Descriptive Set Theory
Théorie descriptive des ensembles
(Org: **Marcin Sabok** (McGill))

DANA BARTOSOVA, University of Sao Paulo
Problems about Boolean algebras in topological dynamics

We will recall that for a group of automorphisms of a discrete structures the universal minimal dynamical system and the greatest ambit have zero-dimensional phase spaces. We will raise questions about the Boolean algebras of clopen sets of these spaces and explain their connections to Ramsey theory.

CLINTON CONLEY, Carnegie Mellon University
Projective separability and incomparable actions of free groups

In 2005 Gaboriau and Popa exhibited a family of continuum-many pairwise orbit inequivalent actions of the free group on two generators. Subsequently, building upon work of Ioana, Hjorth strengthened this to obtain continuum-many actions whose equivalence relations are pairwise incomparable under Borel reducibility. We discuss how stratification techniques allow us to find such collections of actions below projectively separable equivalence relations. This is joint work with Ben Miller.

JAKUB JASINSKI,
Canonical partitions of countable k-regular random hypergraphs

The computation of the Ramsey degrees of elements of a Fraïsse class has a "global" analogue. The latter involves constructing the so-called *canonical partitions* of the corresponding homogeneous structure. The relatively short list of structures whose canonical partitions were found thus far includes countable homogeneous binary relational structures. We establish canonical partitions of countable k-regular random hypergraphs. This is joint work with Norbert Sauer and Claude Laflamme.

BURAK KAYA, Rutgers University
The complexity of topological conjugacy of pointed Cantor minimal systems

In this talk, we will analyze the Borel complexity of the topological conjugacy relation on pointed Cantor minimal systems and show that it is Borel bireducible with the Borel equivalence relation $\Delta_{\mathbb{R}}^{+}$, where $^{+}$ denotes the Friedman-Stanley jump. Moreover, $\Delta_{\mathbb{R}}^{+}$ turns out to be a lower bound for the Borel complexity of topological conjugacy of Cantor minimal systems. If time permits, we shall discuss some applications of our results to properly ordered Bratteli diagrams.

MARTINO LUPINI, California Institute of Technology
Polish groupoids and the classification of operator algebraic varieties

I will give an introduction to the classification problem for operator algebraic varieties and their multiplier algebras. I will then present the main ideas of the proof that multiplier algebras of operator algebraic varieties are not classifiable up to isomorphism by countable structures. The proof uses the theory of turbulence for Polish groupoids, which generalizes Hjoth's theory of turbulence for Polish group actions. This is joint work with Michael Hartz.

ANDREW MARKS, UCLA
Jump operations for Borel graphs

We introduce a jump operation on bipartite Borel graphs, defined by analogy with Louveau's jump operation on Borel equivalence relations. We show that if G is a bipartite Borel graph, then the jump of G is a bipartite Borel graph which has no

Borel homomorphism to G (though G has a Borel homomorphism to its jump). We also consider a jump analogous to the Friedman-Stanley jump, where there are interesting open questions. We use this jump operation to answer a question of Kechris and the speak. This is joint work with Adam Day.

BRICE MBOMBO, University of Sao paulo, Brazil
On topological groups with an approximate fixed point property

A topological group G has the Approximate Fixed Point (AFP) property on a bounded convex subset C of a locally convex space if every continuous affine action of G on C admits a net (x_i), $x_i \in C$, such that $x_i - gx_i \longrightarrow 0$ for all $g \in G$. In this work, we study the relationship between this property and amenability. This is a joint work with Cleon Barroso, and Vladimir Pestov.

JUSTIN MOORE, Cornell University
A finitely presented group of piecewise projective homeomorphisms

In this talk I will present an example of a finitely presented subgroup of the homeomorphism group of the unit interval which consists of piecewise projective homeomorphisms. This group is nonamenable and, by work of N. Monod, does not contain a nonabelian free subgroup. Its presentation contains three generators and nine relations. While Ol'shanskii and Sapir have previously constructed an example of a finitely presented counterexample to the von Neumann-Day problem, ours is the example with a small, explicit presentation. This is joint work with Yash Lodha.

DIANA OJEDA-ARISTIZABAL, University of Toronto
Topological partition relations for countable ordinals

For X, Y topological spaces and natural numbers l, m we write $X \longrightarrow (Y)^2_{l,m}$ if for every l-coloring of $[X]^2$, the unordered pairs of elements of X, there exists $Z \subseteq X$ homeomorphic to Y such that $c \restriction [Z]^2$ takes at most m colors. Recently C. Pina proved that ω^{ω^ω} is the least ordinal γ that satisfies $\gamma \longrightarrow (\omega^2+1)^2_{l,4}$ for all $l \in \mathbb{N}$ and where all ordinals are endowed with the order topology. The key of Pina's result is the use of certain families of finite sets to represent countable ordinals.

