“Representations of Reductive Groups"
Celebrating the 60-th birthday of Meinolf Geck

Aachen 7-9 June 2023

(Last update: June 5, 2023, 12:50pm)

Location

The conference will take place at Pontdriesch 14-16, 52062 Aachen. Talks are in lecture room Semath (008) in the ground floor, coffee breaks are in the Mathe-Lounge in the third floor. (And the organizing Lehrstuhl für Algebra und Zahlentheorie is in the first floor.)

Program

	Wednesday	Thursday	Friday
9:30-10:00am		Gunter Malle	Laura Voggesberger
10:10-10:40am		Eirini Chavli	Frederik Witt
11:30am-12:00am		Maria Chlouveraki	Michel Broué
12:10-12:40pm		Jean Michel	
12:40-2:00pm			
2:00-2:30pm	*Welcome*		
2:30-3:00pm	Hiss	George Lusztig	
3:10-3:40pm	Olivier Dudas	Britta Späth	
4:30-5:00pm	Cédric Bonnafé	Radha Kessar	

Conference dinner: for a joint dinner starting **Thursday, June 8, 19:00** we have reserved tables at the Molkerei (Pontstraße 141-149, 52062 Aachen).

Titles and abstracts

- Cédric Bonnafé (CNRS, Université de Montpellier).

  Title: Very singular curves and surfaces and complex reflection groups.

  Abstract: It is a fairly classical problem in algebraic geometry to construct varieties with exceptional properties (big number of singular points, big number of projective lines, big Picard number, big group of automorphisms,...). It turns out that some of these exceptional examples are obtained from invariants of complex reflection groups. This talk will focus on the question of finding surfaces having lots of ADE singularities.

- Michel Broué (Université Paris-Cité).

  Title: Congruences between Schur elements.

  Abstract: The name *"Schur element"* (for symmetric algebras) is due to Meinolf Geck.

  - For χ an absolutely irreducible character of a finite group G, its Schur element is $S_\chi := |G|/\chi(1)$.
    Congruences (up to sign) modulo a prime number ℓ between Schur elements of finite groups are a basic tool for expressing famous conjectures like the AMIDRUNK conjecture.
  - For ρ a unipotent character of a finite reductive group $\mathbf{G}^F$, its generic Schur element is $\mathbf{S}_\rho := |(\mathbf{G}, F)|/\mathrm{Deg}\rho \in \mathbb{Z}[x]$ (where $|\ (\mathbf{G}, F)|$ is the "generic order" of $\mathbf{G}^F$ and $\mathrm{Deg}\rho$ is the generic degree of ρ).
    Congruences (up to sign) modulo a cyclotomic polynomial Φ between generic Schur elements of finite reductive groups are consequences of conjectures about Deligne–Lusztig varieties.

  We shall make some connections.

- Eirini Chavli (Universität Stuttgart).

  Title: Decomposition matrices for the generic Hecke algebras on 3 strands.

  Abstract: In 2011, M. Chlouveraki and H. Miyachi worked on Cyclotomic Hecke algebras for d-Harish-Chandra series of rank 2 and they provided the decomposition matrices for the case where the parameter defined the associated Hecke algebra is specialized to a root of unity. At this stage, a number of questions arise. Why do these values given to the parameter provide different decomposition matrices? Are there more matrix models for the Cyclotomic case outside the d-Harish-Chandra series? What happens in the generic case? In this talk we will answer all these questions for the generic Hecke algebras on three strands

- Maria Chlouveraki (University of Athens).

  Title: Schur elements and blocks of Hecke algebras.

  Abstract: Schur elements are a powerful tool in the study of the representation theory of a symmetric algebra. They provide a semisimplicity criterion and they help determine the block structure when the algebra is not semisimple. They also give rise to the notion of defect, a numerical datum associated with each simple module which measures the complexity of the block they are contained in. Geck showed that the defect is a block invariant for Iwahori-Hecke algebras of finite Coxeter groups in the equal parameter case, and speculated that a similar result should hold in the unequal parameter case. We generalise Geck's conjecture to all complex reflection groups, and we prove it for the groups of type G(l,p,n), as well as for several exceptional cases. This is joint work with Nicolas Jacon.

