Membrane Function

explores a fascinating aspect of cell biology that is emerging as pivotal for a variety of signaling processes in cells throughout the body; concise reviews of the lipid structure of membranes and how asymmetries in the membrane are formed, maintained and modified; the reader is introduced to the various lipids and their organization within membranes.
Includes bibliographical references.

Structure and Function of Biological Membranes explains the membrane phenomena at the molecular level through the use of biochemical and biophysical approaches. The book is an in-depth study of the structure and function of membranes.

It is fundamental for the flourishing biological cells that membrane proteins mediate the process. Membrane-embedded transporters move ions and larger solutes across membranes; receptors mediate communication

between the cell and its environment and membrane-embedded enzymes catalyze chemical reactions. Understanding these mechanisms of action requires knowledge of how the proteins couple to their fluid, hydrated lipid membrane environment. Here, we present here current studies in computational and experimental membrane protein biophysics, and show how they address outstanding challenges in understanding the complex environmental effects on the

structure, function, and dynamics of membrane proteins.
Membrane Protein Structure and Function Characterization
Probes of Structure and Function of Macromolecules and Membranes: Probes and membrane function, edited by B. Chance, C. Lee, and J. K. Blasie
Its Role in Interaction with the Outside World
The Role of Water in the Structure and Function of Biological Membranes
Molecular Structure and Function

Biomembranes

to the Second Edition RESEARCH INTO MEMBRANE-ASSOCIATED PHENOMENA HAS EXPANDED VERY greatly in the five years that have elapsed since the first edition of Biological Membranes was published. It is to take account of rapid advances in the field that we have written the present edition. There is now general acceptance of the fluid mosaic model of membrane structure and of the chemiosmotic interpretation of energetic processes, and our attention has shifted from justifying these ideas to explaining membrane functions

in their terms. Much more information has become available concerning the role of the plasma membrane in the cell's recognition of and response to external signals, and this is reflected in the increased coverage of these topics in the book. The general form of the book remains the same. As before, a list of suggested reading, sub-divided by chapter, is provided and this has been expanded to include a greater proportion of original papers. The book is still primarily designed as an advanced undergraduate text and also to serve as an introduction for post-graduate

workers entering the field of membrane research. We have taken cognizance of the comments of many reviewers, colleagues and students on the first edition and thank them for their contributions. In particular we wish to acknowledge our colleagues R. Eisenthal, G. D. Holman, D. W. Hough, and A. H. Rose. Dr. C. R.

A Structure-Function Toolbox for Membrane Transporter and Channels, Volume 594, a new release in the Methods in Enzymology series, continues the legacy of this premier serial with quality chapters authored by leaders in the

field. New chapters in the updated serial include Cryo-EM on membrane proteins embedded in nanodics, Solid-Supported membrane-based electrophysiology on membrane transporters and channels, Saposin-lipoprotein scaffolds for structure determination of membrane transporters and channels, Single-molecule FRET on transporters, Dynamics of channels and transporters investigated by NMR, Structure-function studies on channels and transporters, and a section on MemStar, a new GFP-based expression and purification system for transporters and

channels. Continues the legacy of this premier serial with quality chapters authored by leaders in the field Covers membrane transporter and channels

The contents of this book reflect a symposium held in honor of Professor Herman Kalckar's seventy-fifth birthday. His impact on the history of biochemistry is reflected by the diversity of the contributions of his former students and friends. Speakers came from Asia, Europe, and the United States to discuss both procaryotes and eukaryotes. The unifying theme was the cell membrane,

both its organization and its function. Ektobiology, a topic that has held the attention of Professor Kalckar for many years, was clearly defined as a central topic in biology. This subject deals with the key structure whereby the cell interacts with the outside world and which, in a sense, defines the boundary between what is the cell and what is not. Topics discussed include the biogenesis of membrane proteins, sugars and lipids, the role of membrane components in osmoregula tion, and mechanisms of nutrient transport. Of great interest is the system for surface

recognition evolved in vertebrates, exemplified by the HLA system of man. Neoplasia causes changes in the cell membrane that may be of significant future potential in the diagnosis and treatment of malignancies as well as in the understanding of the process of transformation. The changes in glycosphingolipids and carbohydrate antigens in relation to oncogenesis are detailed. I should like to recognize Doctors Kurt J. Isselbacher, Phillips W. Robbins, Victor Ginsburg, and Hiroshi Nikaido for their ,assistance in organizing the symposium. Ms. Jean

Brumbaugh deserves special thanks for putting this book together.

