appendices (mainly taken from materials published by the British Standards Institution or the International Standards Organization) whose contents range from acoustical terms and decibel conversion charts to precautions in audiometry and various types of loudness calculations.

No author could have been expected to cover thoroughly, in 300-odd pages, a "field" held together by a term—noise—or at best by a relation—that of *noise to man*. Most of the numerous references listed contain data of some sort taken under more or less well controlled conditions. But the nonspecialist reader is not so much in need of more data as of a critical evaluation of the assumptions or even prejudices of those who report them. He needs a framework into which he can fit all these facts. Only in the area of hearing loss—where the effects of noise exposure can be ascertained with a great deal more certainty than most other effects that are ascribed to noise and where anatomical, physiological, and behavioral data in animals can be correlated with audiometric findings in man—does there seem to emerge a useful conceptual approach. It consists of a stimulus-response type of model in which noise exposure represents the stimulus whose various parameters can be quite well quantified, as can the demographic characteristics of the exposed population.

Such a model helps both in bringing a certain order into the plethora of data and in specifying maximum permissible exposures that will reduce the risk of hearing loss to an acceptable level. But when it comes to other effects of noise (with the possible exception of interference with speech communication), the problems of establishing acoustic standards to protect what we have come to call the quality of life are far more difficult. Stimulus-response relations no longer suffice. We must be willing to face such issues as social and economic benefits and costs (is the quiet environment really a free good?), technological risks, and privacy. A much deeper understanding of the factors that enter into noise pollution becomes required: What part do economic considerations and population density play? To what extent do people become sensitized to noise when they see themselves the victims rather than the beneficiaries of a noise-producing activity? What human values underlie the trade-offs that legislation and administrative regulations have to take into account? Nobody should criticize Burns for not having included such considerations in his book. They have surfaced only much more recently. There is, for instance, the report entitled "A Study of Technology Assessment" which the Committee on Public Engineering Policy of the National Academy of Engineering submitted to the House Committee on Science and Astronautics in July 1969, which reflects a much more comprehensive approach to dealing with the physiological, psychological, and social consequences of technology. *Noise and Man* reminds us that in an increasingly man-made world our ignorance regarding the effects of man-made noise exemplifies the risk of letting technological progress outpace our understanding of man.

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The Workings of the NSF

The National Science Foundation. DOROTHY SCHAFFTER. Praeger, New York, 1969. xii + 278 pp. $7.95. Praeger Library of U.S. Government Departments and Agencies.

This is a reference book for scientists, public administrators, high school and college students, and others who may need information about the organization, structure, and main functions of the National Science Foundation. It makes no pretense of being a definitive agency study. It briefly sketches the historical background of the NSF and traces some of the changes that have occurred in the agency since its establishment in 1950. The major programs of the NSF are clearly described and defined, including international projects, science education, institutional programs, and science information activities. The agency's role in supporting basic research in the United States is emphasized.

The author writes from the point of view of a specialist in political science. Her main interest is in the legislative and administrative processes that have contributed to the agency's growth and staying power. The best chapters in the book deal with the Foundation's relations with Congress, with other executive agencies, and with its "special publics." A careful reading of these chapters can provide insight into the operational limitations on the NSF and its reluctance to take the lead in formulating national science policy. The author demonstrates a solid understanding of administrative politics and the complexities of bureaucracy. The book's strongest point is its accurate portrayal of the administrative style and self-image of the Foundation.

Schaffter's work may be criticized on two counts. First, the historical background of the NSF is relatively neglected. The pluralist convictions of the leading scientists of the 1940's were programmed into the NSF and are still shaping it to a marked degree. The precedents set by the Office of Scientific Research and Development during World War II were of great significance. The rise of the Atomic Energy Commission and the emergence of the National Institutes of Health limited the scope of the NSF even before it was established. In the 1950's, Sputnik had a large impact on the institutions of American science, including the NSF. None of these historical themes is adequately developed. The second weakness of the book is its overcautious approach. The author hints at the organizational and operational problems of the Foundation but is never bold enough to evaluate its performance. She quotes instead from congressional documents, particularly the critical reports of the Daddario subcommittee, and from independent scholars such as Don K. Price.

The book is the first of its kind about the National Science Foundation. It is informative and well organized. It will be widely used. One wishes only that the author had been less bland and more historical in her approach to this important federal agency.

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Reactions and Mechanisms

Catalysis in Chemistry and Enzymology. WILLIAM P. JENCKS. McGraw-Hill, New York, 1969. xvi + 656 pp., illus. $14.50. McGraw-Hill Series in Advanced Chemistry.

During the last decade certain related pathways of research in biochemistry and organic chemistry have converged to become the interdisciplinary avenue of organobiochemistry. Now William P. Jencks has turned his hand to compiling, collating, and critically reviewing the published material relevant to this interdiscipline. The title of

Jencks's book may seem to promise a wider spectrum of topics than are actually covered, but a work of merit remains just that, regardless of the title. Jencks has succeeded, with conciseness and clarity, in bringing into focus a wide and sometimes exasperatingly diverse array of topics and he has arranged the subject matter in a fashion that provides every assistance to the reader.

