高次脳機能学セミナー
Advanced Brain Functions Seminar

Integration of prior and sensory stimulus in the cerebral cortex

Akihiro Funamizu

Cold Spring Harbor Laboratory, Zador lab

Animals have to act despite limited sensory information because of factors such as interfering background noise or occluded vision. The ability to estimate the current state of the outside world by integrating the sensory information and prior (internal model) is essential for place estimation and decision making. For place estimation, my previous study showed that the mouse posterior parietal cortex (PPC) implemented the two fundamental features of dynamic Bayesian inference: prediction of hidden states using an internal state transition model and updating the prediction with new sensory evidence [1].

In perceptual decision making, the prior knowledge of stimulus probability and reward outcome is essential to optimize behavior. Although a series of studies have shown the neural substrate of outcome expectation in frontal cortices and striatum, the role of sensory cortex is unclear. We trained head-fixed mice on an auditory frequency discrimination task [2], in which either (i) the stimulus probability or (ii) the reward size for category A and category B trials changes in blocks, and imaged the population neuronal activity of auditory cortex with two-photon microscopy. We found that both the stimulus probability and reward amount biased mice toward choices associated with high-probability stimuli or large reward, respectively, indicating that mice used the prior to optimize behavior. The auditory cortical neurons increased the activity when the preferred stimulus had high probability or associated with large reward, suggesting that the integration of sensory stimulus and prior occurs early in the sensory cortex.

<This seminar is presented in English.>

2018年12月4日(火)
17:30~18:30
蛋白質研究所1階講堂
(Lecture room @IPR 1F)

参考文献
[1]Akihiro Funamizu, Bernd Kuhn, Kenji Doya, "Neural substrate of dynamic Bayesian inference in the cerebral cortex.", Nature Neuroscience, 2016, doi:10.1038/nn.4390.
[2]Fred Marbach, Anthony M Zador, "A self-initiated two-alternative forced choice paradigm for head-fixed mice.", bioRxiv, 2017, doi:10.1101/073783.