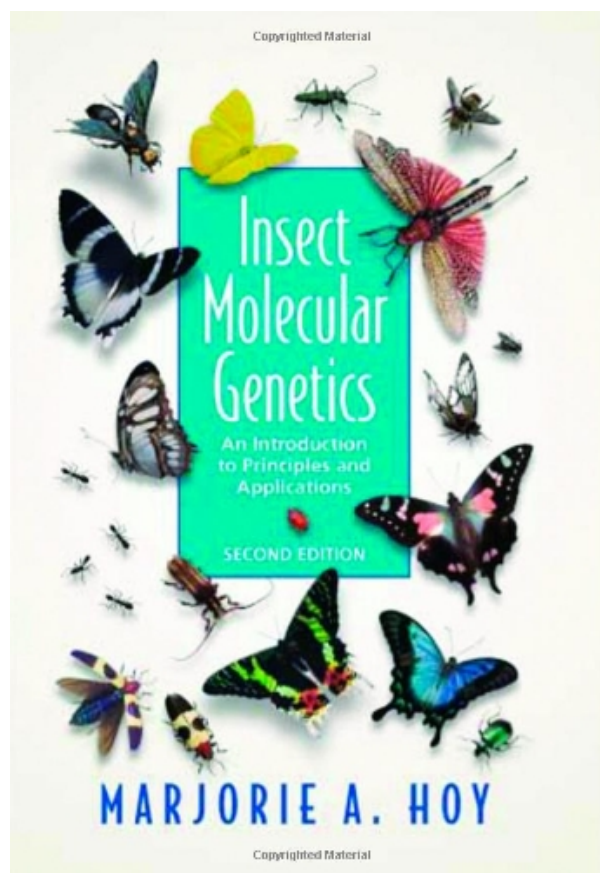
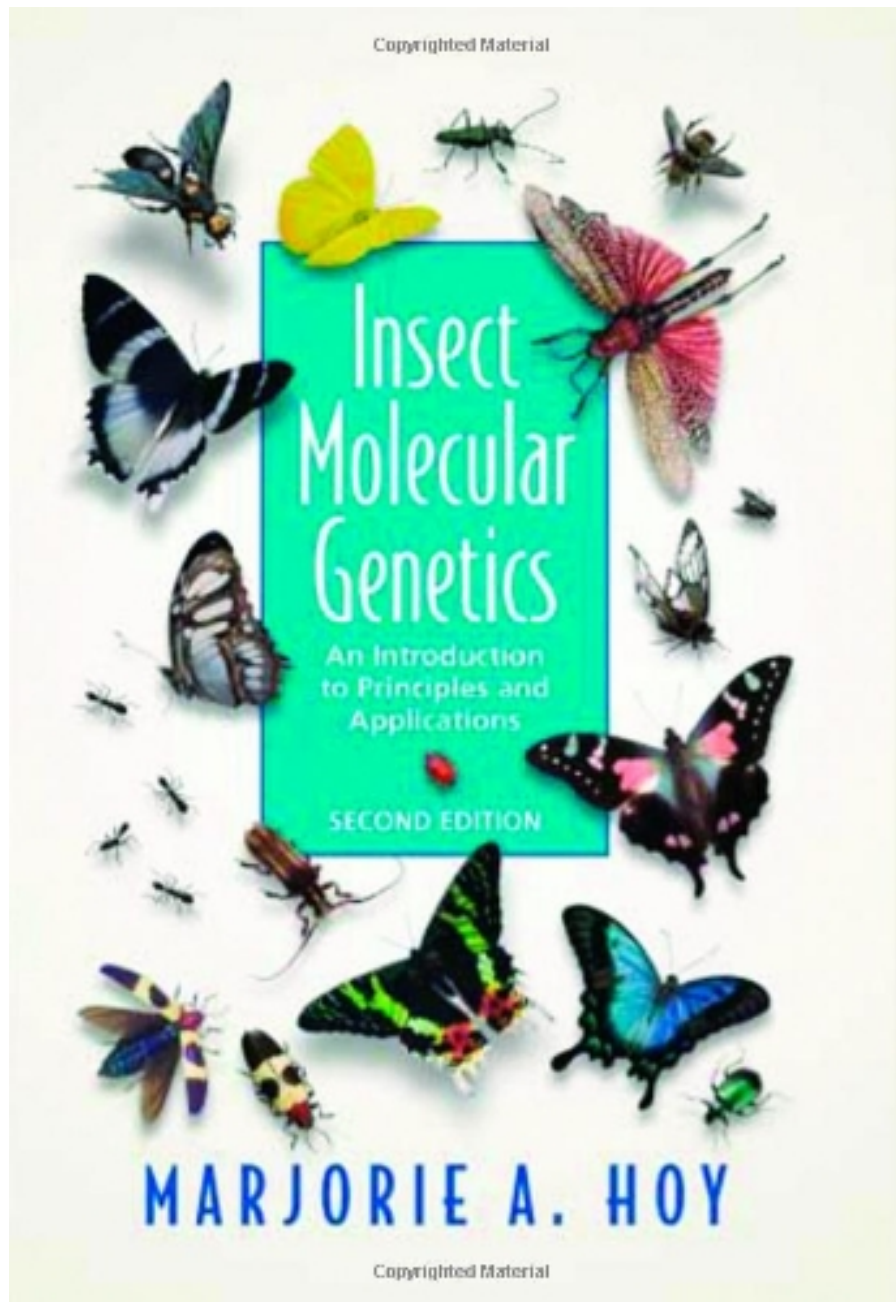


