Membrane Protein Structure Determination Methods And Protocols Methods In Molecular Biology

From Protein Structure to Function with BioinformaticsStructural Biology of Membrane ProteinsThe Next Generation in Membrane Protein Structure DeterminationExpression, Purification, and Structural Biology of Membrane ProteinsModern Techniques in Protein NMRViral Membrane Proteins: Structure, Function, and Drug DesignBiophysics of Membrane ProteinsStudy of Bacteriorhodopsin in a Controlled Lipid EnvironmentStructure and Function of Membrane ProteinsEvolving Methods for Macromolecular CrystallographyMembrane Protein ProtocolsMembrane StructureNMR Spectroscopy of Biological SolidsStructural Biology of Membrane ProteinsMolecular Modeling of ProteinsPractical BioinformaticsComputational Methods for Protein Structure Prediction and ModelingMembrane Proteins Production for Structural AnalysisMembrane Protein Structure and DynamicsProtein Structure and FunctionMembrane Protein StructureProduction of Membrane ProteinsMembrane Proteins – Engineering, Purification and CrystallizationBiophysical Techniques for Structural Characterization of MacromoleculesProtein PurificationAdvanced Methods in Structural BiologyProtein CrystallographyIntroduction to Protein Structure PredictionBiophysical Analysis of Membrane ProteinsThe Next Generation in Membrane Protein Structure DeterminationMembrane Protein CrystallizationCell-Free Protein ExpressionConformational Proteomics of Macromolecular ArchitectureMolecular Biology of the CellProtein StructureProtein CrystallographyMembrane Protein Structure DeterminationMembrane Protein Structure and Function CharacterizationCrystallization of Membrane ProteinsMethods and Results in Crystallization of Membrane Proteins

From Protein Structure to Function with Bioinformatics

Molecular Modeling of Proteins, Second Edition provides a theoretical background of various methods available and enables non-specialists to apply methods to their problems by including updated chapters and new material not covered in the first edition. This detailed volume opens by featuring classical and advanced simulation methods as well as methods to set-up complex systems such as lipid membranes and membrane proteins and continues with chapters devoted to the simulation and analysis of conformational changes of proteins, computational methods for protein structure prediction, usage of experimental data in combination with computational techniques, as well as protein-ligand interactions, which are relevant in the drug design process. Written for the highly successful Methods in Molecular Biology series, chapters include thorough introductions, step-by-step instructions and notes on troubleshooting and avoiding common pitfalls. Update-to-date and authoritative, Molecular Modeling of Proteins, Second Edition aims to aid researchers in the physical, chemical and biosciences interested in utilizing this powerful technology.

Structural Biology of Membrane Proteins

In Viral Membrane Proteins: Structure, Function, and Drug Design, Wolfgang Fischer summarizes the current structural and functional knowledge of membrane proteins encoded by viruses. In addition, contributors to the book address questions about proteins as potential drug targets. The range of information covered includes signal proteins, ion channels, and fusion proteins. This book has a place in the libraries of researchers and scientists in a wide array of fields, including protein chemistry, molecular biophysics, pharmaceutical science and research, bioanotechnology, molecular biology, and biochemistry.

The Next Generation in Membrane Protein Structure Determination

A look at the methods and algorithms used to predict proteinstructure A thorough knowledge of the function and structure of proteinsis critical for the advancement of biology and the life sciences aswell as the development of better drugs, higher-yield crops, andeven synthetic bio-fuels. To that end, this reference sheds lighton the methods used for protein structure prediction and revealsthe key applications of modeled structures. This indispensable bookcovers the applications of modeled protein structures and unravelsthe relationship between pure sequence information andthree-dimensional structure, which continues to be one of thegreatest challenges in molecular biology. With this resource, readers will find an all-encompassingexamination of the problems, methods, tools, servers, databases,and applications of protein structure prediction and they willacquire unique insight into the future applications of the modeledprotein structures. The book begins with a thorough introduction tothe protein structure prediction problem and is divided into fourthemes: a background on structure prediction, the prediction ofstructural elements, tertiary structure prediction, and functionalinsights. Within those four sections, the following topics arecovered: Databases and resources that are commonly used for proteinstructure prediction The structure prediction flagship assessment (CASP) and theprotein structure initiative (PSI) Definitions of recurring substructures and the computationalapproaches used for solving sequence problems Difficulties with contact map prediction and how sophisticatedmachine learning methods can solve those problems Structure prediction methods that rely on homology modeling,threading, and fragment assembly Hybrid methods that achieve high-resolution proteinstructures Parts of the protein structure that may be conserved and usedto interact with other biomolecules How the loop prediction problem can be used for refinement ofthe modeled structures The computational model that detects the differences betweenprotein structure and its modeled mutant Whether working in the field of bioinformatics or molecularbiology research or taking courses in protein modeling, readerswill find the content in this book invaluable.

