

**Department of Epidemiology and Biostatistics  
Biostatistics Seminar**

Thursday, November 21, 2013  
12:00pm-1:00pm – Wood Building Ground Level 73  
Bring your own lunch  
11:45am - Light refreshments

**“Learning about Physical Parameters:  
The Importance of Model”**

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**Abstract:** Science-based simulation models are widely used to predict the behavior of complex physical systems. It is also common to use observations of the physical system to learn about the values of parameters within the model, a process usually called calibration. The values of parameters in the model may be of intrinsic scientific interest, so that learning about them contributes to the underlying science. Another reason for calibration is to improve the predictive performance of the simulator.

In order to make appropriate use of observations of the physical system, however, it is important to recognize model discrepancy, the difference between reality and the simulator output. We illustrate through a simple example that an analysis that does not account for model discrepancy will lead to biased and over-confident parameter estimates and predictions.

The challenge with incorporating model discrepancy in a statistical analysis of computer models is the confounding with calibration parameters, which will only be resolved with meaningful prior information. For our simple example, we model the model-discrepancy via a Gaussian Process and demonstrate that by accounting for model discrepancy our prediction within the range of data is correct. However, only with realistic priors on model discrepancy do we uncover true parameters.