Symposium (Oral) | Symposium | Novel Function and Technology Based on Ensemble Phenomenon

[9p-Z03-1~9]Novel Function and Technology Based on Ensemble Phenomenon

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Wed. Sep 9, 2020 1:30 PM - 5:35 PM Z03

△：Presentation by Applicant for JSAP Young Scientists Presentation Award

▲：English Presentation

▼：Both of Above

No Mark：None of Above

3:50 PM - 4:20 PM

▲[9p-Z03-6]Task-dependent modulation of olfactory representations

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Keywords:ensemble, neuroscience, sensory system

Sensory systems in the brain allow animals to interact with the world. These systems allow information from the environment to be obtained and processed, eventually to be used to guide behavior. One of the goals of neuroscience is to understand the properties of the neural representations of the world, also known as sensory representations, and how neural circuits in the brain implement transformation of the signals in a way that is ultimately used by animals' behaviour.

One property of such representations is the distributed nature, where a stimulus is not just represented by a single neuron, but by a joint activity of multiple neurons scattered over some distance. Further, behavioural contexts, such as tasks that an animal needs to perform, can pose conflicting demands on neural representations of stimuli. That is, a representation that is optimal for one behaviour may be unsuitable for another, as seen in the requirements for discriminating between stimuli vs. generalizing over the same stimuli. Adjusting representations transiently may enable the organism to cope with rapidly changing behavioural contexts. To address this, we investigated how behavioural demands shape olfactory responses in the mouse brain, in particular in the primary olfactory area known as the olfactory bulb output. We observed, using a two-photon microscopy, how neural representations of odours change as mice switch between tasks that differ in difficulty. We find that responses to identical odours change rapidly with task demands, in a manner that is suited to the task at hand. The modulation depends on the stimulus tuning of a given neuron, making olfactory responses more discriminable through selective amplification in a demand-specific way. Future experiments will characterize further the properties of informative neurons, and how they relate causally to decision makings of animals.