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Preface



Membrane proteins occupy a central role in cellular physiology. Almost 50% of all proteins encoded by eukaryotic genomes are membrane proteins. As a result, ~50% of biological processes take place on membranes. This special issue of *BBA-Biomembranes* on *Lipid-Protein Interactions* highlights contemporary issues in this area with emphasis on lipid interactions of membrane proteins, and possible implications in health and disease. Breakthroughs in membrane protein research have been rather slow in the past due to technical challenges in crystallizing membrane proteins and lack of appropriate techniques to monitor lipid-protein interactions *in situ* in natural membranes. Tremendous advances in membrane protein crystallography in the last few years, coupled with powerful molecular dynamics and microscopic approaches, have started to change this scenario.

It is against this backdrop that this special issue has been organized. The articles in this special issue cover various aspects of the complex interplay between membrane proteins and lipids, utilizing a variety of experimental and theoretical tools. As a result, this issue includes articles on important membrane proteins such as receptors, ion channels and pumps explored utilizing a battery of experimental (spectroscopic, dipole potential measurements, optical biosensors) and molecular dynamics simulation (coarse-grain as well as atomistic) approaches. The implications of lipid-protein interactions in membrane protein folding, trafficking and microdomains also constitute the focus of various articles in this issue. We hope that the synthesis of information and knowledge gained by study of multiple systems of varying degrees of complexity would result in a comprehensive understanding of the underlying membrane phenomenon. This would help to develop robust models for function and interaction of membrane proteins, while enhancing our ability to design better therapeutic strategies to combat diseases related to malfunctioning of membrane proteins and receptors.

We would like to make use of this opportunity to thank all the contributors, who are leaders in their respective areas of research, for their efforts in making this an exciting and eclectic issue. Special thanks are due to Hans Vogel and Yechiel Shai, Executive Editors, *BBA-Biomembranes*, and to Andy Deelen, Steve Person, Anne Ruimy, Tiffany Hicks and Rinky Mathew for their cooperation and support in organizing this issue.



Prof. Amitabha Chattopadhyay received his B.Sc. with Honors in Chemistry from St. Xavier's College (Calcutta) and M.Sc. from IIT Kanpur. He obtained his Ph.D. from the State University of New York (SUNY) at Stony Brook, and was a Postdoctoral Fellow at the University of California, Davis. He subsequently joined the Centre for Cellular and Molecular Biology (CCMB) in Hyderabad and is now an Outstanding Scientist (Director level) there. Prof. Chattopadhyay's work is focused on monitoring organization, dynamics and function of biological membranes in healthy and diseased conditions. His group has developed and applied novel, innovative and sensitive techniques using fluorescence spectroscopy for monitoring solvent relaxation in membranes, membrane-mimetic media, and proteins. These pioneering studies have led to a better understanding of the dynamics of hydration of membranes and proteins. Another seminal contribution of his group is the role of membrane cholesterol in regulating G protein-coupled receptors, such as the serotonin_{1A} receptor, showing for the first time, that membrane cholesterol is necessary for their function. His work has also provided novel insight in the role of membrane cholesterol in the entry of pathogens into host cells. Overall, his work has contributed significantly to the understanding of membrane organization and dynamics, and the interplay between membrane lipids and proteins, especially in neuronal membranes. Prof. Chattopadhyay was awarded the *Shanti Swarup Bhatnagar Award*, Ranbaxy Research Award, and the J.C. Bose Fellowship (DST, India). He is an elected Fellow of the *Royal Society of Chemistry*, UK, and all the Indian Academies of Science. Prof. Chattopadhyay has served on the editorial boards of several international journals that include *Biophysical Journal*, *The Journal of Physical Chemistry*, *Journal of Neurochemistry*, *BBA-Biomembranes*, *FEBS Letters*, and *ACS Chemical Neuroscience*. Prof. Chattopadhyay has authored more than 200 research publications (total citations > 7400, *h-index* 46), a monograph, and national and international patents. He is currently an Adjunct Professor at the Royal Melbourne Institute of Technology (Australia), and in a number of reputed institutions in India. He also serves as the first Dean of Biological Sciences of the Academy of Scientific and Innovative Research (India).



Jean-Marie Ruyschaert received his Master's degree and Ph.D. degree in Chemistry from the Free University of Brussels. He worked as a postdoctoral researcher at the Cambridge University (U.K.), Weizmann Institute of Sciences with E. Katchalski (Israel), and Carnegie Institute with D. Pagano (Baltimore, MD). He then joined the Department of Chemistry at the Free University of Brussels where as an Associate Professor (1985) he had the opportunity to start his own research group. Surface scientist by training, Jean-Marie Ruyschaert very early ventured into the field of biological surfaces (model membranes) and developed methods dedicated to a better understanding of the structure, function, and role of biological membranes in cells and cellular organelles with a special emphasis on the study of the structure and function of membrane molecules (lipids and proteins). His current research focuses on a molecular description of lipid-protein interaction and binding sites of receptors of the innate immunity. He has served as President of Belgian Biophysical Society.

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