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.

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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.

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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,