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Review

"I enthusiastically recommend this book to any student or established researcher in need of an introduction to the molecular genetics of arthropods."

-EXPERIMENTAL AND APPLIED ACAROLOGY (2003)

About the Author

By Marjorie A. Hoy

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A valuable addition to the personal libraries of entomologists, geneticists, and molecular biologists.

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Insect Molecular Genetics, 2nd edition, is a succinct book that briefly introduces graduate and undergraduate students to molecular genetics and the techniques used in this well established and important discipline. The book is written for two converging audiences: those familiar with insects that need to learn about molecular genetics, and those that are familiar with molecular genetics but not familiar with insects. Thus, this book is intended to fill the gap between two audiences that share a common middle ground.

- * Up-to-date references to important review articles, websites, and seminal citations in the disciplines
- * Well crafted and instructive illustrations integral to explaining the techniques of molecular genetics
- * Glossary of terms to help beginners learn the vocabulary of molecular biology

- Sales Rank: #4147189 in Books
- Published on: 2003-03-17
- Original language: English
- Number of items: 1
- Dimensions: 1.25" h x 7.10" w x 10.16" l, 2.58 pounds
- Binding: Hardcover
- 544 pages

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3 of 3 people found the following review helpful.

A fascinating overview

By Dr. Lee D. Carlson

The genetic engineering of insects is now commonplace, and for those who want to understand the details behind this exciting and practical technology, this book gives an excellent overview. The goal of this reviewer, who is not a professional biologist, was primarily to understand the efficacy of transgenic strategies in the genetic manipulation of insects. For those with similar interests and backgrounds, the book fills the need, and after reading it, such readers will have a better understanding of just what is possible in the

technology of genetic transformation of insects, along with obtaining a stronger background in genetics. This technology is improving and getting more powerful as this book went into print, and no doubt many more fascinating discoveries will take place in the near future. The genetic manipulation of insects shows much promise in not only reducing the threat of malaria but also in controlling unwanted insect populations. The risks involved in this technology are thankfully also addressed in the book.

A thorough review of a book of this size and detail would take many thousands of words, and so attention here will be concentrated on the things that this reviewer found particularly interesting and the surprises in the book. One of these involved the discussion of the RNA era and its role in the early evolution of life. The author views this time as one where RNA organisms, which had multiple-copy double-stranded RNA genomes, these genomes later fragmenting into chromosomes. The interactions between the RNA and amino acids evolved into the present DNA world. Another interesting fact brought out is that DNA can form more than twenty different variations of right-handed helices, and can form left-handed helices in some regions.

