



Insect Physiology and Biochemistry

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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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