1060-92-112 **Horacio G. Rotstein*** (horacio@njit.edu), Department of Mathematical Sciences, New Jersey Institute of Technology, University Heights, Newark, NJ 07102, and **Tilman Kispersky** (tilman@bu.edu) and **John A. White**. *Canard dynamic structures and their roles in generating abrupt transitions between firing frequency regimes in neural models: The stellate cell case.*

Recent experimental studies have shown that SCs become hyper-excitable in animal models of temporal lobe epilepsy. These studies have also demonstrated the existence of recurrent connections among SCs (excitatory),reduced levels of recurrent inhibition in epileptic networks as compared to control ones, and comparable levels of recurrent excitation among SCs in both network types. In this work, we show that minimal, recurrently connected networks of SCs and interneurons (inhibitory cells) exhibit an abrupt, threshold-like transition between the theta (4- 10 Hz) and hyper-excitable spiking (about 60 Hz) frequency regimes as the result of small increases in the amount of recurrent excitation. These abrupt transitions are observed in the absence of inhibition and in single, self-coupled SCs, which represent a network of coupled synchronous SCs, but not in synaptically isolated SCs. Experimental results confirm our theoretical predictions. We use dynamical systems tools to explain how synaptic excitation interacts with the nonlinearities and time-scale separation present in the SC model to generate these abrupt transitions between firing frequency regimes. (Received March 25, 2010)