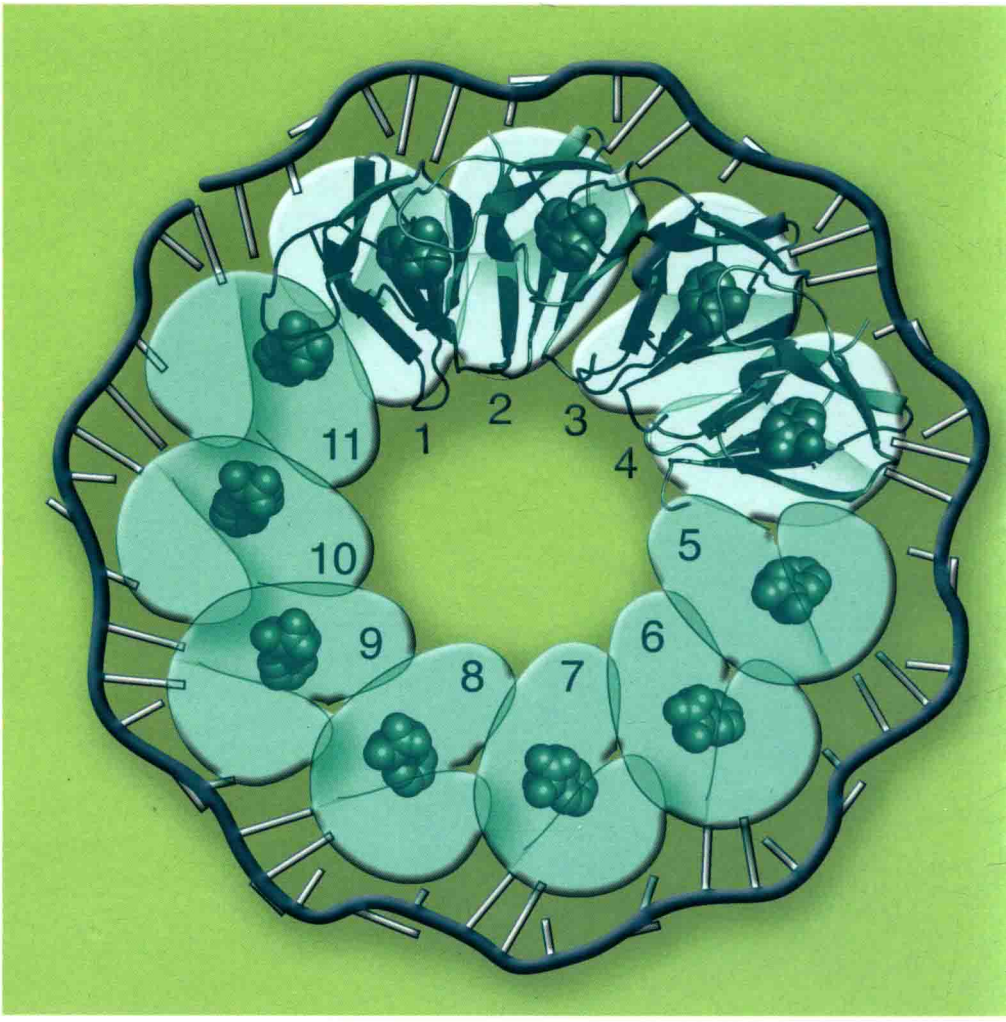
RSC Biomolecular Sciences

Edited by Phoebe A Rice and Carl C Correll

Protein–Nucleic Acid Interactions

Structural Biology



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Preface

The structural biology of protein-nucleic acid interactions is in some ways a mature field and in others in its infancy. High-resolution structures of protein-DNA complexes have been studied since the mid 1980s. A vast array of such structures has now been determined, but surprising and novel structures still appear quite frequently.

High-resolution structures of protein-RNA complexes were relatively rare until the last decade. Propelled by advances in technology as well as a blossoming realization of RNA's importance to biology, the number of example structures has ballooned in recent years. As with many other fields, the deeper one digs, the more questions surface. New insights are now being gained from comparative studies only recently made possible due to the size of the database, as well as from careful biochemical and biophysical studies.

The field has, in some ways, been a victim of its own success: it is no longer possible to write a comprehensive review. Instead, current review articles tend to focus on particular subtopics of interest. This makes it difficult for newcomers to the field to attain a solid understanding of the basics. One goal of this book is therefore to provide in-depth discussions of the fundamental principles of protein-nucleic acid interactions as well as to illustrate those fundamentals with up-to-date and fascinating examples for those who already possess some familiarity with the field.

This book also aims to bridge the gap between the DNA- and the RNA-centric views of nucleic acid–protein recognition, which are often treated as separate fields. However, this is a false dichotomy because protein–DNA and protein–RNA interactions share many general principles. This book therefore includes relevant examples from both sides, and frames discussions of the fundamentals in terms that are relevant to both. History supports this approach: despite the amazing conformational versatility discovered for RNA, many of the lessons learned from early studies of protein-DNA complexes

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could be applied directly to understanding newer protein-RNA complexes. Conversely, recent structures of proteins bound to noncanonical DNA structures reveal recognition strategies more commonly associated with RNA-binding proteins.

We have assembled a team of experts to write the individual chapters of this book. The beginning chapters (1–8) focus on more fundamental aspects of protein-nucleic acid interactions, such as thermodynamics and recognition strategies, while later chapters (9–14) highlight more specialized topics. Since it is impossible to cover all aspects of this rapidly expanding field, we have chosen to highlight a few topics that are fascinating in their own right while also providing a broad range of examples to underscore the basic principles laid out earlier. We hope that readers at all levels will find this an interesting guide and a useful reference.

Phoebe A. Rice
Carl C. Correll

Contents

RSC Biomolecular Sciences
Protein-Nucleic Acid Interactions: Structural Biology
Edited by Phoebe A. Rice and Carl C. Correll