

Interregional Colloquium of Mathematics

IRCM 2009

Programme

Friday, October 23

Hörsaal I, Building E2 5

14:00 h Welcome

14:10 h **Frédéric ROBERT** (Nancy): *Bubbling singularities along a heat flow with exponential nonlinearity.* (Joint work with T.Lamm and M.Struwe)}

Abstract: In this talk, I will discuss the Moser-Trudinger inequality which as a limit case of the Sobolev theorem. The objective here is to construct critical points for this inequality via a flow approach: I will describe a specific flow and its potential singularities due to its conformal invariance structure.

15:15 h **Peter BEISE** (Trier): *Growth conditions for universal entire functions.*

16:00 h ***** Coffee Break *****

16:25 h **Georges HANSOUL** (Liège): *Schröder-Bernstein dans tous ses états.*

17:30 h **Martin SCHLICHENMAIER** (Luxembourg): *Berezin-Toeplitz quantization of moduli spaces.*

Abstract: As was shown by Bordemann, Meinrenken, and Schlichenmaier the Berezin-Toeplitz (BT) operator quantization and its associated star product give a unique natural quantization for a quantizable compact Kaehler manifold. In the talk an overview over BT quantization is given. The procedure is applied for the moduli space of gauge equivalence classes of $SU(N)$ connections on a fixed Riemann surface. In the language of algebraic geometry this moduli space is the moduli space of semi-stable vector bundles over a smooth projective curve. In this context the Verlinde spaces and the Verlinde bundle over Teichmueller space show up. Recent results of J. Andersen on the asymptotic faithfulness of the representation of the mapping class group on the space of covariantly constant sections of the Verlinde bundle are presented.

18:30 h **Wolfgang BOCK** (Kaiserslautern): *The Feynman Integrand as a White Noise Distribution - First Studies in Phase Space.*

Abstract: The construction of Feynman integrands as White Noise Distributions is presented. Furthermore, the first ideas to generalize these concepts to a phase space situation is discussed. The free case is worked out as an example.

19:30 h ***** Dinner at the Restaurant Kaminstuben, Hotel Seewald *****

Saturday, October 24

9:00 h **Mark GROVES** (Saarbrücken): *Spatial dynamics and travelling water waves.*

Abstract: The classical gravity-capillary water-wave problem is the study of the irrotational flow of a three-dimensional perfect fluid bounded below by a flat, rigid bottom and above by a free surface subject to the forces of gravity and surface tension. In this lecture I will present a survey of currently available existence theories for travelling-wave solutions of this problem, that is, waves which move in a specific direction with constant speed and without change of shape.

The talk will focus upon wave motions which are truly three-dimensional, so that the free surface of the water exhibits a two-dimensional pattern, and upon solutions of the complete hydrodynamic equations for water waves rather than model equations.

Specific examples include

- (a) doubly periodic surface waves;
- (b) wave patterns which have a single- or multi-pulse profile in one distinguished horizontal direction and are periodic in another;
- (c) so-called 'fully-localised solitary waves' consisting of a localised trough-like disturbance of the free surface which decays to zero in all horizontal directions.

I will also sketch the mathematical techniques required to prove the existence of the above waves. The key is a formulation of the problem as a dynamical system with infinitely many degrees of freedom together with an associated variational principle.

10:00 h **Dominik FAAS** (Saarbrücken): *Hilbert-Samuel polynomial for semi-Fredholm tuples.*

Abstract: The Hilbert-Samuel polynomial of a single continuous linear operator $T \in L(X)$ on a Banach space X with $\dim(X/TX) < \infty$ is a polynomial $p \in \mathbb{Q}[x]$ with $\deg p \leq 1$ such that $\dim(X/T^k X) = p(k)$ for large k .

For commuting semi-Fredholm tuples, two versions of a Hilbert-Samuel polynomial (with degree up to n) were introduced by R. Douglas and K. Yan. More than 10 years later, it was shown by X. Fang, resp. J. Eschmeier, that both coincide. We present these results and give a generalization to the non-commutative case. Moreover we shall give a natural operator-theoretic interpretation of the degree and the leading coefficient of the Hilbert-Samuel polynomial.

10:40 h ***** Coffee Break *****

10:55 h **Anton THALMAIER** (Luxembourg): *Brownian motion and negative curvature.*

Abstract: It is well-known that on a Riemannian manifold, there is a deep interplay between geometry, harmonic function theory, and the long-term behaviour of Brownian motion. Negative curvature amplifies the tendency of Brownian motion to exit compact sets and, if topologically possible, to wander out to infinity. We discuss examples of negatively curved manifolds where the potential theoretic boundary

does not coincide with the geometric boundary at infinity. To see the full Poisson boundary, certain points at infinity need to be blown up in a non-trivial way. Such examples indicate that the situation concerning the famous conjecture of Greene and Wu about existence of non-trivial bounded harmonic functions on Cartan-Hadamard manifolds may be much more complicated than expected.

11:55 h **Lutz MATTNER** (Trier): One optional observation inflates α by $100/\sqrt{n}$ per cent.

12:55 h **Torben FATTLER** (Kaiserslautern): *An invariance principle for a tagged particle process in continuum with singular interactions.*

Abstract: We present an invariance principle for the dynamics of a tagged particle in an infinite particle environment of interacting particles for a large class of interaction potentials as e.g. the Lennard-Jones potential. In order to apply a general concept of De Masi et al, 1989, to this problem, we have to provide several properties of the tagged particle and the environment process. These are discussed in detail.

13:30 h

End of the Colloquium
