LIST OF TALKS

GAGTA-9, 14-18 SEPTEMBER 2015, CIRM LUMINY

Goulnara Arzhantseva, *University of Vienna*

Almost commuting permutations are near commuting permutations

Abstract. We prove that the commutator is stable in permutations endowed with the Hamming distance, that is, two permutations that almost commute are near two commuting permutations. Our result extends to k-tuples of almost commuting permutations, for any given k, and allows restrictions, for instance, to even permutations. This is a joint work with Liviu Paunescu (Bucharest). It is partially supported by my ERC grant ANALYTIC no. 259527.

Jason Behrstock, *Columbia University*

Random graphs and applications to Coxeter groups

Abstract. Erdős and Rényi introduced a model for studying random graphs of a given "density" and proved that there is a sharp threshold at which lower density random graphs are disconnected and higher density ones are connected. Motivated by ideas in geometric group theory we will explain some new threshold theorems we have discovered for random graphs. We will then explain applications of these results to the geometry of Coxeter groups. Some of this talk will be on joint work with Hagen and Sisto; other parts are joint work with Hagen, Susse, and Falgas-Ravry.

Tara Brough,

Solubility and geometry for finitely generated groups of piecewise-linear homeomorphisms

Abstract. The group $\mathrm{PL}_o(I)$ consists of all orientation-preserving piecewise-linear homeomorphisms of the unit interval. The finitely generated subgroups of

$\mathrm{PL}_o(I)$ include many important groups, most notably Thompson's group F. I will discuss two geometric conditions that are equivalent to solubility for finitely generated subgroups of $\mathrm{PL}_o(I)$, and outline how to use these to determine algorithmically, for a finite set of elements in a "computable" subgroup of $\mathrm{PL}_o(I)$ (in particular, F is computable), whether the group generated by this set is soluble.

This is joint work with Collin Bleak and Susan Hermiller.

Josep Burillo, *Universitat Politècnica de Catalunya*

Normal subgroups of the Lodha-Moore groups

Abstract. The Lodha-Moore groups are finitely presented counterexamples to the von Neumann-Day conjecture, since they are not amenable but they do not contain free subgroups. They appear as subgroups of a group of piecewise projective maps constructed by Monod. I will introduce the group elements as maps and also as pairs of binary trees, in a similar way to Thompson's group F. We study their commutators and second commutators, showing some of them are simple. This leads to a complete description of the normal subgroups of these groups. This is joint work with Yash Lodha and with Lawrence Reeves.

Maurice Chiodo, *Université de Neuchâtel*

Primitive elements in low-index subgroups of finitely generated groups

Abstract. Let G be a finitely generated group of rank n. We call an element g primitive if it lies in some generating set of size n. This generalizes the notion of primitive elements in free groups. In this talk I will show that only one subgroup in G of index $< 1.5\ 2^n$ can fail to contain a primitive element: $[G,G]G^2$. I will discuss the precise conditions under which this subgroup doesn't contain any primitive elements, and explain why all other subgroups of index $< 1.5\ 2^n$ do.

This is a joint work with Jack Button and Mariano Zeron-Medina.

Laura Ciobanu, *Université de Neuchâtel*

Formal conjugacy growth and hyperbolicity

Abstract. Rivin conjectured that the conjugacy growth series of a hyperbolic group is rational if and only if the group is virtually cyclic.

In this talk I will present the proof (joint with Hermiller, Holt and Rees) that the conjugacy growth series of a virtually cyclic group is rational, and then also confirm the other direction of the conjecture, by showing that the conjugacy growth series of a non-elementary hyperbolic group is transcendental (joint with Antolín). The result for non-elementary hyperbolic groups can be used to prove a formal language version of Rivin's conjecture for any finitely generated acylindrically hyperbolic group G, namely that no set of minimal length conjugacy representatives of G can be regular.

