ICM Satellite Conference on Operator Algebras and Applications

August 8-12, 2014
Cheongpung, Korea

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Program

August 8 (Friday), 2014

09:00 – 09:50, Room A [chair: S. G. Lee]

Opening (09:00 – 09:10)
J. Cuntz: C^*-algebras associated with semigroups, rings and dynamical systems from number theory

10:10 – 11:30, Room A [chair: S. Y. Jang]

R. Speicher: Absence of algebraic relations and of zero divisors under the assumption of finite non-microstates free Fisher information
A. Ioana: Orbit equivalence rigidity for translation actions

========== LUNCH ==========

13:30 – 14:50, Room A [chair: M. Choda]

G. Elliott: A brief survey of C^*-algebra classification theory
Y. Sato: Classification theorems for amenable C^*-algebras and Connes' fundamental work for injective factors

15:10 – 16:30, Room A [chair: J. A Jeong]

H. Lin: Classification of unital simple $\mathcal{Z}$-stable C^*-algebras
M. Rørdam: The central sequence algebra

16:50 – 18:05, Room A [chair: Y. Kawahigashi]

K. Shimada: A classification of flows on AFD factors with faithful Connes-Takesaki modules
Y. Isono: Some prime factorization results for free quantum group factors
J. Fang: On a class of operators in the hyperfinite type II_1 factor and generalized universal irrational rotation algebras

Room B [chair: I. Yi]

J. Mingo: Symmetry and random matrices

E. Liflyand: Integrability spaces for the Fourier transform
L. Palacios: Multipliers and perfectness in topological algebras

August 9 (Saturday), 2014

08:30 – 09:50, Room A [chair: Y. M. Park]

G. Pisier: C*-norms on tensor products and quantum expanders
M. Junge: Grothendieck inequality for three tensors

10:10 – 11:30, Room A [chair: W. Y. Lee]

Z.-J. Ruan: Abstract harmonic analysis and related operator algebras on locally compact quantum groups
R. Curto: Truncated moment problems admitting cubic column relations

========== LUNCH ==========

13:30 – 14:50, Room A [chair: G. Elliott]

N. C. Phillips: Large subalgebras of crossed product C^*-algebras
M. Izumi: Indecomposable characters of infinite dimensional groups associated with operator algebras

Room C [chair: E. Ko]

C. Gu: Examples of m-isometries
S. H. Lee: An answer to Lubin's problem: The lifting problem for commuting subnormals

15:10 – 16:25

Room A [chair: H. Lin]

H. Osaka: The Jiang-Su absorption for inclusions of unital C^*-algebras
M. Sun: Existence of tracial Rokhlin property
Y. Suzuki: Amenable minimal Cantor systems of free groups arising from diagonal actions

Room B [chair: J. Heo]

T. de Laat: Noncommutative-L_p-rigidity for high rank lattices and nonembeddability of expanders
Q. Wang: Fibred coarse embeddings of metric spaces and higher index problems
B. Willson: Operator bounded approximate diagonals for locally compact quantum groups using nets in $L^2(\mathbb{G})$

Room C [chair: K. Tanahashi]

D. Djordjevic: On some properties of operators on Hilbert C^*-modules
I. J. An: Note on paranormal operators and operator equations $ABA = A^2$ and $BAB = B^2$
B. Duggal: Dynamics of a class of Hilbert space operators

16:50 – 18:05

Room A [chair: Z. Hu]

D.-W. Kim: Coactions of Hopf C^*-algebras on Cuntz-Pimsner algebras
R. Tomatsu: Product type actions of compact quantum groups
S. Kang: Quantum Heisenberg manifolds as twisted groupoid C^*-algebras

Room B [chair: K.-C. Ha]

T. Takeishi: Bost-Connes system for local fields of characteristic zero
M. Fragoulopoulou: Smooth manifolds in comparison to differential triads

Room C [chair: I. H. Kim]

P. Budzyński: On k-hyperreflexivity of Toeplitz-harmonic subspaces
J. Sarkar: An Invariant subspace theorem

August 10 (Sunday), 2014

08:30 – 09:50, Room A [chair: M. Takesaki]

D.-V. Voiculescu: Some C^*-algebras which are coronas of non-C^*-Banach algebras
Y. Kawahigashi: Boundary conformal field theory and subfactors

10:10 – 11:30, Room A [chair: I. B. Jung]

C. Cowen: Commutants of finite Blaschke product multiplication operators on Hilbert spaces of analytic functions
J. Stochel: Directed trees and subnormality of Hilbert space operators

========== LUNCH ==========

13:30 – 14:50, Room A [chair: G. Pisier]

A. Kishimoto: A mathematical model for measurements

H. H. Lee: Weighted Fourier algebras on non-compact Lie groups and their spectra

Room C [chair: M. Cho]

I. Spitkovsky: One sided invertibility of matrices over commutative rings, corona problems, and Toeplitz operators with matrix symbols
T. Ehrhardt: Spectral properties of Toeplitz-plus-Hankel operators

15:10 – 16:25

Room A [chair: J. Cuntz]

S. H. Kim: Desingularization of labeled graphs and their C^*-algebras

H. Li: Fundamental results of twisted topological graph algebras
B. Kwasniewski: Topological aperiodicity for product systems of C^*-correspondences

Room B [chair: Z.-J. Ruan]

Y. Kuznetsova: Constructing the duals of quantum groups and beyond without the Haar weight
B.-J. Kahng: Separability idempotents in C^*-algebras
M. Amini: From quantum groups to quantum semigroups (and vice versa)

Room C [chair: R. Curto]

R. Harte: The love knot

S. Djordjevic: Recent result for generalized inverses of a linear operator
J. E. Lee: Toeplitz operators and their binormality

16:50 – 18:05

Room A [chair: H. Matui]

J. Lee: Finite groups acting on higher dimensional noncommutative tori
W. Sun: Approximate conjugacies of dynamical systems and K-theory of crossed product C^*-algebras
S. Adji: The partial-isometric crossed product of systems by quasi-lattice ordered semigroups

Room B [chair: K. H. Han]

T. Itoh: Numarical radius operator spaces

A. Helemskii: Homologically best modules in classical and quantum functional analysis

T. H. Dinh: On the generalized Powers-Stormer inequality and some related questions

Room C [chair: A. H. Kim]

S. Jung: On S-Toeplitzness of weighted composition operators on the Hardy space
Y. Kim: On commutators of weighted composition operators on the Hardy space

19:00

Banquet

August 11 (Monday), 2014

08:30 – 09:50, Room A [chair: D. P. Chi]

U. Haagerup: Approximation properties for groups and von Neumann algebras
N. Ozawa: Elementary amenable groups are quasidiagonal

10:10 – 11:30, Room A [chair: F. Hiai]

W. Winter: Regularity of nuclear C^*-algebras
A. Toms: Mean dimension and the structure of C^*-algebras

========== LUNCH ==========

13:30 – 14:45

Room A [chair: U. Haagerup]

S. Knudby: The weak Haagerup property

R. Okayasu: Haagerup approximation property and positive cones associated with a von Neumann algebra

A. Skalski: Haagerup approximation property for arbitrary von Neumann algebras and locally compact quantum groups

Room B [chair: H. H. Lee]

N. Erkursun: Operator nets on preduals of von Neumann algebras

M. Moslehian: Azuma inequality for noncommutative martingales

G. Sadeghi: On the uniform Opial property

Room C[chair:T. Bhattacharyya]

M. Ptak: C-symmetric operators and its preanihilator

D.-O Kang: Normal Toeplitz operators and Hankel operators with operator-valued symbols

T. Yamamoto: Hyponormal singular integral operators with Cauchy kernel on L^2

15:10 – 16:30, Room A [chair: M. B. Ruskai]

G. Yu: Quantitative K-theory for operator algebras and its applications
S. Vaes: Classification of crossed product von Neumann algebras

16:50 – 17:30, Room A [chair: J. Tomiyama]

V. Jones: Towards a continuum limit from planar algebras

Abstracts

Sriwulan Adji (Indonesia)

The partial-isometric crossed product of systems by quasi-lattice ordered semigroups

Let (G, P) be a quasi-lattice ordered semigroup in the sense of Nica, meaning that the partial order induced by a subsemigroup P of G satisfies the property that every finite subset of G with an upper bound in P has a least upper bound. We study the partial-isometric crossed product of a dynamical system (A, P, α), consisting of a C^*-algebra A and an action α of P by endomorphisms on A, in which the semigroup P is represented by partial-isometries. This is not only giving us a better understanding about the Toeplitz algebra $\mathcal{T}_X$ of a discrete product system of Hilbert bimodules over the semigroup P (that is studied earlier by Fowler), it also applies to the system arising from number theory of a lattice semigroup $\mathbb{N}^2$.

