nature neuroscience

Music and the brain

Music, like language, is a universal feature across all human societies, both ancient and modern. And just as the ability to understand spoken language emerges effortlessly in infants, the ability to appreciate music likewise requires no explicit training. Unlike language, however, the adaptive function of music remains largely mysterious and much debated. Despite this uncertainty, research on how the brain processes music—interesting in its own right—is beginning to have an impact on more general questions in neuroscience, such as how genes and the environment interact to produce distinct cognitive abilities and how complex motor sequences are organized and learned.

The six reviews (all peer reviewed) on the following pages of this special focus issue highlight this emerging research. Instead of trying to compile a comprehensive survey of the field, we focused on several areas where significant progress looks likely; we specifically asked authors to take a forward-looking approach.

Marc Hauser and Josh McDermott propose a framework for investigating the evolution of music. They review the literature on music perception in non-human animals, arguing that comparative data will play a key role in constraining evolutionary explanations of music.

Sandra Trehub reviews the literature on music perception in prelinguistic infants, who in many respects show remarkable similarities in music perception compared with adult listeners. In addition to examining questions about the innateness of music perception, her review emphasizes the social and emotional nature of music.

Aniruddh Patel considers the complex relationship between language and music processing. He outlines how cognitive theory can help to resolve a paradox that pits evidence for overlap (from neuroimaging) against evidence for dissociation (from neuropsychological studies of patients with brain damage).

Petr Janata and Scott Grafton emphasize the tight coupling between sensory perception and action in music, and the importance of timekeeping and attentional mechanisms. The authors outline how studies of explicit sequence learning and temporal production can inform our understanding of how complex sequences (such as music) are represented in the brain.

Isabelle Peretz and Max Coltheart discuss how studies in people with music-related deficits (both congenital and acquired) can inform more general questions about the modularity of brain processing. For example, some patients are unable to recognize melodies, but have no problem recognizing spoken lyrics. The authors note how consideration of these studies can guide future neuroimaging studies.

Finally, Robert Zatorre discusses how perfect pitch (the unusual ability to identify the pitch of a sound without any external reference point) offers an especially tractable opportunity to examine how specialized cognitive abilities are linked to brain function.

Several authors have also included supplementary audio files and other background information for interested readers to explore further on the web. For example, by going to the *Nature Neuroscience* web site (www.nature.com/natureneuroscience) or by clinking on the links if you are reading online, you can take a test for perfect pitch or listen to a melody with pitch changes that infants can detect better than adults.

Music is fascinating to study, and may offer a unique window onto the brain. But of course it can also simply be beautiful or just plain fun. We hope you enjoy the issue and that it helps to stimulate further research.

John Spiro
Associate Editor