

Book Reviews, Details

[[Main Page](#)]

Review by Dr. Pritam Singh:

Principles and Procedures for Rearing High Quality Insects, John C. Schneider (ed.)
(2009, Mississippi State University, 352 pp.)

Every insect rearing facility, small or large, will benefit from *Principles and Procedures for Rearing High Quality Insects*. It has covered all aspects of rearing. This is a manual for every insect rearing practitioner in the 21st century. The authors and editor are to be congratulated for its accuracy, in-depth coverage of content and high production quality.

Insect rearing is an ancient science. Three industries, based on insects, have employed thousands of people. For example, silk production from *Bombyx mori* in China dates back 7,000 years; the lac insect, *Laccifer lacca* formed the basis of the shellac industry in India for several thousand years; and production of honey from *Apis mellifera* has been mentioned in the Bible and ancient Egyptian scripts. In the twentieth century, the era of contemporary rearing began when Bogdanow from Russia in 1908 reared a blowfly, *Calliphora vomitoria*, on an artificial diet. Since then, many species have been produced in millions: screwworm, *Cochliomyia hominivorax*; boll weevil, *Anthonomous grandis*; boll worm complex, *Heliothis* spp.; pink bollworm, *Pectinophora gossypiella*; codling moth, *Cydia pomonella*; cabbage looper, *Trichoplusia ni*; several species of tropical fruit flies, house fly; mosquitoes; crickets; mealworms; and several species of parasites, to mention a few. However, in spite of these successes, there was no degree or training program available in insect rearing until the 21 century.

A formal workshop "Principles and Procedures for Rearing High Quality Insects" was first held in September 2000 at the Insect Rearing Center in the Department of Entomology & Plant Pathology at the Mississippi State University under the leadership of Dr. Frank M. Davis. All the contributors have been tutoring at the workshop since its inception and are leading authorities in their respective fields.

This book is the result of this landmark training program. There are 11 chapters in the book starting with "Introduction" by Norman C. Leppla, Frank M. Davis and John C. Schneider; "Insectary Design and Construction" by William R. Fisher; "The Insectary Manager" by William R. Fisher; "Health and Safety Issues in Rearing Arthropods" by John R. Reinecke; "Genetic Considerations and Strategies for Rearing High Quality Insects" by Michael A. Caprio; "Environmental Biology of Insect Rearing" by John C. Schneider; "Insect Nutrition, Feeding, and Artificial Diets" by Muhammad F. Chaudhury; "Microbial Contamination and Insect Rearing" by Douglas Inglis and Peter P. Sikorowski; "Entomopathogens and Insect Rearing" by Douglas Inglis and Peter P. Sikorowski; "The Basics of Quality Control for Insect Rearing" by Norman C. Leppla; and "Insect Rearing Production Systems, A Case Study: The Southwestern Corn Borer" by Frank M. Davis.

The book has over 200 illustrations and includes an 18-page cross referenced index. This book provides an in-depth presentation of every primary element comprising professional insect rearing programs. Its scope includes the entire range of insect rearing but focuses on medium-scale rearing on artificial diets. By applying the principles and procedures discussed here, one can establish new rearing programs or improve those that already exist. In addition, procedures are presented to prevent, diagnose and solve many of the problems that may arise time to time in insect rearing.

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Editor's note: Dr. Singh is a true pioneer of insect rearing and is arguably the person most responsible for promoting the movement from in vivo to in vitro rearing. He is well known internationally for his development of artificial diets, rearing management systems, and for his many publications including the following landmark books: *Artificial Diets for Insects, Mites, and Spiders* (1977, Plenum Publishing, 594 pp.) and *Handbook of Insect Rearing, Vol. I and Vol. II* (1985, co-edited with R. F. Moore, Elsevier Science Publishing, 488 and 514 pp.).

Review by Dr. J. Howard Frank (The Florida Entomologist):

Principles and Procedures for Rearing High Quality Insects, John C. Schneider (ed.)
(2009, Mississippi State University, 352 pp.)

The last book to cover this subject area thoroughly was Singh & Moore (eds.) 1985, *Handbook of insect rearing*. Now out of print, that book had been the standard for a quarter century. This new book, in large format (8.5 x 11), is carefully integrated to cover all aspects of rearing, and is a worthy successor. Not only that, but it provides excellent value, with printing costs subsidized by a contribution from BASF Corporation.

