Preface

The Ras GTPase superfamily includes monomeric, low molecular weight GTP-binding and hydrolyzing proteins that act as molecular switches by coupling extracellular signals to different cellular responses, thus controlling cellular signaling pathways responsible for growth, migration, adhesion, cytoskeletal integrity, survival, and differentiation.

The activities of RasGTPases are controlled by a large number of regulatory molecules that affect either GTP loading (guanine nucleotide exchange factors or GEFs) or GTP hydrolysis (GTPase activating proteins or GAPs). In their active state, they interact with a continually increasing, functionally complex array of downstream effectors.

In addition to their prominent role in regulating virtually all fundamental cellular processes, Ras GTPases have acquired medical relevance because of their participation in several diseases, such as cancer, cardiovascular disorders, aging, neurodegeneration, and developmental syndromes. Thus many efforts have been made to understand molecular mechanisms of Ras signaling both in the physiological and in the pathological state and to develop novel strategies for the treatment of many pathological conditions where RasGTPases play a role.

This book focuses on experimental approaches aimed at shedding light on the complexity of the biological functions of RasGTPases. In particular, it contains general overviews and detailed applications of both well-established and recently developed research techniques, including biochemical, biophysical, molecular biology, genetic and behavioral approaches, advanced high resolution fluorescence and electron microscopy imaging, and "omics" technologies, providing information on expression, posttranslational modifications, subcellular localization and dynamics, regulatory mechanisms of upstream and downstream signaling pathways, and, ultimately, biological activities and functions of RasGTPases in different model systems, including high- and low eukaryotic organisms.

The individual chapters are organized in order to comprise an introductory overview, a list of the materials and reagents needed to complete the experiments, as well as a detailed procedure supported with a troubleshooting section.

We are extremely grateful to the investigators who have generously contributed their time and expertise to bring a wealth of technical knowledge into this volume, which is intended as an aid for investigators of different backgrounds and interests related to the multiple physiological and pathological functions of the large superfamily of RasGTPases.

Siena, Italy — *Lorenza Trabalzini*
Torino, Italy — *Saverio Francesco Retta*

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