

Metaplasticity: Past activity shaping future brain plasticity

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Synaptic plasticity is a fundamental mechanism of learning and memory storage in the brain. It is well known that such plasticity is under the instantaneous control of many external factors, including modulatory neurotransmitters such as dopamine and serotonin, transmitters released by glial cells, and hormones. However, an additional sometimes under-appreciated factor is past neural activity that can leave traces modifying present and future synaptic plasticity, and thus learning. Termed “metaplasticity”, its principles are utilized in psychology and machine learning alike. We have studied a range of metaplasticity phenomena on the basis that understanding their mechanisms can not only enhance our understanding of brain function generally but also offer clues to enhancing learning under normal and disease conditions.