Structural Biology Using Electrons and X-rays

Description: Structural Biology Using Electrons and X-Rays discusses the diffraction and image-based methods used for the determination of complex biological macromolecules. The book focuses on the Fourier transform theory, which is a mathematical function that is computed to transform signals between time and frequency domain. Composed of five parts, the book examines the development of nuclear magnetic resonance (NMR), which allows the calculation of the images of a certain protein. Parts 1 to 4 provide the basic information and the applications of Fourier transforms, as well as the different methods used for image processing using X-ray crystallography and the analysis of electron micrographs. Part 5 focuses entirely on the mathematical aspect of Fourier transforms. In addition, the book examines detailed structural analyses of a specimen's symmetry (i.e., crystals, helices, polyhedral viruses and asymmetrical particles). This book is intended for the biologist or biochemist who is interested in different methods and techniques for calculating the images of proteins using nuclear magnetic resonance (NMR). It is also suitable for readers without a background in physical chemistry or mathematics.

Emphasis on common principles underlying all diffraction-based methods
- Thorough grounding in theory requires understanding of only simple algebra
- Visual representations and explanations of challenging content
- Mathematical detail offered in short-course form to parallel the text

Contents:

Part I: Fourier Transforms
1. Overview
2. Correlations & Convolutions
3. Fourier Fundamentals
4. Digital Fourier Transforms
5. Filters
6. Two-Dimensional FTs

Part II: Optics
7. Microscopy with Rays
8. Waves
9. Wave Imaging

Part III: Further Mathematical Methods/General Aspects
10. Symmetry
11. Statistics & Matrices
12. The Third Dimension

Part IV: Image Analysis/Structure Determination
13. Special Symmetries
14. Crystalline Sheets
15. Helices
16. Icosahedral Particles
17. Unsymmetrical (“Single”) Particles
18. Distortion Correction
19. FT Mathematics
20. Elementary Matrices

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