ABSTRACTS

Anton Alexeev

Title: The Campbell-Hausdorff formula and the Kashiwara-Vergne conjecture.

Abstract: The Kashiwara-Vergne conjecture is a property of the Campbell-Hausdorff series which implies the Duflo isomorphism, and the isomorphism in cohomology, $H(\mathfrak{g}, S(\mathfrak{g})) = H(\mathfrak{g}, U(\mathfrak{g}))$. In the talk, I'll present a proof of the Kashiwara-Vergne conjecture based on the deformation quantization technique of Kontsevich. This is a joint work with E. Meinrenken (Toronto).

Karin Baur

Title: A geometric construction of m-cluster categories (joint work with Robert Marsh).

Abstract: We give a geometric description of the m-cluster categories of A-type in terms of diagonals of a regular polygon. This generalises a result of Caldero, Chapoton and Schiffler for m=1, i.e. for the cluster category. The approach uses the theory of translation quivers and their corresponding mesh categories. We also introduce the notion of the m-th power of a translation quiver and show how it can be used to realise the m-cluster category in terms of the cluster category.

Yuri Bazlov

Title: Commutator doubles.

Abstract: Commutator doubles are a class of associative algebras with triangular decomposition. They include classical and quantum universal enveloping algebras of semisimple Lie algebras, as well as rational Cherednik algebras. We show that the triangular decomposition (the PBW theorem) for algebras of this class is governed by the Yetter-Drinfeld condition, well known in the theory of quantum groups. Commutator doubles are thus obtained by combining solutions of the quantum Yang-Baxter equation. This leads, in particular, to a surprising new application of rational Cherednik algebras. Joint work with A. Berenstein.

Giovanna Carnovale

Title: Spherical conjugacy classes and involutions in the Weyl group.

Abstract: Let G be a simple algebraic group, let B be a Borel subgroup of G. We will show that the spherical conjugacy classes of G intersect only the double cosets of B in G corresponding to involutions in the Weyl group of G. This will enable us to show that for a spherical conjugacy class O with dense B-orbit v contained in BwB there holds

$$l(w) + rk(1 - w) = \dim O$$

providing a new proof of a characterization of spherical conjugacy classes obtained by Cantarini, Costantini and the author.

Michel Duflo

Title: Branching rules for discrete series of Lie groups and moment maps.

Abstract: I consider a discrete series representation T of a connected real Lie group G and a closed connected subgroup H of G. I give a large class of examples (mostly for reductive G) where the restriction of T to H is a direct sum of irreducible representations of H occuring with finite multiplicities, and for which there is a formula for these multiplicities in term of partition functions. Associated to T there is a coadjoint orbit M of G. I will show how these results are related to properties of the Hamiltonian action of H in M.

Jacob Greenstein

Title: Graded representations of current algebras and finite dimensional algebras.

Abstract: The category G of graded representations of a polynomial current algebra of a finite dimensional simple Lie algebra g can is shown to be highest weight. In particular, its Serre subcategories containing finitely many simple objects are equivalent to module categories of quasi-hereditary algebras. Their Gabriel quivers can be described quite explicitly in terms of representations of $\mathfrak{g}$. In particular, one can show that for $\mathfrak{g}$ of classical type, certain Kirillov-Reshetikhin modules are injective and projective in some natural Serre subcategory of G.

Istvan Heckenberger

Title: Classification of Nichols algebras of diagonal type.

Abstract: Nichols algebras appeared first in the work of Nichols on braided Hopf algebras. Later they were used by Drinfeld and Jimbo to construct quantized enveloping algebras, and by Woronowicz to develop the theory of covariant differential calculus on quantum groups. The lifting method of Andruskiewitsch and Schneider to classify (finite dimensional) pointed Hopf algebras with abelian coradical is based essentially on the

understanding of Nichols algebras of diagonal type. In this talk the tools used in the complete classification of (finite dimensional) Nichols algebras of diagonal type, Kharchenko's PBW-basis and the Weyl groupoid, are explained.

Crystal Hoyt

Title: Finite-growth general Kac-Moody superalgebras.