Expression, Purification, and Structural Biology of Membrane Proteins

New textbooks at alllevels of chemistry appear with great regularity. Some fields like basic biochemistry, organic reaction mechanisms, and chemical thermodynamics are weil represented by many excellent texts, and new or revised editions are published sufficiently often to keep up with progress in research.

However, some areas of chemistry, especially many of those taught at the graduate level, suffer from a reallack ofup-to-date textbooks. The most serious needs occur in fields that are rapidly changing. Textbooks in these subjects usually have to be written by scientists actually involved in the research which is advancing the field. lt is not often easy to persuade such individuals to settime aside to help spread the knowledge they have accumu lated. Our goal, in this series, is to pinpoint areas of chemistry where recent progress has outpaced what is covered in any available textbooks, and then seek out and persuade experts in these fields to produce relatively concise but instructive introductions to their fields. These should serve the needs of one semester or one quarter graduate courses in chemistry and biochemistry. In some cases the availability of texts in active research areas should help stimulate the creation of new courses. NewYork CHARLES R. CANTOR Preface to the Second Edition The original plan for the first edition of this book was to title it Enzyme Purification: Princip/es and Practice.

Modern Techniques in Protein NMR

This volume draws on the expertise of leaders in the field of macromolecular crystallography to illuminate the dramatic developments that are accelerating progress in structural biology. Their contributions span the range of techniques from crystallization through data collection, structure solution and analysis. The book shows how modern high-throughput methods are contributing to a deeper understanding of medical problems.

Viral Membrane Proteins: Structure, Function, and Drug Design

This book reviews current techniques used in membrane protein structural biology, with a strong focus on practical issues. The study of membrane protein structures not only provides a basic understanding of life at the molecular level but also helps in the rational and targeted design of new drugs with reduced side effects. Today, about 60% of the commercially available drugs target membrane proteins and it is estimated that nearly 30% of proteins encoded in the human genome are membrane proteins. In recent years much effort has been put towards innovative developments to overcome the numerous obstacles associated with the structure determination of membrane proteins. This book reviews a variety of recent techniques that are essential to any modern researcher in the field of membrane protein structural biology. The topics that are discussed are not commonly found in textbooks. The scope of this book includes: Expression screening using fluorescent proteins The use of detergents in membrane protein research The use of NMR Synchrotron developments in membrane protein structural biology Visualisation and X-ray data collection of microcrystals X-ray diffraction data analysis from multiple crystals Serial millisecond crystallography Serial femtosecond crystallography Membrane protein structures in drug discovery The information provided in this book should be of interest to anyone working in the area of structural biology. Students will find carefully prepared overviews of basic ideas and advanced protein scientists will find the level of detail required to apply the material directly to their day to day work. Chapters 4, 5, 6, 8 and 9 of this book are published open access under a CC BY 4.0 license at link.springer.com.

Biophysics of Membrane Proteins

Protein crystallography has become vital to further understanding the structure and function of many complex biological systems. In recent years, structure determination has progressed tremendously however the quality of crystals and data sets can prevent the best results from being obtained. With contributions from world leading researchers whose software are used worldwide, this book provides a coherent approach on how to handle difficult crystallographic data and how to assess its quality. The chapters will cover all key aspects of protein crystallography, from instrumentation and data processing through to model building. This book also addresses challenges that protein crystallographers will face such as dealing with data from microcrystals and multi protein complexes. This book is ideal for both academics and researchers in industry looking for a comprehensive guide to protein crystallography.

