North West Functional Analysis Seminar (NWFAS)
March 31 - April 1, 2012 (no fooling!)

MEALS

Coffee Breaks: As per daily schedule, in the foyer of the TransCanada Pipeline Pavilion (TCPL) (*included in workshop*)

***For meal options at the Banff Centre, there are there are food outlets on The Banff Centre campus such as Vistas Main Dining Room on the 4th floor of Sally Borden Building (breakfast: 7:00-9:30am; lunch: 11:30am-1:30pm; dinner: 5:30-7:30pm), Le Cafe (ground floor, Sally Borden Building) and the Maclab Bistro (Kinnear Centre). You will also find a good selection of restaurants in the town of Banff which is a 10-15 minute walk from Corbett Hall.**)*

MEETING ROOMS

All lectures will be held in the new lecture theatre in the TransCanada Pipelines Pavilion (TCPL). LCD projector and blackboards are available for presentations.

SCHEDULE

Friday

16:00	Check-in begins (Front Desk - Professional Development Centre - open 24 hours)
19:30	Lectures (if desired) or informal gathering in 2nd floor lounge, Corbett Hall (if desired)
	Beverages and a small assortment of snacks are available in the lounge on a cash honor sy

Saturday

7:00-9:00	Breakfast
9:00	Lectures begin
9:00 - 9:30	Poulin (Dual Factorization in B-algs)
9:40 - 10:10	Choi (Quotients of Fourier-algs)
10:10 - 10:40	Coffee
10:40 - 11:10	Mazowita (Compactification of groups)
11:20 - 11:50	Brudnyi (Trace and extension problems)
12:00-2:00	Lunch
2:00 - 2:30	Putnam (Orbit equivalence)
2:40-3:10	Viselter (Quantum groups)
3:10 - 3:40	Coffee
3:40 - 4:10	Gour (Entropy and quantum channels)
4:20 - 4:50	Julien (Tilings)

Sunday

7:00-9:00	Breakfast
9:00	Lectures begin
9:00 - 9:30	Georgescu (Spectral flow)
9:40 - 10:10	Gao (Compact operators)
10:10 - 10:40	Coffee
10:40 - 11:10	Alonso-Gutierrez (Petty projection)
11:20 - 11:50	Floricel (Eo Semigroups)
12:00-2:00	Lunch, wrap up (Check out by noon.)

** 2-day workshops are welcome to use BIRS facilities (2nd Floor Lounge, TCPL, Reading Room) until 15:00 on Sunday, although participants are still required to checkout of the guest rooms by 12 noon. There is no coffee break service on Sunday afternoon, but self-serve coffee and tea are always available in the 2nd floor lounge of Corbett Hall. **

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ABSTRACTS
(in alphabetic order by speaker surname)

Speaker: **David Alonso-Gutiérrez** (University of Alberta)
Title: *On a reverse Petty projection inequality for projections of convex bodies*
Abstract: We show that every convex body verifies the following reverse Petty projection inequality

$$|K|^{\frac{n-1}{n}}|\Pi^*(K)|^{\frac{1}{n}} \geq \frac{1}{v.r(K)}|B_2^n|^{\frac{n-1}{n}}|\Pi^*(B_2^n)|^{\frac{1}{n}}.$$

We also study, given $0 < \varepsilon < 1$ and $K \subset \mathbb{R}^n$ a convex body, what is the dimension k for which there exists a k-dimensional orthogonal projection $P_E(K)$ verifying a reverse Petty projection inequality $|P_E(K)|^{\frac{k-1}{k}}|\Pi^*(P_E(K))|^{\frac{1}{k}} \geq (1-\varepsilon)|B_2^k|^{\frac{k-1}{k}}|\Pi^*(B_2^k)|^{\frac{1}{k}}$.

