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BOOK REVIEW

CHAPMAN R.F.: THE INSECTS. STRUCTURE AND FUNCTION. 4th ed. Cambridge University Press, Cambridge, UK, 1998, xviii + 770 pp. ISBN 0-521-57048-4 (hardback), price GBP 75.00; 0-521-57890-6 (paperback), price GBP 35.00.

This book, first published in 1969, differs from other entomological textbooks: it lacks a section on insect classification or phylogeny (unlike the author, I think that at least a short preliminary study of insect classification is a necessary prerequisite for any study of insects), and the entire text deals with the individual and below levels of organization (i.e., there is almost nothing on ecology, behavioural interactions, population phenomena, etc.). Morphology, instead of being treated separately in one large section, is divided into functionally coherent subsystems which are briefly described at the beginning of each chapter, and then followed by a description of the system's properties and function. That is, this textbook is mainly concerned with physiology; the ideas of classical morphology are largely those of Snodgrass, which on the whole are still the best available.

Although there are some inherent difficulties in such an approach (should the head and its appendages be included with alimentary tract and feeding or with sensory organs?), the concept works surprisingly well and the book is popular. Improvements in the fourth edition (the first revision since 1982) include shifting of topics to where they are more appropriate, the additions of more illustrations (including, for the first time, some microphotographs), and the bringing of the text up to date. The general layout of the book, however, remained unchanged.

A short review of the book's principal divisions follows: Part I: Head, Ingestion, Utilization and Distribution of Food (Head; Mouthparts and feeding; Alimentary canal, digestion and absorption; Nutrition; Circulatory system, blood and immune systems; Fat body). Part II: Thorax and Locomotion (Thorax; Legs and locomotion; Wings and flight; Muscles). Part III: Abdomen, Reproduction and Development (Abdomen; Male and female reproductive systems; Egg and embryology; Postembryonic development). Part IV: Integument, Gas Exchange and Homeostasis (Integument; Gaseous exchange; Excretion, and salt and water regulation; Thermal relations). Part V: Communication (Nervous system; Endocrine system; Vision; Mechanoreception; Chemoreception; Color and light production; Sound and substrate vibrations; Pheromones and chemicals with interspecific significance). The book ends with taxonomic and subject indices (caution: to obtain the correct page numbers for the indices, subtract 2 from all page numbers ≥ 415).

As this book is certainly extremely useful I am prepared to accept all but one of its self-imposed restrictions. The avoidance of insect evolutionary history is undesirable and damaging. In such a huge taxon, the common features of structure and function are soon exhausted and the author resorts to examples of diversity, which exposes the limitations of the book. Chapman obviously does not consider evolutionary history particularly important in determining structure and function, but this approach has some detrimental effects. First, because of our poor knowledge and limited textbook space it is usually impossible to illustrate fully the diversity within the Insecta and the examples cited by the author often appear to have been selected at random. I believe that in many such points an evolutionary approach could help to present the information in a much more logical fashion. Second, Chapman occasionally becomes so entangled in his functional paradigm that he seeks functional explanations for phenomena that have been largely shaped by phylogenetic constraints. For example (p. 160): "Apart from the Diptera, all the larvae of which are apodous, legless larvae are usually associated with particular modes of life. ... Parasitic larvae of Hymenoptera and Strepsiptera are apodous... Finally, in the social and semisocial Hymenoptera in which the larvae are provided with food by the parent, apodous forms are also the rule." While Chapman realizes that legless larvae are a "systematic" character for the Diptera, he fails to realize this is also the case for Hymenoptera Apocrita where the reduction in the size of the legs in the larvae of the apocritan ancestor had obviously nothing to do with sociality and, judging from the rudimentary legs of the larvae of non-parasitic Siricoidea, even with parasitism. Incidentally, the claim for Strepsiptera is also not entirely correct. Other examples could be cited to show that the phylogenetic basis of diversity is largely ignored by the author. In view of the recent increased activity in the field of insect phylogeny, such an approach is likely to be much less acceptable now than when the book first appeared. Chapman may say he is not interested in such things, but this would raise questions about his scientific method, unless he is only interested in study in a single model species, which would not involve any comparisons; but then you do not need a textbook of entomology. Evolutionary history imposes enormous constraints on all taxa and disregarding this history makes a meaningful study of "structure and function" difficult.

So who could and should make use of this textbook? First, it should not be your sole entomological source. Paradoxically, although written by an author with laboratory inclinations and obviously intended for students with similar inclinations, I think that the book is excellent supplementary reading for classical entomologists with a sound and well-digested previous knowledge who can cope with the above mentioned problems. No other entomological textbook provides such an abundance of morphofunctional data. For others, I suggest using a bookmarker announcing in bold red characters: Select your models with phylogeny in mind or be aware of the constraints.

In the next edition, an introductory chapter on insect classification and preferably also phylogeny should be included, also in order to clarify the author's use of taxonomic units. It took a lot of reading and studying of the cited examples before I understood the author's concept of some problematic taxonomical units such as Orthoptera or Thysanura. In the case of Apterygota and Insecta I failed – the author occasionally cites examples from the entognathous groups but does *not* regard them as insects. In particular I suggest avoiding formulations like "in Diptera and Orthoptera" when we only have information on very few or very closely related species within each taxon. Second, and this would be a much greater task particularly considering the integrated nature of the book, evolutionary interpretations should not be avoided where they help us to understand the morphofunctional data. This is likely to be beyond the capabilities of a single author, and specialists would have to be invited to contribute. Such a multiauthored phylogenetic approach was the key to the success of the vastly popular *Insects of Australia*.

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