Stanford University  
Departments of Mathematics and Statistics  

PROBABILITY SEMINAR  

4:30pm, Monday, May 23, 2016  
Sequoia Hall Room 200  
Cookies served at 4pm, 1st floor Lounge.

Speaker: Todd Kemp  
Department of Mathematics,  
University of California San Diego

Title: The Edge and Fluctuations of Unitary Brownian Motion

Abstract:  
The Brownian motion on the Unitary group $U(N)$ has a large-$N$ limit: for each fixed time, the histogram of eigenvalues converges almost surely to a deterministic law with a (mostly) smooth density on the circle. The first results in this direction appeared in the thesis of Eric Rains, with simultaneous independent development by Philippe Biane in the late 1990s. One can think of this as a companion to Wigner’s semicircle law for Hermitian Gaussian random matrices: the latter is really about the Brownian motion on the Unitary Lie algebra, and so it is compelling that some of the same behavior carries over to the Lie group.

In this lecture, I will talk about two finer properties of the large-$N$ limit of Unitary Brownian motion.

- In joint work with Guillaume Cébron, following related work of Thierry Lévy and Mylène Maïda, we showed that the bulk fluctuations (linear statistics) of the eigenvalues are Gaussian, with an explicit covariance that generalizes the Haar unitary case studied by Evan and Diaconis.

- In joint work with Benoît Collins and Antoine Dahlqvist, we showed that the largest (angle) eigenvalue of the Brownian motion has an explicit almost sure limit.

In both cases, we proved multi-time versions of the theorems, which I will also describe if time permits.