

Preface

Understanding interactions among biological molecules and between biomolecules and cells is at the core of diverse and intersecting disciplines, including biology, biochemistry, pharmaceuticals, biophysics, and related fields. However, studying biomolecular interactions in "real life"—in actual cells, tissues, and the like—has generally been a formidable task due to the complexity of biological systems. The utilization of chemical approaches and in particular the development of innovative *biomimetic platforms* have greatly advanced our knowledge of intimate molecular aspects pertaining to interactions between biological entities, and the significance of such interactions in a larger biological context. This book aims to illuminate novel approaches which provide insight into molecular recognition in biological systems.

The Chapters and contributors to this volume span diverse experimental methodologies and research fields. The systems discussed by the authors, while varied, all underlie the important impact multidisciplinary research has had upon elucidating fundamental biomolecular and cellular factors. Specifically, **Cheng** (Chapter 7) presents the application of unique biomimetic polymer assemblies, exhibiting colorimetric and fluorescent properties, for analysis of biological processes. **Campopiano** (Chapter 6) explores molecular interactions involving synthetic and natural molecules in immune systems, critical events for eliciting immune response. **Willumeit** (Chapter 10) focuses on the significance of *membrane interactions* of short peptides in varied biological processes.

Novel and innovative chemical approaches have contributed to our understanding of diverse biomolecular processes. **Rosenzweig** (Chapter 11) discusses the contribution of fluorescent and luminescent quantum dots for analysis of varied biological processes. **Tovar** (Chapter 2) depicts another interesting class of nanoparticles, designed to provide defined binding sites for biological molecules. Elegant synthetic biomimetic systems chemically designed to bind specific proteins are presented by **Schrader** (Chapter 8), while **Wang** (Chapter 1) describes intriguing virus-like particles and their biological functions. **Shabat** (Chapter 5) presents therapeutic applications of *catalytic antibodies*, a promising technology based upon molecular recognition of transient biological species, and **Marx** (Chapter 4) outlines the pharmaceutical and therapeutic potential of the *molecular imprinting* concept, similarly directly related to induced molecular recognition.

Advanced bioanalytical techniques play a significant role in elucidating the molecular basis of diverse biological processes. **Sim** (Chapter 9) summarizes the applications of *surface Plasmon resonance (SPR)*, a powerful methodology for studying biomolecular interactions. **Sokolov** (Chapter 3) discusses application of atomic force microscopy and fluorescence methods for analysis of silica particle interactions with cells. **D'Auria** (Chapter 12) describes the utilization of advanced fluorescence spectroscopy for biosensing applications, and **Umezawa** (Chapter 13) reviews the comprehensive body of work aimed at developing new approaches for studying molecular interactions involving ions and charged molecules.

Raz Jelinek