Suppose p and q are distinct odd primes. We know that there exists an averaging type action α of $\mathbb{N}^2$ on the group C^*-algebra $C^*(G_{p,q})$, where $G_{p,q} := \{\frac{n}{p^k q^l} : n, k, l \in \mathbb{Z}\}/\mathbb{Z}$ is a subgroup of $\mathbb{Q}/\mathbb{Z}$. We analyze the partial-isometric crossed product of this system, and obtain the composition series of ideals of the crossed product.

Massoud Amini (Tarbiat Modares University, Tehran, Iran)

From quantum groups to quantum semigroups (and vice versa)

We survey recent constructions of quantum semigroups coming from quantum groups. The main motivating example is the quantum semigroup compactification of quantum groups. We give some classical examples of groups coming from (discrete) semigroups and give a report on a work in progress on quantum groups coming from quantum semigroups.

Il Ju An (Seoul National University, Seoul, Korea)

Note on paranormal operators and operator equations $ABA = A^2$ and $BAB = B^2$

Let a pair (A, B) of bounded linear operators acting on a Hilbert space be a solution of the operator equations $ABA = A^2$ and $BAB = B^2$. When A is a paranormal operator, we explore some behaviors of the operators AB, BA, and B. In particular, if A or A^* is a polynomial root of paranormal operators, we show that Weyl type theorems are satisfied for the operators AB, BA, and B.

Piotr Budzyński (University of Agriculture in Kraków, Kraków, Poland)

On k-hyperreflexivity of Toeplitz-harmonic subspaces

Let A be a bounded linear operator acting on a separable complex Hilbert space. The *Toeplitz-harmonic subspace* generated by A, denoted as $\mathcal{T}(A)$, is the smallest weak* closed subspace containing all powers of the operator A and all powers of its adjoint. The space $\mathcal{T}(\mathbb{D})$ of all Toeplitz operators acting in the Hardy space $H^2(\mathbb{D})$ is a Toeplitz-harmonic subspace generated by T_z, the operator of multiplication by the independent variable acting on $H^2(\mathbb{D})$. Motivated by results about transitivity and 2-hyperreflexivity of $\mathcal{T}(\mathbb{D})$, we address the question whether $\mathcal{T}(A)$ is 2-hyperreflexive whenever A is an isometry. We will show that the answer is in the affirmative, even if A is quasinormal. We will present auxiliary results concerning tensor products of some decomposable subspaces and von Neumann algebras. We will also discuss the possibility of generalization of our result to the multi-operator context. This talk is based on a joint work with K. Piwowarczyk.

Carl Cowen (I U P U I (Indiana Univ Purdue Univ Indianapolis), Indianapolis, USA)

Commutants of finite Blaschke product multiplication operators on Hilbert spaces of analytic functions

Except in special circumstances, it is quite difficult to determine conditions that characterize which operators commute with a given operator. Such special circumstances include self-adjoint and normal operators (where the spectral theorem can be used) and cases in which the operator in question has a rich point spectrum. The results in this latter situation come from the application of the easy observation that if A and B commute, the eigenspaces of A are invariant for B.

If $\mathcal{H}$ is a Hilbert space of analytic functions on the unit disk and T_z is the operator of multiplication by z, it is well known that the commutant of T_z is the collection of multiplication operators T_f where f is a bounded analytic function on the disk, f is in $\mathcal{H}$, and $(T_f h)(z) = f(z)h(z)$.

In the 1970's and 80's, the question "Which operators on the Hardy space $H^2(\mathbb{D})$ commute with T_f for f a bounded analytic function on the disk?" was investigated. More recently, there has been interest in this question for the Bergman space $A^2(\mathbb{D})$ and weighted Bergman spaces. In this talk, an overview of the work of thirty years ago will be presented and we will consider this question for $f = B$, a finite Blaschke product, for T_B acting on a broad collection of spaces containing $H^2(\mathbb{D})$, a question that has wider consequences than might be expected. In particular, we show that the commutants of the operators T_B are the same on all of these spaces!

This is joint work with Rebecca G. Wahl at Butler University.

Joachim Cuntz (Münster University, Münster, Germany)

C^*-algebras associated with semigroups, rings and dynamical systems from number theory

Rings of algebraic integers and their associated semigroups give rise very naturally to C^*-algebras with an intriguing structure. A good example exhibiting many of the difficulties is already given by the ring $\mathbb{Z}$ of ordinary integers. There are close connections to dynamical systems of various types.

Raul Curto (University of Iowa, Iowa City, USA)

Truncated moment problems admitting cubic column relations

Abstract. Inverse problems naturally occur in many branches of science and mathematics. An inverse problem entails finding the values of one or more parameters using the values obtained from observed data. A typical example of an inverse problem is the inversion of the Radon transform. Here a function (for example of two variables) is deducedfromitsintegralsalongallpossiblelines. This problem is intimately connected with image reconstruction for X-ray computerized tomography.

Moment problems are a special class of inverse problems. While the classical theory of moments dates back to the beginning of the 20th century, the systematic study of truncated moment problems began only a few years ago. In this talk we will first survey the elementary theory of truncated moment problems, and then focus on moment problems admitting cubic column relations.

For a degree $2n$ real d-dimensional multisequence $\beta \equiv \beta^{(2n)} = \{\beta_i\}_{i \in Z_+^d, |i| \leq 2n}$ to have a representing measure μ, it is necessary for the associated *moment matrix* $M(n)$ to be positive semidefinite, and for the corresponding *algebraic variety*, V_β, to satisfy rank $M(n) \leq \text{card} V_\beta$ as well as the following *consistency condition*: if a polynomial $p(x) \equiv \sum_{|i| \leq 2n} a_i x^i$ vanishes

on V_β, then $p(\beta) := \sum_{|i|\le 2n} a_i \beta i = 0$. In previous joint work with L. Fialkow and M. Möller, we proved that for the *extremal case* (rank $M(n)$ = card V_β), positivity and consistency are sufficient for the existence of a (unique, rank $M(n)$-atomic) representing measure.

In recent joint work with Seonguk Yoo we have considered cubic column relations in $M(3)$ of the form (in complex notation) $Z^3 = itZ + u\bar{Z}$, where u and t are real numbers. For (u, t) in the interior of a real cone, we prove that the algebraic variety V_β consists of exactly 7 points, and we then apply the above mentioned solution of the extremal moment problem to obtain a necessary and sufficient condition for the existence of a representing measure. To check consistency, one needs a new representation theorem for sextic polynomials in Z and $\bar{Z}$ which vanish in the 7-point set V_β. Our proof of this representation theorem relies on two successive applications of the Fundamental Theorem of Linear Algebra. For other extremal moment matrices admitting cubic column relations, one can appeal to the Division Algorithm from real algebraic geometry to obtain similar representations.

Tim de Laat (KU Leuven, Leuven, Belgium)

Noncommutative-L_p-rigidity for high rank lattices and nonembeddability of expanders

For $1 < p < \infty$, a discrete group G is said to be noncommutative-L_p-rigid if the noncommutative L_p-space $L_p(L(G))$ does not have the completely bounded approximation property. In the last years, several examples of noncommutative-L_p-rigid groups have been provided for different values of p. After an overview of these results, I will explain a recent joint work with Mikael de la Salle, in which we proved that for every p in $(1, \infty)$ different from 2, the group $SL(n, \mathbb{Z})$ is noncommutative-L_p-rigid for n sufficiently large. The proof of this result gives rise to an essentially different rigidity result on the non-coarse-embeddability of families of expanders constructed from $SL(n, \mathbb{Z})$. Both results can be generalized to lattices in Lie groups of high real rank.

Trung Hoa Dinh (Ho Chi Minh National University, Ho Chi Minh City, Viet Nam)

On the generalized Powers-Stormer inequality and some related questions

Powers-Stormer inequality for matrices was proven by Audenaert et. al. We give some generalizations of Powers-Stormer inequalities and their applications. We give new characterizations of operator monotonicity by trace and matrix Powers-Stormer type inequalities. Some questions related to Tsallis quantum entropy also will be considered.

Dragan Djordjevic (University of Niš, Niš, Serbia)

On some properties of operators on Hilbert C^*-modules

We present some new results concerning bounded adjointable operators on Hilbert C^*-modules.

