**Stanford University**  
Department of Statistics  

**DEPARTMENTAL SEMINAR**  

4:30pm, Tuesday, February 23, 2016  
*** Note Special Location ***  
Main Quad Building 01-370 Room 370  
Cookies served at 4pm, Sequoia Hall 1st floor Lounge.

**Speaker:** James Johndrow, *Duke University*

**Title:** Tail waiting times and the extremes of stochastic processes

**Abstract:**  
In applications where extreme dependence at different spatial locations is of interest, data are almost always time-indexed. When extremes do not occur contemporaneously, existing methods for inference and modeling in this setting often choose window sizes or introduce temporal dependence in parameters with the goal of preserving temporal information. Here, we propose an alternative paradigm for inference on tail dependence in stochastic processes with arbitrary temporal dependence structure in the extremes, based on the idea that the information on strength of tail dependence at different locations and the temporal structure in this dependence are both encoded in waiting times between exceedances of high thresholds. We construct a class of time-indexed stochastic processes with tail dependence obtained by endowing the support points in de Haan’s spectral representation of max-stable processes with velocities and lifetimes. We extend Smith’s model to these max-stable velocity processes and obtain the distribution of waiting times between extreme events at multiple locations. Motivated by this result, a new definition of tail dependence is proposed that is a function of the distribution of waiting times between threshold exceedances, and an inferential framework is constructed for estimating the strength of extremal dependence and quantifying uncertainty in this paradigm. The method is applied to climatological, financial, and electrophysiology data.