



# Ion Channel Reconstitution

**Yuan Liu, David M. Lovinger**



## **Ion Channel Reconstitution:**

Ion Channel Reconstitution C. Miller, 2013-11-09 It is now over 30 years since the idea of ion conducting pores burst on the electrophysiological scene 15 years since these were generally realized to be membrane spanning proteins and 10 years since the first observations of single ion channels from higher organisms were made During the past 5 years several integral membrane channel proteins have been purified in a functionally competent state the nicotinic acetylcholine receptor the Na channel mitochondrial VDAC and a variety of porins The stage is thus set to attack ion channels in the same ways that biochemists have been attacking enzymes for decades isolation followed by functional analysis in as simple a system as possible with a view towards understanding the molecular mechanisms of the protein's behavior and how this is related to the underlying molecular structure This is always a daunting task all the more so with ion channels because of our still primitive and scanty understanding of channel structures and because of the difficulty in isolating functionally active channel proteins In this volume which can be considered a biochemically slanted companion to Sakmann and Neher's Single Channel Recording I have tried to present a view of the current landscape of ion channel reconstitution These chapters illustrate not only the different approaches and techniques of the major practitioners of ion channel reconstitution but as importantly the varied motivations for doing this kind of work

**Ion Channel Reconstitution Platform Allowing Simultaneous Recording from Multiple Bilayer Sites** Shankar Ramakrishnan, 2011 ABSTRACT The purpose of this study is to demonstrate that stable lipid bilayers can be set up on an array of silicon micropores and can be used as sites for self inserting ion channel proteins which can be studied independently of each other In course of this study an acrylic based holder was designed and machined to ensure leak free fluidic access to the silicon micropores and physical isolation of the individual array channels To measure the ion channel currents we simulated designed and manufactured low noise transimpedance amplifiers and support circuits based on published patch clamp amplifier designs using currently available surface mount components This was done in order to achieve a reduction in size and costs as well as isolation of individual channels without the need for multiplexing of the input During the experiments performed stable bilayers were formed across an array of four vertically mounted 30 nm silicon micropores and OmpF porins were added for self insertion in each of the bilayers To further demonstrate the independence of these bilayer recording sites the antibiotic Ampicillin 2.5 mM was added to one of the fluidic wells The ionic current in each of the wells was recorded simultaneously Subconductance states of OmpF porin were observed in two of the measurement sites In addition the conductance steps in the site containing the antibiotic could be clearly seen to be larger compared to those of the unmodified site This is due to the transient blocking of ion flow through the porin due to translocation of the antibiotic Based on this demonstration ion channel array reconstitution is a potential method for efficient electrophysiological characterization of different types of ion channels simultaneously as well as for studying membrane permeation processes

**Methods in Membrane Lipids** Alex M. Dopico, 2007-08-30 This

book presents a compendium of methodologies for the study of membrane lipids varying from traditional lab bench experimentation to computer simulation and theoretical models The volume provides a comprehensive set of techniques for studying membrane lipids with a strong biophysical emphasis It compares the various available techniques including the pros and cons as seen by the experts

**Molecular Biology of Membrane Transport Disorders** Thomas E. Andreoli, A.M. Brown, D.M. Fambrough, Joseph F. Hoffman, Stanley G. Schultz, Michael J. Welsh, 2013-11-11 When the six of us gathered to start planning for what was to be the Third Edition of Physiology of Membrane Disorders it was clear that since 1986 when the Second Edition appeared the field had experienced the dawning of a new era dominated by a change in focus from phenomenology to underlying mechanisms propelled by the power of molecular biology In 1985 detailed molecular information was available for only three membrane transporters the lac permease bacterial rhodopsin and the acetylcholine receptor During the decade that has since elapsed almost all of the major ion channels and transport proteins have been cloned sequenced mutagenized and expressed in homologous as well as heterologous cells Few if any of the transporters that were identified during the previous era have escaped the probings of the new molecular technologies and in many instances considerable insight has been gained into their mechanisms of function in health and disease Indeed in some instances novel unexpected transporters have emerged that have yet to have their functions identified The decision to adopt the new title Molecular Biology of Membrane Transport Disorders was a natural outgrowth of these considerations

