



Department of Mathematics and Statistics
St. John's, NL Canada A1C 5S7
Tel: (709) 737-8783 Fax: (709) 737-3010

Colloquium Announcement

Speaker: Prof. Manjun Ma,
Affiliation: Zhejiang Sci-tec University, Hangzhou, China

Date: August 27, 2019
Time: 2:00-3:00 P.M.
Room: HH-3017

Title: Stationary and non-stationary patterns of a reaction diffusion system with density -suppressed motility.

Abstract:

In this work, we first explore the stationary problem of a density-suppressed motility (DSM) model where the diffusion rate of the bacterial cells is a decreasing function (motility function) of the concentration of a chemical secreted by bacteria themselves. We show that the DSM model does not admit non-constant steady states if either the chemical diffusion rate or the intrinsic growth rate of bacteria is large. We also prove that when the decay of the motility function is sub-linear or linear, the DSM model does not admit non-constant steady states if either the chemical diffusion rate or the intrinsic growth rate of bacteria is small. Outside these non-existence parameter regimes, we show that the DSM model will have non-constant steady states under some constraints on the parameters. Furthermore we numerically find the stable stationary patterns only when the parameter values are close to the critical regime. Finally by performing a delicate multiple-scale analysis, we derive that the DSM model may generate propagating oscillatory waves whose amplitude is governed by an explicit Ginzburg-Landau equation, which is further verified by numerical simulations. This is a joint work with Prof. Rui Peng (Jiangsu Normal University, Xuzhou, China) and Prof. Zhian Wang (Hong Kong Polytechnic University, Hong Kong, China).