Yves de Cornulier, *Université Paris Sud*

Sofic profile

Abstract. Soficity, for a discrete group, is a common weakening of both residual finiteness and amenability, and is defined in terms of "quasi-free quasi-actions" on finite sets. While "most" groups are known to be sofic, no group is yet known to be non-sofic. We introduce a quantitative notion of soficity, called sofic profile $s(n)$, which measures how the size of the finite set has to grow when the ε in the definition of soficity is $\frac{1}{n}$. Groups with bounded sofic profile are precisely those LEF groups (*locally embeddable in finite groups*), including residually finite groups. Otherwise, the sofic profile grows at least linearly, and is known to be exactly linear in some cases, including Baumslag-Solitar groups.

Patrick Dehornoy, *Université de Caen*

Multifraction reduction in gcd-monoids

Abstract. A classical Ore theorem says that, if M is a cancellative monoid and any two elements of M admit unique gcds and lcms, then M embeds in its enveloping group $U(M)$ and every element of $U(M)$ is represented by a unique irreducible M-fraction. We show how to weaken the assumption that common multiples exist by developing a notion of irreducible multifraction. In good cases, in particular when M admits a finite Garside family, this leads to an algorithm of a new type (but somehow reminiscent of a Dehn algorithm) solving the Word Problem for the group.

JORDI DELGADO, *Universitat Politècnica de Catalunya*

Stallings foldings for $\mathbb{Z}^m \times F_n$

Abstract. We present an adaptation to the family of free-abelian times free groups ($\mathbb{Z}^m \times F_n$) of the classical Stallings procedure for describing subgroups of the free group as automatons. This approach provides an alternative way of understanding several algorithmic results already proved in [1], and a promising way for attacking new ones. This is a joint work with Enric Ventura.

References:

[1] Delgado,Ventura - Algorithmic problems for free-abelian times free groups. *Journal of Algebra* 391 (Oct. 2013), pp. 256-283.

VOLKER DIEKERT, *Universität Stuttgart*

EDT0L-like description of the solution sets for a word equations over RAAGs

Abstract. In my talk, I speak about a generalization of a joint work with Laura Ciobanu and Murray Elder which was announced at GAGTA 8 and presented at ICALP 2012 in Kyoto (Japan). We generalize the ICALP paper from free groups to graph products of free an finite groups. In particular, given a word equation over a right-angled Artin group (RAAG) we can effectively construct a rational set of endomorphisms over a free monoid with involution; and this rational set describes all solutions. This generalization has been obtained in a joint work with Artur Jeż and Manfred Kufleitner.

MURRAY ELDER, *The University of Newcastle, Australia*

Solution sets for equations over free groups are EDT0L languages

Abstract. I will describe recent work with Laura Ciobanu and Volker Diekert on the problem of deciding whether an equation in a free group has a solution, finding all solutions, and describing all solutions in a simple way. We prove that the set of all solutions to an equation is a Lindenmayer language of type EDT0L. We construct this formal language description in quasilinear space in the size of the input equation.

The class of EDT0L languages lies between regular and indexed languages, and are incomparable with context-free languages.

Our work builds on techniques of Plandowski, Jeż and others, who developed the idea of applying data compression techniques to solve equations in free monoids in PSPACE.

Alexander Fel'shtyn, *University of Szczecin*

Groups with the property R_∞

Abstract. Let $\varphi\colon G \to G$ be an endomorphism of a group G. Then two elements x, y of G are said to be twisted φ-conjugate, if there exists a third element $z \in G$ such that $x = zy\varphi(z)1$. The equivalence classes are called the twisted conjugacy classes or the Reidemeister classes of φ. The Reidemeister number of φ denoted by $R(\varphi)$, is the number of those twisted conjugacy classes of φ. This number is either a positive integer or ∞.

An infinite group G has the R_∞-property if for every automorphism φ of G the Reidemeister number of φ is infinite.

