GROUPS: FINITE AND INFINITE

Titles and abstracts

Thomas Gobet

Title : **Dual approach for involutions**

Abstract: We study the restriction of the absolute order on a Coxeter group to intervals $[1, w]$, where w is an involution. We classify those involutions for which the interval is a lattice. In this case, we study the attached interval Garside group (joint with E. Chavli). The obtained interval groups are quite different from Artin groups attached to finite irreducible Coxeter groups, obtained in the case of intervals between the identity and a Coxeter element. For instance, they turn out to be decomposable, and they are isomorphic to right angled Artin groups in several cases.

Henning Krause

Title : **Hereditary categories and their Weyl groups**

Abstract: The talk is devoted to a fascinating interplay between the representation theory of finite dimensional algebras related to hereditay categories and a specific class of reflection groups which arise as Weyl groups. This class includes the crystallographic Coxeter groups, but there are more, and to understand them is an ongoing project, also of Barbara and her collaborators. The talk will provide a survey, explaining in particular the class of hereditary categories and their relevant structure.

Frieder Ladisch

Title : **Polytopes and their Symmetry Groups**

Abstract: Groups are often illustrated as symmetries of geometrical objects, in particular, polytopes. Several symmetry groups of a convex polytope can be defined (most important, the geometric, the affine and the combinatorial symmetry group of the polytope). It is known that every finite group can be realized as the symmetry group of a polytope, but interesting questions arise when one searches for polytopes which are in some sense minimal. Conversely, every finite group gives rise to several polytopes, in particular, orbit polytopes and representation polytopes, a special case of the latter being permutation polytopes. In our talk, we will survey several results related to both directions of this fascinating connection, and also point out several open problems.

Gunter Malle

Title : **Subnormalisers in finite and algebraic groups**

Abstract: Motivated by new yet unpublished local-global conjectures by A. Moretó and N. Rizo for character values of finite groups, we investigate the concepts of picky elements and of subnormalisers of p-elements of a finite group. We also report on partial classifications for finite simple groups of Lie type as well as for simple algebraic groups, leading to the verification of the conjectures at least in some special cases.

Georges Neaime

Title : **Reflection groups of canonical type and their non-crossing partitions**

Abstract: We introduce the notion of reflection groups of canonical type. These groups are related to the K-theoretic study of the canonical algebras of Ringel. We use the notion of a Symbol introduced by Lenzing to define them. We also introduce the associated non-crossing partitions of canonical type, which are intervals of Coxeter elements equipped with a poset structure. In a work in progress with Barbara Baumeister, Igor Burban and Charly Schwabe, two major results are achieved: transitivity of the Hurwitz action for factorisations of Coxeter elements, and a poset isomorphism between the corresponding intervals and certain subcategories of coherent sheaves for an exceptional curve over an arbitrary field. Along with a result by Hubery–Krause, our achievements complete the programme of categorification of generalised non-crossing partitions.

Benjamin Nill

Title : **Polytopes and groups: two doors on the same corridor**

Abstract: In this rather non-technical talk, I will first reminisce about my collaboration with Barbara Baumeister at FU Berlin nearly 20 years ago, where permutation groups and lattice polytopes gave rise to permutation polytopes. Then I will take the opportunity to talk about current research on empty and thin lattice simplices. Here, the appearing groups are just abelian and often even cyclic, but still challenging questions in the geometry of numbers arise. Finally, I will try to open a little door back to group theory.

Luis Paris

Title : **Trickle groups**

Abstract: We present a new family of groups, called trickle groups, which generalize the right angled Artin and Coxeter groups, as well as the Cactus groups. These are defined by relations of the form $xy = yz$ and $x^\mu = 1$, which depend on some combinatorial data called trickle graph. The aim of the talk is to provide the definition of a trickle group, to show several important examples, such as the Thomson group F, and to give some combinatorial results, such as a solution to the word problem.

Sarah Rees

Title : **Avoiding proof by an infinite computation**

Abstract: In recent work of myself with Barbara, Derek Holt, and Georges Neaime, we studied presentations for interval groups associated with quasi-Coxeter elements in Coxeter groups of spherical type. At first we studied those presentations using powerful computational tools within GAP, employing techniques due in particular to Reidemeister & Schreier, Tietze, and Knuth & Bendix. But clearly we couldn't apply infinitely many instances of these algorithms to prove theorems about an infinite sequence of groups. Our experiments led us to make conjectures, and eventually our understanding of the theory behind the techniques led us to theoretical proofs. I hope that this talk will be a good advertisement for this kind of activity.

Petra Schwer

Title : **Conjugation in affine Coxeter groups and beyond**

Abstract: Conjugacy classes in rank n affine Coxeter groups have a beautiful and simple geometric description in terms of their natural action on $(n-1)$-dimensional vector spaces. Moreover, one can locate the conjugating elements and centralizers in the vector space as well. These results allow to characterize the growth of the conjugator length function by geometric investigations.

Sergey Shpectorov

Title : **Simple connectedness of a geometry for the group $G_2(q)$.**

Abstract: In the talk I'll return to the joint project with Barbara Baumeister and Gernot Stroth from a while ago. As part of that project, we provided a proof that a certain natural rank 3 geometry for the group $G_2(q)$ is simply connected for all q, hence yielding a presentation for $G_2(q)$. Over the years, doubts have been raised whether our proof covers the smallest case $q = 2$. In the talk I will review the proof and show that it does in fact cover all cases.

Mireille Soergel

Title : **Beyond Dyer groups**

Abstract: Which groups have the same solution to the word problem as Coxeter groups and right-angled Artin groups? The goal of this talk is to be more precise about what we mean by that, and see how that class is slightly larger than the family of Dyer groups.

Hung Tong-Viet

Title : **Orders of commutators and Products of conjugacy classes in finite groups**

Abstract: Let G be a finite group, $x \in G$, and let p be a prime. In this talk, we explore conditions that forces x to lie in certain characteristic subgroups of G. In particular, we prove that the commutator $[x, g]$ is a p-element for all $g \in G$ if and only if x is central modulo $O_p(G)$, the largest normal p-subgroup of G. This result unifies and generalizes aspects of both the Baer-Suzuki theorem and Glauberman's Z_p^*-theorem. Additionally, we show that if $x \in G$ is a p-element and there exists an integer $m \geq 1$ such that for every $g \in G$, the commutator $[x, g]$ is either trivial or has order m, then the subgroup generated by the conjugacy class of x is solvable. As an application, we confirm a conjecture of Beltrán, Felipe, and Melchor: if K is a conjugacy class in G such that the product $K^{-1}K = 1 \cup D \cup D^{-1}$ for some conjugacy class D, then the subgroup generated by K is solvable.

Henrik Van Maldeghem

Title : **Subgeometries**

Abstract: In group theory, one tries to obtain the subgroup structure of a given group, to get more insight into the group. We propose a similar study of the subgeometry structure of a given geometry, with emphasis on exceptional geometries. We review some old and new results, and explain how some of them connect with other interesting questions in incidence geometry.

Patrick Wegener

Title : **Elliptic Weyl groups and their hyperpolic covers**

Abstract: Elliptic Weyl groups are generalizations of Coxeter groups and were introduced by Saito in the 80s. I will talk about some ongoing joint work with Barbara about these groups which started about 10 years ago. In particular, I will introduce elliptic Weyl groups as well as their hyperbolic covers and talk about the so-called Hurwitz action in these groups.