The concentration of this book is on medium-scale rearing using artificial diets, but it is relevant also to industrial-scale rearing and even to trouble-shooting in small-scale (tabletop) rearing. It has 11 chapters followed by an 18-page index, and it has nine contributors, 10 of them based in the USA, one a USDA employee based in Panama. Chapter 1 is a short Introduction explaining the diverse needs for reared insects, and the taxonomic diversity of reared insects (a 1987 publication claimed 676 species reared in more than 1500 cultures worldwide).

Chapter 2 is about insectary design and construction and, like so many other chapters, is essential reading. Among its many examples is that of the large-scale facility constructed near Tuxtla Gutierrez, Chiapas, Mexico, in the 1970s to rear billions of screwworm flies. Chapter 3 concerns management of an insectary, the need for planning and organization, and personnel management. Chapter 4 covers issues of the health and safety of workers in an insectary, with all the hazards that occur in other factories, but also with consideration of hazards special to insectaries: allergens and pathogens.

Of course insects reared under artificial conditions will be placed under selection pressure to adapt, and of course this is a concern. Chapter 5 considers the genetics of reared insects and how the genetic quality of reared populations may be managed. Chapter 6 is titled 'Environmental biology of insect rearing' and deals of course with aspects of the environment (light, temperature, and humidity) within the insectary and how these must be regulated for the well-being of the insect occupants. It is peppered with 23 text boxes, each containing a helpful tip from the experience of the author. This chapter and its tips are helpful even to very small-scale rearing efforts outside rooms that might formally be designated insectaries.

Chapter 7 on insect nutrition, feeding, and diets, is arguably the very core of the book. Perhaps a whole book could be written on this topic alone (menus for reared insects), but this chapter does not have the space to deal with more than generalities. Although the chapter leads toward the use of artificial diets for their economy in large-scale rearing, it must be noted that artificial diets for several insects are now available commercially for purchase. Also, for those persons wishing to develop a new artificial diet, some of the basic ingredients can be purchased ready prepared, such as Wesson salt mixture, and Vanderzant vitamin mixture.

Chapters 8 and 9 together occupy 140 pages, almost 40% of the book. They are on microbial contamination and insect rearing, and entomopathogens and insect rearing. As anyone who has tried to rear insects knows, pathogens can have a disastrous effect on an insect culture. What are these pathogens? How does contamination occur and how can it be minimized? How do diets get contaminated and how can this be minimized? What is the interplay between the human employees, the insect diets, and the insect cultures in fostering contamination, and which pathogens are dangerous to humans?

Although Chapter 3 already dealt with management of insectaries, Chapter 10 takes a hard look at quality control of their product. The insects produced obviously must be healthy and fit for their stated purpose. They must also be produced on time and in the planned quantity. Monitoring and testing obviously are required as in other industrial processes. Optimization is the key word. The chapter again mentions the screwworm rearing facility at Tuxtla Gutierrez, but also one for production of Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann) (Diptera: Tephritidae) at Metapa de Dominguez, Chiapas, Mexico, which was constructed in 1979 and likewise has produced billions of flies.

The final chapter (11) takes a detailed look at a rearing production system for the southwestern corn borer, *Diatraea grandiosella* Dyar (Lepidoptera: Crambidae) at Mississippi State and touches on all the subjects (relevant to it) that appeared in the preceding chapters (relevant to insect rearing in general). This book is not something that any entomologist might pick up and skim just for pleasure, but it is something that any entomologist who gets serious about rearing insects should own and become familiar with.

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Editor's Note: Dr. Frank is Book Review Editor for *The Florida Entomologist*, a position he has held for ca. 20 years. Trained as an insect ecologist, he has developed a successful biological control program against *Scapteriscus* mole crickets in Florida and has published extensively on bromeliad/insect interactions. The above is the text of his review, which he generously provided in advance of publication. A link will be provided to the published review, which is scheduled to appear in the June issue of *The Florida Entomologist*.

Review by Dr. José Roberto P. Parra:

Principles and Procedures for Rearing High Quality Insects, John C. Schneider (ed.)
(2009, Mississippi State University, 352 pp.)

This book edited by John Schneider, a Professor from Mississippi State University, and written by a team of outstanding collaborators, Frank M. Davis, Norman C. Leppla, Michael A. Caprio, Muhammad F. Chaudhury, William R. Fisher, G. Douglas Inglis, John P. Reinecke, John C. Schneider, and Peter Sikorowski, and published in 2009, was released 5 years after the last book on insect rearing (*Insect Diets: Science and Technology*, Cohen, A.C. CRS Press. 2004).

