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Cognitive influences on spatial hearing

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In reverberant rooms a listener perceives a sound coming from its source but simultaneously suppresses reflected sound or echoes. This phenomenon is known as the precedence effect because the preceding (original) sound is given heavier weight than its subsequent reflections. Our research has explored this perceptual process and found that listeners are sensitive to the acoustic information contained in the reflected sound even though it is "suppressed". Specifically, below echo-threshold information relevant to room acoustics (e.g., delay between lead and lag sounds, filtering of the echo's spectrum, presence or absence of an echo at a particular location) is processed by the listener and influences perception. Listeners' expectations about ongoing input can raise or lower echo threshold. Recent ERP data on listeners' responses to click pairs near echo threshold found that when listeners perceived lead and lag sounds as separate sources, a negativity between 100 and 250 ms was elicited, termed object-related negativity (ORN). When the same stimulus was heard as a single fused sound, no ORN was elicited. These findings suggest that higher-level cognitive processes exert top-down influences over early neurosensory processing.