Speaker: Professor Xiaoqiang Zhao, Memorial University of Newfoundland, Canada

*June 11 (Monday):*

**I. Basic Reproduction Ratios for Periodic Compartmental Models with Time Delay**

In this talk, I will report our recent research on basic reproduction ratios for a large class of time-delayed compartmental population models in a periodic environment. It is proved that this ratio serves as a threshold value for the stability of the zero solution of the associated periodic linear systems. As an illustrative example, we also apply the developed theory to a periodic SEIR model with an incubation period and obtain a threshold result on its global dynamics in terms of the basic reproduction ratio.

**II. A Reaction-Diffusion Model of Vector-Borne Disease with Periodic Delays**

A vector-borne disease is caused by a range of pathogens, and transmitted to hosts through vectors. To investigate the multiple effects of the spatial heterogeneity, the temperature sensitivity of extrinsic incubation period (EIP) and intrinsic incubation period (IIP), and the seasonality on disease transmission, we propose a nonlocal reaction-diffusion model of vector-borne disease with periodic delays. We introduce the basic reproduction ratio R0 for this model and then establish a threshold type result on its global dynamics in terms of R0. In the case where all the coefficients are constants, we further obtain the global attractivity of the positive steady state when R0 is greater than one. We also carry out numerical simulations to study the malaria transmission in Maputo Province, Mozambique.

*June 12 (Tuesday):*

**The Principal Eigenvalue for Degenerate Periodic Reaction-Diffusion Systems I & II**

The theory of the principal eigenvalue is established for the eigenvalue problem associated with a linear time-periodic parabolic cooperative system with some zero diffusion coefficients. Then we apply it to a benthic-drift population model and obtain a threshold type result on its global dynamics in terms of the basic reproduction number.

*June 13 (Wednesday):*

**I. Propagation Dynamics for a Spatially Periodic Integrodifference Competition Model**

In this talk, I will report our recent research on the propagation dynamics for a class of

integrodifference competition models in a periodic habitat. We first prove the global

asymptotic stability of a semi-trival steady state for the periodic initial value problem.

We then show that the model system admits a single spreading speed, and it coincides

with the minimal wave speed of the spatially periodic traveling waves. A set of

sufficient conditions for linear determinacy of the spreading speed is also given.

**II. Spatial Dynamics of a Nonlocal Dispersal Population Model in a Shifting Environment**

We consider the spatial dynamics of a nonlocal dispersal population model in a shifting environment where the favorable region is shrinking. It is shown that there exists a critical number c\* such that the species becomes extinct in the habitat if the speed of the shifting habitat edge is greater than c\*, while the species persists and spreads along the shifting habitat if this speed is less than c\*. Further, we establish the existence, uniqueness and global exponential stability of the forced traveling wave with the wave speed at which the habitat is shifting.