STANFORD PROBABILITY SEMINAR

Alan Hammond, Berkeley
Monday, 22 November 2004
4:15pm (Refreshments at 4pm in the 1st Floor Lounge)
Sequoia Hall, Room 200

The kinetic limit of a system of coagulating Brownian particles

Abstract. In a joint work with Fraydoun Rezakhanlou, we consider a random model of diffusion and coagulation. A large number of small particles are randomly scattered at an initial time. Each particle has some integer mass and moves in a Brownian motion whose diffusion rate is determined by that mass. When any two particles are close, they are liable to combine into a single particle that bears the mass of each of them. Choosing the initial density of particles so that, if their size is very small, a typical one is liable to interact with a unit order of other particles in a unit of time, we determine the macroscopic evolution of the system, in any dimension $d \geq 3$. The density of particles evolves according to the Smoluchowski system of PDEs, indexed by the mass parameter, in which the interaction term is a sum of products of densities. Central to the proof is establishing the so-called Stosszahlensatz, which asserts that, at any given time, the presence of particles of two distinct masses at any given point in macroscopic space is asymptotically independent, as the size of the particles is taken towards zero.