Study of Bacteriorhodopsin in a Controlled Lipid Environment

Membrane proteins play key roles in numerous cellular processes, in particular mediating cell-to-cell communication and signaling events that lead to a multitude of biological effects. Membrane proteins have also been implicated in many critical diseases such as atherosclerosis, hypertension, diabetes and cancer. In Membrane Protein Structure Predictions Methods: Methods and Protocols, expert researcher in the field detail the advances in both experimental and computational approaches of the structure, dynamics and interactions of membrane proteins dividing the volume into two sections. The first section details the procedures used for measurements of structure and dynamics of membrane proteins. While the second section contains a survey of the computational methods that have played a critical role in membrane protein structure prediction as well as in providing atomic level insight into the mechanism of the dynamics of membrane receptors. Written in the highly successful Methods in Molecular BiologyTM series format, the chapters include the kind of detailed description and implementation advice that is crucial for getting optimal results in the laboratory. Thorough and intuitive, Membrane Protein Structure Predicitons: Methods and Protocols seeks to aid scientists in the further study of membrane protein structure and function.

Structure and Function of Membrane Proteins

Explores what use can be made of the solution of over 300 protein structures that have now been determined in atomic detail and discusses the effect of this in medicine. Perutz explains how X-ray crystallographic studies have led to new insights into disease and approaches to treatment.

Evolving Methods for Macromolecular Crystallography

A collection of key techniques for the study of receptors and transport proteins. The book provides examples of how different membrane proteins can be over-expressed in both prokaryotic and eukaryotic expression systems, how natural and overexpressed proteins can be solubilized from their host membranes, and how the solubilized protein can be purified in active form. Each protocols contains step-

by-step instructions to ensure success, troubleshooting advice, lists of reagents, and tips on avoiding pitfalls.

Membrane Protein Protocols

Proteins lie at the heart of almost all biological processes and have an incredibly wide range of activities. Central to the function of all proteins is their ability to adopt, stably or sometimes transiently, structures that allow for interaction with other molecules. An understanding of the structure of a protein can therefore lead us to a much improved picture of its molecular function. This realisation has been a prime motivation of recent Structural Genomics projects, involving large-scale experimental determination of protein structures, often those of proteins about which little is known of function. These initiatives have, in turn, stimulated the massive development of novel methods for prediction of protein function from structure. Since model structures may also take advantage of new function prediction algorithms, the first part of the book deals with the various ways in which protein structures may be predicted or inferred, including specific treatment of membrane and intrinsically disordered proteins. A detailed consideration of current structure-based function prediction methodologies forms the second part of this book, which concludes with two chapters, focusing specifically on case studies, designed to illustrate the real-world application of these methods. With bang up-to-date texts from world experts, and abundant links to publicly available resources, this book will be invaluable to anyone who studies proteins and the endlessly fascinating relationship between their structure and function.

Membrane Structure

Following its inception in the 1950s, cell-free protein synthesis made a tremendous impact on the basic life sciences. The use of cell-free systems was key to understanding molecular mechanisms underlying one of the most complicated processes found in nature: protein translation. Since this time, aggressive cutting-edge research and stiff commerica

NMR Spectroscopy of Biological Solids

The book provides up-to-date reference source for researchers. Introductory sections to each topic are followed by detailed discussions for the experienced biochemist.

Structural Biology of Membrane Proteins

Membrane Structure

Molecular Modeling of Proteins

This book collects up-to-date advanced protocols and advice from leading experts in the area of membrane protein biology that can be applied to structural and functional studies of any membrane protein system. The contents explore methods for cloning and expression of membrane proteins and membrane protein

complexes in prokaryotic and eukaryotic systems, approaches for protein purification, nanobody applications, as well as biophysical characterization and much more. Written for the highly successful Methods in Molecular Biology series, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. Authoritative and thorough, Expression, Purification, and Structure Biology of Membrane Proteins serves to guide and encourage young researchers and newcomers to the field to tackle bold new studies on membrane proteins. Chapter 11 is available open access under a CC-BY 4.0 license via link.springer.com.

Practical Bioinformatics

Meeting the need for a book on developing and using new methods to investigate membrane proteins, this is the first of its kind to present the full range of novel techniques in one resource. Top researchers from around the world focus on the physical principles exploited in the different techniques, and provide examples of how these can bring about important new insights. Following an introduction, further sections discuss structural approaches, molecular interaction and large assemblies, dynamics and spectroscopies, finishing off with an exploration of structure-function relationships in whole cells.

