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***Cellular mechanisms of place cell activation***

In any given environment, a specific ensemble of cells in the hippocampus, called place cells, will be active (each one coding a specific location, their place field) among a larger population of silent cells. This ensemble participates in the formation of a cognitive map, a mental representation of that environment which will be stored in long-term memory, allowing flexible spatial navigation. Recent experimental work suggests that the ability of a given cell to map a new environment could be in part pre-determined even before spatial exploration. The mechanisms behind this predetermination are difficult to study with extracellular recordings, which only capture the output of neurons. In this talk I will describe recently developed techniques to perform intracellular recording of hippocampal pyramidal cells in navigating animals. These techniques allow us to record not only the spiking output of hippocampal cells but also the synaptic inputs and intrinsic cellular properties leading to that output. I will show how these recordings can be used to gain insights into the cellular mechanisms of place cell representation of a new environment. Finally, I will present new results investigating plasticity of intrinsic excitability of CA1 pyramidal cells in vivo, and illustrate the potential role of this form of plasticity in regulating the ensemble of activated cells in a given environment.