16th Annual Dynamical Neuroscience Satellite Symposium on "Neuronal Variability and Its Functional Significance," November 13-14, 2008, Washington, DC.

Finding structure in spike time variability of autonomously firing globus pallidus neurons *in vitro*

Ramana Dodla and Charles J. Wilson
Department of Biology, University of Texas at San Antonio, San Antonio, TX 78249

Autonomous spiking patterns of several globus pallidus external (GPe) neurons were recorded for 60 minutes or more in brain slices of rat basal ganglia. The spike times displayed a time dependent coefficient of variation and correlation times. We used the spike times thus recorded to stimulate (with inhibitory synaptic conductances) a model subthalamic neuron (STN) that incorporated sodium, potassium, leakage and calcium currents and synaptic connections to emulate the supposed *in vivo* GPe-STN network architecture. The model neuron acted as a filter and became selective for patterns in the input data. The output spike time variability of the model was considerably reduced in comparison to its input variability, and depended on the intrinsic firing rate of the model neuron. We also used a model GPe neuron to test the effect of GABAergic extrinsic input timed at the recorded spike times. The variability of the resultant spike times was compared with that of the complex input patterns by parameterizing the strength and time constant of the synaptic conductances, and the frequency of the model neuron. The results may have implications for the generation of pathological firing patterns in Parkinson's disease.