The interest in twisted conjugacy relations has its origins, in particular, in the Nielsen-Reidemeister fixed point theory, in Arthur-Selberg theory, in Algebraic Geometry, in Galois cohomology, in the theory of Linear Algebraic groups, in Representation Theory.

The problem of determining which classes of discrete infinite groups have the R_∞ property is an area of active research initiated by R. Hill and the author in 1994.

Later, it was shown by various authors that the following groups have the R_∞-property: non-elementary Gromov hyperbolic groups(Levitt-Lustig); relatively hyperbolic groups; Baumslag-Solitar groups $BS(m, n)$ except for $BS(1, 1)$; a wide class of saturated weakly branch groups (including the Grigorchuk group and the Gupta-Sidki group), Thompsons groups F and T ; generalized Thompsons groups $F_{n,0}$ and their finite direct products; Houghtons groups; symplectic groups $Sp(2n, \mathbb{Z})$, the mapping class groups Mod_S of a compact oriented surface S with genus g and p boundary components, $3g + p4 > 0$, and the full braid groups $B_n(S)$ on $n > 3$ strands of a compact surface S in the cases where S is either the compact disk D, or the sphere S^2; extensions of $SL(n, \mathbb{Z})$, $PSL(n, \mathbb{Z})$, $GL(n, \mathbb{Z})$, $PGL(n, \mathbb{Z})$, $Sp(2n, \mathbb{Z})$, $PSp(2n, \mathbb{Z})$, $n > 1$, by a countable abelian group, and normal subgroups of $SL(n, \mathbb{Z})$, $n > 2$, not contained in the center; $GL(n, K)$ and $SL(n, K)$ if $n > 2$ and K is an infinite integral domain with trivial group of automorphisms, or K is an integral domain, which has a zero characteristic and for which $Aut(K)$ is periodic; irreducible lattices in a connected semisimple Lie group G with finite center and real rank at least 2; non-amenable, finitely generated residually finite groups; some metabelian groups; lamp-lighter groups $\mathbb{Z}_n \wr \mathbb{Z}$ if and only if $2 \mid n$ or $3 \mid n$; free nilpotent groups N_{rc} of rank $r = 2$ and class $c \geq 9$,

N_{rc} of rank $r = 2$ or $r = 3$ and class $c \geq 4r$, or rank $r \geq 4$ and class $c \geq 2r$, any group N_{2c} for $c \geq 4$, every free solvable group S_{2t} of rank 2 and class $t \geq 2$ (in particular the free metabelian group $M_2 = S_{22}$ of rank 2), any free solvable group S_{rt} of rank $r \geq 2$ and class t big enough; some crystallographic groups. Recently it was proven that N_{rc}, $r > 1$ has the R_∞-property if and only if $c \geq 2r$.

Jabara proved that if residually finite group G admits an automorphism of prime order p with finite Reidemeister number, then G is virtually nilpotent group of class bounded by a function of p.

We have described a lot of classes of non-solvable, finitely generated, residually finite groups which have the R_∞-property. All together was a motivation for the following conjecture proposed by E. Troitsky and the author.

Conjecture Every infinite, residually finite, finitely generated group either possesses the R_∞-property or is a virtually solvable group.

Let Ψ belongs to $Out(G) = Aut(G)/Inn(G)$. We consider an outer automorphism $\Psi \in Out(G)$ as a collection of ordinary automorphisms $a \in Aut(G)$. We say that two automorphisms $a, b \in \Psi$ are similar (or isogredient) if $b = \varphi_h a \varphi_h^1$ for some $h \in G$, where $\varphi_h(g) = hgh^1$ is an inner automorphism induced by the element h. Let $S(\Psi)$ be the set of isogredience classes of automorphisms representing Ψ.

A group G is called an S_∞-group if for any Ψ the set $S(\Psi)$ is infinite. In the talk I would like to discuss old and new results on the R_∞ and S_∞ properties for groups.

