BA2007 ABSTRACTS

Jeronimo Alaminos: *Local derivations* [Thursday 5 July, 15:00–15:30]

We prove that a local derivation from a Banach algebra A into a Banach A-bimodule X is a derivation for a wide class of Banach algebras which includes among others C^*-algebras, group algebras, and Banach algebras generated by idempotents. Moreover, that class also enjoy good properties of heredity.

Razvan Anisca: *On the number of mutually non-isomorphic infinite-dimensional subspaces of a Banach space* [Monday 9 July, 15:00–15:30]

The positive solution to the homogeneous space problem yields that ℓ_2 is the only infinite-dimensional Banach space, up to isomorphism, which is isomorphic to all its infinite-dimensional subspaces. For a Banach space X which is not isomorphic to ℓ_2, we investigate the problem of finding the number of non-isomorphic infinite-dimensional subspaces of X. This kind of subspaces are constructed in such a way that they don't admit a certain type of operators.

Ahmadreza Azimifard: *ϕ-amenable Banach algebras with applications to a certain class of hypergroups* [Wednesday 11 July, 9:45–10:15]

In this talk, we shall present some equivalency to the ϕ-amenability of commutative Banach algebras. Examples will come from the L^1 -algebras of various hypergroups which show distinguished behavior to that of L^1-algebras of groups. Let K be a commutative hypergroup. We will show that the ϕ-amenability of $L^1(K)$ depends not only on ϕ and its asymptotic behavior, but also on the Haar measure on K. We will conclude the talk with the non-amenability of Bessel-Kingman hypergroups which will also indicate that, in general, $L^1(K)$ is not ϕ-amenable if $\{\phi\}$ is a spectral set.

John Bachar: *Banach function algebras having idempotent-like maximal ideals in which no element factors* [Thursday 12 July, 10:20–10:50]

This talk is about range transformations (or functions that operate): Let X, Y, Z be sets, $A(X, Y)$ a set of functions from X to Y, and $B(X, Z)$ a set of functions from X to Z. A range transformation (or function that operates) from $A(X, Y)$ to $B(X, Z)$ is a function $F : Y \mapsto Z$ satisfying the following condition:

$$(*) \qquad \text{for every } f \in A(X,Y), \quad F \circ f \in B(X,Z).$$

The notation $\mathrm{Op}(A(X, Y) \mapsto B(X, Z))$ stands for the collection of all range transformations satisfying $(*)$.

The basic study of range transformations involves the determination of properties of elements in $\mathrm{Op}(A(X, Y) \mapsto B(X, Z))$ in terms of properties of $X, Y, Z, A(X, Y), B(X, Z)$, and the determination of properties of $A(X, Y)$ in terms of the structure of $\mathrm{Op}(A(X, Y) \mapsto B(X, Z))$.

Many results on range transformations have been obtained with respect to the following case: X is an infinite compact Hausdorff space, Z is either $\mathbf{R}$ or $\mathbf{C}$ (real or complex fields, respectively), Y is an open or closed subset of Z, $A(X, Y)$ is the subset of functions in a Banach function algebra A on X (scalar field Z) having range in Y, and $B(X, Z)$ is another Banach function algebra on X (scalar field Z). Under these assumptions, one seeks conditions which imply that each function in $\mathrm{Op}(A(X, Y) \mapsto B(X, Z))$ is continuous, or holomorphic, or realanalytic, or Borel measurable, or Lebesgue measurable, or has other nice properties.

In the situation where A is a complex Banach function algebra on the infinite compact Hausdorff space X, Y is open in $Z \equiv \mathbf{C}$, and $B(X, Z) = C(X, Z)$, the space of all complex continuous functions on X, we will review numerous properties on A that imply $\mathrm{Op}(A(X,Y) \mapsto C(X,Z)) \subset C(U,Z)$, i.e., that imply that every range transformation is automatically continuous, and we will review the relations that exist between members of this set of properties.

Let A be a complex Banach function algebra on an infinite compact Hausdorff space, X, that contain a maximal ideal, M_x , of functions vanishing at a non-isolated point $x \in X$. If M_x has a bounded approximate identity, then every element in M_x factors (Cohen). Furthermore, if the latter holds, then M_x is an idempotent-like (IL) ideal, which, in turn, implies that every range transformation on A is automatically continuous (Bachar). [M_x is an IL ideal iff there exists a sequence (f_n) in M_x and a sequence (x_n) in X such that for all $n, m \in \mathbf{N}$, $f_n(x_m) = \delta_m n$ (Kronecker delta)]. George Willis proved that there is a Banach function algebra which has no bounded approximate identity but in which every element factors. An open question was whether there existed $A, M_x \subset A$ (A, X, x, as above) such that no element in M_x factors but such that M_x is an IL ideal. The principal result in the talk will be to describe the existence of a class of complex Banach function algebras for which this is true.

Christoph Barbian: *Beurling decomposable subspaces in reproducing kernel spaces* [Thursday 5 July, 15:00–15:30]

By Beurling's theorem, the orthogonal projection onto a multiplier invariant subspace M of the Hardy space $H^2(\mathbf{D})$ on the complex unit disk can be represented as $P_M = M_\phi M_\phi^*$ where ϕ is a suitable inner function. This result remains true for arbitrary Nevanlinna-Pick spaces but fails in more general settings such as the Bergman space. We therefore introduce the notion of Beurling decomposability of subspaces: An invariant subspace M of a reproducing kernel space $\mathcal{H}$ is called Beurling decomposable if there exist (operator-valued) multipliers ϕ_1, ϕ_2 such that $P_M = M_{\phi_1} M_{\phi_1}^* - M_{\phi_2} M_{\phi_2}^*$ and $M = \mathrm{ran}\ M_{\phi_1}$. Our aim is to characterize Beurling-decomposable subspaces by means of the core function and the core operator. More precisely, an invariant subspace M of $\mathcal{H}$ is Beurling decomposable exactly if its core function induces a completely bounded Schur multiplication on $B(\mathcal{H})$, defined in an appropriate way. These Schur multiplications turn out to be $(\mathcal{M}(\mathcal{H}), \overline{\mathcal{M}(\mathcal{H})}^{\mathrm{op}})$-module homomorphisms on $B(\mathcal{H})$ (where $\mathcal{M}(\mathcal{H})$ denotes the multiplier algebra of $\mathcal{H}$). This allows us, in formal analogy to the case of classical Schur multipliers and to the study of multipliers of the Fourier algebra $A(G)$, to make use of the representation theory for completely bounded module homomorphisms. As an application, we show that in many analytic Hilbert modules $\mathcal{H}$, every finite-codimensional submodule M is Beurling decomposable and, moreover, can be represented as $M = \sum_{i=1}^r p_i \mathcal{H}$ with suitable polynomials p_i. We thus extend well-known results of Ahern and Clark, Axler and Bourdon and Guo.

Zohra Bendaoud: *Distances between exponential and powers of elements in certain Banach algebras* [Friday 6 July, 15:40–16:10]

Let A be a Banach algebra which contains no nonzero idempotent element, let $\gamma > 0$, and let $x \in A$. We show that if $\|x\| \geq (\log(\gamma+1))/\gamma$, then $\|e^x - e^{(\gamma+1)x}\| \geq \gamma/(\gamma+1)^{1+\frac{1}{\gamma}}$. We also show, assuming a suitable spectral condition on x, that if $\|x\| \geq 1 - 1/(\gamma+1)^{\frac{1}{\gamma}}$, then $\|1 + x - (1+x)^{\gamma+1}\| \geq \gamma/(\gamma+1)^{1+\frac{1}{\gamma}}$.

This is joint work with Jean Esterle and Abdelkader Mokhtari

Pourus Bharucha: *An example in approximate amenability* [Wednesday 4 July, 15:00–15:30]

There are several generalizations of the notion of amenability for Banach algebras. Two of them are approximate amenability, where derivations must only be 'approximately inner' and weak amenability, which involves only examining the dual module. Here, we elucidate a Banach algebra which is approximately weakly amenable, but is neither approximately amenable nor weakly amenable.

