There have been marked advances in the development and application of auditory prostheses since the first book on cochlear implants in this series, *Cochlear Implants: Auditory Prostheses and Electric Hearing* (SHAR, Zeng, Popper, and Fay, 2004). These advances include not only new approaches to cochlear implants themselves but also new advances in implants that stimulate other parts of the auditory pathway, including the middle ear and the central nervous system. This volume, then, provides insight into the advances over the past 7 years and also examines a range of other current issues that concern complex processing of sounds by prosthetic device users.

Chapter 1 (Zeng) provides an overview of the volume, insights into the history of development of prostheses, and thoughts about the future of this burgeoning field. In Chapter 2, van Hoesel examines the natural extension from single to bilateral cochlear implants. This is followed by Chapter 3 in which Turner and Gantz focus on the improved performance of combined electro-acoustic stimulation over electric stimulation alone.

In the near term, implantable middle ear devices have satisfactorily filled a gap between hearing aids and cochlear implants. Snik (Chap. 4) clearly delineates the complex technological and medical scenarios under which implantable middle ear devices can be used.

Dizziness and balance disorders are other major ear-related diseases that may also be treated by electric stimulation but have received little attention until recently. Golub, Phillips, and Rubinstein (Chap. 5) provide a thorough overview of the pathology and dysfunction of the vestibular system as well as recent efforts and progress in animal and engineering studies of vestibular implants.

New technologies are also being developed to advance significant problems associated with current cochlear implants that use electrodes inserted in the scala tympani to stimulate the auditory nerve. Taking one approach, Richter and Matic (Chap. 6) advocate an optical stimulation approach that should significantly improve spatial selectivity over the electric stimulation approach. This is followed by Chapter 7 by Middlebrooks and Snyder, which considers an alternative approach that uses traditional electric stimulation but places the electrodes in direct contact with the neural tissue to achieve selective stimulation.
In patients lacking a functional cochlea or auditory nerve, higher auditory structures have to be stimulated to restore hearing. McCreery and Otto (Chap. 8) present an account of research and development of cochlear nucleus auditory prostheses or the auditory brainstem implants. This is followed by Chapter 9 by Lim, M. Lenarz, and T. Lenarz, which discusses the scientific basis, engineering design, and preliminary human clinical trial data of auditory midbrain implants.

While it is important to continue to develop innovative devices, it is equally important to evaluate their outcomes properly and to understand why and how they work. Sharma and Dorman (Chap. 10) review both deprivation-induced and experience-dependent cortical plasticity as a result of deafness and restoration of hearing via cochlear implants, while Fu and Galvin (Chap. 11) document both the importance and effectiveness of auditory training for cochlear implant users. The significance is considered further for understanding the development of language in children following pediatric cochlear implantation in Chapter 12 by Ambrose, Hamme-Ganguly, and Eisenberg. Still, music perception remains challenging to cochlear implant users. McDermott (Chap. 13) reviews extensive research and recent progress in this area and identifies both design and psychophysical deficiencies that contribute to poor implant musical performance. Similarly, Xu and Zhou (Chap. 14) not only summarize acoustic cues in normal tonal language processing but also identify the design and perceptual issues in implant tonal language processing. Finally, in Chapter 15, Barone and Deguine examine multisensory processing in cochlear implants and present future research and rehabilitation needs in this new direction.

The material in this volume very much relates to material in a large number of previous SHAR volumes. Most notably, the aforementioned volume 20 has much material that complements this volume. But, in addition, issues related to music perception in patients with cochlear implants are considered in a number of chapters in volume 26, *Music Perception* (Jones, Fay, and Popper, 2010) while computational issues related to implants are discussed in chapters in volume 35 on *Computational Models of the Auditory System* (Meddis, Lopez-Poveda, Popper, and Fay, 2010). Finally, hearing impairment and intervention strategies in aging humans is considered at length in volume 34, *The Aging Auditory System* (Gordon-Salant, Frisina, Popper, and Fay, 2010).

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