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.

The Plant Plasma Membrane
Structure and Function
Probes and membrane function
Membrane Protein Complexes: Structure and Function
Investigating Structure and Function
Membranes and Their Cellular Functions

Introduction to Biological Membranes: Composition, Structure and Function, Second Edition is a greatly expanded revision of the first edition that

integrates many aspects of complex biological membrane functions with their composition and structure. A single membrane is composed of hundreds of proteins and thousands of lipids, all in constant flux. Every aspect of membrane structural studies involves parameters that are very small and fast. Both size and time ranges are so vast that multiple instrumentations must be employed, often simultaneously. As a result, a variety of highly specialized and

esoteric biochemical and biophysical methodologies are often utilized. This book addresses the salient features of membranes at the molecular level, offering cohesive, foundational information for advanced undergraduate students, graduate students, biochemists, and membranologists who seek a broad overview of membrane science. Significantly expanded coverage on function, composition, and structure Brings together complex aspects of membrane research in a universally understandable

manner Features profiles of membrane pioneers detailing how contemporary studies originated Includes a timeline of important discoveries related to membrane science

This book is devoted to the red blood cell membrane, its structure and function, and abnormalities in disease states. It presents a well-documented and well-illustrated comprehensive picture of clinical manifestations of red blood cell disorders.

An Introduction to

Biological Membranes: From Bilayers to Rafts covers many aspects of membrane structure/function that bridges membrane biophysics and cell biology. Offering cohesive, foundational information, this publication is valuable for advanced undergraduate students, graduate students and membranologists who seek a broad overview of membrane science. Brings together different facets of membrane research in a universally understandable manner Emphasis on the

historical development of the field Topics include membrane sugars, membrane models, membrane isolation methods, and membrane transport.

In this new edition of The Membranes of Cells, all of the chapters have been updated, some have been completely rewritten, and a new chapter on receptors has been added. The book has been designed to provide both the student and researcher with a synthesis of information from a number of scientific disciplines to create a comprehensive

*view of the structure and function of the membranes of cells. The topics are treated in sufficient depth to provide an entry point to the more detailed literature needed by the researcher. Key Features * Introduces biologists to membrane structure and physical chemistry * Introduces biophysicists to biological membrane function * Provides a comprehensive view of cell membranes to students, either as a necessary background for other specialized disciplines or as an entry into the field*

*of biological membrane research * Clarifies ambiguities in the field*
Molecular Biology of the Cell
The Cell Membrane
Proceedings of the International Symposium on Structure and Function of Membrane Proteins Held in Selva Di Fasano (Italy), May 23-26, 1983
Membrane Structure and Function
Mobility and Proximity in Biological Membranes
Red Blood Cell Membranes

Many membranes in eukaryotic cells are inhomogeneous structures in which various

membrane components are nonrandomly distributed, forming diverse types of 'domains.' Some membrane domains have long been well known, because they are sufficiently large, long-lived, and morphologically well defined to be characterized using classical microscopic and biochemical approaches. However, new technologies have revealed the presence in membranes of smaller, often highly dynamic 'nanodomains' that also play key roles in membrane function. Our current understanding of the diversity, the properties, and the functions of nanodomains is still very limited and, in some cases,

controversial. Nonetheless, it is clear that many important aspects of membrane biology arise from features of membrane organization that 'play out' on spatial and temporal scales that are only now becoming experimentally accessible in living systems. In this book, we will discuss properties and interactions of membrane molecules that lead to nanodomain formation, new and emerging technologies by which nanodomains can be studied, and experimental examples that illustrate both highlights and current limitations of our present knowledge of the properties of

membrane nanodomains in various cell types.

Membrane Physiology (Second Edition) is a soft-cover book containing portions of Physiology of Membrane Disorders (Second Edition). The parent volume contains six major sections. This text encompasses the first three sections: The Nature of Biological Membranes, Methods for Studying Membranes, and General Problems in Membrane Biology. We hope that this smaller volume will be helpful to individuals interested in general physiology and the methods for studying general physiology. THOMAS E. ANDREOLI

JOSEPH F. HOFFMAN DARRELL D. FANESTIL STANLEY G. SCHULTZ vii Preface to the Second Edition The second edition of Physiology of Membrane Disorders represents an extensive revision and a considerable expansion of the first edition. Yet the purpose of the second edition is identical to that of its predecessor, namely, to provide a rational analysis of membrane transport processes in individual membranes, cells, tissues, and organs, which in tum serves as a frame of reference for rationalizing disorders in which derangements of membrane transport processes playa cardinal

role in the clinical expression of disease. As in the first edition, this book is divided into a number of individual, but closely related, sections. Part V represents a new section where the problem of transport across epithelia is treated in some detail. Finally, Part VI, which analyzes clinical derangements, has been enlarged appreciably.

