Logic and Applications
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SHAUN ALLISON, Carnegie Mellon University
Polish groups with the pinned property

Given an analytic equivalence relation E on a Polish space X with all classes Borel, one can define a "virtual E-class" to be a infinity-Borel code which becomes a Borel code for an E-class in any generic extension in which it becomes herediarily countable. For example, the virtual $=^+$-classes correspond to the (possibly uncountable) sets of reals. Then E is considered "pinned" iff every virtual E-class is realized in the ground model. A Polish group G has the "pinned property" iff for every Polish G-space X, the induced orbit equivalence relation E_X^G is pinned. We give an overview of results of Hjorth and Larson-Zapletal, as well as some original work, towards the goal of giving an algebraic characterization of the Polish groups with the pinned property in different models of set theory, such as the Solovay model.

MATT BOWEN, McGill
Monochromatic products and sums in $\mathbb{N}$

An old question of Hindman asks if every finite coloring of $\mathbb{N}$ contains monochromatic sets of the form $\{x, y, xy, x+y\}$. Although this remains open, there have been several recent advances in the field of non-linear Ramsey theory, including Moreira's proof that any finite coloring of $\mathbb{N}$ contains monochromatic sets of the form $\{x, xy, x+y\}$. In this talk I will discuss some refinements of this result, including a proof of the 2-color case of Hindman's question and a common extension of Moreira's theorem and Rado's theorem on linear Ramsey families.

FILIPPO CALDERONI, UIC
Descriptive set theory: order and classification

We shall discuss recent applications of descriptive set theory to ordered groups. First we shall analyze various examples of orderable groups whose Borel space of left-invariant orders, modulo the conjugacy relation, is not standard. Most notably, the conjugacy relation on the space of left-invariant orders of $\mathbb{F}_2$ is a universal countable Borel equivalence relation. Next we shall investigate the complexity of the isomorphism relation on countable ordered Archimedean groups from the viewpoint of Borel reducibility. Time permitting, we shall discuss anti-classification results that prevent classifying ordered Archimedean groups by countable subsets of reals. This includes joint work with A. Clay and with D. Marker, L. Motto Ros, and A. Shani.

TABOKA CHALEBGWA, McMaster University
A remark on certain Schanuel n-tuples for the j-function.

The famous conjecture of Schanuel states that given any n complex numbers $\alpha_1, \ldots, \alpha_n$ that are $\mathbb{Q}$-linearly independent, the transcendence degree of the field extension $\mathbb{Q}(\alpha_1, \ldots, \alpha_n, e^{\alpha_1}, \ldots, e^{\alpha_n})$ is at least n over $\mathbb{Q}$. A rather curious result of K Senthil Kumar states that for any $\mathbb{Q}$-linearly independent tuple $\alpha_1, \ldots, \alpha_n$, there exits uncountably many $c \in \mathbb{C}$ such that the transcendence degree of the field extension $\mathbb{Q}(c\alpha_1, \ldots, c\alpha_n, e^{c\alpha_1}, \ldots, e^{c\alpha_n})$ is at least n over $\mathbb{Q}$. In this talk we will explore a method for obtaining a modular (j-function) analogue of this result.

WILLIAM CHAN, Carnegie Mellon University
Definable Combinatorics of the First Uncountable Cardinal

Under the axiom of determinacy, the first uncountable cardinal ω_1 has the strong partition property which implies that for each $\epsilon \leq \omega_1$, the ϵ-length partition filter, μ_ϵ, is a countably complete ultrafilter. For $1 \leq n < \omega$, ω_{n+1} is the ultrapower of ω_1 by μ_n

and these ultrapower representations are important for combinatorics below ω_ω. Goldberg asked what is the ordertype of the ultrapower of ω_1 by all the other partition measures μ_ϵ when $\omega \leq \epsilon \leq \omega_1$. This talk will discuss progress on this question and other applications to combinatorics of determinacy. This will include club uniformization principles, continuity properties of functions on sequence of countable ordinals, and cardinality computations under determinacy. This is joint work with Stephen Jackson and Nam Trang.

RONNIE CHEN, University of Illinois at Urbana-Champaign
A universal characterization of standard Borel spaces

Standard Borel spaces are widely used in descriptive set theory as a basic model of "definable set", admitting many familiar "countable first-order" set operations such as countable products, countable disjoint unions, etc. We give a category-theoretic justification for the canonicity of the category of standard Borel spaces, by showing that it is the free category admitting some of the aforementioned operations subject to some simple compatibility conditions (e.g., products distribute over disjoint unions). In this talk, we will discuss the precise formulation of this result, its connection with the theory of κ-complete Boolean algebras, and its proof using methods from categorical logic.

