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."

C. David Gutsche
Department of Chemistry, Washington University, St. Louis, Missouri

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

of the physiological and evolutionary aspects of parasitism. The author is to be commended for this thorough presentation of multiple viewpoints from both the old and the new literature, for it is clear that many theories remain unsubstantiated and many questions unresolved.

The greatest enigma concerns the evolutionary origin of parasitism in flowering plants. Here there are two distinct questions: (i) the possible origin (or origins) of haustoria, and (ii) subsequent pathways of evolution within haustoria-forming groups. The second is given thoughtful consideration throughout the book, and in fig. 9-1 the author summarizes possible evolutionary derivations of the various modes of parasitism. The first question is not so easily resolved, for there is no published evidence as to how the parasitic habit was established. Perhaps the most untenable idea in this regard is the statement that "parasitism may have originated by means of chance establishment of one plant on another" (p. 208). An example of an individual of cholla growing out of the trunk of an *Idria* tree is given with the suggestion that mutations in such a plant might occur which further adapt the dispersal mechanism or the germination pattern or the behavior of the root system to the species of tree inhabited. Here the comparative-anatomy–morphology approach employed so successfully throughout the book could easily be replaced with some consideration of the fundamental aspects of population genetics required to explain the origin and maintenance of complex adaptive traits, specifically haustoria.

Clarification of this interesting question will require a generalized hypothesis that explains the mechanism through which flowering-plant populations gained the genetic information necessary to direct the formation of haustoria. Moreover, the hypothesis will have to account for the independent origin of haustoria in eight phylogenetically unrelated groups of flowering plants.

The specialist, as well as the general reader, will find a wealth of new information within these pages. The book is well written, beautifully illustrated, and referenced with over 750 literature citations; it will no doubt be the standard reference on parasitic flowering plants for years to come.

PETER R. ATSATT
Department of Population and Environmental Biology, University of California, Irvine

General Entomology

The Insects. Structure and Function. R. F. CHAPMAN. Elsevier, New York, 1969. xii + 820 pp., illus. $13.75.

Students and investigators of entomology with access to biology libraries have been able to satiate themselves in recent years with annual reviews, advances, essays, and a multivolume treatise in insect physiology. Much of this literature is priced beyond the private reader, and several articles on a subject must be read to balance the prejudices of the authors. Now, with clarity and admirable detachment, R. F. Chapman has brought together the diverse elements of structure and function with the aim of relating them to the behavior of insects in nature. This enterprise grew out of his own interests in behavior and ecology, which later expanded to include morphology and physiology as he grappled with problems in locust research. Although he claims not to have intended a comprehensive book, the coverage of physiology is extensive, and the reasonable price of the book insures that it will be a valued addition to many personal shelves.

The problem of organization in such a work is virtually insurmountable: how to present the unity and diversity of the organismal biology of the largest group of creatures on earth. The author has divided his text into six sections: The Head, Ingestion and Utilisation of the Food; The Thorax and Movement; The Abdomen, Reproduction and Development; The Cuticle, Respiration and Excretion; The Nervous and Sensory Systems; The Blood, Hormones and Pheromones. No topic in insect physiology seems to have been completely overlooked in the book, but by necessity information has been fragmented, and the bits are distributed under numbered subheadings. Some subjects suffer more by this dismemberment than others. For example, the communication and orientation of honey bees might have provided a model study illustrating the author's approach, but the various aspects of the subject have been allotted to the different subsections. Where a given function has been studied in depth in fewer species the author comes closest to his goal, for example in the sections concerning flight and flight behavior.

The phylogeny of structures is dealt with briefly, if at all. Chapman can hardly be blamed for this, since the Golden Age of comparative morphology faded with the death of R. E. Snodgrass. It is regrettable, however, that no reference is made to the works of Hermann Weber. Modern structure-functionalists, with few exceptions, take an empirical attitude and are content with a phenetic catalog of attributes. We can expect an evolutionary morphology to emerge again, this time firmly anchored in genetics and ecology. This book is a step in that direction.

As a text and reference, *The Insects* has one of the best taxonomic and subject indexes available. A supplementary table of contents and typographic distinctions within the index make it easy to locate illustrations and major discussions of the various topics. The reader is also alerted in the text to explicative passages elsewhere. Statements are generously documented, with references listed at the end of the book. These should be consulted, because the author tends to protect his readers from the lively controversies surrounding many areas of active research. Another excellent feature is the abundance of detailed and fully labeled illustrations of anatomy, biochemistry, and physiological functions; but the delicacy of insect structure is not conveyed by the mechanical patterns, and too few glimpses are provided of whole organisms.

All in all, the book is a fine contribution to instructional resources.

HOWELL V. DALY
Department of Entomology and Parasitology, University of California, Berkeley

Codes and Coverings

Recent Progress in Combinatorics. Proceedings of a conference, Waterloo, Ont., May 1968. W. T. TUTTE, Ed. Academic Press, New York, 1969. xiv + 354 pp., illus. $16.

Forty-seven authors contributed to this book. A brief review cannot do justice to the diversity of the topics treated. Here a sampling of the subject matter is described for the nonexpert. The expert is urged to enjoy the rewards of examining the book itself.

A word of length n is a vector $w = (a_1, a_2, \ldots, a_n)$ in which each a_i is a letter of an alphabet A containing q letters. Thus there are q^n different words of length n. In "A survey of coding theory" E. R. Berlekamp summarizes an "instructional course" of five lectures based on his book *Algebraic Coding Theory* (McGraw-Hill,