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**Seminar:**

*“An Integrated High-Speed Imaging and Optogenetic Pacing System to Study Drosophila Heart”*

**Abstract:**

Optical coherence tomography (OCT) is a promising research tool for non-invasive imaging of biological tissues. OCT can be used to capture images of the beating *Drosophila* heart in vivo with micrometer resolution and video-rate imaging speed. Due to its non-invasiveness nature, OCT enables longitudinal imaging of developing flies through the entire life cycle of the insect. We developed two transgenic *Drosophila* organisms with excitatory and inhibitory opsins (ReaChR and NpHR respectively) expressed in the heart and successfully stimulated tachycardia, bradycardia, and cardiac arrest through non-invasive red-light cardiac control at the different developmental stages. The heartbeat of *Drosophila* can be precisely manipulated in real-time by modifying the frequency and pulse width of the excitation light. The combination of noninvasive OCT imaging and optogenetic pacing establishes a powerful research platform to study the *Drosophila* heart.