Models and Groups İstanbul 1

13-14 september 2013

Time	**Friday**	**Saturday**
9.45-11.00	Wagner	(∗)
11.15-12.30	Sklinos	Belegradek
Lunch		
15.00-16.15	Milliet	Uğurlu
16.30-17.45	Wiscons	Yalçınkaya
(∗)	**Contributed talks** Baginski, Lasserre	

Oleg Belegradek
The space of minimal structures

Abstract. For a signature L with at least one constant symbol, an L-structure is called minimal if it has no proper substructures. Let S_L be the set of isomorphism types of minimal L-structures. The elements of S_L can be identified with ultrafilters of the Boolean algebra of quantifier-free L-sentences, and therefore one can define a Stone topology on S_L. This topology on S_L generalizes the topology of the space of n-marked groups. There is a natural ultrametric on S_L; it turns out that the Stone topology on S_L coincides with the topology of the ultrametric space S_L if and only if the ultrametric space S_L is compact if and only if L contains finitely many n-ary symbols for any $n < \omega$. As one of the applications of compactness of the Stone topology on S_L, we prove compactness of certain classes of metric spaces in the Gromov-Hausdorff topology. This shows, in particular, that Gromov's theorem on precompactness of any uniformly totally bounded class of compact metric spaces can be considered a consequence of compactness of Stone spaces of Boolean algebras.

Cédric Milliet
Finding definable envelopes 'around' nilpotent or solvable subgroups

Abstract. Well-known results of Poizat state that in a stable group, every nilpotent subgroup is contained in a definable nilpotent subgroup of the same nilpotency class, and every solvable subgroup is contained in a definable solvable one of the same derived length. Recently, these results have been partially generalised in various contexts: to groups without the independence property (Shelah, Aldama), groups satisfying the descending chain condition on centralizers (Altınel, Baginsky), and groups having a simple theory. We shall review these results and some of their consequences.

Rizos Sklinos
On the superstable part of the free group

Abstract. The proof of the stability of the first-order theory of non-abelian free groups (by Sela) renewed the model theoretic interest in this "natural" theory. Although it was known (by work of Poizat) that non abelian free group are not superstable, it is still interesting to recover the superstable part of their theory. By this we mean to characterize the formulas over a non abelian free group for which the R^{∞}-rank (Shelah-rank) is defined.

On this line of thought, it is quite suggestive that in Sela's work certain formulas called "minimal rank" (with no connection to any model theoretic rank) served as toy examples and all terminating procedures are far easier to prove than in the general case. If a formula ϕ is "minimal rank", then $\phi(F) = \phi(F_{\omega})$, i.e. the formula does not gain an element in higher rank free groups.

We try to philosophically explain the above phenomenon by conjecturing: a formula ϕ over F is superstable if and only if $\phi(F) = \phi(F_{\omega})$. In this talk we will prove one direction of the above conjecture i.e. a formula is superstable only if $\phi(F) = \phi(F_{\omega})$, and give some supporting evidence for the other direction.

This is a joint work with C. Perin.

Pınar Uğurlu
Linear Pseudofinite Groups

Abstract. Pseudofinite groups are infinite models of the theory of finite groups. Simple ones are classified by John S. Wilson as (twisted) Chevalley groups over pseudofinite fields (CFSG is used). It can be observed that Wilson's proof can be used to classify non-abelian definably simple pseudofinite groups of finite centralizer dimension, in particular the linear ones. We will see the connection of this result to Larsen-Pink Theorem which roughly says that large finite simple groups of matrices are Chevalley groups over finite fields. We will also talk about the ongoing project (suggested by Alexandre Borovik) of eliminating the CFSG from our classification result which leads us to a possible 2-Sylow theory for some pseudofinite groups. However, we will also present an example of a linear pseudofinite group (over a characteristic zero field) with non-conjugate Sylow 2-subgroups.

Frank Wagner
The right angle on orthogonal sets

Abstract. Two sets X and Y are orthogonal if every definable subset of $X \times Y$ is a finite union of rectangles $A \times B$ with $A \subseteq X$ and $B \subseteq Y$. I shall study groups definable in the product $X \times Y$. Examples show that they need not be isomorphic to the product of a group definable in X and one definable in Y — in fact there need not be any groups definable in X or Y separately. I shall give a structure theorem assuming X is model-theoretically "simple", and make a conjecture for the general case involving local and approximate groups.

