

Project 1.10. The analysis of the brain networks activated by spatial choice.

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Background:

Hippocampus is a key brain structure for spatial navigation and memory, as well as one of the most investigated regions of the brain. Surprisingly, recent experiments showed that our understanding of its function is incomplete and can be challenged. In particular, recent data indicate that hippocampus is required for spatial choice, i.e. choice that uses spatial information to suppress inappropriate behaviours, rather than spatial memory. In agreement with these findings our experiments show that inactivation of the hippocampus impairs spatial choice in close-to-ecologic conditions, but it has no impact on memory. Moreover, we observed that cellular and behavioural mechanisms that support spatial choice in old mice differ from those observed in young animals (Caly et al. 2021, J. Neurosci. 41(11):2329-2343).

Aim:

We will investigate neuronal networks that support spatial choice, and, in particular, the role of the hippocampus in these networks. To this end we plan to analyse the activity of the hippocampal neurons during spatial choice training and how it is affected by ageing. Overall, our study will describe neuronal networks that suppress incorrect spatial choices in close-to-ecologic conditions. We will implement novel technologies to visualise the networks in a behaving animal. Our study will significantly extend understanding of the hippocampus as a hub brain region for spatial choice. Moreover, our experiments will extend our understanding of dCA1 function in the aged brain and we will possibly propose new strategies to support healthy cognitive aging.

This project will be performed in collaboration with dr. Xiaoke Chen (Stanford University) and Alessio Attardo (Max Plank Institute of Psychiatry). We will introduce cutting-edge technologies that allow for whole-brain imaging ex vivo (iDISCO and light-sheet microscopy) and in vivo imaging of the hippocampus of the living mouse (by Inscopix miniendoscope).

Requirements:

- MSc in biology, biotechnology, psychology, bioinformatics or similar,
- drive to learn,
- curiosity,
- good communication skills,
- fluency in English.