

# Preface

“Yellow Biotechnology” has been introduced an alternative term for insect biotechnology, which is an emerging field in applied entomology. As a complement to Part I, which focuses on the use of insects in drug discovery and preclinical research, Part II considers the applications of insect biotechnology in industrial and food biotechnology, and in modern approaches that allow the sustainable protection of plants.

Industrial (white) biotechnology concerns the biotransformation of raw materials into potentially useful industrial products, predominantly by using microbes and/or enzymes. The industrial and food biotechnology toolbox is now expanding to include novel insect-derived enzymes, such as chitinases and cellulases. The first three chapters of this volume, therefore, cover the use of insect enzymes in food biotechnology and for the conversion of biomass. The deployment of insect enzymes in these fields requires platforms for the large-scale production of recombinant insect proteins. “[Optimization of Insect Cell-Based Protein Production Processes:Online Monitoring, Expression Systems, Scale Up](#)”, therefore, discusses recent developments in the optimization of heterologous production systems based on insect cells.

Insect biotechnology has been defined as the use of biotechnology to develop insects (or their molecules, cells, organs or associated microorganisms) into products and services for specific applications in medicine, plant protection and industry. “[Insect Antenna-Based Biosensors for In Situ Detection of Volatiles](#)” provides an intriguing example of applications involving isolated insect organs, namely the use of individual antennae to develop novel biosensors for the in situ detection of volatiles. Such biosensors can now be used to optimize the application of pheromones in plant protection strategies, and are also being developed for the sensitive detection of drugs and explosives at airports.

Insects that feed on crops or stored products are still the most important competitors for human nutrition, and insects that transmit infectious diseases such as malaria threaten human health on a global scale. Insect biotechnology therefore seeks to explore novel and sustainable strategies to control pest and vector insects, including the development of transgenic plants expressing defense proteins or metabolites, RNAi-based approaches and the sterile male technique. The last four chapters of Part II provide insight into the most recent developments in these areas.



The authors of this volume are members or associates of the first German research program on Insect Biotechnology. The research is funded by the Hessen State Ministry of Higher Education, Research and the Arts via the excellence program LOEWE, is hosted by the Justus-Liebig University of Giessen, and is coordinated by the editor of this book. The generous funding under this program allowed a new department to be established within the Fraunhofer Institute for Molecular Biology and Applied Ecology, focusing on the application of insect biotechnology in projects that are jointly supported by industrial partners such as Dow AgroSciences. The latter contributed to this volume with a chapter discussing transgenic approaches for the control of the western corn rootworm. The growing academic and industrial interest in the biotechnology of insects motivated the editor of this volume to assemble the first treatise on Yellow Biotechnology, which was published in the Springer book series *Advances in Biochemical Engineering and Biotechnology*. Part II now takes the reader further by investigating selected frontiers of insect biotechnology in the fields of industry and plant protection.

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