Artificial and Reconstituted Membrane Systems J. Robin Harris, Abol-Hassan Etémedi, 2013-11-11 This collection of 11 chapters is devoted to a survey of artificial and reconstituted membrane systems These are fundamental themes and areas of great current importance in membrane biochemistry They also relate well to the founding concept of this series namely to present studies that progressively work toward and provide us with an integrated view of the cell In this volume it is the application of a wide range of physiochemical and biochemical techniques to the study of membrane lipids and proteins which serves to demonstrate the significant progress that has been made in this field over the past 25 years From the understanding of simplified artificial systems it is hoped that it will ultimately be possible to gain a more accurate understanding of natural biological membranes in all their diversity This book is an appropriate successor to Volume 13 of the series which deals with fluorescence studies on biological membranes Indeed the present chapter by Lesley Davenport and colleagues was originally due for inclusion in Volume 13 but has been held over for inclusion in this volume where it integrates remarkably well with the other topics The extremely varied and interesting contents of this volume are now briefly outlined In Chapter I Jacqueline A Reynolds and Darrell R McCaslin present a pertinent survey of the interaction of detergents with membrane lipids and proteins together with an assessment of the reconstitution process

**Single-Channel Recording** Bert Sakmann, 2013-11-11 Single channel recording has become a widely used tool for the study of ion permeation mechanisms in biological membranes Whereas the technique might have been considered an art after its introduction in 1976 it developed

into a relatively simple method after it became possible to obtain high resistance several gigaohm membrane pipette seals In the summer of 1982 a course on the technique was held at the Ettore Majorana Center for Scientific Culture in Erice Sicily It brought together people from most of the laboratories involved in patch clamping at that time During the course it became apparent that the technique had reached a state of maturity Repeatedly the opinion was expressed that a detailed description of all the aspects of the technique including representative examples of results should be available We therefore asked the course instructors as well as several other colleagues to provide chapters on selected topics in order to produce this volume The different variants of patch clamping were described quite extensively in an article by Hamill Marty Neher Sakmann and Sigworth Pflugers Archiv 391 85 in 1981 Rather than repeating this survey in an introductory chapter we chose to reprint that article in the Appendix of this volume by permission of Springer Verlag The methods section will therefore go straight into detailed aspects of the technology

Cell Physiology Source Book Nicholas Sperelakis, Nick Sperelakis, 2001-08-02 This completely revised and updated source book provides comprehensive and authoritative coverage of cell physiology and membrane biophysics Intended primarily as a text for advanced undergraduate and graduate students and as a reference for researchers this multidisciplinary book includes several new chapters and is an invaluable aid to scientists interested in cell physiology biophysics cell biology electrophysiology and cell signaling

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**BIOPHYSICAL JOURNAL** The Cell Physiology Source Book was on CHOICE's list of Outstanding Academic Books for 1996 and the second edition was on CHOICE's list of Outstanding Academic Books in 1998

*Cell Physiology Sourcebook* Nicholas Sperelakis, 2001-05-15 This completely revised and updated source book provides comprehensive and authoritative coverage of cell physiology and membrane biophysics Intended primarily as a text for advanced undergraduate and graduate students and as a reference for researchers this multidisciplinary book includes several new chapters and is an

