SEMINAR ON STOCHASTICS
Winter 2000

Interacting Particle Systems With Range Dependence

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This talk will describe work (joint with Claudia Neuhauser) on certain interacting particle systems that can be thought of as stochastic spatial models for the spread of disease in a population. The model can be described as follows. Each site of the 2-dimensional integer lattice can be in one of three possible states: 0 = "*empty*", 1 = "*occupied by a healthy plant*", 2 = "*occupied by an infected plant*". Sites change their states in a cyclic progression according to the following rates:

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0 -> 1 at rate depending on number of 1's within range R,
1 -> 2 at rate depending on number of 2's within range M,
2 -> 0 at constant rate.
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The cyclic nature of the system is intended to mimic the "successional" dynamics found in many plant communities. The dependence of the rates on (different) ranges is another important feature in real populations. We show how to prove coexistence of plants and disease under certain conditions on the dispersal ranges. Here, coexistence refers to the existence of a stationary measure which supports an infinite number of both 1's and 2's. We also discuss pattern formation in a related 1-dimensional integro-differential equation which arises as a high-density limit of our model. These patterns are the mathematical embodiment of temporary waves that are seen in simulations of the model.

(Joint seminar with Math. Biology)
Wednesday February 23; 3:30 p.m.–4:30 p.m.; INSCC 110