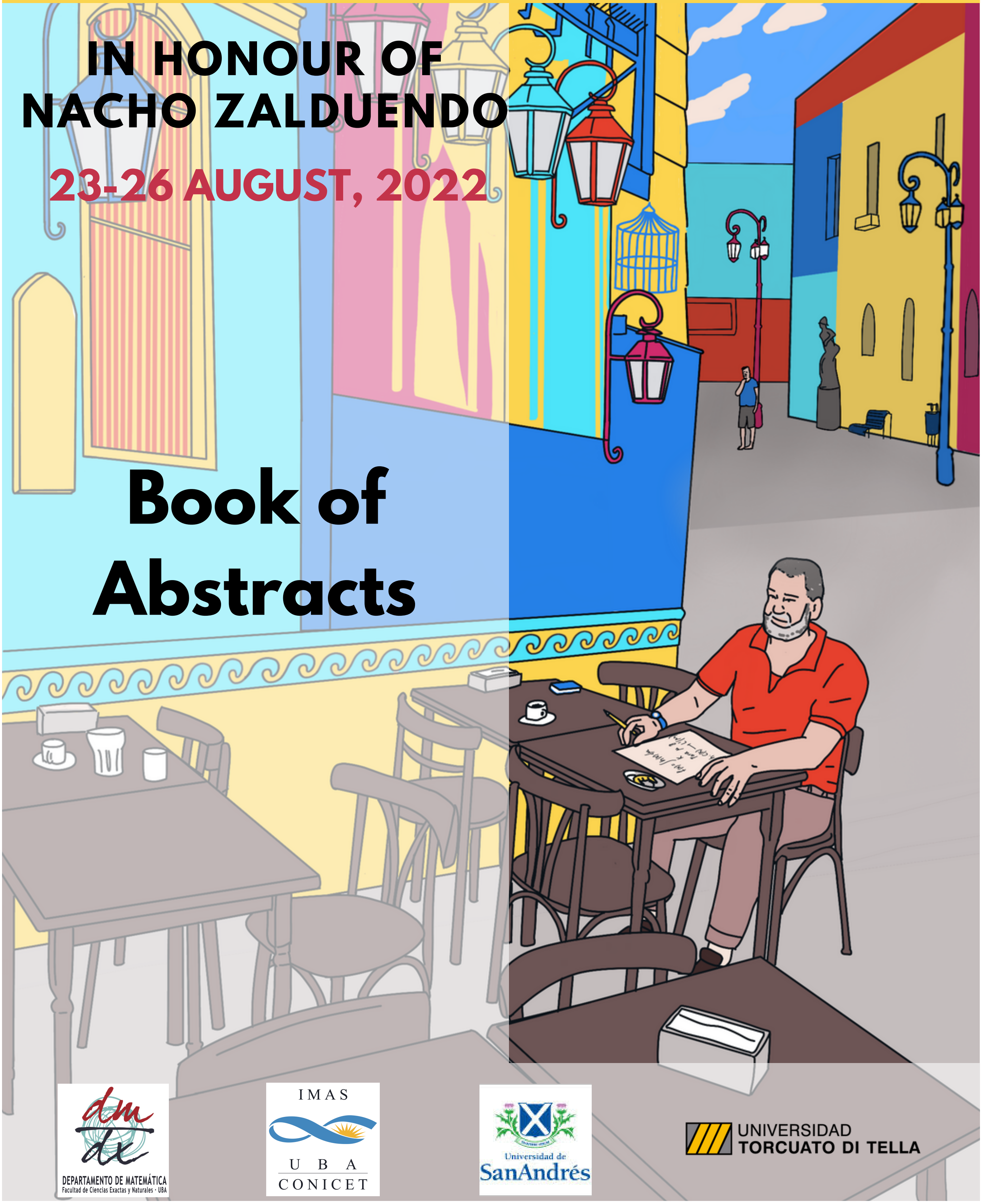
WORKSHOP ON INFINITE DIMENSIONAL ANALYSIS BUENOS AIRES 2022



IN HONOUR OF NACHO ZALDUENDO

23-26 AUGUST, 2022

Book of Abstracts

DEPARTAMENTO DE MATEMÁTICA
Facultad de Ciencias Exactas y Naturales · UBA

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Universidad de SanAndrés

UNIVERSIDAD TORCUATO DI TELLA

Tuesday	Wednesday	Thursday	Friday
9.30 - 10.20 Inscription & Coffee	9.30 - 10.20 **Jesús Ángel Jaramillo**	9.30 - 10.20 **Ray Ryan**	10 - 10.50 **Geraldo Botelho**
10.20 - 10.50 Opening	10.20 - 10.50 Coffee break	10.20 - 10.50 Coffee break	10.50 - 11.20 Coffee break
10.50 - 11.40 **Richard Aron**	10.50 - 11.40 **Rodrigo Cardeccia**	10.50 - 11.40 **Tomás Fernández Vidal**	11.20 - 12.10 **Alexander Litvak**
11.40 - 12.30 **Domingo García**	11.40 - 12.30 **Luiza Amalia Moraes**	11.40 - 12.30 **Maite Fernández Unzueta**	12.10 - 13 **Andreas Defant**

Lunch

14 - 14.50 **Pablo Turco**	14 - 14.50 **Manuel Maestre**	14 - 14.50 **Mieczysław Mastyło**
14.50 - 15.40 **Tomás Rodríguez**	14.50 - 15.40 **Joaquín Singer**	14.50 - 15.40 **Martin Mazzitelli**
15.40 - 16.10 Coffee break	15.50 - 16.40 **Gustavo Corach**	15.40 - 16.10 Coffee break
16.10 - 17 **Carlos Cabrelli**	Brindis for Nacho	16.10 - 17 **Martín Mansilla**

List of talks

NACHO!

Richard M. Aron *Kent State University, USA*

We plan to offer some comments related to the title of the talk.

Adjoints and second adjoints of almost Dunford-Pettis operators

Geraldo Botelho *Universidade Federal de Uberlândia, Brazil*

An operator T from a Banach lattice E to a Banach space F is almost Dunford-Pettis if T sends disjoint weakly null sequences in E to norm null sequences in F. Let $T\colon E \longrightarrow F$ be a positive operator between Banach lattices. In this work we investigate when the adjoint T^* is almost Dunford-Pettis and when the second adjoint T^{**} is almost Dunford-Pettis. The results we prove involve Banach lattices with order continuous norms, Banach lattices with the dual positive Schur property, almost limited operators, positively limited operators and order weakly compact operators. The results we obtain improve upon all known results on the topic we are aware of. This is a joint work with Luis Alberto Garcia (Universidade de São Paulo).

