

# Applied Dynamical Systems Seminar

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HH-3017, 12:00p.m.

*Diffusion, Chemotaxis and Pattern Formation: A Case Study Via  
Topological method and Asymptotic Analysis*

## Abstract:

Pattern formation is quite common to be seen in natural environment such as the formation of animal skin spots. Besides the pioneering explanation of Alan Turing in 1952 in terms of reaction diffusion equations, recently chemotaxis is thought as another important factor in pattern formation. In this talk, by a case study we analyze the effect of diffusion and chemotaxis in a volume-filling model. The existence of Turing Pattern can be proved by topological-degree method. Via an asymptotic analysis, we derive an explicit formula for the stationary patterns. Moreover, based on this explicit formula, we establish the stability criteria and find a selection mechanism of principal wave modes for the stable stationary solutions in virtue of the estimation of the leading term of principal eigenvalues. We show that all bifurcations except the one at the first location of the bifurcation parameter are unstable, and if the pattern is stable, then its principal wave mode must be a positive integer which minimizes the bifurcation parameter.