Series Preface

The following preface is the one that we published in Volume 1 of the Springer Handbook of Auditory Research back in 1992. As anyone reading the original preface, or the many users of the series, will note, we have far exceeded our original expectation of eight volumes. Indeed, with books published to date, and those in the pipeline, we are now set for more than 50 volumes in SHAR, and we are still open to new and exciting ideas for additional books.

We are very proud that there seems to be consensus, at least among our friends and colleagues, that SHAR has become an important and influential part of the auditory literature. While we have worked hard to develop and maintain the quality and value of SHAR, the real value of the books is very much because of the numerous authors who have given their time to write outstanding chapters and to our many coeditors who have provided the intellectual leadership to the individual volumes. We have worked with a remarkable and wonderful group of people, many of whom have become great personal friends of both of us. We also continue to work with a spectacular group of editors at Springer, currently Ann Avouris. Indeed, several of our past editors have moved on in the publishing world to become senior executives. To our delight, this includes the current president of Springer US, Dr. William Curtis.

But the truth is that the series would and could not be possible without the support of our families, and we want to take this opportunity to dedicate all of the SHAR books, past and future, to them. Our wives, Catherine Fay and Helen Popper, and our children, Michelle Popper Levit, Melissa Popper Levinsohn, Christian Fay, and Amanda Fay, have been immensely patient as we developed and worked on this series. We thank them, and state, without doubt, that this series could not have happened without them. We also dedicate the future of SHAR to our next generation of (potential) auditory researchers—our grandchildren—Ethan and Sophie Levinsohn; Emma Levit; and Nathaniel, Evan, and Stella Fay.

Preface 1992

The Springer Handbook of Auditory Research presents a series of comprehensive and synthetic reviews of the fundamental topics in modern auditory research. The volumes are aimed at all individuals with interests in hearing research including advanced graduate students, postdoctoral researchers, and clinical investigators. The volumes are intended to introduce new investigators to important aspects of hearing science and to help established investigators to better understand the fundamental theories and data in the fields of hearing that they may not normally follow closely.

Each volume presents a particular topic comprehensively, and each serves as a synthetic overview and guide to the literature. As such, the chapters present neither exhaustive data reviews nor original research that has not yet appeared in peer-reviewed journals. The volumes focus on the topics that have developed a solid data and conceptual foundation rather than on those for which a literature is only beginning to develop. New research areas will be covered on a timely basis in the series as they begin to mature.

Each volume in the series consists of a few substantial chapters on a particular topic. In some cases, the topics will be ones of traditional interest for which there is a substantial body of data and theory, such as auditory neuroanatomy (Vol. 1) and neurophysiology (Vol. 2). Other volumes in the series deal with topics that have begun to mature more recently, such as development, plasticity, and computational models of neural processing. In many cases, the series editors are joined by a coeditor having special expertise in the topic of the volume.

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Volume Preface

The primary auditory neurons of the inner ear, or spiral ganglion neurons, are critical for hearing as they transmit auditory information in the form of electrical signals from mechanosensory hair cells in the inner ear to the cochlear nuclei in the brain stem. Loss of these auditory neurons and/or hair cells is the leading cause of congenital and acquired neurosensory hearing loss affecting hundreds of millions of people worldwide. The most common therapeutic strategies for hearing loss utilize either hearing aids to increase hair cell stimulation or cochlear implants as an electronic substitute for hair cells. These devices, as well as normal hearing, all require the presence of healthy functional spiral ganglion neurons.

This volume provides an up-to-date source of information on spiral ganglion neurons. From neurogenesis to biophysics and stem cell replacement therapy, the comprehensive and wide-ranging subjects encompassed will ensure that this volume will enlighten and function as a catalyst for future research and discovery. Although loss of auditory neurons has been considered secondary to hair cell loss, an increasing body of evidence clearly indicates that auditory neurons can degenerate as a result of noise exposure and aging, while hair cells remain intact. Therefore, auditory neurons are a primary target for regeneration, and a better understanding of these neurons will ultimately result in long-term maintenance and accelerate regenerative therapies. A comprehensive review of spiral ganglion neurons is important for researchers not only in the inner ear field but also for those working in development, neuroscience, biophysics, as well as neural networks.

The first chapter by Dabdoub and Fritzsch provides an overview of this volume and the current research on auditory neurons, including a perspective on future directions of research. Chapter 2 by Goodrich describes the molecular and genetic factors responsible for the neurogenesis of the spiral ganglion neurons. Chapter 3 by Fritzsch Kersigo, Yan, Jahan, and Pan explains the role of neurotrophic factors in spiral ganglion neuron maintenance. The electrophysiological properties as well as the tonotopic organization of spiral ganglion neurons are detailed in Chap. 4 by Davis and Crozier. Chapter 5 by Moser and Rutherford and Chap. 6 by Muniak, Connelly, Suthakar, Milinkeviciute, Ayeni, and Ryugo reveal the connectivity

details of the auditory neurons with hair cells in the inner ear and the cochlear nucleus in the brain stem, respectively. Chapter 7 by Green, Bailey, Kopelovich, and Hansen details gains in our cellular and molecular understanding of spiral ganglion neurons derived from various in vitro techniques invented during the last 100 years to achieve a mechanistic understanding of enhanced translation. In Chap. 8, Lang reviews processes of spiral ganglion neuron loss and degeneration and their relationship to hearing loss. The final Chap. 9 by Nayagam and Edge introduces stem cell research to replace lost auditory neurons.

As is often the case, chapters in earlier SHAR volumes complement the work presented in the current volume. This is particularly the case for the many chapters in earlier volumes that focus on the sensory hair cell and eighth nerve. For example, several chapters in *Synaptic Mechanisms in the Auditory System* (Vol. 41, edited by Trussell, Popper, and Fay, 2012) consider synapses associated with spiral ganglion neurons, while chapters in *Deafness* (Vol. 47, edited by Kral, Popper, and Fay, 2013) provide a consideration of the relationship of spiral ganglion neurons to hearing loss, as do chapters in *Auditory Prostheses: New Horizons* (Vol. 39, edited by Zeng, Fay, and Popper, 2011).

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Springer

http://www.springer.com/978-1-4939-3030-2

The Primary Auditory Neurons of the Mammalian Cochlea

Dabdoub, A.; Fritzsch, B.; Popper, A.N.; Fay, R.R. (Eds.)
2016, XIV, 286 p., Hardcover
ISBN: 978-1-4939-3030-2