Slavisa Djordjevic (Benemerita Universidad Autonoma, Puebla, Mexico)

Recent result for generalized inverses of a linear operator

We present the inverse along an element in the case of the algebra of bounded linear operators on a Banach space and characterize it as an outer inverse with prescribed range and nullspace. This inverse generalizes the group, Drazin and Koliha-Drazin inverses.

Bhagwati Duggal (Attached to University of Nis(Serbia), London, United Kingdom)

Dynamics of a class of Hilbert space operators

Answering a question of R. Sanders [*Weakly supercyclic operators*, J. Math. Anal. Appl. **292** (2004), 148–149: Question 4.6], F. Bayart and E. Matheron [*Hyponormal operators, weighted shifts and weak forms of supercyclicity*, Proc. Edinburgh Math. Soc. 49 (2006), 1–15: Theorem 3.4] have shown that *a weakly supercyclic hyponormal operator is a scalar multiple of a unitary operator*. The proof of this result, as given by Bayart and Matheron, depends in an essential way on the Berger–Shaw theorem. We consider Hilbert space operators $A \in B(H)$, conveniently denoted operators $A \in \mathcal{A}(s,t)$, such that $|A^*|^{2t} \leq (|A^*|^t|A|^{2s}|A^*|^t)^{\frac{t}{t+s}}$ for all $0 < s,t \leq 1$. It is not known if $\mathcal{A}(s,t)$ operators satisfy the Berger–Shaw theorem; however $\mathcal{A}(s,t)$ operators are known to be paranormal ($\|Ax\|^2 \leq \|A^2x\|$) for all unit vectors $x \in H$) operators. Paranormal operators do not satisfy Bishop's property (β). We prove that: $\mathcal{A}(s,t)$ operators satisfy property (β), paranormal operators are not weakly supercyclic, and an $\mathcal{A}(s,t)$ weakly supercyclic operator is necessarily a scalar multiple of a unitary.

Torsten Ehrhardt (University of California, Santa Cruz, USA)

Spectral properties of Toeplitz-plus-Hankel operators

I will talk about Fredholm and invertibility theory for operators which are a sum of a Toeplitz and a Hankel operator acting on a Hardy space. Properties of the spectrum and essential spectrum of such operators will also be discussed.

George Elliott (University of Toronto, Toronto, Canada)

A brief survey of C^*-algebra classification theory

Over the last sixty years or so, the miraculous phenomenon of classification for operator algebras - von Neumann algebras, or subalgebras of these, or C^*-algebras - has emerged - in the setting of amenability (and separability). Of these three categories, only that of (amenable) C^*-algebras has not yet reached a satisfactory resolution - perhaps one may have to settle for less - but there are indications to the contrary.

Nazife Erkursun (Selcuk University, Konya, Turkey)

Operator nets on preduals of von Neumann algebras

The main object in this talk are Markov operator nets on the predual of a von Neumann algebra. A von Neumann algebra or W^*-algebra is a $*$-algebra of bounded operators on a Hilbert space that is closed in the weak operator topology and contains the identity operator. Our aim is to prove the conditions that Markov operator nets on the predual of von Neumann algebras are strongly convergent.

Junsheng Fang (Dalian University of Technology, Dalian, China)

On a class of operators in the hyperfinite type II_1 factor and generalized universal irrational rotation algebras

In this talk, I will talk about a class of operators in the hyperfinite type II_1 factor. This class of operators is analogy of $\mathcal{R}$-diagonal operators in the free group factors. I will talk about the spectrum, Brown spectrum, von Neumann subalgebra and C^*-subalgebra generated by these operators. It turns out the C^*-algebras generated by such operators is related to the so called generalized universal irrational algebras introduced by myself and Chunlan Jiang, Huaxin Lin, Feng Xu.

Maria Fragoulopoulou (University of Athens, Athens, Greece)

Smooth manifolds in comparison to differential triads

Around 1990, A. Mallios used sheaf–theoretic methods to extend the mechanism of the classical differential geometry of smooth manifolds to spaces that do not admit the usual smooth structure. In this new setting of abstract differential geometry a large number of notions and results of the classical differential geometry have already been extended, becoming at the same time applicable to spaces with singularities and to quantum physics. In this talk, we study conditions assuring that a morphism in the category $\mathcal{DT}$ of differential triads, over a differentiable (in the abstract sense) map, is uniquely determined, a situation analogous to the classical "uniqueness of differentials". Especially we prove that *a continuous map between manifolds, which is differentiable in $\mathcal{DT}$, is also smooth in the usual sense, and its abstract differential coincides with the ordinary one*. This result makes differentials of maps between manifolds unique in both the abstract and the classical setting, while the *category* $\mathcal{M}an$, of smooth manifolds, becomes a *full subcategory* of the category $\mathcal{DT}$.

This is a joint work with M.H. Papatriantafillou (University of Athens, Greece)

Caixing Gu (California Polytechnic State University, San Luis Obispo, USA)

Examples of m-isometries

We will give characterizations and examples of weighted shifts, composition operators on l_p spaces and also multiplication operators on function spaces which are m-isometries. M-isometries are natural generalizations of isometries and this class of operators were first studied by Agler and Stankus and Richter on Hilbert spaces and recently this notion was also extended to Banach spaces.

Uffe Haagerup (University of Copenhagen, Copenhagen, Denmark)

Approximation properties for groups and von Neumann algebras

In the talk I will first give an introduction to weak amenability (M. Cowling and U.H. 1989) and to the weaker approximation property AP (J. Kraus and U.H. 1994) for locally compact groups. Moreover I will discuss the relation of these properties to properties of the group von Neumann algebras for lattices in the groups considered. The main part of the talk will be about two recent joint works with T. de Laat, where we prove that every simple connected Lie group of real rank greater or equal to 2 does not have the AP. More generally we have now shown (work in progress) that a connected Lie group has the AP if and only if all the simple Lie algebras occurring in the Levi decomposition of the Lie algebra of G have real rank at most 1. The talk will also contain a brief introduction to the Thompson groups F, T and V and their group von Neumann algebras.

Robin Harte (Trinity College, Dublin, Ireland)

The love knot

The Love Knot is a small metal brooch made of three interlocking circular arcs; an image of it appears at the centre of the traditional venn diagram for three circular discs in the plane. When the three sets represented by the discs have the property that each is included in the union of the other two, the Venn diagram reduces to the Love Knot. The Love Knot is prevalent in elementary abstract algebra: two-sided invertibility of a product and its factors; two definitions of "exactness"; the spectral theory of an invariant subspace; Muller regularity and the Kato spectrum; various kinds of spectral permanence; and even politics.

Alexander Helemskii (Moscow State (Lomonosov) University, Moscow, Russia)

Homologically best modules in classical and quantum functional analysis

In algebra, "homologically best modules" are projective, injective and flat. In functional analysis there exist several different approaches to each one of these notions. We show that a certain categorical-general scheme contains, as particular cases, all principal versions of projectivity and injectivity. In this scheme, the notion of a free object comes to the forefront, and in the best categories, that we call freedom-loving, projective objects are exactly retracts of free objects. We pay special attention to the so-called metric version of projectivity and give a full description of metrically free "classical" and "quantum" (operator) normed modules. In particular, metrically free quantum spaces are described as quantum l_1-sums of arbitrary families of copies of the quantum space

$$T_\infty := T_1 \oplus_1 T_2 \oplus_1 \cdots \oplus_1 T_n \oplus_1 \cdots ,$$

where T_n is the quantum space of trace-class operators, acting on $\mathbf{C}^n$ and $\oplus_1$ is the symbol of the quantum l_1-sum.

As to the so-called extreme projectivity, studied by Grothendieck in the "classical" case and by Blecher in the "quantum" case, speaking informally, in our scheme, we can interpret it as "assymptotic metric projectivity".

Apart from this, we answer the following concrete question in geometry of normed spaces: what is the structure of metrically projective modules, in the simplest case, when we deal with just normed spaces? It turns out that these are exactly normed subspaces in $l_1(\Lambda)$ (where Λ is an index set), which are formed by functions with finite support. Thus, in this case projectivity coincides with freedom.

Adrian Ioana (University of California, San Diego, USA)

Orbit equivalence rigidity for translation actions

Every dense inclusion of a countable group Γ into a locally compact group G gives rise to a left translation action $\Gamma \curvearrowright G$. In this talk, I will survey recent work motivated by the following question: to what extend does the equivalence relation on G of belonging to the same Γ-orbit remember the inclusion $\Gamma < G$? In particular, I will present a rigidity result which gives necessary and sufficient conditions for "translation profinite" actions with spectral gap, to be orbit equivalent or Borel reducible.

