

Preface

With this volume, we have attempted to provide a guide for those interested in structural biology and biochemistry of membrane proteins. It is our hope that this text will be useful both to experts and to those new to the field. The various chapters illustrate the breadth and depth of approaches to, and the challenges associated with, membrane protein production and solubilization. Our goals were to compare and critically analyze methods that have been used successfully for the expression and isolation of membrane proteins, to identify and help disseminate emerging methods, and to provide a practical reference for those working with these proteins.

Interest in membrane proteins has grown substantially in the last 25 years, in part due to the recognition of their importance in major cellular functions, including signaling, transport, and adhesion. As a result of their roles, membrane proteins comprise 30–60% of all drug discovery efforts, but remain a challenge for structure-based discovery efforts because of the paucity of high-resolution structures.

As of the time of writing, about 260 unique high-resolution membrane protein structures have been solved, with an exponential growth of new structures (e.g., 39 unique structures were determined in 2009). Several centers and focused funding efforts, such as the Protein Structure Initiative, are aimed at accelerating the membrane structure rate, although it is not yet clear whether these approaches will increase the pace to equal that of soluble proteins (see http://blanco.biomol.uci.edu/MP_Structure_Progress.html). These initiatives by federal funding agencies and private organizations have yielded new technologies and creative approaches for the production and stabilization of membrane proteins, many of which are described in this volume.

In this collection, the Introduction gives an overview of the challenges and successes of structural biology of membrane proteins. Chapters 1–6 outline best practices for expression in both prokaryotic and eukaryotic hosts. Chapters 7–9 focus on aspects that are specific for individual protein classes and applications. Chapters 10–14 highlight new approaches to producing and working with membrane proteins.

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