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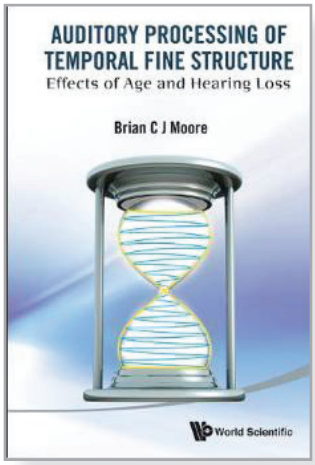
– Philip L. Marston, *Book Review Editor*



Auditory Processing of Temporal Fine Structure: Effects of Age and Hearing Loss

Author: Brian C. J. Moore
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Auditory Processing of Temporal Fine Structure: Effects of Age and Hearing Loss is a comprehensive resource that will be of great use to readers with a variety of backgrounds and purposes. The structure is logical, the references are very up-to-date, and the index and table of contents are practical and useful.

At the core of the book is the concept that signals can be represented in terms of an envelope (ENV) superimposed on the temporal fine structure (TFS). Furthermore, ENV and TFS can be considered at three levels: the physical signal itself (ENV-*P* and TFS-*P*), at a particular place on the basilar membrane or output of a cochlear filter (ENV-*BM* and TFS-*BM*), and in terms of neural representation (ENV-*N* and TFS-*N*).

The introductory chapter expands on these concepts comprehensively. This chapter is the longest in the book, and in some ways is the most crucial. Cochlear filtering, hair cell transduction, and the "active amplifier" system of the cochlea are all explained within the framework of ENV and TFS; at the levels of the physical signal, the pattern of vibration of the basilar membrane, and neural encoding. The way in which various pathologies of hearing damage and aging affect each of these mechanisms are then expanded on, with a great selection of classic and modern references. Finally, the chapter closes with "a list of (seven) possible ways in which hearing loss and ageing might affect the neural encoding of TFS."

Chapters 2–5 that follow go on to explain the role of TFS in perception for both normal-hearing and hearing-impaired listeners. There are chapters on masking, pitch perception, speech perception, and binaural processing, and all share some similarity in structure. Each chapter explains the role of TFS in normal hearing in each case, and then explains how pathology associated with aging or hearing loss affects TFS processing, and subsequently the perceptual ability under review. This structure is somewhat dense but thorough, and does have the advantage of being predictable, so that the reader using the book as a reference can confidently move between chapters. Although the included figures in the middle chapters all clearly illustrate various results and data, some concepts that are explained in text might have been more easily conveyed via a simplified diagram.

The treatment of pitch perception in Chapter 3 covers both the pitch of simple sine waves as well as complex sounds. The chapter starts from the very basic elements of pitch perception. It is interesting to reconsider the old place pitch/temporal pitch war within the ENV/TFS framework. Moore reviews a large literature demonstrating that for pure tones at low frequencies, TFS-N is the main factor contributing to pitch perception. At higher frequencies where there is no more phase locking, place pitch takes over. It would have been interesting to go deeper into other perceptual dimensions of pitch, such as spectral pitch, chroma, or brightness.

The final chapter is a useful overview of the book. It offers practical suggestions for how the ideas presented might be relevant for signal processing in hearing aids, as well as suggestions for how people might avoid the types of acoustic environments which are most detrimental for people who have low sensitivity to TFS.

The book has arrived at an interesting time in the worlds of hearing research and clinical audiology. As Professor Moore alludes to in his preface, there is an imperative for audiomet-

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ric tools that are able to objectively measure *functional* hearing abilities, in addition to thresholds that are obtained via the audiogram. As the book shows, many of the tasks we perform with our hearing in everyday life, such as communicating with someone in a room full of other people also communicating, have been shown to be related with sensitivity to TFS.

One slight disappointment is that the book does not return to this theme and further explore the issues concerning whether a test of TFS sensitivity could be used as a clinical tool to augment the audiogram. Nonetheless, the book advances the current thinking on TFS and will provide an excellent reference to researchers and practitioners alike.

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