TRISTAN BICE

Traces and Ultrapowers

Recent work by Matui–Sato has shown that certain classes of C*-algebras with a unique trace (eg. UHF algebras) also give rise to ultrapowers with a unique trace. Winters asked if, more generally, every trace on an ultrapower is necessarily a limit of traces on the original (separable) algebra. We show that this fails quite generally for C*-algebras with 'large enough' trace space. We also show how you can even get a trace 'coming out of nowhere', i.e. an element (x_n) of the ultrapower of A on which a trace is non-zero even though $t(x_n) = 0$ for every trace t on A. This is a joint work with Ilijas Farah.

BRADD HART

Model theory of operator algebras: the next generation

Although I will explain the basics of the underlying model theory - continuous logic and metric structures, I would like to examine a number of active directions of the interaction between model theory and operator algebras. These include a look a model theoretic formulation of the Connes embedding problem and some its consequences, the role of model theoretic stability, and classes of operator algebras and omitting types. This is joint work variously with Ilijas Farah, David Sherman, Isaac Goldbring, Thomas Sinclair and a Fields-MITACS undergraduate research team.

ILAN HIRSHBERG

Rokhlin dimension for automorphisms of C-algebras*

I'll discuss a notion of Rokhlin dimension for automorphisms of C*-algebras, generalizing the Rokhlin property (which can be thought of as Rokhlin dimension 0). Finite Rokhlin dimension is much more prevalent than the Rokhlin property, and indeed is generic in the Z-absorbing case, but is still strong enough for applications. This is joint work with Winter and Zacharias.

ADRIAN IOANA

Cartan subalgebras in amalgamated free product II_1 factors.

I will present some recent work on the structure of Cartan subalgebras in amalgamated free product II_1 factors. In particular, I will explain a result showing that any free ergodic probability measure preserving action of the free product $G = G_1 * G_2$ of any two groups satisfying $|G_1| > 1$ and $|G_2| > 2$, has a unique Cartan subalgebra, up to unitary conjugacy.

DAVID KERR

Independence, ultraproducts, and actions of sofic groups

I will discuss some recent work with Hanfeng Li in which we initiate a study of combinatorial independence in the context of sofic entropy. The project involves, among other things, ergodic theory on ultraproducts and applications to the Fuglede-Kadison determinant in group von Neumann algebras.

PAUL MCKENNEY

Automorphisms of Corona Algebras

I will discuss what is known about the automorphisms of some corona algebras under various set-theoretic assumptions (including recent joint work with Ilijas Farah). Results in this direction all tend towards a dichotomy, with unwieldy structure under the continuum hypothesis, and simpler structure under forcing axioms. I will try to give an idea of the theme throughout these results, and where next to look.

JULIEN MELLERAY

Generic properties of measure preserving actions

Given a countable group G, the space of all measure-preserving actions of G is naturally endowed with a Polish space structure; it is then interesting to understand which properties are generic. I'll talk about what is known on this subject, and focus on a related question: assume that H is a subgroup of a countable group G; when is it true that, for any comeager set of measure-preserving H-actions, the set of G-actions whose restriction belongs to this prescribed set is also comeager?

JOAV OROVITZ

Tracially $\mathcal{Z}$-absorbing C-algebras*

We introduce and discuss a tracial notion of Z-absorption for simple, unital C*-algebras. It is analogous to other "tracial" notions of regular properties (e.g. tracially AF algebras etc.). This notion is well-behaved under crossed products satisfying a weak tracial version of the Rokhlin property, and C*-algebras satisfying this property have strict comparison. In the nuclear setting, methods of Matui and Sato can be used to show that this notion is in fact equivalent to $\mathcal{Z}$-absorption. This is joint work with Ilan Hirshberg.

MIKAEL RØRDAM

Talk about a current joint project with Kirchberg about properties of the central sequence C*-algebra $A_\omega \cap A'$ and its relation to properties of A, inspired by the recent work of Matui and Sato.

N. CHRISTOPHER PHILLIPS

Existence of outer automorphisms of the Calkin algebra is independent of ZFC: One half of the proof

Let H be a separable infinite dimensional Hilbert space, for example, the space l^2 of all square summable sequences. Let $L(H)$ be the algebra of all continuous linear maps from H to H, and let $K(H)$ be the closure in $L(H)$ of the set of continuous linear maps which have finite rank. Then $K(H)$ is an ideal in $L(H)$, and we can form the quotient algebra $Q = L(H)/K(H)$. It is called the Calkin algebra, and is an example of a C*-algebra. Question: Does the Calkin algebra have outer automorphisms, that is, automorphisms not of the form $a \mapsto uau^{-1}$ for suitable $u \in Q$?

