“How and Why Does a Fly See? Linking Neural Circuits with Computational Purpose Using Virtual Reality and Genetics”

Monday – November 11, 2013 – 12:15 p.m.
EPFL – room SV1717a

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host: Prof. S. Maerkl

Abstract
Circuit neuroscience was revolutionized in the last several years by the use of genetics to express proteins such as channelrhodopsin and GCaMP in molecularly defined neuronal classes. Concurrently, a recent trend in cognitive science is to model the mind within a quantitative framework in which the purpose of perception, decision-making and learning is framed within the context of Bayesian inference. Visually guided behavior of the fruit fly is an ideal experimental system for linking these approaches to establish a both a mechanistic understanding of neuronal circuit function and computational purpose of behavior. I will discuss recent work in my lab examining how flies respond to conflicting visual stimuli. Mechanistically, we have identified a class of neurons that modulate behavioral responses specifically when two simultaneously presented stimuli are in conflict, but not when either stimulus is presented alone. In our efforts to understand the computational purpose of these behaviors, we developed a simple new model based on cellular responses of a particularly well-studied neuronal class and show that this model predicts several previously unexplained components of behavior. Additionally, I will discuss several new technologies we built to allow us to dissect circuit function under naturalistic conditions similar to those in which the relevant behavior evolved, allowing us make rigorous statements about computational purpose. These include an advanced seamless multi-projector virtual reality system for freely moving animals.

Sandwiches will be provided

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