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The Right Chemistry: an Updated Nucleic Acids Textbook

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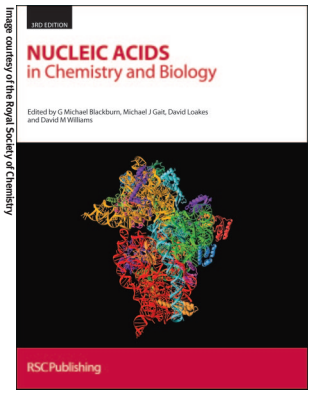
Each year brings another incarnation of the University of California–Berkeley's graduate course in nucleic acid structure and function, and with it the accompanying struggle to find the right text. Hence it was with some excitement that I opened the recently published third edition of the now-classic *Nucleic Acids in Chemistry and Biology* by Blackburn, Gait, Loakes, and Williams. Previous editions of the book have become familiar volumes in any respectable collection of texts on nucleic acid chemistry, and with good reason. The book provides refreshingly in-depth coverage of the physical, chemical, and biological behavior of nucleic acids, reminiscent of Saenger's out-of-print text *Principles of Nucleic Acid Structure*. It also touches on some of the most exciting aspects of nucleic acid biology.

The latest edition of the Blackburn *et al*. book includes content similar to that of the second edition but has been substantially updated. In addition to covering the discovery and basic chemistry, structure, synthesis, and manipulation of nucleic acids, the book now contains chapters dedicated to genes and genomes, RNA structure and function, and a much-expanded discussion of protein–nucleic acid interactions. The detailed table of contents enables quick identification of subtopics within chapters, and the index is comprehensive. A glossary of terms, provided at the front of the book, is a helpful reference for both this text and the broader scientific literature.

Nucleosides, nucleotides, and RNA and DNA structure are dealt with in considerable depth, and the chapters covering these topics are particularly well referenced. The chemistry underlying nucleic acid synthesis and degradation and the behavior of nucleoside and nucleotide analogues is explained at a level of detail suitable for graduate-level chemical biology or biochemistry courses. Many of the figures are simple two-color diagrams, giving these chapters a clean look. The two chapters on small-molecule interactions with nucleic acids provide in-depth discussion of the chemical basis for both covalent and reversible ligand binding. Many interesting and biologically relevant examples are mentioned, ranging from cancer therapeutics to antibiotics and chromosome-staining reagents.

The book aims to put the chemistry of nucleic acids in the context of larger biological systems, and here it is less effective. It is frankly difficult, if not impossible, to do justice to the vast topics of genes, genomes, and protein–nucleic acid interactions in a single-chapter format. Although the section describing the chemical basis for protein–nucleic interactions is excellent, attempts to discuss restriction endonucleases, polymerases, and other enzymes that act on DNA are less well developed. And only five pages are devoted to RNA–protein interactions. Because these areas of biology are advancing so rapidly, the book is already out of date with respect to some of the details that are presented. In addition, some of



Nucleic Acids in Chemistry and Biology, 3rd ed.
Edited by G. Michael Blackburn, Michael J. Gait, David Loakes, and David M. Williams.
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the figures in these chapters are poor-quality reproductions that do not do justice to the beautiful structures they represent. One wonders if it might have been better for the authors to have omitted some of these sections in order to expand others.

The chapters on genomes and biotechnology present comprehensive lists of laboratory techniques for analyzing DNA and RNA. Although these methods are important for understanding nucleic acid research, the discussion is too cursory to be appropriate for graduate students or active researchers. For example, DNA sequencing is covered in two pages, and RNA sequencing is mentioned in just one short paragraph. The chapter on physical and structural techniques for studying nucleic acids is also too brief to be particularly useful.

Overall, however, the book fills an important niche as a guide to understanding the chemistry of nucleic acids at a level sufficient to analyze biological function. Much of the text is written in a clear and direct style that explains complex ideas in a straightforward manner, and importantly, the book does a great job of communicating the excitement of research on nucleic acids. My search for a textbook for next year's nucleic acids course appears to be over!