Oscillatory dynamics of simple circadian models

Ruby Kim

Physiologically-based models using ordinary differential equations (ODEs) can be used to help explain complicated biological phenomena, including circadian (24hr) rhythms that exist within almost every cell in your body. Disruptions to circadian rhythms are linked to various neurological conditions including Parkinson's disease, sleep disorders, and depression. These circadian disruptions occur at both the molecular and behavioral levels.

We will analyze several existing ODE models of circadian rhythms to study the properties required for stable oscillatory behavior. We will use MATLAB to compute numerical solutions and investigate any qualitative changes in these dynamical systems, including the loss of rhythmicity. Prerequisites for this project are Math 217 and some exposure to ordinary differential equations. Coding experience is helpful but not required.