Department of Mathematics

University of Houston

Scientific Computing Seminar

Prof. Alina Chertock
Department of Mathematics
North Carolina State University

Numerical Methods for Chemotaxis and Related Models

Thursday, Jan. 31, 2013
3:00 PM- 4:00 PM
Room 646 PGH

Abstract: Chemotaxis is a movement of micro-organisms or cells towards the areas of high concentration of a certain chemical, which attracts the cells and may be either produced or consumed by them. In its simplest form, the chemotaxis model is described by a system of nonlinear PDEs: a convection-diffusion equation for the cell density coupled with a reaction-diffusion equation for the chemoattractant concentration. It is well-known that solutions of such systems may develop spiky structures or even blow up in finite time provided the total number of cells exceeds a certain threshold. This makes development of numerical methods for chemotaxissystems extremely delicate and challenging task.

In this talk, I will present a new family of high-order finite-volume finite-difference methods for the Keller-Segel chemotaxis system and several related models. Applications of the proposed methods to the classical Patlak-Keller-Segel model, its extensions to the two-species case as well as to the coupled chemotaxis-fluid system will also be discussed.