

Sensorimotor Integration in the Biosonar System of Horseshoe Bats

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Bats have evolved unique methods of perception to navigate and catch prey using ultrasonic sounds. It has been observed that the greater horseshoe bat (*Rhinolophus ferrumequinum*) rapidly move their pinna and noseleaf structures in coordination with pulse emission and echo reception during echolocation, with everything occurring on a 100ms time scale. Sensorimotor integration is not uncommon in neural systems but bats provide a unique case for auditory processing coinciding motion in the periphery. We have developed biomimetic robotic models to replicate the dynamic emission and reception elements of bat echolocation; current data have shown these dynamics introduce time-variant effects which encode information to inform object identification and location. We have planned experiments to understand how motor and auditory systems are integrated, which will be done by recording midbrain responses interacting with stimuli. These recordings will consist of field potential measurements taken from the inferior and superior colliculi; we hope this work will provide physiological events associated with sensorimotor integration for echolocation.

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