Programme of the Seminar Sophus Lie in Luxembourg

June 15 - 16, 2012

Friday, June 15, 2012

9:00 – 10:00	Jørgen Ellegard Andersen	*The geometric construction of the Reshetikhin-Turaev Topological Quantum Field Theory.* **Abstract:** In this talk, we will discuss the geometric construction of the Reshetikhin-Turaev Topological Quantum Field Theory using the geometric quantization of the moduli spaces of flat connections on two dimensional surfaces. We will then discuss various results on the large level asymptotics of these theories.
10:00 – 10:30		*Coffee break.*
10:30 – 11:30	Simone Gutt	*Mp^c-structures and Dirac operators.* **Abstract:** The metaplectic group is a double extension of the symplectic group whereas Mp^c is a central circle extension. As in the Riemannian case for $Spin$ and $Spin^c$, constructions involving a metaplectic structure can be generalized to Mp^c structures; the main advantage is that those exist on any symplectic manifold. We consider various types of Dirac operators and Parthasarathy type formulas on some symmetric spaces.
11:30 – 11:40		*Short break .*
11:40 – 12:40	Cornelia Vizman	*The group structure for jet bundles over Lie groups.* **Abstract:** The jet bundle J^kG of k-jets of curves in a Lie group G has a natural Lie group structure. We present an explicit formula for the group multiplication in the right trivialization and for the group 2-cocycle describing the abelian extension $J^{k+1}G$ of J^kG by $\mathfrak{g}$.
12:40 – 14:30		*Lunch break.*

14:30 – 15:30	Xiaonan Ma	*Asymptotic torsion and Toeplitz operators.*

Abstract: If X is a odd dimensional compact Riemannian manifold and F is a complex flat vector bundle on X such that its cohomology is zero, then the Ray-Singer analytic torsion is a real spectral invariant which by different versions of Cheeger-Müller theorem, can be computed by the combinatorial torsion, which gives the information on the size of the torsion group in the cohomology in the arithmetic case.

We use Toeplitz operators to evaluate the leading term in the asymptotics of the analytic torsion associated with a family of flat vector bundles F_p, thus extending results obtained by Müller for the analytic torsion on 3-dimensional hyperbolic manifolds. For $p \in \mathbb{N}$, the flat vector bundle F_p is the direct image of L^p, where L is a holomorphic positive line bundle on the fibres of a flat fibration by compact Kähler manifolds. The leading term of the analytic torsion is the integral of a locally defined differential form.

This is a joint work with Jean-Michel Bismut and Weiping Zhang.

15:30 – 16:00		*Coffee break.*

16:00 – 17:00	Jonathan Pfaff	*The asymptotics of the analytic torsion on hyperbolic manifolds of finite volume.*

Abstract: We will introduce the analytic torsion for complete $2n + 1$-dimensional hyperbolic manifolds of finite volume with coefficients in flat vector bundles which arise by restricting a representation of the Lie group $G = Spin(2n + 1, 1)$ to the fundamental group of the manifold. Our main result is an asymptotic formula for the analytic torsion with respect to certain rays of representations. This result was established in joint work with Werner Müller. Moreover we will briefly discuss the meromorphic continuation of Ruelle and Selberg zeta functions on hyperbolic manifolds with cusps and describe their relation to the analytic and the combinatorial torsion in the 3-dimensional case.

17:00 – 17:10		*Short break.*

17:10 – 18:10	Christoph Wockel	*A smooth model for the string group.*

Abstract: The string group is an object of recent interest on the border between geometry and algebraic topology. In the talk we will explain what the string group is and discuss some of the fundamental hindrances in constructing explicit models for it. It will turn out that with some ad-hoc constructions is is possible to construct a model as an infinite-dimensional Lie group. In the end of the talk we will see how these constructions can be understood systematically in the context of Lie 2-groups.

20:00		*Conference dinner.*

Saturday, June 16, 2012

9:00 – 10:00   Friedrich Wageman   *On 2-Holonomy.*

Abstract: This is a report on joint work with H. Abbaspour. In this work, we define a Hochschild cycle which encodes the holonomy of a non-abelian gerbe in the same way as ordinary holonomy of a principal G-bundle is described as a Hochschild cycle of the DG algebra of differential forms on the underlying manifold. The gerbe holonomy cycle lives in higher Hochschild homology w.r.t. the 2-torus. One key point in our construction is the possibility (up to equivalence) to choose the structure Lie algebra crossed module $h \to g$ of the gerbe such that the Lie algebra h is abelian.

10:00 – 10:30   *Coffee break.*

10:30 – 11:30   Pierre Bieliavsky   *Oscillating twists and their quantum symmetries.*

Abstract: We present a general notion of oscillating integral for tempered Lie groups allowing to define Fréchet multiplier Hopf-algebras affiliated to Lie groups that provides a nice non-formal topological framework for Drinfel'd twists. In the case of Drinfel'd twists based on a Kahlerian Lie group, this notion of "oscillating twists" underlies multiplicative unitaries in the sense of Baaj and Skandalis that non-trivially deform the classical Kac-Takesaki operator on the group. The construction is entirely explicit. Part of this work is joint with F. D'Andrea and V. Gayral.

11:30 – 11:40   *Short break.*

11:40 – 12:40   Wolfgang Bertram   *From groups to projective geometry: back and forth.*

Abstract: I will report on links between group theory and projective geometry:

- by a simple geometric construction, we attach loops, torsors and groups to projective geometries (joint work with M. Kinyon, in progress),

- conversely, to every group we can attach a geometry sharing many important features with usual projective geometry

(B., arxiv : math.GR/1201.6201).