The Neuroscience Graduate Program

presents:

COLIN LOCKWOOD

ADVISOR: CHARLES DUFFY

IN A THESIS PROPOSAL

TUESDAY, 2 AUGUST 2016

9:00AM IN AUDITORIUM K-307(3-6408)

TASK MODULATION OF OPTIC FLOW ANALYSIS: NEURAL AND NEURONAL MECHANISMS

Optic flow analysis accesses patterned visual motion to support self-movement perception and empower autonomous navigation. Recent studies suggest that single neuron activity in the medial superior temporal area (MST) may be the foundation of scalp recorded evoked potentials (ERPs) that link optic flow analysis to behavior.
I will test this hypothesis by inter-relating MST neuronal activity, ERPs, and perceptual performance in humans and non-human primates.

My first studies demonstrate that visual attentional cueing modulates optic flow discrimination. Human ERPs show cue dependent, shifting cortical lateralization of optic flow responses consistent with previously hypothesized attentional effects. Further, those ERPs reflect optic flow processing changes in aging and Alzheimer's disease that are associated with behavioral deficits. ERPs recorded in primates performing the same cued optic flow discrimination task replicate the component structure of human optic flow ERPs, including similar task dependent effects on response lateralization. I am now recording single neuron activity in MST in two primates to establish relationships between single neuron MST activity, ERP waveforms, and behavioral responses during the perceptual processing of optic flow.

My goals are to: 1) Characterize attentional effects on human optic flow analysis, relating behavioral and neurophysiological responses across aging and Alzheimer's disease. 2) Establish a correspondence between attentional effects on optic flow perception and ERP responses in humans and non-human primates. 3) Link behavioral and ERP effects to single neuron activity in MST to elucidate neuronal mechanisms related to the top-down control of optic flow analysis**.**

These experiments will provide insight into the relationship between scalp recorded ERPs readily accessible in human studies, and the underlying neuronal activity that is uniquely accessible in non-human primates. Understanding the neuronal basis of ERPs could have important implications for both their scientific and clinical utility.