DANDRITE
Danish Research Institute of Translational Neuroscience
Nordic EMBL Partnership for Molecular Medicine

AARHUS UNIVERSITY

DANDRITE Topical Seminars

Monday 17 June 2019
09.30 – 11.15

Auditorium D3, building 1531, room 215
Ny Munkegade 116, 8000 Aarhus C

Carl E. Schoonover, PhD

Associate Research Scientist, Axel Laboratory
Zuckerman Mind Brain Behavior Institute, Columbia University / Howard Hughes Medical Institute

9.30 – 10.15

Unstable odor responses in piriform cortex

The tuning properties of sensory neocortices are stably maintained over long periods in spite of continuous dendritic spine turnover. We have measured the stability of odor representations in piriform cortex (PCx), a three-layered paleocortical structure. In order to observe stimulus responses separated by long intervals, we developed an electrophysiological recording strategy that supports observation of a fixed population of single units for up to one month. In animals presented odorants at weekly intervals we find that representations are unstable; a linear classifier trained to classify responses to a panel of odorants recorded on day 1 performs nearly at chance one month later. However, we observe long term stability if odorants are presented at daily intervals. This stability depends on regular exposure: if daily odorant presentation is halted, representations become unstable once again. These results contrast with the stability of representations in sensory neocortices, even when stimulus presentation is infrequent. We hypothesize that this distinction reflects differences in circuit architecture between neocortex and paleocortex. Neocortex receives patterned thalamic input and exhibits local horizontal connectivity. This organization permits loss and restoration of similarly tuned synapses, ensuring the stability of sensory tuning. In contrast, PCx is characterized by unstructured innervation from olfactory bulb and distributed horizontal connections. Synaptic turnover in PCx is therefore likely to result in instability in stimulus representations, presenting a problem for the maintenance of learned behaviors elicited by odors. Our observations suggest that if PCx encodes odor identity, these representations must be transmitted to a more stable repository of odor information. Alternatively, PCx may not encode odor identity and instead may function in more transient processes of sensory recognition and learning.

Andrew J.P. Fink, PhD

Associate Research Scientist, Axel Laboratory
Zuckerman Mind Brain Behavior Institute, Columbia University / Howard Hughes Medical Institute

10.30 – 11.15

A virtual burrow assay for head-fixed mice measures habituation, discrimination, exploration and avoidance without training

We have designed an assay that measures approach and avoidance behaviors in head- fixed mice at millisecond timescale, is compatible with standard electrophysiological and optical methods for measuring neuronal activity, and requires no training. The Virtual Burrow Assay simulates a scenario in which a mouse, poised at the threshold of its burrow, evaluates whether to exit the enclosure or to retreat inside. The assay provides a sensitive readout of habituation, discrimination and exploration, as well as avoidance of both conditioned and innately aversive cues.

Host: DANDRITE Group Leader Duda Kvitsiani, Department of Molecular Biology and Genetics