Computational Methods for Protein Structure Prediction and Modeling

Structure and Function of Membrane Proteins documents the proceedings of the International Symposium on Structure and Function of Membrane Proteins held in Selva di Fasano on May 23-26, 1983. This compilation makes it possible to obtain more information on the structure of membrane proteins, determining the structure in order to understand the function, and mechanism of action that is only understood by knowledge of the atomic structure. The gathering of data on the function of membrane proteins prior to knowledge of their structure is valuable for characterizing and defining the proteins. Onc

Membrane Proteins Production for Structural Analysis

Membrane Protein Structure and Dynamics

Each title in the 'Primers in Biology' series is constructed on a modular principle that is intended to make them easy to teach from, to learn from, and to use for reference.

Protein Structure and Function

This book updates the latest development in production, stabilization and structural analysis techniques of membrane proteins. This field has made significant advances since the elucidation of the first 3-D structure of a recombinant G Protein Coupled Receptor (GPCR), rhodopsin, with the structure of

several more GPCRs having been solved in the past five years. In fact, the 2012 Nobel Prize in Chemistry was awarded for groundbreaking discoveries on the inner workings of GPCRs. This book is essential reading for all researchers, biochemists and crystallographers working with membrane proteins, who are interested by the structural characterization of their favorite protein and who wish to follow the expression, migration, modifications and recycling of a membrane protein.

Membrane Protein Structure

This volume provides recent advances in the field of biophysics of membrane proteins. Chapters are divided into several parts: detailing biochemistry and functional analysis, experimental and theoretical structural determinations, membrane protein dynamics, and conformation studies. Written in the highly successful Methods in Molecular Biology series format, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. Authoritative and cutting-edge, Biophysics of Membrane Proteins: Methods and Protocols aims to provide comprehensive protocols with notes to help further the understanding of key membrane protein structure and function for students, academics, and industrial researchers.

Production of Membrane Proteins

Volume 16 marks the beginning of a special topic series devoted to modern techniques in protein NMR, under the Biological Magnetic Resonance series. This volume is being followed by Volume 17 with the subtitle Structure Computation and Dynamics in Protein NMR. Volumes 16 and 17 present some of the recent, significant advances in biomolecular NMR field with emphasis on developments during the last five years. We are honored to have brought together in these volumes some of the world’s foremost experts who have provided broad leadership in advancing this field. Volume 16 contains advances in two broad categories: the first, Large Proteins, Complexes, and Membrane Proteins, and second, Pulse Methods. Volume 17, which will follow covers major advances in Computational Methods, and Structure and Dynamics. In the opening chapter of Volume 16, Marius Clore and Angela Gronenborn give a brief review of NMR strategies including the use of long range restraints in the structure determination of large proteins and protein complexes. In the next two chapters, Lewis Kay and Ron Venters and their collaborators describe state-of-t- art advances in the study of perdeuterated large proteins. They are followed by Stanley Opella and co-workers who present recent developments in the study of membrane proteins. (A related topic dealing with magnetic field induced residual dipolar couplings in proteins will appear in the section on Structure and Dynamics in Volume 17).

Membrane Proteins – Engineering, Purification and Crystallization

This book reviews current techniques used in membrane protein structural biology, with a strong focus on practical issues. The study of membrane protein structures

not only provides a basic understanding of life at the molecular level but also helps in the rational and targeted design of new drugs with reduced side effects. Today, about 60% of the commercially available drugs target membrane proteins and it is estimated that nearly 30% of proteins encoded in the human genome are membrane proteins. In recent years much effort has been put towards innovative developments to overcome the numerous obstacles associated with the structure determination of membrane proteins. This book reviews a variety of recent techniques that are essential to any modern researcher in the field of membrane protein structural biology. The topics that are discussed are not commonly found in textbooks. The scope of this book includes: Expression screening using fluorescent proteins The use of detergents in membrane protein research The use of NMR Synchrotron developments in membrane protein structural biology Visualisation and X-ray data collection of microcrystals X-ray diffraction data analysis from multiple crystals Serial millisecond crystallography Serial femtosecond crystallography Membrane protein structures in drug discovery The information provided in this book should be of interest to anyone working in the area of structural biology. Students will find carefully prepared overviews of basic ideas and advanced protein scientists will find the level of detail required to apply the material directly to their day to day work. Chapters 4, 5, 6, 8 and 9 of this book are published open access under a CC BY 4.0 license at link.springer.com.

Biophysical Techniques for Structural Characterization of Macromolecules

This volume provides methods for modern macromolecular crystallography, including all steps leading to crystal structure determination and analysis. Written in the highly successful Methods in Molecular Biology series format, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. Authoritative and practical, Protein Crystallography aims to ensure successful results in the further study of this vital field.

