Behavior and the Relative Importance of Values

In the community of science there is a group that tries to stand aside and observe how science conducts its activities. This predilection to observe ourselves occurs in most human activities, of course, and it is both a fascinating and a frustrating enterprise. Indeed, some scientists feel that such reflections on themselves should be left to the wisdom of a scientist's old age, since they feel that only those who have gone through the rich experience of scientific discovery and verification can successfully write *about* science. Unfortunately, such wisdom of old age produces either the trivial clichés that the scientists' small community have uttered over and over, or else a series of strict admonitions to the young about what is proper and what is improper conduct in science, admonitions that often sound like the conscience of a conservative. There seems to be a real advantage in a man's devoting his whole career to the thorough study of the conduct of a field. But, unfortunately again, too many of these studies end up in a framework that is largely unintelligible to the scientific community, because of a strong predilection to use the language and constraints of contemporary symbolic logic. Alternatively, the studies produce texts in experimental design, or measurement techniques, or some other special part of the scientific enterprise; the student fails to see the whole picture, and is led to believe in certain techniques as though they were unalterable rituals.

That the spirit of Abraham Kaplan's book, **The Conduct of Inquiry: Methodology for Behavioral Science** (Chandler, San Francisco, 1964. 448 pp., $8), is not so constrained, either by the dogma of one man's experience or by a special technique of one part of science, is evidenced by the initial sentence of the book: ". . . the various sciences, taken together, are not colonies subject to the governance of logic, methodology, philosophy of science, or any other discipline whatever, but are, and of right ought to be, free and independent" (p. 3).

This declaration of independence permits the author to discuss the many facets of the conduct of inquiry in the best tradition of pragmatism. The discussion ranges over the various topics: methodology, concepts, laws, experiment, measurement, statics, models, theories, explanation, and values, and in each area the same spirit prevails: no prescriptions about proper conduct are to be handed down until one can understand their purpose, limitations, and connection with the whole process. The emphasis of the book is on the "behavioral sciences," a term recently introduced, I suppose, to cover everything from biology "upwards." But actually, the book can be profitably read by any person interested in research, whether or not he calls it "science."

This is not a book on techniques but on methodology; the distinction is important. A technique is a set of actions that can be more or less precisely defined, and it leads to some specified result. For example, the analysis of variance is a technique since it lays down specific steps to be followed in the handling of data, and the result is a series of "significance" figures. Methodology, on the other hand, is concerned with an understanding of the steps that the scientist follows: it wishes to see why a technique is useful, when it should be modified, how it fits into the whole pattern.

I said that this book fits into the great tradition of pragmatism in its best sense. What the author calls the "vulgar" form of pragmatism is the often quoted version that one can do anything he wishes as long as everything "comes out OK." The "OK" is what makes this philosophy so outrageously inadequate: nobody knows what it means, especially its proponents. No such indefensible concept of what works out well was ever intended by the founders of modern pragmatism—Peirce, James, Dewey, and others. The spirit of their pragmatism could best be described as a disciplined liberalism. One does not simply break away from great traditions because he happens to feel that such radicalism is OK. He must first understand the tradition, be well practiced in it, and well trained to ask the right questions about it: his freedom must be earned. But the freedom is there if the student is willing and able to undergo the discipline. This book will provide him with one pathway to follow.

Although the breadth of the author's presentation provides many opportunities for debate, I shall confine myself to only one topic because I feel it to be such an important one. This is his handling of the problem of values, which of course is ultimately basic in any thoroughly pragmatic philosophy. Many of us agree with Kaplan's suggestion that the behavioral sciences may be construed as "basic science" in the sense that the insights they may provide will help us understand the systems that men inhabit, including the scientific community itself. It is unfortunate that he did not say something about the attempts of behavioral scientists to help redesign some of the systems: the operations researchers, city planners, and the like. Perhaps then he would have been able to elaborate at greater length on the rather sketchy theory of value with which he closes the book. It is true that there are what Kaplan calls "ideal contexts," which permit the widest possible range of predictions about what he calls intrinsic values (p. 391), but this is possible only when a value is separated from all other conflicting values. Thus, reasonable men recognize the intrinsic values of nourishment, shelter, education, profit, freedom, and peace. But this information is practically useless in system design, because, in any large human system, all these values interact and conflict in very subtle ways. Certainly the major value battles of our day—between management and labor, the West and the East, technology and humanism—are all matters of weighing the relative importance of human values. A system design that, like a freeway or a warhead, serves one objective very well seems disastrous to another. It does no good to say that this problem of values lies "outside" of science and is "properly" the task of the policy maker, because, unless we understand how our policy makers actually make their decisions, we are simply children

at the mercy of unconscious and irresponsible drives. This subtle problem of understanding the basis of policy making may be the most important problem the "behavioral sciences" face in the coming decades.

