Ellis' scientific essentialist program

Ellis, *Scientific Essentialism*, Ch. 7, "Natural Necessity."

Ellis, *Scientific Essentialism*, Ch. 8, "The Essentialist Program."

Meeting 5: Armstrong on truthmakers, dispositions, and laws

David Armstrong, "The General Theory of Truthmaking." Ch. 1 of *Truth and Truthmakers*. Cambridge: Cambridge University Press, 2004.

Armstrong, "Properties, Relations, and States of Affairs." Ch. 4 of *Truth and Truthmakers*.

Armstrong, "Causes, Laws, and Dispositions." Ch. 10 of *Truth and Truthmakers*.

Meeting 6: The directedness of powers

U.T. Place, "Intentionality as the Mark of the Dispositional." *Dialectica*, Vol. 50, No. 2. 1996, pp. 91-120.

Stephen Mumford, "Intentionality and the Physical: A New Theory of Disposition Ascription." *The Philosophical Quarterly*, Vol. 49, No. 195. Apr 1999, pp. 215-25.

George Molnar, "Directedness." Ch. 3 of *Powers: A Study in Metaphysics*. Oxford: Oxford University Press, 2003.

Meeting 7: Bird on dispositions

Bird, *Nature's Metaphysics*, Ch. 1, "Introduction—Laws and Properties."

Bird, *Nature's Metaphysics*, Ch. 2, "Dispositions."

Background reading:

David Lewis, "Finkish Dispositions." *The Philosophical Quarterly*, Vol. 47, No. 187. Apr 1997, pp. 143-58.

Meeting 8: Bird's dispositional essentialism, part I

Bird, *Nature's Metaphysics*, Ch. 3, "Dispositional Essentialism and the Laws of Nature."

Bird, *Nature's Metaphysics*, Ch. 4, "Categoricalism."

Bird, *Nature's Metaphysics*, Ch. 5, "Dispositional Essentialism, Modality, and Intentionality."

Meeting 9: Bird's dispositional essentialism, part II

Bird, *Nature's Metaphysics*, Ch. 6, "The Regress Objection."

Bird, *Nature's Metaphysics*, Ch. 7, "Structural Properties."

Bird, *Nature's Metaphysics*, Ch. 8, "The Illusion of Nomic Contingency."

Meeting 10: The ungroundedness of powers, part I

George Molnar, "Do Powers Need Grounds?" Ch. 8 of *Powers: A Study in Metaphysics*. Oxford: Oxford University Press, 2003.

Jonathan Schaffer, "Is There a Fundamental Level?" *Noûs*, Vol. 37, No. 3. 2003, pp. 498-517.

Meeting 11: The ungroundedness of powers, part II

Stephen Mumford, "The Ungrounded Argument." *Synthese*, 149. 2006, pp. 471-489.

Neil Williams, "The Ungrounded Argument is Unfounded: A Reply to Mumford." *Synthese*, 170. 2009, pp. 7-19.

Toby Handfield, "Unfinkable Dispositions." *Synthese*, 160. 2008, pp. 297-308.

Meeting 12: Powers: Rejecting Possible Worlds?

George Molnar, "Putting Powers to Work." Ch. 12 of *Powers: A Study in Metaphysics*. Oxford: Oxford University Press, 2003.

Antony Eagle, "Causal Structuralism, Dispositional Actualism, and Counterfactuals." In Toby Handfield, ed., *Dispositions and Causes*. Oxford: Clarendon Press. 2009, pp. 65-99.

Jonathan Jacobs, "A Powers Theory of Modality: or, How I Learned to Stop Worrying and Reject Possible Worlds." *Philosophical Studies*, Vol. 151, No. 2. 2010, pp. 227-48.

Meeting 13: A problem for causal structuralism

John Hawthorne, "Causal Structuralism." *Philosophical Perspectives*, 15, Metaphysics. 2001, pp. 361-78.

Graduate student presentations

Meeting 14: Laws: some necessary, some contingent

John T. Roberts, "Some Laws of Nature are Metaphysically Contingent." *Australasian Journal of Philosophy*, Vol. 88, No. 3. 2010, pp. 445-57.

Graduate student presentations

Meeting 15: Last meeting

Course evaluations

Graduate student presentations