Joint KJELDGAARD & DANDRITE Lecture

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Building 1593-012 (iNANO)
Aarhus University

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Neuronal circuit mechanisms for learning and memory

Classical fear conditioning is one of the most powerful models for studying the neuronal substrates of associative learning and for investigating how plasticity in defined neuronal circuits causes behavioral changes. In my talk, I will focus on the organization and function of the neuronal circuitry of fear and discuss how functionally, anatomically and genetically defined types of amygdala neurons contribute to the acquisition and expression of conditioned fear behavior. In addition to its role in conditioned fear behavior, the amygdala has long been implicated in the regulation of persistent states, such as anxiety and drive. We are using deep brain calcium imaging of genetically identified neurons while mice engage in a range of self- paced behaviors in combination with computational approaches to analyze the relation between slow dynamics at the neuronal and at the behavioral level. By tracking large neuronal populations across days and paradigms, we describe a hierarchy of activity patterns that emerges in the network dynamics during learning and corresponds to behavior on multiple timescales. Our results describe the response of the network dynamics to perturbations along different dimensions and the interplay between state-like representation and the processing of specific events and actions. Our present findings suggest a general principle of network dynamics that could underlie the involvement of the amygdala in such different functions as sensory associative learning, action selection and emotional processing.

Host: Prof. Marco Capogna, Dept. of Biomedicine, Affiliated Researcher at DANDRITE - Danish Research Institute of Translational Neuroscience, Aarhus University

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