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Semi-regular poset-theoretic representations of groups

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Abstract: Every group G is isomorphic to the automorphism group of a partially ordered set P. Moreover, L. Babai proved that there exists one such representation which is semi-regular, i.e. the action of $\mathrm{Aut}(P)$ in the underlying set of P is free, and with just three orbits. Not every group admits a semi-regular representation with two orbits, but we will see that there is such a representation in many cases. We study the case of finite simple groups, small-cancellation groups, random groups. We also investigate (infinite) groups which admit a regular representation, i.e. with just one orbit.

The finiteness of the non-abelian tensor product of groups

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Abstract: The non-abelian tensor product $G \otimes H$ of groups G and H was introduced by Brown and Loday [3], following works of Miller [6] and Dennis [4]. In [5], Ellis showed the finiteness of the non-abelian tensor product $G \otimes H$ when both G and H are finite (see also, [7]).

I will present some related results that were obtained in [1, 2] concerning the (local) finiteness of the non-abelian tensor product $G \otimes H$.

*This is a joint work with Noraí Rocco (Universidade de Brasília) e Irene Nakaoka (Universidade Estadual de Maringá)

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Conjugacy separability of groups of geometric nature

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Abstract: We shall talk on conjugacy separability of standard arithmetic subgroups of a special orthogonal group. The same property for 3-orbifolds also will be discussed.

*This is a joint work with Angel Del Rio and Pavel Zalesskii.

Self-similar finite p-groups

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Abstract: Let p be a prime and G a finite p-group that admits a faithful, self-similar action on the p-ary rooted tree. We will discuss about the exponent of G and the case when G admits an injective virtual endomorphism.

Describing blocks of profinite groups with cyclic defect group and infinite dihedral defect group

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Abstract: The block theory of finite groups studies modules for the group algebra by writing the group algebra as a product of indecomposable algebras, called blocks, and studying the modules one block at a time. To each block we can associate a subgroup of G called its defect group. Understanding the structure of blocks of a finite group with given defect group is one of the central problems of this theory. In some cases, such a description is known. For example, blocks with cyclic defect group have an explicit description as Brauer tree algebras. In other cases, blocks with a dihedral defect group are described (up to Morita equivalence) as finite dimensional path algebras associated with explicit quivers and relations.

Recently, a block theory for profinite groups has been formulated by myself and J. MacQuarrie. In this talk, I will give a brief introduction to the block theory of finite and profinite groups. I will explain how to describe blocks of a profinite group with a cyclic defect group as a Brauer tree algebra, and then I will give a description of the blocks of profinite groups with an infinite dihedral defect group, as the complete path algebra for specific quivers with relations. In both cases, such a description is given in strict analogy with the finite case.

*This is a joint work with John MacQuarrie (UFMG).

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On finite groups with the Magnus Property

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Abstract: Given an element x of a group G, let $N_x = \langle x^G \rangle$ be the (normal) subgroup of G generated by the conjugacy class of x in G. A group G is said to have the Magnus Property (MP for short) if, whenever two elements x, y of G satisfy $N_x = N_y$, the two elements x, y are either conjugate or inverse-conjugate in G. Free groups have this property. In the recent paper [1], Benjamin Klopsch, Luis Mendonça and Jan Moritz Petschick proved several results concerning groups with the Magnus property, including the fact that, if the group G satisfies some "finiteness" condition, then having the Magnus Property passes to quotients. In particular, this holds for finite groups. In this talk I will discuss some recent results about finite groups with the Magnus property. We will focus specifically on primitive groups and the structure of the factor group of a finite MP group modulo its Frattini subgroup.

*This is a joint work with Claude Marion (University of Porto).

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Block Theory of Profinite Groups

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Abstract: Block Theory for finite groups is an approach to the representation theory of finite groups: it starts from the simple observation that the group algebra can be written as a direct product of indecomposable algebras, and it's enough to study the modules for each factor separately. A profinite group is a (probably infinite) topological group that can be well-understood in terms of its finite quotients. Many facts about finite groups have "profinite analogues". In this talk, I'll explain these things and discuss the block theory of profinite groups, arriving at the observation that the finite/profinite analogy in block theory seems to be even stronger than usual!

*Work from projects joint with Ricardo Franquiz Flores and Peter Symonds.

On the pseudovariety of finite groups $\mathbf{U} = \bigvee_{p\in\mathbb{P}} \mathbf{Ab}(p) * \mathbf{Ab}(p-1)$

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Abstract: In this talk, we introduce and investigate the pseudovariety of finite groups $\mathbf{U} = \bigvee_{p\in\mathbb{P}} \mathbf{Ab}(p) * \mathbf{Ab}(p-1)$. In particular we show that $\mathbf{U}$ is the class of all finite groups which are supersolvable with elementary abelian derived subgroup and abelian Sylow subgroups. We also derive that it is decidable whether an arbitrary finitely generated subgroup of a given free group of finite rank is closed or dense in the pro-$\mathbf{U}$ topology. Finally we exhibit that the variety generated by $\mathbf{U}$ is the variety of all metabelian groups and relate this result to the varieties generated by a Baumslag-Solitar group of the form $BS(1, q)$ with q prime.

*This is a joint work with Pedro Silva and Gareth Tracey.

