

## Introductory Remarks to Symposium 20

### Investigating memory using human single-neuron recordings

*Alana Darcher and Ilona Vieten, Tuebingen and Bonn*

Memory underpins a wide range of cognitive processes and unfolds across various timescales. As a phenomenon, memory is often stratified by duration of storage and additionally by content, with explicit memory categorized as either semantic or episodic. In this symposium, we will present new insights into the single-neuron correlates of human memory. Our understanding of the neural mechanisms of memory at the single-cell level is driven by observations of functionally specialized cell types in the medial temporal lobe, in particular concept cells, place cells, and grid cells. The interplay between these groups of neurons and the precise mechanisms through which they interface with the various facets of memory remain an open topic of investigation.

This symposium focuses broadly on two questions: 1) What roles do single neurons in the human medial temporal play in the formation and retrieval of memories? 2) What is the relationship between single neurons and patterns of population activity or local field potentials during memory formation and retrieval? To this end, J. Daume will discuss how hippocampal dynamics, particularly persistent activity and theta–gamma phase–amplitude coupling, support the control of working memory maintenance as well as long-term memory formation at the level of single neurons. S. Mackay will present experimental evidence for hippocampal indexing and discuss the role of concept cells as the building blocks of episodic memory. I. Vieten will describe the effects of attention on concept neurons and differences between the regions of the medial temporal lobe. M.J. Prakash will discuss the role of gamma oscillations in encoding and maintenance during sequential memory. A. Darcher will show how single-neuron activity and population activity differentially process the semantic content of a novel full-length movie and how these differences could relate to emergent stimulus tuning.

## Symposium 20

*Friday, March 28, 2025  
11:30 - 13:30, Lecture Hall 8*

Chairs: Alana Darcher and Ilona Vieten,  
Tuebingen and Bonn

- 11:30 **Opening Remarks**
- 11:35 Jonathan Daume, Los Angeles, USA  
HIPPOCAMPAL SINGLE-NEURON DYNAMICS IN WORKING MEMORY MAINTENANCE AND LONG-TERM MEMORY FORMATION (S20-1)
- 12:00 Sina Mackay, Bonn  
THE ROLE OF CONCEPT CELLS IN MEMORY FORMATION (S20-2)
- 12:25 Ilona Vieten, Bonn  
ATTENTIONAL MODULATION OF SINGLE-UNIT ACTIVITY IN THE HUMAN MEDIAL TEMPORAL LOBE (S20-3)
- 12:50 Muthu Jeyanthi Prakash, Tuebingen  
THE ROLE OF GAMMA OSCILLATIONS IN STIMULUS ENCODING AND MEMORY MAINTENANCE DURING A SEQUENTIAL MEMORY TASK IN THE HUMAN MEDIAL TEMPORAL LOBE(S20-4)
- 13:00 Alana Darcher, Tuebingen  
DECODING MOVIE CONTENT FROM NEURONAL POPULATION ACTIVITY IN THE HUMAN MEDIAL TEMPORAL LOBE (S20-5)
- 13:25 **Concluding Remarks**