WABASH
EXTRAMURAL MODERN ANALYSIS
MINICONFERENCE

September 27 and 28, 2014

Program and Abstracts

Times given are Eastern Daylight Time

Talks and Registration will be in the Informatics and Communications Technology Complex at IUPUI. The talks will take place in Room 252.

SATURDAY:

9:10 Registration, Refreshments

9:50–10:40 *RON DOUGLAS, Texas A&M University*
An analytic Grothendieck-Riemann-Roch theorem

10:50–11:40 *GELU POPESCU, University of Texas at San Antonio*
Curvature invariant on noncommutative polyballs

11:50–12:10 *TIMOTHY RAINONE, Texas A&M University*
Finiteness and Paradoxical Decompositions in C^*-Dynamical Systems

LUNCH: 12:30 at Tower Dining in Hine Hall

2:00–2:50 *SARAH REZNIKOFF, Kansas State University*
Uniqueness theorems for combinatorially defined C*-algebras

3:00–3:50 *DAVID FISHER (Indiana University)*
Groups acting on Manifolds: Around the Zimmer Program

4:00–4:20 *EVA A. GALLARDO-GUTIERREZ, Universidad Complutense de Madrid*
An extension of a theorem of Domar on invariant subspaces

4:25–4:45 *BOGDAN UDREA, University of Illinois at Champaign Urbana*
Some Rigidity Results for Generalized q-Gaussian Algebras

4:55–5:15 *TIMUR OIKHBERG, University of Illinois at Champaign Urbana*
Almost disjointness preserving operators

5:20–5:40 *CHRISTOPHER SCHAFHAUSER, University of Nebraska - Lincoln*
AF-Embeddings of Graph Algebras

5:45–6:05 *CHENG CHU, Washington University*
Asymptotic Bohr Radius for Polynomials in One Complex Variable

6:10–6:30 *BEN WALLIS, Northern Illinois University*
Constructing Banach ideals using upper ℓ_p-estimates

SUNDAY:

9:00 Refreshments

9:30–10:20 *JERRY KAMINKER, IUPUI and UC Davis*
Random triangulations of Surfaces and Operator Algebras

10:30–11:20 *MARTIJN CASPERS, Westfälische Wilhelms-Universität Münster*
Noncommutative De Leeuw theorems

11:30–12:20 *ALEXANDER IZZO, Bowling Green State University)*
Function algebras invariant under group actions

ABSTRACTS

Ron Douglas *An analytic Grothendieck-Riemann-Roch theorem*

Abstract: About fifteen years ago Arveson conjectured that the closure of a homogeous polynomial ideal in the symmetric Fock space is essentially normal. Various cases of this conjecture have been established, mostly by Guo and Wang using techniques from operator theory. Other results have been obained by Wang and me using techniques from harmonic analysis. In this talk I will review these results as well as present some more recent results obtaineed by Tang, Yu and me. The latter involve techniques from SCV, PDE and K-homology and include a generalization of the index theorem of Boutet de Monvel. Closely related results using somewhat different techniques have been obtained by Englis and Eschmeier.

Gelu Popescu *Curvature invariant on noncommutative polyballs*

Abstract: We develop a theory of curvature (resp. multiplicity) invariant for tensor products of full Fock spaces and also for tensor products of symmetric Fock spaces. This is an attempt to find a more general framework for these invariants and extend some of the results obtained by Arveson for the symmetric Fock space, by the author and Kribs for the full Fock space, and by Fang for the Hardy space $\mathrm{H}^2(\mathbb{D}^k)$ over the polydisc. To prove the existence of the curvature and its basic properties in these settings requires a new approach based on noncommutative Berezin transforms and multivariable operator theory on polyballs and varieties, as well as summability results for completely positive maps. The results are presented in the more general setting of regular polyballs, and lead to an analogue of Arvesons version of Gauss-Bonnet-Chern theorem from Riemannian geometry.

Tomothy Rainone *Finiteness and Paradoxical Decompositions in C^*-Dynamical Systems*

Abstract: We discuss the interplay between K-theoretical dynamics and the structure theory for certain C^*-algebras arising from crossed products. We describe K-theoretical conditions that give rise to RFD and MF reduced crossed products. In the presence of sufficiently many projections we associate to each non-commutative C^*-system (A, G) a type semigroup $S(A, G)$ which reflects much of the spirit of the underlying action. Inspired by the work of Rørdam and Sierakowski we characterize purely infinite, as well as stably finite, crossed products by means of the infinite or rather finite nature of this semigroup.

