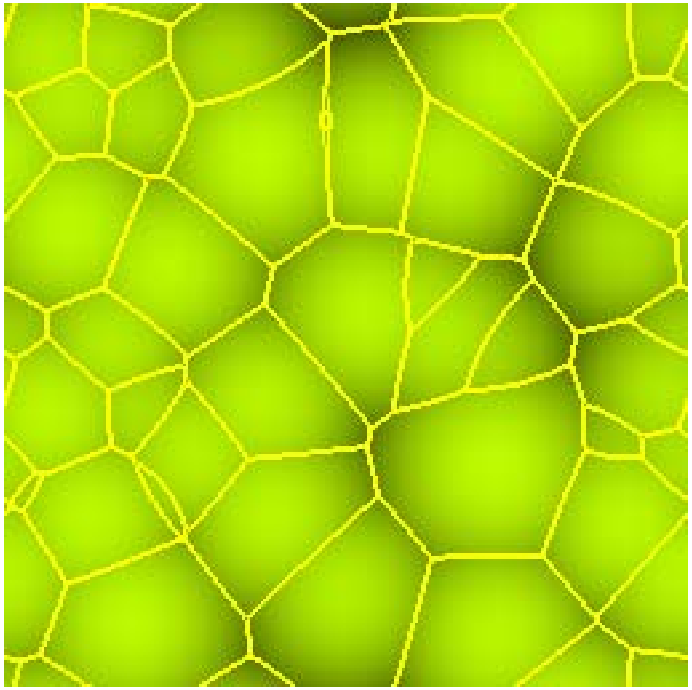
New course: MA800 Mathematical biology
Spring 2007

Professor Nikolay Strigul, nstrigul@stevens.edu
Lectures: Tuesdays 06:15-08:45 pm
Course webpage: http://personal.stevens.edu/~nstrigul/MA800/index_MB.html



Course description

This course targets students majoring in both computational and biological sciences, broadly defined to include mathematical, computer science, bio-medical and environmental majors. The goal of this course is to give students an understanding of the biological-mathematical interface, and how mathematics contributes to the study of biological phenomena. Biological systems are introduced as self-organized complex adaptive systems, which result from complex interactions at different levels of biological organization. The course introduces general mathematic methods in biology, such as scaling, approximations of stochastic and individual-based biological models by differential equations, linearization, and stability analysis, using both classic and recent examples. Topics include: single species models; age- and size-structured models; dynamics of infectious diseases; population and community ecology, forest modeling, natural resource management, enzyme kinetics, chemostat theory, and spatially-distributed models. An important goal of this course is to learn how to use analytical methods and computer simulations in concert with traditional experimental and empirical biological approaches.

Course program

Biological systems as complex adaptive systems. Discrete and continuous single species models. Age- and size- structured populations. Natural resource management, fisheries. Enzyme kinetic. Microbiological models: biodegradation and chemostat theory. Multi-species communities: 1) Competition models, coexistence, 2) Predator-prey models. Optimal foraging, 3) Host-parasite dynamics. Infectious diseases: 1) SIR models, 2) Flu epidemics, AIDS. Forest modeling. Spatially-distributed models: 1) Conservation equation, 2) Random walk and diffusion. Fick's laws. Fitting models to data. Optimal experimental designs.