This text attempts to introduce the molecular biology of cell membranes to students and professionals of diverse backgrounds. Although several membrane biology books are available, they do not integrate recent knowledge gained using

modern molecular tools with more traditional membrane topics. Molecular techniques, such as cDNA cloning and x-ray diffraction, have provided fresh insights into cell membrane structure and function. The great excitement today, which I attempt to convey in this book, is that molecular details are beginning to merge with physiological responses. In other words, we are beginning to understand precisely how membranes work. This textbook is appropriate for upper-level undergraduate or beginning graduate students. Readers should have previous or concurrent coursework in biochemistry; prior

studies in elementary physiology would be helpful. I have found that the presentation of topics in this book is appropriate for students of biology, biochemistry, biophysics and physiology, chemistry, and medicine. This book will be useful in courses focusing on membranes and as a supplementary text in biochemistry courses. Professionals will also find this to be a useful resource book for their personal libraries.

Biological membranes have been under intensive investigation for several decades. Despite very great experimental challenges, membranes are at last beginning

to reveal their secrets. In this book, leading investigators of membrane structure and function report on progress in three related fields: specialization of membrane regions, asymmetry in transport properties, and differentiation of cell faces in epithelia. "Specialization at the Molecular Level" is the subject of the first section; in it, the authors consider such problems as the biogenesis of membranes, the geometry of protein-lipid relationships, and the physical properties of membrane receptor-sites. In the second section, "Asymmetry in Transport," such topics as the sodium-potassium pump, proton

translocation, and anion transport are covered. The last section is entitled "Polar Faces in Epithelia" and deals with the complex properties of ion transport across the complex membrane environment maintained by surfaces such as the renal tubular epithelia.

The Molecular Basis of Membrane Function

Composition, Structure and Function

Viral Membrane Proteins: Structure, Function, and Drug Design

Membrane Microdomain Signaling

Control of Membrane Function:

short-term and long-term

Biophysical Analysis of Membrane Proteins

Structure and Function of Biological Membranes explains the membrane phenomena at the molecular level through the use of biochemical and biophysical approaches. The book is an in-depth study of the structure and function of membranes. It is divided into three main parts. The first part provides an overview of the study of the biological membrane at the molecular level. Part II focuses on the detailed description of the overall molecular organization of membranes. The third part covers the relationship of the

molecular organization of membranes to specific membrane functions; discusses catalytic membrane proteins; presents the role of membranes in important cellular functions; and looks at the membrane systems in eukaryotic cells. Biochemists, cell physiologists, biologists, researchers, and graduate and postdoctoral students in the field of biology will find the text a good reference material.

New textbooks at all levels of chemistry appear with great regularity. Some fields like basic biochemistry, organic reaction mechanisms, and chemical thermody namics are well

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 real lack of up-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. It is not often easy to persuade such individuals to set time aside to help spread the knowledge they have accumulated. 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.
Concepts of Biology is designed for the single-semester introduction to biology course for non-science majors, which

for many students is their only college-level science course. As such, this course represents an important opportunity for students to develop the necessary knowledge, tools, and skills to make informed decisions as they continue with their lives. Rather than being mired down with facts and vocabulary, the typical non-science major student needs information presented in a way that is easy to read and understand. Even more importantly, the content should be meaningful. Students do much better when they understand why biology is relevant to their everyday lives.

For these reasons, Concepts of Biology is grounded on an evolutionary basis and includes exciting features that highlight careers in the biological sciences and everyday applications of the concepts at hand.We also strive to show the interconnectedness of topics within this extremely broad discipline. In order to meet the needs of today's instructors and students, we maintain the overall organization and coverage found in most syllabi for this course. A strength of Concepts of Biology is that instructors can customize the book, adapting it to the approach that works best in their classroom. Concepts of Biology

also includes an innovative art program that incorporates critical thinking and clicker questions to help students understand--and apply--key concepts.