Ariel Blanco: *TBA* [Wednesday 11 July, 15:40–16:10]

David Blecher: *A nice class of Banach algebras* [Thursday 5 July, 9:15–10:15]

Algebras of bounded operators on Hilbert space ('operator algebras') constitute surprisingly interesting examples of Banach algebras. We plan to discuss some of their strong and striking properties, particularly in the case of some interesting examples, focusing on recent work. Most of these properties are unique to operator algebras, but some one might hope to extend to other classes of Banach algebras.

Abdellatif Bourhim: *Spectral pictures of operator-valued weighted bi-shifts* [Wednesday 4 July, 11:30–12:00]

In this talk, we describe spectral and local spectral pictures of operator-valued weighted bi-shifts.

Matej Brešar: *A possible approach to Kaplansky's problem on invertibility preservers* [Wednesday 4 July, 10:50–11:20]

(Joint work with Peter Šemrl) Let A and B be unital Banach algebras with B semisimple. Is every surjective unital invertibility preserving linear map $\phi : A \to B$ a Jordan homomorphism? This is a famous open question, often called the "Kaplansky's problem" in the literature. We will show that in order to answer this question in the affirmative it is enough to establish that $\phi(x^2)$ and $\phi(x)$ commute for every $x \in A$. This generalizes the Gleason-Kahane-Żelazko theorem (the case when $B = \mathbf{C}$), and also gives rise to a new proof of the Marcus-Purves theorem ($A = B = M_n(\mathbf{C})$). The proof is based on the (purely algebraic) theory of functional identities.

Philip Brooker: *The closed ideal lattice of $\mathcal{B}(E)$* [Tuesday 10 July, 15:40–16:10]

Little is known in general about the lattice of closed (two-sided) ideals in $\mathcal{B}(E)$, the Banach algebra of all bounded linear operators on a Banach space E. Indeed, there are very few spaces E for which the closed ideal lattice of $\mathcal{B}(E)$ is completely understood. In this talk, we discuss the case when $E = L_1(\mu)$, μ a σ-finite measure, and $E = C(K)$, the Banach space of continuous functions on a compact Hausdorff space K.

Isabelle Chalendar: *Invariant subspaces for the shift on the vector-valued L^2 and H^2 space of an annulus* [Saturday 7 July, 9:15–10:15]

This is a joint work with N. Chevrot and J.R. Partington.

The first aim of the talk is to study the invariant subspaces of the shift operator acting on the vector-valued L^2 space of an annulus, following an approach which originates in the work of Sarason. A Wiener-type result characterizing the reducing subspaces is also presented, as well as a description of all the invariant and doubly-invariant subspaces generated by a single function.

The second aim of the talk is the description of doubly-invariant subspace (invariant by the shift and its inverse) contained in the Hardy space of the annulus with values in $\mathbf{C}^m$. As a corollary we prove that a doubly-invariant subspace that is also the graph of an operator is singly generated.

The third part of the talk consists in the description of nearly-invariant subspaces (vectorial cases), the link with compact perturbations of isometries, restricted shifts and finally simply-invariant subspace, extending some results due to Sarason, Royden, Hitt, Aleman and Richter.

Yemon Choi: *Homology and cohomology for $\ell^1(\mathbf{Z}_+^k)$* [Thursday 5 July, 11:30–12:00]

While the Hochschild homology and cohomology of the polynomial algebra $\mathbf{C}[z_1, \ldots, z_k]$ is well understood, the continuous versions for the ℓ^1-completion $\ell^1(\mathbf{Z}_+^k)$ present new problems that are still not completely solved.

Thanks to a sequence of papers over the last ten years, the simplicial Hochschild homology groups of $\ell^1(\mathbf{Z}_+^k)$ are now known. I shall show how one can build on this using "soft" algebraic methods to obtain information on cohomology with more general symmetric coefficients.

Garth Dales: *Banach algebras of continuous functions and measures, and their second duals* [Thursday 12 July, 11:40–12:40]

Let G be a locally compact group, and let $M(G)$ be the measure algebra on G. We wish to study the scond dual $M(G)''$ of $M(G)$ with its two Arens products. The first remark is that these Banach algebras are large and very unweildy.

To set the stage, let Ω be a locally compact space, and let $C_0(\Omega)$ be the C^*-algebra of all continuous functions on Ω that vanish at infinity. The second dual of $C_0(\Omega)$ is a unital C^*-algebra of the form $C(\widetilde{\Omega})$ for a certain compact space $\widetilde{\Omega}$. This space is called the *hyper-Stonian cover* of Ω. We shall discuss its properties, and show that there is a unique such space whenever Ω is uncountable and metrizable, giving a topological characterization.

Let $M(\Omega)$ be the Banach space of measures on Ω. Then $M(\Omega)''$ is identified with the Banach space $M(\widetilde{\Omega})$.

We next develop the above preparatory work in the case where Ω is taken to be a locally compact group G. Now $(M(\widetilde{G}), \Box)$ is a Banach algebra containing $\widetilde{G}$ as a subset.

We shall discuss the following questions:

- When is $(\widetilde{G}, \Box)$ is semigroup? What is its structure?
- What are the properties of the ideal $(L^1(G)'', \Box)$ in $(M(\widetilde{G}), \Box)$?
- What is the topological centre of $(M(\widetilde{G}), \Box)$?

This is joint work with A. T.-M. Lau and D. Strauss.

Kenneth R. Davidson: *Operator algebras for multivariable dynamics* [Thursday 5 July, 10:50–11:20]

Let X be a compact Hausdorff space with n continuous maps of X into itself. To this we associate various topological conjugacy algebras; and two emerge as the natural candidates for the universal operator algebra of the system, the tensor algebra and the semicrossed product. I will discuss the reasons, including dilation theory, representations and C*-envelopes. The classification of these algebras leads to a new equivalence between dynamical systems which we call piecewise conjugacy. Generalized notions of wandering sets and recursion will be used to characterize when these algebras are semisimple.

Matthew Daws: *Unique preduals for dual Banach algebras* [Monday 9 July, 15:40–16:10]

Runde formally introduced the notion of a dual Banach algebra as being a Banach algebra which is a dual space such that the product becomes separately weak*-continuous. A canonical example is a von Neumann algebra, for which it is known that the predual is unique. Other examples are the $\ell^1(G)$ group algebras of discrete groups G. We show that under mild, natural conditions, the canonical predual $c_0(G)$ is unique. However, in full generality, we construct different preduals to $c_0(G)$ which still give a weak*-continuous algebra product. For example, in the concrete case when G is the group of integers, this is equivalent to finding preduals of $\ell_1(\mathbf{Z})$ which make the bilateral shift weak*-continuous. We investigate the Banach space properties of such preduals. This is joint work with Richard Haydon, Thomas Schlumprecht and Stuart White.

Étienne Desquith: *On Banach modules and module Banach algebras* [Wednesday 11 July, 10:50–11:20]

Given a Banach algebra A, we introduce the notion of a *module Banach algebra*, that is, an A-module X endowed with a Banach algebra structure such that the product on X and the module action are related by some compatibility property called (LMP). Then we mainly show that the existence of a bounded module map ϕ from X into A gives rise to such an algebra, and we give some of its properties.

Jean Esterle: *Existence of z-invariant subspaces with the division property for weighted Hardy spaces on the unit disc* [Thursday 5 July, 16:45–17:45]

Let ω be a weight on $\mathbf{N}$, and let $H^2_\omega(\mathbf{D}) = \{f \in \mathcal{H}(\mathbf{D}) \mid \sum_{n=0}^{+\infty} |\hat{f}(n)|^2\omega^2(n) < +\infty\}$, where $\hat{f}(n) = f^{(n)}(0)/n!$ for $n \geq 0$, be the weighted Hardy space associated to ω. We will assume that the shift operator $S : f \to zf$ and the backward shift $T : f \to \frac{f-f(0)}{z}$ are bounded on $H^2_\omega(\mathbf{D})$, and that their spectrum is the closed unit disc $\overline{\mathbf{D}}$.