Sarah Reznikoff

Uniqueness theorems for combinatorially defined C-algebras*

Abstract: C*-algebras defined from directed graphs and generalizations comprise a large and useful class of operator algebras. Conveniently, much of the structure of such an algebra is reflected in the combinatorics of the graph. On the other hand, a particular graph may give rise to non-isomorphic algebras; uniqueness theorems address this issue.

We will start with an overview of the construction of graph, k-graph, and groupoid C*-algebras, as well as a brief history of uniqueness theorems for these algebras. We will then proceed to present a new class of theorems, which identify a special, Cartan, subalgebra on which uniqueness is reflected. This is joint work with Jon Brown, Gabriel Nagy, Aidan Sims, and Dana Williams.

David Fisher *Groups acting on Manifolds: Around the Zimmer Program*

Abstract: I will offer a somewhat personal survey of various results concerning when "large groups" can act smoothly on compact manifolds. While questions in this area have been proven by a number of methods, I will emphasize results where the proofs are more functional analytic. I will also mention a number of open problems.

Eva A. Gallardo-Gutierrez *An extension of a theorem of Domar on invariant subspaces*

Abstract: A remarkable theorem of Domar asserts that the lattice of the invariant subspaces of the right shift semigroup $\{S_\tau\}_{\tau\geq 0}$ in $L^2(\mathbb{R}_+, w(t)dt)$ consists of just the *"standard invariant subspaces"* whenever w is a positive continuous function in $\mathbb{R}_+$ such that

1. $\log w$ is concave in $[c,\infty)$ for some $c \geq 0$,
2. $\lim_{t\to\infty} \dfrac{-\log w(t)}{t} = \infty$, and $\lim_{t\to\infty} \dfrac{\log|\log w(t)| - \log t}{\sqrt{\log t}} = \infty$.

We prove an extension of Domar's Theorem to a wider class of weights w not fulfilling condition (1); which answers a question posed by Domar.

Joint work with Jonathan R. Partington (Leeds) and Daniel Rodriguez (Zaragoza).

Bogdan Udrea *Some Rigidity Results for Generalized q-Gaussian Algebras*

Abstract For any trace preserving action $G \curvearrowright A$ of a countable discrete group on a finite von Neumann algebra A, we define the generalized q-gaussian algebras $A \rtimes \Gamma_q(G,K)$, where K is an infinite dimensional separable Hilbert space. We then prove that if $G \curvearrowright A = L^\infty(X)$, $G' \curvearrowright B = L^\infty(Y)$ are p.m.p. ergodic rigid actions, the commutator subgroups $[G,G]$, $[G',G']$ are ICC, and G, G' belong to a fairly large class of groups (including all non-amenable groups having the Haagerup property), then $A \rtimes \Gamma_q(G,K) = B \rtimes \Gamma_q(G',K')$ implies that A and B are unitarily conjugate inside $M = A \rtimes \Gamma_q(G,K)$ and $\mathcal{R}_G \cong \mathcal{R}_{G'}$, where $\mathcal{R}_G$, $\mathcal{R}_{G'}$ are the countable, p.m.p. equivalence relations implemented by the actions of G and G' on A and B, respectively. Using results of D. Gaboriau, S. Popa and A. Ioana, we construct continuously many pairwise non-isomorphic von Neumann algebras of the form $L^\infty(X) \rtimes \Gamma_q(\mathbb{F}_n, K)$, for suitable ergodic p.m.p. actions $\mathbb{F}_n \curvearrowright X$. This is joint work with Marius Junge (UIUC) and Stephen Longfield (UIUC).

