

DANDRITE Lecture

Thursday 11 October 2018

09:30 – 10:30

The Biomedicine Auditorium, building 1170, 3rd floor, room 347

Ole Worms Allé, 8000 Aarhus C



Andreas Schäfer

Professor of Neuroscience, Department of Neuroscience, Physiology and Pharmacology, University College London
Group Leader, The Francis Crick Institute

Mammalian olfaction is a high bandwidth sense

Odours are transported in turbulent plumes resulting locally in highly fluctuating odour concentration. Yet, whether mammals can make use of the ensuing temporal structure to extract information about the olfactory environment remains unknown. Here, we use dual-energy photoionisation recording to simultaneously determine odour concentrations of two odours with >300 Hz bandwidth in air. We show that temporal correlation of odour concentrations reliably predicts whether odorants emerge from the same or different sources in normal turbulent environment outside and in laboratory conditions. To replicate natural odour dynamics in a reproducible manner we developed a multichannel odour delivery device allowing presentation of several odours with 10ms temporal resolution. Integrating this in an automated operant conditioning system we demonstrate that mice can reliably discriminate the correlation structure of odours at frequencies of more than 40 Hz. Consistent with the purely olfactory nature of these tasks already output neurons in the olfactory bulb show segregated responses depending on the correlation of odour stimuli with populations of 10s of neurons sufficient to reach behavioural performance. Our work thus demonstrates that mammals can perceive temporal structure in odour stimuli at surprisingly fast timescales. This in turn might be useful for key behavioural challenges such as odour source separation, figure-ground separation or odour localisation.

"I will discuss this work in some detail but also aim to give an overview where my lab at University College London and the Francis Crick Institute is moving towards, including efforts in neurotechnology development and electron microscopy."

Hosts: PhD Student Sophie Seidenbecher on behalf of Young DANDRITE and Group Leader Duda Kvitsiani, Dept. MBG, Aarhus University