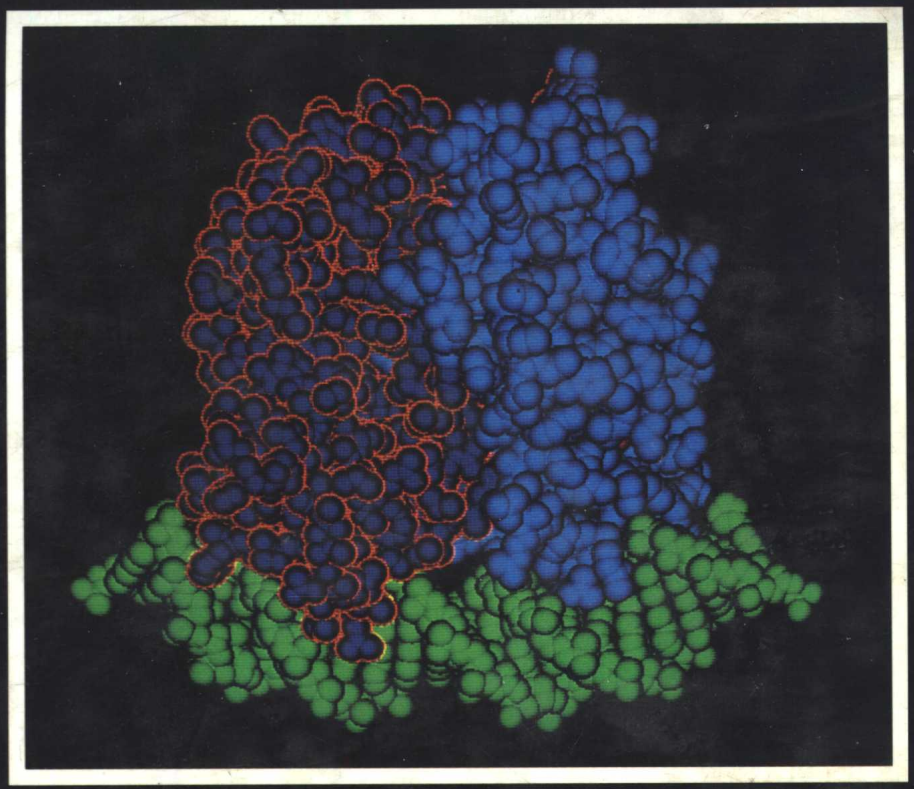

Genetics & Molecular Biology

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P R E F A C E

This book evolved from a course in molecular biology that I have taught for the past twelve years to our graduate students and to some undergraduate students. My main theme is that a relatively small number of principles involving cell biology, physical chemistry, genetics, and biochemistry permit the understanding of a large fraction of molecular biology.

This material is intended to encourage thinking and an appreciation for beautiful experiments. Thus the book is selective in the material it presents. Rather than list each fact that is known, I have tried to find a useful subset of the facts. This is necessary, of course, for by now molecular biology is such an ocean of information that no course should touch an appreciable fraction of what is known.

Although the text together with many of the problems forms a self-contained unit, instructors in advanced courses may want to supplement the material contained here with lectures on recent developments and assigned readings of research papers as appropriate to their own course.

Much of the material in this book discusses results found on prokaryotes. This is possible since many of the important principles of molecular biology are most clearly revealed and explored in prokaryotic systems. However, the extension of such results to eukaryotes is discussed, and eukaryotic systems of special interest are presented.

Few undergraduates will have had the ideal preparation for using this book, courses in cell biology, physical chemistry, and biochemistry. To maximize its utility, however, the book is written as though the reader has had partial acquaintenance with all three subjects. Consequently, many readers will find familiar material, new material, and a few topics for which reference to other texts will be helpful.

Many of the discussions include numbers and dimensions so that students may begin to develop a reliable intuition as well as a quantitative understanding of biological systems at the molecular level. Also, many experiments are outlined to permit the students to acquire a good idea of the ways in which the facts were learned. This approach appears to facilitate understanding. Although each of the

many findings in molecular biology is rather simple, these are remote from direct experience, and hence a large collection of such facts becomes hard to assimilate. Consequently, describing how the knowledge was discovered assists in its learning, because results become less remote, and slight doubts about their reliability are erased.

Many challenging problems are provided at the end of each chapter. Solving two or three of the typical ones per lecture is a reasonable load. A few deal directly with the textual material, but most amplify the textual material or introduce new ideas for which insufficient room existed in the text. Some require access to the literature. The student is urged to work a few of the problems from each chapter and to read all the rest. The particularly difficult ones are marked with a star.

Extensive references to material covered in the text, as well as related material on both prokaryotes and eukaryotes, are provided at the end of each chapter. The Recommended Readings are papers a more advanced student could profitably read in conjunction with the text. The Related Reviews, Books, and Articles list a few of the papers a student can turn to for background information. The papers listed under Deeper Reading permit the advanced student or research worker to find important papers on many topics related to the chapter. The references cover a substantial fraction of the important literature. Naturally, important papers published before those listed will be referred to in these papers. However, important papers published after those listed can also easily be found with the Science Citation Index. This annual reference lists papers and books published in a given year according to the references made in the paper or book. Thus by using this source to find all references to an important earlier work, one can work forward in time from a key paper.

Many people have contributed to this book. I particularly thank Pieter Wensink for penetrating discussions over the years; Donald Green, Thomas Gray, Edward Simon, Robert Vinopal, Philip Perlman, and Mary Ann Jarema for comments and suggestions on the text; James Funston for guidance through the project; and the staff of Addison-Wesley for their excellent production of this book. I would also like to thank Clifford Brunk and Richard L. Bernstein for their opinions on the final manuscript and to my many students for helping me to refine the presentation.

Waltham, Massachusetts *R.S.*

A NOTE TO THE READER

Since molecular genetics is such a broad subject, many important points have been mentioned only in the problems. Therefore reading all the problems, even if you do not intend to solve them, will help you learn more about what is known. Similarly, some of the references discuss points not dealt with at length in the text, and reading their titles in the lists at the ends of the chapters will add to your knowledge of what is known as well as start you in the direction of more information on a topic.

Many of the problems are of the *"Ah-ha!"* type, so that considerable time may be spent in fully understanding a question or an approach to the answer, and when the insight comes, it often comes in a flash. The problems that are known to be harder are marked with a star, as are sections containing harder material that is not essential to understanding the rest of the book.

C O N T E N T S

■ PART ONE ■

Cell Structure and Cell Constituents

■ PART FOUR ■

Mobile DNA

■ PART FIVE ■

Special Topics