



Sensory Processes: From Molecules to Cognition

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Session 3 Neuronal Oscillations and Cellular Communication

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Mechanisms of sparse coding in the dentate gyrus

The dentate gyrus is the most important relay station that transfers polysensory information from the entorhinal cortex into the hippocampus proper. Theoretical and experimental evidence suggests that sparse coding of granule cells is critical for the ability to discriminate similar sensory percepts. The talk will explore some intriguing properties of the dentate gyrus that make it particularly suited for this purpose.

Firstly, multiphoton glutamate uncaging and dual recordings reveal that dentate granule cell dendritic properties are optimized for linear integration and strong attenuation of synaptic input from the entorhinal cortex. Secondly, a highly efficient recruitment of canonical inhibitory feed-back and feed-forward circuits is a key mechanism to generate sparse firing. Finally, modulatory cholinergic inputs regulate inhibitory control of granule neurons. Thus, the dentate gyrus can be viewed as a regulated sparsification device at the entry point to the canonical hippocampal circuit.