This book examines detailed experimental and computational approaches for the analysis of many aspects vital to the understanding of membrane protein structure and function. Readers will receive guidance on the selection and use of methods for over-expression and purification, tools to characterize membrane proteins within different phospholipid bilayers, direction on functional studies, and approaches to determine the

structures of membrane proteins. Detailed experimental steps for specific membrane proteins with critical notes allow the protocols to be modified to different systems. Written for the highly successful Methods in Molecular Biology series, chapters include the kind of practical information and implementation advice that leads to excellent, reproducible results. Authoritative and up-to-date, Structure and Function Studies of Membrane Proteins serves as an ideal guide for biologists, biochemists, and biophysicists striving to further understand these essential proteins and their many

biological roles.

Red Cell Membrane: Structure and Function

Structure and Function of Membrane Proteins

Membrane Hydration

Structure, Function and Other Correlations

Probes of Structure and Function of Macromolecules and Membranes

The Membranes of Cells

Inorganic, Polymeric and Composite Membranes: Structure-Function and Other Correlations covers the latest technical advances in topics such as structure-function relationships for polymeric, inorganic, and composite membranes. Leading

scientists provide in depth reviews and disseminate cutting-edge research results on correlations but also discuss new materials, characterization, modelling, computational simulation, process concepts, and spectroscopy. Unified by fundamental general correlations theme Many graphical examples Covers all major membrane types This edited book contains a compilation of 14 advanced academic chapters dealing with the structure and function of membrane protein complexes. This rapidly advancing important field of study closely parallels those on soluble protein

complexes, and viral protein and nucleoprotein complexes. Diverse topics are included in this book, ranging from membrane-bound enzymes to ion channels, proton pumps and photosystems. Data from X-ray crystallography, cryo-electron microscopy and other biophysical and biochemical techniques are presented throughout the book. There is extensive use of colour figures of protein structures. Throughout the book structure and function are closely correlated. The two editors, Egbert Boekema and J. Robin Harris, have worked on aspects of membrane and soluble proteins throughout their

scientific careers and also have much publishing experience. The Subcellular Biochemistry series has expanded considerably in recent years, including several related volumes. The theme of protein complexes will be continued within several future volumes, thereby creating encyclopaedic coverage. The chapter topics within this book are particularly relevant to those involved in the biological and biomedical sciences. It is aimed at the advanced undergraduates, postgraduates and established researchers within this broad field. It

is hoped that the book will be of interest and use to those involved with the study of cellular membranes and their associated proteins.

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. Once the structure is known, another stage of research will penetrate to the functional assignments of the structure. Other topics covered include the physical methods for the structure-function relationship; identification and mapping of sites in membrane proteins; and primary structure of transport proteins. Tertiary structure and molecular shape of

membrane proteins and structure-function relationship in membrane proteins are also examined. This book is a good source of information for students and individuals conducting research on biochemistry, specifically on membrane proteins.

Current Topics in Membranes is targeted toward scientists and researchers in biochemistry and molecular and cellular biology, providing the necessary membrane research to assist them in discovering the current state of a particular field and in learning where that field is heading. This

volume covers recent breakthroughs in understanding the molecular and cellular basis for patterning vertebrate plasma membranes. A special emphasis is placed on physiological function with chapters covering signaling in the nervous system and heart, vision, and the immune system. consolidates subjects normally dispersed in the literature presents in one volume a subject that has undergone a recent molecular revolution authors are primary contributors and in some cases the founding figures in their fields

Lipid Rafts in Biology and Medicine

Molecular Biology of Membranes
From Bilayers to Rafts Their Structure and Function
Membrane Nanodomains
Structure and Function of Biological Membranes

A critical factor in cell-to-cell interactions is the presence in the cell membrane of highly specific ion channels controlled by specific receptors that are bound to, and activated by, a gamut of external hormones and neurotransmitters. Through both this action on ion channels, and action on other membrane components (such as G-proteins), extracellular signals alter intracellular events, usually

through the mediation of second messengers, and so provide the basis for the transduction mechanism connecting extracellular signals with intracellular effectors. This volume deals with the various ways that such membrane function is controlled.

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. . 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.

