1. A partition theorem for trees

**Antonio Aviles.** We present a new partition theorem for subsets of the $n$-adic tree that takes into account what we call “the record structure”, and some applications. This is a joint work with Stevo Todorcevic, from a paper to appear in Publ. Math. IHES.

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2. Finite Gowers’ FIN$_k$ Theorem with multiple tetris-like operations

**Dana Bartosova.** Striving for an explicite description of the universal minimal flow of the homeomorphism group of a continuum known as the Lelek fan, we encounter the problem of proving that a certain projective class of finite trees satisfies the Ramsey property. This amounts to generalizing Gowers’ FIN$_k$ Theorem, and Miliken-Taylor’s Theorem about colouring finite sequences in FIN$_k$, to include not only one tetris operations, but $k$-many operations that behave as the identity up to some value, and as tetris above. We will present main ideas of the proofs, the correspondence with the Ramsey property for finite trees and the link with the original problem in topological dynamics. This is a joint work with Aleksandra Kwiatkowska.

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3. Generic Ultrafilters and Partition Properties

**Andreas Blass.** I plan to discuss partition properties of ultrafilters on countable sets, especially in connection with ultrafilters produced by certain forcing constructions. I’ll start with the “best” ultrafilters, the selective ones, for which many partition properties and related genericity properties have long been known. Then I’ll turn to the “next best thing to a $P$-point”, a kind of ultrafilter that I studied in joint work with Natasha Dobrinen and Dilip Raghavan. After reviewing some of that work, I’ll describe some additional partition properties and their connection with genericity. I’ll also describe how the proofs of these properties led to an unexpected connection with selectivity.

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4. A theory of stationary trees and the Balanced Baumgartner-Hajnal-Todorcevic Theorem for trees

Ari Meir Brodsky. Building on early work by Stevo Todorcevic, we develop a theory of stationary subtrees of trees of successor-cardinal height. We define the diagonal union of subsets of a tree, as well as normal ideals on a tree, and we characterize arbitrary subsets of a non-special tree as being either stationary or non-stationary. We then use this theory to prove the following partition relation for trees:

Main Theorem. Let $\kappa$ be any infinite regular cardinal, let $\xi$ be any ordinal such that $2^{|\xi|} < \kappa$, and let $k$ be any natural number. Then

$$\text{non-}(2^{<\kappa})\text{-special tree} \rightarrow (\kappa + \xi)^2.$$

This is a generalization to trees of the Balanced Baumgartner-Hajnal-Todorcevic Theorem, which we recover by applying the above to the cardinal $(2^{<\kappa})^+$, the simplest example of a non-$(2^{<\kappa})$-special tree. As a corollary, we obtain a general result for partially ordered sets:

Theorem. Let $\kappa$ be any infinite regular cardinal, let $\xi$ be any ordinal such that $2^{|\xi|} < \kappa$, and let $k$ be any natural number. Let $P$ be a partially ordered set such that $P \rightarrow (2^{<\kappa})^1_{2^{<\kappa}}$. Then

$$P \rightarrow (\kappa + \xi)^2.$$

References


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5. Ordinal indices and the persistence of $\ell_1$ structure

Ryan Causey. We recall several different methods for quantifying $\ell_1$ structure in Banach spaces. We look at several analogues of James’ proof of the non-distortability of $\ell_1$. We also deduce several dichotomy theorems for subspaces and quotients of a given space. We observe applications to computation of Szlenk index, the Bourgain $\ell_1$ index, higher order spreading models, and distortion.

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6. Borel Ramsey properties of orthogonal families of measures

Clinton Conley. As shown by Galvin, when attention is restricted to Borel colorings the continuum satisfies Ramsey’s theorem for pairs (in the sense that any Borel coloring of pairs is homogeneous on a perfect set). A similar property holds at the next Borel cardinal, $2^\omega / E_0$. We discuss related facts working in the context of definable orthogonal families of Borel probability measures, and connect this to analysis of smoothness of measure equivalence on various collections of measures associated with countable Borel equivalence relations. This is joint work with Ben Miller.
7. Nonstandard integers, indempotent ultrafilters, and partition regularity of diophantine equations

Mauro Di Nasso. By using the hyper-natural numbers of nonstandard analysis, we give foundations to a peculiar way of manipulating idempotent ultrafilters and their linear combinations. The resulting formalism is suitable for applications in Ramsey theory of numbers. As examples of the use of our technique, we present a (rather) short proof of Milliken-Taylor’s Theorem, and an ultrafilter version of Rado’s theorem about partition regularity of diophantine equations. Time permitting, we will also outline the nonstandard use of ultrafilters in the study of partition regularity of non-linear equations.