Part 1, Mechanisms for Catalysis, dealing with the manner in which an enzyme might induce a rate acceleration, includes discussions of approximation of reactants, covalent catalysis, general acid-base catalysis, and the induction of distortion or strain in the substrate or enzyme. As befits his physical-chemical orientation, the author focuses attention primarily on nonenzymatic reactions, parading before the reader an array of pertinent and often cleverly chosen examples. The enzyme-catalyzed counterparts are not neglected, however, and the connection between them and their nonenzymatic relatives is stressed wherever possible. Included in this section, perhaps for want of a better place, is a chapter on isotope effects in which the theory, utility, and pitfalls of this valuable mechanistic probe are clearly and concisely delineated.

Part 2, Forces in Aqueous Solution, including discussions of hydrogen bonds, electrostatic interactions, hydrophobic forces, and donor-acceptor and charge-transfer interactions, exposed this reviewer to certain aspects of catalysis that are more remote from his usual concerns than those dealt with in other portions of the book. In this section are expounded ideas which, when couched in the mathematics of rigorous presentation, often seem esoteric and inaccessible, but when explained in Jencks's essentially nonmathematical and lucid English are readily assimilated and understood.

Part 3, Carbonyl and Acyl-Group Reactions, is a thoroughly revised and updated version of the author's chapter in *Progress in Physical Organic Chemistry*. It first presents a general discussion of methods for diagnosing a mechanism and then discusses their application to a variety of reactions of carbonyl systems. Here, as in other sections of the book, the author is adroit in constructing alternative hypotheses. His unflagging attention to mechanistic detail underlines the fact that like baseball, which has been called a game of inches, a chemical process is a game of small distances—fractions of angstroms, in fact.

Part 4, Practical Kinetics, differs in character and intent from the preceding portions of the book; rather than concentrating on the frontiers of knowledge, it deals with the thoroughly classical subject of chemical kinetics. It does so in an exemplary fashion which provides the neophyte with a pragmatic and useful introduction to the subject and the post-neophyte with a cogent review of old and perhaps forgotten topics. The author's caveats regarding the use of kinetic data are particularly apt and should be embroidered in samplers, framed, and hung above the desks of all who would employ kinetics in support of mechanisms.

For persons working in organobiochemistry this book should serve as a useful reference and a source of ideas; for young scientists aspiring to enter this field it should serve as an invaluable guideline of what to learn and how to get started; for professors teaching this subject it is the best available textbook. In all cases, however, augmentation from other sources should be sought; certain facets of organobiochemistry have, of necessity, been dealt with briefly or not at all. Thus, although the modes of action of some of the coenzymes (for example, thiamine pyrophosphate and pyridoxal) are discussed in considerable detail, other coenzymes (for example, nicotinamide adenine dinucleotide and tetrahydrofolic acid) are mentioned only in passing or are omitted entirely (for example, vitamin B_{12} and coenzyme A); many reactions of considerable organobiochemical interest (fatty acid synthesis, diol dehydrase reaction, catalase models, to mention but a few) are not included; certain aspects of enzyme catalysis (for example, the specification of active site residues and the mapping of active site contours) are not considered in detail. These omissions are cited only in emphasis of the fact that there is even more to this rapidly growing and ungainly field than has been captured in Jencks's superb volume. But the acquisition of knowledge in this field must start somewhere, and, to quote the author's paraphrase of Paul Hindemith's admonition to students of harmony, "an enzymologist, even a very gifted one, is no more than half grown and unskilled if he is not thoroughly familiar with the material in this book."

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Botanical Enigmas

The Biology of Parasitic Flowering Plants. Job Kuijt. University of California Press, Berkeley, 1969. xvi + 248 pp., illus. $15.

Parasitic flowering plants share a single unifying characteristic, the capacity to form haustoria. These specialized but extremely variable structures connect the vascular systems of parasite and host, allowing direct infusion of water, minerals, and organic compounds from the host. As a consequence, haustoria-forming species have undergone a shift from autotrophic nutrition to partial or complete heterotrophic nutrition, and in so doing have triggered the evolution of numerous fascinating alternatives to the common green plant. Mistletoe and dodder are the best known of the angiosperm parasites because they are common and because their parasitic nature is clearly recognizable. But the attention given these examples, often buried under the suffocating rubric "plant diseases," has tended to obscure recognition of their less obvious counterparts. Many green flowering plants give no obvious clue to their partially parasitic mode of existence, while others are immediately recognizable but have limited distributions and are only regionally known.

Job Kuijt's splendid new book, *The Biology of Parasitic Flowering Plants*, brings into clear focus for the first time a subject that has been little more than a foggy notion to many biologists. The book is organized around a series of up-to-date biological monographs of each parasitic group. They are presented in the following order: the mistletoes (Loranthaceae and Viscaceae), the sandalwoods and their relatives (Santalaceae, Olacaceae, and Myzodendraceae), the broomrapes and parasitic figworts (Orobanchaceae and Scrophulariaceae), the Rafflesiaceae, Hydnoraceae, and Balanophoraceae; and last but not least, careful consideration is given to *Cuscuta* (Convolvulaceae), *Cassytha* (Lauraceae), the Lennoaceae, and the Krameriaceae. Within this framework there are discussions of general habit, mode of parasitism, floral characteristics, embryology, pollination biology, fruits, seeds, germination, dispersal, and affinities among species, genera, and families. In addition to these topics, there is an introductory chapter dealing with matters of historical, medicinal, and folkloristic interest. Chapter 7 is a comprehensive survey of the haustorium, and is followed by a detailed discussion