

Preface to the Third Edition

In this third edition of *Fundamental Neuroscience*, we have tried to improve on the second edition with a volume that effectively introduces students to the full range of contemporary neuroscience. Neuroscience is a large field founded on the premise that all of behavior and all of mental life have their origin in the structure and function of the nervous system. Today, the need for a single-volume introduction to neuroscience is greater than ever. Towards the end of the 20th century, the study of the brain moved from a peripheral position within both the biological and psychological sciences to become an interdisciplinary field that is now central within each discipline. The maturation of neuroscience has meant that individuals from diverse backgrounds—including molecular biologists, computer scientists, and psychologists—are interested in learning about the structure and function of the brain and about how the brain works. In addition, new techniques and tools have become available to study the brain in increasing detail. In the last 15 years new genetic methods have been introduced to delete or over-express single genes with spatial and temporal specificity. Neuroimaging techniques such as functional magnetic resonance imaging (fMRI) have been developed that allow study of the living human brain while it is engaged in cognition.

This third edition attempts to capture the promise and excitement of this fast-moving discipline. All the chapters have been rewritten to make them more concise. As a result the new edition is about 30% shorter than previous editions but still covers the same comprehensive range of topics. The volume begins with an opening chapter that provides an overview of the discipline. A second chapter presents fundamental information about the architecture and anatomy of

nervous systems. The remainder of the volume (Sections II–VII) presents the major topics of neuroscience. The second section (Cellular and Molecular Neuroscience) considers the cellular and subcellular organization of neurons, the physiology of nerve cells, and how signaling occurs between neurons. The third section (Nervous System Development) includes discussion of neural induction, cell fate, migration, process outgrowth, development of dendrites, synapse formation, programmed cell death, synapse elimination, and early experience including critical periods. The fourth and fifth sections (Sensory Systems and Motor Systems) describe the neural organization of each sensory modality and the organization of the brain pathways and systems important for locomotion, voluntary action, and eye movements. The sixth section (Regulatory Systems) describes the variety of hypothalamic and extra-hypothalamic systems that support motivation, reward, and internal regulation, including cardiovascular function, respiration, food and water intake, neuroendocrine function, circadian rhythms, and sleep and dreaming. The final section (Behavioral and Cognitive Neuroscience) describes the neural foundations of the so-called higher mental functions including perception, attention, memory, language, spatial cognition, and executive function. Additional chapters cover human brain evolution, cognitive development and aging, and consciousness. The volume will be accompanied by an easily accessible companion website, which will present all the figures and increase the flexibility with which the material can be used.

The authors listed at the ends of the chapters and boxes are working scientists, experts in the topics they cover. The Editors edited the chapters to achieve consistency of style and content. At Academic Press/Elsevier Science, the project was coordinated

by Hilary Rowe and Nikki Levy (Publishing Editors), and we are grateful to them for their leadership and advice throughout the project. In addition, Meg Day (Developmental Editor) very capably coordinated the production of the book with the help of Sarah Hajduk (Publishing Services Manager) and Christie Jozwiak (Project Manager).

The Editors of *Fundamental Neuroscience* hope that users of this book, and especially the students who will become the next generation of neuroscientists, find the subject matter of neuroscience as interesting and exciting as we do.

The Editors

Neuroscience is a rapidly expanding field of study, and the editors of *Fundamental Neuroscience* are pleased to present this third edition. The second edition of this book was published in 1995, and since then the field has grown significantly. The editors have worked to ensure that this third edition is up to date and reflects the current state of the field. The book is divided into two main parts: the first part covers the basic principles of neuroscience, and the second part covers the more specialized areas of the field. The editors have also added new chapters on recent developments in the field, such as the use of genetic techniques to study the brain. The book is written for students and researchers alike, and is intended to provide a comprehensive overview of the field. The editors hope that this book will be a valuable resource for anyone interested in neuroscience.

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