Yusuke Isono (Kyoto University, Kyoto, Japan)

Some prime factorization results for free quantum group factors

We prove some unique factorization results for tensor products of free quantum group factors. They are type III analogues of factorization results for direct products of bi-exact groups established by Ozawa and Popa. In the proof, we first take continuous cores of the tensor products, which satisfy a condition similar to condition (AO), and discuss some factorization properties for the continuous cores. We then deduce factorization properties for the original type III factors.

Takashi Itoh (Gunma University, Maebashi, Japan)

Numarical radius operator spaces

We introduce a numerical radius operator space $(X, \mathcal{W}_n)$. The conditions to be a numerical radius operator space are weaker than the Ruan's axiom for an operator space $(X, \mathcal{O}_n)$. Let $w(\cdot)$ be the numerical radius on $\mathbb{B}(\mathcal{H})$. It is shown that if X admits a norm $\mathcal{W}_n(\cdot)$ on the matrix space $\mathbb{M}_n(X)$ which satisfies the conditions

$$\text{WI.} \qquad \mathcal{W}_{m+n}\left(\begin{bmatrix} x & 0 \\ 0 & y \end{bmatrix}\right) = \max\{\mathcal{W}_m(x), \mathcal{W}_n(y)\}$$

$$\text{WII.} \qquad \mathcal{W}_n(\alpha x \alpha^*) \leq \|\alpha\|^2 \mathcal{W}_m(x),$$

for all $x \in \mathbb{M}_m(X), y \in \mathbb{M}_n(X)$ and $\alpha \in \mathbb{M}_{n,m}(C)$ then there is a complete isometry, in the sense of the norms $\mathcal{W}_n(\cdot)$ and $w_n(\cdot)$, from $(X, \mathcal{W}_n)$ into $(\mathbb{B}(\mathcal{H}), w_n)$.

We study the relationship between the operator space $(X, \mathcal{O}_n)$ and the numerical radius operator space $(X, \mathcal{W}_n)$. The category of operator spaces can be regarded as a subcategory of numerical radius operator spaces. As the application, we get a new formulation of the numerical radius $w(\cdot)$ on $\mathbb{B}(\mathcal{H})$.

Masaki Izumi (Kyoto University, Kyoto, Japan)

Indecomposable characters of infinite dimensional groups associated with operator algebras

I talk about our recent work on the classification of indecomposable characters of several classes of infinite dimensional groups associated with operator algebras, including unitary groups of simple unital simple AF algebras and II_1 factors.

Vaughan Jones (Vanderbilt University, Nashville, USA)

Towards a continuum limit from planar algebras

Perhaps the biggest question in subfactors is whether they all hyperfinite ones come in some way from conformal field theories. There are many ways to approach this question, perhaps the most optimistic being to attempt to construct a continuum limit directly from the combinatorial data of the subfactor. Some small progress has been made in this direction.

Sungeun Jung (Ewha Womans university, Seoul, Korea)

On S-Toeplitzness of weighted composition operators on the Hardy space

Let $\mathcal{L}(\mathcal{H})$ be the algebra of all bounded linear operators on a separable, infinite dimensional complex Hilbert space $\mathcal{H}$. An operator $S \in \mathcal{L}(\mathcal{H})$ is said to be a *unilateral forward shift* if it is an isometry such that $\{S^{*n}\}$ converges strongly to 0. We say that $T \in \mathcal{L}(\mathcal{H})$ is an S-*Toeplitz* operator if $S^*TS = T$. An operator $T \in \mathcal{L}(\mathcal{H})$ is said to be *uniformly asymptotically* S *Toeplitz* (abbreviated S-UAT) if the sequence $\{S^{*n}TS^n\}$ converges to some operator in $\mathcal{L}(\mathcal{H})$ in uniform operator topology. Similarly, we define strongly and weakly asymptotically S-Toeplitz (abbreviated S-SAT and S-WAT, respectively) operators. When $S = T_z$ on H^2, we simply write UAT, SAT, and WAT instead of T_z-UAT, T_z-SAT, and T_z-WAT, respectively.

In this talk, we consider T_u-Toeplitz weighted composition operators on the Hardy space H^2 where u is any nonconstant inner function. We first show that $W_{f,\varphi}$ is T_u-Toeplitz if and only if C_φ is; in this case, $C_\varphi u = u$. As a corollary, we get that if $W_{f,\varphi}$ is a cohyponormal T_u-Toeplitz operator where $u(0) = 0$ but u has no nonzero zeros in $\mathbb{D}$, then f is constant and φ is a rotation. We also deal with asymptotic T_u-Toeplitzness of weighted composition operators. In particular, we obtain that every invertible weighted composition operator is not UAT and its adjoint is not SAT.

Marius Junge (University of Illinois, Urbana, USA)

Grothendieck inequality for three tensors

In this talk we will answer a problem of Pisier on whether the Grothendieck theorem for operator spaces can be extended to three tensors. The motivation of the solution comes from Qauntum Information Theory and this connections will be 'explained' in the talk.

Byung-Jay Kahng (Canisius College, Buffalo, USA)

Separability idempotents in C^*-algebras

In this talk, we will discuss the notion of a "separability idempotent", in the (non-unital) C^*-algebra framework. This is analogous to the notion in the purely algebraic setting, typically considered in the case of finite-dimensional algebras with identity. In our case, it is described in terms of a KMS-type weight on a C^*-algebra. This work was motivated by the appearance of such objects in attempts to develop a general C^*-algebraic theory of locally compact quantum groupoids. Quantum groupoids will be discussed only lightly, but we will give some examples that are related to quantum groupoids.

This is based on a joint work with Alfons Van Daele, at KU Leuven (Belgium).

Dong-O Kang (Seoul National University, Seoul, Korea)

Normal Toeplitz operators and Hankel operators with operator-valued symbols

Normality of Toeplitz operators and Hankel operators will be completely characterized in terms of their symbolic properties.

Sooran Kang (University of Otago, Dunedin, New Zealand)

Quantum Heisenberg manifolds as twisted groupoid C^*-algebras

The quantum Heisenberg manifolds are noncommutive manifolds constructed by M. Rieffel as strict deformation quantizations of Heisenberg manifolds and have been studied by various authors. According to the original construction by Rieffel, the quantum Heisenberg manifolds are the generalized fixed-point algebras of certain crossed product C^*-algebras and they also can be realized as crossed product by Hilbert C^*-bimodule in the sense of Abadie et al. In this talk, we describe how the quantum Heisenberg manifolds can be realized as certain twisted groupoid C^*-algebras. This is a joint work with Alex Kumjian and Judith Packer.

Yasuyuki Kawahigashi (The University of Tokyo, Tokyo, Japan)

Boundary conformal field theory and subfactors

We present a new approach and results on boundary conformal field theory based on operator algebras. We prove a conjecture of Kong-Runkel on tensor categories and subfactors, define a phase boundary in terms of nets of von Neumann algebras, and determine boundary conditions in terms of subfactors. This is a joint work with M. Bischoff, R. Longo and K.-H. Rehren.

Dong-Woon Kim (Seoul National University, Seoul, Korea)

Coactions of Hopf C^*-algebras on Cuntz-Pimsner algebras

Following the approaches of Hao and Ng and Kaliszewski, Quigg, and Robertson to actions and coactions of locally compact groups on Cuntz-Pimsner algebras, respectively, we consider coactions of Hopf C^*-algebras.

Sun Ho Kim (Seoul National University, Seoul, Korea)

Desingularization of labeled graphs and their C^*-algebras

In this talk, we consider the quotient algebra of a labeled graph C^*-algebra $C^*(E, \mathcal{L}, \mathcal{B})$ by a gauge-invariant ideal. We give sufficient conditions for a quotient labeled space of which the corresponding quotient labeled graph C^*-algebra can be realized as labeled graph C^*-algebras or Matsumoto algebras. And as in the case of graph C^*-algebras, it can be shown that the arbitrary labeled graph C^*-algebra $C^*(E, \mathcal{L}, \mathcal{B})$ is strong Morita equivalent to the C^*-algebra $C^*(E_r, \mathcal{L}_r, \mathcal{B}_r)$ with no sources or sinks. Finally we modify the necessary condition "strongly cofinal" for a C^*-algebra $C^*(E, \mathcal{L}, \mathcal{B})$ to be simple.