Dynamical Sampling and Orbits of Operators

Carlos Cabrelli *Universidad de Buenos Aires & CONICET, Argentina*

In Dynamical Sampling a signal that is evolving in time needs to be recovered from insufficient measurements. The strategy is to try to compensate the sparse samples, sampling the evolving signal at future stages of its evolution. This simple idea has motivated interesting mathematical questions related to harmonic analysis, functional analysis, complex analysis, and spectral theory.
In this talk, I will survey some of these relations at an expository level.

Frequently recurrence properties and block families

Rodrigo Cardeccia *Instituto Balseiro & CONICET, Argentina*

Given a family of natural numbers $\mathcal{F}$ and an operator T, a vector x is said to be $\mathcal{F}$-recurrent ($\mathcal{F}$-hypercyclic) provided that for every neighborhood V of x (for every nonempty open set V) the set of hitting times $\{n \in \mathbb{N}\colon T^n(x) \in V\} \in \mathcal{F}$. If the set of $\mathcal{F}$-recurrent vectors is dense (if there is an $\mathcal{F}$-hypercyclic vector), then the operator is said to be $\mathcal{F}$-recurrent ($\mathcal{F}$-hypercyclic). In this talk we will study properties of $\mathcal{F}$-recurrence that imply notions of $\mathcal{F}$-hypercyclicity and vice versa, notions of $\mathcal{F}$-hypercyclicity that imply properties of $\mathcal{F}$-recurrence. As an application of the results we will give a new characterization of chaos for adjoint operators and solve a problem related to the existence of reiteratively hypercyclic operators. Joint work with Santiago Muro.

Back to Nacho!

Gustavo Corach *Universidad de Buenos Aires & CONICET, Argentina*

We plan to present some personal account on Nacho's life.

Two theorems on general Dirichlet series by M. Riesz in the light of functional analysis

Andreas Defant *University of Oldenburg, Germany*

We discuss recent joint work with Ingo Schoolmann on Riesz summation of general Dirichlet series.

