Berlin Leipzig Seminar
Analysis/probability theory
Second Meeting Summer Term 2007

Organized by the DFG Research Group *Analysis and Stochastics in Complex Physical Systems*

DATE: **Friday, 13 July 2007**

VENUE: **Max Planck Institute, Inselstr. 22, 04103 Leipzig, Room G10**

PROGRAMME:

9:30 – 10:20: **Anna de Masi (Aquila)**

Ergodic properties of Gibbs measures with constraints

Abstract: The constraint in the title, sometimes called multi-canonical, refers to a condition imposed on the possible values of the empirical averages of the order parameter (particles density or magnetization density) in each cube of a partition of respectively $\mathbb{R}^d$ and $\mathbb{Z}^d$. The situation we want to discuss, which typically arises when implementing the Pirogov-Sinai approach, is when the Hamiltonian in the unconstrained phase space may give rise to phase transitions (small effective temperatures) while the addition of the constraint should select only one phase. The purpose is thus to determine sufficient conditions for uniqueness and exponential decay of correlations in the constrained system.

I will discuss the problem in the context of Hamiltonians with Kac potentials. In the Ising ferromagnet with Kac interactions the result follows from a so called "relativized" Dobrushin uniqueness condition. In continuum particles models which include the Lebowitz, Mazel Presutti system and the continuum Potts models, such a condition fails at least in some range of values of the parameters. We prove in such systems a finite size uniqueness condition, namely we prove that (a) uniqueness holds if in some fixed region a certain condition is verified; (b) such a condition is indeed satisfied in the above class of models (when the scaling parameter is small). The proof of (a) uses couplings techniques (disagreement percolation) and gives exponential decay of correlations in the constrained system. The proof of (b) has required the introduction of new ideas, a basic element being an analysis of variational problems for the functionals associated via a Lebowitz-Penrose coarse-graining to the Kac Hamiltonian.

10:30–11:20: **Günther Grün (Erlangen)**

Thin-film flow influenced by thermal fluctuations

Abstract: We will be concerned with the effects thermal fluctuations have on spreading and dewetting of thin liquid films. Starting from the incompressible Navier-Stokes equations with noise, we use long-wave approximation and Fokker-Planck-type arguments to derive a fourth-order degenerate parabolic stochastic partial differential equation – the stochastic thin-film equation. Besides the usual deterministic terms, it contains multiplicative noise within a convective term. We propose a discretisation scheme and we present formal estimates suggesting the existence of a.s. non-negative solutions. Finally, we give numerical evidence for our conjecture that thermal fluctuations may resolve discrepancies w.r.t. time-scales of dewetting between physical experiments and deterministic numerical simulations. This is joint work – partially with N.Dirr, partially with K.Mecke and M.Rauscher.

11:30–12:20: **Matthias Löwe (Münster)**

Critical fluctuations in the Hopfield model

Abstract: The Hopfield model is one of the most popular mean field spin glass models. In this talk we will review some results on atypical fluctuations of its order parameter at or close to the critical temperature.

Everybody is welcome to attend.

Wolfgang König, University of Leipzig