The book by Schneider and collaborators was prepared like a puzzle where the pieces are connected in order to organize an insect rearing system, according to the practical and commercial point of view. This puzzle can be assembled when each individual piece - Facilities and Management, Environmental Biology, Nutrition and Diets, Pathogens Management, Health and Security, Production Systems, Population Genetics and Quality Control - which correspond to individual chapters, is take all together into consideration. Differently from other books that discuss these issues separately, all chapters of the book from Schneider are interconnected. Chapters are clearly discussed as they are taught in a short Course organized by Frank Davis every year at the Mississippi State University, since 2000. More than 280 students and professionals from 22 countries have attended the Course during this period.

The book brings a highly scientific content in the 370 pages available, which demonstrate how to rear an insect using advanced technologies. A case study is discussed with *Diatraea grandiosella*, a serious pest of corn in the Mississippi area, using the sequential connection and the relationship among the book chapters (last chapter). This is an excellent book and must be in the shelves of professionals and students dedicating their work on "insect nutrition and rearing techniques.

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Editor's Note: Dr. Parra has been an entomologist at the University of Sao Paulo since 1974. He served as Dean of the College of Agriculture at that institution during the period 2003-2006.

He has received several awards including the Frederico de Menezes Veiga award granted by EMBRAPA and the National Order of Scientific Merit and Scientific and Technological Merit Medal granted by the Government of the State of São Paulo. He is member of the Brazilian Academy of Sciences and is currently serving as a Vice-President of the International Organization of Biological Control (IOBC).

Review by Dr. Jeffrey A. Harvey (Entomologische Berichten):
Principles and Procedures for Rearing High Quality Insects, John C. Schneider (ed.)
(2009, Mississippi State University, 352 pp.)

(See review starting on following page.)

Editor's Note: Dr. Harvey is a Senior Scientist in the Department of Multitrophic Interactions at the [Netherlands Institute of Ecology](#) and was formerly an associate editor of [Nature](#).

Uitgelezen

Heiko Bellmann 2010

Des Kosmos Spinnenführer

Franckh-Kosmos Verlags-GmbH & Co. KG, Stuttgart. 429 pp. ISBN: 978-3-440-10114-8. € 27,- (bespreking eerder verschenen in het tijdschrift Natuur.focus)

Enkele jaren na de herdruk van 'Kosmos Atlas Spinnentiere Europas' (Bellmann 1997, met een herdruk in 2006) komt de gerenommeerde Duitse entomoloog/fotograaf Heiko Bellmann met een opvolger van zijn schitterende fotoboek. De foto's van Bellmann vormen voor mij een goede ondersteuning bij determinaties en waarnemingencontrole als spinnen-admin bij onder andere de website Waarneming.be. De in zakformaat gedrukte fotogids met slappe kaft start met een uitklapkaart over huis- en tuinsoorten, een kleurenindex per spinnengroep, een leidraad om snel een familie op te sporen, en wat algemene informatie over spinnen vinden, vangen en fotograferen. De soortenteksten zijn makkelijk geschreven en zelfs met een basis-kennis van het Duits goed leesbaar.

Tegen de verwachtingen in vulde de auteur deze Kosmos Naturführer aan met tal van nieuwe plaatjes én nieuwe soorten in vergelijking met zijn vorige boek, terwijl in genera met goed gelijken de soorten juist flink werd gesnoeid. Anderzijds recupereerde hij tal van foto's, vaak in een 'opgekuiste' versie. Zonder gedetailleerde tekeningen van de secundaire geslachtsorganen, echter noodzakelijk voor een positieve identificatie van de meeste spinnensoorten (!), levert de auteur een praktisch bruikbaar fotoboek met een beschrijving van ca. 400 soorten. Na het schitterende 'Op Spinnensafari' van Koen Van Keer (Van Keer 2008) is dit een volgende praktisch bruikbare fotogids voor de natuurliefhebber die spinnen liever ten velde identificeert. Qua soortenoverzicht is de gids echter verre van volledig (ruim 4.700 soorten in Europa; Van Helsdingen 2010), maar als beginner kom je al een heel eind. Hiertoe kan men bijvoorbeeld ook terecht op de webstek van de Belgische Arachnologische Vereniging (www.arabel.ugent.be), waar naast een knappe spinnengalerij een overzicht van beschikbare spinnenliteratuur werd opgenomen. Ook onze Deense collega Jørgen Lissner bouwde een overzichtelijke spinnengalerij uit (www.jorgenlissner.dk/). De sterk vernieuwde en zeer uitgebreide webstek 'Spiders of Europe' (www.araneae.unibe.ch) daarentegen is wél een uitgekiend middel om tot op soortniveau te determineren, ondermeer met tal van vergelij-



kende tekeningen van mannelijke palpen en vrouwelijke epigynes, habitatpreferentie en een grafische weergave van de activiteitsperiode.