This book is about the importance of water in determining the structure, stability and responsive behavior of biological membranes. Water confers to lipid membranes unique features in terms of surface and mechanical properties. The analysis of the hydration forces, plasticiser effects, controlled hydration, formation of microdomains of confined water suggests that water is an active constituent in a water-lipid

system. The chapters describe water organization at the lipid membrane–water interphase, the water penetration, the long range water structure in the presence of lipid membranes by means of X-ray and neutron scattering, general polarization, fluorescent probes, ATR-FTIR and near infrared spectroscopies, piezo electric methods, computer simulation and surface thermodynamics. Permeation, percolation, osmotic stress, polarization, protrusion, sorption, hydrophobicity, density fluctuations are treated in detail in self-assembled bilayers. Studies in lipid monolayers show the

correlation of surface pressure with water activity and its role in peptide and enzyme interactions. The book concludes with a discussion on anhydrobiosis and the effect of water replacement in microdomains and its consequence for cell function. New definitions of lipid/water interphases consider water not only as a structural-making solvent but as a mediator in signalling metabolic activity, modulating protein insertion and enzymatic activity, triggering oscillatory reactions and functioning of membrane bound receptors. Since these effects occur at the molecular level,

membrane hydration appears fundamental to understand the behavior of nano systems and confined environments mimicking biological systems. These insights in structural, thermodynamical and mechanical water properties give a base for new paradigms in membrane structure and function for those interested in biophysics, physical chemistry, biology, bio and nano medicine, biochemistry, biotechnology and nano sciences searching for biotechnological inputs in human health, food industry, plant growing and energy conversion.

An Introduction to Biological Membranes

Biological Membranes
Dynamic Plasma Membranes: Portals Between Cells and Physiology
Lipid Domains and the Relationship to Membrane Function
Molecular Specialization and Symmetry in Membrane Function
A Structure-Function Toolbox for Membrane Transporter and Channels

Cell surface membranes have long been characterized as two-dimensional fluids whose mobile components are randomized by diffusion in the plane of the membrane bilayer. Recent research has indicated that cell

surface membranes are highly organized and ordered and that important functional units of membranes appear as arrays of interacting molecules rather than as single, freely diffusing molecules. Mobility and Proximity in Biological Membranes provides an overview of the results obtained from biophysical methods for probing the organization of cell surface membranes. These results are presented in the context of detailed treatments of the theory and the technical demands of each of the methods. The book describes a versatile and easily applied mode for investigating molecular proximities in plasma

membranes in a flow cytometer. Its analysis of lipid fluidity and viscosity of membranes and the rotational mobility of proteins offers intimate insight into the physical chemistry of biological membranes. The electrophysiology of lymphocytes is presented with focus on its importance in different diseases. New techniques are described, and new data, new possibilities, and future trends are presented by world experts. This book's chapters can serve both as guides to the existing literature and as starting points for new experiments and approaches associated with problems in membrane function.

The plasma membrane forms the living barrier between the cell and its surroundings. For this reason it has a wide range of important functions related to the regulation of the composition of the cell interior and to com munication with the cell exterior. The plasma membrane has therefore attracted a lot of research interest. Until the early 1970's it was only pos sible to study the plasma membrane in situ, its structure e. g. by electron microscopy and its function e. g. by uptake of radioactively labeled com pounds into the intact cell or tissue. The first isolation of plant protoplasts by enzymatic digestion of the cell wall in the early 1970's was an important step forward in

that it provided direct access to the outer surface of the plasma membrane. More importantly, T. K. Hodges and R. J. Leonard in 1972 published the description of a method by which a fraction enriched in plasma membranes could be isolated from plant tissues using sucrose gradient centrifugation. As a result, the 1970's saw a leap forward in our understanding of the structurc and function of the plasma membrane. In 1981, S. Widell and C. Larsson published the first of a series of papers in which plasma membrane vesicles of high yield and purity were isolated from a wide range of plant tissues using aqueous polymer two-phase parti

tioning.

This volume focuses on the recent advances in understanding plasma membrane organization and function beginning with simple systems and extending to specialized membrane domains of vertebrate cells. Written by leading experts in the field Contains original material, both textual and illustrative, that should become a very relevant reference material Presents material in a very comprehensive manner Ideal for both researchers in the field and general readers who will find relevant and up-to-date information

Structure, Function and Molecular Biology

Concepts of Biology
Membrane Protein Structure, Function, and Dynamics
Functional Organization of Vertebrate Plasma Membrane
Structure: Function: Clinical Implications
Inorganic Polymeric and Composite Membranes