TOMASZ CIESLA, Lancaster University
On lifting invariant probability measures

I'll discuss the following question posed by Feliks Przytycki. Let X be a Polish space with a Borel probability measure μ. Let $T\colon X \to X$ be a pmp map. Let Y be a Polish space and $S\colon Y \to Y$ a continuous map. Suppose that $p\colon Y \to X$ is a Borel surjection such that $p \circ S = T \circ p$. Does μ lift to an S-invariant Borel probability measure ν on Y?

It turns out that if the sets $p^{-1}(x)$ are compact for all $x \in X$ then an S-invariant lift of μ exists. A similar result is true in a more general setting when an amenable semigroup acts on X and Y by pmp maps and continuous maps, respectively, and the actions commute with p. On the other hand, for non-amenable semigroups the result does not hold in general.

NOE DE RANCOURT, University of Vienna
Intersection-smooth equivalence relations

This talk is based on a joint work in progress with Benjamin Miller and Zoltán Vidnyánszky. We introduce the notion of intersection reduction, a generalization of the usual notion of Borel reduction between equivalence relations on Polish spaces. Our main result is a generalization of Kechris–Louveau's $\mathbb{E}_1$-dichotomy to the class of so-called *intersection-smooth* equivalence relations, that is, the class of all equivalence relations that are intersection-reducible to the equality on $\mathbb{R}$. This class contains, in particular, all countable unions of essentially countable equivalence relations, as well as $\mathbb{E}_1$. Consequences and connected results will also be presented.

SAEED GHASEMI, Institute of Mathematics of the Czech Academy of Sciences
Strongly self-absorbing C-algebras and Fraïssé limits*

A unital separable C*-algebra (other than the C*-algebra of all complex numbers) is strongly self-absorbing if it is isomorphic to its (minimal) tensor product with itself, in a "strong" sense. Strongly self-absorbing C*-algebras play a crucial role in Elliott's classification program of separable nuclear C*-algebras by K-theoretic data. Among them, the Jiang- Su algebra $\mathcal{Z}$ has a special place and, to this date, the classification of separable, simple, unital, nuclear C*-algebras that tensorially absorb $\mathcal{Z}$ and satisfy the UCT has been the most remarkable achievement of the classification program. In their original paper from 1999, Jiang and Su already proved that $\mathcal{Z}$ is strongly self-absorbing. However, their proof uses heavy results and machinery from the classification, such as KK-theory. I will outline an easier proof of the fact that $\mathcal{Z}$ is strongly self-absorbing which does not depend on any classification results, via establishing a general connection between the strongly self-absorbing C*-algebras and the "Fraïssé limits" of categories of C*-algebras that are sufficiently closed under tensor products. It was previously known that $\mathcal{Z}$ can be realized as the Fraïssé limit of the category of its building blocks and unital trace-preserving embeddings.

BRADD HART, McMaster University
Undecidability and embedding problems in continuous logic

In their recent work, MIP*=RE, Ji et al use quantum complexity theory to resolve the Connes embedding problem. Together with Isaac Goldbring, we realized that this also showed that the universal theory of certain II_1 factors (particular von Neumann algebras) had undecidable continuous universal theories. There was a certain Gödelian aspect to the proof which I will highlight in this talk. This technique applies to other embedding problems and I will give some examples.

DEIRDRE HASKELL, McMaster

JAN HUBICKA, Department of Applied mathematics
Big Ramsey degrees of the homogeneous universal partial order

We apply the Carlson-Simpson theorem to show that the homogeneous universal partial order are finite. This new construction has several other applications; in particular, it gives the first direct proof of a theorem by Dobrinen on big Ramsey degrees of the universal homogeneous triangle-free graph. We also discuss the generalization to the triangle constrained strong amalgamation classes in binary language satisfying certain completion property and if time allows discuss actual big Ramsey degrees which is a joint project with Balko, Chodounsky, Dobrinen, Konecny, Nesetril, Vena, and Zucker.

DAKOTA IHLI, University of Illinois at Urbana-Champaign
What generic automorphisms of the random poset look like

The Fraïssé limit of the class of finite posets, also called the random poset, admits generic automorphisms — that is, its automorphism group admits a comeagre conjugacy class. This result, due to D. Kuske and J. Truss, was proven without explicitly describing the automorphisms in question. Here we give a new, concrete description of the generic automorphisms, and we discuss the tools-and-tricks involved.

COLIN JAHEL, Université Claude Bernard Lyon 1
Actions of automorphism groups of Fraïssé limits on the space of linear orderings.