Yoenha Kim (Ewha Womans university, Seoul, Korea)

On commutators of weighted composition operators on the Hardy space

In this talk, we prove that if the composition symbols φ and ψ are linear fractional non-automorphisms of $\mathbb{D}$ such that $\varphi(\zeta)$ and $\psi(\zeta)$ belong to $\partial\mathbb{D}$ for some $\zeta \in \partial\mathbb{D}$ and $u, v \in H^\infty$ are continuous on $\partial\mathbb{D}$ with $u(\zeta)v(\zeta) \neq 0$, then $[W^*_{v,\psi}, W_{u,\varphi}]$ is compact on H^2 if and only if ζ is the common boundary fixed point of φ and ψ and one of the following statements holds: (i) both φ and ψ are parabolic; (ii) both φ and ψ are hyperbolic and another fixed point of φ is $\frac{1}{w}$ where w is the fixed point of ψ other than ζ.

This talk is based on a joint work with Sungeun Jung and Eungil Ko.

Aki Kishimoto (Hokkaido University, Sapporo, Japan)

A mathematical model for measurements

We will give a new model for measurements of a quantum system, given as a Hilbert space, such that the measuring apparatuses are described by a unital separable non-type I nuclear simple C*-algebra equipped with certain unital endomorphisms and pure states. An interaction between the quantum system and the apparatus is specified by a unitary associated with the combined system as before. Magnifying to the classical level some aspects of the quantum system so captured in the apparatus is explicitly done by applying the endomorphism; then the resulting state is the superposition of phases with weights. Nature will then choose each phase according to the probability prescribed by the weights just as does one when multiple phases appear as in phase transition. Thus in our model state-reduction (or collapse of the wave function) is a primary event; whether this corresponds to the measurement of an observable or which one if it does is another matter.

Soren Knudby (University of Copenhagen, Copenhagen, Denmark)

The weak Haagerup property

Amenability is an important approximation property for groups, and it has many applications in operator algebras. Several weakened forms of amenability have appeared, some of which are the Haagerup property and weak amenability. We introduce a combination of the two, the weak Haagerup property, and study groups with this property. The class of groups with the weak Haagerup property is quite large. Indeed, the class contains a priori all weakly amenable groups and all groups with the Haagerup property, and the class is even larger. In the opposite direction, the first examples of groups without the weak Haagerup property will be presented. Moreover, we give a complete classification of connected simple Lie groups with the weak Haagerup property. A version of the weak Haagerup property is introduced for finite von Neumann algebras, and we prove that not every von Neumann algebra has this property. In particular, we give examples of von Neumann algebras with different weak Haagerup constants. This is joint work with Uffe Haagerup.

Yulia Kuznetsova (University of Franche-Comte, Besancon, France)

Constructing the duals of quantum groups and beyond without the Haar weight

The aim of this work is to construct a certain duality functor on a wide class of operator bialgebras including locally compact quantum groups. The motivation is, from one side, conceptual: to show that there is no need to know the Haar measure/weight to construct the dual of a locally compact quantum group, thus contributing to the problem of defining a quantum group in a measure-independent way. From the other side, there is more practical outcome: from given von Neumann bialgebras, even rather badly behaved, the proposed functor yields bialgebras with relatively good properties. For example, the dual of every commutative or cocommutative von Neumann bialgebra with a bounded antipode (b.a.) is the enveloping von Neumann algebra of $C_0(G)$ or $C^*(G)$ respectively, where G is a locally compact group. In other words, in the b.a. case our functor sends every semigroup algebra to a group algebra, 'cutting away' the non-invertible part. In the non-commutative case, even non-b.a., one can show that the corresponding multiplicative unitary has certain good properties. The case of a b.a. is to appear in Math. Scand., for preprint see arXiv:1201.5023 [math.OA].

The case of a non-b.a. is in progress.

Bartosz Kwaśniewski (Polish Academy of Science/Univeristy of Bialystok, Warsaw, Poland)

Topological aperiodicity for product systems of C^*-correspondences

We introduce a semigroup dual to a product system of C^*-correspondences over an Ore semigroup. Under a certain aperiodicity condition on this semigroup we obtain a uniqueness theorem and a simplicity criterion for the associated Cuntz-Pimsner algebras. These results generalize similar statements for crossed products by groups (R. J. Archbold, J. S. Spielberg) and Exel's crossed products (R. Exel, A. Vershik). They also give interesting conditions for topological higher rank graphs, and apply to the new Cuntz C^*-algebra Q_N arising from the $ax + b$-semigroup over natural numbers. (Based on joint work with Wojciech Szymanski.)

Hun Hee Lee (Seoul National University, Seoul, Korea)

Weighted Fourier algebras on non-compact Lie groups and their spectrum

In this talk we will discuss a model for a weighted version of Fourier algebras on non-compact Lie groups. If we recall that the spectrum of the Fourier algebra is nothing but the underlying group itself (as a topological space), then it is natural to be interested in determining the spectrum of weighted algebras. We will demonstrate that the spectrum of the resulting commutative Banach algebra is realized inside the complexification of the underlying Lie group by focusing on the case of Heisenberg group and determine them in some concrete cases.

Jaehyup Lee (Seoul National University, Seoul, Korea)

Finite groups acting on higher dimensional noncommutative tori

For the canonical action α of $\mathrm{SL}_2(\mathbb{Z})$ on 2-dimensional simple rotation algebras $\mathcal{A}_\theta$, it is known that if F is a finite subgroup of $\mathrm{SL}_2(\mathbb{Z})$, the crossed products $\mathcal{A}_\theta \rtimes_\alpha F$ are all AF algebras. In this talk we show that this is not the case for higher dimensional noncommutative tori. More precisely, we show that for each $n \geq 3$ there exist noncommutative simple $\phi(n)$-dimensional tori A_Θ which admit canonical action of $\mathbb{Z}_n$ and for each odd $n \geq 7$ with $2\phi(n) \geq n + 5$ their crossed products $\mathcal{A}_\Theta \rtimes_\alpha \mathbb{Z}_n$ are not AF (with nonzero K_1-groups). It is also shown that the only possible canonical action by a finite group on a 3-dimensional simple torus is the flip action by $\mathbb{Z}_2$. Besides, we discuss the canonical actions by finite groups $\mathbb{Z}_5, \mathbb{Z}_8, \mathbb{Z}_{10}$, and $\mathbb{Z}_{12}$ on the 4-dimensional torus of the form $\mathcal{A}_\theta \otimes \mathcal{A}_\theta$. This is a joint work with Ja A Jeong.

Ji Eun Lee (Sejong University, Seoul, Korea)

Toeplitz operators and their binormality

In this paper, we study binormal Toeplitz operators on the Hardy space H^2. In particular, we examine equivalence conditions so that Toeplitz operators are binormal. Moreover, we explore several applications of our main results.

This talk is based on a joint work with Eungil Ko.

Sang Hoon Lee (Chungnam National University, Daejeon, Korea)

An answer to Lubin's problem: The lifting problem for commuting subnormals

The Lifting Problem for Commuting Subnormals (LPCS) asks for necessary and sufficient conditions for a pair of subnormal operators on a Hilbert space to admit commuting normal extensions. This is an old problem in operator theory. There are many known examples of commuting pairs of subnormal operators which admit no lifting. Also many sufficient conditions for the existence of a lifting have been found. In 1978, A. Lubin addressed a concrete problem about the LPCS: Does the subnormality for the sum of commuting subnormal operators guarantee the existence of commuting normal extensions? This question remains still open until now. In this talk we give an answer to this question of A. Lubin. (This is joint work with W. Y. Lee and J. Yoon.)

Hui Li (University of Wollongong, Wollongong, Australia)

Fundamental results of twisted topological graph algebras

We firstly introduce the notion of twisted topological graph algebras which are a generalization of topological graph algebras defined by Katsura. In particular, the twisted topological graph algebra is the Cuntz-Pimsner algebra of the twisted topological graph correspondence which consolidates graph correspondence with the 1-cocycle on the edge set of a topological graph. We exposit fundamental results of the twisted topological graph algebra, such as the Cuntz-Krieger uniqueness theorem, the ideal structure of the twisted topological graph algebra, and so on.

Elijah Liflyand (Bar-Ilan University, Ramat-Gan, Israel)

Integrability spaces for the Fourier transform

Certain relations between the Fourier transform of a function of bounded variation and the Hilbert transform of its derivative are revealed. The widest subspaces of the space of functions of bounded variation are indicated in which the cosine and sine Fourier transforms are integrable. Interrelations of various function spaces are studied.

