PREFACE

Biomacromolecules are fundamental structural and functional units of cells and therefore are at the very core of biochemical interest. They have always been the central topics of biochemical texts and literature. Various physicochemical and biochemical investigations greatly improve our knowledge of biomacromolecular structures and dynamics. The computational approach provides a new tool for structural and functional explorations of biomolecules. Sequence analyses and genetic recombination studies have contributed to our understanding of how biomacromolecules function at molecular and genetic levels. Recent years have witnessed an explosion in biological data that are derived primarily from studies of biomacromolecules. An application of information technology to organize, manage, distribute and analyze these biomacromolecular data has ushered in the new discipline of bioinformatics. There is an increased interest and sophistication in the study of biomacromolecules, as genomics and proteomics take central stage of biochemistry, molecular biology and bioinformatics. Slowly though, glycomics has now gained recognition. These developments give rise to a necessity for the comprehensive documentation and unified presentation of the structures, functions and informatics of biomacromolecules, for which this book is proposed to address.

Biomacromolecules, including nucleic acids (polynucleotides), proteins (polypeptides) and glycans (polysaccharides), are either briefly treated in the introductory biochemistry texts or extensively described in the advanced monographs concerning individual classes of compounds. In response to the renewed interest in biomacromolecules among various fields of biomedical sciences, a unified and comprehensive presentation of these topics is needed. The proposed textbook is aimed at bridging the gap between the introductory/elementary biochemistry course and advanced treatises on an individual class of biomacromolecules. The focus is on the integrated presentation of the structural, dynamic and informational biochemistry of nucleic acids, proteins and glycans, not separately, but as combined topics so that their similarities can be identified/acknowledged and differences compared/appreciated. The book intends to meet the demands of students who would like to broaden their biochemical knowledge beyond the introductory level and to prepare those who would like to venture into the advanced field of studies in genomics, proteomics and/or glycomics.

I have been teaching Biomacromolecules ever since the course was introduced into our program in 1968, on-and-off (and mostly on) before and after my retirement. Since the inception, the subject matter has undergone amazing transformations; from generally descriptive to molecular details, from mainly structure/function to informatics. The field has grown to encompass a large volume of information that any attempt to cover even the most superficial aspects of the topics in a single text is practically impossible if not a daunting task.

This book is written for students who have taken elementary/introductory biochemistry and would like to take further courses in biochemistry related to special topics in nucleic acids, proteins, and/or polysaccharides. Thus it is designed for students who are familiar with the general aspects of biochemistry and would like to further their

knowledge or for those who contemplate to pursue the field of studies related to biomacromolecules. It serves as an intermediate textbook in biochemistry, molecular biology and bioinformatics. Its content follows the organization of general/introductory biochemistry so that the continuity of biochemical curriculum is preserved; however the focus is on the macromolecular biochemistry. The book is unique in that it treats nucleic acids, proteins and glycans jointly as biomacromolecules and describes their structures, dynamics and informatics together.

Following introductory topics on biomacromolecules (Chapters 1–3), the elements of biomacromolecular structures (Chapters 4–6) and their studies (Chapters 7–9) are presented. The functions of biomacromolecules are discussed in terms of their interactions (Chapter 10), catalyses (Chapter 11) and metabolisms, including genetic transmission and applications (Chapters 12, 13). Biomacromolecular informatics (Chapter 14), namely genomics (Chapter 15), proteomics (Chapter 16) and glycomics (Chapter 16), are introduced. Chapter 18 describes biomacromolecular evolution. Each chapter presents a proper background in structures, dynamics or informatics of biomacromolecules, providing the context for further studies, which is supplemented by a list of references. In the areas where the speed of change and growth is high, a book cannot be either all-inclusive or entirely current. It is especially difficult for an introductory textbook of this nature to cover the topic materials up-to-date and comprehensively. Students are urged to consult the reference materials (literature cited and Web sites) for further understanding.

Balanced approaches include some general descriptions, which have been treated in general biochemistry texts, otherwise serving as introductory to advanced presentations, but however, not dwelling too deeply on the topics of specialized interest. Some materials that are commonly available in general texts are not repeatedly described here so that others may be considered. For example, discussion on the stereochemistry of monosaccharides (Chapter 3), spectral recordings (Chapter 7) and detailed descriptions on physiological functions or transformations of biomacromolecules, are either omitted or briefly mentioned. However, classical approaches of general interest in the study of biomacromolecules are presented, since they may serve as the background knowledge for advancing current understanding. Solid phase synthesis (Chapter 8) used in the fabrication of biochips (Chapter 14), and chemical modification of enzymes (Chapter 11) applied to the design of affinity/activity-based probes (Chapter 16), are some of examples. The choices of materials presented in this text are derived from many years of the author's teaching experience. The author alone is responsible for inadequate and erroneous presentations that may occur and readers' suggestions are very much appreciated.

I would like to thank all authors whose published works have contributed to a better understanding of biomacromolecular biochemistry and formed the resource materials of this textbook. The public accessibility of all the sequences and three-dimensional structures of biomacromolecules has greatly facilitated the advancement of our knowledge for the structure, function and informatics of biomacromolecules. The efforts of all the developers, contributors and managers of many outstanding Web sites of biomacromolecules are most appreciated. The writing of this text would not have been possible without the contributions and generosity of these investigators, authors and developers. My wife, Alice, has been most instrumental in helping me complete this text, which I would like to present to her as a gift on our tetracontyl anniversary. It is my pleasure to state that the realization of this text goes to former Editor, Luna Han and Editorial program coordinator, Kristin Hauser. They have patiently urged me to initiate the project prior to their departure for their new posts. I am grateful to the John Wiley staffs, Ian Collins, Thomas Moore, Dean Gonzalez, and Danielle Lacourciere for their timely help to assist the transformation of this manuscript to be publishable and to oversee the completion of this project.

Retired politicians and celebrities write personal memoirs. Retired entrepreneurs and investors write financial guides. Retired engineers and professionals write how-to or do-it-yourself manuals. Why cannot retired academics write text or reference books of their specialized fields? After many years of teaching and research experience, we certainly have lots to write about. I have taken up this project after my mandatory retirement, not without skeptics. However, I am relieved that I have made it.

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