Agelos Georgakopoulos, *University of Warwick*

The planar Cayley graphs are effectively enumerable

Abstract. We show [4] that a group admits a planar, finitely generated Cayley graph if and only if it admits a special kind of group presentation we introduce, called a planar presentation. Planar presentations can be recognised algorithmically. As a consequence, we obtain an effective enumeration of the planar Cayley graphs, yielding in particular an affirmative answer to a question of Droms et al. [1, 2] asking whether the planar groups can be effectively enumerated.

This builds on the techniques of [3], where the 3-regular planar Cayley graphs have been classified.

Joint work with Matthias Hamann.

References

[1] C. Droms. Infinite-ended groups with planar Cayley graphs. *J. Group Theory*, 9(4):487496, 2006.

[2] C. Droms, B. Servatius, and H. Servatius. Connectivity and planarity of Cayley graphs. *Beitr. Algebra Geom.*, 39(2):269282, 1998.

[3] A. Georgakopoulos. The planar cubic Cayley graphs. To appear in *Memoirs of the AMS*.

[4] Agelos Georgakopoulos and Matthias Hamann. The planar Cayley graphs are effectively enumerable. 2015. `arXiv:1506.03361`.

THORSTEN GROTH, *Georg August Universität Göttingen*

Quadratic equations in self similar groups

Abstract. Let G be a *self similar group*, that is, G together with a monomorphism $G \to G \wr_d P$ for a permutation group P acting on a set of d elements. An equation in G is an element $w \in F_X * G$ and a solution is a homomorphism $s\colon F_X * G \to G$ with $s_{|G} = 1$ and $s(w) = 1$.

I will talk about properties such groups G can have which helps solving quadratic equations (e.g. being contracting, regular branched, layered) and algorithmic approaches to decide if a given quadratic equation is solvable in some special cases.

MORITZ GRUBER, *Karlsruhe Institute of Technology*

Higher divergence functions for Heisenberg Groups

Abstract. We examine higher divergence functions, which, roughly speaking, measure the difficulty to fill an outside an r-ball lying k-cycle with an outside a ρr-ball, $0 < \rho \leq 1$, lying $(k+1)$-chain. Using a filling theorem for CAT(0)- spaces [3], there is an easy way to compute them for $\mathbb{R}^n$ [1]. We prove a similar filling theorem for the Heisenberg Groups H^{2n+1}: For a given k-cycle a we construct a $(k+1)$-chain b (the filling) with boundary $\partial b = a$ and controlled volume. For this filling b we prove a uniform bound on the distance of points in b to its boundary a. Using this we compute the higher divergence functions for the Heisenberg Groups H^{2n+1}.

References:

[1] Aaron Abrams, Noel Brady, Pallavi Dani, Moon Duchin and Robert Young, Pushing fillings in right-angled Artin groups, *J. London Math. Soc.(2)* 87 (2013), p. 663-688.

[2] Moritz Gruber, Higher Divergence Functions for Heisenberg Groups, `arXiv: 1410.4064`.

[3] Stefan Wenger, A short proof of Gromovs Filling Inequality, *Proceedings of the American Mathematical Society*, Volume 136, Number 8, 2008, p. 2937-2941.

Arye Juhasz, *Technion*

On a class of Artin groups

Abstract. We introduce a class of Artin groups which may contain arbitrary proper parabolic subgroups in a certain way. We call such parabolics special. We show that if the special parabolic has solvable word problem then the whole group has and prove a similar result for the conjugacy problem and torsionfreeness. We also give a detailed description of fusion in the whole group in terms of fusion in the special parabolic. We compute homology and cohomology of the whole group in terms of the homology and cohomology of the special parabolic respec- tively, and show that if the special parabolic confirms the $K(pi, 1)$ conjecture then the whole group does.