Abstract: We will discuss the classification of finite-growth contragredient Lie superalgebras, by defining the main tools used in the classification and outlining the proof. In particular, this completes the classification of finite-growth Kac-Moody superalgebras, where we find that there are only two non-symmetrizable classes, namely $q(n)^{(2)}$ and $S(1,2,\alpha)$. We will also discuss some properties of $S(1,2,\alpha)$.

Victor Kac

Title: Linearly Compact Superalgebras

Abstract: I will explain the interrelated classifications of three types of simple linearly compact superalgebras: Lie, Jordan, and generalized Poisson.

Bertram Kostant

Title: On Maximal Poisson commutative subalgebras of $S(\mathfrak{g})$ and corresponding Darboux coordinates on any reductive Lie algebra $\mathfrak{g}$.

Abstract: Recently, using Gelfand -Zeitlin and the space of Hessenberg matrices, Wallach and I found natural Darboux coordinates (as a classical mechanical analog of the Gelfand-Kirillov question) on $\mathfrak{g}$ for the case where g is the space of all matrices. Now, at least locally, I do the same for any $\mathfrak{g}$ using Fomenko-Miscenko theory and old results of mine on a generalization of the Hessenberg matrices.

Polyxeni Lamprou

Title: Maximal Poisson commutative subalgebras for certain parabolics of a semisimple Lie algebra (joint work with Anthony Joseph)

Abstract: We show that several properties of the semisimple Lie algebras carry over to some of their (truncated) parabolic subalgebras $\mathfrak{p}$. It has been shown (Fauquant-Millet and Joseph) that $Y(\mathfrak{p})$ is polynomial in most cases.

An analogue of the Kostant slice theorem is established for many parabolics. This involves the existence of an "adapted pair" (rather than an $\mathfrak{sl}_2$ triple that we have in the semisimple case); it turns out that the construction of an adapted pair is closely related to the Kostant cascade. Having an adapted pair and under some extra hypotheses, we

construct a maximal Poisson commutative subalgebra in the symmetric algebra of certain parabolics following Mishchenko and Fomenko (shift of argument).

Bolsinov has given a simple criterion to determine when shift of argument gives a Poisson commutative subalgebra having maximal GK dimension. However this algebra might not be maximal Poisson commutative. Our construction guarantees maximality.

Leonid Makar-Limanov

Title: A new proof of AMS theorem.

Abstarct: How to describe all embeddings of a complex line into a plane if this embedding is nice, i. e. does not have neither singular points nor self-intersections? Speaking algebraically, what can be said about two polynomials with complex coefficients if the subalgebra which they generate is all polynomial ring? The answer is well-known from the mid-seventies: the smaller degree should divide the larger degree. In my talk I'll give a new algebraic proof of this fact which is, at least from my point of view, is simpler than the known proofs.

Maxim Nazarov

Title: Extremal cocycles on Weyl groups and the reflection equation.

Abstract: We establish a correspondence between the "extremal cocycles" on the Weyl groups of series C,D introduced by Zhelobenko, and the canonical intertwining operators between the tensor products of fundamental representations of twisted Yangians. These twisted Yangians may be regarded as quantum affine symmetric spaces, and are defined by means of the reflection equation due to Cherednik. We employ the theory of reductive dual pairs due to Howe.

Boris Noyvert

Title: $\mathbb{Z}_2 \times \mathbb{Z}_2$ graded superconformal algebras of parafermionic type.

Abstract: New parafermionic algebras will be presented. The algebras are formed by a number of superconformal algebras coupled to each other by nontrivial commutation relations of parafermionic type. Different aspects of the representation theory, unitarity, minimal models will be briefly discussed.

Uri Onn

Title: Representations of automorphism groups of finite modules.

Abstract: In a seminal paper from the 1950's, James Green computed the complex characters of the general linear groups over a finite field. Green's approach was to construct a rich family of characters of $GL(n)$ by inducing them from $GL(m)$ with $m < n$. Characters which are not obtained from lower dimensional groups are called cuspidal and are constructed as well by other methods. The beauty and strength of this approach is that by looking at the groups $GL(n)$ as a family, one obtains a very clear understanding of the representation theory of the individual members. In this talk we shall briefly describe Green's ideas and their later evolution, and discuss the possibility of generalizing them to automorphism groups of finite modules over a discrete valuation ring.

