

Reader's Guide to the

# HISTORY OF SCIENCE

*edited by*

ARNE HESSENBRUCH



FITZROY DEARBORN PUBLISHERS  
LONDON • CHICAGO

Copyright © 2000 by  
FITZROY DEARBORN PUBLISHERS

All rights reserved including the right of reproduction in whole or  
in part in any form. For information write to:

FITZROY DEARBORN PUBLISHERS  
919 North Michigan Avenue, Suite 760  
Chicago, Illinois 60611  
USA

*or*

310 Regent Street  
London W1B 3AX  
England

British Library and Library of Congress Cataloguing in Publication Data are available

ISBN 1-884964-29-X

First published in the USA and UK 2000

Typeset by Florence Production Ltd, Stoodleigh, Devon  
Printed and bound by The Bath Press

Cover design by Philip Lewis

As noted, the literature on Descartes's physics and mathematics is plentiful and excellent. Unfortunately, this cannot be said of his other writings in natural philosophy. The few monographs on his medicine and physiology are of inferior quality. LINDEBOOM is a serviceable account that includes sections on Descartes's physiology as well as a brief examination of his hopes of extending human life. This poverty of interpretation is quite distressing, considering that Descartes himself, in the *Discourse on the Method*, described human health and longevity as the foremost goals of his natural philosophy. Perhaps medicine and physiology could therefore be said to form the central concern of Descartes's natural philosophy.

FREDRIK JONSSON

See also Scientific Revolution

## Dialectical Materialism

- Graham, Loren R., *Science, Philosophy, and Human Behavior in the Soviet Union*, New York: Columbia University Press, 1987 (revised version of *Science and Philosophy in the Soviet Union*, 1972)
- Joravsky, David, *Soviet Marxism and Natural Science, 1917-1932*, New York: Columbia University Press, and London: Routledge and Kegan Paul, 1961
- Joravsky, David, *The Lysenko Affair*, Cambridge, Massachusetts: Harvard University Press, 1970
- Krementsov, Nikolai, *Stalinist Science*, Princeton, New Jersey: Princeton University Press, 1997
- Weiner, Douglas R., *Models of Nature: Ecology, Conservation, and Cultural Revolution in Soviet Russia*, Bloomington: Indiana University Press, 1988
- Wetter, Gustav A., *Dialectical Materialism: A Historical and Systematic Survey of Philosophy in the Soviet Union*, translated from the German by Peter Heath, London: Routledge and Kegan Paul, and New York: Praeger, 1958 (original edition, 1952)

Dialectical materialism was the official philosophy of science in the Soviet Union. It was promoted by state-sponsored philosopher-courtiers, and in many ways determined the discourse of science and technology in the USSR. The historiography of dialectical materialism has in the past been heavily colored by Cold War ideologies in both East and West. Several of the important non-Soviet works will be examined here.

In the most general sense, the tenets of dialectical materialism as it evolved in the Soviet context are an amalgam of statements made by V.I. Lenin on science and on Machian positivism before the Russian Revolution, and several late-19th-century texts by Friedrich Engels on the dialectics of nature. The basic elements of the philosophy are an ontology of matter-energy and an application of dialectical methods as the only correct way of reasoning in the sciences, which are themselves subdivided into several interacting but non-reductive levels, such as the social sciences, the life sciences, and the physical sciences.

Thus far, the ideas appear to be rather vague, and that was indeed the assessment of them in the early Soviet Union. JORAVSKY's 1961 monograph on the evolution of a Soviet

philosophy of the natural sciences in the 1920s traces in great detail the different schools of interpretation of dialectical materialism and how both natural scientists and Marxist philosophers (and, to a much lesser degree at this stage, bureaucrats) negotiated the complicated meanings of the philosophy in a highly charged political context. As both an introduction to dialectical materialism and a survey of radically different interpretations, Joravsky's ground-breaking work is an excellent resource.

