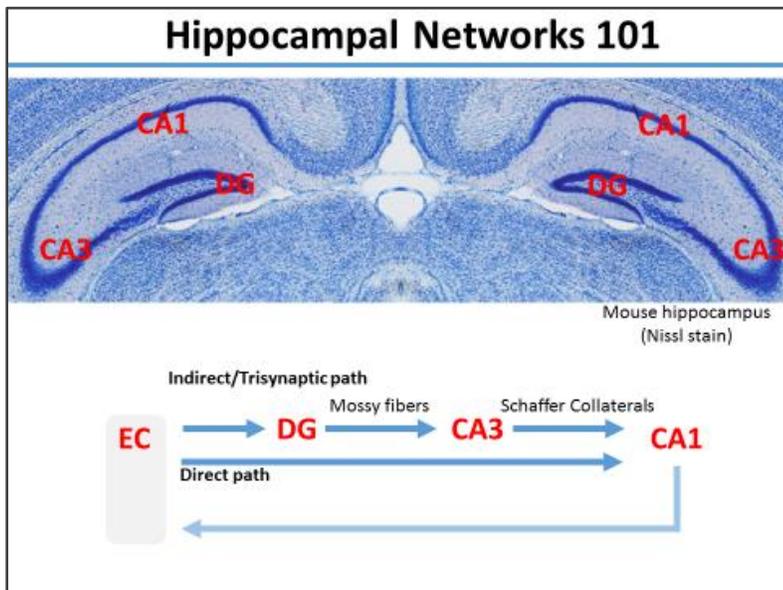


Declarative memory (“knowing what”): is memory of facts (**semantic**) and events (**episodic**), and refers to those memories that can be consciously recalled (or "declared"). It is sometimes called explicit memory, since it consists of information that is explicitly stored and retrieved. Episodic memory is the memory of autobiographical events (times, places, associated emotions, and other contextual who, what, when, where, why knowledge) that can be explicitly stated or conjured. It is the collection of past personal experiences that occurred at a particular time and place.

Procedural Memory (“knowing how”): recall of how to do things such as swimming or driving a car. Procedural memory is usually considered implicit because people don’t have to consciously remember how to perform actions or skills.

Hippocampus anatomical terminology: Hippocampus/CA1 fields/medial temporal lobe/parahippocampus/entorhinal cortex: the medial temporal lobe is one of the 4 lobes of the cerebral cortex and includes the hippocampus, along with the surrounding hippocampal region consisting of the perirhinal, parahippocampal, and entorhinal cortex (EC) (edited from Wikipedia). There are further subdivisions within the hippocampus (the figure to the left includes most –except subiculum- with the arrows indicating the main pathways connecting them): There is no consensus concerning which brain regions are encompassed by the terms hippocampus/hippocampal formation, with some authors defining them as the dentate gyrus (DG), the hippocampus proper (which includes the three CA fields: CA1, CA2, CA3) and the subiculum; and others including also the presubiculum, parasubiculum, and entorhinal cortex. The hippocampal formation is thought to play a role in



memory, spatial navigation and control of attention. The neural layout and pathways within the hippocampal formation are very similar in all mammals (adapted from https://en.wikipedia.org/wiki/Hippocampal_formation).

Representation of space by hippocampal cells: cells in different parts of the hippocampus are thought to ‘encode’ information about location in the environment through the specificity of their spiking patterns. Place cell: pyramidal neuron within the hippocampus that becomes active when an animal enters a particular place in its environment; this place is known as the place field (Wikipedia). Grid cells: a place-modulated neuron whose multiple firing locations define a periodic triangular array covering the entire available surface of an open two-dimensional environment (scholarpedia).

Watch and listen to a recording of place cells from one of the Wilson lab experiments: <https://www.youtube.com/watch?v=lfNVv0A8QvI> and grid cells: <https://www.youtube.com/watch?v=i9GiLBXWAHI>

Reactivation: the 'replay' of previous experienced events (often spatial trajectories traversed in the environment) in the activity of brain cells that encoded those events (e.g., as a sequential activation of place cells).

Sharp-wave ripples: oscillatory patterns (~100-250Hz) in the mammalian brain hippocampus seen on an EEG or LFP during immobility and sleep, and which correspond to the reactivation of experienced spatial trajectories by groups of place cells.

EEG/LFP: EEG: an electrophysiological voltage signal recorded with the electrodes placed along the scalp. The Local Field Potential is an electrophysiological voltage signal recorded from electrodes implanted inside the brain and is generated by the summed electric current flowing from multiple nearby neurons within a small volume of nervous tissue (adapted from Wikipedia). The voltage trace of an EEG/LFP often displays oscillatory activity at different frequencies, e.g., sharp-wave ripple oscillations (~100-150Hz), which occur during non-REM sleep and quite wakefulness, and the theta rhythm (6-10Hz), which is observed during navigation and attentive behavior.

Systems memory consolidation: A reorganization process in which memories from the hippocampal region, where memories are first encoded, are moved to the neo-cortex in a more permanent form of storage (Wikipedia).

LTP (long-term potentiation): a persistent increase in synaptic strength following high-frequency stimulation of a synapse. (Wikipedia)

LTD (long-term depression): an activity-dependent reduction in the efficacy of neuronal synapses lasting hours or longer following a long patterned stimulus.