3'rd **Øresund Symposium on Non-commutative Analysis and Non-commutative Geometry**

January 30, 2004

Centre for Mathematical Sciences, Lund University

Lund, Sweden

Organizers:

Sweden:
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Program

Auditorium MH:332B, Centre for Mathematical Sciences, Lund University,
Slvegatan 18, Lund, Sweden

10.30-10.35: **Welcome address**

10.35-11.15: **Toke Carlsen,** University of Copenhagen, Denmark
C^*-algebras associated with shift spaces.

11.20-12.00: **Tomas Persson,** Lund University, Sweden
Dynamics of Belykh system.

12.00-13.10: Lunch

13.20-14.00: **Daniel Larsson,** Lund University, Sweden
Twisted derivation operators and quasi-hom Lie algebras

14.05-14.55: **Hans Plesner Jakobsen,**
University of Copenhagen, Denmark
Matrix Chain Algebras and their q-analogues.

15.00-15.30: Coffee

15.30-16.20: **Arnfinn Laudal,** University of Oslo, Norway
Moduli of singularities and Lie algebras, and non-commutative algebraic geometry

16.30-17.20: **Gert Almkvist,** Lund University, Sweden
Differential equations, Mirror maps, and zeta values

18.00-: We join at the entrance of the mathematics building for a walk to a dinner in one of the restaurants in the centre of Lund (depending on interest)

Abstracts

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10.35-11.15: **Toke Carlsen,** University of Copenhagen, Denmark
C^*-algebras associated with shift spaces.

Abstract
I will talk about how to associate C^*-algebras to shift spaces.

A shift space is a kind of a topological dynamical system. Our goal is to associated a C^*-algebra to a shift space in a way which reflects the dynamical structure of the shift space. The purpose of this is two-folded: From the perspective of operator algebra, we get nice examples of C^*-algebras with properties which can be determined by the shift space. From the perspective of topological dynamics, the C^*-algebras are invariants of shift spaces, so they can be used to tell shift spaces apart, especially by computing their K-theory.

I will begin by motivating the construction of the C^*-algebras associated to shift spaces and I will discuss their properties. I will then demonstrate how the C^*-algebras work as invariants for shift spaces by looking at some concrete examples.

11.20-12.00: **Tomas Persson,** Lund University, Sweden
Dynamics of Belykh system.

Abstract
We consider the Belykh system - a two-dimensional piecewise linear map. The talk will mainly concern the symbolics of the one-dimensional projection, showing some similarities with the famous β-shift.

13.20-14.00: **Daniel Larsson,** Lund University, Sweden
Twisted derivation operators and quasi-hom Lie algebras

Abstract
This talk will be a summary of results from two papers: *Deformations of Lie algebras using σ-derivations* (with J. T. Hartwig and S.D. Silvestrov) and *Quasi-hom-Lie algebras, central extensions and 2-cocycle-like identities* (with S.D. Silvestrov).

In the first article we develop an approach to deformations of the Witt and Virasoro algebras based on σ-derivations. We show that σ-twisted Jacobi type identity holds for generators of such deformations. For the σ-twisted generalization of Lie algebras modeled by this construction, we develop a theory of central extensions. We show that our approach can be used to construct new deformations of Lie algebras and their central extensions, which in particular include naturally the q-

deformations of the Witt and Virasoro algebras associated to q-difference operators, providing also corresponding q-deformed Jacobi identities.

The second paper begins by introducing the concept of a *quasi-hom-Lie algebra*, or simply, a *qhl-algebra*, which is a natural generalization of hom-Lie algebras introduced in a previous paper (see above). Quasi-hom-Lie algebras include also as special cases (color) Lie algebras and superalgebras, and can be seen as deformations of these by homomorphisms, twisting the Jacobi identity and skew-symmetry. We also develop a theory of central extensions for qhl-algebras which can be used to deform and generalize the Virasoro algebra by centrally extending the deformed Witt type algebras constructed here. In addition, we give a number of other interesting examples of quasi-hom-Lie algebras, among them a deformation of the loop algebra.

14.05-14.55: **Hans Plesner Jakobsen,**
University of Copenhagen, Denmark
Matrix Chain Algebras and their q-analogues.

Abstract

The Lie Algebras for the open, respectively closed, Matrix Chain Models offer an interesting laboratory for the study of various non-trivial mixtures of Heisenberg, Kac-Moody, and Virasoro algebras as well as $sl(\infty)$. We shall explain some details of this in the talk. Also, some q-analogues will be discussed.

15.30-16.20: **Arnfinn Laudal,** University of Oslo, Norway
Moduli of singularities and Lie algebras,
and non-commutative algebraic geometry

Abstract

In this talk I shall first recall some results, see [1], about deformations and moduli of plane curve singularities, and their relations to problems concerning deformations and moduli of Lie algebras, see [2]. Then I shall show how the problems involved in the definition of moduli for singularities and of Lie algebras, are related to noncomutative algebraic geometry, see [5].

In between I shall prove that, by fixing the cohomology of the Lie algebra of (nontrivial) authomorphisms of isolated plane curve singularities, one may define natural (and nice) strata of the base space of the miniversal family of such singularities, for which good moduli spaces exist.

The fact that, to obtain good moduli spaces for singularities, one is forced to stratify the set of iso-classes of singularities in this way, is, in my view, one of the many good reasons for treating invariant theory within a non-commutative algebraic geometry.

To defend this position, I shall sketch a non-commutative deformation theory for modules on some k-algebra, k a field, and a related (new) candidate for a noncommutative algebraic geometry, permiting solutions of general invariant problems.

The final part of the talk is devoted to this invariant (and moduli) theory, in general, and to some non-trivial examples, where the algebraic structure of the set of orbits for a group-action on a k-variety turns out to be non-commutative.

References

[1] Laudal, O.A. and Pfister, G.: Local moduli and singularities. Lecture Notes in Mathematics, Springer Verlag, vol. 1310, (1988)

[2] Bjar, H. and Laudal, O.A.: Deformations of Lie algebras and Lie algebras of deformations. Compositio Math. vol 75 (1990), pp.69-111.

[3] Laudal, O.A.: Noncommutative Deformations of Modules. Homology Homotopy Appl. 4 (2002), no.2, part 2, pp.357-396.

[4] Laudal, O.A.: Noncommutative Algebraic Geometry. Max-Planck-Institut für Mathematik, Preprint Series 2000 (115).

[5] Laudal, O.A.: Noncommutative Algebraic Geometry. Revista Matematica Iberoamericana Vol.19,no.2 (2003),pp.509-580.

16.30-17.20: **Gert Almkvist,** Lund University, Sweden
Differential equations, Mirror maps, and zeta values

Abstract In this talk differential equations, Mirror maps, and zeta values will be discussed, including also some recent results.