Preface

G protein–coupled receptors (GPCRs) also referred as seven transmembrane receptors (7TMRs) lie at the heart of almost every physiological and pathophysiological process in our body. These receptors bind to and get activated by a wide range of ligands ranging from small molecules, hormones, peptides, proteins to lipids. The overall activation and signal transduction mechanisms of GPCRs are highly conserved where binding of an agonist results in a conformational change in the receptor followed by activation of heterotrimeric G proteins and subsequent generation of second messengers and downstream signaling. Downregulation of GPCRs is also primarily a conserved process where activated receptors are phosphorylated by GRKs (GPCR kinases) followed by binding of beta arrestins which leads to receptor desensitization and internalization. GPCRs are targeted by about one-third of the currently prescribed drugs which include angiotensin blockers for hypertension, beta-blockers for heart failure, antihistamines for allergy management, and opioid agonists as analgesic medication.

In this volume of Methods in Cell Biology, we cover multiple aspects of GPCR signaling, trafficking, regulation, and cellular assays in a form of either an overview or as step-by-step protocol. This is an effort to bring together different domains of GPCR pharmacology and signaling on to a common platform and highlight the incredibly versatile nature and diverse functional manifestation of GPCRs. Section I includes chapters on GPCR trafficking in lipid rafts and cilia, imaging endogenous receptor in neurons, single molecule imaging of GPCRs, and a comprehensive analysis of GPCRs in adipose tissue. In Section II, we cover topics ranging from GPCR signaling from endosomes, olfactory receptor signal transduction, studies of a specialized GPCR smoothened in zebra fish model, and the outcome of GPCR signaling in cytoskeletal dynamics. In recent years, a key focus area in GPCR biology has been the development of novel and more sensitive cellular assays to investigate GPCR expression, signaling, and downregulation. Section III of this volume is focused on GPCR assays which include classical radioligand binding, label-free, biosensor and fluorescence–based approaches to study GPCR trafficking and signaling, and TANGO assay for measuring GPCR-beta-arrestin interaction. Finally, Section IV consists of chapters on structural and computational aspects of protease-activated receptors, bitter taste receptors, and GPCR dimerization.

I would like to thank all the authors who have contributed to this focused volume despite their busy schedule. I also express my sincere gratitude to the journal editorial staff and production team for a wonderful job in putting this volume together in a timely fashion. With this brief background, on behalf of the entire Methods in Cell

Biology Team, I present to you this volume entitled "G Protein–Coupled Receptors: Signaling, Trafficking, and Regulation." I sincerely hope that you enjoy the topics covered in this issue and please feel free to share your feedback with us.

Arun K. Shukla
Indian Institute of Technology, Kanpur, India