## Bas Jordans

A classification of SU($d$)-type $C^*$-tensor categories

Kazhdan and Wenzl classified all tensor categories which have a fusion ring isomorphic to the fusion ring of the group SU($d$). In this talk we will consider the $C^*$-analogue of this problem. Given a $C^*$-tensor category $C$ with fusion ring isomorphic to the fusion ring of the group SU($d$), we can extract a constant $q$ from $C$ such that there exists a $*$-representation of the Hecke algebra $H_n(q)$ into $C$. The categorical trace on $C$ induces a Markov trace on $H_n(q)$. Using this Markov trace and a representation of $H_n(q)$ in $\mathrm{Rep}(\mathrm{SU}_{\sqrt{q}}(d))$ we show that $C$ is isomorphic to a twist of the category $\mathrm{Rep}(\mathrm{SU}_{\sqrt{q}}(d))$.

## David Kyed

Continuous derivations with values in affiliated operators

In an effort to obtain computable invariants for $II_1$-factors, Andreas Thom suggested to study the (dimension of the) first continuous Hochschild cohomology with values in a certain algebra of affiliated operators. In my talk I will explain how this invariant behaves when passing to corners and how this leads to a number of vanishing results. If time permits, I will explain how these things are related to Shen's generator invariant and why it might be reasonable to expect that the continuous Hochschild cohomology always vanishes.

This is based on a joint work with Vadim Alekseev.

## Dominic Enders

Lifting the Busby map

Lifting properties for $C^*$-algebras tend to have a bad permanence behavior. In particular, they usually do not pass to ideals, quotients or extensions. In this talk we show how to obtain permanence results along extensions whose associated Busby maps have good lifting properties. We discuss various situations where these results apply and explain how they can be used to describe semiprojectivity for certain classes of $C^*$-algebras.

## Eduard Ortega

Cuntz-Krieger Boolean algebras.

In this talk we are going to explain what a Cuntz-Krieger Boolean $C^*$-algebra associated to a Boolean dynamical system is. We will show that it is a generalization of graph $C^*$-algebras, crossed products of the Cantor set by a homeomorphism and that partially includes the class of labelled graph $C^*$-algebras. Finally we are able to give results on simplicity, purely infiniteness and $K$-theory.

This is an on-going project with Toke Meier Carlsen.

## Erik Alfsen

Finding decompositions of separable states

A (mixed) state of a bipartite quantum system is represented by a density matrix $T \in M_m(C) \otimes M_n(C)$. It is said to be *separable* if it can be decomposed into product states, that is, if it can be written as a convex combination of tensor products $A_i \otimes B_i$ where $A_i$ and $B_i$ are density matrices in $M_m(C)$ and $M_n(C)$ respectively. A state which is not separable, is said to be *entangled*. Testing separability is a surprisingly difficult problem. It is solved for $T$ in the lowest dimensions (when $mn \leq 6$), but it is NP-hard in general, as shown by Gurvits in 2004.

However, there are important classes of states that are known to be separable. One such class consists of states called “quantum classical" (a term due to Holevo). Actually, this class is contained in a much larger class of states which are shown to be separable by an explicit construction of product state decompositions, and these decompositions are unique within the type of decompositions that are appropriate for this class of states. This is the main theorem in a recent paper by F.Shultz and E.A. in *Linear Algebra and Applications*, 437 (2012) 2613–2692, and it will be precisely stated and briefly discussed in the talk.

## Erik Bakken

Finite approximations of physical models over local fields

In this talk I will describe how the Hamilton operator of certain quantum mechanical systems (in particular the harmonic oscillator) can be approximated in a very strong sense by Hamilton operators on finite quantum systems. The quantum systems will be over local fields.

This is based on joint work with Trond Digernes.

## Erik Bedos

On ideals of certain reduced crossed products.

We consider the reduced $C^*$-crossed product associated with a twisted action of a discrete group on a unital $C^*$-algebra. Due to the work of P. de la Harpe, G. Skandalis and others 20-25 years ago, it is known that for a large class of non-amenable groups, such a crossed product is simple if and only if the system is minimal. We will describe how some useful information about the ideal structure can also be obtained in the non-minimal case.

This is joint work with R. Conti.

## George Elliott

The Thomsen circle semigroup

Using the original Thomsen semigroup—what might in retrospect be called the Thomsen interval semigroup—, Klaus Thomsen classified approximate interval (AI) algebras. A similar classification holds for inductive limits of finite direct sums of matrix algebras over any fixed weakly semiprojective $C^*$-algebra $X$, in terms of what might now be called the Thomsen $X$-semigroup. Thus, the Thomsen circle semigroup (in which $X$ is $C(T)$) classifies approximate circle (AT) algebras. In fact, just as the Thomsen interval semigroup is known to classify more general $C^*$-algebras than AI algebras, in particular, arbitrary inductive limits of matrix algebras over trees, the Thomsen circle semigroup also classifies more than AT algebras, for instance limits of matrix algebras over arbitrary graphs.

