1146-92-305 **Nida Obatake*** (nida@math.tamu.edu), **Anne Shiu**, **Xiaoxian Tang** and **Angelica Torres**.
*Oscillations in the ERK network.* Preliminary report.

Chemical Reaction Network theory is an area of mathematics that analyzes the behaviors of chemical processes. A major problem in this area is the stability of steady states of these networks. Rubinstein et al. (2016) showed that the ERK network exhibits multiple steady states, bistability, and undergoes periodic oscillations for some choice of rate constants and total species concentrations. The ERK network reduces to the processive dual-site phosphorylation network when certain reactions are omitted, and this network is known to have a unique, stable steady state (Conradi and Shiu, 2015). To investigate how multiple steady states and oscillations are lost as reactions are removed from the ERK network, we analyze subnetworks of the ERK network. In particular, we prove that oscillations persist even after we greatly simplify the model by making all reactions irreversible and removing intermediates. We prove this using an algebraic criterion for Hopf bifurcations that relies on analyzing polynomials (Yang, 2002). We introduce the Cones Method: an algorithmic procedure that uses techniques from polyhedral geometry to construct a positive point where a pair of polynomials achieve certain desired sign conditions. Joint work with Anne Shiu, Xiaoxian Tang, and Angelica Torres. (Received January 25, 2019)