The author also discusses the role of exons and introns in molecular genetics, and the 'introns-early' and 'introns-late' hypotheses. Their role is still not completely understood, and there are many open questions in their study, as is brought out in the discussion.

Still another interesting discussion concerns the role of telomeres in preventing the loss of DNA during replication and their role in ensuring the stability of linear chromosomes. It turns out that telomerase, an enzyme that is responsible for adding these telomeres to the ends, is, interestingly, a reverse transcriptase, meaning that it can transcribe DNA from an RNA template.

The 'C value paradox' is also discussed by the author, which she describes as a situation where there is more DNA than is needed by the organism. Surprisingly, the genome size is not correlated with the complexity of the organism or the number of genes encoded. The insect genome size varies widely among the insect species, with 250-fold differences in C values being common. The composition of insect DNA is apparently very different for insects than for vertebrates, with the author quoting the guanine and cytosine bases making up only 32-42% of the DNA, as compared to 45% for vertebrates.

The many roles of heterochromatin is discussed in detail by the author, such as in chromosome mechanics, centromere function, and position effect variegation in *Drosophila melanogaster*. In the latter, this silences the euchromatic genes that have been moved to regions adjacent to heterochromatin by chromosomal rearrangements. This change in the location of the gene within the nucleus modifies significantly the amount of 'gene silencing'. In the context of transgenic strategies, the transgenes inserted into the insect genome can be silenced because they become heterochromatized.

A particularly fascinating discussion is given of the role of transposable elements in the insect genome. These can alter the gene structure and function, and can transfer horizontally between species. The microbial symbiont *Wolbachia*'s role in insect evolution is discussed, and the amazing fact that insects contain three or four genomes, namely the nuclear, mitochondrial, gut symbionts, and *Wolbachia*, raising the question of just what constitutes a biological individual. Some species of insects can have diploid males and females, or haploid males and diploid females, or only females. In addition, diploid males may undergo chromosome heterochromatinization and loss during development and become haploid.

A very detailed overview of transgenic strategies and their role in pest management is given at the end of the book. Giving examples of what has been accomplished in traditional breeding for beneficial insects and in sterilization techniques for pest insects, the author discusses the justifications for using transgenic methods. Mention is made of using green fluorescent protein as a molecular marker to track sterile insects. The author argues that fluorescent dusts currently used are not satisfactory since they can reduce the fitness of the insects and do not always adhere to the insects, biasing the results of the sterilization program. The author is clearly supportive of transgenic strategies to perform pest management, but she gives many references that take more cautionary stances on this technology. The author also makes the point that insect transgenesis is most appropriate for traits that are determined primarily by a single gene. The manipulation of traits determined by more complex genetic mechanisms are not yet feasible using transgenic strategies. Briefly discussed, but with many references given, are the different methods for transforming the insect germ-line,

such as P-element vectors, Hermes, hobo, mariner, Minos, piggyBac, baculoviruses, de novo nucleoside viruses, pantropic retroviral vectors, polydnviruses, retrotransposons, and sindbis viruses. Also discussed are paratransgenesis, which involves the genetic transformation of insect symbionts, and FLP-mediated recombination, which involves the introduction of cloned genes into the germ line at a predictable chromosomal site. This latter technique, the author argues, is very desirable for the reason that the likelihood of position effects on gene expression is considerably reduced.

Gene silencing, an evolved mechanism to prevent high-level expression of transposable elements, presents a challenge to transgenic strategies. The author discusses briefly some examples of transgene silencing in *D. melanogaster*. She points out that gene silencing might however be exploited positively by turning off specific genes in insects. References are given that discuss gene silencing in *D. melanogaster*. Horizontal gene transfer, hotly debated in the press these days, is discussed briefly.

0 of 2 people found the following review helpful.

Excellent book for starters in insect molecular genetics

By Tolis

I have found this book an excellent source of information for researchers on this particular subject. I really enjoy browsing through the chapters. I have also found that the list of references is outstanding. I suggest this book to people that start their research in using molecular techniques applied in insects. I think though that more detailed information should be searched in other books, or even in the references.

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