

**Berlin Leipzig Seminar**  
**Analysis/probability theory**  
**First Meeting Winter Term 2007/08**

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

DATE: **Friday, 30 November, 2007**

VENUE: Technical University Berlin, Institute for Mathematics, Str. des 17. Juni 136, 10623 Berlin  
Room MA313/314

PROGRAMME:

9:50 – 10:40: **Noemi Kurt (University of Zurich)**

*A Gaussian interface model with Laplacian interactions in the critical dimension*

*Abstract:* We consider the real-valued Gaussian field on the  $d$ -dimensional integer lattice, whose covariance matrix is given by the Green's function of the discrete Bilaplacian. Such a field can be interpreted as a model for a  $d$ -dimensional interface in  $d + 1$ -dimensional space. For the model we consider,  $d = 4$  is critical in the sense that in higher dimensions, the infinite volume Gibbs measure exists, but not in  $d = 4$  and below. Understanding the model requires good estimates on the Green's function of a discrete biharmonic boundary value problem. In this talk, I will present the analytical and probabilistic methods we use to address this problem, and hint at how these results are used to investigate the effect of a 'hard wall' on the interface, requiring the field to be positive inside a certain region.

10:50 – 11:40: **Fabio Toninelli (University of Lyon)**

*Disordered pinning models: beyond annealed bounds*

*Abstract:* I will discuss models of directed  $d$ -dimensional polymers interacting with a 1-dimensional defect (e.g. (1+1)-dimensional wetting models) in presence of quenched randomness. These may be seen as renewal processes perturbed by disorder. These models undergo a localization/delocalization phase transition. I will discuss heuristic predictions and rigorous results concerning the relation between the (quenched) critical point and critical exponents to the critical point and critical exponents of the corresponding (easy) annealed model. In particular, I will present a simple method, based on the estimation of non-integer moments of the partition function, which allows to prove that quenched and annealed critical points differ in some situations, and to find the asymptotics of the critical point for large disorder. In particular, in the large disorder limit this makes rigorous some heuristic renormalization-group predictions made previously in the physics literature.

If time allows, I will also present related recent results (obtained in collaboration with Giambattista Giacomin and Hubert Lacoin) about a hierarchical version of these models.

11:50 – 12:40: **Milos Zahradnik (Charles University of Prague)**

*A purely combinatorial approach to cluster expansions*

*Abstract:* The problem of convergence of cluster (Mayer) expansions has a long history, and several different methods were used by various authors to get reasonable estimates. The conclusion of some recent developments seems to be that possibly the most powerful, and at the same time the simplest, method is the purely combinatorial one. I will show the connection of this method with exactly soluble cases (determinants, Ising model) and will also suggest the possibility to apply the method to establish the nonabsolute convergence of some interesting cluster expansion series, appearing in the perturbation theory of massless Gaussians.

Everybody is welcome to attend.

Wolfgang König, University of Leipzig