

Preface

The reception of the first two editions of *The Membranes of Cells* was gratifying. Both editions have been useful to students and postdocs who needed to become conversant in membranes since this subject underlies so much of cell biology, biochemistry, microbiology, and biophysics. These editions have also aided senior researchers embarking on research requiring a familiarity with the fundamentals of membrane structure and function.

This third edition of *The Membranes of Cells* is written in response to a revolution in the study of cell membrane structure and function. At the time of the second edition, virtually no high-resolution structure information was available for membrane proteins. Now over 1000 high-resolution structures of membrane proteins are available from X-ray crystallography, electron crystallography, and nuclear magnetic resonance (<http://blanco.biomol.uci.edu/mpstruc/>). While this represents only about 1% of the Protein Data Bank (<http://www.rcsb.org/pdb/home/home.do>) and only a small fraction of all known membrane proteins, nevertheless it provides a critical window through which we can see much more clearly the amazing functions catalyzed by membrane proteins. That universe of new information is well represented in this third edition. It is the new foundation of our understanding of membrane function. And it both inspires and informs the writing of the third edition of *The Membranes of Cells*.

As this book is intended primarily as a resource for learning about the membranes of cells, the referencing is representative, not exhaustive. The second edition introduced in-text referencing as requested by users of the book. That feature is continued in this edition. The references are often to review articles to help introduce students of membranes to the field. Therefore sincere apologies to those many scientists who contributed to the understandings described herein, but whose primary papers may not have been included in the reference lists.

References included date from the 18th century to the 21st century. It is important to acknowledge the roots of many of our understandings of membrane structure and it is intellectually satisfying to trace some of those understandings as far back as Mr Franklin! At the same time, enormous progress has been made in the 21st century so naturally many of the references are very recent publications.

The figures of membrane protein structure in this edition were created from multiple resources. PDB files were obtained from the *Protein Data Bank* and

membrane structures were initially explored through *Membrane Proteins of Known Structure* (links for both these databases are listed above). The figures were drawn using PyMol (<http://pymol.org>) or VMD (Humphrey W, Dalke A, Schulten K. VMD—Visual Molecular Dynamics. *J Mol Graphics* 1996;**14**:33–8). I thank Professor Victoria Robinson for help in creating those figures. Many of the molecular dynamics images were obtained from files available at MemProtMD (<http://sbcb.bioch.ox.ac.uk/memprotmd/beta/>). I thank Professor Mark Sansom, University of Oxford, and his colleagues for introducing me to molecular dynamics of membranes over a number of years. I also thank Virge Kask for drawing several of the more artistic membrane figures in the book.

In addition to the many scientists who were acknowledged in previous editions, I would like to highlight for this edition the professional opportunities and intellectual insights provided by Professor Tony Watts at the University of Oxford, during my sabbatical when this book project was begun. I thank both him and Valerie Watts for their generous hospitality. Appreciation is due to Rutgers University and President Emeritus Richard McCormick for that sabbatical following service as Dean of Arts and Sciences and Interim Chancellor.

I thank Professor Michael Lynes, Head of the Department of Molecular & Cell Biology at the University of Connecticut, for inviting me back to UConn, where I had been Head, to reestablish my academic residence after completing my work at Rutgers University.

I thank the members of my research group for over more than three decades of exploration of the amazing properties of membranes, both at UConn and previously at the University at Buffalo School of Medicine and Biomedical Sciences, who are acknowledged in the many papers to which they contributed. And I thank my longtime colleagues at both institutions. This book is also the result of innumerable conversations over many years with talented researchers in the field from whom I learned so much of what constitutes my understanding of membranes.

Professor Arlene Albert has been priceless in her support of building my understanding of cell membranes and her critical analysis has transformed my science and my writing into something much better over many years.

I thank Janice Audet and Fenton Coulthurst from the Publisher for the invitation to do this book and their patience as I completed it.

Philip L. Yeagle