Huaxin Lin (University of Oregon/ECNU, Eugene, USA)

Classification of unital simple $\mathcal{Z}$-stable C^*-algebras

We will report a classification theorem for unital separable simple $\mathcal{Z}$-stable C^*-algebras which satisfy the Universal Coefficient Theorem. This is a joint work with Guihua Gong and Zhuang Niu. The class of simple C^*-algebras is strictly larger than those whose tensor products with UHF-algebra have finite tracial rank. These C^*-algebras is built through a smaller class which may be described as "tracially Elliott-Thomsen", or C^*-algebras with finite generalized tracial rank one or zero. We show that these C^*-algebras can be classified by the Elliott invariant. We also show it exhausts all possible Elliott invariants for $\mathcal{Z}$-stable simple C^*-algebras.

James Mingo (Queen's University at Kingston, Kingston, Canada)

Symmetry and random matrices

I will discuss the role of symmetry in asymptotic freeness of ensembles of random matrices. In particular the role of the unitary and orthogonal groups and the transpose.

Mohammad Sal Moslehian (Ferdowsi University of Mashhad, Mashhad, Iran)

Azuma inequality for noncommutative martingales

We establish an Azuma inequality for martingales in the noncommutative setting and apply it to deduce a noncommutative Heoffding inequality. We prove that if $\mathfrak{M}$ is a von Neumann algebra with unit element 1 equipped with a faithful normal finite trace τ such that $\tau(1) = 1$, $x = (x_j)_{0\leq j\leq n}$ is a self-adjoint martingale with respect to a filtration $(\mathfrak{M}_n, \mathcal{E}_n)_{n\geq 0}$ of von Neumann subalgebras of $\mathfrak{M}$ and $dx_j = x_j - x_{j-1}$ is its associated martingale differences satisfying $\mathcal{E}_{j-1}((dx_j)^2) \leq \sigma_j^2$ and $dx_j \leq a_j + M$ for some positive constants a_j, σ_j and M and all $1 \leq j \leq n$, then

$$\mathrm{Prob}\left(\left|\sum_{j=1}^{n} dx_j\right| \geq \lambda\right) \leq 2\exp\left\{\frac{-\lambda^2}{2\left(\sum_{j=1}^{n}(\sigma_j^2 + a_j^2\right) + M\lambda/3)}\right\}.$$

for all $\lambda > 0$. Further, we obtain several consequences.

Rui Okayasu (Osaka Kyoiku University, Osaka, Japan)

Haagerup approximation property and positive cones associated with a von Neumann algebra

We discuss various definitions of the Haagerup approximation property for an arbitrary von Neumann algebra. As a consequence, we give a simple and direct proof that the definition given by M. Caspers and A. Skalski is equivalent to our original one defined by using the standard form. Our strategy is to use the one-parameter family of positive cones due to H. Araki. We also discuss the Haagerup approximation property for non-commutative L_p-spaces. This is based on a joint work with Reiji Tomatsu.

Hiroyuki Osaka (Ritsumeikan University, Kusatsu, Japan)

The Jiang-Su absorption for inclusions of unital C^*-algebras

In this talk we will introduce the tracial Rokhlin property for an inclusion of separable simple unital C^*-algebras $P \subset A$ with finite index in the sense of Watatani, and prove theorems of the following type. Suppose that A belongs to a class of C^*-algebras characterized by some structural property, such as tracial rank zero in the sense of Lin. Then P belongs to the same class. The classes we consider include:

- Simple C^*-algebras with real rank zero or stable rank one.
- Simple C^*-algebras with tracial rank zero or tracial rank less than or equal to one.
- Simple C^*-algebras with the Jiang-Su algebra $\mathcal{Z}$ absorption.
- Simple C^*-algebras for which the order on projections is determined by traces.
- Simple C^*-algebras with the strict comparison property for the Cuntz semi-group.

The 3rd condition and 5th condition are important properties related to Toms and Winter's conjecture, that is, the properties of strict comparison, finite nuclear dimension, and $\mathcal{Z}$-absorption are equivalent for separable simple infinite-dimensional nuclear unital C^*-algebras.

We show that an action α from a finite group G on a simple unital C^*-algebra A has the tracial Rokhlin property in the sense of Phillips if and only if the canonical conditional expectation $E : A \to A^G$ has the tracial Rokhlin property for an inclusion $A^G \subset A$. When an action α from a finite group on a (not necessarily simple) unital C^*-algebra has the Rokhlin property in the sense of Izumi all of the above results are proved in [H. Osaka and T. Teruya, *Strongly self-absorbing property for inclusions of C^*-algebras with a finite Watatani index*, Trans. Amer. Math. Soc. **366**(2014) no. 3 1685–1702] and [H. Osaka and T. Teruya, *Nuclear dimension and pureness for an inclusion of unital C^*- algebras*, preprint, arXiv:1111.1808].

This is a joint work with Tamotsu Teruya.

Narutaka Ozawa (Kyoto University, Kyoto, Japan)

Elementary amenable groups are quasidiagonal

Quasidiagonality has been expected for a longtime to find a crucial role in the classification theory of C*-algebras. Thanks to the recent work due to H. Matui and Y. Sato, is became clearer that this is indeed the case. Back in 1987 J. Rosenberg has proved that quasidiagonality of a reduced group C*-algebra $C^*_\lambda(G)$ implies amenability of the group G, and suggested the converse is also true. I will talk about an affirmative answer to this conjecture for all elementary amenable groups. The proof relies on the recent development of the classification theory of "squab" C*-algebras (Separable Simple Quasidiagonal Unital Amenable C*-algebras in the Bootstrap class). This talk is based on the joint work with M. Rørdam and Y. Sato.

Lourdes Palacios (Universidad Autonoma Metropolitana- Iztapalapa, Mexico City, Mexico)

Multipliers and perfectness in topological algebras

If A is a topological algebra, a bounded mapping $T : A \to A$ is called a *left (right) multiplier* on E if $T(xy) = T(x)y$ (resp. $T(xy) = xT(y)$) for all $x, y \in A$; it is called a *multiplier* on A if it is both a left and a right multiplier. Denote by $M(A)$ the algebra of all multipliers on A.

The notion of a *perfect* algebra was defined by M. Haralampidou [M. Har- alampidou, 2003] in terms of the description of the algebra as a projective limit of algebras of a simpler type. This representation is the classical Arens-Michael decomposition in the case of a locally m-convex algebras [E.A. Michael, 1952] and the more recent generalized Arens-Michael decompostion ([M. Abel, 1989], [V.K. Balachandran, 2000]), for the case of a locally m-pseudoconvex algebras.

In this talk we consider a complete locally m-convex $*$-algebra with continuous involution, which is also a perfect projective limit, and we describe its multiplier algebra $M(A)$, under a weaker topology, making it a locally C^*-algebra. This is applied to the case of certain locally convex H^*-algebras. We consider two more cases: when A is a perfect complete locally m-convex algebra with an approximate identity and with complete Arens-Michael normed factors, and when A is a perfect complete locally m-pseudoconvex algebra with an approximate identity and with complete generalized Arens-Michael k_α-normed factors. In both cases we describe the multiplier algebra $M(A)$ in terms of the multiplier algebras of the corresponding factors. Suitable examples will be given.

Joint work with M. Haralampidou and C. Signoret.

N. Christopher Phillips (University of Oregon, Eugene, USA)

Large subalgebras of crossed product C^*-algebras

We define a large subalgebra of a C^*-algebra, exhibit large subalgebras in transformation group C^*-algebras of minimal dynamical systems, and give applications to the structure of some crossed product C^*-algebras.

Gilles Pisier (Texas A&M University, College Station TX, USA)

C^*-norms on tensor products and quantum expanders

This is an account of joint work with N. Ozawa. For any pair M, N of von Neumann algebras such that the algebraic tensor product $M \otimes N$ admits more than one C*-norm, the cardinal of the set of C*-norms is at least $2^{\aleph_0}$. Moreover there is a family with cardinality $2^{\aleph_0}$ of injective tensor product functors for C*-algebras in Kirchberg's sense. Let $\mathbb{B} = \prod_n M_n$. We also show that, for any non-nuclear von Neumann algebra $M \subset \mathbb{B}(\ell_2)$, the set of C*-norms on $\mathbb{B} \otimes M$ has cardinality *equal to* $2^{2^{\aleph_0}}$. The talk will also recall the connection of such questions with the non-separability of the set of finite dimensional (actually 3-dimensional) operator spaces which goes back to a 1995 paper with Marius Junge, and several recent "quantitative" refinements obtained using quantum expanders.

