Deep Brain Stimulation

- Pacemaker-type technique to alleviate symptoms of
  - Parkinson’s Disease
  - Essential Tremor
  - Dystonia
- Side effects include apathy, hallucinations, cognitive dysfunction
- Mechanisms of symptom alleviation not well understood

Information Theory

- Entropy is a measure of disorder that can be applied to spike trains
- Information that Cell B has received from Cell A is calculated using the entropy of Cell B’s ISIs and the entropy of those ISIs for a given CSI

Basal Ganglia Pathways

- Direct Pathway ‘Go’ Pathway
- Indirect Pathway ‘No Go’ Pathway
- Hyperdirect Pathway

Behavioral Validation of Basal Ganglia Pathway Isolation

- D1 Antagonist – SCH23390
  - Shut down ‘direct’ pathway
- D2 Agonist – Quinpirole
  - Shut down ‘indirect’ pathway

Information Quantification and the Basal Ganglia Pathways

- We will quantify the effects of DBS on information transmission from basal ganglia input to basal ganglia output

Mutual information as a correlate of Parkinson’s symptom severity

- Mutual information between basal ganglia output and thalamus is increased in Parkinson’s Disease

Anderson, et. al. 2015

Mutual information between basal ganglia output and thalamus is increased in Parkinson’s Disease

Bias-Corrected Information

Information, mbit/s·spike

Distance Traversed from Saline, m

D1 Antagonist – SCH23390

D2 Agonist – Quinpirole

Difference in Distance Traversed from Saline, m