Given a frequency $\lambda = (\lambda_n)$ and $\ell \geq 0$, we introduce the new (scale of) Banach spaces $H^{\lambda}_{\infty,\ell}[\mathrm{Re} > 0]$ of holomorphic functions f on the right half-plane $[\mathrm{Re} > 0]$, which satisfy the growth condition $|f(s)| = O((1+|s|)^{\ell})$, and are generated by a so-called λ-Riesz germ $D(s) = \sum_n a_n(D)e^{-\lambda_n s}$, i.e. there is some $\alpha \geq 0$ such that $f(s) = \lim_{x\to\infty} \sum_{\lambda_n<x} a_n(D)e^{-\lambda_n s}\big(1-\frac{\lambda_n}{x}\big)^{\alpha}$ pointwise on some (smaller) half-plane $[\mathrm{Re} > \sigma]$. Such λ-Riesz germs D of f then are unique, and define the so-called Bohr coefficients $a_n(f) := a_n(D)$, $n \in \mathbb{N}$ of f.

• Reformulated in our terminology, an important result of M. Riesz shows that, given such function $f \in H^{\lambda}_{\infty,\ell}[\mathrm{Re} > 0]$, for every $k > \ell$ pointwise on the full half-plane $[\mathrm{Re} > 0]$

$$f(s) = \lim_{x\to\infty} \sum_{\lambda_n<x} a_n(f)e^{-\lambda_n s}\Big(1-\frac{\lambda_n}{x}\Big)^{k}.$$

We discuss various extensions of this result – in particular, when the preceding equality even holds true for $k = \ell$.

• By a counterexample of Bayart-Konyagin-Queffélec there exists an ordinary Dirichlet series $\sum a_n n^{-s}$, which on $[\mathrm{Re} > 0]$ converges to a bounded holomorphic function, but diverges at each point of the boundary line $[\mathrm{Re} = 0]$. In contrast to this, given a holomorphic functions $f\colon [\mathrm{Re} > 0] \to \mathbb{C}$ with a λ-Riesz germ and with a continuous extension to all of $[\mathrm{Re} \geq 0]$, another well-known theorem of M.Riesz isolates a couple of sufficient conditions under which f is Riesz summable on $[\mathrm{Re} = 0]$. Again we discuss various supplements of this result within our setting of $H^{\lambda}_{\infty,\ell}$-spaces.

The transition from one domination to another and its use in Lipschitz p-summability

Maite Fernández Unzueta *CIMAT, Mexico*

J.D. Farmer and W.B. Johnson proved that for a bounded linear operator it is equivalent to be p-summing as a linear operator and as a Lipschitz operator. We will see that this result can be extended to multilinear mappings. For the proof we introduce a tool that allows us to move from a Pietsch-type domination of a mapping F to another Pietsch-type domination of F.

Multiplication operators on Hardy spaces of Dirichlet series

Tomás Fernández Vidal *Universidad de Buenos Aires & CONICET, Argentina*

Given $1 \leq p, q \leq \infty$, we determine the multipliers between the Hardy spaces of Dirichlet series $\mathcal{H}_p$ and $\mathcal{H}_q$. That is, those functions φ such that $\varphi \cdot D \in \mathcal{H}_q$ for all $D \in \mathcal{H}_p$. For a fixed multiplier, we study some properties of the induced multiplication operator such as the range and the essential norm.
Joint work with Daniel Galicer and Pablo Sevilla-Peris.

On the compact operators case of the Bishop-Phelps-Bollobás property for numerical radius

Domingo García *Universidad de Valencia, Spain*

We study the Bishop-Phelps-Bollobás property for numerical radius restricted to the case of compact operators (BPBp-nu for compact operators in short). We show that $C_0(L)$ spaces have the BPBp-nu for compact operators for every locally compact Hausdorff topological space L. Besides, we also show that real Hilbert spaces and isometric preduals of ℓ_1 have the BPBp-nu for compact operators.
This is a joint work with M. Maestre, M. Martín and O. Roldán.

Spaces of vector-valued Sobolev functions

Jesús A. Jaramillo *Universidad Complutense de Madrid, Spain*

We will be concerned in this talk with Sobolev-type spaces of vector-valued functions. For an open subset $\Omega \subset \mathbb{R}^n$ and a Banach space V, we will compare the classical Sobolev space $W^{1,p}(\Omega, V)$ with the Sobolev-Reshetnyak space $R^{1,p}(\Omega, V)$. Furthermore, we will characterize this latter space in terms of the existence of partial metric derivatives or w^*-partial derivatives with suitable integrability properties. The talk is based on joint work with I. Caamaño, A. Prieto and A. Ruiz.

Singularity of random Bernoulli matrices.

Alexander Litvak *University of Alberta, Canada*

We discuss recent progress on singularity of random matrices with i.i.d. Bernoulli entries. The talk is partially based on a joint work with K. Tikhomirov.

Norm attaining functions that do not attain their (natural) norm

Manuel Maestre *Universidad de Valencia, Spain*

This is preliminary report on work with Richard Aron and Pepe Bonet and also on another work in progress with Richard, Verónica Dimant and Luis Carlos García Lirola.

The main aim of this talk is the following. Consider $H^\infty(\mathbb{D})$ the Banach algebra of bounded holomorphic functions on the complex unit disk $\mathbb{D}$ endowed with the supremum norm $\|.\|_\infty$. By the maximum modulus principle the only functions in $H^\infty(\mathbb{D})$ that attain their norm are the constant functions. But it is known that $H^\infty(\mathbb{D})$ is a dual space. Hence, by the Bishop-Phelps theorem, the set of elements of $H^\infty(\mathbb{D})$ that attain their norm with respect to that (unique) predual Banach space is a dense set. We will present a characterization of elements of $H^\infty(\mathbb{D})$ which are norm attaining.
Let $\mathrm{Lip}_0(\mathbb{D})$ be the Banach space of Lipschitz functions $f : \mathbb{D} \to \mathbb{D}$ that vanish at 0, endowed with the Lipschitz norm. We will also discuss a similar situation when we consider $T_0(\mathbb{D})$ the Banach subspace of functions in $\mathrm{Lip}_0(\mathbb{D})$ that, moreover, are holomorphic on $\mathbb{D}$.

Integral formulas for projection constants on spaces of multivariate polynomials

Martín Mansilla CONICET, Argentina

The relative projection constant $\lambda(X,Y)$ of a subspace X of a Banach space Y is the smallest norm among all possible projections on Y onto X, and the projection constant $\lambda(X)$ is the supremum of all relative projection constants of X taken with respect to all possible super spaces Y. This is one of the most significant notions of modern Banach space theory and one that has been intensively studied since the birth of abstract operator theory.
Local theory allows to understand geometric aspects of Banach spaces via their finite dimensional subspaces. In this sense general bounds for projection constants of various finite dimensional Banach spaces were studied by many authors. The most fundamental general upper bound is due to Kadets and Snobar (1971): For every n-dimensional Banach space X_n one has $\lambda(X_n) \leq \sqrt{n}$. On the other hand, for particular finite dimensional spaces, some integral formulas where developed as key tools to understand their growth with the dimension. A paradigmatic example is the exact value of $\lambda(\ell_2^n(\mathbb{C}))$ given by Grünbaum (1960):

$$\lambda\Big(\ell_2^n(\mathbb{C})\Big) = n\int_{\mathbb{S}_n(\mathbb{C})} |x_1|\, d\sigma = \frac{\sqrt{\pi}}{2}\frac{n!}{\Gamma(n+\frac{1}{2})},$$

where $d\sigma$ stands for the normalized surface measure on the $(n-1)$-dimensional sphere $\mathbb{S}_n(\mathbb{C})$ in $\mathbb{C}^n$ and Γ is the classical gamma function.
In this talk we will focus in the study of the projection constants of spaces of polynomials. We will discuss an averaging technique that allowed us to provide an integral formula for trigonometric polynomials over a compact abelian group. Also we will explore how we use this formula to understand the asymptotic behaviour of the projection constant of some spaces of polynomials over a finite dimensional Banach space when this dimension goes to infinity. In particular we will concentrate in subspaces of Dirichlet polynomials and polynomials on the Boolean cube.
This is a joint work with A. Defant, D. Galicer, M. Mastyło and S. Muro.

Stability of Fredholm properties of interpolated operators

Mieczysław Mastyło Adam Mickiewicz University, Poznań, Poland

We will discuss the stability of Fredholm properties of operators acting on interpolation Banach spaces. We develop a general framework for compatibility theorems, and our methods apply to abstract interpolation functors. As a by-product we prove that the interpolated isomorphisms satisfy uniqueness-of-inverses. We also prove the stability of lattice isomorphisms on interpolation scales of Banach function lattices and demonstrate their application to the Calderón product spaces as well as to the real method scales. We show applications to certain PDE's problems. The talk is based on the joint works with Irina Asekritova and Natan Kruglyak.

Strong subdifferentiability of the spaces of homogeneous polynomials

Martin Mazzitelli — *Universidad de Cuyo & CONICET, Argentina*

The norm $\|\cdot\|$ of a Banach space X is *strongly subdifferentiable* when, for every $x \in S_X$, the limit

$$\lim_{t \to 0^+} \frac{\|x + th\| - 1}{t}$$

exists uniformly in $h \in B_X$. In this talk, we are concerned with the strong subdifferentiability of the norms of Banach spaces of homogeneous polynomials and its relation with some (recently studied) local Bishop-Phelps-Bollobás type property. Among other results, we characterize when the norms of the spaces $\mathcal{P}(^N\ell_p, \ell_q)$, $\mathcal{P}(^N l_{M_1}, l_{M_2})$ and $\mathcal{P}(^N d(w, p), l_{M_2})$ are strongly subdifferentiable. Analogous results for multilinear mappings are also obtained. Since strong subdifferentiability of a dual space imply reflexivity, we improve some known results of Dimant-Zalduendo and Gonzalo-Jaramillo on the reflexivity of spaces of N-homogeneous polynomials and N-linear mappings.
Joint work with Sheldon Dantas, Mingu Jung and Jorge Tomás Rodríguez.

Compact and Weakly Compact Matrices

Luiza A. Moraes — *Universidade Federal do Rio de Janeiro, Brazil*

Let $M_m(X)$ be the Banach algebra of all $m \times m$ matrices with entries in a Banach algebra X, where m is a strictly positive integer. We define compact (resp. weakly compact) matrices in $M_m(X)$ as matrices that give rise to compact (resp. weakly compact) operators on X^m through their natural identification with an operator on X^m.
The main focus in this talk will be the study of the classes of such matrices for $X = \ell_\infty$ and $X = c$. It will be proved that, in these cases, the sets of compact and weakly compact matrices in $M_m(X)$ are equal, and that they can be identified with the set $M_m(c_0) = \{(a_{ij}) \in M_m(\ell_\infty) \mid a_{ij} \in c_0 \text{ for all } 1 \leq i, j \leq m\}$. In addition, it will be proved that $M_m(c_0)$ is a maximal ideal in $M_m(c)$, meanwhile $M_m(c_0)$ is contained in infinitely many maximal ideals of $M_m(\ell_\infty)$.

The results presented in this talk were obtained in collaboration with Willian Franca, from the Universidade Federal de Juiz de Fora (Brazil), and are part of [1].

References

[1] W. Franca and Luiza A. Moraes, *Compact and Weakly compact matrices*, pre-print.

Algebras of analytic functions on non-symmetrically regular spaces

Jorge Tomás Rodríguez *UNICEN & CONICET, Argentina*

The study of the spectrum of the Fréchet algebra $\mathcal{H}_b(X)$ of entire functions of bounded type began with a renowned article by Aron, Cole, and Gamelin. In that work, the hypothesis of X being symmetrically regular was identified as relevant for the description of its spectrum. From there on, most of the subsequent research on this topic has been mainly devoted to the symmetrically regular case.
This talk aims to follow the unexploited path and study the behavior of morphisms in the spectrum $\mathcal{M}_b(X)$ for X a non-symmetrically regular Banach space. We focus on the fibers of the natural projection $\pi : \mathcal{M}_b(X) \to X''$ defined as

$$\pi(\varphi) = \varphi\Big|_{X'}.$$

Using the Aron-Berner extension of holomorphic functions, one can define morphisms given by evaluations at any point $x^{(2n)}$ on an even dual $X^{(2n)}$. For every $x'' \in X''$, the evaluation morphism $\delta_{x''}$ is an element of the fiber $\mathcal{M}_{x''} := \pi^{-1}(x'')$. The question on the existence of elements in $\mathcal{M}_{x''}$ other than this evaluation has been widely considered. When the space X lacks symmetric regularity, we show that in every fiber of the spectrum there are evaluations in higher duals that do not coincide with evaluations in the second dual. This should be compared with the symmetrically regular case, where a result due to Aron, Galindo, García, and Maestre states that every morphism given by an evaluation in an even dual coincide with some evaluation in the bidual.
Joint work with D. Carando and V. Dimant.