Locally indicable groups and generalized Wirtinger presentations

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Abstract: A group is locally indicable if all its nontrivial finitely generated subgroups admit a nonzero morphism to the integers. In recent decades, the study of these groups has gained great relevance in areas such as dynamics of groups, due to their relationship with left-orderable groups, and in topology, due to their connection with asphericity problems. It is known that knot groups are locally indicable (this was proved by J. Howie in the early 1980s), but the problem remains open for a more general class of groups, namely LOT groups (labeled oriented trees). These groups admit Wirtinger-type presentations (which generalize the Wirtinger presentations of classical knots) and arise naturally when studying the fundamental groups of certain 4-dimensional manifolds.

I will discuss some known problems related to these groups and present recent results regarding the local indicability of groups that admit presentations with the homology of the circle.

*This is a joint work with Agustin Barreto.

Flag-transitive, point-primitive symmetric designs

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Abstract: We say D is a (v, k, λ)-symmetric design if $D = (P, \mathcal{B})$, where P is a (finite) set of v points, $\mathcal{B}$ is a collection of blocks (which can be thought of as subsets of points) each of size k, and every unordered pair of points is incident with exactly λ blocks. The design is *symmetric* if it has as many points as it does blocks. A *flag* of D is an ordered incident point-block pair. The full automorphism group of D is denoted by $\mathrm{Aut}(D)$, and it acts on the points, as well as the blocks and the flags (among other things). We say D is *point-primitive* if it admits a group $G \leq \mathrm{Aut}(D)$ acting primitively on the set of points. Similarly, we define D to be *flag-transitive* if there is a group $G \leq \mathrm{Aut}(D)$ acting transitively on the set of flags. Classifying flag-transitive symmetric designs is an ongoing endeavour, we will review some results obtained so far.

*This is a joint work with José Emanuel Rodríguez-Fitta.

Solvable groups acting on the line

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Abstract: We prove a structural result for orientation-preserving actions of finitely generated solvable groups on real intervals, considered up to semi-conjugacy. As applications we obtain new answers to a problem first considered by J. F. Plante, which asks under which conditions an action of a solvable group on a real interval is semi-conjugate to an action on the line by affine transformations. We show that this is always the case for actions by C^1 diffeomorphisms on closed intervals.

*This is a joint work with Joaquín Brum, Nicolás Matte Bon and Michele Triestino.

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Partial group actions on semiprime Lie algebras

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Abstract: In the present talk, we will study one of the main problems in the theory of partial group actions, namely the globalization problem. More specifically we will study "The globalization problem for partial group actions on semiprime Lie algebras". The main result provides necessary and sufficient conditions for the existence of a semiprime globalization for a partial group action in a semiprime Lie algebra, and with a reasonable additional condition, we show that this semiprime globalization is unique up to isomorphism. Furthermore, under the same conditions, we see that any globalizable partial group action on a semiprime Lie algebra induces a globalizable partial group action in its maximal quotient algebra.

The results presented in this talk are part of a work in collaboration with M. Dokuchaev.

Groups and Loops

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Abstract: Let $< Q, (\cdot), 1 >$ be a magma with a neutral element 1, such that the mappings: $\{L_a\}_{a \in Q}$ $(L_a : Q \to Q, L_a x = a \cdot x)$ and $\{R_a\}_{a \in Q}$ $(R_a : Q \to Q, R_a x = x \cdot a)$ are bijections. Then Q is called a loop. Group Theory methods are widely used in the study of loops. It is well known that any loop can be realized on the cosets of some group by its subgroup, which leads in the case of a Moufang loop to a group with an action of S_3 on it. I will present interesting examples from different classes of loops constructed by groups. As a recent result I will give the classification of the varieties of loops $\{V_i\}$ with the following property: let F_2 be a free loop of two generators of a variety V_i such that $F_2/Z(F_2)$ and $Z(F_2)$ are 2 -elementary abelian groups, where $Z(F_2)$ is the associative and commutative center of F_2.

*This is a joint work with Alexander Grishkov and Marina Rasskazova.

Isomorphism Theorem for g-digroups

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Abstract: The structure of g-digroup was defined as a possible solution for the Coquecigrrue problem. Even though it didn't solve such problem, it became an interesting object to be studied. Since it can be seen as a generalization of a group, many group-like definitions and properties have been extended. To state and prove the isomorphism theorems, we follow an approach from Universal Algebra.

*This is a joint work with Fernando Guzman.

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Probabilistically nilpotent finite groups

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Abstract: There are many ways to characterize finite nilpotent groups. For example, a finite group G is nilpotent iff all long commutators in G are trivial, or iff any two Sylow subgroups of coprime orders commute, and so on.
In this talk we will discuss finite groups in which one of such features holds with high probability and we will see how this affects the structure of the group.

Isomorphism of groups by tensors

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Abstract: Recently nearly every group isomorphism projects has shifted to the study of so-called *Tensor Isomorphism*. Tensors are generalization of matrices to a third dimension, and tensor isomorphism is finding a change of basis to make two such grids equal. Tensor Isomorphism not only solves difficult group isomorphism problems, it is used in quantum computing, cryptography, and the study of P vs. NP.

I will detail current breakthroughs and open problems and how group isomorphism offers perhaps the best lens to study this.