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Gamma Oscillations and Visual Binding PETER A. ROBINSON, JONG WON KIM, School of Physics, University of Sydney, Australia. Brain Dynamics Center, Westmead Hospital and University of Sydney, Australia — At the root of visual perception is the mechanism the brain uses to analyze features in a scene and bind related ones together. Experiments show this process is linked to oscillations of brain activity in the 30-100 Hz gamma band. Oscillations at different sites have correlation functions (CFs) that often peak at zero lag, implying simultaneous firing, even when conduction delays are large. CFs are strongest between cells stimulated by related features. Gamma oscillations are studied here by modeling mm-scale patchy interconnections in the visual cortex. Resulting predictions for gamma responses to stimuli account for numerous experimental findings, including why oscillations and zero-lag synchrony are associated, observed connections with feature preferences, the shape of the zero-lag peak, and variations of CFs with attention. Gamma waves are found to obey the Schroedinger equation, opening the possibility of cortical analogs of quantum phenomena. Gamma instabilities are tied to observations of gamma activity linked to seizures and hallucinations.

Jong Won Kim
University of Sydney

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