



## Miniature Lives: Identifying Insects in Your Home and Garden

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# Book Review

Nation JL. 2016. Insect Physiology and Biochemistry. Third Edition. CRC Press, Boca Raton, Florida. Xxi + 644 p. ISBN 978-1-4822-4758-9, US\$99.95 (hardcover).

The third edition of Nation's "Insect Physiology and Biochemistry" has been thoroughly updated from the second edition, which was published in 2008. I also reviewed the second edition (Jurenka 2008; Florida Entomologist 91: 715). As occurred with previous updates, each chapter has received some updating, with many references added and, where needed, additional narrative in the text. It was nice to see that a thorough update of the recently confirmed juvenile hormone receptor was added to this edition. Like the previous edition, each chapter has a preview, which puts the contents of the chapter in perspective, followed by an introduction and then the contents of the chapter. An updated reference list follows each chapter, and the list appears to be comprehensive, with this edition now containing about 2,600 references. Professor Nation has added a number of review and self-study questions to the end of each chapter before the references. This is new to the third edition and should be a welcomed addition to students taking an Insect Physiology course. Furthermore, new colored pictures and figures were added to the center of the textbook, adding to the overall appeal of the book.

Two new chapters have been added to improve the third edition. With the addition of these chapters, the textbook is becoming a more complete work, covering most aspects of insect physiology. One new chapter is on biological rhythms, which not only includes examples of physiological circadian rhythms but also the most current thinking on how biological clocks work at the biochemical and molecular levels. A considerable amount of new information has been discovered in the past few years on how biological clocks work, and this chapter tries to put this information into context and compares findings from various insects. Of course, most information on the molecular mechanism driving a clock comes from studies using *Drosophila melanogaster* Meigen (Diptera: Drosophilidae). However, the clock genes found in other insects have also been examined. Information is also presented of circadian functions in insects including hormone secretion, reproduction, and behavior. The chapter concludes with a discussion of various types of clock models. The other chapter that is new to the third edition describes insect symbioses. This topic has been an active area of recent research, and new information is continually being discovered, so it is important to include it in a textbook on insect physiology. The new chapter covers aspects of symbionts in termites, bark beetles, and aphids amongst several others. This chapter also includes a section on

*Wolbachia* bacteria and how they can affect the host. The new chapters appear to be just as thorough as the previous chapters.

As with any textbook, some of the information becomes out of date with new discoveries. An area of research that I have an interest in is the role of peptide hormones in insect physiology. There is information presented in the textbook, but more information could have been included, especially on the receptors that are used in cell signaling. Many of these receptors have been identified and most are G-protein coupled receptors or GPCRs. Perhaps a future edition could include more information about cell signaling in general. Another minor aspect that could use updating is the use of the order Homoptera in describing what are now suborders under Hemiptera. Although in most places it is understood which insects are being described, to be up-to-date the suborders Sternorrhyncha and Auchenorrhyncha should be used.

I would recommend this textbook to all students, faculty, and other scholars studying insects. The third edition is improved and covers almost every aspect of insect physiology, but also has information on biochemistry. Every student of entomology should have a course in insect physiology, and up-to-date textbooks are required to help teach these courses. James Nation has spent many years teaching insect physiology so he knows what students are looking for in a textbook. The addition of the self-study questions at the end of each chapter is one example. In addition, the references at the end of each chapter are invaluable to both new and old students who want to find more information about certain topics, and could be a starting point for more in-depth research. Textbooks on insect physiology and biochemistry are still needed in this digital age for students and researchers alike. Textbooks provide background information that is sometimes difficult to find by searching the primary literature. Future research on control of pest populations will require students and researchers to have background knowledge of insect physiology, and this textbook will provide that information.

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Gleeson M. 2016. Miniature Lives: Identifying Insects in Your Home and Garden. CSIRO Publishing, Clayton South, Victoria, Australia. 334 p. ISBN 9781486301379, AU\$39.95, US\$28.95 (paperback; electronic version also available).

Miniature Lives provides exactly what the title suggests: an introduction to insects that results in assigning a name to insects. The name may be order level or species level, or something in between, but it is usually adequate for your "home and garden" needs. There are several approaches taken by the author that make this book an unusually useful identification manual or field guide. Overall, the author cleverly provides much more information than the typical insect identification guide.

Miniature Lives begins with a description of the book and "insect basics." The latter is a concise (18 p.) description of the key morphological features used to identify insects, and it contains the characteristics of the orders. This information is presented in tabular fashion, which makes it easy to read and to navigate through the material. Also found in this section is a brief treatment of metamorphosis.

The second major section (45 p.) is titled "Morphology—what insects look like" but it is not a treatise on morphology. Rather, it is a morphology-based dichotomous key. The key is organized into a number of questions, each with two user-friendly answers. So the mechanics of the key are fairly traditional, but the language is much more suitable for non-entomologists than are traditional keys. The key is well illustrated with stylized drawings that portray the insects and insect body parts under discussion in the key. The key is also complemented by symbols that denote "handy tips," "exceptions," "common mistakes," "age determinants," and "help with tricky areas." The purpose of this supplemental material is to keep the user on track, and to accommodate exceptions. These pointers are quite helpful.

