Physics Department Seminars

Fundamental Elements of Navigation in Crawling Insects

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Abstract

Physics seeks to understand how things work from basic principles. When studying the physics of living systems, the goal is similar: determine how external inputs and internal characteristics combine to produce an output. When the living system is a motile organism, the goal is to determine how sensory input information transforms into behavioral output in the form of physical motion. Two universally important outputs of such sensorimotor transformations are exploration and navigation, deployed to find conditions conducive to survival and fitness.

Using the Drosophila larva model system, our lab investigates navigation in the context of a modulated random walk, across multiple scales: from the population ecology level, to neural circuits, to the molecular mechanisms underlying sensing. This seminar will focus on two projects: (1) characterizing the larva's response to mechanical vibration, especially features of adaptation, where we determine multiple time constants related to desensitization and recovery; and (2) characterizing internal states of individual animals, and how internal preferences compete with external sensory cues to determine behavioral output. We will also look ahead to future projects involving multi-sensory integration at the brain circuit and behavioral levels.