A closed subspace M of $H^2_\omega(\mathbf{D})$ is said to have the *division property* if $f_\lambda : z \to \frac{f(z)}{z-\lambda} \in M$ whenever $f \in M$ and $f(\lambda) = 0$, with $|\lambda| < 1$. The existence of a nontrivial z-invariant subspace of $H^2_\omega(\mathbf{D})$ having the division property or, equivalently, the existence of a nontrivial zero-free z-invariant subspace of index one, is an open problem (a counterexample would allow to construct a bounded invertible operator on the separable Hilbert space having no common nontrivial invariant subspace with its inverse). We will discuss partial positive answers to this question obtained by Nikolski, Atzmon and Borichev-Hedenmalm-Volberg by using very different methods. We will also show that $\mathrm{Spec}(S_M) = \{1\}$, where S_M denotes the compression of the shift operator S to the quotient spaces $H^2_\omega(\mathbf{D})/M$, and where M are the z-invariant subspaces having the division property constructed in 1974 by Nikolski using the so-called Keldysh lemma.

Jose Extremera: *Operators determining the norm* [Wednesday 11 July, 15:00–15:30]

Let G be a locally compact abelian group, let X be a Banach space and let τ be a strongly continuous bounded representation of G on X. Let $A(\tau)$ be the weakly closed subalgebra of $L(X)$ generated by all Fourier transforms $\int_G \tau(t)d\mu(t)$ with $\mu \in M(G)$. We say that $T \in A(\tau)$ determines the norm of X if every continuous norm $\|\cdot\|$ on X making the operator $T\colon (X, \|\cdot\|) \to (X, \|\cdot\|)$ continuous is equivalent to the Banach space norm of X. In this talk we give necessary and sufficient conditions on T in order to determine the norm of X. Such conditions are mainly related with the topological structure of the Arveson spectrum of T and with the existence of critical eigenvalues of T.

Joel Feinstein: *Completions and completeness of algebras of differentiable functions on compact plane sets* [Thursday 12 July, 10:20–10:50]

This is joint work with Professor H. Garth Dales (Leeds).

We investigate the completeness and completions of the normed algebras $D^{(1)}(X)$ of continuously complex-differentiable functions on perfect compact plane sets X. In particular, we solve a problem raised in an earlier paper of Bland and Feinstein by constructing a radially self-absorbing compact plane set X such that $D^{(1)}(X)$ is not complete.

In this earlier paper, the notion of an $\mathcal{F}$-derivative of a function was introduced, where $\mathcal{F}$ is a suitable set of rectifiable paths, and with it a new set of Banach algebras $\mathcal{D}^1_{\mathcal{F}}(X)$ corresponding to the normed algebras $D^{(1)}(X)$. In the current paper, we strengthen results of Bland and Feinstein concerning when $D^{(1)}(X)$ and $\mathcal{D}^1_{\mathcal{F}}(X)$ are equal, and when the former is dense in the latter. In particular, we show that equality holds whenever X is '$\mathcal{F}$-regular'.

An example of Bishop shows that the completion of $D^{(1)}(X)$ need not be semisimple. We show that the completion of $D^{(1)}(X)$ is semisimple whenever the union of the images of all rectifiable Jordan arcs in X is dense in X.

Brian Forrest: *A new Fourier Algebra for Weakly Amenable Groups* [Wednesday 4 July, 10:50–11:20]

It is well known that amenability can be characterized in many ways via the Fourier algebra. Most notably, Leptin showed that $A(G)$ has a bounded approximate identity if and only if G is amenable. In this talk, we consider the closure $A_M(G)$ of the Fourier algebra in its multiplier algebra and the closure $A_0(G)$ of the Fourier algebra in its completely bounded multipliers. We show that when G is (M)-weakly amenable that these algebras behave much like the Fourier algebra of an amenable group.

José E. Galé: *Complex geometry in representations of operator algebras* [Tuesday 10 July, 10:50–11:20]

Let A be a C^*-algebra with unitary group U_A. There has been recently proved that restrictions, to U_A, of GNS representations of A (associated with conditional expectations) can be realized as natural actions on Hilbert spaces formed by real analytic sections, of smooth Hermitian vector bundles, which are constructed using an appropriate notion of reproducing kernel (B. Beltita and T. S. Ratiu, *Geometric representation theory for unitary groups of operator algebras*, to appear in Advances in Math.).In the talk, it will be shown how to extend the theory to the setting of holomorphy. In passing, we will obtain some results about complexifications of manifolds and bundles, and give some applications in dilation theory of completely positive mappings as well as to orbits of representations of amenable groups or Banach algebras. *Remark:* The subjects of the talk are part of a joint paper, still in progress, with D. Beltita, from the Institute S. Stoilow, Bucharest.

Fereidoun Ghahramani: *A characterization of boundedly approximate amenability* [Wednesday 4 July, 15:40–16:10]

A Banach algebra A is boundedly approximately amenable if every continuous derivation from A into any dual Banach A -bimodule is limit of a bounded net of inner derivations, in strong operator topology. There are many examples of boundedly approximately Banach algebras which are not amenable. In this talk I will give a characterization of bounded approximate amenability in terms of existence of a net in the second dual of a diagonal ideal such that the net acts as a right approximate identity on the diagonal ideal and is bounded in the multiplier norm. I will also touch upon the question of approximate amenability of direct sums and its relation to existence of two-sided approximate identities in approximately amenable Banach algebras. This is joint work with Rick Loy and Yong Zhang.

Mahya Ghandehari: *Amenability constants for semilattice algebras* [Wednesday 4 July, 16:20–16:50]

For any finite unital commutative idempotent semi-group S, a unital semi-lattice, we show how to compute the amenability constant of its semi-group algebra $\ell_1(S)$, which is always of the form $4n+1$. We then show that these give lower bounds to amenability constants of certain Banach algebras graded over semilattices. Our theory applies to certain natural subalgebras of Fourier-Stieltjes algebras.

Julien Giol: *On the geometry of projections in Operator Algebras* [Friday 6 July, 15:00–15:30]

As is well-known, the norm estimate $\|p-q\| \leq 1$ holds for any pair of projections in an operator algebra. If $\|p-q\| < 1$, then p and q are homotopic, i.e. they can be connected by a continuous projection-valued path. Conversely, if p and q are homotopic, then there exists a sequence $p = p_0, p_1, \ldots, p_n = q$ of projections such that $\|p_i - p_{i+1}\| < 1$ for all i. We denote $\delta(p,q)$ the minimum of all integers n fulfilling the latter condition and we investigate the (possibly infinite) invariant $\delta(A) := \sup \delta(p,q)$, where the supremum runs over all pairs of homotopic projections in the algebra A.

For instance, if A has topological stable rank one, then $\delta(A) \le 2$. But this does not say much when A is projectionless ...

On the opposite, we find that the estimate $\delta(M) \le 3$ holds for every von Neumann algebra M. Moreover, we have the following characterization: $\delta(M) = 3$ if and only if M is infinite.

We will explain how these results arose from the pioneering work of Kovarik (1977), Zemánek (1979), Aupetit (1981), Esterle (1983) and Trémon (1985) on the idempotents of a Banach algebra. We will also explain how Lauzon-Treil's characterization (2004) of pairs of subspaces admitting a common complement fits in this context. Finally, if time allows, we will give an account on our recent efforts to position these questions with respect to the Dixmier property.

Pamela Gorkin: *Finite products of interpolating Blaschke products: How you'll know them when you see them* [Friday 6 July, 9:15–10:15]

Blaschke products play an important role in the study of bounded analytic functions. An equally important role is played by a much smaller class of functions: the interpolating Blaschke products. Interpolating Blaschke products have zero sequences that are separated in a very natural way, while a general Blaschke product does not. Yet, it seems that interpolating Blaschke products are more flexible than might be expected. In this talk, we begin with an overview of the current literature on interpolating Blaschke products, including a look at the role such products have played in the study of bounded analytic functions and some recent results on approximation by interpolating Blaschke products. We conclude with some new characterizations of finite products of interpolating Blaschke products and, consequently, a surprising characterization of Blaschke products that are not finite products of interpolating Blaschke products.

