

The last chapter of the book concerns seasonality and insect pest management. Methodology is briefly discussed, including treatment of genetic control strategies. There is no critical review in this part, and one wonders to what extent the information on seasonal adaptations of insects has benefited the development of pest management tactics. There is an optimistic tone, however, given the progress of research in discovering some of the mechanisms underlying insects' seasonal adaptations.

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INSECTS-IN-DEMAND

Fundamentals of Insect Physiology. Murray S. Blum, ed. John Wiley & Sons, New York, 1985. 598 pp., illus. \$39.95 (cloth).

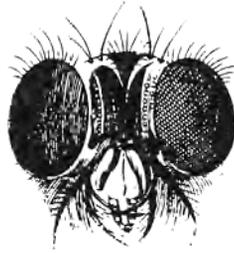
The amount of information on the physiology of insects doubles roughly every ten years, if the size of reference works is any gauge. There are over 45 programs in the United States alone offering a Ph.D. in the field of entomology or the equivalent, with insect physiology obviously an important part of any curriculum. Therefore, a contemporary text in insect physiology is always in demand. The recent volume by Blum and his colleagues is a valiant effort to fill the void and will definitely be useful.

In 14 chapters contributed by 14 physiologists, the book covers circulation, nutrition, excretion, respiration, *metabolism*, *integument*, *reproduction*, muscles, behavior, hormones, the nervous system, pheromones, and defensive secretions. Growth and development are not covered per se, but some egg development is described in the chapter on reproduction. The excellent hormone chapter deals mostly with development during late instars and metamorphosis, where most of the current knowledge is centered.

An excellent treatment of integument contains new information on the structure of silk protein. The only

minor drawback in the chapter is a lack of sharp distinction between sclerotization, tanning, hardening, and darkening. The chapter on circulation, while being one of the more useful treatments available on hemocytes and cellular defensive reactions, does contain a few minor errors. Chapter eight presents us with a lovely treatment of sensory structures. The full use of examples and anatomy are very helpful and will be good lecture supplements. The chapter on respiratory systems is not only descriptive, but quantitative.

In general, I would have been happier with more chemical formulas in



the book. The chapter on metabolism documented numerous reactions and is very useful, but has only one incomplete structure of trehalose. The general lack of chemical structures is in marked contrast with lists of chemical formulas used with the final chapter on exocrine systems. A textbook on insect physiology may not be the place for what appears to be essentially a review of this particular subject, since it really does not deal with fundamental principles of insect physiology. I would have preferred to see a balanced account of the pheromone biosynthesis scheme in the leaf-roller complex, a topic that has been ready for the textbooks for a few years now, and which every student should know.

Two notable features present problems. First, few references are used. Although I assume this was done intentionally, checking a subject for accuracy or knowing what authority is referred to is difficult or impossible. Second, there are omissions and inconsistencies throughout the index, making it difficult to get at specific subjects. When authors strayed into unfamiliar areas, they tended to get into trouble; however, this textbook contains large amounts of useful information and most of the chapters

make good outlines around which to design lectures.

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ON CRUSTACEANS

Crustacea. F. R. Schram. Oxford University Press, New York, 1986. 606 pp., illus. \$59.95 (cloth).

The need for a major single-volume reference on crustaceans has been evident to both specialists and nonspecialists for some time. Given the amount of attention devoted to crustacean research, it is rather surprising that the last major one-volume compendium written on Crustacea was the classic work of W. T. Calman (*Crustacea*. 1909. Pt. VII. In E. R. Lankester, ed. *A Treatise on Zoology*. Adam & Charles Black, London) published almost 80 years ago. The book *Crustacea*, by F. R. Schram, was written to serve as a reference text in crustacean evolutionary biology. Although it covers many aspects of crustacean biology, the primary emphases are morphology and phylogeny. The author is to be commended for bringing together recent literature on these themes. The book is comprehensive, including detailed chapters on taxa not usually covered in other one-volume texts or references.

