

Columbia Workshop on Brain Circuits, Memory and Computation

Monday and Tuesday, March 16-17, 2015 | Davis Auditorium, CEPSR

Organizer and Program Chair: Aurel A. Lazar (Columbia University)

The goal of the workshop is to bring together researchers interested in developing executable models of neural computation/processing of the brain of model organisms. Of interest are models of computation that consist of elementary units of processing using brain circuits and memory elements. Elementary units of computation/processing include population encoding/decoding circuits with biophysically-grounded neuron models, non-linear dendritic processors for motion detection/direction selectivity, spike processing and pattern recognition neural circuits, movement control and decision-making circuits, etc. Memory units include models of spatio-temporal memory circuits, circuit models for memory access and storage, etc. A major aim of the workshop is to explore the integration of various computational sensory and control models.

Program Overview

Monday 09:00 AM - 05:45 PM

09:00 AM - 09:45 AM **Yoshi Aso** (HHMI Janelia), Mushroom Body Output Neurons Encode Valence and Guide Memory-based Action Selection

09:45 AM - 10:30 AM **Barbara Webb** (University of Edinburgh), A Computational Model of the Insect Mushroom Body Applied to Ant Navigation

10:30 AM - 11:00 AM Coffee Break

11:00 AM - 11:45 AM **Wolfgang Maass** (Graz University of Technology), A New Perspective of Synaptic Plasticity and Network Rewiring

11:45 AM - 12:30 PM **Charles Randy Gallistel** (Rutgers University), The Memory Coding Problem

12:30 PM - 02:00 PM Lunch Break

02:00 PM - 02:45 PM **Charles D. Gilbert** (Rockefeller University), The Dynamic Brain

02:45 PM - 03:30 PM **Stefan Mihalas** (Allen Institute for Brain Science), Computational Properties of Cortical Columns

03:30 PM - 04:00 PM Afternoon Break

04:00 PM - 04:45 PM **Gary F. Marcus** (New York University), The Atoms of Neural Computation

04:45 PM - 05:45 PM Panel Discussion: What Would a Good Theory of the Brain Actually Look Like?

Tuesday 09:00 AM - 05:45 PM

09:00 AM - 09:45 AM **Vivek Jayaraman** (HHMI Janelia), A Donut that Means the World to the Fly

09:45 AM - 10:30 AM **Daniel Coca** (University of Sheffield), Fly Photoreceptors Detect Phase Congruency

10:30 AM - 11:00 AM Coffee Break

11:00 AM - 11:45 AM **Damon A. Clark** (Yale University), Tuning Neural Nonlinearities for Naturalistic Visual Motion Estimation

11:45 AM - 12:30 PM **Aurel A. Lazar** (Columbia University), Neurokernel: Building an in Silico Fruit Fly Brain

12:30 PM - 02:00 PM Lunch Break

02:00 PM - 02:45 PM **Anthony Leonardo** (HHMI Janelia), Neural Circuits Underlying Internal Models in Predictive Motor Control

02:45 PM - 03:30 PM **Fabrizio Gabbiani** (Baylor College of Medicine), Biophysics and Neural Computations Underlying Visually-Guided Collision Avoidance Behaviors

03:30 PM - 04:00 PM Afternoon Break

04:00 PM - 04:45 PM **Dmitri "Mitya" B. Chklovskii** (Simons Foundation), A Biological Neuron as an Online Matrix Factorization Device

04:45 PM - 05:45 PM Panel Discussion: A Neuroscience Esperanto: Building a Better Bridge Between Modeling and Experimental Neurobiology

Registration is free but all participants have to register at: <https://bcmc15.eventbrite.com/>