For a more detailed look at the actual philosophical claims of dialectical materialism, WETTER is a standard reference. He articulates the origins of the philosophy of nature and of dialectics back to Hegel and through various interpretations in the Russian context. The philosophical work is impressive but at times tedious, and there is little development of a historical context in this already lengthy tome. There is some discussion of the impact of dialectical materialism on Soviet science, which follows the philosophical analysis. The assumption by Wetter, a quite common assumption for German scholars working on this topic in the 1950s, is that dialectical materialism conceptually *mattered* for Soviet scientists.

For American authors, this claim has been much more controversial. The most famous example of dialectical materialism being invoked to justify a scientific viewpoint as valid, and not merely to explain it, is the notorious Lysenko affair, in which agronomist Trofim Lysenko managed to convince the Soviet state to ban genetics as a "bourgeois" science. JORAVSKY (1970) treats this incident at length, and makes a strong argument for the Lysenko affair being typical of Soviet state-science interactions. He claims that Lysenkoism was an instance of state-sponsored ideology being imposed by political bosses on scientists who wanted nothing to do with dialectical materialism – with disastrous consequences.

KREMENTSOV takes an entirely different view of the Lysenko affair's relation to dialectical materialism, but with a similar fundamental message. For him, dialectical materialism is the language in which Stalinist science was conducted. Both geneticists and Lysenkoists used this language to try to garner state patronage. It happens that in the heat of battle, the Lysenkoists won and managed to convince the state to oppress their opponents, but the opposite would have been the case had the geneticists won. Here, dialectical materialism is not a matter of conviction: it is a rhetorical tool used to accomplish an end. There is an affinity with Joravsky (1970) here: no scientists actually believe dialectical materialism in the Soviet Union, they have to use it or face destruction. Krementsov differs only in that he points out that the geneticists used the same ruses and techniques.

GRAHAM's magisterial text begs to differ. Looking closely at debates about dialectical materialism after Stalin's death in 1953, he traces how dialectical materialism was sincerely embraced by certain scientists to achieve major scientific advances in fields as disparate as relativity theory, quantum mechanics, cybernetics, origin of life, psychology, and linguistics. Graham does not see the pronouncements in favor of dialectical materialism as "window dressing" or the vestiges of totalitarianism, but as a positive world-view that scientists used to advance their various disciplines. He also points out several purely philosophical discussions of the metaphysics implied by dialectical materialism, further showing that the

meaning of this supposedly "monolithic" philosophy was by no means settled. This stance in a Cold War context was received negatively by many who wanted to insist that the role of dialectical materialism exemplified by the Lysenko affair was typical. Graham's denial of this view is now widely accepted.

Largely inspired by Graham's work, there have appeared recently several excellent studies of specific disciplines to examine how dialectical materialism was actually introduced, negotiated, and used in several fields. WEINER's study of the rise of ecology in the Soviet Union points to ways in which dialectical materialism was both opportunistically and sincerely used by ecologists to set up a wide network of nature preserves. In the end, however, I.I. Prezent, Lysenko's future henchman, crushed ecology by using similar dialectical materialist arguments. The merit of Weiner's work lies in showing just how complicated such philosophical positions became when worked out in localized fields at definite times. The generalizing position so common on both sides of the Cold War has loosened its grip on studies of the history of dialectical materialism.