Joshua Wiscons
Generically n-transitive permutation groups

Abstract. The last decade witnessed a substantial increase in the knowledge of groups of finite Morley rank (fMr) with the Algebraicity Conjecture being, for the most part, the guiding light. Of course, the conjecture, which posits that every simple group of fMr is an algebraic group over an algebraically closed field, is still wide open. However, the conjecture has been settled for groups of so-called even and mixed types, and there is a substantial body of knowledge about groups of odd type. With these partial classification results and general structure theory in hand, Borovik and Cherlin initiated a very broad study of permutation groups of fMr. Their 2009 paper not only well illustrates the type of general results we are currently capable of, but, perhaps more importantly, it lays out a wealth of problems to guide the subject in the future.

This talk will introduce the audience to permutation groups of fMr with a focus on those which are generically n-transitive, that is, those for which the group has a "large" orbit on the nth cartesian power of the set. Natural examples of such permutation groups arise in the classical groups, and we will present a handful of these. In addition to providing some background, the goals will be to highlight work in progress and open questions.

Şükrü Yalçınkaya
Black box groups

Abstract. Black box groups are introduced as an idealized setting for randomised algorithms for solving permutation and matrix group problems in computational group theory. A *black box group* G is a finite group whose elements are encoded as 0-1 strings of uniform length and the group operations are performed by an oracle ('black box'). Given strings representing $g, h \in G$, the black box can compute the strings representing $g \cdot h$, g^{-1} and decide whether $g = h$. In this context, a natural task is to find a probabilistic algorithm which determines the isomorphism type of a group within given (arbitrarily small) probability of error. More desirable algorithms, called *constructive recognition algorithms*, are the ones producing an isomorphism between a black box copy of a finite group and its natural copy.

A simple observation on the recognition algorithms in black box group theory is that procedures are based on checking whether some first order formulae satisfied by the given black box group. I will focus on this observation and discuss constructive recognition of black box groups of Lie type. Along the way, I will explain how we define a standard Frobenius automorphism in a black box group isomorphic to (P)SL$(2, q)$ and construct (or interpret) of a black box field in black box groups using only black box group operations. If time permits, I will talk about the interpretation of inverse transpose map and graph automorphisms, and the corresponding constructions in the black box groups of Lie type.

This is a joint work with Alexandre Borovik.

Contributed Talks

Paul Baginski
Stability and Countable Categoricity in Nonassociative Rings

Abstract. A classic result due to Felgner and to Baur, Cherlin and Macintyre in the 1970s states that a stable, $\aleph_0$-categorical group is nilpotent by finite. At around the same time, Baldwin and Rose proved that a stable, $\aleph_0$-categorical associative ring is nilpotent by finite. Recently, Wagner, Krupinski and others have renewed interest in these two results by proving analogous statements where stability is replaced by other model theoretic properties. In all cases, the rings being considered are associative. However, Rose extended many of his results with Baldwin in a second paper to a class of nonassociative rings called alternative rings. However, the question of whether a stable, $\aleph_0$-categorical alternative ring was nilpotent by finite remained open. We have answered this question affirmatively and I will discuss the obstacles and success in generalizing this problem to more general nonassociative rings.

Clément Lasserre
A better understanding of the model theory of Thompson's groups F, T, V.

Abstract. The theory of Thompson's groups F, T and V is undecidable. Actually, these groups interpret the arithmetic of the integers, as was proven by T. Altinel and A. Muranov in an even more general context.

The arithmetic arises to be of great interest in studying groups which are quasi-finitely axiomatizable (QFA). This notion was introduced in 2003 by A. Nies in order to better gauge the expressiveness of first-order logic for finitely generated groups. Namely, a f.g. group is QFA if it is characterized amongst f.g. groups by a single first-order sentence. A. Khlif have shown that biinterpretability with the arithmetic of the integers can be used as tool for proving that f.g. groups are QFA (and also prime), but it is also stronger.

We explain that Thompson's groups F, T and V are biinterpretable with the arithmetic. The groups T and V are of special interest because they provide the first examples of simple groups which are QFA and prime (a question by A. Nies). This also proves that many subgroups are definable, e.g. F is definable in T, F and T are definable in V (a question by T. Altinel and A. Muranov).

The method used in the proof leads to give more definabilities and interpretations which may be of interest by themselves: the Cantor set and the action of F, T, V on it are interpretable, and even a kind of addition and division by 2^n, so that the property that an element is affine on some interval is first-order, the groups contain a definable encoding of breakpoints of its elements...