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Physics

Plasma Spectroscopy. Hans R. Griem. McGraw-Hill, New York, 1964. xii + 580 pp. Illus. $18.50.

The author's professed intention is to provide a reference source in theoretical and experimental spectroscopy for plasma physicists and astrophysicists as well as a textbook for graduate students. It is my opinion that the concepts "textbook" and "reference source" are somewhat contradictory, particularly in this field which is so rich in original literature. The task of writing a reference source in this field is an enormous one that requires a different outline than the one used by the author, and perhaps two to three volumes the same size as this book.

The first nine chapters, which constitute an excellent survey of the basic and refined theories that form the backbone of plasma spectroscopy, also demonstrate that the author is well versed in these theories. Griem very neatly shows that the theories frequently can be simplified without significant loss in accuracy, while still exposing the dominant physical processes. This is indeed very commendable. However, he completely ignores the fact that a theory must be compared with experimental data before it is possible to judge whether that theory is adequate. It is possible to overlook such an omission in a purely theoretical treatise, and perhaps in a textbook, but not in a volume that is supposed to be a reference source in experimental as well as theoretical plasma spectroscopy. Objective critical consideration of the relevant experimental data in conjunction with the exposition of the various theories would add considerably to the importance of the book.

The last seven chapters of the book (about 100 pages) are devoted to practical aspects of plasma spectroscopy. The author discusses light sources, instruments, detectors, and standards, as well as measurements of temperatures, densities, and atomic parameters. He does so rather well, considering the small amount of space assigned to each one of the numerous subtitles in these chapters. The limited space allows only a rather scant treatment of the practical aspects of the plasma spectroscopy, which is acceptable in a textbook but not in a reference source. The author has included rather complete tables of the numbers and coefficients that are important in both theoretical and experimental plasma spectroscopy.

The structure of the book is good. It covers the basic elements of plasma spectroscopy and provides the necessary references to the original work. It is a good graduate textbook for a semester course in plasma spectroscopy but needs to be considerably expanded before it will serve as a reference handbook. It is recommended to physicists who do not have a specialist's training in spectroscopy. It is my hope that the author will expand a future edition to include more critical evaluations of the various theories with respect to the experimental observations as well as more detailed discussions of the practical problems that face the experimentalist.

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Carbohydrate Chemistry

An Introduction to the Chemistry of Carbohydrates. R. D. Guthrie and John Honeyman. Oxford University Press, New York, ed. 2, 1964. viii + 144 pp. Illus. $3.40.

There is a continuing need for a short, compact, up-to-date, textbook account of carbohydrate chemistry. This subject, which represents one of the important areas of organic chemistry and an extensive area of industry, is not well presented in most organic chemistry and biochemistry textbooks. Treatises are much too large and, in most small volumes, the subject matter is irregularly covered.

This second edition of *An Introduction to the Chemistry of Carbohydrates*, a small, modern view of carbohydrates, contains a useful presentation of the subject for the average student who wishes a general simplified presentation. It presents a brief description of the simple sugars, their proof of structure, conformation, and chemical reactions. Oligosaccharides are treated very briefly, as are polysaccharides. I believe this book is the best short account of carbohydrates that is available. My principal criticism is that the organic chemistry of the carbohydrates is not presented in the light of modern reaction mechanism chemistry, but perhaps such explanation may be anticipated in the looked-for third edition.

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Antarctic Research Series

Biology of the Antarctic Seas. vol. 1. Milton O. Lee, Ed. American Geophysical Union, Washington, D.C., 1964. xii + 186 pp. Illus. $10.

The Antarctic Research Series, a new series emanating from the recent IGY program, will report results from all disciplines of Antarctic research.

The first volume, edited by Milton O. Lee, is a collection of eight reports dealing with Antarctic marine life. The titles are as follows: "Primary organic production in the Drake Passage and Bransfield Strait"; "Primary productivity under sea ice in Antarctic Waters, 1, Concentrations and photosynthetic activities of microalgae in the waters of McMurdo Sound, Antarctica, . . . [and] 2, Influence of light and other factors on photosynthetic activities of Antarctic marine microalgae"; "Respiratory metabolism and ecological characteristics of some fishes in McMurdo Sound, Antarctica"; "Temperature responses and tissue respiration in Antarctic Crustacea, with particular reference to the krill *Euphausia superba*"; "Antarctic foraminiferal zonation"; "Improved techniques for benthic trawling at depths greater than 2,000 meters"; and "Catalogue and bibliography of Antarctic and sub-Antarctic benthic marine algae."

Inasmuch as most of these articles are of moderate length and deal with specific problems, they would customarily be published in a variety of scientific journals. The American Geophysical Union is to be commended for preventing this scattering by bringing these articles together in a single volume. This not only facilitates the