invaluable aid to scientists interested in cell physiology biophysics cell biology electrophysiology and cell signaling Includes broad coverage of both animal and plant cells Appendices review basics of the propagation of action potentials electricity and cable properties     *Membrane-active Peptides* Miguel A. R. B. Castanho,2010     **Membrane Proteins: Structures, Interactions and Models** A. Pullman,Joshua Jortner,2012-12-06 The 25th Jerusalem Symposium represents a most significant highlight in the development and history of these meetings Living within the decimal system we have celebrated with much pleasure the lath and the 20th Jerusalem Symposia With this one we experience a feeling of particular satisfaction because 25 years is different from is more than two decades and a half It is a quarter of a century It seems thus as if we have changed the dimension of our endeavour In no way do we loose the sense of modesty with respect to the significance of these meetings For the organizers however they do represent a continuity of efforts which we feel happy to have been able to carry out At this occasion it seems useful to say a few words about the origin of the Jerusalem Symposia and to recall the name of a colleague who played an essential role in their creation and has been a most efficient and devoted co organizer of the seven first of them This was Professor Ernst Bergmann one of the most distinguished founders of Israeli Science and a world famous physico organic chemist     **Signal Transduction – Single Cell Techniques** Bert, van Duijn,Anneke Wiltink,2012-12-06 A variety of powerful techniques for monitoring and analysing events during signal transduction at the single cell level are described in this lab manual An introductory section on cell handling includes guidelines for constructing a perfusion chamber A main section of the book presents protocols on fluorescence techniques such as flow cytometry microfluorescence ion imaging and confocal microscopy The electrophysiological section illustrates multiple applications of the patch clamp technique in various cell types from both animals and plants Emphasis is put on calibration and validation of the different techniques to measure changes of membrane potential and intracellular ion concentration or pH     Planar Lipid Bilayers W. Hanke,W. R. Schulue,2012-12-02 Biological Techniques is a series of volumes aimed at introducing to a wide audience the latest advances in methodology The pitfalls and problems of new techniques are given due consideration as are those small but vital details not always explicit in the methods sections of journal papers In recent years most biological laboratories have been invaded by computers and a wealth of new DNA technology and this will be reflected in many of the titles appearing in the series The books will be of value to advanced researchers and graduate students seeking to learn and apply new techniques and will be useful to teachers of advanced undergraduate courses involving practical or project work Methods of constructing artificial membranes planar lipid bilayers from the main components of cell membranes lipids date from the early 1960s Planar bilayers offer direct quantitative experimental approaches to the study of membranes of precisely determined composition which can be manipulated by the experimenter Pore forming molecules transporter molecules ATP dependent enzymes and other entities can be incorporated into the bilayers to simulate biological functions Reconstitution of such functions in this way remains a key final step in attributing a functional role to purified cell

membrane proteins This book aims to demystify these techniques and begins with a broad overview of the development of the subject before dealing with the protocols involved Key references are provided at the end of the book together with a list of suppliers Full practical details include How to set up conventional painted and folded bilayer experiments Patch dipping methods and use of giant liposomes Lipid characterization preparation and purification Discussion of construction of essential apparatus flux measurements electrical recording data acquisition and computer support Biochemical methods for use in planar bilayer experiments Techniques for incorporation of native proteins and other molecules

*Comprehensive Nanoscience and Technology*, 2010-10-29 From the Introduction Nanotechnology and its underpinning sciences are progressing with unprecedented rapidity With technical advances in a variety of nanoscale fabrication and manipulation technologies the whole topical area is maturing into a vibrant field that is generating new scientific research and a burgeoning range of commercial applications with an annual market already at the trillion dollar threshold The means of fabricating and controlling matter on the nanoscale afford striking and unprecedented opportunities to exploit a variety of exotic phenomena such as quantum nanophotonic and nanoelectromechanical effects Moreover researchers are elucidating new perspectives on the electronic and optical properties of matter because of the way that nanoscale materials bridge the disparate theories describing molecules and bulk matter Surface phenomena also gain a greatly increased significance even the well known link between chemical reactivity and surface to volume ratio becomes a major determinant of physical properties when it operates over nanoscale dimensions Against this background this comprehensive work is designed to address the need for a dynamic authoritative and readily accessible source of information capturing the full breadth of the subject Its six volumes covering a broad spectrum of disciplines including material sciences chemistry physics and life sciences have been written and edited by an outstanding team of international experts Addressing an extensive cross disciplinary audience each chapter aims to cover key developments in a scholarly readable and critical style providing an indispensable first point of entry to the literature for scientists and technologists from interdisciplinary fields The work focuses on the major classes of nanomaterials in terms of their synthesis structure and applications reviewing nanomaterials and their respective technologies in well structured and comprehensive articles with extensive cross references It has been a constant surprise and delight to have found amongst the rapidly escalating number who work in nanoscience and technology so many highly esteemed authors willing to contribute Sharing our anticipation of a major addition to the literature they have also captured the excitement of the field itself in each carefully crafted chapter Along with our painstaking and meticulous volume editors full credit for the success of this enterprise must go to these individuals together with our thanks for largely adhering to the given deadlines Lastly we record our sincere thanks and appreciation for the skills and professionalism of the numerous Elsevier staff who have been involved in this project notably Fiona Geraghty Megan Palmer and Greg Harris and especially Donna De Weerd Wilson who has steered it through from its inception We have greatly enjoyed working with them

