



The Croucher Foundation Advanced Study Institute
Recent Development in Nonlinear Partial Differential Equations: Part I

Date: 28 February 2011

Venue: Rm. 501a, Academic Building 1, IMS, CUHK

Time	Date	28 February 2011 (Monday)
09:00am – 10:15am		Professor Wei Ming Ni <i>East China Normal University & University of Minnesota</i> Title: The Mathematics of Diffusion Diffusion, Directed Movements, and Spatial Heterogeneity in Mathematical Ecology (Part I)
10:15am – 10:45am		Tea Break
10:45am – 12:00pm		Professor Wei Ming Ni <i>East China Normal University & University of Minnesota</i> Title: The Mathematics of Diffusion Diffusion, Directed Movements, and Spatial Heterogeneity in Mathematical Ecology (Part II)
12:00pm – 02:00pm		Working Lunch[#]
02:00pm – 02:45pm		Professor Tai Chia Lin <i>National Taiwan University</i> Title: Two-component Gross-Pitaevskii functionals
02:45pm – 03:30pm		Mr. King Yeung Lam <i>University of Minnesota</i> Title: A Semilinear Equation with Large Advection from Population Dynamics
03:30pm – 04:00pm		Tea Break
04:00pm – 04:45pm		Professor Zhiqiang Wang <i>Utah State University & Nankai University</i> Title: Bifurcation results for a nonlinear Schrödinger system
04:45pm – 05:30pm		Professor Man Kam Kwong <i>Hong Kong Polytechnic University</i> Title: Some problems on the periodic solutions of the forced pendulum equation
06:00pm – 08:00pm		Welcome Dinner[#] (Venue: Chung Chi College Staff Club, CUHK)

For invited speakers and invited guests only.

The Mathematics of Diffusion
Diffusion, Directed Movements, and Spatial Heterogeneity in Mathematical Ecology

Professor Wei-Ming Ni
Center for PDE, East China Normal University
and
School of Mathematics, University of Minnesota

Abstract

In this series of lectures, starting from a single logistic equation, I will describe the interactions between diffusion and spatial heterogeneity in Lotka-Volterra competition systems. Various phenomena in mathematical ecology will be compared in both homogeneous and inhomogeneous environments. Directed movements will be considered as well.

Two-component Gross-Pitaevskii functionals

Professor Tai Chia Lin
Department of Mathematics, National Taiwan University

Abstract

Two-component Gross-Pitaevskii (GP) functional is a crucial model to describe Bose-Einstein condensates. Several interesting mathematical problems can be formed by such a functional. In this lecture, I'll introduce the GP functional and recent results.

A Semilinear Equation with Large Advection from Population Dynamics

Mr. King-Yeung Lam
School of Mathematics, University of Minnesota

Abstract

We study a reaction-diffusion-advection system modeling the competition of two species. They are identical except for their modes of dispersal: the first species disperses completely randomly while the second species moves up the environmental gradient to more favorable habitat in addition to diffusion. In [Cantrell, Cosner and Lou, Proc. Roy. Soc. Edinburgh A, 2007], it is proved that directed movement of the second species is not always beneficial in competition. In fact, when the strength of the directed movement of the first species is large, the two species always co-exist stably. We study the limiting profile of co-existence steady-states which helps understand the reasons behind such coexistence. A crucial step in the proof is to establish a Liouville-type result in R^N .

Bifurcation results for a nonlinear Schrödinger system

Professor Zhiqiang Wang
Department of Mathematics and Statistics, Utah State University
and
Chern Institute of Mathematics, Nankai University

Abstract

We discuss some work on local and global bifurcation structure of positive solutions for a nonlinear system of Schrödinger type equations, which give multiplicity results of positive bound state solutions of the system in the repulsive case.

Some problems on the periodic solutions of the forced pendulum equation

Professor Man Kam Kwong
Department of Applied Mathematics, The Hong Kong Polytechnic University

Abstract