Title: My journey to Mathematical Ecology

Abstract:

In this talk I shall share with the audience my personal research experience in Mathematical Ecology in the past forty years.

One of the central questions in Mathematical Ecology is to understand biodiversity and coexistence of the species. Various temporal and spatial mathematical models are constructed to explain the phenomena of coexistence of species observed in nature. These models also brought new facinating research topics in differential equations and dynamical systems.

First I shall introduce the mathematical models in chemostat. The k resources- n

consumers interactions are used to describe the mechanisms

of competition among the species. The resources

will include nutrients and light and the consumers

will be phytoplankton species. These models are

formulated in ODE. However in nature, we shall

consider the PDE models in a water column.

The second part is to consider the models in

general ecology. We shall discuss the mathematical

models of predator-prey systems , food chain

systems and n species competition

systems. In addition to regular dynamics,   we may

have chaotics dynamics.

Mathematical challenges in these topics are

to prove the global dynamics for example the global

stability of equilibrium, uniqueness of limit cycles,

existence of periodic solutions and uniform

persistence. Various applications of monotone dynamical systems will be discussed, especially the general frame of two species competition in ordered Banach spaces.