

Preface

Natural biochemical processes are continuously being discovered that involve RNA. Some of these processes, such as RNA interference, are now being exploited for biotechnology and medicinal applications. DNA has also proven in recent years to be more than a passive storehouse of information. For example, non-B-form DNA structures formed by G-rich DNA have been shown to participate in the regulation of gene expression, a discovery that presents new possibilities for drug targets in the genome. The current quest to understand how nucleic acids function at the most fundamental levels requires that we have a detailed understanding of nucleic acid-metal ion interactions. Due to the polyanionic nature of nucleic acids, DNA and RNA molecules are always associated with cations in living cells and these cations are essential for maintaining nucleic acid structure and function. The nature of these interactions varies greatly, from monovalent alkali metal ions that are primarily delocalized in a diffuse cloud around duplex DNA and RNA, to transition metals that are directly coordinated to the nucleotide bases. During the past decade, many important insights regarding nucleic acid-metal ion interactions have resulted from the application of spectroscopic techniques in the solution state and the determination of X-ray crystal structures. The present volume has been compiled to provide readers with an overview of these biophysical investigations. Our goal in writing each chapter has been two-fold. We have sought to produce a book that could serve as a reference source for researchers in the field, and also a text with sufficient background to serve as an initial starting point for students and researchers interested in entering the field or simply learning about this exciting topic.

As Editor, I am indebted to my co-authors for their generous contributions to this book. We have worked together to make the chapters as complementary as possible and to minimize overlap.