Book Reviews

Philosophers on Technology

Research in Philosophy and Technology. An Annual Compilation of Research. Vol. 1. PAUL T. DURBIN and CARL MITCHAM, Eds. Jai Press, Greenwich, Conn., 1978. vi, 394 pp. $15; to institutions, $28.50.

Perhaps the most accurate observation one can make about the philosophy of technology is that there really isn't one. At least if we look at the writings of the two sorts of people who might be expected to have been interested in the topic—philosophers and engineers—we find little attention to questions about the character and meaning of technology in human life. For example, the six-volume *Encyclopedia of Philosophy*, a recent compendium by philosophers covering the traditional themes in philosophical discourse, contains no entry whatsoever under the category "technology." Professional engineers, more interested in solving problems than in inquiring after first principles, have done little to fill the void; notably missing from their writings is any philosophically rigorous attention to the fundamental "why's," "what's," and "how's" of technical practice. Despite the fact that no one would deny its importance to an understanding of the human condition, technology has never joined such topics as epistemology, metaphysics, esthetics, ethics, science, law, and politics as a fully respectable focus of philosophical inquiry.

Research in Philosophy and Technology is an attempt to get things going. The first volume of a projected series, the book contains papers by 14 American philosophers first presented at a meeting at the University of Delaware in 1975 and at the AAAS annual meeting in 1976. Reflecting a sudden burst of interest in this subject over the past decade, the essays attempt to answer the question "What would constitute an adequate philosophy of technology?" The results vary in quality from good to mediocre, but the collection offers an introduction to the subject that will be useful to specialists and nonspecialists alike.

As one might expect of a fledgling subdiscipline, a great deal of time is spent sorting through issues of "approach" and "methodology." A number of different philosophical persuasions are represented—analytical philosophy, phenomenology, Marxism, Popperian philosophy of science, and classical metaphysics among others. Employing these well-established systems of thought as points of reference, the writers seek to determine what, if anything, characterizes technology as a distinctive area of human knowledge and activity.

Durbin's contribution, "Toward a social philosophy of technology," finds its model in the success of contemporary studies in the philosophy and sociology of science. He is concerned to explain the workings of "the technical community," technology seen as a social system, "its inner subdivisions, structures, and functions, with its relationships to other subcultures in society, its products, its values, and its (sometimes implicit) view of human nature and society." Durbin has in mind the sociological research on scientific communities done by Robert K. Merton, Norman Storer, Diana Crane, and others. Arguing that science and technology now have many institutional similarities, he suggests that philosophy provide guidelines for empirical research on the technical professions and at the same time offer a framework for deciding how the technical community ought to work in a "*good* technological society."

The path Durbin proposes might well achieve the kind of academic respectability he finds important. But it would severely limit the range of issues that could be addressed. As papers by Willis H. Truitt, Joseph Agassi, Edmund Byrne, Joseph Margolis, and Albert Borgmann make clear, there are many interesting epistemological, ethical, and political questions raised by developments in modern technology that would simply not be met by founding a new subfield in sociology.

A much different approach to the subject, that of Frankfurt School neo-Marxian criticism, is sketched in Kai Nielsen's "Technology as ideology." Nielsen argues that the issues that matter are the "ills flowing from the use to which technology is put in advanced capitalist and bureaucratic socialist societies." A critical theory of technology ought to pay attention to the class interests of those who make and employ sophisticated modern systems as a means of domination. In this regard Nielsen identifies scientific and technical rationality as a kind of disguised ideology in which "political problems are treated as technical ones." He offers an alternative model of rationality based on a conception of human emancipation and self-reflective understanding. The essay closely follows the thinking of the German philosopher Jürgen Habermas and was, in fact, disappointing to this reader for its unwillingness to say much beyond what Habermas and Marcuse have already written on the matter.

The tendency to stress methodological proposals at the expense of substantive concerns is at least partly overcome in Robert E. McGinn's "The problem of scale in human life." McGinn investigates the ways in which dimensions of size, number, powers, speed, and duration make a difference in how we view technologies of various kinds. Those involved in the study of large-scale systems or small-scale, "appropriate" technics will benefit from McGinn's attempt to blaze a trail through the conceptual underbrush.

A consistent shortcoming of the collection is the philosophers' relative lack of awareness of either the history of technology or existing engineering practice. Philosophers are, of course, most comfortable dealing with concepts and systems of ideas. But the subject of technology confronts us with historical and contemporary facts that must be taken into account. Too often the essays here fail to leaven abstract speculation with an understanding of what has actually taken place.

An exception here is Stanley R. Carpenter's "The cognitive dimension of technological change." Carpenter, a former engineer, employs examples from the history of technology and science to strengthen his argument about the problems created for modern society by the extension of technical control over things and people. Carpenter fears that the power offered by such developments as systems engineering and genetic manipulation will not be used responsibly. He observes that in the face of such possibilities one common reaction is "to seek to escape from reason itself by returning to the eternal present of intuition, eros, and enchantment. Another adopts a 'business as usual' attitude toward technological practice while closing one's eyes to all but the most optimistic long-term extrapolations."

