Scholarship about Science

A Guide to the Culture of Science, Technology, and Medicine. PAUL T. DURBIN, Ed. Free Press (Macmillan), New York, and Collier Macmillan, London, 1980. xl, 724 pp. $45.

This *Guide* will soon become a much-thumbed addition to bookshelves and a reassuring vade mecum, though not principally for the reasons advanced in its introduction. There Paul Durbin states that the unifying explanatory theme of these nine bibliographical essays in the history, philosophy, and sociology of science, technology, and medicine is to pose "value questions": value *in* science, the value *of* science, the relations between science and other values—esthetic, economic, religious, and so on. This is, however, window dressing. The authors of the separate essays—quite sensibly—do not focus upon this rather artificial relevance-guaranteeing theme but content themselves with surveys of the state of the art in their own fields. The essays can stand on their own merits.

Each essay consists of a discursive "introduction" of 30 pages or more, surveying the field, followed by a bibliography of a few hundred items, chiefly in a single alphabetical listing, though most of the bibliographies also have short prefatory accounts of source materials, reference works, and so on. As Durbin notes in his introduction to the volume, the chief users of these essays in survey and bibliography will be educated people and scholars from cognate fields wanting guidance in a foreign area, graduate students, and teachers needing direction for getting up courses. Deploying a chapter most advantageously to these ends is a tricky business not entirely achieved here.

Some of the problems arise from the perennial editorial headache of getting diverse authors to write and think as a team. As Durbin confesses, the contributions are very diverse (he frankly calls one "an uneasy amalgam"). Possibly broadest in scope, Arnold Thackray's piece on the history of science has the briefest bibliography (which even omits such classics as A. C. Crombie's *Augustine to Galileo* and the works of Stephen Toulmin and June Goodfield), whereas the longest is the account by H. Tristram Engelhardt, Jr., of philosophy of medicine with an exceedingly detailed bibliography from learned periodicals on medical ethics. A few contributors have rather earnestly taken it as part of their brief to indicate where research ought to go. (As Durbin ominously writes, "One hoped for outcome . . . is a sizable list of researchable topics for future discussion.")

Other problems arise because this is a concise (though 700-page) guide, not an encyclopedic bibliography. Thus Gert H. Brieger's highly selective chapter on the history of medicine hardly touches upon fringe medicine or psychoanalysis (Freud gets one brief mention) and says nothing of the important revisionism generated by Foucault and the French structuralists. (The American-centeredness of the book is occasionally unbalancing. The fundamental role of German universities in forging modern medical scholarship is skated over, for instance; and this English reviewer is alarmed to find the University of Bath sited in Birmingham [p. 95].)

A major difficulty is that it was evidently decided that each chapter's reading list should basically form a single consecutive listing containing bare bibliographical data. This makes the (otherwise excellent) bibliographies awkward to use on their own, if one is looking, say, for items on the history of chemistry or the funding of cancer research; also, the index is not keyed to the bibliographies. More convenient would have been to have lists, overlapping if necessary, under thematic headings. Also it would have been far more valuable and space-saving to have appended to items in the bibliographies brief comments elucidating contents, instructing on use, and noting pitfalls (surely functions of a guide). As it is, one must track down relevant portions of the discursive essays in hope of finding comments.

Sometimes comments on the literature listed exist, sometimes they don't—a difficulty that follows from uncertainty how to key the essays into the bibliographies. Some authors struggle to say a little something about each bibliographical entry, and, awed by the collaborative nature of the project, keep their comments neutral. This encourages frequent flannel such as "oral history is one of the oldest methods of passing on historical lore from generation to generation" (p. 141) or locutions such as reference to a book "which no serious scholar working in this period can afford to ignore" (p. 133). Brieger's essay is so restrained that it doesn't even indicate where major controversies exist (for instance concerning Peter Razzell's work on the demographic significance of smallpox inoculation)—Brieger's only sharp comments lie in his reference to "feminist ideology," from which certain recent work has "suffered" (p. 153).

One consequence of the understandable urge to say something about everything is to say nothing very much about anything; in other words, to pen vacuities. Thus Alex C. Michalos writes about French philosophy of science, "Strongly influenced by G. Bachelard, Georges Canguilhem . . . has shown the inseparability of the history and philosophy of science. . . . Michel Foucault's famous *Naissance de la clinique* and *Histoire de la folie* are in the same tradition" (p. 209). One sees what is meant, but the compression and generality are positively misleading. After all, Bachelard proclaimed the total incompatibility of science and philosophy, and Foucault has banished the categories of history and philosophy, preferring to essay an "archeology of knowledge."

Sometimes the otherwise laudable desire to be comprehensive just results in sprawl. Engelhardt's piece is in one sense admirably densely textured, but the forest has been lost amid the trees. I for one find it strange that the most influential fly in the ointment of medical ethics over the last decade, Ivan Illich, gets just one mention and that his *Medical Nemesis* doesn't even make the bibliography.

One escape from writing an essay as just a travelogue on the bibliography is tried by Thackray in his chapter on the history of science. His piece is primarily a culturally anchored survey of the development of scholarship in the history of science, charting orientations such as the professionalization of the discipline within universities (chiefly since World War II) and explaining its intellectual currents in broader sociocultural terms (for example the "internalist" thrust from the late 1940's as being a reaction to Nazi and Stalinist anti-intellectualism). Thackray's essay is a major piece of research and interpretation in its own right, far more sophisticated than other historical overviews offered in this book, and required reading for practitioners in the field. Unfortunately—despite its illu-

minating paragraphs on topics such as the historiography of the Scientific Revolution—it won't be a very direct help to the teacher or student seeking a guide to the attached bibliography or wanting to bone up on topics such as the development of evolutionism.

