April 26 (BERT 012)

9:30 am: Jessica Bernstein

Effects of Nutrient Availability on Tumor Proliferation

To study the growth of tumor cells we used the model of Gerlee and Anderson, which is a simple hybrid cellular automata including the diffusion of nutrients and the resulting consumption rate of a cell, which in turn effects the growth dynamics of the tumor colony. By varying k, the cells constant consumption rate, we studied the resulting tumor patterns, focusing on shape and the ability of the colony to sustain living cells (N_{alive}). The respective quantities of active and inactive cells were studied, as well, as a function of r, the radius of the resulting colony. Our imaging results did not reflect the resulting tumor patterns of Gerlee et al., but we find qualitatively good agreement that increasing k results in a decrease in the colony's ability to maintain active cells.

9:50 am: Evan Palumbo

Simplifying the Complex Dynamics of a Stock Market

A simulation of a simplified Stock market, using specific rules to govern trading. Our market is simplified by excluding all derivatives and other financial instruments except underlying equities with yielding no dividends. The market has specific times in which it is closed and no trading is allowed. The worth of each trader's portfolio is presented, along with the overall growth of the entire market. We find the average net difference in the worth of each trader to be -0.6.

April 26 (BERT 012)

10:10 am: Lia Harrington

Associative Memory in Neural Networks

We use Monte Carlo simulations of the Hopfield neural network to measure associative memory and magnetization as a function of temperature T and time. We find that associative memory decays with increasing temperature, and that magnetization variance diverges at $T \approx 1.4$. A surprising finding is that a double log of temperature vs memory yields a linear relationship.

10:30 am: Jacob Lusa

Simulation of a Damped Driven Pendulum

Using molecular dynamics, we simulated a damped driven pendulum. We determined the bifurcation diagram $\omega(g)$. We find good agreement with previous results [Baker & Gollub].