Experimental Tests of State-dependent Networks, and Plasticity within Recurrent Networks

Dean Buonomano, UCLA.

State-dependent networks provide a powerful computational model of cortical function: in the general form, computations arise via the interaction between external stimuli and the evolving network state. Critical to state-dependent network models is the presence of time-dependent neuronal properties, such as short-term synaptic plasticity, which provide an evolving network trajectory even in the absence of ongoing activity (Buonomano & Merzenich, 1995). However, unaddressed issues include: 1) how do cortical networks set the synaptic weights in a manner that provides balanced dynamics. Here we demonstrate that the inclusion of a homeostatic form of plasticity can be used to set the synaptic weights in a self-organizing manner. 2) One potential short-coming of state-dependent networks it the reset problem: previous stimuli influence the processing of subsequent stimuli. Here we take this as an experimental prediction, which is tested using human psychophysics experiments.