Speaker: **Alexander Brudnyi** (University of Calgary)
Title: *Trace and extension problems for classes of differentiable functions on weak Markov sets*
Abstract: Weak Markov sets were introduced by A. & Yu. Brudnyi in connection with Whitney problems for differentiable functions. The purpose of the talk is to develop a differential calculus on weak Markov sets similar to that on open subsets of an n-dimensional Euclidean space and to show that some classical theorems for smooth functions and differential forms (e.g., Poincaré lemma, de Rham and Hartogs theorems, Künneth formulas, etc.) are valid also on certain weak Markov sets and more generally certain topological spaces with weak Markov structures. The class of such spaces include, in particular, smooth manifolds with boundaries and some fractal manifolds.

Speaker: **Yemon Choi** (University of Saskatchewan)
Title: *Quotients of the Fourier algebra, and representations that are not completely bounded*
Abstract: Bounded representations of $L^1(\Gamma)$ on Hilbert space, where Γ is abelian, are known to be similar to $*$-representations. Taking the Fourier transform, one can view this as a theorem about bounded representations of the Fourier algebra $A(G)$, G abelian. Recent work of M. Brannan and E. Samei has generalised this to classes of nonabelian G, but with the stronger assumption that the representation must be completely bounded.

We exploit these results to show that there are groups G and bounded representations of $A(G)$ on Hilbert space which are not completely bounded, and hence are not similar to $*$-representations; this question had been left open in work of previous authors. The approach naturally suggests looking at restriction algebras of the form $A(E)$, and whether such an algebra can be completely isomorphic, in its natural quotient structure, to an infinite-dimensional operator algebra. We will present some partial progress and some avenues for future work.

This is joint work with E. Samei (Saskatchewan).

Speaker: **Remus Floricel** (University of Regina)
Title: *Pure cocycle perturbations of E_0-semigroups*
Abstract: We introduce a parameterization of the class of pure E_0-semigroups that are cocycle conjugate to a given E_0-semigroup $\rho = \{\rho_t\}_{t\geq 0}$ of $B(H)$ in terms of the class of pure essential mixing states of the spectral C^*-algebra of the concrete product system of the semigroup $\rho = \{\rho_t\}_{t\geq 0}$. We also discuss some general properties of the class of E_0-semigroups with finite dimensional tail flows.

Speaker: **Niushan Gao** (University of Alberta)
Title: *Compact positive operators*
Abstract: In this talk, we discuss properties of compact positive operators which semi-commute with an irreducible positive operator. In particular, we answer a question proposed by Abramovich et al and a question proposed by Drnovsek et al. We will also prove existence of positive eigenvectors of the operator S in the following three chains: $S \leftrightarrow T \leftrightarrow K$, $T \leftrightarrow K \leftrightarrow S$ and $T \leftrightarrow S \leftrightarrow K$ where $\leftrightarrow$ stands for commutation, $T > 0$ is irreducible and $K > 0$ is compact.

Speaker: **Gilad Gour** (University of Calgary)
Title: *Local additivity of the minimum entropy output of a quantum channel*
Abstract: One of the major open problems in quantum information concerns with the question whether entanglement between signal states can help to send classical information on quantum channels. Recently, Hasting proved that entanglement does help by finding a counter-example for the long standing additivity conjecture that the minimum von-Neumann entropy output of a quantum channel is additive under taking tensor products. In this talk I will show that the minimum von-Neumann entropy output of a quantum channel is locally additive. Hasting's counterexample for the global additivity conjecture, makes this result somewhat surprising. In particular, it indicates that the non-additivity of the minimum entropy output is related to a global effect of quantum channels. I will end with few related open problems.

Speaker: **Magdalena Georgescu** (University of Victoria)
Title: *Integral Formulas for Spectral Flow*
Abstract: Spectral flow can be defined in a semifinite von Neumann algebra for paths of self-adjoint Breuer-Fredholm operators. It is possible to make sense of the definition for paths of unbounded operators under suitably chosen continuity conditions. We will concentrate on the case of bounded perturbations of a fixed unbounded operator. Under the additional restriction that the unbounded operator is p-summable, we can prove that integrating a specific one-form will give us the spectral flow.