The third major section (73 p.) is "Habitat—where insects live and occur." This part is not simply a discussion of the environments inhabited by insects, but a classification system that informs the reader what insects will typically be found in certain habitats. For example, the author appropriately places moth flies (*Psychodidae*) in bathrooms, and bed bugs (*Cimex*) plus clothes moths (*Tineola*) in bedrooms. I am not so certain about the placement of some, such as German cockroaches in the living room, but the author does note that the insects she associates with the living room can also be found elsewhere in the house, so she cannot really be faulted. The habitats included in this section are numerous, and include vegetable gardens, lawns, citrus, soil and leaf litter, water, plus many others. Here, she also has a section for insects that occur in large groups, such as processionary caterpillars (*Ochrogaster*) and plague locusts (*Chortocetes*). Though not exactly a habitat, such clusters certainly must attract the attention of the curious!

A fourth major section (14 p.) is "Clever clues—the strange structures and evidence that insects leave behind." Markings, feeding damage, nests, eggs, cocoons, and other insect products often are quite diagnostic, but are rarely included in an organized manner for field guides. "Tracks and Sign of Insects and Other Invertebrates" (Eiseman & Charney 2010) is an interesting exception, and may have served as the inspiration for this chapter. The presence of frothy spittle is certainly diagnostic of spittle bugs (*Cercopidae*), as are the funnel-shaped holes in the sand formed by antlion larvae (*Myrmeleontidae*). Indeed, the author is able to characterize quite a number of insects based on their activities rather than on their appearance. Despite its short length, this unit is quite instructive.

The final major section (142 p.) is "Insect orders" and presents an overview of the orders included in this book, plus some information on non-insect arthropods. This is the most traditional section of the book, providing the appearance, diet and habitat, life cycle, and defense. However, this section contains some unusual features such as the "Don't confuse..." sections, which point out other insects that might be erroneously confused with each insect order. In the dragonfly and damselfly section (Odonata), for example, the author tells how to distinguish them from lacewings (Neuroptera). Personally, I think antlions should have been mentioned here, too, but Neuroptera is separated so it is not really a problem. Also found here are sections devoted to the importance of the insects as pests or beneficials ("Goodie or baddie?"), the ease of rearing the insects ("Future fido?"), and unusual aspects ("Fascinating facts"). Each section ends with both printed and online references so you can learn more about the taxon.

The book ends with a short glossary, pronunciation guide, bibliography, further reading, and an index. The further reading section rates the further reading books (a 1 to 3 beetle ranking!) based on difficulty of use.

In a somewhat unusual approach for an identification guide, Michelle Gleeson does not include all orders (she includes 18) in her treatment. She leaves out the small, rare, and aquatic groups, and the entognathans (six-legged arthropods no longer considered by most to

be insects, namely, proturans, diplurans, and collembolans). Normally, these taxa receive at least cursory treatment. However, these deletions seem warranted. After all, how often do we stumble across a webspinner or a scorpionfly? Some might argue about not including the aquatic groups. Although Australia is well known for its xeric environment, it is not without significant water features, especially in eastern Australia. For anyone living near fresh water, adults of the aquatic groups might be of interest. As it turns out, many aquatic insects are, in fact, included in the book—but the orders containing exclusively aquatic species are not specifically described.

Michelle Gleeson has written a very useful tome that will assist many Australians with basic identification of insects they find about the home and garden. She rather uniquely provides informational aids based on insect appearance, habitat, and activities along with traditional morphology-based order recognition. And, of course, once an order determination is made, information on pest status, rearing potential, and fun facts are available. Although the numerous other field guides and identification manuals (e.g., Borror & White 1970; Arnett & Jacques 1981; Milne & Milne 1996; Eaton & Kaufman 2007; Evans 2007 are well-known American guides) have their attributes, including more information or superb photographs, they are focused entirely on insect morphology.

Although this guide will undoubtedly be helpful for Australians, a reasonable question might be to ask if this identification guide provides anything useful to others. Specifically, does it have utility outside Australia? Frankly, I was surprised when I started leafing through this book. I expected to find pictures of strange-looking, exotic insects. After all, this book is about Australia, where they have unusual and outlandish-looking animals! But I was incorrect. Almost without exception, the images provided were recognizable to family, and the characters given for higher-level identification were suitable for use in North and South America. When you consider that most people do not really need species-level identification, and factor in the value of having several different means to identify an insect, this manual should be valuable nearly anywhere. In particular, students who are struggling to make an insect collection for an introductory entomology course, and laboring with a dense dichotomous key, will find this book to be very helpful. I recommend that a copy be available to beginning students in their laboratory. I suspect that beginning instructors and teaching assistants will also find this book to provide a practical approach to identification, and therefore to be a handy reference.

Miniature Lives is printed on glossy paper, and the color photographs are quite high quality. It is worth more than the asking price.

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