Drosophila sechellia: a novel model to investigate nervous system and behavioral evolution

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How animals' extraordinarily diverse behaviors have evolved is unknown. Relating interspecific behavioral differences to anatomical or physiological distinctions in neural circuits, and causal genetic variation, offers a powerful approach to inform how nervous systems develop, function and change.

Understanding behavioral and nervous system evolution requires deep investment in select species. The proposed PhD project will be part of a larger goal in the lab to establish a new model neurogenetic system: *Drosophila sechellia*, an island endemic that is closely related to *D. melanogaster* and *D. simulans*. While *D. sechellia* retains global genomic and superficial morphological similarity to its cosmopolitan generalist cousins, this species has adapted to a unique ecological niche, using *Morinda* fruit as a sole host for feeding and breeding. The PhD project will be developed in conjunction with the student within one (or more) of the following areas:

1. Establishment of a D. sechellia (neuro)genetic toolkit: you will build essential genetic reagents for generation and maintenance of animals of desired genotypes, for neurogenetic manipulations, and for recombination mapping-based approaches.

2. Behavioral, neuroanatomical and molecular phenomics: you will perform a systematic comparison of *D. sechellia, D. simulans* and *D. melanogaster* for their behaviors, their neuroanatomy and their neuro-molecular expression properties to reveal how *D. sechellia* has adapted to its niche. This information will provide multiple entry-points to relate molecular, neuronal and behavioral differences between these species.

3. Defining the genetic basis and functional significance of a neuronal adaptation in D. sechellia: through high-resolution mapping and allele swap approaches, you will identify the causal genetic changes underlying a neural adaption in *D. sechellia*, and its physiological and behavioral significance.

The PhD project will help to establish a powerful new model system for evolutionary neuroscience (and many other fields) and provide insights into the origins and mechanisms of nervous system and behavioral diversification.