Operator Algebras and Operator Theory
Algèbres d'opérateurs et théorie des opérateurs
(Org: **Ken Davidson** (Waterloo) and/et **Matthew Kennedy** (Carleton))

MARTIN ARGERAMI, University of Regina
Classification of finitely generated operator systems

The classification problem for separable operator systems is commonly believed to be intractable. In recent collaboration with S. Coskey, M. Kalantar, M. Kennedy, M. Lupini, and M. Sabok, we have shown that, on the other hand, the classification problem for finitely generated operator systems is smooth. After an introduction to operator systems and completely positive maps, I will discuss Borel complexity theory, I will tell you what "smooth" means, and I will present some concrete classification results.

RAPHAEL CLOUATRE, University of Waterloo
Duality and peak-interpolation for continuous multipliers of the Drury-Arveson space

A measure on the unit sphere is said to be Henkin if it has a certain weak-* continuity property. Such measures are completely characterized by a classical theorem due to Henkin and Cole-Range, and they can be used in the context of operator theory to show that a constrained absolutely continuous contraction must be pure. Motivated by the corresponding question for commuting row contractions, we investigate the dual of the algebra $\mathcal{A}_d$ of continuous multipliers of the Drury-Arveson space by studying "Henkin" functionals. We also consider a version of the classical peak-interpolation problem from the theory of uniform algebras. (Joint work with Ken Davidson)

ADAM DOR-ON, University of Waterloo
C-envelopes of tensor algebras arising from Markov chains*

In this talk we consider the C*-envelope of the tensor algebras associated to subproduct systems arising from stochastic matrices. This builds upon our previous work where we classified these tensor algebras, and computed the Cuntz-Pimsner algebras associated to finite essential stochastic matrices.

For a tensor algebra arising from a product system X, Katsoulis and Kribs have shown that the C*-envelope of the tensor algebra is always the Cuntz-Pimsner algebra $\mathcal{O}(X)$.

When one considers a subproduct system X, which is not necessarily a product system, the situation may change. When X is a "commutative" subproduct system of finite dimensional Hilbert spaces, Davidson, Ramsey and Shalit have shown that the C*-envelope of the tensor algebra of X is the Toeplitz algebra $\mathcal{T}(X)$. Moreover, Kakariadis and Shalit have recently proven that for a subproduct system X of finite dimensional Hilbert spaces associated to two sided subshifts, either $C^*_{env}(\mathcal{T}_+(X)) = \mathcal{O}(X)$ or $C^*_{env}(\mathcal{T}_+(X)) = \mathcal{T}(X)$ depending on a combinatorial condition on the subshifts.

In contrast to the plausible dichotomy suggested above, for a $d \times d$ irreducible stochastic matrix P we show that the tensor algebra $\mathcal{T}_+(P)$ associated to P yields different C*-envelopes, depending on the columns of the matrix P, which are all "between" the Toeplitz algebra $\mathcal{T}(P)$ and the Cuntz-Pimsner algebra $\mathcal{O}(P)$. We also provide an explicit description of the Shilov ideal of $\mathcal{T}_+(P)$ inside $\mathcal{T}(P)$.

*Joint work with Daniel Markiewicz.

GEORGE ELLIOTT, University of Toronto
Recent progress in C-algebra classification theory*

A brief survey will be given of recent progress in the classification of separable amenable C*-algebras. There has been progress

both in the general theory (with striking results by Matui and Sato), and in the study of examples. (A number of different constructions have been shown to give rise to C*-algebras that are not only amenable but amenable to classification!)

ILIJAS FARAH, York
Model theory of strongly self absorbing C-algebras*

Virtually all uses of ultrapowers in operator algebras (and elsewhere) rely on two of their model-theoretic properties, countable saturation and Los's theorem. Unlike ultrapowers, relative commutants do not have a well-studied abstract analogue. Because of their central role it would be desirable to have a better understanding of relative commutants. When algebras in question are strongly-self absorbing the relative commutant is as well behaved as the ultrapower, in a very specific (and somewhat surprising) way.

DOUG FARENICK, University of Regina
Expectation and Bayes rule with quantum random variables

Common statistical notions, such as expected value and variance, may be defined for quantum random variables in the context of positive operator-valued measures. In this lecture I will review these notions and indicated how Bayes' rule is formulated. I will also describe how, through the use of the operator-theoretic geometric mean, the standard chain rules for Radon-Nikodym derivatives extend to positive operator-valued measures. Based on joint work with Michael Kozdron and Sarah Plosker.

ADAM FULLER, University of Nebraska - Lincoln
Von Neumann Algebras and Extensions of Inverse Semigroups

Recall that a maximal abelain subalgebra D of a von Neumann algebra M is Cartan if the unitaries $U \in M$ satisfying $UDU^* \subseteq D$ span a dense subset of M.

Feldman and Moore gave a complete description of Cartan MASAs in von Neumann algebras with separable preduals, in terms of measured equivalence relations. I will present joint work with Allan Donsig and David Pitts in which we describe a bijective correspondence between the family of all Cartan pairs and a certain family of extensions of inverse semigroups.

