

Program

Automorphism Groups, Differential Galois Theory and Model Theory

Schedule

	Monday 26	Tuesday 27
9:30	Poizat	Newelski
10:30	Coffee Break	
11:00	Chernikov	Kim
12:00	Crespo	Palacín
13:00	Lunch	
15:00	León Sánchez	Pillay
16:00	Wagner	Chatzidakis
17:00	Coffee Break	
17:30	Casanovas	Ziegler

Talks

Enrique Casanovas

Title: Model theory of Steiner triple systems.

Abstract: A Steiner triple system is a set A together with a collection S of subsets of A of size 3 such that every two elements of A belong to exactly one element of S . They can be treated as a set with a binary operation sending every two different elements a, b to the third element $a \cdot b$ in the subset. If $a = b$, we set $a \cdot b = a$. In this language they are called Steiner quasigroups. The finite Steiner quasigroups have a Fraïssé limit M_0 . We study the theory of M_0 , which has quantifier elimination, TP_2 and $NSOP_1$. This is a joint work with Silvia Barbina.

Zoe Chatzidakis

Title: Definable Galois theory in difference fields, and algebraic dynamics.

Abstract: (Joint work with Ehud Hrushovski) The initial question we were looking at is the following: given a transcendental field extension K of k , and an algebraic dynamics (V, f) defined over K which is dominated by an algebraic dynamics (W, g) defined over k , what can one say about (V, f) ?

One answer is: (V, f) has a quotient (U, h) which is defined over k , and with $\deg(h) = \deg(f)$. This however doesn't say much when the degree of f is 1. The talk will focus on this question, more precisely when

the algebraic dynamics (V, f) is isomorphic (over some difference field extending K) to an algebraic dynamics of the form (V', id) .

The solution to this problem involves Galois groups of difference equations, and I will talk a little about this as well.

[Recall that an algebraic dynamics is a pair (V, f) , where V is an irreducible algebraic variety, and f is a rational dominant endo-map of V . If the data is defined over K , then this yields a difference field $(K(V), F)$, where $K(V)$ is the function field of V , and F coincides with f^* .]

Artem Chernikov

Title: Title: Mekler's construction and generalized stability.

Abstract: Mekler has demonstrated that every structure in a finite relational language can be interpreted in a pure group (nilpotent of class 2 and exponent p , but not finitely generated). Even though his construction is not a bi-interpretation, it is known to preserve many model-theoretic properties of the original structure including stability and simplicity. We demonstrate that k -dependence of the theory is also preserved, thus obtaining first examples of strictly k -dependent pure groups for all k . Joint work with Nadja Hempel.

Teresa Crespo

Title: Picard-Vessiot theory over real and p -adic fields.

Abstract: For a linear differential equation defined over a differential field K with field of constants k , a Picard-Vessiot field is a differential field extension L of K containing a full space of solutions of the equation, V , differentially generated by V over K and with field of constants equal to k . When k is algebraically closed, Kolchin established the existence of a Picard-Vessiot field and its unicity, up to a K -differential isomorphism. Jointly with Zbigniew Hajto and Marius van der Put, we have obtained the existence of a real (resp. p -adic) Picard-Vessiot field when K is a real (resp. p -adic) differential field and k is real closed (resp. p -adically closed), together with a unicity result. The proof uses Deligne's work on Tannakian categories and a result of Serre on Galois cohomology. In my talk I will present our result and discuss some features of Picard-Vessiot fields and differential Galois groups in the real case.

Byunghan Kim

Title: The Lascar Galois groups and type-amalgamations.

Abstract: Let $p(x)$ be a strong type over say $\emptyset = acl^{eq}(\emptyset)$ in an arbitrary complete theory T . Now fix an independence relation satisfying 5 basic axioms (At least one such exists by putting every triple of sets independent). Then using the independence, one can define the first homology group $H_1(p)$ of p measuring a complexity of type-amalgamations in p . We show that $H_1(p)$ is isomorphic to a quotient group of a relativized Lascar group of p , so indeed it is independent from the choice of the independence. This gives the following criterion: p is a Lascar type iff $H_1(p)$ is trivial and a relativized Lascar group of p is abelian. I will talk about some applications of the criterion too. This is a joint work with Jan Dobrowolski and Junguk Lee.

Omar León Sánchez

Title: Poisson algebra representations via model theory.

Abstract: In the study of irreducible representations of Poisson algebras the primitive Poisson ideals play a crucial role. It is thus important to give useful characterizations of such ideals. In this talk I will explain how one can use the model theory of differential fields (with not necessarily commuting derivations) to tackle this problem in the case of Poisson-Hopf algebras. I will give definitions along the way. This is joint work with S. Launois.

Ludomir Newelski

Title: Countable relative categoricity over a set.

Abstract: I will recall the idea of constructing a countable model of a given theory T , provided a type-definable subset Q of it is given. If the resulting model is unique up to isomorphism (not necessarily fixing the set Q), T is called countably categorical over Q . There is a corresponding variant of the Ryll-Nardzewski theorem. I

will argue that the phenomenon of countable categoricity over a set is rather ubiquitous, although basically no general structural description is known here. The subject is vaguely related to topological dynamics.

Daniel Palacín

Title: Triviality and generalized amalgamation.

Abstract: I will explain some relation between generalized amalgamation, triviality and quantifier elimination in simple theories. Afterwards, I will discuss some consequences for finitely homogeneous structures.

Anand Pillay

Title: The Lascar group.

Abstract: I will discuss progress on various questions raised in the paper Galois groups of first order theories (2001), by Casanovas, Lascar, Ziegler, and myself, and related issues.

Bruno Poizat

Title: Medio y Simetría.

Abstract: En un grupo G , llamamos simetría de centro z la transformación involutiva $y = sz(x) = z.x^{-1}.z$; si cada uno elemento de G tiene una única raíz cuadrática, podemos definir el medio de (x, y) como el único centro z tal cual $y = sz(x)$. Vamos a estudiar dos contextos donde la clausura de un conjunto X por simetría $(x, y \in X \Rightarrow xy^{-1}x \in X)$ es equivalente a su clausura para tomar el medio : el primero es el contexto de los subconjuntos de grupos periódicos sin involuciones, y el segundo lo de los conjuntos definisables en un grupo de rango de Morley finito sin involuciones. Esos conjuntos, que llamamos convexos, aparecieron en la demostración de Frécon sobre la inexistencia de los grupos malos de rango tres ; se puede mostrar que ningun grupo malo tiene conjuntos convexos otros que puntos, derechas o el espacio total ; por mala suerte, no basta para una prueba de inexistencia en dimensión mas alta que tres.

Frank. O. Wagner

Title: Strictly two-transitive groups of finite Morley rank

Abstract: Strictly two-transitive permutation groups are a special case of Frobenius groups (groups satisfying the hypotheses of Frobenius' theorem), and Frobenius' theorem is an essential ingredient in the proof of the Feit-Thompson odd order theorem, which is the starting point for the classification of the finite simple groups. It thus seems relevant to try to classify strictly two-transitive permutation groups of finite Morley rank. Nesin has conjectured that they are just the affine transformations over an algebraically closed field. We shall prove this conjecture in characteristic three, and give partial results in characteristic different from three. This is joint work with Tuna Altinel and Ayse Berkman.

Martin Ziegler

Title: Pairs of algebraically closed fields are equational.

Abstract: This is joint work with Amador Martin Pizarro. We prove that pairs of algebraically closed fields are equational.