Sandy Grabiner: *Good weights for weak* properties of convolution algebras* [Friday 6 July, 10:50–11:20]

Let w be a weight, that is a positive Borel function on $\mathbf{R}^+ = [0, \infty)$, and let $M(w)$ be the usual weighted Banach space of measures. We show that if $M(w)$ is an algebra under convolution on $\mathbf{R}^+$ (equivalently if there is a positive K for which $w(x+y) \le Kw(x)w(y)$), then $M(w)$ is isomorphic, but not necessarily isometric, to the dual space of the weighted space of continuous functions $C_0(1/w)$ and to the multiplier algebra of the weighted convolution algebra $L^1(w)$. The proof involves finding what we have called a strongly algebraic weight (so that the analogous properties hold isometrically) for which the spaces are unchanged except for a change to an equivalent norm. Thus all algebraic, normed, and weak* results proved for strongly algebraic weights are true isomorphically, but not necessarily isometrically, as long as $M(w)$ is an algebra. We also give some new weak* results for $L^1(w)$ when w is a strongly algebraic weight.

Colin C. Graham: *Summation methods that are (and are not) support-perceiving for pseudomeasures and pseudofunctions* [Saturday 7 July, 10:50–11:20]

Some summation methods on $\mathbf{R}$ can perceive the support of pseudomeasures; some cannot. We find 1) a new class of summation methods (which includes known methods) that are support-perceiving in a very strong sense, and 2) methods that fail to perceive the support of point measures but nevertheless are support-perceiving for the class of pseudofunctions in a (not quite so) strong sense.

Edmond E. Granirer: *On strong and extremely strong Ditkin sets on some function algebras* [Saturday 7 July, 11:30–12:00]

Ditkin, Strong Ditkin, and Extremely Strong Ditkin sets on Figa-Talamanca, Herz, Lebesgue Banach Algebras on locally compact groups are investigated.

Niels Grønbæk: *Push-outs of derivations* [Thursday 5 July, 15:40–16:10]

Let A be a Banach algebra and let X be a Banach A-bimodule. In studying $\mathcal{H}^1(A, X)$ it is often useful to extend a given derivation $D: A \to X$ to a Banach algebra B containing A as an ideal, thereby exploiting (or establishing) hereditary properties. This is usually done using (bounded/unbounded) approximate identities to obtain the extension as a limit of operators $b \mapsto D(ba) - b.D(a),\ a \in A$ in an appropriate operator topology, the main point in the proof being to show that the limit map is in fact a derivation. In this presentation we make clear which part of the approach is analytic and which algebraic by presenting an algebraic scheme that gives derivations in all situations at the cost of enlarging the module. We use our construction to give improvements and shorter proofs of some results from the literature and to give a necessary and sufficient condition that biprojectivity and biflatness is inherited to ideals.

Matthew J. Heath: *Universal plane sets and rational approximation* [Saturday 7 July, 11:30–12:00]

We call a plane set X *universal* it has no interior in $\mathbf{C}$ and for every plane set Y with no interior in $\mathbf{C}$ there exists a subset of X homeomorphic to Y. he first example of a universal plane set was the famous fractal the Sierpiński carpet. We show that a large class of "Swiss cheese" plane sets X (indeed essentially all such sets constructed as examples in the theory of uniform algebras) contain a subset, Y, homeomorphic to the Sierpiński carpet such that $R(Y)$ is essential. Furthermore, many interesting properties of $R(X)$ pass to $R(Y)$ and so we may construct examples of natural, essential uniform algebras on the Sierpiński carpet with these properties. We also note the purely topological corollary that the original Swiss cheese sets are universal plane sets. This talk is based on joint work with J.F. Feinstein.

A. Ya. Helemskii: *Semi-Ruan one-sided modules, the extreme flatness and the Arveson–Wittstock Theorem* [Friday 6 July, 11:30–12:00]

Arveson–Wittstock Theorem on the extension of completely bounded operators is one of most important achievements of quantum functional analysis (= operator space theory). It plays the role of a "quantum" version of the classical Hahn–Banach Theorem on the extension of bounded functionals. In this talk we shall show that this theorem or, more precisely, its non-matricial version can be obtained as a rather straightforward corollary of a certain statement, concerning tensor products of some one-sided modules. This statement, probably, is of an independent interest.

Fix an infinite-dimensional Hilbert space L and denote, for brevity, $\mathcal{B}(L)$ by $\mathcal{B}$. We call a normed contractive right $\mathcal{B}$-module Y a *semi-Ruan module*, if for arbitrary orthogonal projections $P, Q \in \mathcal{B}$ and arbitrary $x, y \in Y$, we have

$$\|x \cdot P + y \cdot Q\| \leq (\|x \cdot P\|^2 + \|y \cdot Q\|^2)^{1/2}.$$

Further, we call a normed contractive left $\mathcal{B}$-module X *extremely flat*, if for every isometric morphism $\varphi : Y \to Z$ of right semi-Ruan $\mathcal{B}$-modules the operator $\varphi \otimes_{\mathcal{B}} \mathbf{1}_X : Y \otimes_{\mathcal{B}} X \to Z \otimes_{\mathcal{B}} X$ is also isometric.

Theorem. *Let H be an arbitrary Hilbert space, and $\mathcal{S}(H, L)$ the space of Schmidt operators from H into L, equipped with the left outer multiplication $a \cdot \tilde{b}$ defined as just the composition $a\tilde{b}, a \in \mathcal{B}, \tilde{b} \in \mathcal{S}(H, L)$. Then $\mathcal{S}(H, L)$ is an extremely flat module.*

This result, being combined with some simple general facts about semi-Ruan modules and extremely flat modules, provides several theorems of Arveson–Wittstock type, including the "genuine" Arveson–Wittstock Theorem.

Monica Ilie: *On extension theorems and weak* continuity of homomorphisms of the Fourier algebras* [Wednesday 4 July, 11:30–12:00]

For locally compact groups G, H any continuous, piecewise affine map $\alpha : Y \subset H \to G$ induces a completely bounded algebra homomorphism $j_\alpha : B(G) \to B(H)$. We prove that j_α is w^*-continuous if and only if α is an open map, which extends results due to M.B. Bekka, E. Kaniuth, A.T. Lau, and G. Schlichting. Several classical theorems regarding isomorphisms and extensions of homomorphisms on group algebras of abelian groups are extended to the setting of Fourier–Stieltjes algebras of amenable groups. The results presented are joint work with Ross Stokke.

Kinvi Kangni: *Spherical Grassmannian on reductive Lie group* [Wednesday 11 July, 9:45–10:15]

Let G be a locally compact group, K a compact subgroup of G and δ an arbitrary class of irreducible unitary representations of K. The p-δ-spherical Grassmannian $\mathcal{G}_{p,\delta}$ is an equivalence class of spherical functions of type δ-positive of height p. In this work, we construct some elements of $\mathcal{G}_{p,\delta}$ on reductive Lie group using a generalized Abel transform.

Derek Kitson: *Riesz points for tuples of commuting operators* [Wednesday 11 July, 11:30–12:00]

In this talk we define the notion of a Riesz point for a tuple of commuting operators on a Banach space using the joint Taylor spectrum. The associated joint Browder spectrum agrees with that of Curto and Dash. A generalisation of the Ruston characterisation of Riesz operators also holds for tuples of commuting Riesz operators.

Julia Kuznetsova: *Weighted L_p-algebras* [Thursday 12 July, 11:00–11:30]

Further properties of weighted convolution algebras $L_p(G, w)$ are presented. First, we prove an existence theorem: Weighted algebras with $p > 1$ exist on any σ-compact locally compact group, and in the abelian case this is a complete description of all possible groups.

Next, we prove in final form a well-known criterion (proved in special cases subsequently by Edwards, Feichtinger, and Grabiner): $L_1(G, w)$ on a LCG G is an algebra iff w is equivalent to a continuous submultiplicative function.

The rest of the talk is devoted to regular algebras on abelian groups. A commutative algebra is called regular if the image of its Gelfand transform separates points and closed sets (the notion was introduced by G.E.Shilov). Beurling has proved on the real line, and Domar in general case the following criterion: The algebra $L_1(G, w)$ on a LCAG G is regular iff $\sum_{n=1}^{\infty} \ln w(nx)/n^2 < \infty$ for all x.

We show that this result is trivially generalized to the case $p > 1$ under assumption that $L_p(G, w)$ is translation-invariant. If it is not, the series may not converge even in a regular algebra. We also demonstrate some other pathological properties of non-invariant algebras.

