



## PhD Position

### Contextual modulation of spatial memory consolidation

#### **Collaborative Research Center 1315 “Memory Consolidation” (SFB 1315)**

Brain & Behavior Lab (Prof. Christoph Ploner/Prof. Carsten Finke)

Department of Neurology, Charité – Universitätsmedizin Berlin

**Starting date October 2022**

We invite applications for a **four-year PhD position** in the CRC 1315 project “Spatial Memory Consolidation Networks”. The CRC 1315 “Memory Consolidation” brings together outstanding memory researchers from Berlin institutions, including Charité, Humboldt-Universität zu Berlin, Freie Universität Berlin and Technische Universität Berlin. The successful applicant will become a member of the Brain & Behavior Group at the Dept. of Neurology at Charité Berlin and will be embedded in an interdisciplinary network of basic and clinical neuroscience researchers. There will be continuous exchanges with Postdocs, PhD students and Faculty of the CRC and associated institutions, including the Excellence Cluster NeuroCure, the Bernstein Center for Computational Neuroscience and the Berlin School of Mind and Brain.

The project combines electrophysiological, pharmacological, imaging and lesion approaches in patients and healthy participants with behavioral/virtual reality paradigms to study contextual modulation of spatial memory consolidation. Please see the attached project summary and graphical abstract for more details.

#### **Requirements**

- Master’s degree in Psychology, Cognitive Science, Neuroscience, Biology, Computer Science or related disciplines with excellent results

#### **Desirable**

- Experience in one of the proposed research methods (i.e., electrophysiology/intracranial recordings, neuroimaging (structural/functional MRI), human lesion studies, behavioral/virtual reality studies)
- Familiarity with memory research, spatial cognition and hippocampal function
- Experience in the study of clinical populations
- Programming skills, preferably in Matlab, Python or R

Please **contact** us for further details: [christoph.ploner@charite.de](mailto:christoph.ploner@charite.de) or [carsten.finke@charite.de](mailto:carsten.finke@charite.de).

Please send your **application** as a single PDF file including a CV, a motivation letter and a statement of research experience, and the names and contact details of two academic references to [carsten.finke@charite.de](mailto:carsten.finke@charite.de) (applications will be considered until the position is filled).



## ABSTRACT Project B05 - SFB1315 “Contextual modulation of spatial memory consolidation”

Current theories of systems memory consolidation suggest distinct possible modes by which neural interactions between hippocampus and neocortex are modulated during memory formation. Previous research suggests that this interaction starts early after encoding and may extend across delays of decades. Although time by itself is a major modulator of how hippocampus and neocortex interact, preliminary evidence suggests that systems consolidation is anything else but a ballistic process that stereotypically follows encoding, but rather a process that may flexibly adapt to distinct behavioral contexts and distinct mental sets of the organism.

The proposed project continues previous work of the applicants within the CRC by systematically investigating contextual factors that may critically determine relative contributions of hippocampus and neocortex within networks for memory consolidation. We will focus on the effects of mental schema on consolidation of visuo-spatial information. Our central hypothesis is that availability of previous knowledge not only facilitates initial learning but also critically determines hippocampal-neocortical interaction during systems consolidation.

In four work packages (WPs), we will combine electrophysiological, pharmacological, imaging and lesion approaches in patients and healthy participants with behavioral paradigms that are intended to facilitate translational research between human and animal research on memory consolidation. In WP 1, we will study schema effects on memory-related oscillations recorded from the human medial temporal lobe and neocortex during pre-surgical epilepsy monitoring. In WP 2, we will study whether early memory consolidation of schema-congruent and -incongruent visuo-spatial information shows a differential susceptibility to transient GABA-ergic modulation of hippocampal neural activity with the anesthetic propofol. In WP3, we will investigate the role of the hippocampus for the integration and consolidation of spatial with contextual information. In WP 4, we will study how the availability of autobiographically relevant spatial information facilitates consolidation of spatial memoranda.

### Graphical abstract

#### Background

Current theories of systems memory consolidation (i.e. standard, multiple trace, scene construction) disagree on mode and time course of interaction of hippocampus and neocortex during consolidation.

Winocur & Moscovitch 2011; Squire et al. 2015; Barry & Maguire 2019

#### Hypothesis

Mode and time course of interaction between hippocampus (Hip.) and neocortex (Ncx.) during consolidation is flexible and adapts to **contextual factors**. These include availability of previous knowledge (i.e. availability of schema), self-relatedness and repeated retrieval.

Hebsher et al. 2019; van Kesteren & Meeter 2020

#### WP1

Recordings of memory-related oscillations from medial temporal lobe and neocortex of presurgical epilepsy patients during **schema memory task**

#### WP2

Testing of patients undergoing general anesthesia with propofol with **spatial schema memory task**

#### WP3

Testing of patients with hippocampal dysfunction during veridical spatial navigation in a **context-associative navigation task**

#### WP4

Testing of patients with hippocampal encephalitis with an **autobiographical spatial memory task**