MICHAEL HARTZ, University of Waterloo
Nevanlinna-Pick spaces with subnormal multiplication operators

The Hardy space H^2 on the unit disc enjoys two seemingly unrelated properties: Firstly, it is a complete Nevanlinna-Pick space, and secondly, all multiplication operators on H^2 are subnormal. I will talk about a result which indicates that this is special: The Hardy space H^2 is essentially the only Hilbert function space which satisfies both properties.

MATTHEW KENNEDY, Carleton University
C-simplicity and the unique trace property for discrete groups*

In joint work with M. Kalantar, we established necessary and sufficient conditions for the simplicity of the reduced C*-algebra of a discrete group. More recently, in joint work with E. Breuillard, M. Kalantar and N. Ozawa, we proved that any tracial state on the reduced C*-algebra of a discrete group is supported on the amenable radical. Hence every C*-simple group has the unique trace property. I will discuss these results, along with some applications.

MARCELO LACA, University of Victoria
von Neumann algebras of strongly connected higher rank graphs

We investigate the factor types of the extremal KMS states for the preferred dynamics on the Toeplitz algebra and the Cuntz-Krieger algebra of a strongly connected finite k-graph. For inverse temperatures above 1, all of the extremal KMS states are

of type I_∞. At inverse temperature 1, there is a dichotomy: if the k-graph is a simple k-dimensional cycle, we obtain a finite type I factor; otherwise we obtain a type III factor, whose Connes invariant we compute in terms of the spectral radii of the coordinate matrices and the degrees of cycles in the graph.

MARTINO LUPINI, York University
Uniqueness, homogeneity, and universality of the noncommutative Gurarij space

The noncommutative Gurarij space is the operator space analog of the Gurarij Banach space introduced and studied by Oikhberg. We prove that such an operator space is unique up to complete isometry, homogeneous, and universal for separable 1-exact operator spaces. This result is obtained as an application of the Fraisse theory for metric structures recently developed by Ben Yaacov.

LAURENT MARCOUX, University of Waterloo
On selfadjoint extensions of semigroups of partial isometries

Let $\mathcal{S}$ be a semigroup of partial isometries acting on a complex, infinite-dimensional, separable Hilbert space. We shall discuss criteria which will guarantee that the selfadjoint semigroup $\mathcal{T}$ generated by $\mathcal{S}$ consists of partial isometries as well. Amongst other things, we show that this is the case when the set $\mathcal{Q}(\mathcal{S})$ of final projections of elements of $\mathcal{S}$ generates an abelian von Neumann algebra of uniform finite multiplicity.

JAMIE MINGO, Queen's University
Freeness and the Transpose

One of the most stunning achievements of free probability theory is that freeness can be used to model certain ensembles of random matrices. These theorems, which go back to Voiculescu in 1991, assume that the ensembles are independent and satisfy some invariance condition and conclude that the ensembles are asymptotically free, in that as the size of the matrix increases the matrices become free in the sense of Voiculescu.

Recently Mihai Popa and I showed that a matrix can be free from its transpose or even its partial transpose, thereby eliminating the independence assumption. I will give a brief explanation of asymptotic freeness and illustrate this with some simple examples.

ZHUANG NIU, University of Wyoming
The C-algebra of a minimal homeomorphism with zero mean dimension*

Consider an infinite compact metrizable space together with a minimal homeomorphism of zero mean dimension. It is shown that the C*-algebra of this dynamical system always absorbs the Jiang-Su algebra tensorially. In particular, this implies that the C*-algebra of an arbitrary uniquely ergodic system is classifiable. This is a joint work with George A. Elliott.

CHRIS RAMSEY, University of Virginia
The semicrossed product algebra of a dynamical system

A multivariable dynamical system is a locally compact Hausdorf space along with n proper continuous self maps. From such a system one can construct a universal operator algebra called the semicrossed product algebra. In the one-variable case, first introduced by Arveson, it has been proven by Davidson and Katsoulis that two systems are conjugate if and only if their semicrossed product algebras are isomorphic as algebras. In the multivariable context, I will establish that two dynamical systems with connected spaces are conjugate if and only if their semicrossed product algebras are isometrically isomorphic.

PAUL SKOUFRANIS, Texas A&M Univesity
Free Probability for Pairs of Faces

Free probability is a non-commutative probability theory that arises by examining the joint moments of operators acting on the left-hand side of reduced free product spaces. Introduced by Voiculescu in the 1980s, free probability has become an important part of the theory of operator algebras with applications to random matrix theory and subfactor theory.

Last year, Voiculescu introduced the notion of bi-free independence in order to simultaneously study the left and right representations of algebras on reduced free product spaces. In this talk, we will survey the recent advances in bi-free probability including the (ℓ, r)-cumulants, partial R-transforms, and the combinatorical structures of bi-free probability.