This is joint work with Luis Santiago.

## Gunnar Restorff

Automorphisms of Cuntz-Krieger algebras

We prove that the natural homomorphism from Kirchberg's ideal-related KK-theory with one specified ideal into the homomorphism group of ideal-related K-theory with coefficients is an isomorphism for a class of extensions which includes all Cuntz-Krieger algebras with exactly one ideal. Using Kirchberg's results, this gives a classification of the automorphisms of two-component Cuntz-Krieger algebras.

This is joint work with S. Eilers and E. Ruiz.

## Henrik D. Pedersen

$L^2$-Betti numbers of type $I$ groups.

I will describe recent joint work with Alain Valette where we compute the $L^2$-Betti numbers of locally compact type $I$ groups in terms of ordinary cohomology with coefficients in irreducible representations. In particular this gives a computation of the $L^2$-Betti numbers of any lattice in such a group.

The talk will include a general introduction to $L^2$-Betti numbers of locally compact groups, touching also on joint work with David Kyed and Stefaan Vaes to extend the ME-invariance theorem for $L^2$-Betti numbers, due to Gaboriau, to the locally compact setting.

## James Gabe

On absorbing extensions of $C^*$-algebras

We consider the problem of when an extension of separable $C^*$-algebras $A$ by $B$ with $B$ stable, absorbs a class of extensions. In particular, if $A$ and $B$ are $C^*$-algebras over $X$, we prove the existence of a (weakly nuclear) $X$-equivariant extension of $A$ by $B$ which absorbs any other (weakly nuclear) $X$-equivariant extension of $A$ by $B$ with an $X$-equivariant c.p. splitting. These extensions are unique up to unitary homotopy and satisfy an analogue of the purely largeness condition defined by Elliott and Kucerovsky. We show that this purely largeness condition implies absorbtion of weakly nuclear $X$-equivariant extensions if $X$ is a finite $T_0$ space.

This is joint work with Efren Ruiz.

## Jens Kaad

Index theory for non-Fredholm operators

In the eighties, the investigation of an index theory for non-Fredholm operators was initiated by Gesztesy-Simon and Carey-Pincus. The generalized index is defined as a scaling limit at zero of a super trace of resolvents and is thus tightly linked to Krein's spectral shift function. In this talk I will present a local formula for the scaling limit at infinity in the case of Dirac-type operators on Euclidean space. The talk is based on joint work with Alan Carey and Harald Grosse.

## Johannes Aastrup

The quantum-holonomy-diffeomorphism algebra

In the talk I will introduce the quantum-holonomy-diffeomorphism algebra and describe its infintesimal version.

## Ken Dykema

Upper triangular forms for elements of finite von Neumann algebras

In a finite von Neumann algebra, using the Haagerup–Schultz hyperinvariant projections based on Brown measure, an arbitrary element $T$ can be written in the form $T = N + Q$ where $N$ is normal and has the same Brown measure as $T$ and where $Q$ is s.o.t.-quasinilpotent. This is an analogue of Ringrose's theorem for compact operators. This decomposition also behaves well with respect to holomorphic functional calculus.

Joint with F. Sukochev and D. Zanin.

## Liguang Wang

On von Neumann algebras which are complemented subspaces of $B(H)$

Let $M$ be a von Neumann algebra of type $II_1$ which is also a complemeted subspace of $B(H)$. We establish an algebraic criterion, which ensures that $M$ is injective. Some corollaries are given.

This is joint work with Erik Christensen.

## Lyudmyla Turowska

Sets of multiplicity and closable multipliers on group algebras

A closed subset $F$ of a locally compact group $G$ is called a set of multiplicity if there exists a non-zero operator in the reduced C*-algebra $C_r^*(G)$ of $G$ supported on $F$. Analogously, a subset $E$ of $G \times G$ is called a set of operator multiplicity if there exists a non-zero compact operator acting on $L^2(G)$ supported on $E$. I will discuss recent results on the connection between sets of multiplicity and those of operator multiplicity and closable multipliers on group algebras.

The talk will be based on joint work with V. S. Shulman and I. Todorov.

## Magnus D. Norling

The K-theory of some reduced inverse semigroup $C^*$-algebras

What can one expect the K-theory of the reduced $C^*$-algebra of an inverse semigroup to be? We present some results on a family of special cases using a description by Cuntz, Echterhoff and Li of the K-theory of some totally disconnected dynamical systems.

