

The latest on DNA form and function

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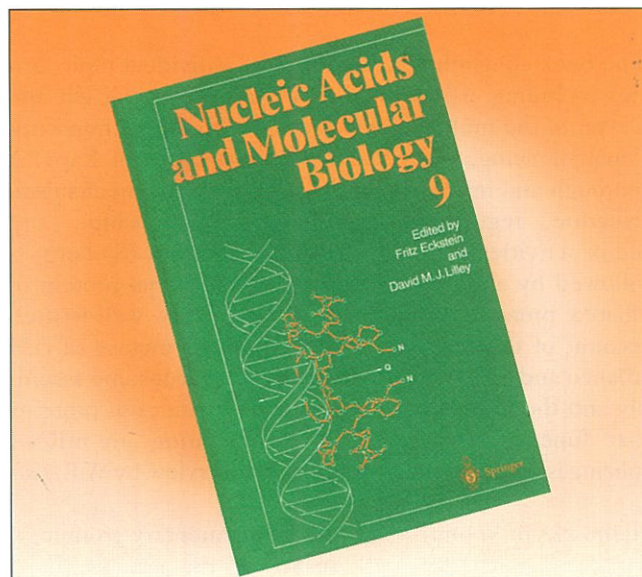
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Nucleic Acids and Molecular Biology Volume 9 edited by Fritz Eckstein and David MJ Lilley, Springer-Verlag, Berlin, Heidelberg, 1995, 376 pp. \$178.00 hardcover (ISBN 3-540-58824-8).

For decades we have been fascinated by how two meters of DNA fits into a single cell nucleus and how DNA has such diverse cellular functions as recombination, replication and transcription. Yet the DNA structure in most people's minds was a straight, stiff and rather homogeneous double helical molecule that came in three flavors: A-DNA, B-DNA, and Z-DNA. Recent developments in the molecular biology of nucleic acids, however, have opened our eyes to new possibilities for DNA structure and function. DNA can form multi-stranded structures; it can be bent, looped, wrapped, twisted, and untwisted by proteins that bind in both grooves, and it can be manipulated by enzymes in ways that were hardly imaginable just two decades ago. The study of protein-nucleic acid recognition has also rapidly shifted from a focus on simple codes, based on chemical principles of hydrogen bonding and salt bridge interactions between the DNA bases and phosphates and amino acid residues of proteins, to an understanding that the shape and deformability of DNA are also important in recognition. In the span of a decade or so the image of DNA has changed dramatically and we can no longer consider it to be a boring relative of RNA.

For those interested in keeping abreast of such rapid changes in the structure and function of nucleic acids the series of books *Nucleic Acids and Molecular Biology*, edited by Fritz Eckstein and David Lilley, provides a rich and up-to-date collection of review articles. Since the first volume of the series was published in 1987, these books have provided an effective 'access guide' to new areas of the literature for scientists who are already conversant with the molecular biology of nucleic acids. Volume 9 is the latest testament to the structure and dynamics of non-canonical DNA structures formed in the presence and absence of interacting proteins. The 18 review articles in Volume 9 cover 4 main subjects: DNA structure, enzymes that act on DNA, DNA binding proteins, and snRNA-protein interactions. An author index and a helpful subject index are found at the beginning and the end of the book respectively. Another useful feature is



the reference listing at the end of each article that includes the title of each reference.

The book opens with broad and informative reviews of the types, chemical principles, biological relevance, structural studies and potential methodological applications of triple helical DNA (Bernués and Azorin) and parallel stranded guanine tetraplexes (Murchie *et al.*). Hayes and Wolffe emphasize studies on the *Xenopus* 5S RNA gene system in a cogent review on chromatin structure and transcription. The kinetics and putative models for branch migration of various recombination intermediates by spontaneous mechanisms is reviewed systematically by Hsieh and Panyutin. A thoughtful review of the protein-mediated branch migration mechanisms, typified by the RuvAB and RecG proteins of *Escherichia coli* and their interactions with different sorts of DNA substrates (Whitby *et al.*), provides a link to the proteinaceous subjects of the remainder of the articles.

Principles involved in managing DNA unlinking and correct DNA topology during replication are described in an educational article by Ullsperger *et al.*, while evolutionary, biochemical and structural aspects of reverse gyrase (Duguet) and gyrase (Wigley) conclude this well-written and interesting trio of articles on DNA topology. Concise and cogent reviews on DNA recognition by transcription factors focus on the structure and function of the *E. coli* cyclic AMP receptor protein by Busby *et al.* and the DNA recognition properties of the helix-loop-helix protein family by Ferré-D'Amaré and Burley. DNA recognition by the structural/regulatory proteins of the HMG-domain

family is reviewed from three different perspectives: general properties of the UBF protein (Reeder *et al.*), structure and DNA recognition by HMG-1 type proteins (Read *et al.*), and HMG-domain interactions with DNA containing cisplatin adducts (McA'Nulty and Lippard).

The book concludes with a series of individual topic articles including a broad and lucid account by Gilson and Gasser of the multiple-modes of DNA-binding, transcriptional silencing, and physiological properties of Rap1. A thorough and interesting article detailing the mechanism, structure, regulation, evolutionary relationships, and redox activities of ribonucleotide reductases (Sjoberg) is followed by a review on the unusual terminal protein of ciliated protozoa (Price) and a particularly well-written account of the function of the DNA polymerase of $\phi 29$ (Blanco and Salas). Last but not least, spliceosome assembly and the known interactions and dynamics of proteins that function together with RNA during pre-mRNA splicing is described in an educational overview by Will *et al.*

Hallmarks of Volume 9 are the complementary groupings, focus and generally high quality of the articles. Each article addresses a single concept, protein, or type of nucleic acid structure from the perspective of an active researcher in the field. Because each topic is narrower than in traditional review articles, authors include aspects of the history, genetic analysis, evolutionary relationships, as well as biochemical, biophysical (thermodynamic and kinetic), and structural (X-ray and NMR) characterization applicable to their topic. A consequence of this approach is that a few articles do not effectively connect the author's work to other work in the field, which leads to incomplete and biased citations. The decision of the editors to include two to three articles on closely related subjects is an excellent one. Different perspectives on similar topics, such as HMG-domains, branch migration, and DNA topology, serve to moderate the effects of the author's bias and to provide an excellent opportunity for the reader to synthesize varied expert viewpoints to gain a deeper understanding of the topic. An inevitable consequence of including multiple articles on related topics is that complete coverage of the field is impossible. For example, the RNA field is neglected in Volume 9, with the exception of the article by Will *et al.* Other developing areas such as DNA repair and RNA-protein recognition would be welcome topics for future volumes. That said, the tradeoff between complementary viewpoints and complete coverage of exciting developments every year is one that the editors should continue to make.

In conclusion, those who are fascinated by the structure and function of nucleic acids in molecular biology will enjoy reading and owning these books. Volume 9 contains a valuable collection of articles that offer a good balance of exciting and up-to-date material that fits somewhere

between the *Current Opinions* style of review articles and the more comprehensive review articles of *Progress in Nucleic Acid Research and Molecular Biology*, *Annual Reviews of Biophysics and Biomolecular Structure*, and *Annual Reviews of Biochemistry*. It is surprising that this series of books is not available at all libraries. Perhaps this is due to the cost of each book, which may make it difficult for everyone to own a complete set.