



INSTITUT PARIS DESCARTES  
NEUROSCIENCES  
COGNITION



## Neuroscience Seminar Series

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**Friday, September 25th, 2015 at 11:30**

Salle des Conférences (R229)  
Centre Universitaire des Saints-Pères  
45 rue des Saints-Pères, 75006 Paris

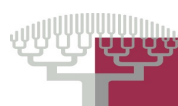
### **Ed Boyden**

*Leader, Synthetic Neurobiology Group; Associate Professor, MIT Media and and McGovern Institute; Departments of Biological Engineering and Brain and Cognitive Sciences; Co-Director, MIT Center for Neurobiological Engineering; Massachusetts Institute of Technology*

#### **Tools for Analyzing and Repairing Complex Biological Systems**

To enable the understanding and repair of complex biological systems such as the brain, we are creating tools that enable molecular-resolution maps of large scale systems, as well as technologies for observing and controlling high-speed physiological dynamics in such systems. First, we have developed a method for imaging large 3-D specimens with nanoscale precision, by embedding them in a swellable polymer, which upon exposure to water expands isotropically severalfold. This method, which we call expansion microscopy, enables conventional diffraction-limited microscopes to do large-volume nanoscopy. Second, we have collaboratively developed strategies to image fast physiological processes in 3-D with millisecond precision, and used them to acquire neural activity maps throughout small organisms. Third, we have collaboratively developed nanotechnological and robotic methods to record high-speed electrical events with single cell resolution in living mammalian brain. Finally, we have developed a set of genetically-encoded reagents, known as optogenetic tools, that when expressed in specific neurons, enable their electrical activities to be precisely driven or silenced in response to millisecond timescale pulses of light. In this way we aim to enable the systematic mapping, dynamical observation, and control of complex biological systems like the brain.

**Contact *Valentina Emiliani* ([valentina.emiliani@parisdescartes.fr](mailto:valentina.emiliani@parisdescartes.fr)) to meet with the speaker.**



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