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## Learning and Memory in the Prefrontal Cortex

Min-Whan Jung

*Neuroscience Laboratory, Institute for Medical Sciences, Ajou University, Suwon 443-749*

Modifying behavioral strategies in accordance with changes in environment are extremely important for survival. The prefrontal cortex (PFC) is likely to play a crucial role in this adaptive process considering that one important function of the PFC is the planning of future behaviors. In order to investigate neural mechanisms by which the PFC adaptively modifies its activities based on past experience, we investigated learning-induced changes in neural activity and synaptic plasticity in rat PFC. Single neuron recording studies in behaving animals revealed that PFC neural activities change rapidly in parallel with behavior learning. Moreover, correlations among neurons were altered in the process of learning, and long-term potentiation was induced by high-frequency stimulation in sensory cortical projections to the PFC. These results suggest that synaptic weights are modified within the PFC in the process of new task learning so that neural activity changes dynamically as an animal learns a new behavioral strategy. Some neurons exhibited different activity patterns but correlations among neurons were similar across two different behavioral tasks, suggesting that multiple behavioral strategies are represented in an overlapping, distributed manner in the PFC neural network. These studies stress the importance of learning and memory as an essential component of the PFC functions.