What is Science?

Rodney Schreiner
Chemistry Department, University of Wisconsin-Madison

A list of sources.

Logical Foundations of Probability, by Rudolf Carnap, 2nd edition, The University of Chicago Press, 1962.

Constructs a system of inductive logic and examines how it functions in science.

The Logic of Scientific Discovery, by Karl Popper, Basic Books, 1959.

Popper argues that science should adopt a methodology based on falsifiability, because no number of experiments can ever prove a theory, but a single experiment can contradict one. Popper held that empirical theories are characterized by falsifiability. (A reworked English version of the original German published in 1934.)

The Structure of Scientific Revolutions, by Thomas S. Kuhn, University of Chicago Press, 3rd edition, 1996.

A landmark work in the study of science, it introduced the phrase "paradigm shift" to common speech. Much of his descriptions of science sound right to scientists, although some parts are problematic.

Against Method, by Paul Feyerabend, Verso Press, 1975.

A radical view of science. Nevertheless, chapter 18, the final chapter, is an approachable challenge to many popular and tenuous beliefs regarding the role of science in the world. His views are not uncommon today.

"The Republic of Science," by Michael Polanyi, in *Minerva*, Vol. 1, pp. 54-73, 1962.

Describes how the activities of scientists are coordinated and the principle of their co-ordination.

"Mapping Reality," Chapter 6 in *Science, Truth, and Democracy*, by Philip Kitcher, Oxford University Press, 2001.

Describes the process and product of science in terms of map making and maps.

Explanations, styles of explanation in science, edited by John Cornwell, Oxford University Press, 2004.

A compendium of essays by scientists, philosophers, a mathematician, and an anthropologist discussing of the nature of explanation in science, why explanations work, and how they vary among disciplines, periods, and cultures.

A list of further readings.

What is this thing called Science?, by A. F. Chalmers, Hackett Publishing, 3rd edition, 1999.

> One of the best overall introductions to the philosophy of science. Gives clear, accurate descriptions of the major developments in the study of science over the 20th Century.

Philosophy of Science: A Very Short Introduction, by Samir Okasha, Oxford Paperbacks; 2002.

> Provides in 160 pages a concise overview of the main themes of contemporary philosophy of science.

Scientific Literacy and the Myth of the Scientific Method, by Henry H. Bauer, University of Illinois Press, 1992.

> Examines some widely held misconceptions of how scientists work and how science functions in our society. Recommended especially for science teachers.

The Structure of Scientific Theories, edited by Frederick Suppe, University of Illinois Press, 2nd edition, 1977.

> A massive compendium of the state of philosophy of science in the 1970s in the form of a series talks, rebuttals, and discussions. Extensive and sometimes obscure.

Science and the Quest for Reality, edited by Alfred I. Tauber, New York University Press, 1997.

> An anthology of essays from scientists (*e.g.*, Heisenberg), philosophers (*e.g.*, Whitehead), and philosophers of science (*e.g.*, Kuhn), both praising and castigating science and its role in our world.

Making Truth: Metaphor in Science, by Theodore L. Brown, University of Illinois Press, 2003.

> Through a series of studies of scientific systems, ranging from the atom to current topics in chemistry and biology such as protein folding, chaperone proteins, and global warming, the presence and power of metaphor in science is described. These elucidate science as an intellectual and social practice and the nature of scientific truth.