Finally, we show that regular algebras $L_p(G, w)$ with $p > 1$ exist on any σ-compact abelian group.

Niels Jakob Laustsen: *Classifying closed ideals in the Banach algebra of bounded linear operators on a Banach space* [Tuesday 10 July, 15:00–15:30]

I shall report on the progress made in recent years in the study of the lattice of closed ideals in the Banach algebra $\mathcal{B}(E)$ of bounded linear operators on a Banach space E, and I shall describe strategies and open problems for future research.

Rick Loy: *Approximate amenability for classes of Banach algebras* [Monday 9 July, 10:50–11:20]

For some classes of Banach algebras, the concepts of amenability and approximate amenability are known to coincide, in others classes they are distinct, and in others the question remains open. We will discuss these situations and give some new results in the first two cases, with particular focus on semigroup algebras.

Zinaida A. Lykova: *The Künneth formula for nuclear DF-spaces and Hochschild cohomology* [Thursday 5 July, 10:50–11:20]

We consider a complex of nuclear Fréchet spaces $(\mathcal{X}, d)$ and continuous boundary maps d_n with closed ranges and prove that, up to topological isomorphism, $(H_n(\mathcal{X}, d))^* = H^n(\mathcal{X}^*, d^*)$, where $(H_n(\mathcal{X}, d))^*$ is the dual space of the homology group of $(\mathcal{X}, d)$ and $H^n(\mathcal{X}^*, d^*)$ is the cohomology group of the dual complex $(\mathcal{X}^*, d^*)$. We use this result to establish the existence of a topological isomorphism in the Künneth formula for the cohomology groups of complete nuclear DF-complexes for which all boundary maps have closed ranges. This allows us to prove the existence of a topological isomorphism in the Künneth formula for continuous Hochschild cohomology groups of nuclear $\hat{\otimes}$-algebras which are Fréchet spaces or DF-spaces. We describe explicitly continuous Hochschild and cyclic cohomology groups of certain tensor products of nuclear $\hat{\otimes}$-algebras which are Fréchet spaces or DF-spaces.

Hakimeh Mahyar: *Quasicompact and Riesz endomorphisms of infinitely differentiable Lipschitz algebras* [Wednesday 11 July, 15:40–16:10]

Let X be a perfect compact plane set, and $0 < \alpha \leq 1$. The Lipschitz algebra $\mathrm{Lip}(X, \alpha)$ of order α, is the algebra of all complex-valued functions f on X for which

$$p_\alpha(f) = \sup\Big\{\frac{|f(z) - f(w)|}{|z - w|^\alpha} : z, w \in X, z \neq w\Big\} < \infty.$$

The algebra $\mathrm{Lip}(X, \alpha)$ is a Banach function algebra on X, with the norm $\|f\|_\alpha = \|f\|_X + p_\alpha(f)$, where $\|f\|_X = \sup_{x\in X} |f(x)|$. The algebra of functions f on X whose derivatives of all orders exist and $f^{(n)} \in \mathrm{Lip}(X, \alpha)$ for all n, is denoted by $\mathrm{Lip}^\infty(X, \alpha)$. Let (M_n) be a sequence of positive numbers satisfying $M_0 = 1$ and $M_{n+m}/(M_n M_m) \geq \binom{n+m}{n}$ where m and n are non-negative integers, and define

$$\mathrm{Lip}(X, M, \alpha) = \{f \in \mathrm{Lip}^\infty(X, \alpha) : \|f\| = \sum_{k=0}^{\infty} \|f^{(k)}\|_\alpha / M_k < \infty\}.$$

We study the endomorphisms of the infinitely differentiable Lipschitz algebras $\mathrm{Lip}(X, M, \alpha)$ which are quasicompact operators or Riesz operators. We show that under certain conditions every quasicompact or Riesz endomorphism of these algebras is necessarily power compact. Then we determine the spectra of Riesz and quasicompact endomorphisms of $\mathrm{Lip}(X, M, \alpha)$, when it is a natural Banach function algebra on X.

Javad Mashreghi: *Generalized Lipschitz functions* [Tuesday 10 July, 15:00–15:30]

We introduce the class $Lip\,\alpha(t)$ of continuous functions. The definition is arranged so that for the constant function $\alpha(t) \equiv \alpha$, the class $Lip\,\alpha(t)$ is exactly the classical Lipschitz space $Lip\,\alpha$. Then, to justify that our set of axioms for $\alpha(t)$ are properly chosen, some celebrated theorems of Privalov, Titchmarsh, Hardy and Littlewood about $Lip\,\alpha$ functions are shown to be also valid for $Lip\,\alpha(t)$ functions.

This presentation in a conference on Banach algebras should be considered as an invitation for specialists in this domain to verify if their theorems having Lipschitz conditions can also be extended for generalized Lipschitz classes.

Martin Mathieu: *When are two C*-algebras Jordan isomorphic?* [Wednesday 4 July, 15:00–15:30]

Kaplansky's question whether a linear surjection between semisimple, complex Banach algebras that preserves the spectrum of each element has to be a Jordan isomorphism was answered positively in the case of von Neumann algebras by Aupetit in 2000. Since then a number of extensions have been obtained by a variety of authors. In our talk we plan to discuss which spectral properties a linear surjection between C*-algebras has to preserve so that it must be a Jordan isomorphism. In particular, we shall compare two extreme opposite situations, on the one hand, purely infinite, not necessarily simple C*-algebras and on the other hand, certain type I C*-algebras.

[1] Y.-F. Lin, M. Mathieu, Jordan isomorphism of purely infinite C*-algebras, Quart. J. Math. (2007), in press.

[2] M. Mathieu, C. Ruddy, Spectral isometries, II, Contemp. Math. (2007), in press.

Sonja Mouton: *On Spectral Continuity in Ordered Banach Algebras* [Monday 9 July, 15:40–16:10]

It is well-known that if A is a non-commutative Banach algebra, then the spectrum and spectral radius functions are only upper semicontinuous on A, while if A is a commutative Banach algebra, then these functions are uniformly continuous on A. More generally, if $x \in A$, then $|\rho(y) - \rho(x)| \leq \rho(x - y)$ for all $y \in \{x\}^c$, where ρ denotes the spectral radius and $\{x\}^c$ the commutant of x (so that the spectral radius is continuous at x, considered an element of $\{x\}^c$).

In this talk we present certain generalisations of this result for positive elements in an ordered Banach algebra.

Matthias Neufang: *New Trends in Abstract Harmonic Analysis* [Friday 6 July, 16:45–17:45]

In recent years, the classical realm of abstract harmonic analysis – i.e., locally compact groups – has been extended into very different, but equally exciting directions. The purpose of this talk is to report on some of those, chosen according to my own bias.

1. From groups to semigroups: The study of biduals of group and semigroup algebras naturally leads to semigroup compactifications, and thus to a fascinating interplay between harmonic analysis and topology – as witnessed, in particular, by the recent memoir *Banach Algebras on Semigroups and their Compactifications* by H.G. Dales, A.T.-M. Lau, and D. Strauss. One novel insight emerging from the latter is the existence of very small sets which are determining for the topological centre (dtc). I will present various results concerning a natural generalization of dtc sets for Beurling algebras, as well as for the algebra $\mathcal{T}(\ell_2(\mathcal{G}))$, endowed with a natural convolution type product, over a discrete group $\mathcal{G}$. I will also mention an intriguing link between the latter and the famous Kadison–Singer Conjecture from 1959. This is mainly based on joint work with Z. Hu and Z.-J. Ruan, and my Master's students C. Auger and M. Mazowita, respectively.
2. Beyond local compactness: In 2001, V.G. Pestov asked: *"Is there life beyond local compactness?"* His 2006 monograph *Dynamics of Infinite-dimensional Groups – The Ramsey–Dvoretzky–Milman Phenomenon* shows that non locally compact groups are even *extremely* lively! I will discuss both differences and similarities between harmonic analysis on "small" and on "massive" groups, through specific examples. With regard to amenability, many non locally compact groups show a behaviour which can never be observed in the classical situation: they are *extremely amenable*, i.e., there is a multiplicative left invariant mean on LUC($\mathcal{G}$). On the other hand, the multiplication on group algebras such as LUC$(\mathcal{G})^*$ turns out to be as irregular as in the locally compact case. Indeed, the topological centre of the latter equals precisely the algebra of uniform measures on $\mathcal{G}$, for arbitrary ω-bounded – e.g., separable – groups $\mathcal{G}$ (joint work with S. Ferri). This yields in particular a result due to M.G. Megrelishvili, V.G. Pestov and V.V. Uspenskij, characterizing precompactness of an ω-bounded group through the existence of a unique left invariant mean on LUC($\mathcal{G}$).
3. From groups to quantum groups: Locally compact quantum groups, as presented by J. Kustermans and S. Vaes in 2000, provide the perfect framework for Pontryagin duality beyond locally compact abelian groups, as well as for several non group-like algebras arising in mathematical physics. After a brief introduction of the general theory, I shall focus on recent joint work with M. Junge and Z.-J. Ruan which unifies and generalizes earlier work of F. Ghahramani, N. Spronk, E. Størmer, Z.-J. Ruan and myself in the group case, to arbitrary locally compact quan-

