MODEL THEORY OF OPERATOR ALGEBRAS
CONFERENCE SCHEDULE
SEPTEMBER 23-24, 2017

Saturday, September 23

Doheny Beach Ballroom

8:30-Breakfast
9-Ilijas Farah (York University)
10:00-Coffee break
10:30-Stephen Hardy (Hampden-Sydney College)
11:30-Bernard Russo (UC Irvine)
12:30-Lunch
2-Bruce Blackadar (University of Nevada, Reno)
3-Isaac Goldbring (UC Irvine)
4-Camilo Argoty (Sergio Arboleda University and Universidad Central, Colombia)
4:30-Alessandro Vignati (Paris Diderot)

Sunday, September 24

Doheny Beach Ballroom

8:30-Breakfast
9-Hiroshi Ando (Chiba University)
10-Christopher Eagle (University of Victoria)
11-Dan Virgil Voiculescu (UC Berkeley)

ABSTRACTS

Hiroshi Ando- *Ultraproduct of self-adjoint operators*

The ultraproduct constructions for bounded operators/operator algebras in various metric structures have been so useful for the study of operator algebras. It is sometimes desirable to treat the same construction for unbounded operators. Such a construction for self-adjoint operators is proposed by Krupa and Zawisza. I will explain some observations regarding their construction and its relation to the conjugation action of the unitary group.

Camilo Argoty- *Operator algebras do not have nice mode theoretic properties*

Abstract: In this talk I prove that the algebra $K(H)$ of compact operators on an infinite dimensional Hilbert space H has the independence property and that factors of type I_∞, II and III have the TP2 property. This gives an indication that the theory of C*-algebras may be as complex as arithmetic.

Bruce Blackadar- *Symmetry and Complex Structure in* C*-*algebras*

We will discuss the problem of when the complex scalar multiplication on a C*-algebra is determined up to isomorphism by the rest of the structure, or equivalently when a C*-algebra is isomorphic to its opposite algebra. This problem has a major potential impact on the classification program and perhaps on the Universal Coefficient Theorem. Some examples and constructions will be described, but there will be more open problems than results.

Christopher Eagle- *Most* C*-*algebras do not admit quantifier elimination*

Quantifier elimination often plays an important role in applied model theory, because it enables a concrete description of definable objects in a given theory. In the language of unital C*-algebras the only algebras with quantifier elimination are $\mathbb{C}$, $\mathbb{C}^2$, $M_2(\mathbb{C})$, and $C(X)$, where X is a compact 0-dimensional space without isolated points. The proof of this result splits into several cases, and we will discuss some of the obstacles to quantifier elimination in each case. This is joint work with Diego Caudillo Amador, Ilijas Farah, Isaac Goldbring, Bradd Hart, Jamal Kawach, Se-Jin Kim, Eberhard Kirchberg, and Alessandro Vignati.

Ilijas Farah- *Strict order property and universal nuclear* C*-*algebras*

By one of the earliest results in model theory of operator algebras, theories of both C*-algebras and II_1 factors have the order property (F.-Hart-Sherman, but really going back to Ge-Hadwin). A slightly more precise result is that the theory of C*-algebras has the strict order property and the theory of II_1 factors has the independence property. The former fact can be used to prove that if κ is a cardinal and there is no universal linear order of cardinality κ, then there are no universal abelian C*-algebras of density κ and there are no universal simple and nuclear C*-algebras of density κ. This is a joint work with Ilan Hirshberg. (It is also related to a joint work with Alessandro Vignati - see Alessandro's talk.)

Isaac Goldbring- *Embedding problems, games, and square roots*

I will discuss how the notion of building models by games allows us to give new reformulations of many of the embedding problems in operator algebra, e.g. the Connes embedding problem, the Kirchberg embedding problem, and the quasidiagonality problem. We will also indicate how all of these problems can be reformulated in terms of the enforceability of tensor square roots.

Stephen Hardy-*Pseudocompact* C*-*algebras*

Historically, C*-algebras which are built from finite-dimensional C*-algebras in nice ways have been tractable. For instance, the algebra of compact operators (norm limits of finite rank operators), and the AF C*-algebras (inductive limits of finite-dimensional C*-algebras) are well understood. Instead of norm limits or inductive limits, we study the logical limits of finite-dimensional C*-algebras. These logical limits of matrix algebras are called the pseudocompact C*-algebras. This idea was first used by Ax to study the logical limits of finite fields. The analogous metric objects defined using using the continuous logic were introduced by Goldbring and Lopes. We will explore the finiteness properties and K-theory of pseudocompact C*-algebras.

Bernard Russo- *Derivations on operator algebras and their non associative counterparts*

Building on earlier work of Kadison and Kaplansky, Sakai proved in 1966 that every derivation of a von Neumann algebra is inner, extending some finite dimensional classical results of Wedderburn, Noether, and Hochschild. Building on earlier work of Bunce and Paschke, Haagerup proved in 1983 that every derivation of a C*-algebra into its dual is inner. In 1990, Kadison proved that every local derivation of a von Neumann algebra is a derivation. In this talk I will survey some generalizations of these results and some analogs in various non associative operator contexts.

Alessandro Vignati- *Saturation and universality*

We analyze the saturation and universality properties of the Calkin algebra $\mathcal{Q}(H)$. We show that, despite the fact that the Calkin algebra fails to be countably saturated, a fairly strong fragment of saturation still holds. In particular, we show that all C*-algebras of density $\aleph_1$ embed into $\mathcal{Q}(H)$. Time permitting, we discuss universality in other categories, and we relate the Strict Order Property with the possibility of not having $2^{\aleph_0}$-universal objects. This is joint work with Ilijas Farah.

Dan Virgil Voiculescu- *Commutants mod normed ideals and their Calkin algebras*

The talk will deal with commutants modulo normed ideals of n-tuples of hermitian operators satisfying various quasicentral approximation conditions relative to the ideal. These Banach algebras with involution have an ideal of compact operators, the quotient by which is a relative of the usual Calkin algebra. I will discuss properties of these exotic Calkin algebras, including Banach space duality properties and K-theory results. Surprisingly, though their K-theory can be quite different in nature from that of the Calkin algebra or of Paschke duals, they often have much in common with the Calkin algebra, including being isomorphic to C*-algebras. This may justify some hope that like many coronas, their study could benefit from model theory ideas.