In 2005, Kechris, Pestov and Todorcevic exhibited a correspondence between combinatorial properties of structures and dynamical properties of their automorphism groups. In 2012, Angel, Kechris and Lyons used this correspondence to show the unique ergodicity of all the actions of some groups. In this talk, I will give an overview of the aforementioned results and discuss recent work generalizing results of Angel, Kechris and Lyons.

CHRIS KAPULKIN, University of Western Ontario
Canonicity for Homotopy Type Theory

I will outline a proof, joint with Sattler, of Voevodsky's conjecture asserting that univalent type theory has the (homotopy) canonicity property. The proof is based on Artin's gluing, adapted to models of dependent type theory by Shulman and homotopical inverse diagram models of homotopy type theory, developed jointly with Lumsdaine.

JAMAL KAWACH, University of Toronto
Fraïssé and Ramsey properties of Fréchet spaces

A topological group G is *extremely amenable* if every continuous action of G on a compact Hausdorff space has a common fixed point. In 2005, Kechris, Pestov and Todorčević showed that Fraïssé theory provides a useful link between extreme amenability

and Ramsey theory. In this talk we will survey some recent Fraïssé-theoretic developments in the context of Fréchet spaces, which we view as topological vector spaces equipped with a compatible sequence of semi-norms. We will define an approximate Ramsey property of finite-dimensional Fréchet spaces, and we will see how this property is related to the extreme amenability of the automorphism groups of approximately ultrahomogeneous Fréchet spaces.

This is joint work in progress with Jordi López-Abad.

ANTONINA KOLOKOLOVA, Memorial

CLAUDE LAFLAMME, University of Calgary
How many siblings do you have?

Two structures are *siblings*, or *equimorphic*, if each embeds in the other. The famous Cantor-Bernstein-Schroeder Theorem states that, in a language with pure equality, equimorphic structures (sets) are isomorphic. This is the case for various other structures, but in the general equimorphic structures need not to be isomorphic.

The main objective of this program is to understand these equimorphic structures, with a first step being simply to count siblings (up to isomorphy).

Bonato and Tardif conjectured [06] that any tree having a non-isomorphic sibling must have infinitely many such siblings (up to isomorhism). Thomassé proposed a related conjecture [00], that any countable relational structures with at most countably many relations must have either one, $\aleph_0$, or $2^{\aleph_0}$ siblings (up to isomorhism).

We will briefly review progress made on those conjectures and present recent joint results on $\aleph_0$-categorical structures.

Both conjectures remain open.

PAVLOS MOTAKIS, York University
Coarse Universality

The Bourgain index is a tool that can be used to show that if a separable Banach space contains isomorphic copies of all members of a class C then it must contain isomorphic copies of all separable Banach spaces. This can be applied, e.g., to the class R of separable reflexive spaces. Notably, the embedding of each member of R does not witness the universality of X. We investigate a natural coarse analogue of this index which can be used, e.g., to show that a separable metric space that contains coarse copies of all members in certain "small" classes of metric spaces C then X contains a coarse copy of c_0 and thus of all separable metric spaces.

This is joint work with F. Baudier, G. Lancien, and Th. Schlumprecht.

ARISTOTELIS PANAGIOTOPOULOS, WWU
Dynamical obstructions to classification by (co)homology and other TSI-group invariants.

One of the leading questions in many mathematical research programs is whether a certain classification problem admits a "satisfactory" solution. Hjorth's theory of turbulence provides conditions under which such a classification problem cannot be solved using only isomorphism types of countable structures as invariants. In the same spirit, we will introduce "unbalancedness": a new dynamical obstruction to classification by orbits of a Polish group which admits a two-side invariant metric (TSI). We will illustrate how "unbalancedness" can be used for showing that a classification problem cannot be solved by classical homology and cohomology invariants, and we will apply these ideas to attain anti-classification results for the isomorphism problem of Hermitian line bundles.

This is joint work with Shaun Allison.

DINO ROSSEGGER, University of Waterloo
Degree spectra of analytic complete equivalence relations

We present new results on the complexity of the classification problem of countable structures and their computational complexity. We show that the elementary bi-embeddability relation on the class of graphs is analytic complete under Borel reducibility by giving a reduction from the bi-embeddability relation on graphs. We then compare the degree spectra with respect to these equivalence relations. The degree spectrum of a countable structure with respect to an equivalence relation E is the set of Turing degrees of structures E equivalent to it. We show that the degree spectra of structures with respect to bi-embeddability and elementary bi-embeddability are related: Every bi-embeddability spectrum of a graph is the set of jumps of Turing degrees in the elementary bi-embeddability spectrum of a graph.