tum groups $\mathbf{G}$. We introduce the algebra $M^r_{cb}(L_1(\mathbf{G}))$ of completely bounded right multipliers on $L_1(\mathbf{G})$, and prove that it can be identified with the algebra of normal completely bounded $L_\infty(\hat{\mathbf{G}})$-bimodule maps on $\mathcal{B}(L_2(\mathbf{G}))$ leaving $L_\infty(\mathbf{G})$ invariant. From this representation we deduce that every completely bounded right centralizer of $L_1(\mathbf{G})$ is in fact implemented by an element of $M^r_{cb}(L_1(\mathbf{G}))$. We also show that our representation framework allows us to express quantum group Pontryagin duality purely as a commutation relation. We discuss applications to quantum information theory of this natural class of channels, and calculate the cb-entropy in the finite dimensional setting.

Narutaka Ozawa: *Survey on Classification of Group von Neumann Algebras* [Tuesday 10 July, 9:15–10:15]
Classification of group von Neumann algebras have seen a remarkable progress since Popa's breakthrough in 2002. I will review the history and recent developments of classification of group von Neumann algebras.

Thomas Vils Pedersen: *Weak-star properties of homomorphisms from weighted algebras on the half-line* [Friday 6 July, 11:30–12:00]
Let $L^1(\omega) = L^1_\omega(\mathbf{R}^+)$ be the weighted convolution algebra on $\mathbf{R}^+$ with weight ω. For a non-zero, continuous homomorphism $\Phi : L^1(\omega_1) \to L^1(\omega_2)$, Grabiner recently proved that the unique continuous extension $\widetilde{\Phi} : M(\omega_1) \to M(\omega_2)$ to a homomorphism between the corresponding weighted measure algebras on $\mathbf{R}^+$ is also continuous with respect to the weak-star topologies on these algebras.

In this talk we investigate whether similar results hold for homomorphisms from $L^1(\omega)$ into some other commutative Banach algebras. In particular, we prove that for the disc algebra $\mathcal{A}(\overline{\mathbf{D}})$ every non-zero homomorphism $\Phi : L^1(\omega) \to \mathcal{A}(\overline{\mathbf{D}})$ extends uniquely to a continuous homomorphism $\widetilde{\Phi} : M(\omega) \to \mathcal{H}^\infty(\mathbf{D})$ which is also continuous with respect to the weak-star topologies. Similarly, for the Beurling algebras $\mathcal{A}^+_v$ on $\overline{\mathbf{D}}$ we prove that every non-zero homomorphism $\Phi : L^1(\omega) \to \mathcal{A}^+_v$ extends uniquely to a continuous homomorphism $\widetilde{\Phi} : M(\omega) \to \mathcal{A}^+_v$ which is also continuous with respect to the weak-star topologies.

Finally, we present a mathematical swindle, where the conference participants are invited to spot the mistake in a false proof of the long-standing conjecture that all continuous homomorphisms $\Phi : L^1(\omega_1) \to L^1(\omega_2)$ are standard; meaning that $L^1(\omega_2) * \Phi(f)$ is dense in $L^1(\omega_2)$ whenever $L^1(\omega_1) * f$ is dense in $L^1(\omega_1)$.

Alexei Pirkovskii: *Weak homological dimensions of Fréchet algebras and nuclearity* [Thursday 12 July, 9:00–10:00]
Let A be a Fréchet algebra, and let $\mathrm{w.dg}\,A$ (resp. $\mathrm{w.db}\,A$) denote the weak global dimension (resp. the weak bidimension) of A. The corresponding "strong" (i.e., projective) dimensions will be denoted by $\mathrm{dg}\,A$ and $\mathrm{db}\,A$, respectively. It is known that $\mathrm{dg}\,A \le \mathrm{db}\,A$ and $\mathrm{w.dg}\,A \le \mathrm{w.db}\,A$ for every A. However, it is an open problem whether there exists a Fréchet algebra A for which any of the above inequalities is strict. We show that $\mathrm{w.dg}\,A = \mathrm{w.db}\,A$ provided that A is nuclear and satisfies $\mathrm{w.db}\,A < \infty$. If, in addition, A has a "nice" projective bimodule resolution, then we show that $\mathrm{dg}\,A \le \mathrm{db}\,A \le \mathrm{dg}\,A + 1$.

Next we specialize to biflat Köthe sequence algebras $A = \lambda(P)$. For such an algebra A, we prove that $\mathrm{w.dg}\,A = \mathrm{w.db}\,A \le 1$ if and only if A is nuclear, and $\mathrm{w.dg}\,A = \mathrm{w.db}\,A = 2$ otherwise. Under some additional assumptions, the nuclearity of A is equivalent to the stronger inequality $\mathrm{db}\,A \le 1$. On the other hand, we construct an example of a nuclear biflat Köthe algebra A with $\mathrm{w.db}\,A = 1$ and $\mathrm{db}\,A = 2$.

Sandra Pott: *Tangential interpolation in vector-valued H^p-spaces* [Thursday 5 July, 15:40–16:10]
We obtain norm estimates for the problem of minimal-norm weighted tangential interpolation by functions in vector-valued H^p spaces, expressed in terms of the Carleson constants of related scalar and vector measures. Applications are given to the controllability properties of linear semigroup systems with a Riesz basis of eigenvectors. This is joint work with Birgit Jacob (Delft University of Technology, Netherlands) and Jonathan R. Partington (University of Leeds,UK).

Paul Ramsden: *Projectivity, injectivity and flatness of $L^1(G)$- and $M(G)$-modules* [Wednesday 11 July, 11:30–12:00]
A typical concern in homological algebra is the identification of projective and injective modules over an algebra. Let G be a locally compact group, and let $L^1(G)$ be the Banach algebra which is the group algebra of G, and let $M(G)$ be the Banach algebra which is the measure algebra on G. We consider a variety of Banach left $L^1(G)$-modules and $M(G)$-modules, and seek to determine conditions on G such that these modules are either projective, injective or flat. The answers typically involve G being compact or discrete or amenable.

Charles Read: *The hypercyclicity problem* [Wednesday 4 July, 9:15–10:15]
An operator T on a Banach space X is hypercyclic if there is a vector x whose translates $T^r x$ are dense. For the translates thus to take a walk through the whole space is regarded as chaotic behaviour, so this definition is related to the general area of mathematical chaos. There is a well known sufficient condition for T to be hypercyclic, known as the hypercyclicity criterion. It turns out that this happens if and only if the direct sum $T \oplus T$ is hypercyclic, but the condition is not necessary for T to be hypercyclic. We will show this during the talk, and discuss the quite curious condition that T must satisfy if $T \oplus T$ is hypercyclic, but which does not always happen if T is hypercyclic.

Jean Roydor: *Completely 1-complemented subspaces of Schatten spaces* [Saturday 7 July, 10:50–11:20]
We consider the Schatten spaces S^p in the framework of operator space theory and for any $1 \leq p \neq 2 < \infty$, we characterize the subspaces of S^p which are the image of a completely contractive projection. They turn out to be the direct sum of spaces of the form $S^p(H, K)$, where H, K are Hilbert spaces.