Een mooie aanvulling in vergelijking met 'Kosmos Atlas Spinnentiere Europas' zijn enkele foto's van Schizomida (kortstaartzweepschorpioenen), een voornamelijk (sub)tropische groep van zeer kleine spinachtigen, en Solifugae (rolspinnen of kameelspinnen), in Europa voornamelijk in steppegebieden en halfwoestijnen. De foto's van Bellmann zijn prachtig met enkele sterke staaltjes van zijn kunnen en geduld, zoals twee strijdende mannetjes *Myrmarachne formicaria* (bosmier-springspin), een frontaal zicht op *Pistius truncatus* (stompe krabspin), matrifagie bij *Theridion sisyphium* (kleine wigwamspin), parende *Scytodes thoracica* (getijgerde lijmspuiters) of ei-afzet van *Argiope bruennichi* (tijgerspin). De beelden van Heiko Bellmann laten zelfs de meest panische arachnofoob niet onberoerd. We wisten het al langer hoor... spinnen zijn de max!

Literatuur

- Bellmann H 1997 (herdruk 2006). Kosmos Atlas Spinnentiere Europas. Franckh-Kosmos Verlags-GmbH & Co.
Van Helsdingen PJ 2010. Araneae, database European spiders and their distribution - Version 2010.1. In: Fauna Europaea. [Geraadpleegd: 11 april 2011]
Van Keer K 2008. Op Spinnensafari. Manteau, Standaard Uitgeverij & Koen Van Keer.

Kevin Lambeets

John C. Schneider (ed) 2009

Principles and procedures for rearing high quality insects

Mississippi State University, Mississippi State. 370 pp. ISBN 978-0-615-31190-6. \$ 70,-

Insects represent among the most important organisms in both fundamental and applied research. For more than a century insects have been model subjects in the study of questions relating to a very broad array of topics in ecology, evolutionary biology and biological control. One of the main reasons for this is that many insects have very short life-cycles – in some species spanning less than 20 days between the neonate and the adult – and because large numbers of these small animals can be reared in the laboratory where they often require much less care and maintenance than large invertebrates or vertebrates.

In spite of this, lab-based cultures of insects often encounter problems that lead to periodic and dramatic declines in the numbers of the insects being reared, leading to inbreeding, genetic loading and in the worse case scenario loss of the species being studied. This can have serious repercussions on projects that may involve many researchers who are working on the same insect species, from students to senior scientists. Therefore, a comprehensive understanding of the proper techniques that optimize efficient rearing, thus reducing the risk of 'boom-bust' scenarios, should be a priority for any entomology department.

Until now, a comprehensive book examining practical approaches to the rearing and maintenance of insects has been hard to find. However, this knowledge gap has now been filled with the timely publication of the book 'Principles and procedures for rearing high quality insects'. This volume is sure to be of practical use for both students studying insects for the first time, to those who have years of expertise working with insect cultures. In particular, it provides an excellent framework for the maintenance of insect cultures, with no taxonomic bias.

The cover of the book shows the interlocking pieces of an 'insect rearing jigsaw puzzle', with each piece representing an integral part of the proper rearing methodology. Each of the following chapters covers one of the jigsaw pieces in detail, providing comprehensive discussion of proper insect rearing methodology. The reader is guided through an interwoven tapestry whereby the information provided in each chapter links with the content in the following chapter.

The first chapter provides a very broad overview of insect rearing in a historical

Principles and Procedures for Rearing High Quality Insects



JOHN C. SCHNEIDER, Editor

perspective, and concludes by discussing future prospects and challenges in the rearing of insects. This leads nicely into chapters examining optimal insectary design, management and safety. The latter provides insightful tips on ways in which, through proper sanitation and maintenance, the risk of pathogenic infection and spread can be minimized. Several following chapters explore the biological side of insect rearing. This includes the importance and means of maintaining high genetic diversity, and the ways in which seasonal inactivity (e.g. aestivation, diapause) can be recognized and, if necessary, broken. Given the constant threat posed to insect cultures by bacterial, viral and entomopathogenic contamination, chapters 8 and 9 also provide detailed information on the symptoms of different kinds of pathogens and their identification.

Other chapters cover a range of other highly relevant areas including the provisioning of suitable nutrition and the use of artificial diets for insect herbivores, as well as an overview of quality control (linking the topic covered in chapter one). The final chapter is very helpful in that it provides an example of an insect pest that is mass reared for experiments in biological control – the south-western corn borer. By referring to this chapter, the reader can use it as a handy guide to the proper rearing of insects in their own culture.

