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Timbre: Acoustics, Perception, and Cognition

Series: Springer Handbook of Auditory Research

- Outlines the principal perceptual processes that orchestrate timbre processing
- Explores timbre as part of specific scenarios, including the perception of the human voice
- Details computational acoustic models of timbre

Roughly defined as any property other than pitch, duration, and loudness that allows two sounds to be distinguished, timbre is a foundational aspect of hearing. The remarkable ability of humans to recognize sound sources and events (e.g., glass breaking, a friend's voice, a tone from a piano) stems primarily from a capacity to perceive and process differences in the timbre of sounds. Timbre raises many important issues in psychology and the cognitive sciences, musical acoustics, speech processing, medical engineering, and artificial intelligence. Current research on timbre perception unfolds along three main fronts: On the one hand, researchers explore the principal perceptual processes that orchestrate timbre processing, such as the structure of its perceptual representation, sound categorization and recognition, memory for timbre, and its ability to elicit rich semantic associations, as well as the underlying neural mechanisms. On the other hand, timbre is studied as part of specific scenarios, including the perception of the human voice, as a structuring force in music, as perceived with cochlear implants, and through its role in affecting sound quality and sound design. Finally, computational acoustic models are sought through prediction of psychophysical data, physiologically inspired representations, and audio analysis-synthesis techniques. Along these three scientific fronts, significant breakthroughs have been achieved during the last decade. This volume will be the first book dedicated to a comprehensive and authoritative presentation of timbre perception and cognition research and the acoustic modeling of timbre.

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