Using families of finite sets to represent countable ordinals, we begin our study with ordinals of the form $\omega \cdot k + 1$ with $k \geq 2$. We find that for every countable ordinal γ there exists a 3-coloring of $[\gamma]^2$ that can't be reduced in a copy of $\omega \cdot 2 + 1$. We set out to find for each $m \geq 3$ the least ordinal γ such that for every l we have that $\gamma \longrightarrow (\omega \cdot 2 + 1)^2_{l,m}$. It turns out that if $\gamma \longrightarrow (\omega \cdot 2 + 1)^2_{l,3}$ for every l, then already $\gamma \geq \omega^{\omega^\omega}$. We carry out a similar analysis for ordinals of the form $\omega \cdot k + 1$ with $k > 2$. This is joint work with William Weiss from the University of Toronto.

ARISTOTELIS PANAGIOTOPOULOS, University of Illinois at Urbana Champaign
Menger compacta and projective Fraisse limits

In every dimension n, there exists a canonical compact, metrizable space called the n-dimensional Menger space. For $n = 0$ it is the Cantor space and for $n = \infty$ it is the Hilbert cube. On the first part of the talk I will illustrate how basic notions of classical descriptive set theory naturally generalize into higher homotopical dimensions. In the second part of the talk I will use projective Fraisse machinery to provide a very canonical construction of the Menger-1 space and show that this object is highly homogeneous.

This is a joint work with Slawomir Solecki.

KONSTANTIN SLUTSKY, University of Illinois at Chicago
Lebesgue orbit equivalence of Borel flows

A Borel flow is a Borel measurable action of the Euclidean space $\mathbb{R}^d$ on a standard Borel space. Free Borel flows are said to be Lebesgue orbit equivalent if there is a Borel bijection between the phase spaces which sends orbits onto orbits and preserves the

Lebesgue measure within each orbit. We show that free non-smooth Borel flows are classified up to Lebesgue orbit equivalence by the number of ergodic invariant probability measures. This classification is in accordance with the classification of hyperfinite Borel equivalence relations by Dougherty, Jackson, and Kechris.

IIAN SMYTHE, Cornell University
Turbulence and Essential Equivalence of Subspaces

Using Hjorth's theory of turbulence, it can be shown that various equivalence relations induced by operator ideals on the space of bounded operators on a Hilbert space are not classifiable by countable structures. In particular, we examine essential equivalence of closed subspaces of a Hilbert space, realized as equivalence of the corresponding projections operators, modulo the compact operators. Even in this restricted setting, we recover non-classifiability. Similar results for non-reduction to orbit equivalence relations from Polish group actions will be discussed for equivalence modulo finite rank or finite dimension.

JURIS STEPRANS, York University
Complexity of weakly almost periodic functions

Given a group G one can consider the Banach algebra formed by the dual of the group algebra $\ell_1^{**}(G) = \ell_1(G)$. In determining when the two Arens products on this algebra agree, it is natural to consider the complexity of the weakly almost periodic functions as a subset of $\ell_\infty(G)$. This talk will discuss some calculations for specific groups.

SIMON THOMAS, Rutgers University
The isomorphism and bi-embeddability relations for finitely generated groups

I will discuss the isomorphism and bi-embeddability relations on the spaces of Kazhdan groups and finitely generated simple groups.

PHILLIP WESOLEK, Université catholique de Louvain
Chief factors in Polish groups

(Joint work with Colin Reid.) For a Polish group G, closed normal subgroups $L < K$ of G form a chief factor K/L if there is no closed normal subgroup of G strictly between L and K. Chief factors play an important role in the structure theory of finite groups. Surprisingly, the theory of chief factors admits a natural and useful extension to the setting of Polish groups. We discuss this theory and its two key ingredients, the association relation and normal compressions. We then outline a Schreier refinement theorem and a trichotomy theorem for topologically characteristically simple Polish groups. Time permitting, we discuss applications to locally compact Polish groups and finitely generated branch groups.

JINDRICH ZAPLETAL, University of Florida
Borel reducibility of ideal equivalence relations

I introduce several combinatorial properties of ideals I on natural numbers that make it possible to prove negative results regarding the Borel reducibility of the equivalence relation modulo I to other analytic equivalence relations.

JOSEPH ZIELINSKI, University of Illinois at Chicago
Compact metrizable structures and classification problems

We consider metrizable compact spaces equipped with closed relations. The natural notion of equivalence between such structures is homeomorphic isomorphism. Through this notion, we establish bounds for classification problems in Borel reducibility. Portions of this talk are based on joint work with C. Rosendal.