

Preface

A major challenge in current entomology is to integrate different levels of organization, from cellular mechanism to function in ecosystem. In the postgenomic era of the 21st century various fields of study have become possible, which use the information of fully sequenced insect genomes (<https://www.hgsc.bcm.edu/arthropods/i5k-pilot-project-summary>). However, the rapid development of molecular techniques for studying gene functions will revolutionize entomology not only for the insect model organisms, but in general. The majority of these techniques can also be applied if only partial sequence information is available. With these tools, entomologists are able to answer questions in insect biochemistry, physiology, and endocrinology, but also illuminate very complex behavioral and ecological aspects.

When I edited a book on "Environmental Physiology and Biochemistry of Insects" in 1985 for the Springer-Verlag, Berlin, mechanisms of environmental adaptation in growth and development, energy metabolism, or respiration to temperature, oxygen tension, food supply or salt concentrations were in the focus of interest. It was at the time of "Physiological Ecology". About 30 years later, the omics era gives us the opportunity to gain deeper insight into different aspects of insect physiology and environmental adaptation, for example, by overexpression or silencing of candidate genes of interest. When we understand, how physiological processes are regulated and at what time, we will be able to manipulate them, hereby providing attractive potential for practical application, for example, in an ecologically friendly insect pest control.

In 2008, we started with a Master program in "Molecular Ecology" at our University of Bayreuth, which has become very successful during the last 6 years. The Master's program was designed to play a special role in the synergistic cross-linking of the two focal points at our University, "Ecology and Environmental Sciences" and "Molecular Biosciences". The focus of interest is the functions of organisms—and especially of insects—in their environment and the analysis of (bio)chemical interactions in complex ecosystems. "Molecular" should mean not only to study the

function of macromolecular compounds such as proteins and nucleic acids, but to analyze also the structure and capacity of low molecular weight substances like signal molecules, toxins or drugs. This Master program inspired me to edit the present book on *Insect Molecular Biology and Ecology*.

The book provides a mix of topical review articles and current research work. In several chapters previously unpublished data are presented showing novel applications for the use of omics technologies in the postgenomic era. The book should prove useful not only to researchers of the *Insecta*, but also to teachers and graduate students who are interested in understanding the molecular basis of insect functioning in their natural environment.

I acknowledge the support received from the authors who accepted the invitation to write an article on their area of expertise and for delivering the manuscripts in due time. Any success this book may achieve has to be attributed to their efforts.

Bayreuth, July 17, 2014