ASSAF SHANI, Harvard University
Classification by sequences of countable sets of reals

We study Borel equivalence relations which can be completely classified by countable sequences of "definably countable" sets of reals. We define an equivalence relation which is arguably maximal with this property, and study it in comparison to other known Borel equivalence relations.

FORTE SHINKO, Caltech
Lifts of Borel actions on quotient spaces

Given a countable Borel equivalence relation E and a countable group G, we study the problem of when a Borel action of G on X/E can be lifted to a Borel action of G on X. This is joint work with Joshua Frisch and Alexander Kechris.

RILEY THORNTON, UCLA
Factor of i.i.d. processes and Cayley diagrams

Let G be a Cayley graph for a countable group Γ. This talk will look at when Γ-f.i.i.d. solutions (or approximate solutions) to local labelling problems on G lift to $aut(G)$-f.i.i.d. solutions. In particular we'll show that this lifting is always possible when G admits an $aut(G)$-f.i.i.d. (approximate) Cayley diagram and establish some results on which graphs admit such diagrams.

SPENCER UNGER, University of Toronto
Embeddings and factor maps between $\mathbb{Z}^d$ actions

We present several results on the existence of Borel embeddings and factor maps into natural spaces of colorings, tilings and Hamilton paths of the Cayley graph of $\mathbb{Z}^d$. This is joint work with Nishant Chandgotia.

ZOLTÁN VIDNYÁNSZKY, California Institute of Technology
Bases for Borel graphs of large chromatic number: injective case

The Kechris-Solecki-Todorcevic dichotomy states that there is a single element basis for Borel graphs with uncountable Borel chromatic number ordered by Borel homomorphisms. Recently, an analogous theorem has been found for Borel graphs with Borel chromatic number at least 3. We discuss what happens in the above cases when the Borel homomorphisms are required to be injective.

FELIX WEILACHER, Carnegie Mellon University
Descriptive Chromatic Numbers of Locally Finite and Everywhere Two Ended Graphs

We construct Borel graphs which settle or advance several questions in descriptive graph combinatorics. The theme of these questions is "What can the discrete structure of a Borel graph tell us about its descriptive combinatorics?". Specific instances we may discuss include "What bounds does the (discrete) chromatic number place on the Baire measurable chromatic number?", the analogous question in the Borel probability measure setting, and "What does the Cayley graph of a group tell us about its Bernoulli shift?".

MICHAEL WOLMAN, Caltech
Probabilistic Programming Semantics for Name Generation

In this talk we present a probabilistic model for name generation. Specifically, we interpret the nu-calculus, a simply-typed lambda-calculus with name generation, in the category of quasi-Borel spaces, an extension of the category of standard Borel spaces supporting both measure theory and higher-order programming. We prove that this model is fully abstract at first-order types. This is joint work with Marcin Sabok, Sam Staton and Dario Stein.

KONRAD WROBEL, Texas A&M University
Cost of inner amenable equivalence relations

Cost is a $[1, \infty)$-valued measure-isomorphism invariant of equivalence relations defined by Gilbert Levitt and heavily studied by Damien Gaboriau. For a large class of equivalence relations, including aperiodic amenable, the cost is 1. Yoshikata Kida and Robin Tucker-Drob recently defined the notion of an inner amenable equivalence relation as an analog of inner amenability in the setting of groups. We show inner amenable equivalence relations also have cost 1. This is joint work with Robin Tucker-Drob.

JENNA ZOMBACK, University of Illinois at Urbana Champaign
A backward ergodic theorem and its forward implications

A pointwise ergodic theorem for a transformation T on a probability space equates the global property of ergodicity of the transformation to its pointwise combinatorics. Our main result is a backward (in the direction of T^{-1}) ergodic theorem for countable-to-one probability measure preserving (pmp) transformations T. We discuss examples of such transformations, including the shift map on Markov chains, which yields a new (forward) pointwise ergodic theorem for pmp actions of finitely generated countable groups. This is joint work with Anush Tserunyan.

ANDY ZUCKER, UC San Diego
Big Ramsey degrees via coding trees

Recently, Dobrinen has shown that for every k, the class of k-clique free graphs has finite big Ramsey degrees. In this talk, I will discuss a generalization and simplification of this result which works for almost any binary free amalgamation class in a finite language. Time permitting, I will discuss joint work in progress with Balko, Chodounsky, Dobrinen, Hubicka, Konecny, and Vena which characterizes the exact big Ramsey degrees for these classes.