

STATISTICS COLLOQUIUM

MONDAY, OCTOBER 22, 2012

TALK: 4:00 PM — SCIENCE CENTER RM. 309

RECEPTION: 5:15 PM — SCIENCE CENTER, 7TH FLOOR

**“Hybrid stochastic models in systems biology:
inferring the structure of a circadian oscillator”**

**Guido Sanguinetti
University of Edinburgh
School of Informatics**

ABSTRACT

Stochastic continuous time models are an attractive mathematical framework to model biological processes at the single cell level, due to their ability to handle naturally the intrinsic noise of chemical reactions at low copy numbers. Statistical inference in such models however is non-trivial. For some years, we have studied a class of models which represent transcriptional regulation as a conditionally Ornstein-Uhlenbeck process: given the occupancy state of a gene's promoter (modelled as a telegraph process), the gene expression is Gaussian and OU. Inference can be carried out exactly in simple cases, and an efficient variational approach gives an excellent approximation. I will review the approach, and present some recent unpublished results which allow us to extend the framework to non-linear systems including feedback loops. As an application, I will show how this approach can be used to model the circadian clock of the picoalga *Ostreococcus tauri*, where preliminary results have allowed us to challenge existing models and present an alternative that is more supported by the data.