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Editors' introduction to Hearing Research special issue: Music: A window into the hearing brain

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There has been a surge of music-themed research in the field of auditory neuroscience in the past decade. A wealth of data have confirmed that musically trained individuals have structural, functional, and developmental differences in their brains relative to nonmusicians. Together, this work also has informed us about speech processing, capitalizing on the neural overlap between speech and music circuitry in the brain. Additionally, it has provided insights into experience-dependent plasticity and the biological mechanisms that drive it. However, much of this work has failed to reach the mainstream hearing scientist. This special issue of *Hearing Research* aims to bridge this divide.

It is interesting to note that music, in some ways, gave birth to hearing science. A foundational work of cochlear mechanics was Helmholtz's mid-nineteenth century cochlear resonance theory, proposing the tonotopic organizational principles that pervade the entire auditory system. Notably, it was postulated in a treatise entitled, "On the sensation of tone as a physiological basis for the theory of music." In other words, tackling cochlear function was a means to an end for Helmholtz to better understand music perception. In this spirit, the editors of this volume are hopeful that, like our predecessors, we can use auditory neuroscience to teach us about music and use music to inform us about auditory neuroscience.

Finally, it is important to bring music into the clinic. A study by Dubé and Le Bel (2003) ranked music as one of the top pleasure-bringers in life, scoring similarly to success, sex and romance and well above food, holding a baby, literature, dessert and a host of other pleasurable activities. It is no wonder then that the loss of being able to enjoy music is a chief complaint of hearing impaired people; hearing aids and cochlear implants rarely fully restore the enjoyment of music (see Hockley and Chasin, pp. 2–12 and Limb and Roy, pp. 13–26). Therefore, a goal for clinical hearing professionals should be to embrace music as a probe and its successful perception as an outcome in the quest to provide the best possible experience for the hearing impaired.

In this issue of *Hearing Research*, "Music: A window into the hearing brain," we hope to bring music out of the shadows of auditory neuroscience by highlighting recent research on music and musicians, including work on the aided perception of music, the functional biology underlying music perception (Lerud et al., pp. 41–49; Musacchia, Large and Schroeder, pp. 50–59; Trainor et al., pp. 60–70), the application of music theory to avian vocalizations (Rothenberg et al., pp. 71–83) and music as a vehicle for auditory learning (Moreno and Bidelman, pp. 84–97; Patel, pp. 98–108; Strait and Kraus, pp. 109–121). The neural plasticity associated with music training is further reviewed in the context of cochlear mechanics (Perrot and Collet, pp. 27–40), development and aging (Alain et al., pp. 162–173; Strait and Kraus, pp. 109–121 and its implications for language processing (Francois and Schon, pp. 122–128; Grube et al., pp. 129–140; Leong and Goswami, pp. 141–161; Patel, pp. 98–108). It is worth pointing out that music is not only deeply linked to the auditory system but that it also engages almost every other neural system and cognitive function: motor, multisensory, memory, attention, and emotion are all part and parcel of music. Music thus essentially engages the totality of the nervous system, posing a challenge to understanding but also providing an opportunity to deepen our knowledge of the entire system. The pieces in this special issue provide excellent insights into this interactive system. Together, these manuscripts extend Helmoholtz's music-guided scientific approach to the present day by revealing that music continues to impact current understanding of basic principles of auditory neuroscience.

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