Overall, this book is an outstanding addition to any entomological library and will certainly be appreciated by those working with on insects for small-scale experiments as well as by larger laboratories rearing insects in enormous numbers. As an entomologist who during my

career has worked with more than 40 species of parasitoid wasps and their hosts, and has reared their various hosts on both plant and artificial diets, this book is a treasure chest that provides both deep insight and invaluable tips for proper insect rearing and maintenance. If I had one minor quibble that would be to suggest that the book could have been illustrated better, on the old maxim that 'a picture is worth a thousand words'. However, this is a pedantic point. Overall, I highly recommend this book as a guide to insect rearing.

Jeffrey A. Harvey

Nico van Straalen 2010

Rennen met een zwarte dame, evolutiebiologie in het dagelijks leven

N.M. van Stralen, Amsterdam. 190 pp.
ISBN 978-90-815982-1-7. € 9,50

Over dit boekje kan ik eigenlijk heel kort zijn: het gaat niet over insecten, maar over mensen. Ik zou hier dus kunnen stoppen, maar dat zou een beetje flauw zijn.

In 89 korte verhaaltjes van steeds twee pagina's worden aspecten van de menselijke biologie, vooral gedrag, evolutionair geduid. Daarbij worden vaak vergelijkingen getrokken met andere dieren, en heel soms is dat een geleedpotige (1x mijt, 3x pissebed, 1x garnaal, 1x sluipwesp, 1x fruitvlieg; het woord 'kevertjes' komt ook een keer voor). Regelmatig krijgen we een inkijkje in het dagelijks leven aan de VU, waarbij echt bestaande en bij ons niet onbekende personages ten tonele verschijnen. De verhaaltjes lezen

lekker en leggen heel wat moeilijke biologische problemen in zeer begrijpelijke taal uit. Dat moest ook wel, want de meeste verhaaltjes zijn eerder als columns in regionale dagbladen verschenen. De zwarte dame is afgeleid van de 'red queen' uit Alice in Wonderland, die moest blijven rennen om op dezelfde plaats te blijven. In de evolutiebiologie wordt ze vaak als analogie gebruikt om aan te geven dat stilstand achteruitgang is. Soorten moeten zich constant aan veranderende omstandigheden blijven aanpassen, anders verdwijnen ze. De mens denkt vaak dat hij zich buiten deze evolutionaire wedloop heeft geplaatst, maar is er toch op zijn minst een product van. Dat kun je door de ogen van Nico van Straalen nog aan heel wat dingen zien.

Het is een prima leesbaar boek van een voormalige columnist van Entomologische Berichten en te bestellen bij de auteur zelf via nico.van.straalen@falw.vu.nl.

Peter Koomen



Nico van Straalen

Chapters and Authors (Click for the full [Table of Contents](#) and [Author Affiliations](#).)

- 1 **Introduction** NORMAN C. LEPPLA, FRANK M. DAVIS & JOHN C. SCHNEIDER
- 2 **Insectary Design and Construction** WILLIAM R. FISHER
- 3 **The Insectary Manager** WILLIAM R. FISHER
- 4 **Health and Safety Issues in Rearing Arthropods** JOHN P. REINECKE
- 5 **Genetic Considerations and Strategies for Rearing High Quality Insects** MICHAEL A. CAPRIO
- 6 **Environmental Biology of Insect Rearing** JOHN C. SCHNEIDER
- 7 **Insect Nutrition, Feeding, and Artificial Diets** MUHAMMAD F. CHAUDHURY
- 8 **Microbial Contamination and Insect Rearing** G DOUGLAS INGLIS & PETER P. SIKOROWSKI
- 9 **Entomopathogens and Insect Rearing** G. DOUGLAS INGLIS & PETER P. SIKOROWSKI
- 10 **The Basics of Quality Control for Insect Rearing** NORMAN C. LEPPLA
- 11 **Insect Rearing Production Systems, A Case Study: The Southwestern Corn Borer** FRANK M. DAVIS

Additional Information including Ordering

The book is 8.5x11" (21x28 cm) and contains 370 pages printed on 70-lb, coated, matte-finish paper. There are 203 illustrations of which 25 are printed using a 4-color process. An 18-page (ca. 1300 entries) and extensively cross referenced index is provided. The book is hardcover with a laminated, 4-color surface. The binding is Smyth-sewn for durability and flat opening. It was printed and bound by Thomson-Shore, Inc. located in Dexter, MI.

A generous contribution by BASF Corporation toward printing this book is gratefully acknowledged. All proceeds from sales of the book will be used to support the Insect Rearing Center at Mississippi State University. [Click for ordering information.](#)