Protein Purification

Electronic version of the text of the same title with additional audio and video links.

Advanced Methods in Structural Biology

Over the past decade, a myriad of techniques have shown that solid-state nuclear magnetic resonance (NMR) can be used in a broad spectrum of applications with exceptionally impressive results. Solid-state NMR results can yield high-resolution details on the structure and function of many important biological solids, including viruses, fibril-forming molecules, and molecules embedded in the cell membrane. Filling a void in the current literature, NMR Spectroscopy of Biological Solids examines all the recent developments, implementation, and interpretation of solid-state NMR experiments and the advantages of applying them to biological systems. The book emphasizes how these techniques can be used to realize the structure of non-crystalline systems of any size. It explains how these isotropic and

anisotropic couplings interactions are used to determine atomic-level structures of biological molecules in a non-soluble state and extrapolate the three-dimensional structure of membrane proteins using magic-angle spinning (MAS). The book also focuses on the use of multidimensional solid-state NMR methods in the study of aligned systems to provide basic information about the mechanisms of action of a variety of biologically active molecules. Addressing principles, methods, and applications, this book provides a critical selection of solid-state NMR methods for solving a wide range of practical problems that arise in both academic and industrial research of biomolecules in the solid state. NMR Spectroscopy of Biological Solids is a forward-thinking resource for students and researchers in analytical chemistry, bioengineering, material sciences, and structural genomics.

Protein Crystallography

This book focuses on the study of how the properties of nanodiscs, such as lipid composition and size, influence the function of the embedding integral membrane protein, bacteriorhodopsin. The author performed systematic studies to show that the lipid composition and the charge of the hydrophobic head and the structure of hydrophilic tails affect the photocycle pathway of bacteriorhodopsin, which is closely associated with its proton-pumping activity. Furthermore, the author demonstrated a highly efficient method for extracting membrane proteins directly from the biological membrane, preserving protein conformation, function and essential native lipids. This book demonstrates optimization and sample preparation, and presents practical methods of preparing membrane protein-embedded nanodisc samples for biophysical studies, which benefit structural and functional studies in the field of membrane protein characterization, both.

Introduction to Protein Structure Prediction

Methods in Molecular Biology[&™] series format, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. --

Biophysical Analysis of Membrane Proteins

The precise knowledge of the structure of biological macromolecules forms the basis of understanding their function and their mechanism of action. It also lays the foundation for rational protein and drug design. The only method to obtain this knowledge is still crystallography. At present, the structures of about 400 proteins are known at or nearly at atomic proteins. However, only two of them are membrane proteins or complexes of the membrane proteins. The reasons for the difference is not the crystals of membrane proteins resists forming special problems when being analysed. The reason is that the membrane proteins resist into forming into well-ordered crystals. The intention of this book is to help to produce well-ordered crystals proteins and to provide guidelines, it is aimed at both biochemists and protein crystallographer‘s.

The Next Generation in Membrane Protein Structure

Determination

The book provides up-to-date reference source for researchers. Introductory sections to each topic are followed by detailed discussions for the experienced biochemist.

Membrane Protein Crystallization

Cell-Free Protein Expression

Conformational Proteomics of Macromolecular Architecture

Designed as a research-level guide to current strategies and methods of membrane protein production on the small to intermediate scale, this practice-oriented book provides detailed, step-by-step laboratory protocols as well as an explanation of the principles behind each method, together with a discussion of its relative advantages and disadvantages. Following an introductory section on current challenges in membrane protein production, the book goes on to look at expression systems, emerging methods and approaches, and protein specific considerations. Case studies illustrate how to select or sample the optimal production system for any desired membrane protein, saving both time and money on the laboratory as well as the technical production scale. Unique in its coverage of "difficult" proteins with large membrane-embedded domains, proteins from extremophiles, peripheral membrane proteins, and protein fragments.