- Olivier Dudas (CNRS Université Aix-Marseille).

  Title: Decomposition matrices for finite reductive groups and unipotent support.

  Abstract: Decomposition matrices encode how irreducible characters behave after reduction modulo a prime number. In his thesis Meinolf made several striking observations on the shape of these matrices in the case of finite reductive groups. I will present some of the geometric methods that should hopefully shed some light on these problems.

- Gerhard Hiss (RWTH Aachen).

  Title: Basic sets.

  Abstract: The notion of a basic set of Brauer characters is a central idea in modular representation theory of finite groups. I will give a survey of this concept and in particular highlight the contributions by Meinolf Geck and his school.

- Radha Kessar (University of Manchester).

  Title: Fusion systems and representation theory of exotic reductive groups.

  Abstract: I will report on an ongoing project with Gunter Malle and Jason Semeraro which explores how the theory of fusion systems can be used to transport principles of the modular representation theory of finite reductive groups in non-defining characteristic to allied settings such as spetses, compact Lie groups and p-compact groups.

- George Lusztig (MIT).

  Title: From families in Weyl groups to Springer representations.

  Abstract: Let W be the Weyl group of a connected reductive group G over an algebraically closed field whose characteristic is 0 or a good prime. The set of irreducible representations of W can be partitioned in two different ways: one into families (by pure algebra) and one in subsets indexed by unipotent classes of G defined geometrically by Springer. We show that this second partition can be defined without use of geometry based on the first partition.

- Gunter Malle (TU Kaiserslautern).

  Title: Yokonuma Hecke algebras for ℓ-adic reflection groups.

  Abstract: The classical Yokonuma Hecke algebra was introduced to study the permutation representation of a Chevalley group on a maximal unipotent subgroup. It is a deformation of the normaliser of a maximal torus, and has the Iwahori–Hecke algebra as a quotient. In joint work with Radha Kessar and Jason Semeraro we were led to construct a generalisation attached to an arbitrary finite ℓ-adic reflection group. We report on some properties as well as on open problems (linked to the yet incomplete understanding of the corresponding Hecke algebras).

- Jean Michel (CNRS Université Paris-Cité).

  Title: TBA

  Abstract: TBA

- Britta Späth (Universität Wuppertal).

  Title: More unitriangular decomposition matrices.

  Abstract: In joint work with Z. Feng we verified more cases of Geck's conjecture that blocks of finite reductive groups should have a unitriangular decomposition matrix. A key step is a going-up lemma showing that basic sets and unitriangularity transfer to an overgroup. The tools are Clifford theoretic and apply to centralisers of semisimple elements in the dual of a finite reductive group. Jordan decomposition then helps applying that to some counting conjectures on representations of finite groups.

- Laura Voggesberger (Universität Bochum).

  Title: Semisimplification for subalgebras of Lie algebras of reductive algebraic groups.

  Abstract: Let G be a connected reductive linear algebraic group over a field k. We introduce the concept of a k-semisimplification h' of h for a Lie subalgebra h of the Lie algebra $g = Lie(G)$ of G. Here h' is a Lie subalgebra of g associated to h which is G-completely reducible over k. This is the Lie algebra counterpart of the analogous notion for subgroups studied earlier by Bate, Martin and Röhrle. As in the subgroup case, we show that h' is unique up to $Ad(G(k))$-conjugacy in g. Moreover, we prove that the two concepts are compatible: for H a closed subgroup of G and H' a k-semisimplification of H, the Lie algebra $Lie(H')$ is a k-semisimplification of $Lie(H)$.

  This is a joint work with S. Böhm, M. Bate, B. Martin, and G. Röhrle.

- Frederik Witt (Universität Stuttgart).

  Title: Exceptional sequences on flag varieties.

  Abstract: Beilinson gave a semi-orthogonal decomposition of the bounded derived category of coherent sheaves on projective space by exhibiting a full exceptional sequence of line bundles. We discuss such sequences on the flag varieties $\mathrm{FL}(1, \ell, \ell + 1)$ and related geometries based on joint work with Klaus Altmann and Andreas Hochenegger.