

Preface

A thorough comprehension of normal and aberrant activities of the central nervous system (CNS) relies directly on our ability to understand the anatomical and functional properties of neurons and the brain circuits in which they participate. Studies on the roles and response profiles of immediate early genes (IEGs) have shed significant light into a number of properties of CNS neurons and networks. IEGs represent a set of genes that are expressed without new protein synthesis, in a rapidly and transiently fashion following synaptic input and, therefore, constitute the first genomic response to sensory input. The most widely studied IEGs in neurobiology encode transcription factors, as is the case of *c-fos* and NGFI-A (a.k.a *zif268*, *egr-1*, *krox-24* and *zenk*), however, efforts from several research groups in the field have identified more recently members of this class of gene that also encode proteins with varied physiological roles such as growth factors, cytoskeletal proteins and signaling molecules, to name a few. Thus, either by regulating the expression of target genes, as in the case of transcription factors, or by direct actions of “effector” protein products, IEGs are well positioned to reactively and prospectively shape CNS function.

The dependence of IEG expression on synaptic activity has been, for almost two decades now, a valuable tool for researchers within virtually all fields of neuroscience, given that the detection of the products that result from their expression allows for a detailed mapping of neuronal activity patterns, with extremely high spatial resolution. The use of IEG expression as a mapping tool for neuronal activity has significantly improved our understanding of a large variety of critical processes during development and adulthood, in normal and abnormal activities of the CNS. More recently the development of modern technologies that allow for direct and selective interference with gene expression has yielded significant information on the specific roles of IEG products in neuronal physiology, brain network functioning and behavior.

The central goal of this book was to compile the most updated information on how the expression of IEGs is impacted by external (environmental) and internal (physiological) information and how IEG expression has contributed to our understanding of the anatomical and functional organization, as well as the aberrant function of brain systems. In addition, a main goal of this book was to review the current knowledge on the specific roles of IEG products to neuronal physiology and the regulation of behavior. In order to generate as complete and engaging a work as possible, we invited several leading authors in the field to join us in this project and lend us their expertise. Our goal was to place readers

who were new to this subject at the crossroads of several avenues of work. For investigators who are active in IEG-related research, we wanted to assemble an easy reference for the breadth of discovery that is advancing in several directions in this field.

We would like to take this opportunity to thank our many contributors and collaborators on this book. Assembling a book requires enormous generosity of spirit on the part of all participants. We consider ourselves extremely lucky to have had the opportunity to work along side scientific leaders in the various fields reviewed in this volume. We greatly appreciated your incredible efforts and cooperation both in terms of content and timelines, as well as for your endless patience and enthusiasm throughout the editorial process. It is our hope that you will be as pleased as we are with the final product.

In addition to thanking those who contributed intellectually to this work, we must also extend our sincerest thanks to the amazing team that works behind the scenes at Springer in order to materialize the final product and bring it to the marketplace. We are greatly indebted to Joe Burns and Marcia Kidston, who provided advice and administrative help throughout this project. We extend our sincerest thanks to our partner Sheri Campbell whose expertise, timely help, endless energy and commitment to quality was essential to the generation of this book. We also thank Arūnas Ūsaitis for a superb work in the generation of book proofs and Marc Palmer for his outstanding work on the development of the cover art. Finally we thank all members of our families whose lay interest, enthusiasm and support gave us continued energy to assemble this work.

Raphael Pinaud, Durham, NC, USA
Liisa A. Tremere, Durham, NC, USA

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