World Wide NeuRise

Talks by rising stars of neuroscience

Transcriptional adaptation couples past experience and future sensory responses

Tatsuya Tsukahara - Datta Lab
(Harvard Medical School)

Animals traversing different environments encounter both stable background stimuli and novel cues, which are generally thought to be detected by primary sensory neurons and then distinguished by downstream brain circuits. Sensory adaptation is a neural mechanism that filters background by minimizing responses to stable sensory stimuli, and a fundamental feature of sensory systems. Adaptation over relatively fast timescales (milliseconds to minutes) have been reported in many sensory systems. However, adaptation to persistent environmental stimuli over longer timescales (hours to days) have been largely unexplored, even though those timescales are ethologically important since animals typically stay in one environment for hours. I showed that each of the ~1,000 olfactory sensory neuron (OSN) subtypes in the mouse harbors a distinct transcriptome whose content is precisely determined by interactions between its odorant receptor and the environment. This transcriptional variation is systematically organized to support sensory adaptation: expression levels of many genes relevant to transforming odors into spikes continuously vary across OSN subtypes, dynamically adjust to new environments over hours, and accurately predict acute OSN-specific odor responses. The sensory periphery therefore separates salient signals from predictable background via a transcriptional mechanism whose moment-to-moment state reflects the past and constrains the future; these findings suggest a general model in which structured transcriptional variation within a cell type reflects individual experience.

Event link:
https://www.crowdcast.io/e/wwneurise/