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The Neural Basis of Timing: Plasticity and Dynamics in Neural Microcircuits

The brain's ability to seamlessly assimilate and process temporal information is critical to most behaviors, e.g. speech recognition or the ability anticipate external events. Consequently, timing and temporal processing represent a fundamental neural computation.

We have proposed that because timing is so important to brain function that cortical circuits are intrinsically able to tell time on the scale of milliseconds to seconds. To test this hypothesis we study plasticity of neural dynamics in cortical slices.

We have shown that by using optogenetics to present temporal intervals, that cortical slices can in a sense learn those intervals. We have also developed models of cortical networks that can account for both sensory and motor timing.