

HARDIE, J., AND A. K. MINKS (eds.). 1999. Pheromones of Non-Lepidopteran Insects Associated with Agricultural Plants. CABI Publishing, Wallingford, Oxon, UK. Hardback, ISBN 0-85199-345-1. \$140.

A compilation of pheromone work on insects other than Lepidoptera has been overdue, and this book, edited by Hardie and Minks, is an excellent and needed addition to pheromone literature. There are 17 chapters on pests and beneficial insects. The 13 chapters on pest insects tend to be organized along taxonomic lines, although the beetles get 5 of the 13 chapters. Included are chapters on tephritid fruit flies, gall midges, scarab beetles, sap beetles, weevils, forest beetles, stored-product beetles, sawflies and seed wasps, aphids, scale insects, phytophagous bugs, grasshoppers and locusts, and termites. There follow 4 chapters on beneficial insects organized along ecological lines, including a chapter each on predators, parasitoids, parasitoid hosts, and bees. Species and subjects are indexed separately. In addition to the obvious use of the subject index, it is useful if one wants to know which insects produce a particular semiochemical, or which insects respond behaviorally to a chemical. For example, one can easily determine that  $\alpha$ -pinene is a semiochemical responded to, or produced by, numerous insects, as detailed from page 10 to page 342. Numerous trap types are described and indexed. In the subject index, a chemical compound is indexed by the first letter of its chemical name, but preceded by designations of chirality or numbers indicating positions of double bonds. For example, (*Z*)-7,15-hexadecadien-4-olide is indexed with other topics beginning with "h". There are many illustrations of chemical structures, and numerous black and white photos of insects, tables, and graphic figures.

The specialists who have written the chapters in this book have provided a valuable service, not

only in summarizing and interpreting the chemical, ecological, and behavioral information on a particular group of insects, but also in collating an extraordinarily vast pheromone literature. Thus, a wide audience is likely to find the book useful. Each chapter ends with an extensive bibliography, providing the student or specialist an easy way to get into the literature. Students and young scientists will find the book invaluable as an introduction to chemical ecology or a potential research problem. There are brief discussions of the practical applications of pheromones in most chapters, but it is not a "how to use pheromones" book. Nevertheless, it should help crop and plant protection consultants to integrate selected use of pheromones into their management strategies. Teachers of insect chemical ecology and pheromone physiology will find a wealth of information to illustrate both the diversity of insect chemical ecology, and the evolutionary theme that pervades all of biology. The book is indispensable for pheromone research.

The book comprises 466 pages printed on high quality paper with easily read print, and the heavy hard cover has interesting photos of pentatomid bugs that are 3-dimensionally layered in different sizes and at different depths. This is a beautiful book that provides much valuable information.

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