

# Applied and Computational Mathematics and Statistics Colloquium

**Richard Moore**

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will give a lecture entitled:

*Rare Events in Nonlinear Optics*

Wednesday, December 8th, 2010

4:00 PM

Location: 127 Hayes-Healy Hall

## Abstract:

I discuss the application of importance sampling to rare event computations in two scenarios arising in nonlinear optics: bit errors in fiber-optic communication lines and phase slips in mode-locked lasers. In both cases, only those exceedingly rare noise-driven events that cross a critical threshold are of interest, rather than small excursions near equilibrium. While large deviations in finite-dimensional systems are amenable to study using Wentzell-Freidlin theory, infinite-dimensional systems are often only tractable using a Monte Carlo approach. Pulse evolution in the nonlinear Schroedinger and complex Ginzburg-Landau equations lies between these two extremes, where carefully designed variance reduction techniques can improve the efficiency of Monte Carlo simulations in computing the rare events by several orders of magnitude.