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8. Ramsey properties and selectors for equivalence relations

Carlos Di Prisco. We will present several results concerning partition properties of collections of sets of natural numbers, stressing connections with the existence of selectors for equivalence classes of certain equivalence relations. Among several types of partitions, we will consider partitions that are invariant under finite changes as well as partitions that are not invariant but cyclic. Some of the results that will be presented are part of work done with J. Henle, A.R.D. Mathias and S. Todorcevic.

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9. Topological Ramsey spaces

Natasha Dobrinen. We present recent work of Dobrinen, Mijares, and Trujillo in [2] and of Dobrinen in [1] in which new classes of topological Ramsey spaces are constructed. We shall give an overview of these works, including a new Erdős-Rado type of theorem for equivalence relations on products of certain Fraïssé classes with the Ramsey property, the Ramsey-classification theorems obtained, and their application to finding initial structures in the Tukey types of ultrafilters, including some non-p-points.

References


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10. Ramsey type properties of definable ideals

Michael Hrusak. We study properties of definable ideals related to the Ramsey property. We call an ideal $I$ Ramsey if for every coloring of pairs of elements of an $I$-positive set there is an $I$-positive homogeneous set. Among other things we show that no tall $F_\sigma$ is Ramsey, while there is a tall co-analytic Ramsey ideal. The question of existence of a Borel Ramsey ideal is raised and studied. This is a joint work with D. Meza, E. Thuemmel and C. Uzcategui.

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11. Ramsey properties of finite measure algebras and topological dynamics

Alexander S. Kechris. I will discuss joint work with Miodrag Sokić and Stevo Todorcevic in topological dynamics and its connections with combinatorics, including, in particular, an open problem in finite Ramsey theory to which it leads.

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12. The wondrous graphs of Albin Jones

Jean Larson. Jones has introduced the family of wondrous graphs, a sub-collection of graphs whose sets of vertices are uncountable subsets of $\omega_1$. The family has some nice properties. For any wondrous graph and any uncountable subset of its vertices, the induced subgraph generated by that set is a wondrous graph. The wondrous graphs have an even nicer subcollection consisting of the simply wondrous graphs, with an analogous closure property. If $<$ is the usual order and $<'$ is another linear order of the vertices of a wondrous graph $G$ and the edges of $G$ are split into agreeable edges where the two orders agree and disagreeable edges on which they disagree, then either there is a simply wondrous subgraph with all agreeable edges or there is a subgraph with all disagreeable edges. This talk will review recent work of Jones on wondrous graphs.

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13. Sumsets contained in sets of positive density

Steven C. Leth. In this talk I will outline some results obtained jointly with Di Nasso, Goldbring, Jin, Lupini and Mahlburg. We use nonstandard methods to show that any subset of the natural numbers with Banach density greater than $1/2$ contains a set of the form $B + C$ where $B$ and $C$ are infinite. This provides a partial answer to an old question posed by Erdős, who conjectured that this conclusion holds for any set of positive lower density. A simple application of Ramseys Theorem shows that our result implies that if $A$ has positive Banach density (a weaker assumption than positive lower density) then there are infinite $B, C \subseteq \mathbb{N}$ and $k \in \mathbb{N}$ such that $B + C \subseteq A \cup (A + k)$. The talk will include a brief introduction to nonstandard methods in a combinatorial setting.

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14. **Subgroups of isometries of Urysohn-Katětov metric spaces of uncountable density**

**Brice Mbombo.** One of the central observations about the Urysohn universal metric space $\mathbb{U}$ is Uspenskij’s result stating that the group $\text{Iso}(\mathbb{U})$ is a universal Polish group: every second-countable topological group is isomorphic with a suitable topological subgroup of $\text{Iso}(\mathbb{U})$. The question of existence of a universal topological group of a given uncountable weight $m > \aleph_0$ remains open.

In this connection, it is rather natural to begin by examining the group of isometries of a non-separable version of the Urysohn space $\mathbb{U}_m$ constructed by Katětov for every cardinal $m$ such that: $\sup \{m^n : n < m\} = m$. We observe that in contrast with Uspenskij’s result the group $\text{Iso}(\mathbb{U}_m)$ is not a universal group of weight $m$ for $m$ uncountable. This is a joint work with Vladimir Pestov (University of Ottawa, Canada).

