## Operator Algebras
## Algèbres des opérateurs
(Org: **Martin Argerami**, **Juliana Erlijman** and/et **Remus Floricel** (Regina))

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**BERNDT BRENKEN**, University of Calgary
*Universal C*-algebras of *-semigroups and the C*-algebra of a partial isometry*

A structure of the C*-algebra of a partial isometry is described in terms of a Cuntz-Pimsner C*-algebra associated with a C*-correspondence; this can be viewed as a form of crossed product C*-algebra for an action by a completely positive map on a non-unital C*-algebra. The C*-algebras involved occur as universal C*-algebras associated with contractive *-representations, and complete order *-representations, of certain *-semigroups.

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**MAN-DUEN CHOI**, University of Toronto
*The Taming of the Shrew with Positive Linear Maps*

I look into the full structure of positive linear maps between matrix algebras. In particular, I wish to tame the quantum entanglements, from the pure mathematical point of view. Note that the research work along these lines, has been proven to be useful to the foundation of abstract quantum information in the light of (the reality of) quantum computers.

This is an expository talk. No knowledge of quantum information or operator algebras is assumed.

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**ANDREW DEAN**, Lakehead University
*Classification of C*-dynamical systems*

We shall discuss the problem of classifying C*-dynamical systems up to outer conjugacy.

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**HEATH EMERSON**, University of Victoria
*Fredholm modules and boundaries of hyperbolic groups*

We describe the construction of finitely summable Fredholm modules over the crossed-product C*-algebras of Gromov hyperbolic groups acting on their boundaries. These Fredholm modules are homologically nontrivial (yield nonzero maps on K-theory) and encode in an analytic way the canonical invariant Holder geometry that exists on the boundary of any such group. The degree of summability is computed, and shown to agree with the Hausdorff dimension of the boundary, and we will describe how to compute the induced maps on K-theory using several methods, e.g. via Connes' Chern character in cyclic cohomology, and, in the case of classical hyperbolic groups, via characteristic classes. This is joint work with Bogdan Nica.

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**DOUG FARENICK**, University of Regina
*Ando's numerical radius theorem revisited*

A classic theorem in operator theory is Ando's result on the structure of Hilbert space operators with numerical radius no larger than one. One way to view Ando's theorem is that it provides a solution to a certain matrix completion problem, where the matrix entries are Hilbert space operators. It is natural to ask whether Ando's theorem has a purely C*-algebraic formulation. Furthermore, by taking the view that Ando's theorem is a result concerning matrix completions, one can formulate a multivariable version of Ando's theorem and pose the question: what are the C*-algebras for which the multivariable form of Ando's theorem holds? The answer: precisely those C*-algebras that have the weak expectation property. This is joint work with Ali Kavruk and Vern Paulsen.

**GILAD GOUR**, University of Calgary
*Closed formula for the relative entropy of entanglement*

A quantum state (positive semi-definite matrix) acting on a tensor product of two Hilbert spaces, is called a product state if it can be written as a tensor product of two quantum states. A separable state is a convex combination of product states, that describes a composite physical system with no quantum entanglement. Entanglement of a non-separable (i.e. entangled) quantum state is measured by the relative entropy "distance" of the state to the convex set of separable states. This distance is therefore called the relative entropy of entanglement (REE). Since it is NP hard to determine whether a quantum state is separable or not, the convex optimization problem posed by the REE can not be solved analytically. However, in this talk, I will show that a closed formula exists for the inverse problem. That is, for a quantum state on the boundary of the set of separable states, there is a closed formula for all the entangled state for which this state is the closest separable state (CSS). In addition I will show that if an entangled state is full rank, then its CSS is unique. My talk is based on a joint work with Shmuel Friedland.

**SIRI-MALÉN HØYNES**, NTNU
*Toeplitz dynamical systems and their K-theory*

We will show that the family of Toeplitz systems can be associated to simple dimension groups with non-trivial rational subdimension groups. Furthermore, we will present a class of examples which has a particularly nice Bratteli diagram presentation.

