

Department of Mathematics

Applied Math Seminar

DATE: **Wednesday, October 28, 2009**

PLACE: **JR 202**

TIME: **3:00-4:00 P.M.**

SPEAKER: **Dr. Tibor Antal**
Evolutionary Dynamics Department
Harvard University

TITLE: **Simplest Stochastic Models of Tumor Progression**

ABSTRACT:

Recent progresses in experimental biology enabled unprecedented quantitative modeling of evolving cell populations with branching processes. These models are exactly solvable in the simplest cases. In more complicated situations approximate results can be obtained. To model tumor progression, we consider an evolving cell population, where each cell can acquire mutations during cell divisions. Mutations in certain genes lead to a fitness advantage of the cell.

Cells with many such mutated genes are considered cancerous. In the simplest case, we use a multi-type branching process to model a freely expanding cell population with unlimited resources. To take into account the effect of space and limited resources, which pose restrictions on the population size, we study a modified Wright-Fisher process. Despite the simplicity of these models, explicit solutions are not available, but quite precise approximate answers can be obtained for the key quantities: the average time to acquire a certain number of mutations, or the average number of mutations in a tumor of given size. Connections to experiments will also be discussed.