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15. **Better-Quasi-Ordering Partial Orders**

**Gregory Mckay.** In the 60s Nash Williams developed his theory of better-quasi-ordered (bqo) sets and proved that trees of height omega are well-quasi-ordered under embeddability (that is, there are no infinite descending chains or infinite antichains). Laver expanded Nash-Williams’ theorem and used it to prove that the sigma-scattered linear orders (countable unions of linear orders that do not embed the rationals) are bqo. Later he proved a similar theorem for a class of sigma-scattered trees. We present a generalisation of these theorems to a larger class of partial orders inspired among others by Thomasse’s proof that the countable “N-free” partial orders are bqo under embeddability.

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16. **On various strengthenings of the notion of indivisibility**

**Nadav Meir.** A structure $\mathcal{M}$ in a first order language $\mathcal{L}$ is indivisible if for every colouring of its universe $M$ in two colours, there is a monochromatic substructure $\mathcal{M}' \subseteq \mathcal{M}$ such that $\mathcal{M}' \cong \mathcal{M}$. Additionally, we say that $\mathcal{M}$ is symmetrically indivisible if $\mathcal{M}'$ can be chosen to be symmetrically embedded in $\mathcal{M}$ (That is, every automorphism of $\mathcal{M}'$ can be can be extended to an automorphism of $\mathcal{M}$), and that $\mathcal{M}$ is elementarily indivisible if $\mathcal{M}'$ can be chosen to be an elementary substructure. The notion of indivisibility is a long-studied subject. We will present these strengthenings of the notion notion, examples and some basic properties. We will define a new “product” of structures which preserves these notions and use this to answer some questions presented in [1] regarding the properties and interaction between these notions.

**References**

17. **Topological Ramsey spaces and metrically Baire sets**

**José G. Mijares.** This is a joint work with Natasha Dobrinen. We characterize a class of topological Ramsey spaces such that each element $R$ of the class induces a collection $\{R_k\}_{k<\omega}$ of projected metric spaces which have the property that every Baire set is Ramsey. This answers a question due to S. Todorcevic and generalizes the results of Carlson [1], Carlson-Simpson [2], Prömel-Voigt [3], and Voigt [4]. We also present a new family of topological Ramsey spaces contained in the aforementioned class which generalize the spaces of ascending parameter words of Carlson-Simpson [2] and Prömel-Voigt [3] and the spaces $FIN^{|\infty|}_m$, $0 < m < \omega$, of block sequences defined by Todorcevic [5].

**References**


18. **Universal minimal proximal flows of non-Archimedean Polish groups**

**Lionel Nguyen Van Thé.** Given a topological group $G$, certain classes of minimal $G$-flows admit a unique universal element. Proximal flows fall into that category, and the purpose of this talk will be to use the Kechris-Pestov-Todorcevic correspondence between structural Ramsey theory and topological dynamics to describe explicitly the universal object attached to various non-Archimedean Polish groups. This is a joint work with Julien Melleray (Université Lyon 1) and Todor Tsankov (Université Paris-Diderot).

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19. **Finite forms of Gowers’ Theorem on the oscillation stability of $c_0$**

**Diana Ojeda-Aristizabal.** The FIN$_k$ Theorem is closely related to the oscillation stability of the Banach space $c_0$. The stabilization of Lipschitz functions on arbitrary finite dimensional Banach spaces was studied well before by V. Milman. We give a constructive proof of the finite version of Gowers’ FIN$_k$ Theorem and analyse the corresponding upper bounds. We will also compare the finite FIN$_k$ Theorem with the finite stabilization principle in the case of spaces of the form $\ell^p_\infty$, $n \in \mathbb{N}$ and establish a much slower growing upper bound for the finite stabilization principle in this particular case.
20. From Well to Better, the Space of Ideals

Yann Pequignot. On the one hand, the ideals of a well quasi-order (wqo) naturally form a compact topological space into which the wqo embeds. On the other hand, Nash-Williams’ barriers are given a uniform structure by embedding them into the Cantor space.

We prove that every map from a barrier into a wqo restricts on a barrier to a uniformly continuous map, and therefore extends to a continuous map from a countable closed subset of the Cantor space into the space of ideals of the wqo. We then prove that, by shrinking further, any such continuous map admits a canonical form with regard to the points whose image is not isolated. As a consequence, we obtain a simple proof of a result on better quasiorders (bqo); namely, a wqo whose set of non principal ideals is bqo is actually bqo.

Joint work with Raphaël Carroy. Accepted for publication in Fundamenta Mathematicae.

21. Some problems on partition relations for countable ordinal spaces

Caribet Piña. In this talk, we will present some problems on partition relations of the type $\alpha \rightarrow (\text{top} \beta)^{k}_{l,m}$, where $\alpha$ and $\beta$ are countable ordinal spaces, and $k, m, l$ are positive integers. We shall briefly present the content of the paper [2]. Specifically, we will show the method used to prove some of the results in [2], in which we find bounds for $m$ in the partition relation $\alpha \rightarrow (\text{top} \omega^n + 1)^{k}_{l,m}$, for every $n$; and we obtain optimal values for $\alpha$ and $m$ when $n = 2$.

