

Gangwere, S. K. 2005. *Entomology*. First Page Publications, 12103 Merriman, Livonia MI, 48150 USA. 353 pp. Paperback. \$24.95. ISBN: 1-928623-26-3.

This general textbook of entomology is written out of the extensive experience of Stan Gangwere, now professor emeritus at Wayne State University, Detroit, Michigan. The author explains in a frontpage that his intention is to produce a book that can serve as an introduction to entomology for students in the biological sciences. I think this objective has been admirably accomplished. In 19 chapters the author covers external body structure, internal structure and physiology, metamorphosis, natural history and habits of insects, behavior, and, in two concluding chapters, taxonomy, systematics, and evolution of insects. There are many line drawings and an excellent 18-page glossary. The index appears to be thorough and accurate (some page numbers are in bold print and it is not entirely clear what this means, but maybe to indicate illustrations and/or definition of structure). The book concludes with a picture of the author and a brief biographical paragraph.

Chapter 1 is an excellent Introduction to the general features that characterize insects and set them apart from other arthropods. Chapter 2 details the external morphology of insects and provides names for body parts, appendages, wings and wing veins, sutures, mouthparts, and some muscles that move the appendages. Chapters 3-10 describe internal body structure and physiology. It was particularly enjoyable for me to read these 8 chapters because of my special interest in physiology. Professor Gangwere has an excellent knowledge of physiology, but I might quibble with a few statements that are not so much incorrect as perhaps not sufficiently detailed. On page 96 the explanation of repolarization of a neuron is not incorrect but it does not clearly state that the sodium-potassium pump is not actually necessary for immediate repolarization. The pump is necessary for long-term maintenance of proper ion distribution, which is required for nerve function, including repolarization. On page 115-116, the role of the proton ( $H^+$ ) ion pump in functioning of the Malpighian tubules is not mentioned. The proton

pump creates the ion distribution and electropotential necessary for the secretion of  $K^+$  (and ultimately the passive movement of water) into the Malpighian tubules. The role of pheromones gets only a short paragraph on page 228-229, and only sex pheromones are specifically mentioned as an example. The terms "allomones" and "kairomones" are not mentioned in the glossary nor are they referenced in the index. Overall, however, I found the chapters on internal anatomy and physiology to be accurate, albeit with somewhat abbreviated functional descriptions.

Chapter 11 is a very succinct 7+ pages on Metamorphosis. Insect natural history and insect habits are presented in chapters 12 and 13, respectively. Chapters 14, 15, 16, and 17 are grouped under the major heading of "Behavior," and cover feeding, locomotion, mating and reproduction, and aggregations and societies, respectively.

I found chapter 18 on Nomenclature, Taxonomy, and Systematics and Chapter 19 entitled Classification and Major Insect Groups very helpful. These are topics that often seem esoteric for physiologists like me, and others who have specialized in the biochemical and molecular biology of insects. These chapters will be very useful to the amateur collector of insects, for biologists whose major field is not entomology, and for young students in middle and high school who may find an interest in insect biology and identification of major groups. I recommend the book for an introductory class in entomology, and as an entomology refresher for those who may have taken an entomology course a long time ago. Amateurs and young students interested in insects and entomology will find the book very readable, understandable, and useful.

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