Descriptive Set Theory
Théorie descriptive des ensembles
(Org: **Marcin Sabok** (McGill University) and/et **Assaf Shani** (Concordia University))

NATE ACKERMAN, Harvard University
A Counterexample to the Infinitary Vaught Conjecture

The infinitary Vaught conjecture is the statement that every sentence of $L_{\omega_1,\omega}$ (in a countable language) has either countably many our continuum many countable models. This is equivalent to the statement that any Borel action of S_∞, the permutation group of the unique countably infinite set, has countably or continuum many orbits. In this talk I will discuss a counterexample to the infinitary Vaught conjecture.

This is joint work with Cameron Freer and Robin Knight.

JOHN CLEMENS, Boise State University
A reflection principle for co-anaalytic sets

The First Reflection Theorem says that for any Π^1-on-Σ^1_1 property Φ, if an analytic set A satisfies Φ then there is a Borel set $B \supseteq A$ which satisfies Φ. We say that Φ satisfies Bounded Reflection if the previous set B can be found of a fixed Borel rank, and Φ satisfies Π^1_1-Reflection if this holds for co-analytic sets A as well. We show that for a suitable class of properties Φ, the statement that every Φ satisfying Bounded Reflection also satisfies Π^1_1-Reflection is equivalent to the Perfect Set Property for Π^1_1-sets. This is joint work with Jindra Zapletal.

CECELIA HIGGINS, Rutgers University, New Brunswick
Spectral theory and descriptive combinatorics for Borel pmp graphs

In classical spectral graph theory, one associates to finite graphs Hermitian matrices, such as the adjacency matrix, that encode graphical information. The spectral properties of these matrices are then leveraged to analyze the combinatorial features, including vertex coloring, edge coloring, and matching, of the corresponding graphs. Analogously, one can associate bounded, self-adjoint operators, such as the adjacency operator, to Borel pmp graphs of bounded degree. In this talk, we present new descriptive combinatorics results for pmp graphs that involve the application of spectral theory to their associated operators. This is joint work with Pieter Spaas, Alexander Tenenbaum, and Sofia Torelli.

JOEY LAKERDAS-GAYLE, University of Waterloo
Big Ramsey degrees and posets of ages in infinitely-constrained binary free amalgamation classes

For a finite binary relational language L and a family $\mathcal{F}$ of finite irreducible L-structures, $\mathrm{Forb}(\mathcal{F})$ is the Fraïssé class of finite $\mathcal{F}$-free L-structures. Generalizing methods of Dobrinen, Zucker showed that $\mathrm{Forb}(\mathcal{F})$ has finite big Ramsey degrees when $\mathcal{F}$ is finite, while Sauer showed that there are infinite families $\mathcal{F}$ for which vertices have infinite big Ramsey degree. We study the possible structure of the associated partial orders known as posets of ages, and construct an infinitely-constrained binary free amalgamation class with finite big Ramsey degrees, providing a counterexample to a conjecture of Balko, Chodounský, Dobrinen, Hubička, Konečný, Vena, and Zucker. This is joint work with Andy Zucker.

SAM MURRAY, McGill University

BO PENG, McGill University
Anti-classification results in ergodic theory

Joint work with Philipp Kunde, some progress in anti-classification theory.

SPENCER UNGER, University of Toronto
Projections between Ramsey quasi-orders

A Ramsey quasi-order is a Polish space equipped with a definable quasi-order in which analytic subsets satisfy a natural Ramsey property with respect to the ordering. There are many natural such orders, for example: infinite subsets of natural numbers under containment, block sequences from FIN_k under reduction, strong subtrees of the complete binary tree under containment and sequences of variable words under substitution and concatenation. We introduce a framework for comparing these Ramsey quasi-orders and show that under natural assumptions, monotone maps between these quasi-orders transfer their Ramsey properties if and only if they map generic filters to generic filters. In this case we say that there is a "weak projection" between the Ramsey quasi-orders. Applying this definition to a large collection of Ramsey quasi-orders from the literature, we are able to give a fairly complete picture of which of them do and do not weakly project to each other. This is joint work with Clement Yung.

NARMADA VARADARAJAN, University of Toronto
Continuous combinatorics and LOCAL algorithms

Given a class of graphs and a coloring problem, what is the optimal complexity of a solution? A descriptive set theorist reading this will insert the word 'Borel' in front of as many words as they can, while a computer scientist will interpret it as an algorithmic question about finite graphs. It turns out that they are still asking the same question (almost). My talk will give an overview of the translation between LOCAL algorithms on finite graphs and Borel solutions on infinite Borel graphs, focusing on the case of continuous solutions. For some graph classes (trees and Cayley graphs), continuous solutions are exactly equivalent to fast LOCAL algorithms. I will discuss my current research on extending this equivalence to all graph classes. If time permits (which it rarely does in a math talk), I will also talk about other open problems in this area.