

Speaker: Carlos Lois

Title: Visualizing synaptic connectivity in brain circuits

Abstract: Deciphering the brain's wiring diagram is widely thought to be necessary towards understanding how brain circuits process information. However, this goal is extremely challenging because currently available methods to study brain connectivity suffer from important limitations. In particular, there is an urgent need in neuroscience for a tool can provide the following features: (i) allow for the identification of connections between neurons located in distant parts of the brain, (ii) enable genetic manipulation of synaptically connected neurons, and (iii) allow for the simultaneous analysis of structural connectivity and neuronal function. We have developed a new system for visualizing and genetically manipulating neurons connected by synapses that has the potential to provide these key features. This method is called TRACT (*TRansneuronal ACTivation of Transcription*) and it works through genetic manipulations of two groups of neurons: the donors, which produce an artificial ligand, and the receivers, which express an engineered receptor. The interaction of the ligand and receptor across the synaptic cleft activates a transcriptional cascade in the synaptically connected neurons. These new tools will allow researchers to perform experiments that are not currently feasible with other available techniques, and which will provide valuable information towards understanding the complex workings of human brains and its diseases, such as autism and schizophrenia.