Delaram Kahrobaei, *City University of New York*

Conjugacy Problem in Polycyclic and Metabelian Groups: Algorithms and Complexity

Abstract. (joint work with B. Cavallo, J. Gryak, C. Martínez-Pérez). In this talk we present a couple of algorithms for solving the conjugacy problem in various polycyclic and metabelian groups. We analyze the complexity of such algorithms, and present experimental results of the algorithms performance.

Arkadius Kalka, *Bar-Ilan University*

On some classes of Coxeter- and Artin-like groups

Abstract. We consider the following class of finitely generated groups whose relators are powers of commutators of the generators. This class contains as a small subclass graph groups (also called RAAGs), namely if all powers are one. Graph groups are the only torsionfree groups in these class.

The generators are of infinite order, but we may also add torsion by assigning arbitrary orders to the generators. Then the above mentioned small subclass contains socalled *right angled Shephard groups.*

We also discuss other classes, namely groups with relators that are powers of products (resp. quotients) of generators (which are of finite or infinite order). Like in Coxeter and Artin groups, for all these groups, each relator involves only 2 generators. Furthermore, like Coxeter and Artin groups, these groups may be characterized by some labelled graphs. One may say that all these groups lie somehow between Coxeter groups and Artin groups, because on the one hand

they contain torsion elements, but on the other hand the order of the generators may be infinite.

We give a solution to the word problem for groups in the above mentioned class. The very short proof requires only elementary methods in combinatorial group theory.

Ilya Kazachkov, *Universidad del Pais Vasco*

On limit groups over partially commutative groups.

Abstract. The class of limit groups can be likened to the classical coordinate algebras in algebraic geometry. Limit groups admit extremely rich and diverse characterizations and this versatile nature makes them a fine example of the connection between Group Theory, Algebra, Geometry, and Model Theory. Its importance from each of the different perspectives has led to an intensive study of these groups in recent years.

In this talk, I will report on the ongoing project of solving algorithmic problems for limit groups over partially commutative groups.

Olga Kharlampovich, *Hunter College, CUNY*

Model Theory of groups and algebras

Abstract. I will discuss elementary classification questions for groups, associative algebras and group algebras.

Sang-Jin Lee, *Konkuk University*

Path lifting properties and embedding between RAAGs

Abstract. For a finite simplicial graph Γ, let $G(\Gamma)$ denote the right-angled Artin group on the complement graph of Γ. In the talk, we introduce the notions of "induced path lifting property" and "semi-induced path lifting property" for immersions between graphs, and obtain graph theoretical criteria for the embedability between right-angled Artin groups. We recover the result of Sang-hyun Kim and Thomas Koberda that an arbitrary $G(\Gamma)$ admits a quasi-isometric group embedding into $G(T)$ for some finite tree T. The upper bound on the number of vertices of T is improved from a double exponential function to an exponential function in the number of vertices of Γ.

This is a joint work with E.-K. Lee.

Gilbert Levitt, *Université de Caen*

Induced automorphisms

Abstract. I will report on work in progress with Vincent Guirardel about the following problem: given a group G and a subgroup H, understand the group of automorphisms of H which extend to G. For instance, if G is a finitely generated free group and every automorphism of H extends to G, we show that H is cyclic or a free factor.

Alexei Miasnikov, *Stevens Institute of Technology*

Algorithmic double personality of finitely generated nilpotent groups

Abstract. Algorithmic problems in finitely generated nilpotent groups G exhibit two quite opposite types of behavior: they are either surprisingly easy (PTIME, LOGSPACE, REALTIME, etc), or notoriously hard (often undecidable). In the former case they may behave just like abelian groups, while in the latter they turn out like finitely generated commutative unitary rings. Using this dichotomy, I will explain hardness of various problems on equations in G and their relations to Diophantine problems in rings of algebraic integers.