Yet sometimes the couplet of essay and bibliography does succeed, providing an illuminating discussion of the state of the art that also keys into the bibliography. This tends to work best in the more philosophical essays, where the issues are clearly polarized and pro's and con's can be argued. Michalos's piece on the philosophy of science recovers from a cardboard historical account to give a workmanlike and instructive discussion of front-line issues such as induction, the validity of empiricism, falsification, and the nature of scientific "law" (even if his angle is conventional enough to skimp radical attacks on traditional philosophy of science such as that of the anarcho-subjectivist Paul Feyerabend, whose books are astonishingly not listed).

Diana Crane's essay on science policy studies benefits from tight organization and useful subdivisions, and Jerry Gaston's on sociology of science and technology is a similarly readable and useful piece because Gaston has had the courage to simplify the range of his subject into two main traditions, the Mertonian and the Kuhnian, each, as he sees it, valuable in its own right (Kuhn's model showing how the content of science changes, Merton's indicating the social operation of science). Gaston's essay is also refreshing precisely because he boldly evaluates the worth of various contributions to the literature.

The most successful, however, in my view, is Carl Mitcham's piece on the philosophy of technology. Sensibly limiting himself to a few main issues (for example the epistemological status of technology and its responsibilities to civilization), Mitcham gives lucid and extended accounts of little-known trends in the field (such as Eastern European theories about connections between relations of production—the class structures behind manufacturing—and technologies), as well as focused perspectives on familiar figures such as Lewis Mumford and Herbert Marcuse.

It is a mark both of the coming of age of these academic disciplines and of Balkanizing specialization within them that handbooks of reference and bibliography have recently become so vital. Some—such as the *Dictionary of Scientific Biography* (16 volumes) and the *Isis Cumulative Bibliography* (four volumes to date)—though exhaustive and splendid are, alas, too dear or just too bulky to be the handy volume lying within hand's reach on the desk. Though less readily usable than it might have been, this *Guide* will rightly find its place there.

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Physics and Its Milieu

Selected Papers of Léon Rosenfeld. ROBERT S. COHEN and JOHN J. STACHEL, Eds. Reidel, Boston, 1979 (distributor, Kluwer Boston, Hingham, Mass.). Cloth, $74; paper, $28.50. Synthese Library, vol. 100. Boston Studies in the Philosophy of Science, vol. 21.

Léon Rosenfeld was one of Bohr's closest associates, and perhaps the most lucid interpreter of the "Kopenhagenischer Geist." He was an eminent theoretical physicist—he made important contributions to quantum field theory, nuclear physics, thermodynamics, and statistical mechanics—who throughout his life had a deep and continuing interest in the history and philosophy of science. (Among his first published papers in 1927–28 are two on Newton's theory of colors and several dealing with the philosophical foundations of mathematics.) It may well be that Rosenfeld will be remembered primarily for his contribution as a historian and philosopher of science, for he brought to these activities erudition, clarity of thought, felicity of expression, and sensitivity to the social context.

This impression is reinforced by the volume of his selected papers that has been issued under the careful editorship of Robert Cohen and John Stachel. They have gathered Rosenfeld's most important writings (Rosenfeld himself helped in the selection) and have made available many of his previously inaccessible, oft-quoted (but one suspects little-read) papers. These are grouped under four headings—History of Science, Epistemology, Theoretical Physics, and Social Relations of Science—and are introduced by two short but valuable essays, one by the editors, the other by Stefan Rozental. The volume also contains a fairly complete bibliography of Rosenfeld's writings.

Although there is much of interest in each of the four sections, the papers that reflect Rosenfeld's strong interaction with Bohr will probably be the ones most valued. Thus the section on epistemology contains the important and famous 1933 and 1950 Bohr-Rosenfeld papers on the measurability of field and charge in quantum electrodynamics (the first of which appears here for the first time in English). It also contains most of Rosenfeld's philosophical papers on the foundation of quantum mechanics (complementarity, wave-particle duality, causality, the measuring process). These essays are clear, eloquent statements of Bohr's views interpreted as representing a basically materialistic view of the world. They argue convincingly against the idealist position forcefully propounded by Heisenberg.

The historical section includes most of Rosenfeld's previously published recollections and reminiscences of Bohr. They are warm, appreciative evocations by someone who was closer to Bohr's intellectual ruminations after 1930 than anyone else. The section on theoretical physics is a testament to Rosenfeld's contribution to that field. It includes his classic papers on the definitions of the energy-momentum and angular-momentum tensors in a quantum field theory. Also represented are his expository papers on the foundations of thermodynamics and statistical mechanics. These are succinct, didactic, and masterly presentations and are worthy successors to the Ehrenfests' earlier classic statement. Also included is one of Rosenfeld's papers on the dynamical theory of nuclear resonances, which gives clear proof of his appreciation of the role of esthetics in the formulation of physical theories. The papers in the section on the social relations of science contain astute insights into the changing role of science and scientists in his own lifetime.

Taken together the essays give a vivid picture of the efforts a sensitive, highly intelligent and gifted individual—an undogmatic Marxist—made to give coherence to his intellectual life. They are most welcome: physicists, historians, and philosophers of science—anyone interested in understanding how one consistent interpretation of quantum mechanics was forged—will find reading and studying them rewarding. It is good to have these stimulating and informative essays all in one place.

The book also does something else. It reminds us that we really know very little of the broader intellectual interactions that produced the epistemological foundations of quantum theory. Although Forman, Feuer, and Petersen have made notable starts in that direction no one, for example, has as yet written on the role of Piagetan psychology in these developments. Reading these essays one wishes that the Bohr-Rosenfeld