The author, whose background is in paleontology, presents separate chapters on fossil taxa or integrates fossil groups into appropriate chapters on recent forms; he also describes the embryology of those groups for which such information is available. The author uses current biogeographical and geological concepts to interpret geographical distributions of several taxa. The book begins with a short introduction to the Crustacea, contains a chapter on their relationships to other arthropod groups, and ends with chapters on the author's view of crustacean phylogeny and evolutionary patterns. Most of the book is made up of chapters on individual taxa, and the author follows a basic format similar to Calman's in providing a definition of the group; a short historical account; a detailed

morphology; and sec-
atural history, taxonomy,
topics.

unfortunate, after amassing so
information and detail from the
ature, that the author has been
careless in the presentation of this
material. I was struck by the sheer
number of outright errors and ortho-
graphic mistakes but it would take
too much space to detail all of them
here. As an example, in one page (p.
256) in the chapter on the Procaridi-
dea, there is a mix-up of figure cap-
tions (paragnaths with maxillule), a
misspelling of the figure label sca-
phognathite, and a mistake in the gill
formula of *Procaris* (this animal does
have maxillipedal epipods, correctly
stated in the first source given for the
table).

Errors and inconsistencies in the
use of family names and their vernac-
ular forms are common throughout
the book. For example, the vernacu-
lar form of the family Phyetocaridi-
dae, correctly "physetocaridids" is
given as "phycetocarids" and "physe-
tocarids." The caridean taxonomy
also omits the family Eugonatonoti-
dae and has several typographical er-
rors. Among the goals stated for this
book is that it serve "to standardize
the terminology and orthography
used in the discipline." To meet that
goal, the many inaccuracies, errors,
and orthographic mistakes must be
eliminated from any future editions.

It would have been useful if the
author had followed Calman in giv-
ing an outline of his classification, or
at least referring the reader to it,
before beginning his chapters on spe-
cific taxa. Schram's classification is
not given until the next-to-the-last
chapter, and the reader is not directed
to it in the chapters on particular
groups. The higher taxonomic cate-
gories to which a group belongs are
frequently mentioned, but their fea-
tures are not given. The interested
reader must do a lot of searching to
find a definition for some of these
groups. For example, Peracaridans
are defined in Chapter 43, but the
reader coming across the term "pera-
carid" will not find it in the subject
index, and the page citations to "Per-
acarida" in the taxonomic index do
not refer the reader to Chapter 43. As
frustrating as this problem is to the
reviewer, a practicing carcinologist,



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how much more frustrating and con-
fusing it will be to the novice student
of crustaceans or nonspecialist using
the book as a standard reference or
text.

Although the author hopes to stan-
dardize terminology with this refer-
ence, he has not done a great deal to
promote such a goal. A glossary of
the many terms specific to crustacea
would have gone a long way to help
both the aspiring and practicing spe-
cialist in this regard. An alternative to
a glossary would be a brief definition



of a carcinological term, set off by
parentheses or commas, the first time
the term is used.

In the chapter that deals with crus-
tacean phylogeny and classification
based on standard cladistic methods,

the author's approach is organized
and rigorous. But, I object to his
statements that his cladograms "af-
ford a much clearer understanding of
crustacean phylogeny than anything
proposed heretofore" (p. 526) and
that "The taxonomy proposed here is
more natural than any proposed here-
tofore" (p. 541). The choice and in-
terpretation of characters used by the
author to generate phylogenetic trees
seem no more natural, objective, or
lucid than other recent studies on
crustacean evolution. On the con-
trary, the brilliant analysis of Hessler
(1983), to pick one example, on eu-
malacostracan and, in particular, per-
acaridan evolution and phylogeny is
far more objective, balanced, and in-
formative than that presented by the
author. As the author himself points
out, in reference to his cladogram on
the Maxillopoda, "choices of slightly
different characters or elimination of
some others can produce some signifi-
cant changes in the tree." This book
would be much better if the author
had followed Hessler's (1982) style of
clearly stating both sides of a phylo-
genetic controversy.

The last chapter, on evolutionary patterns, has brief sections on paedomorphosis and sex that are followed by a lengthier, better developed review of feeding mechanisms. The author is correct in presenting paedomorphosis as an important process in crustacean evolution, although it would have been instructive to discuss in more detail specific samples (e.g., hypothesized progenetic origin of maxillopodans). Some of the author's views on the role of sex in evolution are perplexing, particularly his "interpretation of sex as a means of dampening variation" and his suggestion that the hypothesized inbreeding of tanaidaceans has beneficial effects. The brief paragraph on protandric hermaphroditism fails to discuss the best documented and most relevant example in the Crustacea, that of pandalid shrimps (Charnov 1982).

In summary, although *Crustacea* might be useful to carcinologists, in its present form the book fails to meet its goal as a reference text in crustacean evolutionary biology. It is hoped that those specialists who might be working on their own crustacean texts will not be discouraged by the appearance of this book. There is still a need for a single-volume reference on Crustacea, one more carefully written and edited, with alternative points of view.

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