

# Volume Preface

Hearing impairment is the third-most-prevalent chronic disability in the United States, with a major portion of the loss related to exposure to noise in the environment. Hearing loss attributed to noise is called noise-induced hearing loss (NIHL). This volume describes the effect of environmental noise on hearing, provides important background on the subject, and also explores the broader issues currently arising on effects of noise on nonhuman vertebrates.

In Chapter 1, Le Prell and Henderson provide an introduction that outlines the problem. The first section of the book (Chapters 2 and 3) more carefully defines the scope of the problem. Rabinowitz, in Chapter 2, describes the prevalence and significance of NIHL and the public health importance of this health issue. More specific concerns about exposure to sound in the military are discussed in Chapter 3 by Grantham.

The second section of the book (Chapters 4–8) details the relationships among noise exposure and anatomical trauma, physiological changes, and perceptual deficits. In Chapter 4, Henderson and Hamernik review the classic measures of sound, such as sound pressure level, frequency, and duration, and their relationship to NIHL. Importantly, this chapter extends this discussion to the special hazards of impact/impulse noise. Hu, in Chapter 5, describes noise-induced pathological changes in the cochlea, including both apoptotic and necrotic pathways of cell death and the relationship between pathology and hearing loss. In Chapter 6, Young describes the impact of noise on the auditory nerve, including implications for loudness, pitch, and temporal coding.

In Chapter 7, Shrivastav reviews known psychophysical changes associated with NIHL in detail, specifically including processing of speech in noise, and contrasts the changes that occur subsequent to noise exposure with those that occur as a consequence of age-related hearing loss (ARHL). In the last chapter in this section, Kaltenbach and Manz (Chapter 8) carefully describe the effects of noise on the central nervous system (CNS), with special emphasis on neural plasticity and development of tinnitus as a consequence of neural changes that develop in the days and months post-noise exposure.

The third section of the book (Chapters 9–11) focuses on factors influencing susceptibility to NIHL. First, Gong and Lomax (Chapter 9) carefully review the genetics of NIHL. The links between NIHL and ARHL emerge in further detail in Chapter 10 by Bielefeld. Finally, in Chapter 11, Morata and Johnson address interactions between noise and a variety of chemicals.

The final section of this book (Chapters 12–14) addresses issues of protection and repair. In Chapter 12, Casali reviews the specific characteristics of different personal protection devices (PPD). In Chapter 13, Le Prell and Bao expand on the notion of protection, although the topic is intervention using novel pharmaceuticals currently under development and other potential therapeutic agents. Finally, in Chapter 14, Yamasoba, Miller, Ulfendahl, and Altschuler explore the next new frontiers in hearing science.

Issues of noise and its effects on hearing are emphasized in this volume, but many earlier volumes in the Springer Handbook of Auditory Research have themes and chapters germane to the issues in this volume. For example, otoacoustic emissions are broadly considered in *Active Processes and Otoacoustic Emissions* (Volume 30, edited by Manley, Fay, and Popper), while the effects of noise on the ear, and repair of such damage, are discussed in detail in Volume 31 on *Auditory Trauma, Protection, and Repair* (edited by Schacht, Popper, and Fay) and Volume 33 on *Hair Cell Regeneration, Repair, and Protection* (edited by Salvi, Popper, and Fay). Of course, another source of hearing loss is aging, and this is considered in depth in *The Aging Auditory System* (Volume 34, edited by Gordon-Salant, Frisina, Popper, and Fay). Finally, issues of loudness are also associated with hearing loss, and this topic is considered in *Loudness* (Volume 37, edited by Florentine, Popper, and Fay).

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