Marek Ptak (University of Agriculture in Kraków, Kraków, Poland)

C-symmetric operators and its preanihilator

Let $\mathcal{H}$ be a complex separable Hilbert space. Let C be an isometric antilinear involution in $\mathcal{H}$. A bounded operator $T \in B(\mathcal{H})$ is called *C-symmetric*, if $CTC = T^*$. Let $\mathcal{C}$ denote the set of all C-symmetric operators.

C–symmetric operators and the whole set $\mathcal{C}$ was intensively studied recently. There were many examples of C–symmetric operators such as Jordan blocks, truncated Toeplitz operators, Hankel operators, etc. The aim of the talk is to present the description of the preanihilator of the space of all C–symmetric operators. It will be shown that the subspace of all C-symmetric operators is transitive and 2-reflexive or even 2-hyperreflexive. It means that the preanihilator of $\mathcal{C}$ does not contain any rank-one operators and rank-two operators are dense in the preanihilator. Moreover, the description all rank-two operators in this preanihilator is given.

Joint work with K. Kliś–Garlicka.

Mikael Rørdam (University of Copenhagen, Copenhagen, Denmark)

The central sequence algebra

The C^*-algebra of (norm) central sequences of a C^*-algebra determines important properties of the C^*-algebra, such as if it absorbs the Jiang-Su algebra (or any other strongly self-absorbing C^*-algebra). Matui and Sato have recently developed techniques to study the central sequence algebra, and they have in this way been able to decide when (certain) simple C^*-algebras absorb the Jiang-Su algebra. We discuss these results and some extensions of them, and we also talk about when central sequence C^*-algebras have a character, and the possible significance of this property.

This is a joint work with Eberhard Kirchberg

Zhong-Jin Ruan (University of Illinois, Urbana, USA)

Abstract harmonic analysis and related operator algebras on locally compact quantum groups

The analysis aspect of quantum group theory is largely motivated from abstract harmonic analysis and operator algebra theory. Some classical results on locally compact groups can be naturally generalized to locally compact quantum groups. I will discuss some recent progress in this direction.

Ghadir Sadeghi (Hakim Sabzevari University, Sabzevar, Iran)

On the uniform Opial property

Let X be Banach spaces and τ a topology on X. We say that X has the uniform Opial condition with respect to τ if $o_\tau(\alpha) > 0$ for every $\alpha > 0$, where $o_\tau(\cdot)$ is the Opial modulus defined as

$$o_\tau(\alpha) = \inf \left\{ \liminf_{n\to\infty} \|x_n + x\| - 1 \right\},$$

where the infimum is taken over all $x \in X$ with $\|x\| \geq \alpha$ and all sequences $\{x_n\}$ such that τ-$\lim_{n\to\infty} x_n = 0$ and $\liminf_{n\to\infty} \|x_n\| \geq 1$. Let $\mathfrak{M}$ be a semifinite von Neumann algebra on a Hilbert space $\mathfrak{H}$ with a normal faithful trace τ, we consider noncommutative modular function spaces $\mathcal{L}_{\widetilde{\rho}}(\widetilde{\mathfrak{M}}, \tau)$ of τ–measurable operators affiliated to $\mathfrak{M}$. We prove that these spaces have the uniform Opial condition with respect to convergence $\widetilde{\rho}$–a.e.

Jaydeb Sarkar (Indian Statistical Institute, Bangalore, India)

An Invariant subspace theorem

In this talk, we will begin by outlining the classification results on shift invariant subspaces of the Hardy space, due to A. Beurling, P. Lax and P. Halmos, including the role of the wandering subspace theorem for isometries, due to J. von Neumann and H. Wold. We will then present a characterization result of invariant subspaces for a large class of bounded linear operators on separable Hilbert spaces, generalizing the classification results of Beurling, Lax and Halmos. We will apply these results to give a complete classification of shift invariant subspaces of analytic reproducing kernel Hilbert spaces in one and several variables set up.

Yasuhiko Sato (Kyoto University, Kyoto, Japan)

Classification theorems for amenable C^*-algebras and Connes' fundamental work for injective factors

In 1976, Connes showed the classification theorem for injective factors of type II_1, II_∞, and III_λ, $\lambda \neq 1$ on a separable Hilbert space. Later, Haagerup completed the case of type III_1. On the other hand, for C^*-algebras, Elliott showed that a certain class of amenable C^*-algebras can be classified by their K-groups. Following these successes, Elliott initiated the program to classify amenable C^*-algebras via K-theoretic invariants.

Recently, in his program it has become necessary to invoke some regularity property of the classifiable C^*-algebras in various manners, after the appearance of pathological examples constructed by Villadsen, Rordam and Toms. With the aim of characterizing classifiable C^*-algebras, in 2008, Toms and Winter have conjectured that the following three fundamental properties are equivalent for all unital, separable, simple, amenable, infinite-dimensional C^*-algebras: strict comparison, absorption of the Jiang-Su algebra, and finite nuclear dimension (or finite decomposition rank for stably finite cases). This conjecture has attracted a fair amount of attention from experts in operator algebras. Actually, it is known that an affirmative answer to this conjecture induces a solution of Rosenberg's conjecture and also of the Blackadar-Kirchberg conjecture, which are concerned with quasidiagonality of amenable C^*-algebras.

In this talk, I report on the recent progress of the Toms-Winter conjecture, with particular emphasis on the now apparent role of Connes' work. I would also like to talk about its application to the classification theorem for amenable C^*-algebras and to their dynamical systems.

Koichi Shimada (The University of Tokyo, Tokyo, Japan)

A classification of flows on AFD factors with faithful Connes–Takesaki modules

In this talk, we will explain a result about group actions on von Neumann algebras. We present a classification of flows on AFD factors with faithful Connes-Takesaki modules. This is a generalization of classification of trace-scaling flows on the AFD II_∞ factor, which is equivalent to the uniqueness of the AFD type III_1 factor. In order to do this, we show that a flow on any AFD factor with faithful Connes-Takesaki module has the Rohlin property, which is a kind of outerness for flows. This result means that pointwisely non approximately inner flows have the Rohlin property.

Adam Skalski (Polish Academy of Sciences/University of Warsaw, Warsaw, Poland)

Haagerup approximation property for arbitrary von Neumann algebras and locally compact quantum groups

Haagerup property of a discrete group is equivalent to a certain approximation property (also called the Haagerup approximation property) of the group von Neumann algebra. This motivated the detailed study of the latter approximation property for finite von Neumann algebras. Started recently investigations of the geometric properties of quantum groups motivated the need to extend the notion of the Haagerup property to arbitrary von Neumann algebras. We will discuss these motivations and using the crossed product techniques prove that the new Haagerup property does not depend on the choice of a reference state (or weight). The talk is based mainly on joint work with Martijn Caspers.

Roland Speicher (Saarland University, Saarbruecken, Germany)

Absence of algebraic relations and of zero divisors under the assumption of finite non-microstates free Fisher information

In a series of papers which started in 1993, Voiculescu transferred the notion of entropy and Fisher information to the world of non-commutative probability theory. It is believed that finiteness of entropy or Fisher information implies, like in the classical case, strong regularity properties for the considered non-commutative distributions. In my talk, I will address questions of this kind, namely the absence of algebraic relations and of zero divisors, for finite non-microstates free Fisher information. This is joint work with T. Mai and M. Weber.

Ilya Spitkovsky (College of William and Mary/New York University Abu Dhabi, Williamsburg, USA)

One sided invertibility of matrices over commutative rings, corona problems, and Toeplitz operators with matrix symbols

Conditions are established under which Fredholmness, Coburn's property and one- or two-sided invertibility are shared by a Toeplitz operator with matrix symbol G and the Toeplitz operator with scalar symbol $\det G$. These results are based on one-sided invertibility criteria for rectangular matrices over appropriate commutative rings and related scalar corona type problems, and are obtained jointly with M. C. Camara and L. Rodman.

