CDB SEMINAR

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Friday, March 24, 2017
14:00-15:00 A7F Seminar Room

Dissecting Olfactory Neural Circuits by Viral and Genetic Technology in Mice

Summary

Most brain areas contain diverse types of neurons with specific input/output connectivity and physiological response profiles. Understanding information processing in the brain depends on our ability to identify and manipulate distinct types of neurons individually, yet within the context of their larger network. I have implemented genetically controllable trans-synaptic tracing method for efficient retrograde labeling of long-distance projections, for precise analysis of local connectivity, and for elucidation of input-output organization of neuronal circuits. Combined with 3D reconstruction of labeled neurons, *in vivo* electrophysiology, and optogenetics, trans-synaptic tracing enables to decipher anatomical attributes of a particular type of neurons in the brain. In the first part of this seminar, I will overview several applications of trans-synaptic tracing in the mouse olfactory and neuromodulatory systems.

To complement these anatomical studies, in the second part, I will discuss functional dissection of neuronal circuit by studying how a specific sensory input evokes an appropriate behavioral output. As a model, I focus on sexual behaviors of female mice that are facilitated by a male pheromone, and suppressed by a juvenile pheromone. By CRISPR-mediated gene knockout, I showed that these two distinct pheromones were received by distinct pheromone receptors. Downstream of these receptors were each unique brain regions and neuronal sub-populations whose activities were necessary and sufficient for pheromone-mediated changes of sexual behaviors. These studies illuminated two parallel labeled-lines that regulate sexual behaviors of female mice to the opposite directions. I will discuss new insights into functional organizations of amygdala-hypothalamus axis underlying social behavioral output in mice.

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