Molecular Biology of the Cell

In this present volume, different approaches are detailed to produce membrane proteins, purify them, study their function, determine their structure, and model them in membrane. Since every membrane protein behaves mostly in a unique way /fashion, knowledge of guidelines and tricks may help to increase chances to express, purify and characterize a peculiar membrane protein. Production of correctly folded protein remains a challenge. Moreover, getting a functional and stable protein requires to optimize membrane mimicking environments that can be detergent or artificial membranes. In some cases, the finding of the correct ligand which will stabilize the desired conformation is needed. In other cases, stabilization can be obtained using specific antibodies. This volume also presents different techniques to analyze the functional status of membrane proteins. Written in the highly successful Methods in Molecular Biology series format, chapters in Membrane Protein Structure and Function Characterization: Methods and Protocols provide different techniques to analyze the functional and structural status of membrane proteins. Chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. Authoritative and practical, Membrane Protein Structure and Function Characterization: Methods and Protocols aims to ensure successful results in the further study of this vital field.

Protein Structure

Membrane Proteins – Engineering, Purification and Crystallization, a volume of Methods In Enzymology, encompasses chapters from the leading experts in the area of membrane protein biology. The chapters provide a brief overview of the topics covered and also outline step-by-step protocol for the interested audience. Illustrations and case example images are included wherever appropriate to help the readers understand the schematics and general experimental outlines. Volume of Methods In Enzymology Contains a collection of a diverse array of topics in the area of membrane protein biology ranging from recombinant expression, isolation, functional characterization, biophysical studies and crystallization

Protein Crystallography

This book provides practical information on a whole set of protein experiments for advanced structural biology, such as X-ray crystallography, NMR, electron microscopy, advanced mass spectroscopy, and surface plasmon resonance, as well as a wide variety of expression systems including eukaryotic and in vitro expression. In the past decade, structural genomics studies have pushed forward the development of automated methods in the field of structural biology, however there is an increasing need for the structural analysis of difficult targets, such as large protein complexes and membrane proteins, which are hard to achieve using conventional automated methods, and require knowledge that goes beyond standard protein chemistry protocols. To address these problems and to help researchers develop novel methods, this volume provides examples of the development of new protein investigation methods and their theoretical background. This book particularly appeals to graduate students, postdoctoral researchers, young investigators wishing to gain a better understanding of the theory behind experiments, and those seeking further advanced, practical structural biology methods.

Membrane Protein Structure Determination

This book presents applications of bioinformatics tools that experimental research scientists use in "daily practice." Its interdisciplinary approach combines computational and experimental methods to solve scientific problems. The book begins with reviews of computational methods for protein sequence-structure-function analysis, followed by methods that use experimental data obtained in the laboratory to improve functional predictions.

Membrane Protein Structure and Function Characterization

This volume of Current Topics in Membranes focuses on Membrane Protein Crystallization, beginning with a review of past successes and general trends, then further discussing challenges of mebranes protein crystallization, cell free production of membrane proteins and novel lipids for membrane protein crystallization. This publication also includes tools to enchance membrane protein crystallization, technique advancements, and crystallization strategies used for photosystem I and its complexes, establishing Membrane Protein Crystallization as

a needed, practical reference for researchers.

Crystallization of Membrane Proteins

Volume One of this two-volume sequence focuses on the basic characterization of known protein structures, and structure prediction from protein sequence information. Eleven chapters survey of the field, covering key topics in modeling, force fields, classification, computational methods, and structure prediction. Each chapter is a self contained review covering definition of the problem and historical perspective; mathematical formulation; computational methods and algorithms; performance results; existing software; strengths, pitfalls, challenges, and future research.

Methods and Results in Crystallization of Membrane Proteins

Studies of receptors, ion channels, and other membrane proteins require a solid understanding of the structural principles of these important biomolecules. Membrane protein structure is, however, a very challenging field. The structures of only three types of transmembrane proteins have been determined to moderate or high resolution during the last two decades, a period during which the amino acid sequences of hundreds, if not thousands, of membrane proteins have been reported. As a result, the creation of structural models to serve as guides for studies of receptors, channels, and other membrane proteins has become crucially important. This book has been assembled in order to share the experiences and findings of expert researchers in protein structure and structure-prediction methods as well as membrane biophysics and lipid physical chemistry, whose work establishes the basis for the development of suitable model structures. The reviews presented here emphasize fundamental ideas and provide an entry to the diverse and complex literature. The four major sections deal with the general nature of the membrane protein structure problem, biochemical and molecular biological approaches to protein topology, direct structural methods, and model and physicochemical approaches. The work will be of interest to physiologists, cellular and molecular biologists, biophysicists, and biochemists working on the function of membrane proteins such as receptors, ion channels, and transporters, as well as senior graduate students and independent investigators.