Far and away the most rigorous and original article in the book is Carl Mitch-

am's "Types of technology." An investigation into the meaning of the concept "technology," the chapter divides its subject into four reasonable parts—technology as object, technology as process, technology as knowledge, and technology as volition—and exhaustively analyzes various conceptual distinctions within each category. Thus, Mitcham identifies "(a) invention, (b) design, (c) making (in the sense of materially fabricating), and (d) using" as basic kinds of human activity contained within his technology-as-process category and discusses each in considerable detail. His ultimate goal is to discover the "essence" of technology, a task he does not complete here. Whatever the outcome of his investigations in that respect may be, Mitcham's painstaking analysis offers valuable help to anyone who wishes to transcend the sloppiness with which the term "technology" is commonly used nowadays.

Mitcham and his colleague Jim Grote have also written several book reviews and an annotated bibliography for the volume. Their work supplements the *Bibliography of the Philosophy of Technology* (1973) edited by Mitcham and Robert Mackey, already a standard reference in the field.

There is a crucial dialogue waiting to take place in the philosophy of technology, one that would involve not only philosophers but also historians of technology and practicing engineers. It is a conversation that would take up the question of the nature and extent of modern technological practice and, most important, the limits of such practice. Engineers and technical specialists have tended to shy away from such discussions, all too often misinterpreting the issues raised by philosophers (especially moral and political issues) as an attack on their character. Philosophers and historians, some of whom have begun studying the subject from their own points of view, have so far tended to be satisfied with narrow accomplishments recognized within their disciplines. It may happen, therefore, that some of the most urgent questions of our times—questions about who we are and what we are doing when we do technology—will be lost in academicism or pure timidity. The present volume makes a noble effort to enlist participants for the dialogue. But it is only a start.

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Models

Statistical Mechanics and Statistical Methods in Theory and Application. A Tribute to Elliott W. Montroll. Proceedings of a symposium, Rochester, N.Y., Nov. 1976. UZI LANDMAN, Ed. Plenum, New York, 1977. xii, 814 pp., illus. $59.50.

Perhaps the most fruitful scientific research is that of the "cross fertilizers" who transfer ideas and techniques that have been successful in one field to a completely unrelated field where no one has thought of using them before. Few scientists of the present generation can have achieved more in this respect than Elliott Waters Montroll, who seems equally at home in mathematics, statistics, physics, chemistry, biology, social science, and the study of traffic flow and has contributed significantly to all of them. He has trained generations of students and collaborated widely. Since he has also consulted frequently with government and industry his influence has indeed been widespread.

Montroll specializes in clean and elegant mathematics; the problems that occur in nature are usually dirty and intractable. To bridge the gap it is necessary to invent a model that is soluble mathematically and sufficiently close to reality to cast light on the phenomenon under study. Time and again Montroll has succeeded in developing such models, which have initiated a precise approach in fields in which only qualitative information was previously available.

The volume under review is a record of the lectures and written contributions prepared for a one-day symposium organized by Montroll's colleagues (led by Uzi Landman) at the University of Rochester to celebrate his 60th birthday.

The volume reflects Montroll's wide interests, and many of the papers are in fields in which he has made pioneering contributions. Statistical mechanics is well represented in all its aspects. The current situation in the thermodynamics of hard sphere fluids is reviewed by H. Reiss, and the Montroll-Ward technique for dealing with interactions of quantum particles is applied by A. Isihara to the calculation of electron correlations in two and three dimensions.

Several of the contributions are concerned with different aspects of critical behavior and the Ising model. B. M. McCoy, C. A. Tracy, and T. T. Wu have made remarkable progress in recent years in the exact calculation of correlation functions, and their contribution, which links their own approach with that of Montroll, Potts, and Ward, is very much in the tradition of Lars Onsager. (Onsager was one of Montroll's oldest friends and has recorded that it was Montroll who first kindled his interest in the Ising model; it is particularly sad that he died a few weeks before the symposium.) For lattice models in which no exact solution is possible, M. E. Fisher discusses a new type of approximant for series expansions in two or more variables that could be of great practical importance for crossover behavior and multicritical points. The renormalization group, which has had a considerable impact in the past few years, is applied by M. S. Green to a van der Waals fluid to identify a van der Waals fixed point. G. A. Baker, Jr., uses the concepts of critical phenomena to gain insight into a lattice boson field theory, and B. Widom considers the structure and thermodynamics of interfaces, particularly those near critical points.

Other contributions are concerned with nonequilibrium statistical mechanics. V. M. Kenkre deals with the Master Equation and incidentally provides an appendix entitled "Poor man's version of the explanation of the origin of irreversibility" that should be useful to the uninitiated. M. Kac discusses a law of decay that would be valid far from equilibrium. G. G. Emch discusses the more sophisticated problem of nonequilibrium quantum statistical mechanics, and R. H. G. Helleman shows how a simple deterministic mapping can apparently produce stochastic behavior.

Random walks and lattice dynamics are subjects to which Montroll has devoted attention throughout his career—in fact he was the first to appreciate that the two are closely related. M. F. Shlesinger shows how the use of a particular random walk that models photo currents in xerographic films has led to new inequalities for the gamma function. H. Silver, K. E. Shuler, and K. Lindenberg discuss two-dimensional anisotropic random walks with practical applications to transport processes in anisotropic crystals. M. Lax and W. J. Shugard consider a model for the capture of carriers at deep traps as a basis for understanding the transmission of laser light through highly transparent materials. A. A. Maradudin, R. F. Wallis, and A. Eguiluz investigate the surface contribution to the specific heat of a semi-infinite solid. I. P. Ipatova and A. V. Subashiev calculate by diagrammatic methods the optical spectra line shapes for mixed crystals.

During the past decade Montroll has become increasingly interested in the ap-