MATHEMATICAL AND COMPUTATIONAL METHODS
FOR MULTISCALE MODELING:
Adaptive Control of Modeling Error

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“If error is corrected whenever it is recognized, the path of error is the path of truth.”
Hans Reichenbauch
The Rise of Scientific Philosophy, 1951

With this statement, Reichenbauch laid the foundation for a fundamental tenant of computational science: a posteriori estimation and control of error. In this lecture, we describe a general approach for estimating and controlling modeling error, which is defined as the difference between values of certain quantities of interest theoretically attainable by a fine-scale base model and those values supplied by a sequence of coarser-scale surrogate models. This theory provides the basis for goal-oriented adaptivity of multiscale models.

We describe applications to molecular statics of large polymer structures encountered in the nano-manufacturing of semiconductor devices.

References: