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On the occasion of
the 60th birthday
of Andreas Defant

Abstracts

Universitat de València

Universitat Politècnica de València

Talks

Banach function lattices with the Daugavet property

María D. Acosta
Universidad de Granada (Spain)

A Banach space X has the Daugavet property if for every rank-one operator T on X it is satisfied that $\|I+T\| = 1+\|T\|$. In case that K is a perfect compact topological space, the space $C(K)$ has the Daugavet property. Amongst the class of rearrangement spaces on $[0,1]$ the only known spaces with the Daugavet property are $L_1[0,1]$ and $L_\infty[0,1]$. V. Kadets, M. Martín, J. Merí and D. Werner characterized L_1 as the unique r.i. separable space on a finite measure space without atoms with the Daugavet property. In the non separable case we proved under mild assumptions that a r.i. with the Daugavet property is isometric to L_∞ under the same hypothesis on the measure space .
This is part of a joint work with A. Kamińska and M. Mastyło.

Uniform mean ergodicity of C_0–semigroups of linear operators in lcHs

Angela A. Albanese
Università del Salento (Italy)

Let $(T(t))_{t\geq 0}$ be a strongly continuous C_0–semigroup of bounded linear operators on a Banach space X such that $\lim_{t\to\infty}\|T(t)/t\| = 0$. Characterizations of when $(T(t))_{t\geq 0}$ is uniformly mean ergodic, i.e., of when its Cesàro means $r^{-1}\int_0^r T(s)\,ds$ converge in operator norm as $r\to\infty$, are known. For instance, this is so if and only if the infinitesimal generator A has closed range in X if and only if $\lim_{\lambda\downarrow 0^+}\lambda R(\lambda,A)$ exists in the operator norm topology (where $R(\lambda,A)$ is the resolvent operator of A at λ). Best known, these criteria are due to Lin.
The aim of this talk is to show that not all Banach results carry over automatically in the setting of strongly continuous C_0–semigroups of linear operators acting on locally convex spaces; new phenomena arise which are not present in Banach spaces. For instance, there exists an equicontinuous C_0–semigroup acting in a Fréchet space X which is uniformly mean ergodic (equivalently, Abel mean ergodic) but, unlike for Banach spaces, the range ImA of A fails to be closed. We also present several positive (new) results in this direction. In particular, despite the general case of locally convex spaces (even, of Fréchet spaces), we show that these characterizations, and others, remains valid in the class of quojection Fréchet spaces, which includes all Banach spaces, countable products of Banach spaces, and many more.

[1] A. A. Albanese, J. Bonet and W.J. Ricker, *Mean ergodic semigroups of operators*, Rev. R. Acad. Cien. Serie A, Mat., RACSAM, 106 (2012), 299–319.

[2] A. A. Albanese, J. Bonet and W.J. Ricker, *Montel resolvents and uniformly mean ergodic semigroups of linear operators*, Quaest. Math (to appear).

[3] A. A. Albanese, J. Bonet and W.J. Ricker, *Uniform mean ergodicity of C_0–semigroups in a class of Fréchet spaces*, preprint 2013.

Separation of singularites of holomorphic functions

Lev Aizenberg
Bar-Ilan University (Israel)

A statement is proved on the separation of singulatites of holomorphic functions from the H^p, $p > 1$, spaces over strictly pseudoconvex domains.

Commutativity of the Valdivia-Vogt structure table

Christian Bargetz
University of Innsbruck (Austria)

The Valdivia-Vogt structure table

$$\begin{array}{ccccccccccccccc}
\mathscr{D} & \subset & \mathscr{S} & \subset & \mathscr{D}_{L^p} & \subset & \dot{\mathscr{B}} & \subset & \mathscr{D}_{L^\infty} & \subset & \mathscr{O}_C & \subset & \mathscr{O}_M & \subset & \mathscr{E} \\
\cong & & \cong & & \cong & & \cong & & \cong & & \cong & & \cong & & \cong \\
\mathbb{C}^{(\mathbb{N})}\widehat{\otimes}_\iota s & \subset & s\widehat{\otimes}s & \subset & \ell^p\widehat{\otimes}s & \subset & c_0\widehat{\otimes}s & \subset & \ell^\infty\widehat{\otimes}s & \subset & s'\widehat{\otimes}_\iota s & \subset & s'\widehat{\otimes}_\pi s & \subset & \mathbb{C}^{\mathbb{N}}\widehat{\otimes}s
\end{array}$$

presented in [1,2] contains the most prominent spaces of smooth functions occurring in the theory of distributions together with their sequence space representations. We construct a semi-explicit isomorphism $\Phi\colon \mathscr{E} \to \mathbb{C}^{\mathbb{N}}\widehat{\otimes}s$ by decomposing smooth functions into sequences of Whitney-functions with flatness restrictions. We show that the restriction of Φ to any other space in the structure table provides an isomorphism between this space and its sequence space representation, i.e., using Φ, we can interpret the Valdivia-Vogt structure table as a commutative diagram.

[1] Christian Bargetz. *A sequence space representation of L. Schwartz' space $\mathscr{O}_C$*. Arch. Math. (Basel), 98(4):317–326, 2012.

[2] Norbert Ortner and Peter Wagner. *Explicit representations of L. Schwartz' spaces $\mathscr{D}_{L^p}$ and $\mathscr{D}'_{L^p}$ by the sequence spaces $s\hat{\otimes}l^p$ and $s'\hat{\otimes}l^p$, respectively, for* $1 < p < \infty$. J. Math. Anal. Appl., 404(1):1 – 10, 2013.

Distributional chaos in the solutions of certain differential equations

Xavier Barrachina
Universitat Politècnica de València (Spain)

The notion of distributional chaos has been rencently added to the study of the linear dynamics of operators and C_0-semigroups of operators. A criterion for distributional chaos and the existence of a dense distributionally irregular manifold for a C_0-semigroup has been recently obtained in [1]. We apply it to several examples of C_0-semigroups that were already known to be chaotic in the sense of Devaney. In particular we will study distributional chaos for birth-and-death processes with proliferations.
Joint work with J. Alberto Conejero.

[1] Angela A. Albanese, Xavier Barrachina, Elisabetta M. Mangino, and Alfredo Peris. *Distributional chaos for strongly continuous semigroups of operators.* Commun. Pure Appl. Anal., 12(5):2069–2082, 2013.

[2] Xavier Barrachina and José A. Conejero. *Devaney chaos and distributional chaos in the solution of certain partial differential equations.* Abstr. Appl. Anal., 2012:Art. ID 457019, 11, 2012.

Some results about different types of "genericity"
Françoise Bastin
University of Liège (Belgium)

The talk will be concerned with several results about different types of genericity in the context of spaces of type $\mathscr{S}^{\nu}$ and in the context of nowhere analytic (Gevrey) functions.

Dynamics of differentiation and integration operators on weighted spaces of entire functions
María José Beltrán
Universitat de València (Spain)

The purpose of this lecture is to study the differentiation operator $Df = f'$, the integration operator $Jf(z) = \int_0^z f(\zeta)d\zeta$ and the Hardy operator $Hf(z) = \frac{1}{z}\int_0^z f(\zeta)d\zeta$ on weighted spaces of entire functions $B_{p,q}(v)$, $1 \le p \le \infty$, $q = 0$, $1 \le q \le \infty$, studied by Lusky, defined by weights of exponential type. We study the boundedness, the norm, the spectrum, compactness and surjectivity of the operators, and we analyze when they are power bounded, (uniformly) mean ergodic, hypercyclic or chaotic. The dynamics of these operators on weighted inductive and projective limits of spaces of entire functions is also studied. Joint work with José Bonet y Carmen Fernández

[1] A. Atzmon; B. Brive, *Surjectivity and invariant subspaces of differential operators on weighted Bergman spaces of entire functions.* Bergman spaces and related topics in complex analysis, Contemp. Math., Amer. Math. Soc. 404, 27–39 (2006).

[2] M.J. Beltrán, *Dynamics of differentiation and integration operators on weighted spaces of entire functions.* Preprint.

[3] M.J. Beltrán; J. Bonet, C. Fernández, *Classical operators on weighted Banach spaces of entire functions.*To appear in Proceedings of the American Mathematical Society.

[4] J. Bonet, *Dynamics of the differentiation operator on weighted spaces of entire functions*, Math. Z. 261, 649–657 (2009).

[5] J. Bonet; A. Bonilla , *Chaos of the defferentiation operator on weighted Banach spaces of entire functions*, To appear in Complex Anal. Oper. Theory.

[6] W. Lusky, *On generalized Bergman spaces*, Stud. Math. 119, 77-95 (1996).

Disjointness in hypercyclicity
Juan Bès
Bowling Green State University (USA)

A (continuos, linear) operator T on a Fréchet space X is said to be hypercyclic provided it supports some vector f in X whose orbit $\{f, Tf, T^2f, \ldots\}$ is dense in X. Such f is called a hypercyclic vector for T. A tuple (T_1, T_2) of hypercyclic operators on X is said to be disjoint-hypercyclic provided the direct sum $T_1 \oplus T_2$ supports a hypercyclic vector of the form (f, f) in $X \times X$. We contrast the dynamics of a single operator T versus the disjoint dynamics of a tuple (T_1, T_2).
This includes joint work with Ö. Martin, A. Peris, R. Sanders, and S. Shkarin.

[1] F. Bayart and E. Matheron, *Dynamics of linear operators.* Cambridge University Press, 2009.

[2] L. Bernal-González, *Disjoint hypercyclic operators.* Studia Math. 182 (2007) 113–131.

[3] J. Bès and A. Peris, *Disjointness in hypercyclicity.* J. Math. Anal. Appl. 336 (2007) 297–315.

[4] J. Bès and Ö. Martin, *Compositional disjoint hypercyclicity equals disjoint supercyclicity.* Houston Math. J. 38(4), (2012) 1149–1163.

[5] J. Bès, Ö Martin, and A. Peris, *Disjoint linear fractional composition operators.* J. Math. Anal. Appl. 381 (2) (2011), 843–856.

[6] J. Bès, Ö Martin, A. Peris, and S. Shkarin, *Disjoint mixing operators.* J. Funct. Anal. 263 (2012), 1283–1322.

[7] J. Bès, Ö Martin, and R. Sanders, *Disjoint hypercyclic shift operators.* J. Operator Theory, to appear.

[8] K.-G. Grosse-Erdmann and A. Peris, *Linear chaos.* Springer-Verlag, 2011.

[9] H. Salas, *Dual disjoint hypercyclic operators.* J. Math. Anal. Appl. 374 (1) (2011), 106–117.

[10] S. Shkarin, *A short proof of existence of disjoint hypercyclic operators.* J. Math. Anal. Appl. 367 (2) (2010) 713–715.

On variations of the Borh radius

Óscar Blasco
Universidad de Valencia (Spain)

Let $1 \le p, q < \infty$ and let X be a complex Banach space. For each X-valued bounded holomorphic function $f(z) = \sum_{n=0}^{\infty} x_n z^n$ with $\|f\|_{H^\infty(\mathbb{D},X)} \le 1$ we define $R_{p,q}(f,X) = \sup\{r \ge 0 : \|x_0\|^p + (\sum_{n=1}^{\infty} \|x_n\| r^n)^q \le 1\}$. For a complex Banach space X we associate a Bohr radius $R_{p,q}(X) = \inf\{R_{p,q}(f,X) : \|f\|_{H^\infty(\mathbb{D},X)} \le 1\}$. Famuous Bohr's theorem establishes that $R_{1,1}(\mathbb{C}) = \frac{1}{3}$. In 2002 V. Paulsen, G. Popescu, D. Singh showed that $R_{2,1}(\mathbb{C}) = \frac{1}{2}$. This was extended in 2010 by the author to show that $R_{p,1}(\mathbb{C}) = \frac{p}{2+p}$ for $1 \le p \le 2$. On the other hand it is easy to see that $R_{1,1}(\mathbb{C}^2) = 0$. Hence the notion for different values p, q is neccesary for dimension greater than one.
Our aim is to find geometric conditions on spaces to haye $R_{p,q}(X) > 0$. This fact turns out to be connected with classical geometrical properties concerning certain convexity conditions.

The polynomial dual of an operator ideal

Geraldo Botelho
Universidade Federal de Uberlândia (Brazil)

We prove that the adjoint of a continuous homogeneous polynomial P between Banach spaces belongs to a given operator ideal $\mathscr{I}$ if and only if P admits a factorization $P = u \circ Q$ where the adjoint of the linear operator u belongs to $\mathscr{I}$. Several consequences of this factorization are obtained: we characterize the polynomials whose adjoints are absolutely p-summing, we provide new examples of π_1-holomorphy types and we investigate the validity of the equality $\overline{\mathscr{I}}^{\mathscr{P}-\mathrm{dual}} = \overline{\mathscr{I}^{\mathscr{P}-\mathrm{dual}}}$.
This is a joint work with Erhan Çaliskan and Giselle Moraes.

Locally Asaplund spaces and the reflexivity of spaces of homogeneous polynomials
Christopher Boyd
University College Dublin (Ireland)

In 1985 R. Alencar showed that if E is a reflexive Banach space with the approximation property and n is a positive integer then the space of n-homogeneous polynomials on E, $\mathscr{P}(^nE)$, is reflexive if and only if each n-homogeneous polynomial on E is weakly continuous on bounded subsets of E. We examine the extension of this result from Banach spaces to Fréchet spaces. We will see how the concept of local Asplundness, introduced by Defant as spaces having dual with the local Radon–Nikodým, is central to the generalisation of this result.

Bohr's absolute convergence problem for $\mathscr{H}_p$-Dirichlet series in Banach spaces
Daniel Carando
Universidad de Buenos Aires (Argentina)

The Bohr-Bohnenblust-Hille Theorem states that the width of the strip in the complex plane on which an ordinary Dirichlet series $\sum_n a_n n^{-s}$ converges uniformly but not absolutely is less than or equal to $1/2$, and this estimate is optimal. Equivalently, the supremum of the absolute convergence abscissas of all Dirichlet series in the Hardy space $\mathscr{H}_\infty$ equals $1/2$. By a surprising fact of Bayart the same result holds true if $\mathscr{H}_\infty$ is replaced by any Hardy space $\mathscr{H}_p$, $1 \le p < \infty$, of Dirichlet series. For Dirichlet series with coefficients in a Banach space X the maximal width of Bohr's strips depend on the geometry of X; Defant, García, Maestre and Pérez-García proved that such maximal width equal $1 - 1/Cot(X)$, where $Cot(X)$ denotes the optimal cotype of X. Equivalently, the supremum over the absolute convergence abscissas of all Dirichlet series in the vector-valued Hardy space $\mathscr{H}_\infty(X)$ equals $1 - 1/Cot(X)$. We show that this result remains true if $\mathscr{H}_\infty(X)$ is replaced by the larger class $\mathscr{H}_p(X)$, $1 \le p < \infty$.
This is a joint work with Andreas Defant and Pablo Sevilla-Peris

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On fragmentability and its applications
Bernardo Cascales
Universidad de Murcia (Spain)

Fragmentability combined with Simons' inequality leads to a nice study of strong boundaries. Fragmentability combined with Bishop-Phelps theorem leads to new results for the Bishop-Phelps-Bollobás property for operators with values in uniform algebras (in particular the disk algebra).
Results obtained with A. Guirao, V. Kadets and J. Orihuela will be presented.
This research was partially supported by MEC and FEDER project MTM2011-25377

Geometrical Properties of the Disk Algebra

Yun Sung Choi
POSTECH (Rep. of Korea)

We show some geometrical properties of certain classes of uniform algebras, in particular the disk algebra $A_u(B_X)$ of all uniformly continuous functions on the closed unit ball and holomorphic on the open unit ball of a complex Banach space X. More precisely, we can see that $A_u(B_X)$ has the k-numerical index 1 for every k, the lush property and also the AHSP. Moreover, the algebra of the disk $A(\mathbb{D})$, and more in general any uniform algebra whose Choquet boundary has no isolated points, is showed to have the polynomial Daugavet property.

Subalgebras and ideals in the algebra of smoothing operators

Tomasz Ciaś
A. Mickiewicz University in Poznań (Poland)

Let s be the space of rapidly decreasing sequences. We present several results concerning algebraic structure of the Frećhet *-algebra $L(s', s)$ of so-called smoothing operators. In particular, we give a characterization of closed commutative *-subalgebras of $L(s', s)$ and closed left ideals in $L(s', s)$.

Splitting-Theory for PLH spaces

Bernhard Dierolf
University of Trier (Germany)

The main theorem in the article of P. Domański and M. Mastyło [1] shows that in splitting-theory for Fréchet spaces hilbertization is the key to results under symmetric assumptions. In a natural way these results lead to considering PLH spaces, i.e. projective limits of strongly reduced projective spectra of inductive limits of Hilbert spaces, and the splitting of short exact sequences in this context as a kind of hilbertization of the splitting-theory of PLS spaces. This class contains many of the spaces of interest in functional analysis as the space of real analytic functions $\mathscr{A}(\Omega)$, the space of Schwartz Distributions $\mathscr{D}'(\Omega)$, and various spaces of ultradifferentiable functions and ultradistributions.
We will determine the maximal exact structure in the category of PLH spaces allowing us to apply homological methods made available by D. Sieg in his PhD thesis to connect the splitting of short exact sequences of PLH spaces to the vanishing of some Yoneda-Ext group. This in turn can be connected – as in the PLS case – to the vanishing of the first derivative of the projective limit functor in a spectrum of operator spaces. Using the Hilbert tensor norm we will connect the latter vanishing to parameter dependence of solutions, which leads to the positive solution of Grothendieck's *problème des topologies* for Fréchet-Hilbert spaces and the tensor topology arising from the Hilbert tensor norm.

[1] P. Domański, M. Mastyło, *Characterization of splitting for Fréchet-Hilbert spaces via interpolation*, Math. Ann. 339, 317-340, 2007.

Bilinear ideals in operator spaces

Verónica Dimant
Universidad de San Andrés (Argentina)

We introduce a concept of bilinear ideals of jointly completely bounded mappings between operator spaces. In particular, we study the ideal $\mathscr{I}$ of completely integral bilinear mappings and prove that it is naturally identified with the ideal of (linear) completely integral mappings on the injective operator space tensor product. We also consider the bilinear ideals $\mathscr{N}$ (completely nuclear), $\mathscr{E}$ (completely extendible) and $\mathscr{M}$ (multiplicatively bounded). We compare all the ideals set before establishing contentions among them and providing examples to distinguish the different classes.
Joint work with Maite Fernández-Unzueta (CIMAT-México).

Expanding Holomorphic Functions Over Infinite Dimensional Domains

Seán Dineen
University College Dublin (Ireland)

I will discuss various types of expansions of holomorphic functions over different kinds of locally convex spaces and give an example of a Banach space where the monomials form a Schauder basis for the space of all holomorphic functions.
Joint work with Jorge Mujica (Campinas).

Invertibility of Taylor coefficient multipliers for real analytic functions

Paweł Domański
Adam Mickiewicz University (Poland)

A Taylor coefficient multiplier T on the space $A(\mathbb{R})$ of real analytic functions on the real line is any linear (continuous) map $T : A(\mathbb{R}) \to A(\mathbb{R})$ such that each monomial is an eigenvector. The corresponding sequence of eigenvalues (m_n) is called a multiplier sequence — it is easily seen that these operators just multiply Taylor coefficients at zero of the function by the multiplier sequence (m_n). Since monomials does not form a Schauder basis in $A(\mathbb{R})$ it is by far not clear which sequences (m_n) correspond to some well defined T.
We give various representations of Taylor coefficient multipliers and descriptions of the corresponding class of sequences (m_n), identifying among them Euler differential operators of infinite order. We characterize surjective (equivalently, invertible) multipliers and describe in some cases a construction of their inverse. It allows to solve some Euler differential equations of infinite order in an algorithmic way. Some analogues for the several variable case will be also given.
The results were obtained jointly with M. Langenbruch (Oldenburg).

Spectral invariance for matrix algebras

Carmen Fernández Rosell
Universidad de Valencia (Spain)

Classical Wiener's lemma asserts that the pointwise inverse of an absolutely convergent Fourier series without zeros is again an absolutely convergent Fourier series. It can be re-phrased saying that $\ell^1(\mathbb{Z}^d)$, under convolution, is inverse closed in $\mathscr{B}(\ell^2(\mathbb{Z}^d))$. Weighted versions of Wiener's lemma hold under a condition on the weight introduced by Gel'fand, Raikov and Shilov (GRS). With the same assumption on the weight, Baskakov proved that the non-commutive algebra $\mathscr{C}_v$ of matrices $(a(j,k))_{j,k\in\mathbb{Z}^d}$ such that

$$\sum_{j\in\mathbb{Z}^d} \sup_{k\in\mathbb{Z}^d} \left|a_{k,k-j}\right| v(j) < \infty.$$

is also inverse closed in $\mathscr{B}(\ell^2(\mathbb{Z}^d)$. On the other hand, Wiener's lemma in the weigthed setting fails if the weight does not satisfy GRS.

In this talk we investigate the inverses of matrices in $\mathscr{C}_v$ when the weight v does not satisfy the GRS-condition. This extends previous results by Jaffard.

The results are then applied to the study of inverses of pseudodifferential operators having symbol in some weighted modulation class $M_v^{\infty,1}$.

Joint work with A. Galbis and J. Toft.

Metric geometry and energy integrals for convex bodies

Daniel Galicer

Universidad de Buenos Aires (Argentina)

Let $K \subset \mathbb{R}^n$ be a compact set endowed with the metric $d_\alpha(x,y) = |x-y|^\alpha$, where $0 < \alpha < 1$. A classical result of Schoenberg and von Neumann asserts that there exist a minimum r for which the metric space (K, d_α) may be isometrically embedded on the surface of a Hilbert sphere of radius r. We provide estimates of these radii for several centrally symmetric convex bodies K. To this end, we study the energy integral

$$\sup \int_K \int_K |x-y|^{2\alpha} d\mu(x) d\mu(y),$$

where the supremum runs over all finite signed Borel measures μ on K of total mass one. We bound this value by the mean width of K or the 2α-summing norm of certain operator. In the case where K is an ellipsoid or $K = B_q^n$, the unit ball of ℓ_q^n (for $1 \le q \le 2$), we obtain the correct asymptotical behavior of the least possible radius.

Joint work with Daniel Carando and Damián Pinasco.

Continuity of convolution on certain LF-algebras and continuity of associated representations

Helge Glöckner

Universität Paderborn (Germany)

For $k \in \mathbb{N}$, let S_k be the strip of complex numbers $z = x + iy$ with $|y| < 1/k$, and $A_k(\mathbb{R})$ be the space of all holomorphic functions $f : S_k \to \mathbb{C}$ such that

$$\|f\|_{k,m} := \sup\{e^{m|x|}|f(x+iy)| : x+iy \in S_k\} < \infty \quad \text{for all } m \in \mathbb{N}_0,$$

which is a Fréchet space with respect to the seminorms $\|.\|_{k,m}$, $m \in \mathbb{N}$. Identifying $f \in S_k$ with its restriction to the real line, the union

$$A(\mathbb{R}) = \bigcup_{k=1}^\infty A_k(\mathbb{R})$$

can be formed, and endowed with the locally convex direct limit topology; it is an algebra under convolution. An analogous convolution algebra $\mathscr{A}(G)$ of "superdecaying analytic functions" can be defined for every (finite-dimensional) Lie group G such that $G \subseteq G_\mathbb{C}$ (see [2]). Also the space $C_c^\infty(G)$ of complex-valued test functions is an algebra under convolution.

Consider a topological G-module (E,π), i.e., a continuous linear action $\pi\colon G \times E \to E$ of G on a complex locally convex space E. Let E^∞ be the space of smooth vectors $v \in E$ and E^ω be the space of analytic vectors (i.e., all v for which the orbit map $G \to E$, $g \mapsto \pi(g,v)$ is smooth and real analytic, respectively). If E is complete, then E^∞ is a $C_c^\infty(G)$-module via

$$f.v := \int_G f(x)\pi(x,v)\,dx.$$

The same formula turns E^ω into an $A(G)$-module, if E is a projective limit of Banach G-modules (cf. [2]).

It is natural to ask whether convolution is jointly continuous as a map $C_c^\infty(G) \times C_c^\infty(G) \to C_c^\infty(G)$ and $A(G) \times A(G) \to A(G)$, respectively. Also, one would like to know whether the preceding module operations on E^∞ and E^ω are jointly continuous. These answers (or partial answers) found in [1] and [3] will be described in the talk. Besides, varying a result by Yamasaki [4], a criterion is provided which ensures that the locally convex direct limit topology on an (LF)-space $E = \lim(E_1 \subseteq E_2 \subseteq \cdots)$ differs from the direct limit topology [3]. Strictness is replaced with sequentially compact regularity.

[1] Birth, L. and H. Glöckner, *Continuity of convolution of test functions on Lie groups*, Canadian J. Math., http://dx.doi.org/10.4153/CJM-2012-035-6.

[2] Gimperlein, H., B. Krötz, and H. Schlichtkrull, *Analytic representation theory of Lie groups: general theory and analytic globalizations of Harish-Chandra modules*, Compos. Math. 147 (2011), 1581–1607.

[3] Glöckner, H., *Continuity of LF-algebra representations associated to representations of Lie groups*, to appear in Kyoto J. Math., http://arxiv.org/pdf/1203.3418v3.pdf.

[4] Yamasaki, A., *Inductive limit of general linear groups*, J. Math. Kyoto Univ. 38 (1998), 769–779.

Operators without nontrivial invariant subspaces on a range of natural Fréchet spaces

Michał Goliński

Adam Mickiewicz University (Poland)

We present a rough sketch of a construnction of operators without nontrivial invariant subspaces on many natural nuclear Fréchet spaces of analysis. This includes in particular the space of entire functions in any dimension $H(\mathbb{C}^d)$, the space of holomorphic functions on the polydisk $H(\mathbb{D}^d)$ and the space of rapidly decreasing functions $\mathscr{S}(\mathbb{R}^d)$.

Construction is based on ideas used by C. Read in his construction of such operators on the space ℓ_1, which was quite technical. Fortunately, because of the structure of a non-normable Fréchet space it can be somewhat simplified in the considered cases. As a further refinement of the proof, we can also build an operator without notrivial invariant subsets on the space $\mathscr{S}(\mathbb{R}^d)$.

Sums of powers vs. powers of sums

Karl-G. Grosse-Erdmann

Université de Mons (Belgium)

The remarkable identity

$$(1+2+3+\ldots+n)^2 = 1^3+2^3+3^3+\ldots+n^3$$

is not as singular as is often believed. Similar but less concise identites like

$$\Big(\sum_{k=1}^{n} k\Big)^3 = \frac{1}{4}\sum_{k=1}^{n} k^3 + \frac{3}{4}\sum_{k=1}^{n} k^5$$

date back to the 19th century. In joint work with G. Bennett we study non-integer exponents, in which case only inequalities are available. As an application we obtain the best constant in an inequality studied by R. P. Boas.

On $(2, p)$-isometric and $(2,\infty)$-isometric operator tuples

Philipp Hoffmann
University College Dublin (Ireland)

So–called $(2, p)$-isometric operator tuples are finite tuples of commuting bounded linear operators on a normed space X, that satisfy point-wise a certain multinomial equation. Their analogues for infinity p are called $(2,\infty)$-isometric tuples. We will give the precise definition of these objects and present some historical background. We then move on to discuss some fundamental properties of both kind of tuples and use these properties to determine the class of intersection of these tuples on a given space X.

Regular method of summability in $L^1(\nu)$ of a vector measure

Eduardo Jiménez Fernández
Universidad Politécnica de Valencia (Spain)

Let (Ω,Σ,μ) be a finite measure space. Let $L^1(\nu)$ be the space of (classes of) integrable functions with respect to a vector measure where μ is a control measure of ν. In this talk we characterize the regular methods of summability in terms of a weak $\sigma-$Fatou and $\sigma-$order continuity properties of these spaces.

Weighted vector-valued holomorphic functions on Banach spaces

Enrique Jordá
Universidad Politécnica de Valencia (Spain)

We study weighted Banach spaces of vector-valued holomorphic functions defined on and open and connected subset of a Banach space. We use linearization results on these spaces to get conditions which ensure that a function f defined in a subset A of an open and connected subset U of a Banach space X, with values in another Banach space E and admitting certain weak extensions in a Banach space of holomorphic functions can be holomorphically extended in the corresponding Banach space of vector-valued functions. These results extend previous research of the author with J.Bonet, L. Frerick and J. Wengenroth on spaces of vector valued holomorphic functions defined on open subsets of finite dimensional spaces.

Wave front sets with respect to the iterates of an operator with constant coefficients

David Jornet
Universitat Politècnica de València (Spain)

In the 60s Komatsu characterized analytic functions f in terms of the behaviour not of the derivatives $D^\alpha f$, but of successive iterates $P(D)^j f$ for a partial differential elliptic operator $P(D)$ with constant coefficients, proving that a C^∞ function f is real analytic in Ω if and only if for every compact set $K \subset\subset \Omega$ there is a constant $C > 0$ such that

$$\|P(D)^j f\|_{2,K} \leq C^{j+1}(j!)^m$$

where m is the order of the operator and $\|\cdot\|_{2,K}$ is the L^2 norm on K.
Later this result was generalized in the setting of Gevrey functions or in more general spaces of ultradifferentiable non-quasianalytic functions of Beurling or Roumieu type.
We consider ultradifferentiable functions as introduced by Braun, Meise and Taylor. Our aim is to define the wave front set in terms of the iterates of the operator, obtaining in this case more precise information on the propagation of singularities rather than with the classical wave front set.
On joint work with C. Boiti and J. Juan Huguet.

Factorization of operators between abstract Banach lattices through spaces of p-integrable functions

Mª Aránzazu Juan
Universidad de Valencia (Spain)

Several extensions of the so called Maurey-Rosenthal theorems for operators between Banach function spaces are nowadays known. However, all of them uses strongly two Basic facts that concer the lattice structure of the involved space, mainly regarding the order continuity and the σ-finiteness of the measure space (and so the representation of the dual space as a space of integrable functions). In this talk we explain how far the arguments can be extended to the case of p-convex abstract Banach lattices, for example spaces of measurable functions over a non σ-finite case, as $\ell^p(\Gamma)$ for an uncountable set Γ.

Chaotic C_0-semigroups induced by semiflows in Lebesgue and Sobolev spaces

Thomas Kalmes
Universität Trier (Germany)

We give characterizations of chaos for C_0-semigroups induced by semiflows on weighted Lebesgue spaces $L^p_\rho(\Omega)$ for open intervals $\Omega \subseteq \mathbb{R}$ similar to the known characterizations of hypercyclicity and mixing of such C_0-semigroups. Moreover, we characterize hypercyclicity, mixing, and chaos for these class of C_0-semigroups on the Sobolev space $W^{1,p}_*(a,b) := \{f \in W^{1,p}(a,b); f(a) = 0\}$ for a bounded interval $[a,b] \subseteq \mathbb{R}$.
This is a joint work with Javi Aroza and Elisabetta Mangino.

Convolution operators on spaces of real analytic functions

Michael Langenbruch
University of Oldenburg (Germany)

The theory of convolution equations on spaces of real analytic functions is a classical field of application for complex analytic and functional analytic methods which has been intensively studied (e.g. by Ehrenpreis, Kawai, Hörmander, Korobeinik, Napalkov/Rudakov and many others). We will solve the corresponding problems completely for operators in one variable. To be specific, let $I \subset \mathbb{R}$ be an open interval and let $\mu \in A(\mathbb{R})'$ and $G := \text{conv}(\text{supp}(\mu))$. We will characterize the surjectivity of the convolution operator $T_\mu : A(I-G) \to A(I)$ by means of a new estimate from below for the Fourier transform $\widehat{\mu}$ valid on conical subsets of $\mathbb{C} \setminus \mathbb{R}$. We also characterize when T_μ admits a continuous linear right inverse. The characterizations have applications in our joint work with P. Domański on Euler differential operators of infinite order.

The division problem in $\mathscr{O}'_C$ and surjectivity of differential operators in $\mathscr{O}_M$

Julian Larcher
University of Innsbruck (Austria)

The possibility of division of distributions by polynomials is already resolved for the spaces $\mathscr{D}'$, $\mathscr{E}'$, $\mathscr{S}'$ and $\mathscr{O}'_M$ of L. Schwartz, see [3] and [1]. Furthermore M. S. Baouendi [2] gave a counterexample of a polynomial for which division in $\mathscr{O}'_C$—the space of rapidly decreasing distributions—is not always possible, i.e. there exist a polynomial P and a distribution $T \in \mathscr{O}'_C$ such that there is no $S \in \mathscr{O}'_C$ with $PS = T$. But he asserts that division by hypoelliptic polynomials is always possible. Since via Fourier transform the possibility of division in $\mathscr{O}'_C$ by a polynomial P is equivalent to the surjectivity of the corresponding linear partial differential operator $P(D)$ on $\mathscr{O}_M$, hypoelliptic operators will always be surjective on $\mathscr{O}_M$.

We generalise this assertion for polynomials whose set of real zeros is bounded by characterising those that define surjective differential operators on $\mathscr{O}_M$ and for which division in $\mathscr{O}'_C$ is always possible. We also present examples of surjective operators defined by polynomials with unbounded zero set (mostly hyperbolic operators) and give a necessary condition for the general case.

[1] Mohamed Salah Baouendi, *Division des distributions dans $\mathscr{O}'_M$*, C. R. Acad. Sci. Paris, 258 (1964), 1978–1980.

[2] Mohamed Salah Baouendi, *Impossibilité de la division par un polynome dans $\mathscr{O}_C{}'$*, C. R. Acad. Sci. Paris, 260 (1965), 760–762.

[3] Lars Hörmander, *On the division of distributions by polynomials*, Ark. Mat. 3 (1958), 555–568.

Bishop-Phelps-Bollobás type theorem for L_p spaces

Han Ju Lee
Dongguk University - Seoul (Republic of Korea)

A bounded linear operator T from a Banach space X to a Banach space Y is said to be norm-attaining if there is an element x in the closed unit ball B_X of X such that $||T|| = ||Tx||$. If Y is a scalar (real or complex) field, then such a T is called a norm-attaining functional. The celebrated Bishop-Phelps theorem says that norm-attaining functionals are dense in the dual space X^*. This theorem has far-reaching applications. Bishop-Phelps asked in the same paper if the set of norm-attaining operators is

dense in the space $L(X,Y)$ of bounded linear operators from X to Y. Even though the answer is negative in general, there has been several attempts to find a proper solution to this question.
A new quantitative approach, so-called “Bishop-Phelphs-Bollobas property (BPBp)”, was introduce by M. Acosta, R. Aron, M. Maestre and D. García. This property is stronger than the Bishop-Phelps property and an operator version of Bishop-Phelps-Bollobas theorem.
In this talk, the recent development of this property will be presented with the conclusion that the pair $(L_p(\mu), L_q(\nu))$ has the BPBp

(1) for all measures μ and ν if $p=1$ and $1 \leq q < \infty$.

(2) for any measure μ and any localizable measure ν if $p=1$, $q=\infty$.

(3) for all measures μ and ν if $1 < p < \infty$ and $1 \leq q \leq \infty$.

(4) for all measures μ and ν if $p=\infty$, $q=\infty$, in the real case.

Fourier transform versus Hilbert transform

Elijah Liflyand
Bar-Ilan University (Israel)

We discuss several problems where the interplay of the two transforms is either an interesting and important ingredient of the proofs or appears in assumptions or assertions. The obtained results are concerned with the integrability of the Fourier transform. Among the considered spaces stand out and most actively used the Hardy space and that of functions of bounded variation.

Analyticity of semigroups generated by a class of degenerate evolution equations on domains with corners

Elisabetta M. Mangino
Università del Salento (Italy)

The analyticity in the space of continuous functions on the d-dimensional canonical simplex S^d of the semigroup generated by the multi-dimensional Fleming-Viot operator (also known as Kimura operator or Wright-Fischer operator) has been a long-time open problem. This operator is defined by

$$Au(x) = \frac{1}{2}\sum_{i,j=1}^{d} x_i(\delta_{ij} - x_j)\partial^2_{x_i x_j} u(x) + \sum_{i=1}^{d} b_i(x)\partial_{x_i} u(x), \tag{1}$$

where $b = (b_1, \dots, b_d)$ is a continuous inward pointing drift on S^d. It arises in the theory of Fleming–Viot processes as the generator of a Markov C_0–semigroup defined on $C(S_d)$ and associated with diffusion approximation of empirical processes appearing in population genetics. These operators have been largely studied using an analytic approach by several authors in different settings. The difficulty in their investigation is twofold: the operators (1) degenerate on the boundary of S_d in a very natural way and the domain S_d is not smooth as its boundary presents edges and corners. Thus the classical techniques for the study of uniformly elliptic operators on smooth domains cannot be applied.
In the talk, a brief survey of the known results about the regularity of the semigroup generated by A is presented, focusing on the recent analyticity results proved in [1,2], where one of the key argument is the proof of multi-dimensional weighted gradient estimates by applying injective tensor products techniques.

[1] A. A. Albanese and E. M. Mangino, *Analyticity of a class of degenerate evolution equations on the canonical simplex of* $\mathbf{R}^d$ *arising from Fleming–Viot processes* , J. Math. Anal. Appl. 379 (2011), 401–424.

[2] A. A. Albanese and E. M. Mangino, Analyticity of semigroups generated by a class of degenerate evolution equations on domains with corners, http://arxiv.org/pdf/1301.5449v1.pdf (2013)

The specification property for linear operators: Relationship with other dynamical properties

Félix Martínez-Giménez
Universidad Politécnica de Valencia (Spain)

We introduce the notion of the Specification Property (SP) for operators on Banach spaces, inspired by the usual one of Bowen for continuous maps on compact spaces. This is a very strong dynamical property related to the chaotic behaviour. Several general properties of operators with the SP are established. For instance, every operator with the SP is mixing, Devaney chaotic, and frequently hypercyclic. In the context of weighted backward shifts, the SP is equivalent to Devaney chaos. In contrast, there are Devaney chaotic operators (respectively, mixing and frequently hypercyclic operators) which do not have the SP.
This is a joint work with S. Bartoll and A. Peris

Domination theorems for multilinear operators

Mieczysław Mastyło
Adam Mickiewicz University Poznań (Poland)

We will discuss some recent work with Enrique A. Sánchez Pérez, concerning vector norm inequalities and their applications to factorization of multilinear operators.

Tauberian Polynomials

Luiza A. Moraes
Universidade Federal do Rio de Janeiro (Brazil)

We say that a continuous n-homogeneous polynomial $P : E \to F$ is **Tauberian** if $\tilde{P}^{-1}(F) \subset E$ or, equivalently, if $\tilde{P}(E'' \setminus E) \subset F'' \setminus F$, where $\tilde{P}$ denotes the Aron-Berner extension of P (which is a polynomial from E'' into F''). In case of a continuous linear operator $T : E \to F$, this condition means that $T^{**-1}(F) \subset E$ (where T^{**} denotes a bi-transpose of T). Continuous linear operators satisfying this condition have been studied in [3] by N. Kalton and A. Wilansky, who refered to them as **Tauberian operators**. Tauberian operators were introduced to investigate a problem in summability theory from an abstract point of view. Afterwards, they have made a deep impact on the isomorphic theory of Banach spaces. A vast literature has been devoted to them; we refer to the recent monography [2] by M. González and A. Martínez-Abejón for details.
In this talk we will see how some of the ideas behind the notion of Tauberian operator can be seen from a multilinear or polynomial point of view and to which extent results valid for Tauberian operators still

hold in such non linear setting. When loosing linearity new difficulties arise and different tools are required.
All the results presented in this talk where obtained in collaboration with Maria D. Acosta (Universidad de Granada) and Pablo Galindo (Universidad de València) and are part of [1].

[1] M. D. Acosta, P. Galindo e L. A. Moraes, *Tauberian polynomials*, pre-print.

[2] M. González and A. Martínez-Abejón, *Tauberian Operators*, Operator Theory: Advances and Applications, vol. **194**, Birkhäuser Verlag, Basel, 2010.

[3] N. J. Kalton e A. Wilansky, *Tauberian operators on Banach spaces*, Proc. Amer. Math. Soc. 57 (1976) 251-255.

An integral formula for the multiple summing norm

Santiago Muro
Universidad de Buenos Aires (Argentina)

We prove that the multiple p-summing norm of a multilinear operator $T : \ell_r^N \times \cdots \times \ell_r^N \to \ell_q$ may be obtained as the L^p-norm of $\|T(\cdot)\|_q$ on some measure space. We show some consequences of this fact. This is a joint work with D. Carando, V. Dimant and D. Pinasco.

One side James' Compactness Theorem

José Orihuela
Universidad de Murcia (Spain)

Let C be a convex, closed, bounded, but not weakly compact set in a separable Banach space E with the origin outside of C. Is it possible to find a linear functional strictly positive on C but not attaining its minimum on C?
Motivated by this question of Freddy Delbaen we will present in the talk a possible one side version of James's sup theorem for weak compactness as well as the answer of Richard Haydon to the problem.
Results obtained with B. Cascales and M. Ruíz will be presented.

This research was partially supported by MEC and FEDER project MTM2011-25377

A lower bound in Nehari's theorem on the polydisc

Joaquim Ortega-Cerdà
Universitat de Barcelona (Spain)

We solve the question posed by H. Helson on an analogue of Nehari's theorem on the infinite-dimensional polydisc.

Dunford-Pettis properties in projective tensor products

Antonio M. Peralta
Universidad de Granada (Spain)

The study of those pairs of Banach spaces (X, Y) satisfying that their projective tensor product has the *Dunford-Pettis property* or some of its (isomorphic or isometric) variants is a non-trivial problem which has been treated from different points of view and has served as entertainment for some mathematicians. We shall review some of the techniques which allowed to determine all pairs of C*-algebras whose projective tensor product satisfies the *Dunford-Pettis property* or the *Alternative Dunford-Pettis property*.

Some applications of an integral representation formula for holomorphic functions

Damián Pinasco
Universidad Torcuato di Tella (Argentina)

In this talk I will discuss some applications of an integral representation for- mula for holomorphic functions. Namely, it is possible to derive a polynomial Khintchine-type inequality for complex valued gaussian random variables and study lower bounds for the uniform norm of products of homogeneous polynomials on $L_p(\mu)$.
Most of the results presented here were obtained jointly with D. Carando, V. Dimant, J. T. Rodríguez and I. Zalduendo.

Automatic continuity results for the non-commutative Schwartz space

Krzysztof Piszczek
Adam Mickiewicz University in Poznan (Poland)

Let s be the space of rapidly decreasing sequences and $\mathscr{S} := L(s', s)$ the Fréchet space of linear and continuous operators with the topology of uniform convergence on bounded sets. We then endow this space with the multiplication defined by

$$xy := x \circ \iota \circ y$$

where $\iota\colon s \hookrightarrow s'$ is the inclusion map. For reasons that will become apparent during the talk we call $\mathscr{S}$ the non-commutative Schwartz space.
By a derivation from $\mathscr{S}$ into a Fréchet $\mathscr{S}$-bimodule E we mean a linear map $\delta\colon \mathscr{S} \to E$ satisfying the 'derivation rule'

$$\delta(ab) = \delta(a)b + a\delta(b).$$

After introducing all necessary definitions we will show that any derivation from $\mathscr{S}$ into any Fréchet $\mathscr{S}$-bimodule is continuous.

Closed range composition operators for one-dimensional smooth symbols

Adam Przestacki
A. Mickiewicz University in Poznań (Poland)

Let $\psi : \mathbb{R} \to \mathbb{R}$ be a smooth function and let $C_\psi : C^\infty(\mathbb{R}) \to C^\infty(\mathbb{R})$, $F \mapsto F \circ \psi$ be the composition operator with symbol ψ. We characterize when C_ψ has closed range i.e. when the set Im $C_\psi = \{F \circ \psi : F \in C^\infty(\mathbb{R})\}$ is closed in $C^\infty(\mathbb{R})$.

The Schur test revisited

Hervé Queffélec
Université de Lille (France)

The Schur test is an old and well-known sufficient condition for an infinite matrix to define a bounded operator on the Hilbert space ℓ^2, giving sometimes sharp estimates on the norm of this operator, as is the case for the Hilbert matrix. Surprisingly, this test still has applications, as was demonstrated in recent works of Helson (2010) and Ortega-Cerda and Seip (2012). I will describe other recent applications, which give quite simple and unified proofs of results of Cowen-Hurst and Hammond on norms of composition operators, as well as some generalizations.

The Banach Mazur distance between Hilbertian operator spaces

Cristina Radu
Universidade Federal do Rio de Janeiro (Brazil)

An operator space E is a closed subspace of $B(H)$. The C^*-algebra structure of $B(H)$ determines a unique sequence of norms on each $M_n(E)$, $n \in \mathbf{N}$.

$$M_n(E) \subset M_n(B(H)) \simeq B(H \oplus H \ldots \oplus H).$$

This sequence of norms defines the operator space structure on E. The most important examples of operator spaces are the Hilbertian operator spaces R and C, respectively the row and the column operator spaces. We are interested in the finite dimension versions of these spaces, R_n and C_n. They may be identified as operator spaces with the first row and first column, respectively, of the $n \times n$ matrices, M_n, endowed with the operator space structure inherited from $\mathscr{B}(\ell_n^2, \ell_n^2)$. If we interpolate between R_n and C_n we obtain a continuum of Hilbertian operator spaces $R_n[\theta] = (R_n, C_n)_\theta$, $0 \le \theta \le 1$. A remarcable example is $R_n[1/2] = OH_n$, Pisier's self dual operator space. We measure the distance between operator spaces using the Banach Mazur distance

$$d_{cb}(E,F) = \inf\left\{\|u\|_{cb}\|u^{-1}\|_{cb} \mid u : E \to F \ \text{ complete isomorphism}\right\}.$$

If E and F are n-dimensional $d_{cb}(E,F) \le n$. R_n and C_n are identical as Banach spaces since they are both isometric to l_2^n but as operator spaces they are extremely far apart, in fact $d_{cb}(R_n, C_n) = n$.
Our main result states that if $0 \le \theta, \varphi \le 1$ then $d_{cb}(R_n[\theta], R_n[\varphi]) = n^{|\theta-\varphi|}$. This generalizes the results due to Mathes $\theta = 0$, $\varphi = 1$, Pisier $\theta = 0$ or $1/2$ and $\varphi = 1/2$ or 1 and Zhang $\theta = 0$ or 1 and φ arbitrary.

The regularity of roots of polynomials

Armin Rainer
University of Vienna (Austria)

We show that the roots of a smooth curve of monic polynomials admit parameterizations that are locally absolutely continuous.This solves a problem which was open for over a decade and has important

connections with partial differential equations.
Joint work with Adam Parusinski.

Absolutely summing Carleson embeddings on Hardy spaces
Luis Rodríguez Piazza
Universidad de Sevilla (Spain)

Let μ be a finite measure on the unit disk $\mathbb{D}$. If the Hardy space $H^p(\mathbb{D})$ is contained in $L^p(\mu)$ $(1 \le p < +\infty)$ we will say that μ is a Carleson measure, and we call the operator $H^p \hookrightarrow L^p(\mu)$ a Carleson embedding. It turns out that the characterization of Carleson measures does not depend on p.
In this talk we will study for which measures μ the Carleson embedding is r-summing. In particular we will give a characterization of absolutely summing Carleson embeddings for $1 < p < 2$. This characterization depends on p and it will be applied to determine the absolutely summing composition operators on $H^p(\mathbb{D})$.
This is a joint work with Pascal Lefèvre.

To what extent do dominated polynomials factor in the spirit of Pietsch?
Pilar Rueda
Universidad de Valencia (Spain)

Since Pietsch proposed in 1976 a research program on non linear ideals, many mathematicians have searched different non linear settings where p-summing operators and their main properties could be extended. Whereas the attempts to deal with multilinear mappings have proved to be successful, when looking for a Pietsch-type factorization theorem, different incursions among homogeneous polynomials have proved yet more elusive. We show some factorization results for dominated polynomials obtained jointly with G. Botelho and D. Pellegrino. Since the first attempt of factoring dominated polynomials in 1996, we present the subclass of dominated m-homogeneous polynomials that factor through subspaces of L^p-spaces by means of the m-power of the formal identity map $C(K) \to L^p(\mu)$, which turns out to be the canonical prototype of this class of polynomials. This result, which is the final curtain of the factorization problem for dominated polynomials, has been obtained jointly with E. A. Sánchez-Pérez.

Unconditionality in spaces of polynomials
Sunke Schlüters
Universität Oldenburg (Germany)

Subject of our studies is the best constant $c = c(X,\Lambda) > 0$ such that

$$\sup_{\xi \in B_X} \sum_{\alpha \in \Lambda} |c_\alpha \xi^\alpha| \le c \cdot \sup_{\xi \in B_X} \Big| \sum_{\alpha \in \Lambda} c_\alpha \xi^\alpha \Big|, \tag{1}$$

for every choice of $(c_\alpha)_\alpha \subset \mathbb{C}$, where X denotes a Banach sequence space (e.g. $X = \ell_p$ for $1 \le p \le \infty$) and Λ denotes a set of multiindices.
For $X = \ell_\infty$ and $\Lambda = \Lambda(x) = \{\alpha \in \mathbb{N}^{(\mathbb{N})} \,|\, 2^{\alpha_1} 3^{\alpha_2} 5^{\alpha_3} \cdots \le x\}$, through ideas of Bohr, the problem has an equivalent formulation in terms of Dirichlet series.

In this setting of Dirichlet series an optimal constant (asymptotically in x) is already known:

$$c = c\big(\ell_\infty, \Lambda(x)\big) = x^{\frac{1}{2}} \cdot e^{\left(-\frac{1}{\sqrt{2}}+o(1)\right)\sqrt{\log x \log\log x}}. \tag{2}$$

The origin of the research on this constant may be seen in Bohr's absolute convergence problem in 1913 — the significant steps in the proof however were made by several authors in the last 20 years.
Our *main theorem* states now for $X = \ell_p$ and $\Lambda = \Lambda(x)$

$$c\big(\ell_p, \Lambda(x)\big) \le x^{1-\frac{1}{\min\{p,2\}}} \cdot e^{\left(-\sqrt{2}(1-\frac{1}{\min\{p,2\}})+o(1)\right)\sqrt{\log x \log\log x}}. \tag{3}$$

Although this result is a natural extension of (2), several of the techniques used in the proof (such as the Bohnenblust-Hille inequality) do not transfer.
The main theorem is part of my PhD project, supervised by Andreas Defant.

On the uniform structure of separable $\mathscr{L}_\infty$-spaces

Jesús Suárez de la Fuente
Universidad de Extremadura (Spain)

Aharoni and Lindenstrauss gave an example of two non-isomorphic $\mathscr{L}_\infty$-spaces which are uniformly homeomorphic. The spaces considered in such an example are non-separable while separable examples are not known. We give an example of two non-isomorphic separable $\mathscr{L}_\infty$-spaces which are uniformly homeomorphic. This answers a question of Johnson, Lindenstrauss and Schechtman.

[1] I. Aharoni and J. Lindenstrauss, *Uniform equivalence between Banach spaces*, Bull. Am. Math. Soc. 84, 281-283 (1978).

[2] W.B. Johnson, J. Lindenstrauss and G. Schechtman, *Banach spaces determined by their uniform structures*, Geom. Funct. Anal. 6, No.3, 430-470 (1996).

Disjointly homogeneous Banach lattices: duality and complementation

Pedro Tradacete
Universidad Carlos III de Madrid (Spain)

A Banach lattice is called disjointly homogeneous when every two sequences of normalized pair-wise disjoint elements share an equivalent subsequence. This class includes L_p spaces, Lorentz spaces $\Lambda_{W,p}[0,1]$ and several others.
We study some properties of disjointly homogeneous Banach lattices with a special focus on two questions: the self-duality of this class and the existence of disjoint sequences spanning complemented subspaces. We give examples of reflexive disjointly homogenous spaces whose dual spaces are not, answering in the negative the first question, and provide some partial positive results too.
This is a joint work with J. Flores, F. L. Hernández, E. Spinu and V. G. Troitsky.

Holomorphically complemented family of subspaces of a Banach space
Milena Venkova
Dublin Institute of Technology (Ireland)

Let E and X be Banach spaces and Ω be an open subspace of X. Let $\{M(z)\}_{z\in\Omega}$ be a family of complemented subspaces of E. If there exists $P \in \mathcal{H}(\Omega, \mathcal{L}(X))$ such that $P(z)$ is a projection mapping of X onto $M(z)$ for all $z \in \Omega$, $\{M(z)\}_{z\in\Omega}$ is called a *holomorphically complemented family* of subspaces of E.
We introduce the following definition: a sequence $\left(x_n\right)_{n\in\mathbb{N}}$ with $x_n \in \mathcal{H}(\Omega, E)$ for all $n \in \mathbb{N}$ is said to form a *holomorphic basis* for E if the following two conditions are satisfied:

1. $\left(x_n(z)\right)_{n\in\mathbb{N}}$ is a Schauder basis for E for every $z \in \Omega$;
2. for every $z_0 \in \Omega$ there exist a neighbourhood V_0 of z_0 and continuous mappings $l_0 : V_0 \to \mathbb{R}^+$ and $L_0 : V_0 \to \mathbb{R}^+$ such that

$$l_0(z)\left\| \sum_{n=1}^{N} a_n x_n(z_0)\right\| \leq \left\| \sum_{n=1}^{N} a_n x_n(z)\right\| \leq L_0(z)\left\| \sum_{n=1}^{N} a_n x_n(z_0)\right\|$$

   for all $\left(a_n\right)_{n\in\mathbb{N}}$, all $N \in \mathbb{N}$, and all $z \in V_0$.

We study the relationship between families of subspaces with holomorphic basis and holomorphically complemented families of subspaces. In particular, we show that if Ω is a pseudo-convex open subset of a Banach space with a basis and $\left(x_n\right)_{n\in\mathbb{N}}$ is a holomorphic basic sequence such that the closed linear span of $\left(x_n(z)\right)_{n\in\mathbb{N}}$, $M(z)$, is a complemented subspace of E for every $z \in \Omega$, then $\{M(z)\}_{z\in\Omega}$ is holomorphically complemented in E.

The behaviour of most matrices with respect to Grothendieck's inequality
Ignacio Villanueva
Universidad Complutense de Madrid (Spain)

Grothendieck's inequality states that for every $n \in \mathbb{N}$ and every square matrix $A = (a_{ij})_{i,j=1}^{n}$, the ratio

$$\rho_A := \frac{\sup \sum_{i,j} a_{ij} \langle u_i | v_j \rangle}{\sup \sum_{i,j} a_{ij} \varepsilon_i \sigma_j} \leq K_G \approx 1'6$$

where u_i, v_j are norm one vectors in a Hilbert space, $\epsilon_i, \sigma_j = \pm 1$ and $1,67 < K_G < 1,783$.
In relation to certain problems in Quantum Information Theory it is relevant to quantify, or at least bound, the "typical" value of ρ_A. Using tools from random matrix theory and elaborating on the ideas from [1] we show that, for large values of n, almost every matrix A verifies

$$1,20 < \rho_A.$$

In [1] it was proven that for almost every sign matrix A,

$$1,20 < \rho_A < 1,564.$$

We have numerical evidence that the upper bound also holds for almost every matrix.

[1] *Quantum strategies are better than classical in almost any XOR game* Andris Ambainis, Arturs Backurs, Kaspars Balodis, Dmitry Kravcenko, Raitis Ozols, Juris Smotrovs, Madars Virza, http://arxiv.org/pdf/1112.3330v1.pdf

Smooth function spaces on the Cantor set
Dietmar Vogt
Bergische Universität Wuppertal (Germany)

Let X be the classical Cantor set. It is shown that

$$A_\infty(X) = C_\infty(X) = \mathscr{E}(X) \cong s.$$

Here A^∞ denotes the space of 2π-periodic C^∞-functions on $\mathbb{R}$ with vanishing negative Fourier coefficients or, equivalently, the space of holomorphic functions on the unit disc with C^∞-boundary values. $A_\infty(X)$ and $C_\infty(X)$ denote the spaces of restrictions of A^∞ and C^∞, respectively, to X. $\mathscr{E}(X)$ denotes the Whitney jets on X. The first and the last equality/isomorphism are new and nontrivial, the middle equation is clear. $A_\infty(X) \cong s$ disproves a conjecture of S. R. Patel.

Stability of semigroups on locally convex spaces
Sven-Ake Wegner
University of Wuppertal (Germany)

In this talk different concepts of stability for strongly continuous semigroups on locally convex spaces are studied. For barrelled resp. Baire spaces we show that – similar to the Banach space case – several of these notions coincide. Under the additional assumption that the semigroup is exponentially bounded we present a Datko-Pazy type theorem for locally convex spaces.
However, suitable examples will illustrate that not all equivalences which are valid on Banach spaces remain true in the more general situation of locally convex spaces. There are, for instance, multiplication semigroups on the space of rapidly decreasing sequences which decay faster than every polynomial but fail to decay exponentially.
The results presented in this talk arise from joint work with Birgit Jacob.

Whitney extension operators without loss of derivatives
Jochen Wengenroth
Universität Trier (Germany)

The problem that compact sets $K \subseteq \mathbb{R}^d$ are often too small to determine all derivatives of differentiable functions on it was overcome by Whitney's ingeneous invention of spaces $\mathscr{E}^n(K)$ and $\mathscr{E}(K) = \mathscr{E}^\infty(K)$ of *jets* (of finite and infinite order, respectively) which he proved to be exactly the spaces of restrictions $(\partial^\alpha f|_K)_\alpha$ for $f \in \mathscr{C}^n(\mathbb{R}^d)$, $n \in \mathbb{N} \cup \{\infty\}$. In the finite order case, the extension can be even done by a continuous linear operator, and the last eighty years have seen numerous results about the notoriously difficult problem to characterize the existence of continuous linear extension operators $\mathscr{E}(K) \to \mathscr{C}^\infty(\mathbb{R}^d)$ in the infinite order case if both spaces are endowed with their natural families of (semi-) norms.
In the present article we charaterize the existence of operators which, simultaneously for all $n \in \mathbb{N}_0 \cup \{\infty\}$, are extensions $\mathscr{E}^n(K) \to \mathscr{C}^n(\mathbb{R}^d)$. Till now, only very few cases were understood, the most prominent result being Stein's extension operator for sets with Lipschitz boundary. In view of the apparent difficulty of the unrestricted case and to our own surprise the final answer for the case of *extension operators without loss of derivatives* is strikingly simple:

Theorem. *A compact set $K \subseteq \mathbb{R}^d$ has an extension operator $\mathscr{E}(K) \to \mathscr{C}^\infty(\mathbb{R}^d)$ without loss of derivatives* *if and only if there is* $\varrho \in (0,1)$ *such that, for every* $x_0 \in K$ *and* $\varepsilon \in (0,1)$, *there are* d *points* $x_1 \ldots, x_d$ *in* $K \cap B(x_0, \varepsilon)$ *satisfying*

$$\mathrm{dist}(x_{n+1}, \text{affine hull}\{x_0, \ldots, x_n\}) \geq \varrho\varepsilon$$

for all $n \in \{0, \ldots, d-1\}$.

This is a joint work with Leonhard Frerick and Enrique Jordá.

Rearrangement invariant spaces with the Daugavet property

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A Banach space X has the Daugavet property if

$$\|\mathrm{Id} + T\| = 1 + \|T\|$$

for all compact operators $T : X \to X$. Classical examples include $C[0,1]$, $L_1[0,1]$ and the disc algebra. We are going to present a characterisation of Banach spaces with the Daugavet property among separable rearrangement invariant function spaces on $[0,1]$.
This is joint work with V. Kadets, M. Martín, and J. Merí.

Quasilinear functions, Banach spaces and polyhedra

David Yost
University of Ballarat (Australia)

We begin with topological vector spaces (which are not necessarily locally convex) and a class of mappings between them defined by a certain functional inequality. We describe how their study led us to some new results about Minkowski decomposability of finite-dimensional convex sets. In particular, we show that bounds on the number of vertices and edges of a polytope can force indecomposability.

Posters

Remarks on Strongly (p, q)-Summing

Dahmane Achour
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We introduce and study a concept of positive strongly $(p;q)$-summing. Among other results, relationships between these operators and positive $(p;q)$-summing are shown and the Pitesch-type theorem is proved. It is also shown that certain known results on (p,q)-concave operators from Banach lattices can be lifted to a class of (q,p)-convex operators.
This is a joint work with A. Belacel

Examples of chaotic C_0-semigroups induced by semiflows

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Our aim is to provide precise examples of chaotic C_0-semigroups induced by semiflows following [1]. We will show that, for certain types of linear PDEs, Devaney chaos appears in the associated C_0-semigroups defined on $L^p_\rho(\Omega)$, for open $\Omega \subseteq \mathbb{R}$ and on the closed subspace $W^{1,p}_*(a,b) = \{f \in W^{1,p}(a,b); f(a) = 0\}$ of Sobolev spaces.
This is a joint work with Thomas Kalmes, Universität Trier, Trier (Germany) and Elisabetta Mangino, Università del Salento, Lecce (Italy).

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Real interpolation methods and Lorentz spaces associated to a vector measure

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It is well-known that if the classical Lions-Peetre real interpolation method $(\cdot,\cdot)_{\theta,q}$ $(0<\theta<1\leq, q\leq\infty)$ is applied to a pair $(X, L^\infty(\mu))$, the result is the Lorentz space $L^{p,q}(\mu)$ with $p=\frac{1}{1-\theta}$, for every quasi-Banach space X such that $L^1(\mu)\subseteq X\subseteq L^{1,\infty}(\mu)$ and any scalar positive measure μ. See e.g. [2].
The aim of this work is to extend this result in a twofold direction: From scalar measures μ to vector measures m, and from the classical real interpolation method $(\cdot,\cdot)_{\theta,q}$ to general real interpolation methods $(\cdot,\cdot)_{\rho,q}$ associated to parameter functions ρ. For parameter functions ρ in certain classes of functions, these spaces $(X_0, X_1)_{\rho,q}$ were studied, first by Kalugina [4] and Gustavsson [3], and later by Persson [5], and other authors.
This extension procedure carries the necessity of introducing suitable Lorentz spaces $\Lambda^q_v(\|m\|)$ associated to a vector measure m and a weight v, which fit with our interpolation spaces. As a consequence of our interpolation results, we will find conditions under which such spaces are really normable quasi-Banach spaces.
Our approach is based on the relationship of the pair (ρ, q) with the *Ariño-Muckenhoupt weights* (see [1] and [6]), and sheds light even to the scalar measure case, providing a different point of view for it.
Joint work with A. Fernández, A. Manzano, F. Mayoral and F. Naranjo.

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Coherence and Compatibility of Dominated Continuous Polynomials
ELhadj Dahia
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The multi-ideal of dominated (p,σ)-continuous m-linear operators on Banach spaces has been recently defined and characterized by Dahia et al. as a natural multilinear extension of the classical ideal of $(p;\sigma)$-absolutely continuous linear operators. This multi-ideal has many good properties and extends almost all the ones that are satisfied by the ideals of absolutely p-summing and p-dominated multilinear operators. On the other hand, Achour et al. have introduced and studied the polynomial version of $(p;p_1,\ldots,p_m;\sigma)$-absolutely continuous multilinear operators, that will be called $(p;q;\sigma)$-absolutely continuous polynomials. An especial attention is given to the particular case of dominated $(p;\sigma)$-continuous polynomials.
The main goal of this contribution is to show that the sequence composed by the ideals of dominated (p,σ)-continuous m-linear operators and the associated ideal of m-homogeneous polynomials, is coherent and compatible (in the sense of Pellegrino and Ribeiro) with the ideal of (p,σ)-absolutely continuous linear operators.
Joint work with Dahmane Achour.

About the optimal domain of the Laplace transform
Orlando Galdames Bravo
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We consider the optimal domain for the Laplace transform taking values in a suitable weighted L^p-space isometric to $L^p[0,\infty)$. We prove that given $1 \leq q \leq \infty$, it is possible to choose a weight so that $L^q[0,\infty)$ is continuously included in such optimal domain. We also provide a bound for the norm of the Laplace transform considered between L^p-spaces. Finally we apply the (u,v)-th power factorization to such construction in order to find this optimal domain and also factorizations for the Laplace transform. As application a compactness criteria is provided, and as example, a concrete factorization through L^p-spaces, including Hilbert spaces, is given.

Bilinear versions of classical linear extension theorems: Good and bad news

Ricardo García
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We study different aspects of the connections between the local theory of Banach spaces and the problem of the extension of bilinear forms from subspaces of Banach spaces. While there is no hope for a general Hahn-Banach result in this non-linear situation, there are however several interesting partial results. With a combination of homological techniques and local theory of Banach spaces we study the bilinear forms version of some classical extension theorems for linear operators.
The bad news:

- There is no bilinear Lindenstrauss-Pełczyński theorem (1971) "*every $C(K)$-valued operator defined on a subspace of c_0 can be extended to the whole c_0*".
- There is no bilinear Johnson-Zippin theorem (1995) "*$\mathscr{L}_\infty$-valued operators defined on weak*-closed subspaces of ℓ_1 can be extended to the whole ℓ_1*". Moreover, every $\mathscr{L}_1$-space admits a bilinear form on a subspace that cannot be extended to the whole space.

The good news:

- The bilinear version of Maurey's extension theorem (1974) and a sort of converse.
If X has type 2, then every bilinear form on a subspace of X can be extended to the whole X.
If every bilinear form on every subspace can be extended to X then X is weak Hilbert (X must have type $2-\varepsilon$ for every $\varepsilon > 0$). The converse fails since the Kalton-Peck space Z_2 is weak Hilbert and contains an uncomplemented copy of ℓ_2.
- The bilinear version of the Lindenstrauss-Rosenthal theorem (1969). X is an $\mathscr{L}_\infty$-space iff for every Banach space Y containing X there is an operator of extension $\mathscr{B}(X) \to \mathscr{B}(Y)$ between the spaces of bilinear forms (the Aron-Berner type extension). Note that if we do not require an operator of extension, we have that every bilinear form on $A(\mathbb{D})$ -the disk algebra- extends to any super-space.
- Bilinear version of the Lindenstrauss-Tzafriri theorem (1971). X is a Hilbert space iff for every subspace Y of X there is an operator of extension $\mathscr{B}(Y) \to \mathscr{B}(X)$.

We will see that questions of this type are up to some point finite dimensional in nature.
This is a joint work with Jesús M.F. Castillo, Andreas Defant, David Pérez-García and Jesús Suárez (see [1,2]).

[1] J.M.F. Castillo, A. Defant, R. García, D. Pérez-García, and J. Súarez, *Local complementation and the extension of bilinear mappings*, Math. Proc. Camb. Phil. Soc., 152 (2012), 153–166

[2] J.M.F. Castillo, R. García, and J. Súarez, *Extension and lifting of operators and polynomials*, Mediterranean J. Math., 9 (2012), 767–788.

Strong mixing measures for C_0-semigroups

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We present a criterion based on the frequently hypercyclicity criterion that ensures the existence of invariant mixing measures for C_0-semigroups. From this it follows that the C_0-semigroup will also verifies other topological properties. We will also give some examples that illustrate these results.
Joint work with Alfred Peris.

[1] E. Mangino and A. Peris, *Frequently hypercyclic semigroups*, Studia Math. 202 (2011), 227–242.

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Shrinking and boundedly complete Schauder frames in Fréchet spaces
Juan M. Ribera
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We study Schauder frames in Fréchet spaces and their duals, as well as perturbation results. We define shrinking and boundedly complete Schauder frames on a locally convex space, study the duality of these two concepts and their relation with the reflexivity of the space. We characterize when an unconditional Schauder frame is shrinking or boundedly complete in terms of properties of the space. Several examples of concrete Schauder frames in function spaces are also presented.
Joint work with José Bonet, Carmen Fernández and Antonio Galbis.

Factorization of operators through Orlicz spaces
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Universidad Politécnica de Valencia (Spain)

The main object of this poster is to present some factorization theorems for operators and bilinear forms when the domain spaces involved are Banach lattices. We discuss relationships between vector norm inequalities and the factorization of operators through Orlicz spaces. When we specialize our results to operators into L_p-spaces we obtain the famous Maurey-Rosenthal factorization theorem.
This is a joint work with M. Mastyło.

Spaces of ultra-differentiable functions defined by a weight matrix $\mathscr{M}$ - properties and conditions
Gerhard Schindl
University of Vienna

Spaces of so-called "ultra-differentiable functions" are special classes of smooth functions with certain growing conditions on all their derivatives. One can distinguish between classes of *Roumieu*- and of *Beurling-type*. Such classes are usually defined by using either weight sequences $M = (M_p)_p$ or weight functions ω.
We have introduced and studied function spaces defined by a weight matrix $\mathscr{M}$ - a (countable) family of weight sequences. It turns out that using this new notation one can describe both the classes defined by a single weight sequence M and by a weight function ω (with some standard assumptions), so the weight matrix notation is a common generalization of both different well-known ways. But one is able to describe in fact also classes, which cannot be defined neither by using a single weight sequence M nor by using a weight function ω, e.g. the so called *Gevrey-matrix spaces*.
For such new spaces we will present some results, conditions and the general behavior (which is in some

situations completely different compared with the well-known definitions), we study also the so-called naturality of the matrix-space construction. It turns out that the "pseudo moderate growth" conditions of Roumieu- resp. Beurling-type $(\mathscr{M}_{\{mg\}})$ resp. $(\mathscr{M}_{(mg)})$ play a very important role, in particular with regard to the convenient setting - *Cartesian closedness*.
The presented results, conditions and theorems are partially based on the joint work with Armin Rainer, online available:
http://arxiv.org/pdf/1210.5102.pdf
