General Mathematics Seminar
of the
University of Luxembourg
in cooperation with the
Luxembourg Mathematical Society

September, 2011

Tuesday, September 13, 2011, at 17:00 **Campus Kirchberg, Room B02**

Melchior Grützmann
(Sun Yat- Sen University, China)

Matched pairs of Courant algebroids

Abstract:

Matched pairs of Lie algebroids were introduced by Lu in 1997 and studied by Mokri. We will generalize their idea to Courant algebroids, i.e. two Courant algebroids over the same base together with some additional structure such that their direct sum is a Courant algebroid. We will give numerous examples from complex geometry, such as the twisted standard complex Courant algebroid, a construction from a holomorphic Courant algebroid. Another example from Chen, Stiénon, and Xu's classification of regular Courant algebroids. Finally, we also describe the construction in the language of dg-symplectic supermanifolds. This is joint work with M. Stiénon.

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Tuesday, September 20, 2011, at 17:00 **Campus Kirchberg, Room B02**

Loïc Foissy
(University of Reims)

Free and cofree combinatorial Hopf algebras

Abstract:

In the theory of combinatorial Hopf algebras, a certain number of free and cofree objects are studied, for example:
- The Hopf algebra of permutations (Malvenuto-Reutenauer),
- The Hopf algebras of (decorated) plane trees (Connes-Kreimer),
- The free dendriform Hopf algebra of binary trees (Loday-Ronco). -...

They all satisfy certain common properties, such as the self-duality, or the freeness of the Lie algebra of their primitive elements. We here answer the following questions:

1) Is a free and cofree Hopf algebra always self-dual?
2) What can be said about the Lie algebra of the primitive elements of a free and cofree Hopf algebra?
3) When are two free and cofree Hopf algebras isomorphic?

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Tuesday, September 27, 2011, at 15:30 **Campus Kirchberg, Room B02**

Zdzislaw Brzezniak
(University of York, UK)

Stochastic geometric heat equations

Abstract:

I will show that an approach from the paper Brzeźniak and Ondreját (2007) can be applied to the stochastic heat flow equation in the case when the domain is one dimensional. The one dimensionality of the domain allows us to work with the energy space, i.e. the Hilbert space $H^{1,2}(\mathbb{S}^1, \mathbb{R}^d)$ as a state space since in this case the embedding of the energy space into the Banach space $C(\mathbb{S}^1, \mathbb{R}^d)$ of continuous functions holds. Some techniques that have been developed by the speaker in collaboration with Goldys and Jegaraj (2010) are essential. Let us point out a difference between our proof of the global existence and the one in the deterministic case by Eells-Sampson (1964) and Hamilton (1975). While in the latter papers the crucial step is to prove that the energy density solves certain scalar parabolic equation, in our case the crucial step is to prove an inequality for the L^2-norm of the gradient of the solution which is based on certain geometric property of the target manifold M. Based on a joint work of the speaker with B. Goldys and M. Ondrejat.

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Tuesday, September 27, 2011 **Campus Kirchberg, Room B02**

Igor Wigman
(Cardiff University)

Nodal length fluctuations for arithmetic random wave

Abstract:

Using the spectral multiplicities of the standard torus, we endow the Laplace eigenspace with Gaussian probability measure. This induces a notion of random Gaussian Laplace eigenfunctions on the torus ("arithmetic random wave"). We study the distribution of the nodal length of random Laplace eigenfunctions for high eigenvalues.

It is standard to compute that the expected length is commensurable with the square root of the eigenvalue. Our primary find is that the asymptotics for the variance is intimately related to arithmetics of lattice points lying on the circle with radius corresponding to the energy.