Stanford University  
Departments of Mathematics and Statistics  

PROBABILITY SEMINAR  

4:15pm, Monday, April 07, 2014  
Sequoia Hall Room 200  
Cookies served at 3:45pm, 1st Floor Lounge.  

Speaker: David Aldous, UC Berkeley  

Title: The averaging process, the compulsive gambler process and the metric coalescent  

Abstract:  
Interpret the vertices of a finite edge-weighted graph as agents, each agent in a “state” described by a real number. Interpret the edge-weights as rates at which agents meet and update their states according to some deterministic or random rule. We study two, conceptually opposite, such “interacting particle systems” in which we visualize the states as amounts of money. In the averaging process the meeting agents split their money equally; in the compulsive gambler process they instantly play a fair game in which one wins the other’s money. These processes turn out to have interesting mathematical structure which enables us to study quantitative non-asymptotic behavior. The averaging process has a duality relation with Markov chains, analogous to the voter model. The compulsive gambler process has martingale structure, comparison relations with Kingman’s coalescent, and an “exchangeable over the money elements” property. By scaling so that total money equals 1 and giving agents positions in a metric space $S$, we can re-interpret the state space as finite support distributions on $S$. A construction reminiscent of the Donnelly–Kurtz look-down construction suggests that its dynamics make sense even with a general-support initial distribution. Under regularity assumptions, such a metric coalescent process exists as a Feller process on the space of all probability distributions on $S$.  

This is joint work with Dan Lanoue.