Jan Stochel (Uniwersytet Jagiellonski, Krakow, Poland)

Directed trees and subnormality of Hilbert space operators

The aim of my talk is to present some recent achievements in the theory of unbounded Hilbert space operators in the context of weighted shifts on directed trees and composition operators (in L^2-spaces). I will concentrate on the question of subnormality. It turns out that there is no satisfactory criterion for subnormality of general operators. Fortunately, such a criterion has been recently established in the case of weighted shifts on directed trees and composition operators. This criterion depends on the existence of a family of probability measures on the closed half line satisfying the so-called consistency condition. It becomes a necessary and sufficient condition for subnormality of bounded weighted shifts on directed trees and bounded composition operators. Recall that subnormality of bounded composition operators is completely characterized by the celebrated Lambert's condition (written in terms of Radon-Nikodym derivatives). I will give an example of an unbounded non-subnormal composition operator which satisfies the Lambert's condition. In fact, this example is strongly related to an example of a weighted shift on a directed tree with similar properties; the underlying directed tree is rootless and has one branching vertex. The whole construction depends heavily on subtle properties of N-extremal measures, the vital part of the theory of Hamburger and Stieltjes moment sequences. The talk is based on the following papers: [Z. J. Jabłoński, I. B. Jung, J. Stochel, Weighted shifts on directed trees, Memoirs of the American Mathematical Society, 216 (2012)], [Z. J. Jabłoński, I. B. Jung, J. Stochel, A non-hyponormal operator generating Stieltjes moment sequences, Journal of Functional Analysis, 262 (2012), 3946-3980] and [P. Budzyński, Z. J. Jabłoński, I. B. Jung, J. Stochel, Unbounded subnormal composition operators in L^2-spaces, arXiv:1303.6486].

Michael Sun (University of Oregon, Eugene, USA)

Existence of tracial Rokhlin property

Matui-Sato defined the tracial Rokhlin property for discrete amenable groups and proved that such actions preserved Jiang-Su stability from the original algebra to the crossed product algebra. We show by construction that this Matui-Sato tracial Rokhlin property exists for all unital simple separable nuclear tracially approximately divisible C^*-algebras and elementary amenable groups. We also verify that for a certain class of groups that the crossed product by this constructed action all belong to the same class of classifiable algebras.

Wei Sun (East China Normal University, Shanghai, China)

Approximate conjugacies of dynamical systems and K-theory of crossed product C^*-algebras

For a type of minimal dynamical systems, we studied the K-theory of the corresponding crossed prouct C^*-algebras and determines the case when K-theory can yield approximate conjugacy. Besides, the relationship between "approximate conjugacies" and the K-theory of the crossed products is also studied.

Yuhei Suzuki (The University of Tokyo/Kyoto University, Tokyo/Kyoto, Japan)

Amenable minimal Cantor systems of free groups arising from diagonal actions

We study amenable minimal Cantor systems of free groups. We show for every free group, (explicitly given) continuum many Kirchberg algebras are realized as the crossed product of an amenable minimal Cantor system of it. In particular this shows that there are continuum many Kirchberg algebras such that each of which is decomposed to the crossed products of amenable minimal Cantor systems of any virtually free group. We also give computations of K-groups for the diagonal actions of the boundary action and the odometer transformations. These computations classify them in terms of the topological full groups, continuous orbit equivalence, strong orbit equivalence, and the crossed products. Reference:arXiv:1312.7098 (to appear in J. reine Angew. Math.)

Takuya Takeishi (The University of Tokyo, Tokyo, Japan)

Bost-Connes system for local fields of characteristic zero

The Bost-Connes system, which describes the relation between quantum statistical mechanics and class field theory, was first constructed by Bost and Connes for the rational field, and generalized for arbitrary number fields by the contribution of many researchers. In this talk, we will introduce a generalization of the Bost-Connes sysmtem for local fields of characteristic zero, and introduce some properties.

Reiji Tomatsu (Hokkaido University, Sapporo, Japan)

Product type actions of compact quantum groups

A faithful product type action of the q-deformation of a connected semisimple compact Lie group is discussed. Our main theorem states that such an action is induced from a minimal action of the maximal torus. I will sketch out its proof.

Andrew Toms (Purdue University, West Lafayette, USA)

Mean dimension and the structure of C^*-algebras

The mean dimension of a topological dynamical system was introduced by Gromov and developed by Lindenstrauss and Weiss. Giol and Kerr were the first to show that this invariant is connected to the structure and classification theory of separable and amenable C^*-algebras. This talk will explore this connection further, and provide evidence that minimal systems of mean dimension zero give rise to C^*-algebras which are determined up to isomorphism by K-theory.

Stefaan Vaes (KU Leuven, Leuven, Belgium)

Classification of crossed product von Neumann algebras

Actions of countable groups by automorphisms give rise to interesting families of von Neumann algebras through the crossed product construction. Starting from a joint work with Sorin Popa on crossed products by actions of the free groups, I will survey several recent classification theorems for type II_1 factors, type III factors and subfactors, arising from actions on measure spaces, as well as on injective factors.

Dan-Virgil Voiculescu (University of California, Berkeley, USA)

Some C^*-algebras which are Coronas of Non-C^*-Banach Algebras

The talk will deal with algebras which arise from commutants modulo certain normed ideals of n-tuples of operators and their ideal of compact operators. This will include duality properties, K-theory aspects and the model-theory property of degree-1 saturation.

Qin Wang (East China Normal University, Shanghai, China)

Fibred coarse embeddings of metric spaces and higher index problems

We introduce a notion of fibred coarse embedding into Hilbert space for metric spaces, which is a generalization of Gromov's notion of coarse embedding into Hilbert space. It turns out that a large class of expander graphs admit such an embedding. We show that the maximal coarse Baum–Connes conjecture holds for metric spaces with bounded geometry which admit a fibred coarse embedding into Hilbert space. We also show that a finitely generated, residually finite group has the Haagerup property (Gromov's a-T-amenability) if and only if one (or equivalently, all) of its box spaces admits a fibred coarse embedding into Hilbert space. In contrast, the box spaces of a finitely generated, residually finite hyperbolic group with property (T) do not admit a fibred coarse embedding into Hilbert space, but do admit a fibred coarse embedding into an l_p space for some $p > 2$. These are joint work with Xiaoman Chen, Xianjin Wang and Guoliang Yu.

Benjamin Willson (Hanyang University, Seoul, Korea)

Operator bounded approximate diagonals for locally compact quantum groups using nets in $L^2(\mathbb{G})$

For a locally compact group G, the unitary operator W on $L^2(G \times G)$ given by $W\xi(x, y) = \xi(x, x^{-1}y)$ encapsulates the structure of G. If G is amenable then one can find simple tensors in $L^2(G) \otimes L^2(G)$ which, when acted upon by W^* produce the square root of an (operator) bounded approximate diagonal for $L^1(G)$. Using this approximate diagonal for a group algebra as a motivating example, this talk will discuss the relationship between these tensors and approximate identities and approximate translation invariant means.

The structure of locally compact quantum groups is similarly described by a multiplicative unitary and we can attempt the same construction. The above approach relies upon strong amenability, co-amenability and the commutativity of $L^\infty(G)$. The final condition can be weakened to requiring that WW'^* approximates the identity when acting on the aforementioned net of simple tensors.

A slightly stronger version of the final condition also allows the construction of an operator approximate diagonal for the dual quantum group.

Wilhelm Winter (Münster University, Münster, Germany)

Regularity of nuclear C^*-algebras

I will survey recent developments in the structure and classification theory of nuclear C^*-algebras and their interplay with topological dynamics.

Takanori Yamamoto (Hokkai-Gakuen University, Sapporo, Japan)

Hyponormal singular integral operators with Cauchy kernel on L^2

Let α and β be functions in $L^\infty(\mathbb{T})$, where $\mathbb{T}$ is the unit circle. Let P denote the orthogonal projection from $L^2(\mathbb{T})$ onto the Hardy space $H^2(\mathbb{T})$, and $Q = I - P$, where I is the identity operator on $L^2(\mathbb{T})$. This talk is concerned with the singular integral operators $S_{\alpha,\beta}$ on $L^2(\mathbb{T})$ of the form $S_{\alpha,\beta}f = \alpha Pf + \beta Qf$, for $f \in L^2(\mathbb{T})$. In this talk, we study the hyponormality of $S_{\alpha,\beta}$ which is related to the hyponormal Toeplitz operator on $H^2(\mathbb{T})$.

Guoliang Yu (Texas A&M University, College Station TX, USA)

Quantitative K-theory for operator algebras and its applications

I will give an introduction to quantitative K-theory for operator algebras and discuss its applications to Kunneth formula and UCT for certain C^*-algebras. This is joint work with Herve Oyono-Oyono.

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