YANLI SONG, University of Toronto
Localization of fundamental K-homology classes

In this talk, I will talk about the distinguished K-homology fundamental classes associated to Riemannian manifolds with compact Lie groups action. This class was introduced by Kasparov and defined using the de Rham differential operators. With some vector fields on the manifolds, we can define perturbed fundamental classes which live in the K-homology of crossed product of C*-algebra and obtain a localization formula. This provides a K-homological approach to transversally elliptic operators.

VLADIMIR TROITSKY, University of Alberta
Multinorms, p-multinorms, and Banach lattices

Let $1 \leq p \leq \infty$ and X be a vector space. For every $n \in \mathbb{N}$, let $\|\cdot\|_n$ be a norm on X^n. The resulting sequence of norms is called a p-multinorm provided $\|A\bar{x}\|_m \leq \|A\colon \ell_p^n \to \ell_p^m\|_n \cdot \|\bar{x}\|_n$ for every "multivector" $\bar{x} \in X^n$ and every $m \times n$ scalar matrix A. In the cases $p = 1$ and $p = \infty$, these spaces were introduced by G.Dales and M.Polyakov. p-multinorms can be characterized as certain norms on $\ell_p \otimes X$ and (under certain assumptions) as subspaces of Banach lattices. This is a joint work with G.Dales, N.Laustsen, and T.Oikhberg.

MARIA-GRAZIA VIOLA, Lakehead University
Classification of spatial L^p AF algebras

We first introduce the notion of L^p operator algebras and spatial L^p AF algebras. Our main result gives a complete classification of spatial L^p AF algebras. We show that two spatial L^p AF algebras are isomorphic if and only if their scaled ordered K_0 groups are isomorphic. Moreover, we prove that any countable Riesz group can be realized as the scaled ordered K_0 group of a spatial L^p AF algebra. Therefore, the classification given by G. Elliott for AF algebras also holds for spatial L^p AF algebras. Lastly, we discuss incompressibility and p-incompressibility for L^p AF algebras.

KUN WANG, Fields Institute
Equivalence of two Invariants of C-algebras with the ideal property*

Successful classification results have been obtained by using the traditional Elliott's Invariant for the AH algebras for cases of real rank zero and simple AH algebras with slow dimension growth. The ideal property (each closed two-sided nontrivial ideal is generated by the projections inside the ideal) unifies and generalizes the above two cases. K.Stevens first uses the so called Stevens' Invariant to classify AI algebras with the ideal property. After that, C.Jiang, K.Ji and K.Wang prove more general classification theorems. In my talk, I want to show that the Stevens' Invariant are equivalent to the Elliott's Invariant when extended positive real valued traces are considered for the C*-algebras with the ideal property.

QINGYUN WANG, University of Toronto
Regularity property and actions with the weak tracial Rokhlin property

Tracial Rokhlin property was introduced by Chris Phillips to study the structure of the crossed product of actions on C*-algebras. It is more flexible than the Rokhlin property, and still yield important structural theorems. In this talk, we will generalize the

definition of tracial Rokhlin property to actions of amenable groups and to C*-algebras possibly without projection, which we shall call the weak tracial Rokhlin property. We will show that, the crossed product of an action with the weak tracial Rokhlin property preserves the following classes: (1). tracially $\mathcal{Z}$-stable C*-algebras. (2). C*-algebra whose Cuntz semigroup is almost unperforated and almost divisible. If time permits, we will also talk about some interesting examples. This is a joint work with Chris Phillips and Joav Oravitz.

MATT WIERSMA, University of Waterloo

C-norms for tensor products of discrete group C*-algebras*

A C^*-algebra $\mathcal{A}$ is said to be nuclear if the algebraic tensor product $\mathcal{A} \otimes \mathcal{B}$ admits a unique C^*-norm for every C^*-algebra $\mathcal{B}$. Lance showed in 1973 that a discrete group Γ is amenable if and only if $C_r^*(\Gamma)$ is nuclear. We are able to show that if Γ is nonamenable, then $C_r^*(\Gamma) \otimes C_r^*(\Gamma)$ and $C^*(\Gamma) \otimes C_r^*(\Gamma)$ admit nonunique C^*-norms. Further, when Γ_1 and Γ_2 contain copies of noncommutative free groups, then $C_r^*(\Gamma_1) \otimes C_r^*(\Gamma_2)$ and $C^*(\Gamma_1) \otimes C_r^*(\Gamma_2)$ admit $2^{\aleph_0}$ distinct C^*-norms.

DILIAN YANG, University of Windsor

Cycline subalgebras of k-graph C-algebras*

k-graphs are a higher dimensional generalization of directed graphs; directed graphs are naturally identified with 1-graphs. The graph C*-algebra of a k-graph is the universal C*-algebra among its all Cuntz-Krieger families. An important subalgebra of a k-graph C*-algebra is its cycline algebra, which plays a vital role in a generalized Cuntz-Krieger uniqueness theorem. In this talk, we will present some new results on the cycline algebra.