Schlichenmaierfest: programme

Luxembourg, December 10 - 12, 2012

Lecture room **Salle Paul Feidert**, Campus Kirchberg.

Monday, December 10, 2012

14:15 – 15:00 Harald Upmeier

Geometric Quantization and Asymptotic Expansions for Symmetric Spaces.

Abstract: Hermitian symmetric spaces $M = G/K$, of compact or non-compact type, are Kähler manifolds with a transitive action of a semi-simple Lie group G. There exist various G-invariant quantization procedures such as the Berezin-Toeplitz calculus or the Weyl calculus. In joint work with M. Englis, Prague, we found the complete asymptotic expansion of the Moyal type star-products for the Berezin-Toeplitz quantization, both for the compact type (also studied by Bordemann, Meinrenken and Schlichenmaier) and for the non-compact type. The primary tool is the Peter-Weyl decomposition of the reproducing Bergman kernel into irreducible K-types labelled by partitions of length $r = \mathrm{rank}(M)$. A similar expansion holds for the Berezin transform (and its inverse). For real non-hermitian symmetric spaces, it is possible to define a deformation of "states"(instead of "observables") which has also an asymptotic expansion into irreducible K-types. This approach generalizes the well-known Segal-Bargmann transform to the setting of curved manifolds.

15:00 – 15:45 Ping Xu

Weyl Quantization and Courant algebroids.

Abstract: Weyl quantization is a classical result which associates a differential operator on R^n to every polynomial on R^{2n}. We will present a Weyl quantization formula for symplectic N-manifolds of degree 2. Applications to Courant algebroids will be discussed.

15:45 – 16:30 *Coffee break.*

16:30 – 17:15 Ryszard Nest

On quantization of Hamiltonian actions.

Abstract: TBA

17:15 – 18:00 Pierre Schapira

Microlocal Euler Class.

Abstract: TBA.

18:15 *Evening reception.* Outside the lecture room (Salle Paul Feidert).

Tuesday, December 11, 2012

9:15 – 10:00 Rainer Weissauer

Galois theory revisited.

Abstract: We consider some new kind of Galois groups naturally attached to coverings of Riemann surfaces or more generally of complex smooth projective varieties. These groups turn out to a mixture of both the classical discrete finite Galois groups and certain nonclassical algebraic reductive groups.

10:00 – 10:45 Anton Alekseev

The Duflo Isomorphism Theorem: Hard or Soft?.

Abstract: This talk is about the Duflo isomorphism and the Kashiwara-Vergne problem.

10:45 – 11:15

Coffee break.

11:15 – 12:00 Oleg Sheinman

Almost graded Lie algebras and Riemann surfaces.

Abstract: A boom of the 80's in applications of infinite-dimensional Lie algebras and Riemann surfaces in theoretical physics has motivated the necessity of a closer relation between these two disciplines. This was the purpose of introducing in 1987 the analogs of the Virasoro and Kac-Moody algebras related to Riemann surfaces with marked points, called Krichever-Novikov algebras. These are Lie algebras of meromorphic objects (functions, vector fields, currents) defined on a Riemann surface of a finite non-negative genus, and holomorphic outside the marked points. A crucial structure to be adjusted was the graded structure which had been replaced by an almost-grading, without sacrificing the functionality. The idea of almost-grading is due to Krichever and Novikov who have incarnated it in the case of an arbitrary Riemann surface with two marked points. It was a non-trivial step to generalize the almost graded structure to the case of several marked points. The first idea (1990) and full description are due to Schlichenmaier (see also Sadov, 1991, for a particular case). There are quite a number other significant works due to Schlichenmaier in the theory and applications of almost-graded infinite-dimensional Lie algebras, such as high-genera Sugawara construction and Knizhnik-Zamolodchikov equations, basic uniqueness results in classification of the central extensions of Krichever-Novikov and Lax operator algebras, non-rigidity results in the deformation theory of Kac-Moody and Virasoro algebras.
In my talk I will try to give at least a brief outline of some of the above listed.

12:00 – 12:45 Armen Sergeev

Magnetic Bloch theory and non-commutative geometry.

Abstract: In our talk we shall give an interpretation of magnetic Bloch theory in terms of noncommutative geometry. In other words, we present a "vocabulary" which allows to reformulate basic properties of magnetic Schrödinger operator in terms of C^*-algebras. There was a number of papers devoted to this subject, in our presentation we follow mainly an approach proposed by Mikhail Shubin.
As an application of this version of Bloch theory we shall give an interpretation of quantum Hall effect in terms of noncommutative geometry.

