Circuit motifs for flexible, goal-directed navigation

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Relatively unstructured artificial networks can be trained over millions of trials to perform specific flexible behaviors, but it is notable that many animals, including flies, adapt their behavior to changing cues, contexts and goals with barely any experience. I will use a combination of behavioral, physiological and connectomic evidence from the fly, *Drosophila melanogaster*, to highlight how the modularity and genetically specified architecture of its neural networks, when combined with plasticity at specific nodes, allow the animal to quickly generate and modify internal representations that enable it to navigate flexibly.

The aim of the Jayaraman lab is to establish causal links between neural circuit dynamics and behavioral decisions in animals navigating a multi-sensory world. The focus is on uncovering the emergence and specific role of relevant neural representations and dynamics in shaping adaptive behavior. They utilize the genetic model organism *Drosophila melanogaster* for experiments, involving monitoring and manipulating specific neural populations during head-fixed behavior. Their approach combines two-photon calcium imaging, whole-cell patch clamp electrophysiology, quantitative behavior, optogenetics, and computational analysis/modeling. The goal is to mechanistically connect computation in the central complex, a higher brain region, to the fly's behavioral decisions.

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