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book reviews

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Oxford handbook of nucleic acid structure. Edited by Stephen Neidle. Pp. xviii + 662. Oxford University Press, 1999. Price US$140.00. ISBN 0-19-850038-6.

Nucleic acids: structures, properties and functions. By Victor A. Bloomfield, Donald M. Crothers and Ignacio Tinoco Jr. Pp. xii + 794. Sausalito: University Science Books, 2000. Price US$79.20. ISBN 0-935702-49-0.

During the last several decades our knowledge of nucleic acid structure has undergone an extraordinary transformation. The expansion of knowledge has progressed quite rapidly from the first efforts to establish the structural details of nucleic acid base pairs to the determination of the molecular structure of $tRNA^{Phe}$ and of a B-DNA dodecamer to the recent spectacular developments in the structural study of ribosomes. In addition to X-ray crystallography, NMR spectroscopy and computational chemistry have become important tools of the structural chemistry of nucleic acids. All these remarkable advances are the subject of these two recent books that deserve the attention of a wide range of interested practitioners.

The Oxford Handbook of Nucleic Acid Structures is designed to provide comprehensive and up-to-date information about nucleic acid systems of varying degrees of complexity. It contains 19 separate articles by 39 contributors, including two of the authors of the other work reviewed here. The book begins with a stimulating historical account of the fiber-diffraction analysis of polynucleotides by Arnott, who points out how surprisingly off the mark some of the earliest work on DNA was! The introduction is followed by a description of base and base-pair morphologies, helical parameters and definitions by Lavery and Zakrzewska.

Three chapters are devoted to current understanding of DNA structures provided by X-ray diffraction studies. The first, by Wahl and Sundaralingam, discusses A-DNA duplexes, in the next Dickerson provides an elegant conformational analysis of B-DNA, and in the third Basham, Eichman and Ho offer an interesting survey of the crystal structures of Z-DNA fragments. Additional X-ray studies are described by Hunter and Brown in a chapter on non-Watson–Crick base associations of mismatches, modified bases and non-duplex oligonucleotide structures, and Masquida and Westhof introduce the reader to the complexities of crystallographic research on RNA oligonucleotides and ribozymes.

Several chapters are devoted to the structure of nucleic acids in solution. In a short but comprehensive contribution, Berman and Schneider compare the results of crystallographic and NMR studies on nucleic acid hydration. Schmitz, Blocker and James illustrate the applications of NMR spectroscopy to the study of standard DNA duplexes and RNA:DNA hybrids, and Chou and Reid tackle the solution structure of DNA mismatches. RNA structure in solution is discussed in detail by Nowakowski and Tinoco.

A number of leading experts provide an interesting survey of the experimental techniques used to study unusual nucleic acid asemblies. E. Wang and Feigon describe nucleic acid triplexes, and the team of Patel, Bouaziz, Kettani and Y. Wang characterize DNA quadruplexes. Lilley provides a fascinating account on the helical junctions in nucleic acids and Olson discusses higher order DNA structures. Crothers and Shakked discuss DNA bending and Arnez and Moras examine the relationship between the structure and function of transfer RNA.

A chapter by Miller, Cheatham and Kollman describes computer simulations of nucleic acid structures, and Berman, Zardecki and Westbrook provide a chapter describing the use of the nucleic acid database as a research and teaching tool.

This handbook is well written and carefully edited. Numerous illustrations, including a set of nine color plates, add to the value of this excellent volume, which can be recommended to everyone exploring the intriguing world of nucleic acids.

Nucleic Acids: Structures, Properties and Functions is devoted to the physical chemistry of nucleic acids and its implications for biochemistry and molecular biology. This book is actually a modified and expanded version of an earlier work [Bloomfield, V. A., Crothers, D. M. & Tinoco, I. (1974), *Physical Chemistry of Nucleic Acids*. New York: Harper & Row]. Several new discoveries and developments are described in the present work, including such subjects as new techniques for the synthesis and structural analysis of nucleic acids, thermodynamic databases for use in predicting secondary structure and multidimensional NMR.

The book's 14 chapters cover the vast field in a comprehensive and expert manner, providing the reader with an invaluable research resource. Good-quality figures and color plates aid in the understanding of the main concepts of the biophysical chemistry of nucleic acids. The book is generally free from errors, although some occur in the chapter on the interactions of nucleic acids with water and ions. The metal-ion series on p. 512 should begin with Mg^{II} rather than with Zn^{II}, and Ag^{I} not Ag^{II} should be at the other end of the ranking. Some typographical errors are also present in Tables 11.4 and 11.5. However, these only marginally affect the high quality of this excellent book that should be on the shelf of all involved in research on nucleic acids.

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