all as we have with each other      *Biophysics of Gap Junction Channels* M.D. Peracchia, 2018-01-18 This book provides a state of the art account of present knowledge of the biophysics of cell to cell channels It is divided into two sections one dealing with two cell systems and the other with reconstitution systems      **Planar Lipid Bilayers (BLM's) and Their Applications** H.T. Tien †, A. Ottova-Leitmannova, 2003-02-27 The lipid bilayer is the most basic structural element of cell membranes A wide range of topics are covered in this volume from the origin of the lipid bilayer concept to current applications and experimental techniques Each chapter in this volume is self contained and describes a group's research providing detailed methodology and key references useful for researchers Lipid bilayer research is of great interest to many because of its interdisciplinary nature Provides an overview of decades of research on the lipid bilayer 38 contributed chapters by leading scientists cover a wide range of topics in one authoritative volume Book coincides with 40th anniversary of BLM      **Thermodynamics of Membrane Receptors and Channels** Meyer B. Jackson, 1992-11-18 Thermodynamics of Membrane Receptors and Channels synthesizes a wealth of new information regarding the biophysics of membrane proteins New insights provided by molecular genetics single channel recording and high resolution structural techniques are discussed from a conceptual perspective Basic theoretical topics are introduced developed and then extensively illustrated with recent results from the literature or data from the authors own laboratories Theoretical and experimental information is incorporated into in depth discussions of ion permeation mechanisms ion channel and receptor conformational changes aggregate activity of complexes of lipids and proteins and how coupling is achieved between different energy modes in the many transduction systems residing in biomembranes Thermodynamics of Membrane Receptors and Channels will be valuable both as a learning aid and a reference for biophysicists neuroscientists cell biologists physiologists and other researchers investigating any aspects of biomembranes      Heterotrimeric G-Protein Effectors Ravi Iyengar, 1994-09-08 This volume of *Methods in Enzymology* and its companion Volume 237 include molecular biological and biochemical methods for the study of cell surface heterotrimeric G proteins and their effectors Methods unique to signal transducing G proteins and general techniques that have been applied to the study of G protein systems are covered      **Current Topics in Membranes and Transport**, 1991-01-18 **Current Topics in Membranes and Transport**      **Methods in Alcohol-Related Neuroscience Research** Yuan Liu, David M. Lovinger, 2002-02-14 Written by a panel of experts *Methods in Alcohol Related Neuroscience Research* not only provides information of a technical nature but also gives an overview of the many areas in investigating the effects of alcohol on the brain It gives technical guidance for investigators doing research at the molecular cellular systems and behavioral levels These techniques include a wide variety of approaches ranging from gene mapping and examination of molecular interactions of alcohol at the sub cellular level to recording of neural activities in freely behaving animals and imaging alcohol effects on the living human brain      *Methods in Pharmacology* H. Glossmann, J. Striessnig, 2013-03-09 The current volume provides detailed experimental protocols used to study plasma membrane ion



channels as pharmacological targets Coverage includes molecular and biochemical characterization of ion channels functional analysis of ion channels after reconstitution expression or in cells and specific methods and tools This wealth of information will benefit academic and industrial researchers and graduate students in pharmacology biochemistry physiology and biophysics

## Unveiling the Magic of Words: A Review of "**Ion Channel Reconstitution**"

In some sort of defined by information and interconnectivity, the enchanting power of words has acquired unparalleled significance. Their capability to kindle emotions, provoke contemplation, and ignite transformative change is truly awe-inspiring. Enter the realm of "**Ion Channel Reconstitution**," a mesmerizing literary masterpiece penned by a distinguished author, guiding readers on a profound journey to unravel the secrets and potential hidden within every word. In this critique, we shall delve to the book is central themes, examine its distinctive writing style, and assess its profound effect on the souls of its readers.

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