論文の内容の要旨

論文題目　Integration of excitatory and inhibitory synaptic inputs in the *Drosophila* mushroom body

(ショウジョウバエのキノコ体における興奮性・抑制性シナプス入力の統合)

氏名　稲田　健吾

How cell-type-specific physiological properties shape neuronal functions in a circuit remains poorly understood. I addressed this issue in the *Drosophila* mushroom body, a higher olfactory circuit, where neurons belonging to distinct glomeruli in the antennal lobe feed excitation to three types of intrinsic neurons, α/β, α'/β', and γ Kenyon cells (KCs). Two-photon optogenetics and intracellular recording revealed that whereas glomerular inputs add similarly in all KCs, spikes were generated most readily in α'/β' KCs. This cell type was also the most competent in recruiting GABAergic inhibition fed back by anterior paired lateral neuron, which responded to odors either locally within a lobe or globally across all lobes depending on the strength of stimuli. Notably, as predicted from these physiological properties, α'/β' KCs had the highest odor detection speed, sensitivity, and discriminability. This enhanced discrimination required proper GABAergic inhibition. These results link cell-type-specific mechanisms and functions in the mushroom body circuit.