

CEA - Saclay 91191 Gif-sur-yvette Cedex  
**Service de Physique de l'Etat Condensé**  
**SÉMINAIRE**

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**Mercredi 30 octobre 11h15**

**Orme des Merisiers SPEC Salle Itzykson, Bât.774**

**Reduced models, statistical closures, and non-equilibrium  
thermodynamics**

**Bruce Turkington**

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Mathematical scientists are often faced with the challenge of devising low-dimensional models that capture the essential features of high-dimensional, complex dynamical systems. A common approach is to adopt some low-dimensional equations for a resolved vector and to model the effects of unresolved variables by some kind of noise, the result being a stochastic model. But what if the governing equations for the full system are known and deterministic, even though their detailed solutions are chaotic and computationally inaccessible?

In this talk I will describe a model reduction approach that uses an optimization procedure to fit a canonical statistical model to an underlying Hamiltonian dynamics. The resulting statistical closure has the generic structure and properties of non-equilibrium thermodynamics. In particular, this approach gives a new representation of entropy production. As a particular application, I will coarse-grain the spectrally-truncated Burgers-Hopf equation, which can be viewed as a prototype problem for turbulence.

A coffee break will be served at 11h00. The seminar will be given in English.

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