BOOK REVIEW

GOLDSMITH, M. R. AND A. S. WILKINS. (eds.) Molecular Model Systems in the Lepidoptera. Cambridge University Press, New York, xii + 542 p. ISBN 0-521-40249-2. Hardback. $125.00.

Yes, molecular genetics research *is* conducted on insects other than *Drosophila melanogaster*! The stated aim of this book is to provide readers with a review of molecular research in Lepidoptera and to convince readers that Lepidoptera can serve as important model systems. The chapters cover topics as diverse as silkworm genetics; transposable elements of Lepidoptera; lepidopteran molecular phylogeny, embryogenesis, and development; chorion gene regulation and evolution; silk protein gene regulation in the silk gland; hormone action on the central nervous system; the molecular genetics of moth olfaction and the immune response; and, the use of baculoviruses for insect pest control. This book contains a wonderfully rich body of fundamental information and provides an entre to an extensive literature. As such, it is a welcome addition to the growing list of books providing information on insect molecular genetics and molecular biology.

The editors and authors are experts and have produced a well-written and illustrated volume of value to entomologists looking for molecular arthropod models other than the ubiquitous fruit fly, *Drosophila melanogaster*. Ninety-three pages of references provide access to much of the relevant literature. This book is an excellent review of lepidopteran molecular genetics and could serve as supplementary reading in courses on insect molecular genetics. It was not intended, and is not suitable, for an introductory text on insect molecular genetics. This book reminds us that *D. melanogaster* is a very specialized insect, and a full understanding of insect genetics and evolution requires comparative studies using other species.

The Lepidoptera contain species of great economic importance and esthetic value, as well as providing species sufficiently large to be particularly amenable to physiological, behavioral, genetic, and ecological studies. Using *Bombyx mori*, *Ephestia*, *Manduca sexta*, *Antheraea pernyi*, and *Hyalophora cecropia*, fundamental advances have been made in insect genetics, endocrinology, and biochemistry. The 16 chapters provide: a history of Lepidoptera as model systems (J. H. Willis, A. S. Wilkins and M. R. Goldsmith), an overview of silkworm genetics (M. R. Goldsmith), a review of mobile elements of Lepidoptera (T. H. Eickbush), a review of phylogeny and comparative development (J. C. Regier, T. Friedlander, R. F. Leclerc, C. Mitter and B. M. Wiegmann), a summary of embryogenesis and experimental embryology (L. M. Nagy), a discussion of homeotic genes in *Bombyx* development (K. Ueno, T. Nagata and Y. Suzuki), an overview of structure, function, and regulation of chorion genes (F. C. Kafatos, G. Tzertzinis, N. A. Spoerel and H. T. Nguyen), molecular models of chorion gene evolution (T. H. Eickbush and J. A. Izzo), a review of silk protein gene regulation and homeobox genes in silk gland development (C. Hui and Y. Suzuki), an analysis of the control of transcription of *B. mori* RNA polymerase III (K. U. Sprague), a review of hormonal regulation of gene expression during development (L. M. Riddiford), a review of the impact of hormones on the central nervous system (J. W. Truman), an overview of the molecular genetics of moth olfaction (R. G. Vogt), an analysis of the molecular biology of the immune response (A. B. Mulnix and P. E. Dunn), a discussion of engineered baculoviruses as tools for understanding development and physiology and as potential agents for pest control (K. Iatrou), and an epilogue containing a summary of the unresolved issues and prospects for Lepidoptera as model systems (A. S. Wilkins and M. R. Goldsmith).

Wilkins and Goldsmith point out that the Lepidoptera have several nearly unique features and phenomena that make them novel and intrinsically interesting (e. g., elaborate wing patterns; silk production with its specialized translational apparatus; and pheromone production and response, with the possibility of integrating behavior, molecular, neurological and evolutionary aspects of moth pheromone utilization). Furthermore, certain lepidopteran species are exceptional models for more general phenomena, especially hormonal changes associated with metamorphosis and the construction of the insect chorion. Hemolymph and cuticular proteins, and endocrinology can be studied easily in Lepidoptera because the model insects are relatively large and comparatively slow in their developmental rate, thereby facilitating experimentation.

The Lepidoptera are also important in comparative analyses of important developmental processes. *B. mori* has been shown to have an unusual development which is distinctly different from the classic long germ band mode of development found in *D. melanogaster.* The homeotic genes and segmentation of *B. mori* are organized and expressed differently, and their chorion genes are regulated differently. Thus, the Lepidoptera are valuable in comparative studies of insect genome structure and evolution. Novel families of proteins are involved in immune responses in the Lepidoptera, and these may even have relevance to understanding vertebrate immune systems. The editors conclude that the limitations to further progress in molecular biology of the Lepidoptera include the lack of conventional genetics and molecular maps, as well as a reliable and efficient genetic transformation system for genetic manipulation.

This book should stimulate a new generation of molecular entomologists to consider the virtues and limitations of lepidopteran species as model systems for analysis of the molecular biology and genetics of insects.

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