University of Miami
Institute for Theoretical and Mathematical Ecology
in cooperation with the
Department of Mathematics
College of Arts and Sciences

Colloquium

Professor Hao Wang

University of Alberta

will present

"The Role of Light and Nutrients in Aquatic Trophic Interactions"

Friday, April 16th, 2010
4:30- 6:00 pm, Ungar Bldg. rm 402

Refreshments served at 4:00 p.m. in CC 521

Abstract

Carbon (C), nitrogen (N), and phosphorus (P) are vital constituents in biomass: C supplies energy to cells, N is essential to build proteins, and P is an essential component of nucleic acids. The scarcity of any of these elements can severely restrict organism and population growth. Thus in nutrient deficient environments, the consideration of nutrient cycling, or stoichiometry, may be
essential for population models. To show this idea, I will present two case studies in this talk.

We carried out a microcosm experiment evaluating competition of an invasive species Daphnia lumholtzi with a widespread native species, Daphnia pulex. We applied two light treatments to these two different microcosms and found strong context-dependent competitive exclusion in both treatments. To better understand these results we developed and tested a mechanistically formulated stoichiometric model. This model exhibits chaotic coexistence of the competing species of Daphnia. The rich dynamics of this model as well as the experiment allow us to suggest some plausible strategies to control the invasive species D. lumholtzi.

We modeled bacteria-algae interactions in the epilimnion with the explicit consideration of carbon (energy) and phosphorus (nutrient). We hypothesized that there are three dynamical scenarios determined by the basic reproductive numbers of bacteria and algae. Effects of key environmental conditions were examined through these scenarios. Competition of bacterial strains were modeled to examine Nishimura's hypothesis that in severely P-limited environments such as Lake Biwa, P-limitation exerts more severe constraints on the growth of bacterial groups with higher nucleic acid contents, which allows low nucleic acid bacteria to be competitive.