

Bonn Melbourne Seminar in Decision Making and Computational Psychiatry

“Neural Representations Underlying Flexible Behavior”

Prof Mona Garvert (Faculty of Human Sciences, University of Würzburg, Germany)

Abstract

In our ever-changing world, the ability to adapt to novel situations is essential. This adaptability often involves leveraging our past experiences to navigate new challenges. For example, when choosing from a menu in an unfamiliar restaurant, we instinctively draw upon past dining experiences to guide our decision. Such generalization is a cornerstone of adaptive behavior, allowing us to make informed decisions without relearning strategies for every new scenario. In this talk, I explore how the human brain enables such behavior. I will demonstrate that the brain constructs hippocampal cognitive maps, traditionally known for encoding spatial relationships, to also represent other types of relational knowledge, providing a flexible foundation for generalization and novel inference. In high-dimensional decision-making scenarios, the orbitofrontal cortex selectively activates relevant cognitive maps tailored to the specific task, showcasing the brain's dynamic information processing capability. Additionally, our research reveals that with time and consolidation, the brain forms more abstract relational maps, which transcend specific stimuli and reflect the broader relational structure of experiences. In summary, our findings illustrate the remarkable adaptability of neural representations in the human brain. They demonstrate how these representations are not just static archives of past experiences but are dynamic tools actively reshaped to aid decision-making and behavior in ever-changing environments.

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