Neuronal basis of spatial choice

Hippocampus is a part of our brain system for spatial navigation and memory, as well as one of the most investigated regions of the brain. However, recent experiments showed that our understanding of its the function is incomplete and can be challenged. In particular, data from Bannerman and collaborators 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 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. Motivated by these observations 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 accomplish three tasks: identify brain networks activated during spatial choice training; analyse activity of hippocampal neurons during spatial choice and analyse brain networks during spatial choice in the aged brain.

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 and present their characteristics with single cell resolution both *ex vivo* and 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 a significant technological advancement. In collaboration with dr. Xiaoke Chen (Stanford University) and Alessio Attardo (Max Plank Institute of Psychiatry), we will introduce in the lab cutting-edge technologies that allow for whole-brain imaging *ex vivo* and *in vivo* imaging of the hippocampus of the living mouse. These techniques will allow us to ask many further questions related to brain functions that are not accessible with traditional microscopy.