Condensed Matter Seminar

Shannon Serrao

Physics, Virginia Tech

"Fluctuation effects on a cyclic predator-prey system (May-Leonard model)"

Monday, November 26, 2018

4:00pm – 5:00pm

304 Robeson Hall

Owing to close proximity with observed cyclic predator-prey dynamics in nature, we study the cyclic predator-prey model of May-Leonard with three species. The May-Leonard model is characterized by strong fluctuation induced effects to its non-equilibrium stationary state, notably the noise induced spatio-temporal spiral patterns on the two dimensional lattice; and the extinction of the long-lived coexistence state on account of large but rare fluctuations. We study both these stochastic effects by firstly, characterizing the size of the aforementioned spiral patterns to the lowest order using the Doi-Peliti coherent state path integral formalism and encoding the pattern quantitatively in the coefficients of the noisy complex Ginsburg-Landau equation. Secondly, on the well-mixed version of the model, we obtain the extinction times of all but one species driven by large fluctuations from a stable coexistence state and compare our results to Gillespie simulations across the transcritical bifurcation in the system.