MICHAEL D. GORDIN

## Discipline

- Abbott, Andrew, *The System of Professions: An Essay on the Division of Expert Labor*, Chicago: University of Chicago Press, 1988
- Bechtel, William (ed.), *Integrating Scientific Disciplines*, The Hague: Nijhoff, 1986
- Ben-David, Joseph, *Scientific Growth: Essays on the Social Organization and Ethos of Science*, Berkeley: University of California Press, 1991
- Dogan, Mattie and Robert Pahre, *Creative Marginality: Innovation at Intersections of the Social Sciences*, Boulder, Colorado: Westview Press, 1990
- Fuchs, Stephan, *The Professional Quest for Truth: A Social Theory of Science and Knowledge*, Albany: State University of New York Press, 1992
- Fuller, Steve, *Social Epistemology*, Bloomington: Indiana University Press, 1988
- Geison, Gerald L. and Frederic L. Holmes (eds), *Research Schools: Historical Reappraisals*, special issue of *Osiris*, 8 (1993)
- Graham, Loren, Wolf Lepenies and Peter Weingart, *The Functions and Uses of Disciplinary Histories*, Dordrecht: Reidel, 1983
- Klein, Julie Thompson, *Interdisciplinarity: History, Theory and Practice*, Detroit: Wayne State University Press, 1990
- Merz, John Theodore, *History of European Scientific Thought in the Nineteenth Century (1904-12)*, 4 vols, New York: Dover, 1965
- Messer-Davidow, Ellen, David R. Shumway and David J. Sylvan (eds), *Knowledges: Historical and Critical Studies in Disciplinarity*, Charlottesville: University Press of Virginia, 1993
- Olesko, Kathryn M., *Physics as a Calling: Discipline and Practice in the Königsberg Seminar for Physics*, Ithaca, New York: Cornell University Press, 1991
- Toulmin, Stephen, *Human Understanding*, Oxford: Clarendon Press, and Princeton, New Jersey: Princeton University Press, 1972

Whitley, Richard, *The Intellectual and Social Organization of the Sciences*, Oxford: Clarendon Press, and New York: Oxford University Press, 1984

There have always been scientific disciplines, in the sense that one speaks of monastic and other forms of religious discipline: namely, a set of practices that are cultivated and transmitted by a group of specially trained people. However, as the authors in GEISON & HOLMES claim, the rise of the modern university system in the 19th century has caused historians to reconceptualize this older sense of discipline as a "school", especially stressing the localized and face-to-face character of its knowledge transmission. In contrast, "discipline" is now reserved for more far-flung epistemic regimes, that rely heavily on common textbooks and other formal means of knowledge transmission. OLESKO goes further, correcting the pervasive view (originating with Michael Polanyi and Thomas Kuhn) that scientific schools are grounded primarily in "tacit knowledge". She argues that this grossly underestimates the role of teaching by explicit precept, which is essential if the knowledge produced by schools is to achieve disciplinary status.

MERZ still provides the most comprehensive historical account of how the emergence of national university systems in Europe created the modern disciplinary mentality, and its attendant hierarchies and turf wars. According to Merz, scientific orientations that began as world views (e.g., atomism, vitalism, etc.) are eventually reduced to disciplinary proportions as they confront each other in the laboratory and the corridors of academic politics. Historians of science may have ignored disciplines (until the recent sociologization of their field), because disciplines are more easily tracked by their teaching and administrative functions than by their research functions. Yet, most general histories of science have been of the research frontier. The contributors to GRAHAM, LEPENIES & WEINGART look at this problem from the standpoint of the disciplines themselves (both the natural and the social sciences), the histories of which most often serve to motivate contemporary research agendas.

A good sociological complement to Merz is BEN-DAVID, who stresses the importance of the changing academic labour market to the incidence and resolution of cross-disciplinary turf wars. Ben-David is especially astute on the role of labour migration in the rise of new disciplines, as a shrinking job market forces academics trained in one field to find work in another. The emergence of experimental psychology as a result of medical scientists moving to philosophy departments is a case in point.

WHITLEY hit on the fruitful idea of explaining the differences between disciplines in terms of organizational sociology. He isolates two variables as being of particular significance: the degree to which practitioners can agree on an appropriate problem, and the degree to which they depend on each other for a solution. Whitley supposes that a discipline ranking high on both variables (e.g., physics) is ideal because it will allow piecemeal growth and rapid diffusion of innovations. FUCHS, whose own work is based on Whitley's model, draws the opposite conclusion, largely as a result of his own postmodernist scruples. In terms of promoting the creativity of its practitioners and preventing premature closure on debate, broadly