Neural recordings of wild bats reveal unique organization of midbrain region for tracking and capturing prey

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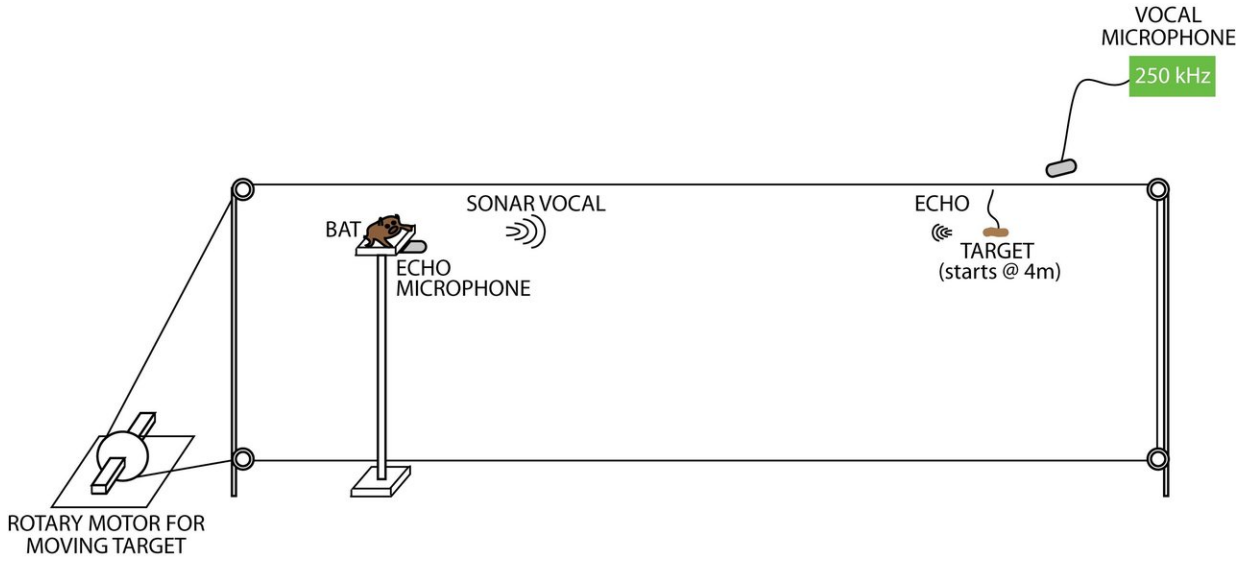


The bat is trained to remain stationary on a platform and track a moving target. The target (mealworms) is tethered to a loop of fishing line connected to a rotary motor, allowing us to control target motion. While the bat performs this task, microphones recording sonar vocalizations and echoes, and neural recordings are collected. Credit: Melville J. Wohlgemuth et al., *JNeurosci* (2017)

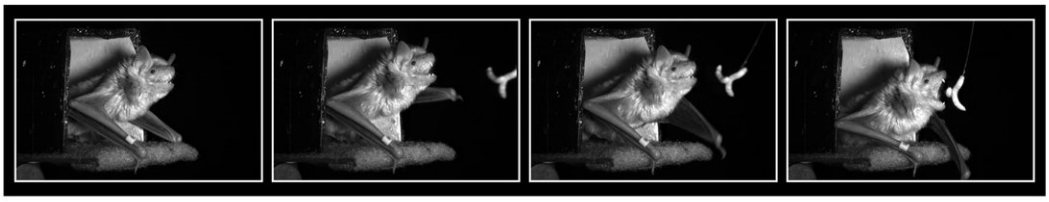
The bat midbrain is uniquely organized to facilitate rapid integration of sensory and motor information required for tracking prey using biological sonar, according to neural recordings of wild bats obtained

during laboratory experiments described in *The Journal of Neuroscience*.

The superior colliculus (SC) is a layered structure in the mammalian brain that uses sensory information to orient the animal to a particular location in its environment. The SC has been well-studied in species that rely primarily on vision to accomplish this task, and almost entirely in artificial settings that preclude understanding SC function during naturalistic behaviors. As bats use echolocation (the process of emitting sound and processing echoes) to navigate their environment, Melville Wohlgemuth and colleagues investigated how auditory input and vocal output might influence the organization and function of the SC in these animals.

The authors recorded SC activity from four big brown bats while manipulating the location of a prey item around a dimly lit room. By comparing the bats' changes in neural activity to their vocalizations and echoes, they found both sensory and motor neurons throughout the SC layers.

This finding contributes to previously studied species in which these different neuron types are separated, and integration occurs across layers. SC activity also changed as the bats closed in on the prey, which may support the localization of a target at close distances when processing demands are high.



Left to right, four frames of a high-speed video (500 fps) as the bat tracks and intercepts the target. In this task, a bat is trained to remain stationary on a platform and track a moving target using echolocation. These four frames are taken during the final stages of target interception. Credit: Melville Wohlgemuth

More information: Functional organization and dynamic activity in the superior colliculus of the echolocating bat, Eptesicus fuscus, *Journal of Neuroscience*, DOI: 10.1523/JNEUROSCI.1775-17.2017

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