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Stimulus-onset asynchrony can aid odor segregation

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Insects have a remarkable ability to identify and track odor sources in multi-odor backgrounds. Recent behavioral experiments show that this ability relies on detecting millisecond stimulus asynchronies between odors that originate from different sources [1]. Honeybees are able to distinguish mixtures where both odors arrive at the same time (synchronous mixtures) from those where odor onsets are staggered (asynchronous mixtures) even if the delay is only a few milliseconds.

On this poster we explore asynchronous mixture recognition in a model of the honeybee antennal lobe. We demonstrate how local neuronal processing can translate the small onset time difference into lasting differences in the response pattern in the antennal lobe and hypothesize that a mechanism of this kind could facilitate odor-background segregation in downstream circuits of the olfactory pathway. We present a detailed data-driven model of the bee antennal lobe that reproduces a large data set of experimentally observed odor responses [2] and demonstrate with this model that our hypothesis is consistent with the current knowledge of the olfactory circuits in the bee brain.

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