

MATHEMATICS SEMINAR  
of the  
UNIVERSITY OF LUXEMBOURG  
in cooperation with the  
LUXEMBOURG MATHEMATICAL SOCIETY

November 2006

7 November 2006 at 5 pm

Room 3.04 bs

Anton Thalmaier  
University of Luxembourg

**Brownian motion and Riemann zeta function**

Abstract

The theory of Brownian motion contains many remarkable identities. Some of them were considered as curiosities, though eventually they received a complete explanation inside a broader theory; for others a proper explanation remains to be found. We discuss some of such formulas related to the Jacobi theta and Riemann zeta functions, Bessel processes and Brownian excursions. Possible connections to Statistical Mechanics (ferromagnetic spin systems, Lee-Yang-Newman theorem) are sketched.

14 November 2006 at 5 pm

Room 3.04 bs

Eli Hawkins  
Radboud University, Nijmegen

**A Groupoid Approach to Quantization**

Abstract

Symplectic groupoids were introduced almost 20 years ago as a tool for the geometric quantization of Poisson manifolds. Unfortunately, in this time there has been relatively

little progress on this approach to quantization. The problem is that most polarizations do not respect the groupoid structure.

I introduce the concept of a groupoid polarization, and in particular a symplectic groupoid polarization. Using this, I sketch a geometric quantization procedure for Poisson manifolds. This appears to unify all examples of geometrically constructed quantizations of Poisson manifolds.

**21 November 2006 at 5 pm**

**Room 3.04 bs**

Marc Arnaudon  
University of Poitiers

### **Coupling semimartingales in manifolds; some recent applications**

Abstract

We report on recent work where parallel coupling of Brownian motions with drift is used to prove geometric inequalities on manifolds. We compare the densities of the joint law of hitting time and hitting position of the boundary of a relatively compact domain, by two Brownian motions started at different points inside the domain. We use it to obtain Harnack inequalities and estimates of the heat kernel in manifolds with curvature unbounded below.

**22 November 2006 at 5 pm**

**Room 3.04 bs**

Claude Roger  
University of Lyon

### **The Schrödinger-Virasoro Lie Group and Algebra: Representation Theory and Cohomological Study**

Abstract

The talk will focus on the Schrödinger-Virasoro Lie algebra, an infinite-dimensional Lie algebra, introduced in the frame of non-equilibrium statistical physics, and containing as subalgebras both, the Lie algebra of invariance of the free Schrödinger equation and the central charge-free Virasoro algebra. Realizations as Lie symmetries of field equations, coadjoint representation, coinduced representations in connection with Cartan's prolongation method, as well as cohomological investigations, in particular a classification of deformations and central extensions, will be addressed.

28 November 2006 at 5 pm

Room 3.04 bs

Charles Boubel  
University of Strasbourg

### **Lorentzian flows on compact 3-manifolds**

#### Abstract

I will give a classification of the 1-dimensional foliations —here shortly called flows— of compact 3-manifolds, which are transversally Lorentzian and satisfy a transversal completeness condition. In the main part of the talk we will then present a new example of a Lorentzian flow which is not transversally complete.

Let me recall that a pseudo-Riemannian metric transverse to a foliation  $F$  on a manifold  $M$  is a field of non degenerate symmetric bilinear forms on the normal bundle  $TM/TF$  of  $F$ , which is invariant by the flow of every vector field tangent to  $F$ . If we take for  $F$  the trivial foliation of  $M$  by points, we get the definition of a pseudo-Riemannian metric on  $M$ . The existence of the latter depends on purely topological conditions on  $M$  and always holds in the Riemannian case. The existence of a transversal metric to a non trivial foliation  $F$ , on the other hand, yields strong dynamical conditions on  $F$ .

This is a joint work with P. Mounoud and C. Tarquini.