Berlin Leipzig Seminar
Analysis/probability theory
Second Meeting Summer Term 2006

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

DATE:

Friday, 7 July 2006

VENUE:

University of Leipzig, Mathematical Institute, Augustusplatz 10/11, 04109 Leipzig

Room 4-24 (Felix Klein Lecture Hall)

PROGRAMME:

10:30–11:30: **Alexander Mielke (WIAS Berlin and HU Berlin)**

   Multiple scales and Gamma limits in rate-independent material models

11:40–12:40: **Stefan Adams (MPI Leipzig)**

   Large deviations for long cycles and probabilistic approaches to Bose-Einstein condensation

— LUNCH BREAK —

14:00–15:00: **Amir Dembo (Stanford University)**

   Sequence and structure matching: applications of probability theory

Everybody is welcome to attend.   Wolfgang König, University of Leipzig

Abstracts:

Mielke: *Multiple scales and Gamma limits in rate-independent material models*

Many rate-independent evolution systems can be described by an energy strorage functional and a dissipation functional. Thus, there is a similar geometric structure like in gradient flows; but now the dissipation is positively homogeneous of degree 1 and not 2 like for gradient flows. These functionals may depend on small parameters, for instance due to a periodic inhomogeneities, singular perturbations, regularizing terms or due to numerical discretization. We present abstract conditions that guarantee the convergence of solutions of these problems for the parameter going to 0 to the solutions associated with the limit functionals obtained as suitable Gamma limits. Application to a two-scale homogenization for elastoplasticity is discussed. (The talk is based on joint work with Michael Ortiz, Ulisse Stefanelli, Tomas Roubicek and Aida Timofte.)

Adams: *Large deviations for long cycles and probabilistic approaches to Bose-Einstein condensation*

We study probability distributions on cycles representating permutations of finitely many elements. These distributions are defined through Feynman-Kac formulae for traces of certain trace class operators studied in quantum statistical mechanics. Large deviations results are obtained for continuous and lattice systems. We discuss various definitions of Bose-Einstein condensation and their probabilistic interpretation.

Dembo: *Sequence and structure matching: applications of probability theory*

The problem of assessing the significance of rare phenomena involving scoring schemes is an example in which probability theory has been quite useful for bio-molecular data analysis.

A key reason for the success of this line of research is the ability to focus on questions and models that retain generality and relevance for applications while introducing enough structure to be of theoretical interest and beauty.

I shall explore this interplay while reviewing few contributions made in this direction.

For example, gapless local alignment is linked to asymptotic of large exceedances in random sequences which is closely related to queuing theory and sequential statistics. Under somewhat different assumptions it leads instead to an asymptotic of waiting times that are highly relevant for information theory. The assessment of significance of approximate local matching for 3D protein structures results with asymptotic theory for maxima of partial sums indexed by geometrical structures. Finally, theoretical considerations of local optimality yield for a certain parameter regime both logarithmic growth of the gapped local alignment score and a bound on its p-value.