**CRISTIAN IVANESCU**, MacEwan University
*A Krein-Milman type theorem for C*-algebras*

Positive unital maps between C*-algebras form a convex set whose extreme points are unital *-homomorphisms. K. Thomsen showed for a large class of homogeneous C*-algebras that the closed convex hull of *-homomorphisms is the set of unital positive maps. Later L. Li showed a major improvement of Thomsen's result which proved to be essential to the classification program for C*-algebras. In our work, we plan to extend these results to certain subhomogeneous C*-algebras.

**LAURENT MARCOUX**, University of Waterloo
*Almost invariant subspaces*

A closed subspace of a Banach space $\mathcal{X}$ is almost-invariant for a collection $\mathcal{S}$ of bounded linear operators on $\mathcal{X}$ if for each $T \in \mathcal{S}$ there exists a finite-dimensional subspace $\mathcal{F}_T$ of $\mathcal{X}$ such that $T\mathcal{Y} \subseteq \mathcal{Y} + \mathcal{F}_T$. In this paper, we study the existence of almost-invariant subspaces of infinite dimension and codimension for various classes and sets of Banach and Hilbert space operators.

This is joint work with A. Popov and H. Radjavi.

**SHAWN MCCANN**, Univ. of Calgary
*$C^*$-algebras Associated with Topological Group Quivers*

We shall provide a quick survey of properties concerning $C^*$-algebras associated with topological quivers with edge set $\Gamma$, a locally compact group, and vertex set $\Omega_{\alpha,\beta}(\Gamma) = \{(x,y) \in \Gamma \times \Gamma \,|\, \alpha(y) = \beta(x)\}$ where $\alpha$ and $\beta$ are continuous endomorphisms on $\Gamma$. In particular, we are interested in the case when $\Gamma$ is the $d$-torus and both $\alpha$ and $\beta$ are matrices with integer coefficients.

**YASUHIKO SATO**, University of Oregon, Kyoto University
*Strict comparison and Z-absorption of nuclear C*-algebras*

X. Jiang and H. Su constructed a unital separable simple infinite-dimensional nuclear C*-algebra, called the Jiang-Su algebra, whose K-theoretic invariant is isomorphic to that of the complex numbers. The Jiang-Su algebra has recently become to play a central role in Elliott's classification program for nuclear C*-algebras. In our research of its structure, we proved that tensorial absorption of the Jiang-Su algebra, strict comparison, and property (SI) are equivalent for any unital separable simple infinite-dimensional nuclear C*-algebra with finitely many extremal traces. This result provides a partial answer to Toms-Winter's conjecture.

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**EUGENIU SPINU**, University of Alberta
*Domination problem in the non-commutative setting*

We will consider the classical Domination Problem for Banach lattices in the non-commutative setting. Let X and Y be ordered Banach spaces and $0 < T < S$ are operators from X to Y. Assume that S belongs to a certain class of operators (ideal of compact, weakly compact and Dunford-Petis operator). Does T belong to the same class? We will consider the case when either X or Y is a C*-algebra or a non-commutative function space.

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**AMI VISELTER**, University of Alberta
*Locally compact quantum groups and amenability*

In this talk we will introduce the Kustermans-Vaes definition of locally compact quantum groups (LCQGs), and discuss a few specific types of LCQGs. Afterwards, we will review the definition of amenability for locally compact groups, present its generalization(s) to LCQGs, and relate several problems of current research connected with these notions.

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**DILIAN YANG**, University of Windsor
*Type III von Neumann algebras associated with rank 2 graphs*

Let $\mathbb{F}_\theta^+$ be a rank 2 graph, where $\theta$ is a permeation encoding the factorization property in the rank 2 graph, and $\omega$ be a distinguished faithful state associated with its graph C*-algebra. In this talk, we will discuss when the von Neumann algebra induced from the GNS representation of $\omega$ is a factor and its type.