## Makoto Yamashita

Classification of $\mathrm{SU}_q(n)$-like quantum groups by categorical duality

The notion of compact quantum group actions on operator algebras can be dualized into that of $\mathrm{Rep}(G)$-module $C^*$-categories, in the spirit of Woronowicz's Tannaka-Krein duality. Under this correspondence, the braided commutative Yetter-Drinfeld G-algebras are classified by the $C^*$-tensor categories with tensor functors from $\mathrm{Rep}(G)$. Recasting the noncommutative Poisson boundary in this framework, we obtain an explicit list of the non-Kac quantum groups with the same fusion rule and classical dimension of representations as $\mathrm{SU}(n)$.

This talk is based on joint work with Sergey Neshveyev.

## Martin Wanvik

Categorical group $W^*$-algebras

We construct a "categorical" $W^*$-crossed product using the adjoint functor theorem of Peter J. Freyd. As a special case, we obtain a group algebra functor, which associates a $W^*$-algebra to every topological group. It is left adjoint to an appropriate unitary group functor on the category of $W^*$-algebras. These algebras have previously appeared in papers by H. Grundling and A.I. Shtern (separately), though the universal property (or functoriality, for that matter) has never previously (to the speaker's knowledge) been described. A more explicit description will also be given.

## Rune Johansen

Visualizing Endomorphisms of Graph Algebras

Each endpoint-fixing permutation of the paths of a given length in a directed graph induces an endomorphism of the corresponding graph $C^*$-algebra. Such an endomorphism can be represented by a labelled graph, called the permtation graph, which facilitates computations involving the endomorphism. In particular, conditions will be given for when such an endomorphism is an automorphism. Examples will also be given of how this approach has made it possible to write computer programs capable of searching for such permutative automorphisms.

This is joint work with James Avery and Wojciech Szymanski.

## Sara Arklint

Reduced filtered $K$-theory for Cuntz-Krieger algebras

In 2006, Restorff showed that *reduced filtered $K$-theory* classifies the purely infinite Cuntz-Krieger algebras.

In my talk, I will describe the range of reduced filtered $K$-theory wrt. purely infinite Cuntz-Krieger algebras (thus completing the image), and establish completeness of it in an a priori larger class under some conditions.

I will also compare reduced filtered $K$-theory to the larger invariant *filtered $K$-theory* and provide an example that supports the preference of reduced filtered $K$-theory.

Joint work with Bentmann, Katsura, Restorff, and Ruiz.

## Søren Knudby

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.

## Sören Möller

Radial multipliers on amalgamated free products of $II_1$-factors

Let $M_i$ be a family of $II_1$-factors, containing a common finite index $II_1$-subfactor $N$. Furthermore, let $\phi : N_0 - > C$. We show that if a Hankel matrix related to $\phi$ is trace-class, then there exists a unique completely bounded map $M_\phi$ on the amalgamated free product of the $M_i$ with amalgamation over $N$ , which acts as an radial multiplier. Hereby we extend a result of U. Haagerup and the author for radial multipliers on reduced free products of unital $C^*$- and von Neumann algebras.

## Steven Deprez

TBA

TBA

## Tyrone Crisp

Parabolic induction and $K$-theory for $p$-adic SL(2)

Parabolic induction, or the formation of principal series, is an important construction in the representation theory of reductive groups. Considering the special linear group $G = \mathrm{SL}(2)$ over a $p$-adic field, and its subgroup $M$ of diagonal matrices, we construct a map $K_*(C_r^*(M)) \to K_*(C_r^*(G))$ that corresponds, via the Chern character, to parabolic induction.

## Uffe Haagerup

Approximation properties for groups and von Neumann algebras.

This talk is about recent advances concerning approximation properties for groups and group von Neumann algebras. In 1994 Jon Kraus and I introduced a new approximation property (AP) for locally compact groups and we proved that for dicrete groups AP is equivalent to the property W*-OAP of Effros and Ruan for the group von Neumann algebra. In 2011 Vincent Lafforgue and Michael de la Salle has proved that $\mathrm{SL}(n, \mathbb{R})$ and $\mathrm{SL}(n, \mathbb{Z})$ does not have the property AP for $n \geq 3$. In a joint work with Tim de Laat (Duke Math. J. 2012), we extend their result by proving that $\mathrm{Sp}(2, \mathbb{R})$ and more generally all simple connected Lie groups of real rank $= 2$ and with finite center do not have the AP. The proof uses some careful estimates of Jacobi polynomials obtained in collaboration with Henrik Shlichtkrull. In a second paper (`arXiv:1307.2526`) Tim de Laat and I have now removed the finite center condition from our result in Duke.

## Wojciech Szymanski

Automorphisms and conjugacy of MASAs in the Cuntz algebras

I discuss some recent results on the structure of the outer automorphism groups of the Cuntz algebras, and related to this problem of conjugacy of MASAs.