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**CENTER FOR
NEURO-ENGINEERING
AND COGNITIVE SCIENCE**



NANOSYSTEM MANUFACTURING CENTER

Seminar

Untangling Cortico-thalamo-cortical Networks using Optogenetics

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Signals from the eye arrive via the lateral geniculate nucleus (LGN) of the thalamus at a network consisting of the primary visual cortex (V1), the lateral pulvinar nucleus (PL) of the thalamus, and the secondary visual cortex (V2). While the response properties of neurons in this network are well known, understanding the causal relationship between neural activity in V1, PL, and V2 remains a challenge due to the complexity of interconnections between these areas. As a first step towards this goal, we manipulated PL activity and assessed the net effect on area V1. Reversibly inactivating lateral pulvinar prevented supra-granular V1 neurons from responding to visual stimulation. Reversible, focal excitation of lateral pulvinar receptive fields increased 4-fold the visual responses in coincident V1 receptive fields and shifted partially overlapping V1 receptive fields towards the center of excitation. To investigate the microcircuitry underlying these strong effects, we used viral vectors to express light-sensitive channelrhodopsin-2 (ChR2) in PL neurons projecting to V1. ChR2 expressed in the axons of PL neurons targeting V1 and retrogradely transported to V1 neurons projecting to PL. Selective photo-activation and assessment of neural activity at different nodes using this method provides a novel tool for dissecting the V1-PL-V2 network.

Date: Monday, July 2, 2012

Time: 1PM

Location: W122-D3 (Engineering Building 2)

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