Homogeneous Polynomials on Banach Lattices

Raymond A. Ryan *National University of Ireland Galway, Ireland*

(Joint work with Christopher Boyd and Nina Snigireva)

The *regular* m-homogeneous polynomials on a Banach lattice E are those polynomials P for which an absolute value, $|P|$, exists. The *regular norm* is defined by $\|P\|_r = \| |P| \|$ and the space of regular m-homogeneous polynomials is a Banach lattice with this norm.

We will look at two problems about regular homogeneous polynomials. First, we ask if the regular norm is preserved by the Aron-Berner extension to the bidual. We relate this to a classical result of Synnatzschke concerning the transpose of a regular linear operator $T\colon E \to F$, between Banach lattices (with F assumed to be Dedekind complete). He showed that the identity $|T'| = |T|'$ holds if we restrict T' to the *order continuous dual*, $(E)'_n$, of E, which consists of all the order continuous linear functionals. We extend this result to regular homogeneous polynomials $P\colon E \to F$ and we use this to prove that the Aron-Berner extension preserves the regular norm: $\|\widetilde{P}\|_r = \|P\|_r$, on the order continuous bidual $(E')'_n$.

We then consider a polynomial generalization of the classical Nakano Carrier Theorem. The *null ideal* of a bounded linear functional φ on a Banach lattice E is the ideal defined by $N_\varphi = \{x \in E : |\varphi|(|x|) = 0\}$ and the *carrier* of φ is its disjoint complement: $C_\varphi = N_\varphi^\perp$. Nakano's theorem states that, if one of the bounded linear functionals φ, ψ is order continuous, then they are disjoint in the Banach lattice E' if and only if their carriers C_φ, C_ψ are disjoint in E, in the sense that $|x| \wedge |y| = 0$ for every $x \in C_\varphi$, $y \in C_\psi$. We discuss how the concept of the carrier can be extended to homogeneous polynomials and we prove a carrier theorem for orthogonally additive polynomials.

Homomorphisms between uniform algebras over a Hilbert space

Joaquín Singer *Universidad de Buenos Aires & CONICET, Argentina*

In this work we study the vector-valued spectrum $\mathcal{M}_{u,\infty}(B_{\ell_2}, B_{\ell_2})$ which is the set of nonzero algebra homomorphisms from $\mathcal{A}_u(B_{\ell_2})$ (the algebra of uniformly continuous holomorphic functions on B_{ℓ_2}) to $\mathcal{H}^\infty(B_{\ell_2})$ (the algebra of bounded holomorphic functions on B_{ℓ_2}). This set is naturally projected onto the closed unit ball of $\mathcal{H}^\infty(B_{\ell_2}, \ell_2)$ giving rise to an associated fibering. Extending the classical notion of cluster sets introduced by I. J. Schark (1961) to the vector-valued spectrum we define vector-valued cluster sets. Then we look at the relationship between fibers and cluster sets obtaining results regarding the existence of analytic balls into these sets.
Joint work with Verónica Dimant (Universidad de San Andrés & CONICET).

On the coincidence between p-compact and q-compact linear and non linear operators

Pablo Turco *Universidad de Buenos Aires & CONICET, Argentina*

In 2002, Sinha and Karn formalized the concept of p-compact sets in Banach spaces, which can be seen as a refinement of the notion of compact sets. A set K in a Banach space E is p-compact if there exists a p-summable sequence $(x_n)_n$ in E such that $K \subset \{\sum_{n=1}^{\infty} \alpha_n x_n : (\alpha_n)_n \in B_{\ell_{p'}}\}$, $\frac{1}{p} + \frac{1}{p'} = 1$. In a natural way, replacing compact by p-compact sets, we obtain the classes of p-compact linear operators, p-compact n-homogeneous polynomials, p-compact Lipschitz mappings, among others. In this talk, we will give a brief discussion of the following questions:
1) For which Banach spaces E and F, the class of p-compact linear operators from E to F coincides with that of q-compact operators $(p \neq q)$?
2) When both classes coincide, does it happen the same for the classes of p-compact and q-compact n-homogeneous polynomials (or Lipschitz mappings) from E to F $(p \neq q)$?
3) When the classes are different, is there any linear structure on the class formed by all q-compact operators which are not p-compact?
Joint work with Thiago Alves.