

Volume Preface

Auditory function depends on highly ordered structures and extremely precise connectivity. Understanding the ontogeny of these pathways represents a unique interdisciplinary challenge in auditory research. This volume presents some of the most recent advances in the field. The volume is also presented as a celebration of the career of Dr. Edwin W Rubel, a scholar, mentor, and friend who has contributed a vast range of new discoveries in this area. Indeed, Ed's broad contributions to auditory system development have substantially impacted the field and spawned new generations of investigators pursuing new questions in these areas. This volume spans a wide range of topics within auditory development, from cellular specification of the auditory periphery to physiological development of the central auditory system and maturation of auditory perception. These chapters, from colleagues whose work has been touched by Ed's contributions, pay homage to the breadth of this area and the advances that have been made possible.

In Chap. 2, Matthew Kelley and Jennifer Stone review sensory hair cell development and examine the innate plasticity (or lack thereof) that characterizes hair cell regeneration in vertebrates. Next, in Chap. 3, Hillary McGraw, Catherine Drerup, Teresa Nicolson, and Alex Nechiporuk review the development of the lateral line, a sensory system present in aquatic vertebrates in which lateral line organs (neuromasts) contain clusters of hair cells and supporting cells, analogous to the inner ear.

Auditory brainstem development is then considered in Chap. 4, in which Jason Sanchez and Yong Lu review the role of the excitatory neurotransmitter glutamate in the auditory brainstem, drawing on the vast literature from both birds and mammals. Next, in Chap. 5, Michael Burger describes the role of inhibition in the auditory brainstem, relying primarily on the elegant avian model pioneered by Ed Rubel. Then, in Chap. 6, Leonard Kaczmarek examines functional maturation and plasticity of the auditory brainstem through the lens of potassium current changes.

The last two chapters focus on perceptual development of auditory processing and vocal communication in species that learn their vocalization. In Chap. 7, Lynne Werner reviews the maturation of the human outer and middle ear and development of perceptual features of sound, relying largely on behavioral studies in human infants and children. Then, in Chap. 8, Sarah Woolley addresses vocal learning in

songbirds, including the critical role of auditory experience, highlighting some important parallels with language learning in humans.

As most other SHAR volumes, this volume closely complements earlier ones in the series. Most notably, this volume represents the advances in the field of auditory development since *Development of the Auditory System* (Vol. 9, 1998, edited by Rubel, Popper, and Fay) and *Plasticity of the Auditory System* (Vol. 23, 2004, edited by Parks, Rubel, Fay, and Popper). Other related volumes include *Development of the Inner Ear* (Vol. 26, 2005, edited by Kelley, Wu, Popper, and Fay), *Hair Cell Regeneration, Repair, and Protection* (Vol. 33, 2008, edited by Salvi, Popper, and Fay), and *Human Auditory Development* (Vol. 42, 2012, edited by Werner, Fay, and Popper).

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In Honor of Edwin W Rubel

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