Volker Runde: *Locally compact quantum groups for Banach algebraists* [Friday 6 July, 10:50–11:20]
The predual of a Hopf-von Neumann algebra is a (completely contractive) Banach algebra in a canonical way. Examples of Banach algebras arising in this fashion are $L^1(G)$ and the Fourier algebra $A(G)$ for a locally compact group. Locally compact quantum groups, as introduced by Kustermans and Vaes, provide an axiomatic framework in which $L^1(G)$ and $A(G)$ are dual to one another. Many Banach algebraic results about those algebras - Leptin's theorem, and the amenability theorems by Johnson and Ruan - assume a more natural form when rephrased in the language of locally compact quantum groups and hint at possible generalizations. We give a survey of known results and open problems.

Mohammad Sal Moslehian: *Approximate double centralizers* [Saturday 7 July, 12:10–12:40]
Let $\mathcal{A}$ be an algebra. A double centralizer of $\mathcal{A}$ is a pair (L, R) of linear mappings $L, R : \mathcal{A} \to \mathcal{A}$ such that

$$L(ab) = L(a)b, \quad R(ab) = aR(b), \quad aL(b) = R(a)b \qquad (a, b \in \mathcal{A}).$$

We establish the generalized stability of double centralizers associated with the Cauchy, Jensen, and Trif functional equations in the framework of Banach algebras. Introducing a notion of approximate double centralizer we also investigate the superstability of double centralizers of Banach algebras strongly without order.

References:

[A-M] M. Amyari and M.S. Moslehian, Approximate homomorphisms of ternary semigroups, Lett. Math. Phys. 77 (2006), 1–9.

[MOS] M. S. Moslehian, Approximately vanishing of topological cohomology groups, J. Math. Anal. Appl. 318 (2006), no. 2, 758–771.

[PAL] T. W. Palmer, Banach Algebras and the General Theory of $*$-Algebras, Vol. I. Algebras and Banach Algebras, Encyclopedia of Mathematics and its Applications 49, Cambridge University Press, Cambridge, 1994.

Ebrahim Samei: *2-weak amenability of Beurling algebras* [Friday 6 July, 15:00–15:30]

Let G be a locally compact abelian group, let ω be a weight on G, and let $L^1_\omega(G)$ be the Beurling algebra on G. We first introduce the concept of vector-valued Beurling algebras and then we use it to give examples of Beurling algebras which are 2-weakly amenable. Some of these examples are already known but we also present some new cases too.

Bert Schreiber: *Topological algebras of random elements* [Wednesday 11 July, 15:00–15:30]

For a Banach algebra A and a probability space $(\Omega, \mathcal{A}, P)$, let $L_0(\Omega, A)$ denote the topological algebra of A-valued, Bochner measurable random variables with the the topology of convergence in probability. In this talk we consider various topological-algebra properties of $L_0(\Omega, A)$. This is joint work with M.V. Velasco.

Andrzej Sołtysiak:*Continuous characters and spectra of generators in topological algebras* [Thursday 12 July, 11:00–11:30]

It is well-known that if A is a unital (complex) Banach algebra generated by the elements $x_1, \ldots, x_n$, then the joint spectrum of generators, $\sigma(x_1, \ldots, x_n)$, can be obtained by the formula

$$\sigma(x_1, \ldots, x_n) = \{(f(x_1), \ldots, f(x_n)) \colon f \text{ is a character of } A\}.$$

In the commutative case this is the classical theorem (see e.g [3], p.78) while in case the algebra is noncommutative it was proved in [1] (see also [2]). Recently this result was extended by W. Żelazko in [4] to a general case of commutative semitopological algebras with the joint spectrum replaced by the topological joint spectrum. In the talk we present a noncommutative version of Żelazko's result.

[1] Che-Kao Fong and A. Sołtysiak, Existence of a multiplicative functional and joint spectra, Studia Math. 81 (1985), 213–220.

[2] V. Müller and A. Sołtysiak, Spectrum of generators of a noncommutative Banach algebra, Studia Math. 93 (1989), 87–95.

[3] W. Żelazko, Banach Algebras, Elsevier, PWN, Amsterdam, Warszawa 1973.

[4] W. Żelazko, Continuous characters and joint topological spectra, submitted.

Nico Spronk: *Operator Space Structure on Feichtinger's Segal Algebra* [Monday 9 July, 11:30–12:00]

We extend the definition, from the class of abelian groups to a general locally compact group G, of Feichtinger's remarkable Segal algebra $S_0(G)$. In order to obtain functorial properties for non-abelian groups, in particular a tensor product formula, we endow $S_0(G)$ with an operator space structure. With this structure $S_0(G)$ is simultaneously an operator Segal algebra of the Fourier algebra $A(G)$, and of the group algebra $L^1(G)$. We show that this operator space structure is consistent with the major functorial properties: (i) $S_0(G)\hat{\otimes}S_0(H) = S_0(G \times H)$ completely isomorphically (operator projective tensor product), if H is another locally compact group; (ii) the restriction map $u \mapsto u|_H : S_0(G) \to S_0(H)$ is completely surjective, if H is a closed subgroup; and (iii) $T_N : S_0(G) \to S_0(G/N)$ is completely surjective, where N is a normal subgroup and $T_N u(sN) = \int_N u(sn)dn$. We also show that $S_0(G)$ is an invariant for G when it is treated simultaneously as a pointwise algebra and a convolutive algebra.

Some of the above properties stand in contrast to those for other simultaneous operator Segal algebras of $A(G)$ and $L^1(G)$, such as $A(G) \cap L^1(G)$, which was studied earlier by Ghahramani and Lau and by Forrest, Wood and the speaker.

Venta Terauds: *Extrapolation of well-bounded operators and the BV functional calculus* [Tuesday 10 July, 15:40–16:10]

A well-bounded operator on a Banach space X is one that admits a functional calculus for an algebra $\mathrm{AC}[a, b]$ of absolutely continuous functions defined on a closed interval of the real line. If T is a well-bounded operator on a reflexive space, then there is a natural extension of the canonical functional calculus to an algebra $\mathrm{BV}[a, b]$ of functions of bounded variation. In general, neat conditions on a space X that ensure such an extended functional calculus for a well-bounded operator $T \in L(X)$ are rare.

We consider a family of Banach spaces $\{X_p : p \in [a, b]\}$, where $1 \le a < b \le \infty$, and a linear map T that defines a well-bounded operator T_p on each X_p for $p \in (a, b)$. We show that on families such as $X_p = L^p[0, 1], \ell^p$ or C_p, the domain of T may always be extended to X_a and X_b, and under certain boundedness conditions, the operators $T_a \in L(X_a)$ and $T_b \in L(X_b)$ will also be well-bounded with a natural BV functional calculus.

Richard Timoney: *Inequalities for matrix norms and an application to C*-algebras* [Monday 9 July, 10:50–11:20]

In joint work with R. Archbold and D. Somerset, we consider the problem of estimating the maximum possible norm of a matrix given that a specified collection of principal submatrices have norm one. In some cases we have exact results. We relate this to a question in C*-algebras, concerning boundedness of the inverse of the canonical contraction from the central Haagerup tensor product of a C*-algebra A with itself to the CB operators on A.

Thomas V. Tonev: *Peripheral additivity and isomorphisms between semisimple commutative Banach algebras* [Monday 9 July, 15:00–15:30]

We give sufficient conditions for mappings between semisimple commutative Banach algebras, not necessarily linear, to be algebra isomorphisms. Namely, if A and B are semisimple commutative Banach algebras, then a mapping $T\colon A \to B$ is *peripherally-additive* if $\sigma_\pi(Tf + Tg) = \sigma_\pi(f + g)$ for all $f, g \in A$, where $\sigma_\pi(f)$ is the peripheral spectrum of f. It is shown that under natural conditions every such mapping T is an isometric algebra isomorphism from A onto B that preserves the spectral radii, and therefore is linear and multiplicative. It is shown that similar result holds also for symmetric semisimple commutative Banach algebras.

