

## **Studying the neural basis of locomotion in *Drosophila* larvae using optogenetics and connectomics.**

We are at the beginning of an exciting new era for neuroscience, as our ability to probe neural circuits and their neuronal components is advancing rapidly due to genetic and optogenetic tools. My lab applies these tools to address fundamental questions about how the nervous system generates different locomotor behaviors. We investigate these questions using the *Drosophila* larva. I will talk about how we have used electron microscopy to reconstruct the connectome of the larval nervous system (i.e., the motor circuits), enabling us to identify, at the single-synapse level, the pre and postsynaptic partners of each individual neuron embedded in it. The larval nervous system generates multiple motor behaviors that can be studied at the single neuron/single muscle level. I will present our recent works where we have used muscle calcium imaging to characterize three different locomotor behaviors in the larvae: forward crawling, backward crawling, and escape rolling response. Moreover, I will talk about the optogenetic tools, experiments, and published and unpublished data that have helped us understand the neural basis of larval locomotion.