References


22. Functional classes

Miodrag Sokic. We give an overview of Ramsey results in the world of functional classes.

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23. Algebra and dynamics behind Galvin–Glazer–type results

**Slawomir Solecki.** Galvin–Glazer–type results are an important part of infinite Ramsey theory. A number of them are known. I will describe an algebraic setting that makes it possible to state a general such theorem, which I will state. It leads to a new kind of problems in dynamics of monoids, with monoids acting on compact semigroups via continuous homomorphisms.

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24. Partition regularity for infinite matrices

**Dona Strauss.** The theory of partition regular matrices plays a significant role in Ramsey Theory. Some of the important theorems of Ramsey Theory are equivalent to the statement that a particular matrix is partition regular. These include van der Waerden’s Theorem, Hindman’s Theorem and the Milliken–Taylor Theorem. The theory of the partition regularity of finite matrices is very well understood indeed, the partition regularity of a finite matrix with entries in $\mathbb{Q}$ is a computable property. The theory of partition regularity for infinite matrices is far less complete. I intend to describe some of the classical results of the theory, and to talk about new results obtained very recently.

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25. Ramsey spaces of trees

**Stevo Todorcevic.** We present several Ramsey spaces of trees. Many of them are motivated by specific applications which will be exposed as well in each such case.

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26. Topological Ramsey spaces, associated ultrafilters, and their applications to the Tukey theory of ultrafilters and Dedekind cuts of nonstandard arithmetic

**Timothy Trujillo.** I will present the main results from my PhD dissertation. The results are broken into three parts and comprise the final three chapters of the dissertation. From Chapter 3, we answer an open question of Dobrinen; namely, “for $n < \omega$, are the notions of Ramsey for $\mathcal{R}_n$ and selective for $\mathcal{R}_n$ equivalent?” We show that for each $n < \omega$, it is consistent with ZFC that there exists a selective for $\mathcal{R}_n$ ultrafilter which is not Ramsey for $\mathcal{R}_n$.

From Chapter 4, we extend results of Blass concerning Dedekind cuts associated to ultrafilter mappings from p-point and weakly-Ramsey ultrafilters to ultrafilter mappings from Ramsey for $\mathcal{R}_1$ ultrafilters. Blass associates to each ultrafilter $\mathcal{U}$ on a countable set $X$ and each function $g$ with domain $X$ a Dedekind cut in the model of arithmetic given by the ultrapower $\omega^{\text{ran}}(g)/g(\mathcal{U})$. We will characterize, under the continuum hypothesis, the cuts obtainable from an ultrafilter mapping from a Ramsey for $\mathcal{R}_1$ ultrafilter. We will also discuss the result that the only cut obtainable for ultrafilter mappings between p-points, which
are Tukey reducible to a given Ramsey for $\mathcal{R}_1$ ultrafilter, is the standard cut consisting of equivalence classes of constant sequences. These results imply existence theorems for various special kinds of ultrafilters.

From Chapter 5, we look at extensions of the work of Dobrinen and Todorcevic concerning the canonical Ramsey theory of $\mathcal{R}_1$ to the space $\mathcal{H}^2$ given by forming the product of the space $\mathcal{R}_1$ with itself. These results imply new existence theorems for initial Tukey structures of nonprincipal ultrafilters. These results shed light on the following open question of Dobrinen concerning the Tukey theory of ultrafilters, “what are the possible initial Tukey structures for ultrafilters on a countable base set?” In particular, the results we present show for the first time that it is consistent with ZFC that the four-element Boolean algebra appears as an initial Tukey structure.

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27. A general van der Corput lemma and underlying Ramsey theory

Anush Tserunyan. A major theme in ergodic Ramsey theory is proving multiple recurrence results for certain doubly recurrent (mixing) actions of semigroups. The amplification of double to multiple recurrence is usually done using a so-called van der Corput difference lemma for a suitable filter on the semigroup. Particular instances of this lemma (for concrete filters) have been proven before (by Furstenberg, Bergelson-McCutcheon, and others), with a different proof for each filter. We define a notion of differentiation for subsets of semigroups and isolate the class of filters that respect this notion. The filters in this class (call them Delta-filters) include all of those for which the van der Corput lemma was known, and our main result about them is a Ramsey theorem related to labeling edges between the semigroup elements with their ratios. An application of this theorem yields a van der Corput lemma for Delta-filters, generalizing all its previous instances.

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