Tatiana Nagnibeda, *Université de Genève*

Substitutional dynamics associated with Grigorchuk's group

Abstract. We shall discuss substitutions and subshifts associated with Grigorchuk's group and some other self-similar groups. They appear naturally in recursive presentations of these groups by generators and relators but also happen to describe the dynamics of the action of the group on the boundary of the rooted tree and can be used to study the spectra of the associated random walks. The talk is based on joint works with I. Bondarenko, D. D'Angeli, R. Grigorchuk and D. Lenz.

DENIS OSIN, *Vanderbilt University*

Invariant random subgroups of acylindrically hyperbolic groups

Abstract. A subgroup H of an acylindrically hyperbolic groups G is called geometrically dense if for every non-elementary acylindrical action of G on a hyperbolic space, the limit sets of G and H coincide. We prove that for every ergodic measure preserving action of a countable acylindrically hyperbolic group G on a Borel probability space, either the stabilizer of almost every point is geometrically dense in G, or the action is essentially almost free (i.e., the stabilizers are finite). Various corollaries and generalizations of this result will be discussed.

MATTHIEU PICANTIN, *Université Paris-7*

From automatic semigroups to automaton semigroups

Abstract. We develop an effective and natural approach to interpret any cancellative semigroup admitting a special language of greedy normal forms as an automaton semigroup, namely the semigroup generated by a Mealy automaton encoding the behavior of such a language of greedy normal forms under one-sided multiplication. The framework embraces many of the well-known classes of (automatic) semigroups: free semigroups, free commutative semi-groups, trace or divisibility monoids, braid or Artin-Tits monoids, as well as some variations of the bicyclic monoid, etc. It provides what appears to be the first known connection from a class of automatic semigroups to a class of automaton semigroups.

Like plactic monoids or Chinese monoids, some non-cancellative automatic semigroups are also investigated.

N.S. ROMANOVSKIY, *Sobolev Institute of Mathematics, Novosibirsk*

Hilbert's Nullstellensatz in algebraic geometry over rigid solvable groups

Abstract. The classical Hilbert's Nullstellensatz says: if K is algebraically closed field and there is a system of polynomial equations over K, $\{f_i(x_1, \dots, x_n) = 0 \mid i \in I\}$, then an equation $f(x_1, \dots, x_n) = 0$ is a logical consequence of this system (satisfies all the solutions of the system in K^n) if and only if some nonzero power of f belongs to the ideal $(f_i \mid i \in I)$ of the ring $K[x_1, \dots, x_n]$. One can say say that we give an algebraic method for constructing all logical consequences of the given system of equations: f is obtained from f_i $(i \in I)$ using the operations of addition, subtraction, multiplication by elements of $K[x_1, \dots, x_n]$, and extraction of roots.

Our approach to Hilbert's theorem in algebraic geometry over groups is as follows.

(1) We should consider some good class of equationally Noetherian groups, let it be a hypothetical class $\mathcal{K}$.
(2) In this class, we need to define and allocate algebraically closed objects and to prove that any group of $\mathcal{K}$ is embedded into some algebraically closed group. Hilbert's theorem should be formulated and proved for algebraically closed in $\mathcal{K}$ groups.
(3) Further, let G be an algebraically closed group in $\mathcal{K}$. We think about equations over G as about expressions $v = 1$, where v is an element of the coordinate group of the affine space G^n.
(4) Since an arbitrary closed subset of G^n is defined in general not by a system of equations, but by a positive quantifier free formula (Boolean combination without negations of a finite set of equations) we should consider as basic blocks not equations, but positive formulas.
(5) We should specify and fix some set algebraic rules of deduction on the set of positive formulas over G.
(6) If the above conditions Hilbert's theorem will consist in a statement that all logical consequences of given positive formula over G are exactly the algebraic consequences.

We realized this approach in algebraic geometry over rigid solvable groups.

