

Talk 3.7

Stereotyped activity flow in neocortical microcircuits

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Information is processed in the cortex by the parallel action of large numbers of neurons. To study the structure of ensemble activity during sensory stimulation, we recorded auditory cortical populations (40-100 cells) while presenting simple stimuli (tones, noise, and clicks) in a passive listening paradigm. We observed a diversity of stimulus tuning and temporal response profiles, even amongst neurons recorded on a single electrode. Neural firing rates varied substantially with stimuli; however, differences between the temporal structures of responses evoked by multiple stimuli in a single neuron were small, compared to differences between the temporal structures of multiple cells to a single stimulus.

At the population level, diverse yet reliable onset latencies revealed a stereotyped spread of activation through the recorded population. This activation sequence was similar across stimuli, and also for spontaneously occurring patterns associated with the start of cortical UP states. To investigate the consequences of this temporal structure for stimulus coding, we performed a population vector analysis. Population codes evolved with time, characterized by increasing sparseness and orthogonalization during the first few hundred milliseconds of stimulus presentation. We hypothesize that our observations may reflect the interplay of recurrent network activity and diverse cellular physiologies.

Project (or PI) Website

<http://qneuro.rutgers.edu>

Publications

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7. A.Luczak; P.Bartho; S.L.Marguet; G.Buzsaki; K.D.Harris. Fine structure of neocortical spontaneous activity in vivo. Soc Neurosci Abs #970.19 (2005)
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