

NOVEL METHOD TO STUDY MEMORY FORMATION AND RECALL AT THE NEURONAL POPULATION LEVEL

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Abstract:

Understanding how long-term memories are encoded in neuronal activity is an area of active investigation. Hippocampal neural activity has been related to the representation of memories since the discovery of place-cells (O'Keefe & Dostrovsky 1971), which supported the concept of "the cognitive map" (O'Keefe & Nadel, 1978), first proposed by Tolman in 1948 as the hyperspace where memories are organized. Despite a large body of research most previous investigations about long-term memory encoding described only the spatial component of the hippocampal neuronal activity with only a few showing how to read-out memory related information. Place-cell responses are stable over time, thus it is hard to read from their activity how much an animal knows and remembers about an environment or task. I will review examples of hippocampal neural activity related to memory and describe a novel behavioral task that allows quantification of the strength of several memories created at different time points, mimicking in a more ethological way memory formation over time. This novel task is compatible with recording the activity of a large population of neurons utilizing miniaturized microscopes for calcium imaging and opens the door to investigating the roles of different cell types and brain regions during memory formation and recall.