

What is it that makes the sciences *rational*, if anything? For much of the twentieth century, philosophers of science held that if science were rational then it must be *logical*, logic being the very essence of reason. Philosophers agreed that there must be a *logic of scientific discovery*, though they disagreed about how that logic of discovery might be best characterized. Some argued that scientific claims must be inductively *verified* by appropriate sense data. Others replied that verifying the truth of a claim in science was impossible in principle (for several reasons), and so they argued that the *falsification* of claims was the best that might be achieved. In 1962, Thomas Kuhn published his *Structure of Scientific Revolutions* in which he placed less of an emphasis on the logic of scientific discovery and more of an emphasis on the *history* of scientific discovery. Kuhn claimed that science involves non-rational (non-logical) changes of belief which he initially called “paradigm shifts.” This new emphasis precipitated what at least one philosopher has called a “crisis of rationality.”

Since about 1962 (but almost certainly not because of Kuhn), researchers in the social sciences have been rethinking rationality. Rather than equating rationality with obedience to logical prescriptions they have attempted to understand rationality from a *naturalistic* perspective. That is, they have been looking at how people *actually do* go about reasoning and making decisions, rather than arguing about how people *ought* to reason in order to qualify as rational. This does not decry logic. It suggests only that people reason effectively in several ways, only one these ways is a logical style of reasoning. The question for this course is this. Can naturalistic accounts of reasoning help us understand how science might be described as rational even if there may be no identifiable logic of scientific discovery?

**Requirements:**

	Undergraduate	Graduate
Course Engagement	10%	10%
Seminar and Handout	20%	20%
First Essay (~6 pages)	10%	10%
Second Essay (~6 pages)	25%	20%
Final Paper	35% (8-10 pages)	40% (12-14 pages)

**Expectations:**

- All class members will be engaging with the same course materials. In papers and class discussion, both undergraduate and graduate students are expected to demonstrate thoughtfulness and (on occasion) insight.
- However, the mark distributions and qualitative expectations are different for undergraduate and graduates. Graduate students are expected to demonstrate a proficiency in argument, expression and writing appropriate to their level of study.

**Submission Rules:**

- Late papers will be penalised 3 percent per day (of 100 percent of the assignment grade). This is a modest penalty in recognition of the real problem of course work congestion.
- Papers more than five days late will not be accepted without an extension. Weekends count as two days.
- Extensions are granted for documented illness and under other extenuating circumstances.
- Papers *may not* be submitted by email.

**Tentative Reading List (Subject to Revision)****Topic 1 – Verification and Falsification**

Stephen Straker, “Knowledge and Logic: An Introduction”.  
Carl Hempel, *Philosophy of Natural Science*, ch.3, 4, 6-8.

Karl Popper, “Truth, Rationality and the Growth of Scientific Knowledge” in  
*Conjectures and Refutations*, ch.11.

Karl Popper, *The Logic of Scientific Discovery*, Appendix VII.

Nelson Goodman, *Fact, Fiction and Forecast*, ch.3.

Nelson Goodman, *Ways of World Making*, ch.1 and ch.6.

## **Topic 2 – Scientific Revolutions**

Paul Feyerabend, “Explanation, Reduction and Empiricism” from *Minnesota Studies in the Philosophy of Science*.

Paul Feyerabend, “Consolation for the Specialist” in *Criticism and the Growth of Knowledge*

Barry Barnes, “Thomas Kuhn” in Quentin Skinner, ed., *The Return of the Grand Theory in the Human Sciences*, ch.5.

Thomas Kuhn, “What Are Scientific Revolutions?” in *The Road Since Structure*, ch.1.

Karl Popper, “The Rationality of Scientific Revolutions” in Ian Hacking, ed., *Scientific Revolutions*, ch.4.

## **Topic 3 – For and Against Incommensurability**

Hilary Putnam, “Two Theories of Rationality” in *Reason, Truth and History*.

Donald Davidson, “On the Very Idea of a Conceptual Scheme” in *Inquiries into Truth and Interpretation*.

Thomas Kuhn, “Commensurability, Comparability, Communicability” in *The Road Since Structure*, ch.2.

