

Alpha oscillations have been widely treated as signatures of functional inhibition of task-irrelevant brain regions, shaping how alpha-related changes in behavior and perception are understood. However, functional suppression at the cognitive level does not imply that alpha oscillations are generated by physiological inhibition. Here we argue that conflating physiological and functional inhibition has obscured a central mechanism of alpha oscillations: state-dependent physiological excitation. Converging cellular evidence identifies excitatory thalamocortical dynamics as a key source of alpha rhythmicity. Integrating cellular, circuit-level and human electrophysiological findings, we argue how excitation driven thalamocortical mechanisms can account for canonical alpha phenomena.