



SEMINARIO PRESENCIAL

Viernes, 12 de Mayo de 2023

12:30 h. Instituto Cajal (CSIC) Madrid

DRA. CLAUDIA BÖHM

HHMI Janelia Research Campus / Charité Berlin (from May 2023)

TIME, SPACE, AND MEMORY IN PREFRONTAL CORTEX DURING FLEXIBLE BEHAVIOR

Abstract

Flexibly storing and updating memory content is a fundamental ability of animals in which prefrontal cortex (PFC) is believed to play a major role as its activity can reflect information that must be temporarily maintained to realize the current goal. However, in our flexible spatial working memory task, where rats were required to navigate from different starting points and via multiple routes to one of multiple possible goal locations, we found no evidence that the well-controlled delay period contained current-goal-specific memory. This suggests that under conditions where memory needs to be employed flexibly, alternative mechanisms must exist. PFC activity instead categorized important spatial locations according to their meaning in the task and displayed neural representations that reflected the geometry of the maze. Furthermore, we found that elapsed time was encoded at starts and goals and that this time code was invariant to different locations within a category (goal or start). Despite the tendency of individual neurons to show mixed selectivity, i.e. to be selective for multiple task-relevant variables, we found that subsets of neurons had functional preferences for time or space. This structured selectivity may facilitate complex behaviors by efficiently generating informative representations of multiple variables.

Affiliation and short bio

During her PhD in Berlin Claudia's work focused on neuromodulator-induced neural plasticity as well as mechanisms of memory consolidation in the subiculum, where she investigated the role of different cell types during fast hippocampal oscillations. She then moved to the US to join Janelia Research Campus as a postdoc. Here she was involved in the development of large-scale electrophysiological recording devices and established a new behavioural assay to study flexible working memory and neural correlates of time and space in the prefrontal cortex of rodents. Later this year Claudia will take on a position as a Junior professor at Charité Berlin. Her group's work will focus on the neural basis of cognitive flexibility, learning and factors leading to disruptions in models of early-life stress in rodents.

Related publications with the topic

- C. Böhm, A. K. Lee, Functional specialization and structured representations for space and time in prefrontal cortex, bioRxiv 2023; doi: [10.1101/2023.01.16.524214](https://doi.org/10.1101/2023.01.16.524214)
- C. Böhm, A. K. Lee, Canonical goal-selective representations are absent from prefrontal cortex in a spatial working memory task requiring behavioral flexibility, eLife 2020; doi: [10.7554/eLife.63035](https://doi.org/10.7554/eLife.63035)
- N. A. Steinmetz*, C. Aydin*, A. Lebedeva*, M. Okun*, M. Pachitariu*, M. Bauza, M. Beau, J. Bhagat, C. Böhm, ..., T. D. Harris, Neuropixels 2.0: A miniaturized high-density probe for stable, long-term brain recordings, Science 2021;372(6539) eabf4588; doi: 10.1126/science.abf4588 *equal contribution