12:45 – 14:15 *Lunch break.*

14:30 – 15:15 George Marinescu

Equidistribution of zero-divisors of random holomorphic sections.
Abstract: Random polynomials and more generally holomorphic sections are a model for eigenfunctions of quantum chaotic maps. We discuss equidistribution results for zero-divisors of high tensor powers of a quantum line bundle.

15:15 – 16:00 Jørgen Ellegaard Andersen

A perturbative version of the Witten-Reshetikhin-Turaev TQFT.
Abstract: In this talk we will review the geometric approach to the Witten-Reshetikhin-Turaev TQFT. This will, via Toeplitz operator theory on moduli spaces of flat connections, lead us to a perturbative version of this TQFT, which has interesting relations to a number of conjectures concerning this TQFT, including the so called AJ-conjecture.

16:00 – 16:45 *Coffee break.*

16:50 – 17:35 Ryoichi Kobayashi

Hamiltonian Volume Minimizing Property of Maximal Torus Orbits in the Complex Projective Spaces.
Abstract: We will prove that any $U(1)^n$-orbit in $\mathbb{P}^n$ is volume minimizing under any Hamiltonian deformation. The idea of the proof is the following: (1) We extend a given $U(1)^n$-orbit to the moment torus fibration $\{T_t\}$ and consider its Hamiltonian deformation $\{\phi(T_t)\}$ where ϕ is a Hamiltonian diffeomorphism of $\mathbb{P}^n$. Then, (2) We compare a given $U(1)^n$-orbit and its Hamiltonian deformation by looking at the large k-asymptotic behavior of the sequence of projective embeddings defined, for each k, by the basis of $H^0(\mathbb{P}^n, \mathcal{O}(k))$ obtained by the Borthwick-Paul-Uribe semi-classical approximation of the $\mathcal{O}(k)$-Bohr-Sommerfeld tori of the Lagrangian torus fibrations $\{T_t\}$ and its Hamiltonian deformation $\{\phi(T_t)\}$.

17:40 – 18:00 Ilse Page

Intercultural Approach to a Mathematician
Abstract: Living with a Mathematician for more than 30 years sometimes is a special challenge besides the fact, that he is a man. Therefore, it seems to be worthwhile to have a closer look on what is so specific in Mathematicians behaviour and its impact on daily life. In order to have a scientif basis, this talk will refer to the 3 cultural dimensions, E.T. Hall formed in 1990 in order to understand cultural differences.

20:00 *Conference dinner.* "La Lorraine", 7 place d'Armes, L-1136 Luxembourg.

Wednesday, December 12, 2012

9:15 – 10:00 Peter Schupp

Non-commutative non-associative non-geometry.
Abstract: Flux compactifications are useful to relate string theory to observable phenomena and lead to mathematical structures that generalize the usual notions of geometry. We analyze these non-geometric structures in the context of AKSZ Courant sigma models using methods of deformation quantization and identify a dynamical noncommutative nonassociative star product.

10:00 – 10:45 Miroslav Englis

Quantization, deformation and orthogonal polynomials.
Abstract: From the beginning, mathematical foundations of quantum mechanics have traditionally involved a lot of operator theory, with geometry, groups and their representations, and other themes thrown in not long afterwards. With the advent of deformation quantization, cohomology of algebras and related disciplines have also entered. In this talk, we first overview some topics in quantization which draw heavily on complex analysis and microlocal techniques, and then present some recent developments in the latter which in turn were inspired by the applications in quantization. (Joint work with S.-Twareque Ali, Concordia University, Montreal.)

10:45 – 11:15

Coffee break.

11:15 – 12:00 Johannes Huebschmann

A step towards Lie's dream
Abstract: The origins of Lie theory are well known: Galois theory had clarified the relationship between the solutions of polynomial equations and their symmetries. Lie had attended lectures by Sylow on Galois theory and came up with the idea to develop a similar theory for differential equations and their symmetries which he and coworkers then successfully built. At a certain stage, they noticed that "transformations groups" with finite-dimensional Lie algebra was a very tractable area. This resulted in a brilliant and complete theory, that of Lie groups, but the connection with the origins gets somewhat lost. The idea of a Galois theory for differential equations prompted as well what has come to be known as differential Galois theory. We will present a general approach that encompasses ordinary Galois extensions (of commutative rings), differential Galois theory, and principal bundles (in differential geometry and algebraic geometry). The new notion that we introduce for that purpose is that of *principal comorphism of Lie-Rinehart algebras.*

12:00 – 12:45 Pierre Bieliavsky

Noncommutative surfaces
Abstract: TBA