

The Dynamics of Choice: How Leeches Decide among Behaviors

Decisions to act are made by neurons that receive high-level sensory input and trigger complex motor acts. Previous work, primarily using invertebrate nervous systems, suggested that the same neurons that trigger one behavior actively inhibit others. When we tested this strategy in the medicinal leech, we found that it was far too simple. Instead, “decision neurons” in the leech are **multiplexed** (they help to trigger more than one behavior), thereby contributing to a **combinatorial code** for making decisions. To break this code, we need to record from a large number of neurons simultaneously and determine how they interact. We are using voltage-sensitive dyes to record neuronal activity and a variety of clustering algorithms to pinpoint the most important neurons and their voltage trajectories. Ultimately, we use electrophysiological recording and stimulation to test the correlations seen with the dyes. Interactions among decision-making neurons may be a common decision-making strategy in complex nervous systems.