Operator Algebras Seminar

Organizers: Dietmar Bisch

Fridays, 4:00 - 6:00 pm, 6635 South Hall

April 14 **Anne Louise Svendsen**, UCSB
Ultrapower algebras and central sequences

Abstract: Factors are von Neumann algebras with trivial center. A factor may however have certain asymptotic commutativity properties, for instance, the factor may contain non-trivial central sequences.

We will start out by defining the ultrapower algebra and explain some basic properties of this construction. Then we will use this to show some conditions which are equivalent to having central sequences (due to Connes in the single algebra setting and to Bisch in the subfactor setting).

Lecture on Quantum Computation

April 21 **David A. Meyer**, UCSD
Quantum search algorithms

Abstract: Although Grover's quantum search algorithm is the most famous, there are others which are also superior to the best corresponding classical algorithm. In this talk I'll explain several algorithms, including Grover's. The others beat their classical counterparts by even greater margins; I'll show that they are each as good as possible. I'll also discuss the role of entanglement in these algorithms, and comment on the recent experiments, proposed and realized, to implement Grover's algorithm without entanglement.

April 28 **Anne Louise Svendsen**, UCSB
On Connes' $\chi(M)$ invariant

Abstract: Connes introduced in the 80's an invariant, $\chi(M)$, for a separable II_1 factor M. We will define this invariant, show that it is an abelian group and discuss some properties.

Then we will use $\chi(M)$, along with a refinement of the invariant, to show that there is a II_1 factor M, which is not isomorphic to its opposite via an

isomorphism of period 2. This implies in particular that there are II_1 factors which are not group von Neumann algebras.

May 9 **Guofang Wei**, UCSB **Tuesday, 5/9, 2-3 pm in SH 6635**
Introduction to Gromov-Hausdorff distance

Abstract: Gromov-Hausdorff distance defines a distance on the space of all compact metric spaces, in that we have a way of measuring when metric spaces look alike. This powerful notion has many applications in g eometry, topology and group theory. We will define Gromov-Hausdorff distance and give some examples and show how it is used in geometry.

May 12 **Chuck Akemann**, UCSB
Regularity Revisited

Abstract: For a separable C*-algebra A we define an open projection as the range projection $[b]$ in A^{**} of a positive element b of A, and a closed projection as the complement of an open projection. The closure $\overline{q}$ of any projection q in A^{**} is defined to be the smallest closed projection in A^{**} that dominates q.

A projection p in the double dual A^{**} of a C*-algebra A is said to be *regular* if $||ap|| = ||a\overline{p}||$ for all a in A.

When dealing with a regular projection p the connection between p and $\overline{p}$ is completely described by the ordinary topological closure of a suitable set in the quasi-state space. This is not the case for a nonregular projection.

In this talk I will establish some background and explain why nonregular, dense, open projections exist even in very "nice" simple C*-algebras.

May 17 **Claudio D'Antoni** , Universita di Roma "Tor Vergata"
A generalization of equilibrium states in C*-dynamical systems

Abstract: **Note: Wednesday, 5/17, 4-5 pm in SH 6635**

A natural generalization of equilibrium states is studied in the framework of C*-dynamical systems with a local structure. Basic properties of the representation of the quasi local C*-algebra induced by such states, such as Reeh-Schlieder, Borchers, ..., are investigated.

May 19 **Sorin Popa**, UCLA
Embedding into free group algebras and a vanishing cohomology problem

Abstract: We relate the vanishing of the cohomology problem for certain cocycle actions of discrete groups G on the free group algebra $L(F_\infty)$, considered by Connes and Jones, to an embedding problem asking whether or

not there exist non-hyperfinite type II_1 von Neumann subalgebras B of $L(F_n)$ with non-atomic relative commutant. Various other embedding and vanishing cohomology results are also discussed.

May 26 **Dimitri Shlyakhtenko**, UCLA
Prime type III factors

Abstract: We show that for each $0 < \lambda < 1$, the free Araki-Woods factor of type III_λ cannot be written as a tensor product of two diffuse von Neumann algebras (i.e., is prime). Thus there exist prime factors of type III. We also show that this factor does not contain a Cartan subalgebra.

June 2 **Alexis Alevras**, UCSB
The variational principle for non-commutative dynamical systems

Abstract: The variational principle of classical ergodic theory says (in one of its forms) that the entropy $h(T)$ of a topological dynamical system (X, T) is equal to $\sup h_\mu(T)$, where $h_\mu(T)$ is the Kolmogorov entropy of the measurable dynamical system (X, μ, T) and where the supremum is taken over all T-invariant probability measures μ. The non-commutative analogue – $ht(\alpha) = \sup h_\phi(\alpha)$, where α is an automorphism of a $C^\star$-algebra, $ht(\alpha)$ is Voiculescu's topological entropy, $h_\phi(\alpha)$ is the CNT entropy and where the supremum is taken over all α-invariant states ϕ– is generally not true.

In the talk we will present a recent proof, due to Neshveyev and Størmer, of this non-commutative variational principle for a certain class of asymptotically abelian $C^\star$-dynamical systems.