

Preface to Third Edition

The last few decades have seen major advances in both biology and information technology. Indeed, processing the vast amounts of genetic data generated depends on advanced computer technology. This book reflects this massive surge in understanding the molecular foundations of genetics. Today we know that genes are much more than the abstract entities proposed over a century ago by Mendel. Genes are segments of DNA molecules, carrying encoded information. Indeed, genes have now become chemical reagents, to be manipulated in the test tube and, more recently, even in living organisms.

Over the next half century our understanding of how living organisms function at the molecular level, together with our ability to intervene, will expand in ways we are only just beginning to perceive. In particular, this will have a major impact in the area of health. Many people are now having their own genomes partly or fully sequenced and it is becoming possible to tailor clinical treatment individually by using the genetic data of individual patients, an area known as personal genomics.

Nonetheless, because molecular biology illuminates an ever-widening array of topics, we have avoided overloading detail in favor of wider coverage. Molecular biology applies to far more than just health care and has greatly impacted other areas such as agriculture, animal behavior, evolution, and microbiology.

This book is intended for upper division students in a variety of biological disciplines. In particular it is aimed at first year undergraduates and beginning graduate students. This book does not attempt to be exhaustive in its coverage. There is a companion volume, entitled "Biotechnology," that emphasizes the more practical aspects of modern genetics. Together we hope that both books effectively survey the foundations and applications of modern molecular genetics.

Some students who are using this book will already be well grounded in molecular biology, due to having taken courses in genetics, biochemistry, and cell biology. However, others will not be so well prepared, due to the continued influx into molecular biology of students from biology programs that are not molecular in their orientation. For them we have tried to create a book whose early chapters cover the basics before launching out into the depths.

The book is divided into modules, each of several related chapters. The first module contains introductory material that experienced students can either skip or skim through rapidly. Sections within chapters have been numbered to aid in cross-reference. Review questions and suggestions for further reading are provided at the end of each chapter.

Changes in the Third Edition

Although much of its basis have remained largely unchanged, several areas of molecular biology have shown spectacular growth in recent years. These include the overwhelming flood of sequence information that is emerging faster than it can be thoroughly analyzed. Many areas, such as molecular evolution and metagenomics, have been stimulated by this plethora of new data. The related area of epigenomics, has recently flourished, largely due to new analytical techniques. This has been covered in a new chapter, Epigenetics and Epigenomics (Chapter 22).

The role of RNA is still expanding with the discovery of new classes of noncoding RNA and with new regulatory roles. But the most publicized advance has been the emergence of genome editing techniques based on the CRISPR system of bacteria. Two new chapters, Noncoding RNA (Chapter 19) and Genome Defense (including CRISPR and its applications; Chapter 20) have been designed to accommodate these advances.



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Online Materials

The website contains the "Focus on Relevant Research" features. These include discussions of recent papers in the field published by Cell Press and build case studies around the content. The objective is to help students learn how to read and understand the primary literature in hopes of preparing them for the scientific world. "Conceptual Questions," which were previously incorporated in the book are now on the website as well.

Other online materials to supplement the text include dashboards, animations, quizzes to prepare for tests, and PowerPoint slides with images for note taking. Students also have access to online references as they can then be directly linked to Internet databases, such as PubMed or ScienceDirect. Professors have access to all of the previously mentioned, including PowerPoint slides of the book and journal articles, and test banks for the book and journal articles.

Thank you!

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