Thomas Kuhn, “Second Thoughts on Paradigms” in *The Essential Tension*, ch.12.

Ian Hacking, “Working in a New World: The Taxonomic Solution” in Paul Horwich, ed., *World Changes*.

Helen Longino, *Science as Social Knowledge*, ch.3-5.

## **Topic 4 – Realism**

Grover Maxwell, “The Ontological Status of Theoretical Entities” in Feigl and Maxwell, *Scientific Explanation*.

Bas C. Van Fraassen, “Arguments Concerning Scientific Realism” in Curd and Cover, *Philosophy of Science: The Central Issues*.

Ian Hacking, “Do We See Through a Microscope?” in Churchland and Hooker, *Images of Science*.

Charles Chihara and Carol Chihara, “A Biological Objection to Constructive Empiricism” in *British Journal for the Philosophy of Science* 44 (1993), 653-658..

Anjan Chakravartty, “Semi-Realism” in *Studies in the History and Philosophy of Science*, 29A 3 (1998), 391-408.

Larry Laudan, “A Confutation of Convergent Realism” in *Philosophy of Science* 48 (1981), 19-49.

## Topic 5 – Historical Epistemologies

Peter Galison and Alexi Assmus, “Artificial Clouds, Real Particles” in *The Uses of Experiment*.

Peter Galison and Lorraine Daston, “Images of Objectivity” in *Representations* 40 (1992), 81-128.

Ronald Giere, “Realism in the Laboratory” in *Explaining Science*, ch.5.

Bruno Latour, “Where Were Microbes before Pasteur?” in *Pandora’s Hope*, ch.5.

Bruno Latour, “Circulating Reference: Sampling Soil in the Amazon Forest” from *Pandora's Hope*, ch.2.

A. Nelson, “How Could Scientific Facts Be Socially Constructed?” in *Studies in History and Philosophy of Science* 25 (1994), 535,547.

Nancy Cartwright, “Do the Laws of Physics State the Facts?” in Curd and Cover, *Philosophy of Science*.

William P. Alston, “Belief-forming Practices and the Social” in Frederick Schmitt, ed., *Socializing Epistemology*.

Hilary Kornblith, “A Conservative Approach to Social Epistemology” in Frederick Schmitt, ed., *Socializing Epistemology*.

Philip Kitcher, “Contrasting Conceptions of Social Epistemology” in Frederick Schmitt, ed., *Socializing Epistemology*.

Donna Haraway, “Apes in Eden, Apes in Space,” from *Primate Visions*, ch.7

Helen E. Longino, “The Fate of Knowledge in Social Theories of Science” in Frederick Schmitt, ed., *Socializing Epistemology*.

## Topic 6 – Rational Actors

Miriam Solomon, “Scientific Rationality and Human Reasoning” in *Philosophy of Science* 59 (3), 439-455.

Paul Thagard, “Scientific Cognition: Hot or Cold?” in Steve Fuller, ed., *The Cognitive Turn: Sociological and Psychological Perspectives on Science*, 71-82.

N. Naqvi, B. Shiv, A Bechara, “The Role of Emotion in Decision-making: A Cognitive Neuroscience Perspective” in *Current Directions in Psychological Science* 15 (2006), 260-264.

Thomas Kuhn, “Objectivity Value Judgment and Theory Choice” from *The Essential Tension*.

Kenneth Arrow, *Social Choice and Individual Values*, ch.1-3.

Kenneth Arrow, “The Efficacy of Mathematical Formalism in Economics”

Kenneth Arrow, "Mathematical Models in the Social Sciences" in Lerner and Lasswell, eds. *Policy Sciences*.

Amos Tversky and Daniel Kahneman, , "Rational Choice and the Framing of Decisions" in Robin M. Hogarth and Melvin W. Reder, eds., *Rational Choice*.

Amartya Sen, “Rationality and Social Choice” in *Rationality and Freedom*

Philip Kitcher, *The Advancement of Science*.

Husain Sarkar, *Group Rationality in Scientific Research*.

Paul Weirich, *Collective Rationality: Equilibrium in Cooperative Games*.