Ivan Penkov

Title: Towards a structure theory for infinite dimensional matrix algebras.

Abstract: This is a survey talk on recent results about the structure of locally reductive Lie algebras and their representations. More precisely, I will discuss the Lie algebras themselves (root-reductive, diagonal and non-diagonal) and the results of E. Dan-Cohen, I. Dimitrov, N. Snyder, K.-H. Neeb, and the speaker about Cartan and Borel subalgebras of the root-reductive Lie algebras. At the end I will talk about the flag ind-varieties $\mathcal{F}l(F, E)$ of root-reductive ind-groups (constructed by I. Dimitrov and the speaker) as well as of the Bott-Borel-Weil theory on these ind-varieties (I. Dimitrov, J.A. Wolf and the speaker). Throughout the talk I will highlight the differences between the finite and infinite-dimensional cases.

Iulia Pop

Title: Rational solutions of CYBE for simple compact Lie algebras

Abstract: In a series of papers from 1991, A. Stolin developed a theory of rational solutions of the classical Yang-Baxter equation for a simple complex Lie algebra. In the present talk we discuss this theory for a simple compact real Lie algebra g . We determine the form of the rational solutions up to so-called gauge equivalence. The method is based on the construction of a correspondence between rational solutions and so-called orders in $g((u^{-}1))$ and the description of the maximal orders. The quantization of the rational solutions is also emphasized. This is a joint paper with A. Stolin, to appear in Journal of Geometry and Physics.

Alexander Premet

Title: Symmetric invariants of centralizers in reductive Lie algebras.

Abstract: I am going to report on a recent joint work with D. Panyushev and O. Yakimova. Let $\mathfrak{g}$ be a finite dimensional complex simple Lie algebra and e a nilpotent element in $\mathfrak{g}$. Let $\mathfrak{g}_e$ be the centraliser of e in $\mathfrak{g}$. We show that in many cases the algebra

of symmetric invariants $S(\mathfrak{g}_e)^{\mathfrak{g}_e}$ is isomorphic to a graded polynomial algebra in l variables where l is the rank of $\mathfrak{g}$. If $\mathfrak{g}$ is of type A or C, then this holds for all nilpotent elements in $\mathfrak{g}$.

Vera Serganova

Title: Representations with bounded multiplicities.

Abstract: We study modules M over a semisimple Lie algebra $\mathfrak{g}$ such that their restriction on subalgebra $\mathfrak{k} \subset \mathfrak{g}$ is the direct sum of finite-dimensional submodules, and the multiplicities of irreducible $\mathfrak{k}$-modules in M are uniformly bounded.

Catharina Stroppel

Title: Perverse sheaves on Grassmannians: a diagrammatical description and the relation to Springer fibres.

Abstract: In this talk I want to give a purely diagrammatical description of the algebra describing perverse sheaves on Grassmannians. This is based on results of Braden. A connection with the geometry of Springer fibres will be explained.

Andras Szenes

Title: Hyperplane arrangements and the cohomology of representation varieties (joint work with Tamas Hausel).

Abstract: We present a conjecture on the cohomology rings of moduli spaces of flat connections on Riemann surfaces with complex reductive structure groups. The construction goes through the moduli spaces of Higgs bundles, for which we describe the U(1)-equivariant cohomology using a deformation of Witten's formulas for the compact structure group case. We give ample computational evidence for our conjecture.

Alexander Vainshtein

Title: Cluster algebras and Poisson geometry

Abstract: In this talk I will explain how certain geometric notions, such as Poisson brackets and closed 2-forms, arise naturally in the context of cluster algebras. This allows to provide a geometric explanation for the mutation, and, to some extent, transformation rules of cluster algebras, as well as to prove new results. The talk is based on a joint work with Michael Gekhtman (Notre Dame) and Michael Shapiro (East Lansing).