Preface

Molecular biology is the study of biology taken to the molecular level. It reveals the essential principles behind the transmission and expression of genetic information in terms of DNA, RNA, and proteins.

Having been long engaged in collaborative research, we realized that the field of molecular biology has undergone great changes in recent years, becoming a highly structure-based science. Whether it is the elegant, dynamic structure of the ribosome, and how that structure explains the details of protein synthesis, or the complex organization of the human genome and its transcription, structural information is the key to understanding molecular mechanisms. For over a decade, one of us has taught an advanced molecular biology course, both in the classroom and online, and simply could not find a suitable text. A new textbook with contemporary coverage was needed.

Molecular Biology: Structure and Dynamics of Genomes and Proteomes elucidates the exquisite relationship between molecular structure and dynamics and the transmission and expression of genetic information. New techniques, ranging from single-molecule methods to whole-genome sequencing, have deepened our understanding of molecular processes and widened the scope of our vision of their interrelationships. These important advances present a new paradigm and must be considered in context of the dramatic history of the field—one of the most remarkable in modern sciences. An important example is our frequent reference to the ENCODE project and its implications. At the other end of the scale are the numerous illustrations of molecular interactions by cryo-electron microscopy and single-molecule dynamics.

From a pedagogical point of view, molecular biology is becoming more dependent on visual representations, and our goal was to create a dynamic and engaging illustration program. Accordingly, nearly 700 illustrations comprise a substantial portion of the book. We feel that legends should fully complement the figures so that figure and legend together can be essentially self-standing. Therefore, we have provided comprehensive explanatory detail within the figures themselves.

The text is written primarily for students at the upper undergraduate to first-year graduate level. The book can be adapted for students with or without an introductory course in biochemistry. A number of features make it flexible in approach: the first four introductory chapters could be covered very quickly as a review by an advanced audience, but they provide essential background for students with less experience in the biological sciences. In a similar vein, we have organized contextual and practical material (history, techniques, general cell biology background, and medical applications) into supplemental boxes. So that this book is useful to as wide a spectrum of students as possible, certain boxes represent a deeper analysis of a topic than will be needed for every course—labeled as "A Closer Look." These insights can be bypassed for a more direct, compact course, but they are available to those instructors or students who wish to explore more deeply into the topic. An additional feature is our focus on references that cover cutting-edge techniques, like single-molecule methods, that allow true molecular insights. Every effort has been made to consult and refer to the most current work in every area.

With these devices, the text offers readable, essential coverage of the field. The book is organized as follows. We begin with two introductory chapters, first presenting the basic ideas and development of molecular biology and elements of genetics. There follow two more chapters detailing the substances under study: proteins and nucleic acids. These four chapters could be used for a brief review in an advanced course. The processes by which genetic information is expressed, regulated, and maintained compose the core of the book. These are taken in the order of transcription, translation, and replication, with each topic requiring several chapters to cover structures, mechanisms, and regulation. Special chapters in the core are devoted to recombinant DNA techniques and the structure of the genome. The book concludes with chapters on genetic recombination and DNA repair.

Finally, a special note to the student: you are entering one of the most dynamic and exciting areas of science. Enjoy it!

Jordanka Zlatanova **Kensal E. van Holde**

RESOURCES FOR INSTRUCTORS AND STUDENTS

Teaching and learning resources for instructors and students are available online. The homework platform is available to everyone, though instructors will need to set up student access in order to use the dashboard to track student progress on assignments. The Instructor's Resources on the Garland Science Website are password-protected and available only to adopting instructors. The Student Resources on the Garland Science Website are available to everyone. We hope these resources will enhance student learning and make it easier for instructors to prepare dynamic lectures and activities for the classroom.

Online Homework Platform with Instructor Dashboard

Instructors can obtain access to the online homework platform from their sales representative or by emailing science@garland.com. Students who wish to use the platform must purchase access and, if required for class, obtain a course link from their instructor.

The online homework platform is designed to improve and track student performance. It allows instructors to select homework assignments on specific topics and review the performance of the entire class, as well as individual students, via the instructor dashboard. The user-friendly system provides a convenient way to gauge student progress and tailor classroom discussion, activities, and lectures to areas that require specific remediation.

Instructor Dashboard displays data on student performance, such as responses to individual questions and length of time required to complete assignments.

Tutorials explain essential or difficult concepts and are integrated with a variety of questions that assess student engagement and mastery of the material. The tutorials were created by Kristopher Koudelka, Point Loma Nazarene University.

Instructor Resources

Instructor Resources are available on the Garland Science Instructor Resource Center, located at www.garlandscience.com and selecting the "instructor" tab. The Website provides access not only to the teaching resources for this book but also to all other Garland Science textbooks. Adopting instructors can obtain access to the site from their sales representative or by emailing science@garland.com.

Art of Molecular Biology: The images from the book are available in two convenient formats: PowerPoint® and JPEG. They have been optimized for display on a computer. Figures are searchable by figure number, by figure name, or by keywords used in the figure legend from the book.

Student Resources

The resources for students are available on the *Molecular Biology* Student Website, located at www.garlandscience.com and selecting the "student" tab.

Flashcards: Each chapter contains flashcards, built into the student Website, that allow students to review key terms from the text.

Glossary: The comprehensive glossary of key terms from the book is online and can be searched or browsed.