

Introduction

The world of insects (and other arthropods such as mites and spiders) is endlessly fascinating. Their complex behaviors and lives provide a window into the timeless dance of biodiversity in the world around us. In some cases, when these animals eat our crops or spread diseases, our understanding of their complex behaviors and lives can help us develop targeted tools that we can use to manage their populations. The field of entomology is unique among scientific disciplines in that it integrates knowledge across biological levels, from genomes to ecosystems, and readily adopts techniques and approaches from other fields, including chemistry and engineering, and often informs them. Entomology seeks to answer fundamental and long-standing questions in biology while creating strategies to tackle some of the most complex and emerging challenges of our time.

As a teenager, Charles Darwin once lamented, “I am dying by inches, from not having anybody to talk to about insects.” If only he had been able to read the *Annual Review of Entomology*! This journal, first published in 1956, provides an amazing forum for entomologists to share their expertise and perspectives from across this dynamic and vibrant field. Each article, and each volume, is a gift, and with the change to open access, these gifts are now available to all, including teenagers desperate to learn more about insects. Moreover, our partner, *Knowable Magazine*, produces in-depth articles, interviews, graphics, and comics to make the science in articles in Annual Reviews journals accessible to everyone.

Volume 69 of *Annual Review of Entomology* takes us across the world and across time. We consider how complex behaviors evolve and are regulated in “The Biology and Social Life of Earwigs (Dermaptera)” (Meunier) and “The Evolutionary Importance of Intraspecific Variation in Sexual Communication Signals Across Sensory Modalities” (Groot et al.). We learn about strategies to cope with complex environments in “Adaption and Survival of Marine-Associated Spiders (Araneae)” (Leggett et al.) and “Mechanisms of Systemic Osmoregulation in Insects” (Halberg & Denholm). We examine cross-species interactions in “150 Years of Coevolution Research: Evolution and Ecology of Yucca Moths (Prodoxidae) and Their Hosts” (Smith & Leebens-Mack) and “Host Plant Effects on Sexual Selection Dynamics in Phytophagous Insects” (Jarrett & Miller). Several articles explore cross-species interactions between insect hosts and their symbionts, including “The Hidden Secrets of Psylloidea: Biology, Behavior, Symbionts, and Ecology” (Mauck et al.), “Insect Bacteriocytes: Adaptation, Development, and Evolution” (Luan), and “Toward an Integrated Understanding of the Lepidoptera Microbiome” (Shao et al.).

A deep understanding of insect biology can lead to novel methods for management. Such approaches are explored in “Chemical Ecology and Management of Dengue

Vectors” (Torto & Tchouassi) and “How Nutrients Mediate the Impacts of Global Change on Locust Outbreaks” (Cease). Several articles provide an in-depth discussion of the biology, ecology, and management of pest insects, including pests of crops and forests, and vectors of disease. For those are being tormented by emerald ash borer beetles (Sun et al.), the potato psyllid (Wenninger & Rashed), flea beetles (Li et al.), palm weevils (Hoddle et al.), elaterids (Rashed & van Herk), mirids (Lu et al.), Bactrocera (Zhao et al.), fruit flies (Papadopoulos et al.), mosquitos (Zhao & Xue), or whiteflies (Morin et al.), this volume of the *Annual Review of Entomology* has answers for you! Rust et al. also discuss the history of and opportunities in urban entomology. As more and more humans live in cities, this field is likely to become more prominent.

Insects are also vital to the health and productivity of our agricultural systems and are essential for terrestrial biodiversity. Bees, as key pollinators of flowering plants, are featured in “The Extraordinary Alkali Bee, *Nomia melanderi* (Halictidae), the World’s Only Intensively Managed Ground-Nesting Bee” (Cane) and “Ecology and Management of African Honey Bees (*Apis mellifera* L.)” (Frazier et al.). Threats posed by our agricultural systems to bees are discussed in “Pesticide Exposure and Effects on Non-*Apis* Bees” (Raine & Rundlöf). In “Dietary and Therapeutic Benefits of Edible Insects: A Global Perspective,” Tanga & Ekesi summarize the growing industry using insects for human and animal food.

In Volume 65 of the *Annual Review of Entomology*, David L. Wagner’s “Insect Declines in the Anthropocene” (1) highlighted the dramatic declines in populations of insects that are being reported across the world. This review has been cited, thus far, more than 800 times, and stories of insect declines are now common in the public news. In this volume, Lövei & Ferrante discuss “The Use and Prospects of Nonlethal Methods in Entomology,” which provides a framework for considering how to monitor insects without harming them and to potentially scale up these approaches to allow for extensive monitoring at the high spatial and temporal resolutions needed to make management and conservation decisions. Developing strategies to allow for this extensive monitoring will require partnerships with scientists from the fields of computer science, engineering, and artificial intelligence—partnerships that entomologists, with their wide-ranging curiosity, integrative mind set, and breadth of expertise, are well positioned to create.

Christina M. Grozinger
Co-Editor

LITERATURE CITED

1. Wagner DL. 2019. Insect declines in the Anthropocene. *Annu. Rev. Entomol.* 65:457–80