Sergei Treil: *The problem of ideals of H^∞* [Monday 9 July, 16:45–17:45]

The talk is devoted to the problem of ideals of H^∞: describe increasing functions $\varphi \ge 0$ such that for all bounded analytic functions $f_1, f_2, \ldots, f_n, \tau$ in the unit disc $\mathbf{D}$ the condition

$$|\tau(z)| \le \varphi\left(\left(\sum |f_k(z)|^2\right)^{1/2}\right) \qquad \forall z \in \mathbf{D}$$

implies that τ belong to the ideal generated by $f_1, f_2, \ldots, f_n$, i.e. that there exist bounded analytic functions $g_1, g_2, \ldots, g_n$ such that $\sum_{k=1}^n f_k g_k = \tau$.

It was proved earlier that the function $\varphi(s) = s^2$ does not satisfy this condition. The strongest known before positive result in this direction due to J. Pau states that the function $\varphi(s) = s^2/((\ln s^{-1})^{3/2} \ln\ln s^{-1})$ works. However, there was always a suspicion that the critical exponent at $\ln s^{-1}$ is 1 and not 3/2.

In the talk I will present a new approach to the problem which leads to some new results: in particular it gives a new sufficient condition on the function φ. This condition looks like a final answer, although I cannot prove that it is necessary. This condition also shows that 3/2 is indeed not a critical exponent, that the critical exponent is at most 1. The new approach to the problem is based on investigating geometry of holomorphic vector bundles as well as using Bellman function methods.

Lyudmila Turowska: *Multidimensional operator multipliers* [Thursday 5 July, 11:30–12:00]

We introduce multidimensional Schur multipliers and characterise them generalising well known results by Grothendieck and Peller. We define a multidimensional version of the two dimensional operator multipliers studied recently by Kissin and Shulman. The multidimensional operator multipliers are defined as elements of the minimal tensor product of several C*-algebras satisfying certain boundedness conditions. In the case of commutative C*-algebras, the multidimensional operator multipliers reduce to continuous multidimensional Schur multipliers. We show that the multipliers with respect to some given representations of the corresponding C*-algebras do not change if the representations are replaced by approximately equivalent ones. We establish a non-commutative and multidimensional version of the characterisations by Grothendieck and Peller which shows that universal operator multipliers can be obtained as certain weak limits of elements of the algebraic tensor product of the corresponding C*-algebras. This is a joint work with I.G.Todorov and K.Juschenko.

Hans-Olav Tylli: *Composition operators from weak to strong spaces of vector-valued analytic functions* [Wednesday 4 July, 16:20–16:50]

I will describe joint work [1] with J. Laitila (Helsinki) and M. Wang (Wuhan), where it is shown that the composition operator $C_\varphi; f \mapsto f \circ \varphi$, is bounded $wH^p(X) \to H^p(X)$ for $2 \le p < \infty$ if and only if C_φ is a Hilbert-Schmidt operator $H^2 \to H^2$. Here φ is an analytic self-map of the unit disk $D \subset \mathbf{C}$, X is any complex infinite-dimensional Banach space, $H^p(X)$ is the X-valued Hardy space and $wH^p(X)$ is a related weak vector-valued Hardy space. A similar result holds for vector-valued Bergman spaces. These results were motivated by a question of S. Kaijser.

[1] J. Laitila, H.-O. Tylli and M. Wang: Composition operators from weak to strong spaces of vector-valued analytic functions. Dept. Math. Stat. Reports # 450 (2007), University of Helsinki

Armando Villena: *Maps preserving zero products* [Wednesday 4 July, 15:40–16:10]

We prove that every continuous linear map $T\colon A \to B$ preserving zero products is a weighted homomorphism for a large class of Banach algebras which includes C^*-algebras, group algebras, and Banach algebras generated by idempotents. Furthermore, that class is stable for the usual methods of constructing Banach algebras.

Griffith Ware: *An alternate norm on Calkin Algebras* [Wednesday 11 July, 10:50–11:20]

Let X be a Banach Space. We study the quotient algebra $B(X)/K(X)$ under a non-standard norm that measures the degree of divergence of images of bounded sequences in X, and compare this norm with the canonical quotient norm in certain specific cases.

Michael C. White: *The bicyclic semigroup algebra* [Tuesday 10 July, 11:30–12:00]

The bicyclic semigroup is generated by two elements, q and p, subject to the relation $qp = 1$. For a model of this semigroup you may think of the C^*-algebra generated by the right shift and its adjoint on Hilbert space. This C^*-algebra is amenable and so most of its cohomology is trivial. One can also consider the 1-normed algebra generated by this semigroup. The algebra is not amenable, in particular it has (non-inner) derivations into its dual, so is not even weakly amenable. We will see how the semigroup's structure can be used to calculate the cohomology of this algebra.

George Willis: *Just integral domains* [Monday 9 July, 9:15–10:15]

A commutative Banach algebra A is *just an integral domain* if it is an integral domain but no proper quotient is an integral domain. Every just integral domain is either isomorphic to the complex numbers or is radical.

That various radical algebras are (or are not) just integral domains follows as a corollary of known results about classes of radical algebras, and old open questions acquire new interest in the light of this concept. Analogy with the notion of *just infinite group* suggests that it might be possible and useful to give a broad description of the structure of just integral domains. The attempt to achieve such a description focuses attention on radicals smaller than the Jacobson radical.

Jafar Zafarani: *Banach–Stone type theorems for Borel and Baire functions* [Monday 9 July, 11:30–12:00]

Let X a Hausdorff topological space. For each ordinal α, we denote the Banach algebra of bounded Borel (resp. Baire) functions of class α by $B_\alpha^\circ(X)$(resp. $\beta_\alpha^\circ(X)$) equipped with uniform norm. When X and Y are perfectly normal spaces, we establish a Banach–Stone type theorem for Borel functions : If $\varphi : B_\alpha^\circ(Y) \to B_\alpha^\circ(X)$ is a surjective isometric ring isomorphism, then there exists an α-homeomorphism $\tau : X \to Y$ such that

$$\varphi(f) = f \circ \tau, \ \ \forall f \in B_\alpha^\circ(Y).$$

Moreover, when X and Y are completely regular spaces, we obtain a Banach–Stone type theorem for Baire functions : If every singleton in X and Y is a $\mathcal{Z}_\alpha$ set and $\varphi : \beta_\alpha^\circ(Y) \to \beta_\alpha^\circ(X)$ is a surjective isometric linear isomorphism, then there exists a Baire α-homeomorphism $\tau : X \to Y$ and a unitary element $h \in \beta_\alpha^\circ(X)$ such that

$$\varphi(f)(x) = h(x)\ (f \circ \tau)(x),\ \forall f \in \beta_\alpha^\circ(Y).$$

Here $\mathcal{Z}_\alpha$ is designated for the the family of all zero sets of $\beta_\alpha^\circ(X)$. Finally in the case that a Banach space E has the Banach–Stone property, we obtain E-valued versions of the above results.

Wiesław Żelazko: *An infinite dimensional Banach algebra with all but one maximal abelian subalgebras of dimension two* [Tuesday 10 July, 10:50–11:20]

Consider the following problem: Let X be an infinite dimensional Banach (or Hilbert) space. Is it possible that some maximal abelian subalgebra of $L(X)$ is finite dimensional? While it seems almost obvious that the answer should be in negative, I could not answer this question. However, as a by-product of my efforts, I have constructed a closed subalgebra of $L(H)$ with the property announced in the title. In my talk I shall present this construction.

Jaroslav Zemánek: *Resolvents and powers* [Tuesday 10 July, 11:30–12:00]

We investigate various kinds of resolvent conditions and their mutual relations. For instance, the strong Kreiss condition implies the Cesàro boundedness of the operator.

Yong Zhang: *Generalized amenability of Beurling algebras* [Friday 6 July, 15:40–16:10]

A Beurling algebra on a locally compact group G is a weighted convolution L^1-algebra on G, denoted by $L^1(G, \omega)$, where ω is a weight function on G. We will discuss generalized notions of amenability for Beurling algebras. In particular, we will focus on bounded approximate amenability for this type of algebras. Under some conditions on ω, we show that bounded approximate amenability will imply amenability for $L^1(G,\omega)$. The general question of whether an approximately amenable Beurling algebra is amenable is still left open.

This is joint work with F. Ghahramani and R. Loy.