It turns out that this question is undecidable in ZFC. In this talk, we will outline a proof (joint work with Nik Weaver) that, assuming the Continuum Hypothesis, outer automorphisms exist. In fact, there are more automorphisms than there are possible choices for u. (However, Ilijas Farah proved that it is consistent with ZFC that Q has no outer automorphisms.) Along the way, we will see a bad aspect of the model theory of Q. The failure of the appropriate statement makes the proof more difficult.
This talk is intended to be accessible to set theorists with little knowledge of C*-algebras.

ROMAN SASYK

Analytic sets of von Neumann algebras.

Together with A. Törnquist we showed that the isomorphism relation of type II_1 von Neumann factors is Borel complete for countable structures. I will discuss some aspects of the proof of this theorem.

AARON TIKUISIS

Decomposition rank and Jiang-Su stability of C-algebras*

I will discuss two properties for C*-algebras which are both considered (particularly to those working on the classification programme) to be measures of regularity or "good behaviour": finite decomposition rank (a noncommutative version of finite topological dimension) and $\mathcal{Z}$-stability (tensorial absorption of a strongly self-absorbing C*-algebra). What is known and conjectured about classification of C*-algebras suggests that these properties should be equivalent, for the class of simple, separable, finite, nonelementary, nuclear C*-algebras; in fact, this constitutes a part of the somewhat grander Toms-Winter conjecture. I will discuss this conjecture, including evidence that it is true, without even requiring the hypothesis of simplicity.

ANDREW TOMS, BACK2FIELDS COLLOQUIUM

Tensorial absorption and the structure of operator algebras

The theory of rings of bounded operators on Hilbert space was initiated by Murray and von Neumann in the 1930s, and has since developed in myriad directions. Among these we single out the theory of noncommutative topological spaces (C*-algebras) and non-commutative measure spaces (von Neumann algebras), and examine the structure of those objects which can reasonably be called amenable. Here we find a common theme: deep information about the structure of these algebras is often rooted in their tensorial ab-sroption of a canonical tractable algebra. For II_1 factors this object is the hyperfinite II_1 factor, and for purely infinite nuclear C*-algebras it is the Cuntz algebra $\mathcal{O}_\infty$. For general nuclear simple separable C*-algebras, the correct object is the Jiang-Su algebra $\mathcal{Z}$. In this talk we will discuss progress on proving tensorial absorption of $\mathcal{Z}$, and its consequences for the classification theory of C*-algebras.

ANUSH TSERUNYAN

Finite generators for countable group actions

Consider a Borel action of a countable group G on a standard Borel space X. A countable Borel partition P of X is called a generator if $GP = \{gA : g \in G, A \in P\}$ generates the Borel sigma-algebra of X. The existence of such P of cardinality n is equivalent to the existence of a G-embedding of X into the shift n^G. For $G = Z$, the Kolmogorov-Sinai theorem implies that finite generators do not exist in the presence of an invariant probability measure with infinite entropy. It was asked by Weiss in the late 80s, whether the nonexistence of any invariant probability measure would guarantee the existence of a finite generator. We show that the answer is positive in case X admits a sigma-compact topological realization (e.g. if X is a sigma-compact Polish G-space). We also show that finite generators always exist in the context of Baire category thus answering a question of Kechris. More precisely, we prove that if X is an aperiodic Polish G-space, then there is a 4-generator on an invariant comeager set.

ROBIN TUCKER-DROB

Shift Minimal Groups

A countable group G is called shift-minimal if all non-trivial measure pre- serving actions of G weakly contained in the Bernoulli shift G $([0,1]^G, \lambda^G)$ are free. I will discuss the relation between shift-minimality and certain properties of the reduced C*-algebra of G, and present a proof that any group whose reduced C*-algebra admits a unique tracial state is shift-minimal. This implies shift-minimality for a wide variety of groups in- cluding all non-abelian free groups. I will outline how direct ergodic theoretic arguments also give more specific information about freeness properties of many shift-minimal groups. Several open questions will be discussed.

NIK WEAVER

Falsifying Kadison-Singer.

The Kadison-Singer problem can be reformulated as a combinatorial problem in finite dimensions. Finite groups might be used to construct a counterexample.

STUART WHITE

Constructing tracially large order zero maps

I will discuss the methods for establishing Z-stability for simple, separable unital nuclear C*-algebras and show how recent work of Matui and Sato can be extended to C*-algebras with more complicated trace simplices. This is joint work with Andrew Toms and Wilhelm Winter.

WILHELM WINTER

Dynamics, dimension and classification of C-algebras*

We report on recent developments in the classification and structure theory of nuclear C*-algebras and connections to dynamical systems.