Speaker: **Antoine Julien** (University of Victoria)
Title: *Spectral triple for substitution tilings*
Abstract: Pearson and Bellissard gave a construction of a spectral triple for ultrametric Cantor sets. I will describe this construction in the specific case when the Cantor set comes from a self-similar tiling. In this case, it is possible to carry out explicit computations.
(joint work with J. Savinien)

Speaker: **Matthew Mazowita** (University of Alberta)
Title: *The weighted compactification of a group and topological centres*
Abstract: The spectrum of the algebra of LUC (left uniformly continuous) functions on a topological group G is a compact right topological semigroup with the Arens product, called the LUC-compactification of the group, and has topological centre equal to G. In the context of weights

and Beurling algebras, the spectrum of the weighted LUC algebra is what we call the weighted LUC-compactification of the group. This compactification is not (in general) a semigroup but its algebraic properties reflect properties of the weight. We study this compactification and use it to find the topological centres of related semigroups and algebras, and extend some results of Isik, Budak, and Pym on the existence of small sets which determine the topological centres of the LUC and group algebras to their weighted analogues.

Speaker: **Denis Poulin** (University of Alberta)
Title: *Strong Dual Factorization Property*
Abstract: In 1996, A. T.M. Lau and A. Ülger studied for the first time the properties $A^* = A^*A$ and $A^* = AA^*$, which we call left, respectively right, strong dual factorization property, where A is a Banach algebra with a bounded approximate identity (BAI). These properties are particularly interesting if A is weakly sequentially complete. For example, if A is weakly sequentially complete with a sequential BAI, then A is unital if and only if $A^* = A^*A$. Moreover, without any assumption on the cardinality of the BAI, the group algebra $L^1(G)$ and the Fourier algebra $A(G)$, assuming G be an amenable locally compact group, are both unital if and only if they enjoy the left or right strong dual factorization property.

In this talk, we first present definitions of three levels of dual factorization property with some examples. We also give a new characterization of the strong dual factorization property for Banach algebra with a BAI. Using Segal algebra we obtain a necessary condition for general Banach algebras to enjoy the strong dual factorization property. With this condition in mind, we focus on the algebra $A(E)$ of approximable operators on a Banach space E. Using the notion of strong topological centre, we characterize for which Banach space E, the algebra $A(E)$ has the strong dual factorization property. We also present the first example of a non-reflexive Banach algebra A such that $A^* = \overline{\langle A^*A \rangle}$, where $\overline{\langle A^*A \rangle}$ denotes the closed linear span of the set A^*A. We finish with a list of open problems concerning dual factorization properties.

Speaker: **Ian Putnam** (University of Victoria)
Title: *Orbit equivalence for minimal dynamics on the Cantor set*
Abstract: I will present a brief survey of results of orbit equivalence for minimal actions of finitely generated abelian groups on totally disconnected metrizable spaces. The main result is that there is a complete invariant which is analogous to (and even related to) Elliott's classification for amenable C*-algebras.

Speaker: **Ami Viselter** (University of Alberta)
Title: *Locally compact quantum groups and amenability*
Abstract: The concept of group duality is one of the most fundamental ones in the analysis of abelian, locally compact groups. The theory of quantum groups was initially developed in order to provide a framework for duality of general locally compact groups. Building on the preceding, deep work of Kac and Vainerman, Enock and Schwartz, Woronowicz and Baaj and Skandalis (to name a few), Kustermans and Vaes suggested in 1999 a relatively simple set of axioms for "locally compact quantum groups" (LCQGs). In this talk we will introduce their definition, and discuss a few specific types of LCQGs. Afterwards, we will review the definition of amenability for locally compact groups, present its generalization(s) to LCQGs, and relate several problems of current research connected with these notions.