Oikhberg, Timur *Almost disjointness preserving operators*

Abstract Suppose T is an operator between Banach lattices E and F. We say that T is disjointness preserving (DP) if $Tx \perp Ty$ whenever $x \perp y$ (here $\perp$ denotes disjointness of elements of a Banach lattice). T is said to be ε-disjointness preserving (ε-DP) if $\||Tx| \wedge |Ty|\| \leq \varepsilon$ whenever x and y are disjoint elements of the unit ball of E ($\wedge$ stands for the minimum of two elements). Can a ε-DP operator be approximated by a DP one? In certain cases we provide a positive answer. However, in general, counterexamples exist. (This is joint work with P. Tradacete)

Christopher Schafhauser *AF-Embeddings of Graph Algebras*

Abstract In the early 1990's, Blackadar and Kirchberg asked if every separable, nuclear, stably finite C^*-algebra can be embedded into an AF-algebra. We will discuss this conjecture for the class of graph C^*-algebras. In particular, suppose either that E is a discrete graph or that E is a compact topological graph with no sinks. If $C^*(E)$ is finite, then $C^*(E)$ is AF-embeddable.

Cheng Chu *Asymptotic Bohr Radius for Polynomials in One Complex Variable*

Abstract Given a polynomial P on the unit disk, form the polynomial $\tilde{P}$ by replacing the coefficients of P with their absolute values. There is a maximal radius R, so that the supremum of $\tilde{P}$ on the disk of radius R is bounded by the supremum of P on the whole unit disk, for every choice of P. Bohr's famous theorem shows that $R = \frac{1}{3}$, and this radius is called the Bohr radius.

In this talk, we consider the similar Bohr radius R_n for the class of polynomials of degree at most n. Clearly $R_n \to \frac{1}{3}$, as $n \to \infty$. In 2008, R. Fournier conjectured the asymptotic formula that $R_n = \frac{1}{3} + \frac{\pi^2}{3n^2} + o(\frac{1}{n^2})$. We prove this conjecture is true.

Ben Wallis *Constructing Banach ideals using upper ℓ_p-estimates.*

Abstract We describe a new family of operator ideals $\mathcal{WD}_{\ell_p}^{(\infty,\xi)}$ containing the completely continuous operators, and with parameters $1 \leq p \leq \infty$ and $1 \leq \xi \leq \omega_1$. For the nontrivial case $p \neq 1$, there always exists a separable space X (depending on p and ξ) for which $\mathcal{WD}_{\ell_p}^{(\infty,\xi)}(X)$ fails to be norm-closed in the space $\mathcal{L}(X)$ of continuous linear operators on X. However, for the case $\xi = 1$, there exists an ideal norm $\|\cdot\|_{(p,1)}$ under which the class $\mathcal{WD}_{\ell_p}^{(\infty,1)}$ becomes a Banach ideal. These ideals are distinct as p ranges over $1 \leq p \leq \infty$. It is not yet known if the same can be said of ξ ranging over $1 \leq \xi \leq \omega_1$, but we do provide a partial result in this direction.

Jerry Kaminker *Random triangulations of Surfaces and Operator Algebras*

Abstract: We consider triangulated genus zero surfaces. The set of them can be given the structure of a foliated space. Based on work of Benjamini and Schramm one obtains invariant transverse measures which allow the construction of von Neumann algebras. In general, these are hyperfinite II_1-factors. There is a Shubin formula expressing spectral properties of certain operators affiliated with the von Neumann algebra in terms of the trace associated to the transverse measure.

This is joint work with Eric Babson and Nate Hannon.

Martijn Caspers *Noncommutative De Leeuw theorems*

Abstract: Classical De Leeuw theorems concern the interaction of Lp-Fourier multipliers of the real numbers and $\widehat{H}$, the Pontrjagin dual of a subgroup $H \subseteq \mathbb{R}$. In particular any Lp-Fourier multiplier with continuous symbol on $\mathbb{R}$ restricts to H as a Lp-multiplier with a smaller norm. In addition the main results of De Leeuw's original paper from 1965 include compactification and periodization theorems. In this talk we discuss versions of these theorems for arbitrary groups.

This is joint work with Javier Parcet, Mathilde Perrin, Éric Ricard.

Alexander Izzo *Function algebras invariant under group actions*

Abstract Motivated by his work on a conjecture of William Arveson in operator theory, Ronald Douglas raised a question regarding function algebras on the unit sphere in complex n-space invariant under the torus action. Surprisingly, the answer depends on the dimension.

The speaker's work on Douglas' question led him to formulate a conjecture regarding function algebras that are invariant under a transitive group action. Results related to this conjecture will be presented. The conjecture has been proven in many special cases.