Gerhard Rosenberger, *Universität Hamburg*

CSA and CT groups and related topics

Abstract. A group G is commutative transitive or CT if commuting is transitive on nontrivial elements. A group is conjugately separated abelian or CSA if abelian subgroups are malnormal. These concepts had played a prominent role in the studies of fully residually free groups. They are especially important in the solution of the Tarski problems. CSA always implies CT however the class of CSA groups is a proper subclass of the class of CT groups. For finitely generated elementary free groups they are equivalent. First, we give further classes of groups where these two concepts are equivalent. Second, we examine the relationship between the two concepts. In particular we show that a finite CSA group must be abelian. If G is CT then G is not CSA if and only if G contains a nonabelian subgroup H which contains a nontrivial abelian subgroup N that is normal in H. We give further descriptions for CT and CSA groups, for instance, for linear groups.

MARK SAPIR, *Vanderbilt University*

On subgroups of the R. Thompson group F

Abstract. We provide two ways to show that the R. Thompson group F has maximal subgroups of infinite index which do not fix any number in the unit interval under the natural action of F on $(0, 1)$, thus solving a problem by D. Savchuk. The first way employs Jones' subgroup of the R. Thompson group F and leads to an explicit finitely generated example. The second way employs directed 2-complexes and 2-dimensional analogs of Stallings' core graphs, and gives many implicit examples. We also show that F has a decreasing sequence of finitely generated subgroups $F > H_1 > H_2 > \cdots$ such that $\bigcap H_i = \{1\}$ and for every i there exist only finitely many subgroups of F containing H_i. This is a joint work with Gili Golan.

VLADIMIR SHPILRAIN, *City College, CUNY*

Semigroups of linear functions

Abstract. Motivated by applications to hashing, we address the question of when two linear functions (of one variable) generate a free semigroup under composition. The talk is based on joint work (in progress) with Alice Medvedev and Bianca Sosnovski.

PEDRO V. SILVA, *University of Porto*

Extending endomorphisms of hyperbolic groups to the boundary

Abstract. The boundary ∂G of a hyperbolic group G (endowed with the hyperbolic topology) is a central concept in the theory of hyperbolic groups. The group G embeds in the compact space $\widehat{G} = G \cup \partial G$, which turns out to be the completion of G for any of the metrics known as visual metrics, defined by means of the Gromov product. Clearly, an endomorphism of G admits a continuous extension to $\widehat{G}$ if and only if it is uniformly continuous for a (fixed) visual metric d. It turns out that Hölder conditions play a major role in this context. In joint work with Vítor Araújo (Federal Univ. of Bahia, Brazil), we could prove the following result:

Theorem. *Let φ be a nontrivial endomorphism of a hyperbolic group G, endowed with a visual metric d. Then φ satisfies a Hölder condition with respect to d if and only if φ is virtually injective and its image is a quasiconvex subgroup of G.*

If G is either virtually free or torsion-free co-hopfian, we can drop the quasi-convexity requirement, and satisfying a Hölder condition is equivalent to uniform continuity. We ignore if this is also the case for arbitrary hyperbolic groups, but some conjectures have already been disproved.

We shall mention also some equivalent characterizations of what we call *polygon hyperbolic* geodesic metric spaces, providing a general viewpoint on the virtually free case.

Alina Vdovina, *University of Newcastle*

Lattices, superrigidity and surfaces

Abstract. One of the most well known open questions in geometric group theory is the following question of Gromov: is it true, that every one-ended hyperbolic group contains a surface group? Even if we restrict ourselves to groups acting on hyperbolic buildings the answer is not known in general. We'll present some non-obvious embeddings of surfaces groups into groups acting on buildings as well as some negative results, leaving a possibility for counter-examples.

