**Introduction**

Coordination of neocortical oscillations has been hypothesized to underlie cognitive "binding." The mechanisms that generate neocortical oscillations in physiological frequency bands remain unknown. We simulated a neocortical network wired according to known anatomical data. A physiological network wired according to known unknown. We simulated a neocortical physiological frequency bands remain that generate neocortical oscillations in cognitive "binding." The mechanisms has been hypothesized to underlie Coordination of neocortical oscillations (divergence multiplied by average population (E red, I blue). Line thickness represents the number of cells in the layer number (2 represents 2/3) and an connections. Cell types are E (excitatory) or I (inhibitory), followed by cell interactions in network.

**Methods**

Network structure and wiring. LFPs from 9 columns are shown. '+' (lowest trace) indicates LFP corresponding to raster. Also shown are single cell voltage traces from low-threshold spiking interneuron(I2L), fast-spiking interneuron (I2), and pyramidal neuron (E2) in layers 2/3.

**Results**

Addition of hubs to E2 produces substantial power increases in unconnected columns. Population spikes are prominent in unconnected columns of 10 E2 hub network.

**Frequency homeostasis**

No appreciable shift in E MUA peak with increased external inputs to E2 cells.

**Comparison with experimental data**

Comparison of power spectra from LFP recorded in left medial prefrontal cortex of awake rat to normalized MUA power spectra from the different simulation types. The frequencies that show coupling, and those that don’t, are similar in both experiment and simulation.

**Conclusions**

Layer 2/3, excitatory cells were the primary drivers (for E cells) or sculptor (for I cells) of overall spectral patterns. Lateral inhibition between columns reduced activity, but did not change the form of the spectrum. The network possessed internal homeostatic mechanisms. The network produced a complex pattern of intercolumnar correlation relationships that could provide the basis for the neocortical phase relations putatively used in cognitive binding.

**Acknowledgments**

AnnMary Mathew (Brooklyn College), Gordon Shepherd & Ben Suter (Northwestern U.), Ahmet Omurtag (BioSignal Group, Brooklyn, NY) Larry Eberle (SUNY Downstate)

**Support**

DARPA N66001-10-C-2008 NSF I0S-725001 NIH R01MH084038-01 NINDS R42NS064474-02A1

**Emergent oscillations in neocortex: a simulation study**


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