1154-92-1042 **Hwayeon Ryu*** (hryu@elon.edu) and **Sue Ann Campbell** (sacampbell@uwaterloo.ca).
Stability, Bifurcation, and the Emergence of Synchronization and Clusters in Time Delayed Neural Networks.

We study synaptically coupled neuronal networks to identify the role of coupling delays in network's synchronized behaviors. We consider a network of coupled neurons where two distinct populations, each of which consists of a pair of excitatory-inhibitory neurons, interact with each other. Two pairs are coupled via excitatory neurons, while the inhibitory neuron is communicating only with its respective excitatory neuron in the same population. Linear stability analysis of the equilibrium solution of this system is conducted to derive a parameter space consisting of the coupling delays between the populations and the coupling strengths. It is shown that, when coupling delays are present, the equilibrium point may lose stability via a Hopf bifurcation from which a synchronous periodic solution emerges. Qualitatively different behaviors such as clusters between two pairs could also emerge via other types of bifurcations. Numerical simulations are conducted to confirm and supplement our analysis. (Received September 12, 2019)