As the tools and techniques of structural biophysics assume greater roles in biological research and a range of application areas, learning how proteins behave becomes crucial to understanding their connection to the most basic and important aspects of life.

With more than 350 color images throughout, *Introduction to Proteins: Structure, Function, and Motion* presents a unified, in-depth treatment of the relationship between the structure, dynamics, and function of proteins. Taking a structural-biophysical approach, the authors discuss the molecular interactions and thermodynamic changes that transpire in these highly complex molecules.

The text incorporates various biochemical, physical, functional, and medical aspects. It covers different levels of protein structure, current methods for structure determination, energetics of protein structure, protein folding and folded state dynamics, and the functions of intrinsically unstructured proteins. The authors also clarify the structure-function relationship of proteins by presenting the principles of protein action in the form of guidelines.

This comprehensive, color book uses numerous proteins as examples to illustrate the topics and principles and to show how proteins can be analyzed in multiple ways. It refers to many everyday applications of proteins and enzymes in medical disorders, drugs, toxins, chemical warfare, and animal behavior. Downloadable questions for each chapter are available at CRC Press Online.

### Table of Contents

**Chapter 1. Introduction**

1.1 The importance of proteins in living organisms  
1.2 Structural complexity and its effect on protein function  
1.3 Non-covalent interactions between atoms in biomolecules  
1.4 Summary  
1.5 Organization of the book  
References

**Chapter 2. Protein Structure**

2.1 Introduction  
2.2 Primary structure  
2.3 Secondary structure  
2.4 Tertiary structure
Chapter 3. Methods of Structure Determination and Prediction

3.1 Introduction
3.2 Diffraction/scattering methods
3.3 Spectroscopic methods
3.4 Computational methods for structure prediction
3.5 Conclusions
3.6 Protein data bank (PDB)
3.7 Summary

Chapter 4. Energetics and Protein Stability

4.1 Basic principles of thermodynamics
4.2 Protein stability and the forces involved
4.3 Protein denaturation and adaptation to extreme conditions
4.4 Stability enhancement of industrial enzymes using protein engineering
4.5 Summary

Chapter 5. Protein Structural Dynamics

5.1 Introduction
5.2 Protein folding
5.3 Folded state dynamics
5.4 Methods for studying protein dynamics
5.5 Summary

Chapter 6. Non-globular Proteins

6.1 Introduction
6.2 Fibrous proteins
6.3 Intrinsically unstructured proteins
6.4 Summary

Chapter 7. Membrane Proteins

7.1 Introduction
7.2 Structure and organization of biological membranes
7.3 Principles of membrane protein structure
7.4 Proteine-membrane interactions
7.5 Structure-function relationship in membrane proteins and peptides
7.6 Summary

Chapter 8. Protein-ligand Interactions

8.1 Introduction
8.2 Theories on protein-ligand binding
8.3 Protein-ligand binding energetics
8.4 The ligand-binding
8.5 Protein-protein interactions
8.6 Protein-ligand interactions in drug action and design
8.7 Summary

Index