Enric Ventura, *Universitat Politècnica de Catalunya*

The degree of commutativity of an infinite group

Abstract. There is a classical result saying that, in a finite group, the probability that two elements commute is never between 5/8 and 1 (i.e., if it is bigger than 5/8 then the group is abelian). It seems clear that this fact cannot be translated/adapted to infinite groups, but it is possible to give a notion of degree of commutativity for finitely generated groups (w.r.t. a fixed finite set of generators) as the limit of such probabilities, when counted over successively growing balls in the group. This asymptotic notion is a lot more vague than in the finite setting, but we are still able to prove some results concerning this new concept, the main one being the following: for any finitely generated group of polynomial growth G, the commuting degree of G is positive if and only if G is virtually abelian.

Stefan Virchow, *Universität Rostock*

The Probability of Generating the Symmetric Group

Abstract. We give a new proof of Dixon's conjecture: The probability that a pair of random permutations generates either A_n or S_n is $1 - 1/n + \mathcal{O}(n^{-\frac{3}{2}+\varepsilon})$.

Our proof is based on character theory and character estimates and does not need the classification of the finite simple groups. Therefore, we fulfill L. Babai's wish to find an elementary proof of Dixon's conjecture.

BERT WIEST, *Université de Rennes*

An analogue of the curve complex for Garside groups

Abstract. Garside groups are a family of groups with particularly nice algorithmic properties, containing in particular all Artin groups of spherical type; the most famous examples are the braid groups. In this talk I will present a simple construction which associates to every Garside group a locally infinite, delta-hyperbolic graph on which the group acts; we call it the "additional length complex" of the group. I will show that these complexes share important features with the curve complexes – in fact, the additional length complex of the braid group B_n is conjectured to be quasi-isometric to the curve complex of the n-times punctured disk. Our construction has the potential to be adapted to many other contexts. (Joint with Matthieu Calvez.)

JIANCHUN WU, *Universitat Politècnica de Catalunya*

Fixed subgroups are compressed in surface groups

Abstract. For a compact surface Σ (orientable or not, and with boundary or not) we show that the fixed subgroup, $\mathrm{Fix}(\mathcal{B})$, of any family $\mathcal{B}$ of endomorphisms of $\pi_1(\Sigma)$ is compressed in $\pi_1(\Sigma)$ i.e., $\mathsf{rank}(\mathrm{Fix}(\mathcal{B})) \leqslant \mathsf{rank}(H)$ for any subgroup $\mathrm{Fix}(\mathcal{B}) \leqslant H \leqslant \pi_1(\Sigma)$. On the way, we give a partial positive solution to the inertia conjecture, both for free and for surface groups. We also investigate direct products, G, of finitely many free and surface groups, and give a characterization of when G satisfies that $\mathsf{rank}(\mathrm{Fix}(\varphi)) \leqslant \mathsf{rank}(G)$ for every $\varphi \in \mathrm{Aut}(G)$.

WENYUAN YANG, *Beijing International Center for Mathematical Research*

Hausdorff dimension of boundaries of relatively hyperbolic groups

Abstract. In this talk, we will discuss the Floyd and Bowditch boundaries of a relatively hyperbolic group and calculate the Hausdorff dimension with respect to the Floyd metric and shortcut metric respectively. Our main result is that

Hausdorff dimension of boundaries is identified with the growth rate of the group, up to a multiplicative constant. This is joint work with Leonid Potyagailo.

Alexander Zakharov, *Universidad del Pais Vasco*

Kurosh rank of intersection of subgroups in groups acting on trees with finite edge stabilizers

Abstract. Suppose group G acts on an oriented tree T with finite quotient and finite edge stabilizers, and H and K are subgroups of G which act freely on the edges of T. For such subgroups the notion of Kurosh rank can be defined, which is a natural generalization of free group rank. Suppose that H and K have finite Kurosh ranks. We prove an estimate of the Hanna Neumann type for the Kurosh rank of the intersection of H and K. Using Bass-Serre theory we get corollaries for amalgamated free products and HNN-extensions. This is joint work with Sergei Ivanov.

Andrzej Zuk, *Université Paris-7*

Random walks on random symmetric groups

Abstract. TBA