

Contribution Title:	MACROSCOPIC PHENOMENA AND RANDOMNESS
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Macroscopic phenomena are usually described by deterministic non linear PDEs but there are several cases where randomness plays a significant role and stochastic effects cannot be ignored, as for instance in spinodal decomposition, interface fluctuations, metastability, tunneling and hysteresis. I shall illustrate such phenomena by discussing simplified mathematical models where a rigorous analysis can be carried through, at least partially.

As the appearance of deterministic equations is related to the validity of a law of large numbers in the macroscopic limit, the presence of stochastic effects must be ascribed to a failure of such a law. It will clearly appear in the models I shall present, that this is due to some instabilities in the deterministic equations which amplify the small fluctuations intrinsically present when reducing to macroscopic variables. As we shall see spinodal decomposition is related to a linear instability, metastability, tunnelling and hysteresis to the existence of several local minimizers, interface fluctuations to the existence of neutral directions. The mathematical analysis of these phenomena is also very rich, non linear PDE's, variational problems, large deviations will in fact be extensively used.