

Abstracts

*XIV Encuentro
de Análisis Funcional*

Murcia Valencia



*A conference to celebrate the
60th birthday of*

**Manuel
Maestre**

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*Ciudad Politécnica de la Innovación
Universitat Politècnica de València*

September 24-26, 2015

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Jueves 24/09/2015

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Viernes 25/09/2015

10:00-10:30 I. Zalduendo
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10:00-10:30 B. Cascales
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13:00-13:30 Y.S. Choi
13:30-13:45 Clausura de las jornadas
13:45-15:30 Comida

Charlas

Continuity properties of sequentially asymptotically center-complete spaces

Carlos Angosto

Universidad Politécnica de Cartagena

We obtain formulae to calculate the asymptotic center and radius of bounded sequences in $C(K)$ spaces and their simplest hyperplanes, generalizing previous results by Lim ([1], [2],[3]). In the spirit of [4], we also study the existence of continuous selectors for the asymptotic center map in general Banach spaces. Following Baronti and Papini [5], we finish by giving a Hölder-type estimation in Hilbert spaces

Joint work with Fernando Rambla-Barreno and María del Carmen Listán-García.

References

- [1] T. Lim, *A fixed point theorem for families on nonexpansive mappings*, Pacific J. Math. 53 (1974), 487–493.
- [2] T. Lim, *Asymptotic centers and nonexpansive mappings in conjugate Banach spaces*, Pacific J. Math. 90 (1980), no.1, 135–143.
- [3] T. Lim, *Asymptotic centers in c_0 , c and m* , Contemp. Math. 18 (1983), 141–154.
- [4] D. Amir, J. Mach, *Chebyshev centers in normed spaces*, J. Approx. Theory 40 (1984), 364–374.
- [5] M. Baronti, P.L. Papini, *Nearby sets and centers*, Approximation and optimization (Havana, 1987), Lecture Notes in Math. 1354 (1988), 98–105.
- [6] A. L. Garkavi, *On the optimal net and best cross-section of a set in a normed space* (Russian), Izv. Akad. Nauk SSSR Ser. Mat. 26 (1962), 87–106.
- [7] M. C. Listán-García, Rambla-Barreno, F., *Rough convergence and Chebyshev centers in Banach spaces*, Numer. Funct. Anal. Optim. 35 (2014), no. 4,432–442.
- [8] J. Mach, *Continuity Properties of Chebyshev Centers*, J. Approx. Theory 29 (1980), 223–230.
- [9] L. Veselý, *Chebyshev centers in hyperplanes of c_0* , Czechoslovak Math. J. 52 (127) (2002), 721–729.

Complaint about lineability

Richard M. Aron

Kent State University (USA)

A property \mathcal{P} on a Banach or Fréchet space X is called *lineable* if the set of vectors in X that satisfy \mathcal{P} contains an infinite dimensional vector space. Lineability, and related topics such as spaceability and algebrability, have attracted a lot of attention in the last 10 years, with a number of highly interesting papers by distinguished mathematicians.

This curmudgeon will try to defend the opposite point of view, namely that the *lack of lineability* is truly interesting, apparently rather unusual, and that it merits further study.

Examples will be given of both when lineability occurs and when it fails.

The Bohr radius of a Banach space versus convexity

Óscar Blasco

Universidad de Valencia

Following the scalar-valued case considered by Djakov and Ramanujan in [3] we introduce, for each complex Banach space X and $1 \leq p < \infty$, the p -Bohr radius of X as the value

$$r_p(X) = \sup\{r \geq 0 : \sum_{n=0}^{\infty} \|x_n\|^p r^{np} \leq \sup_{|z|<1} \|f(z)\|^p\}$$

where $x_n \in X$ for each $n \geq 0$ and $f(z) = \sum_{n=0}^{\infty} x_n z^n \in H^\infty(\mathbb{D}, X)$. We show that for a complex (possibly infinite dimensional) Banach space X the condition $r_p(X) > 0$ for some $p \geq 2$ and is equivalent to the condition of X being p -uniformly \mathbb{C} -convex introduced by Davis, Garling and Tomczak-Jaegermann in [1]. We analyze the p -Bohr radius in the cases $X = L^q(\mu)$ for different values of q and give some lower estimates for $r_2(L^q(\mu))$ for $1 \leq q < 2$.

References

- [1] W.J. Davis, D.J.H. Garling, N. Tomczak-Jaegermann *The complex convexity of quasi-normed linear spaces* J. Funct. Anal. 55 (1984), 110-150.
- [2] A. Defant, M. Maestre and U. Schwaning *Bohr radii of vector-valued holomorphic functions* Adv. Math. 231 (2012), 2837-2857.
- [3] P. B. Djakov and M. S. Ramanujan *A remark on Bohr's theorem and its generalizations* J. Anal. 8 (2000), 65-77.

The Bishop-Phelps-Bollobás Property

Yun Sung Choi

POSTECH (Korea)

The Bishop-Phelps theorem [2], that is, "the set of norm attaining linear functionals on a Banach space X is dense in its dual space X^* " appeared in 1961, and Bollobás [3] sharpened in 1970 the Bishop-Phelps theorem by dealing simultaneously with norm attaining linear functionals and their norming points.

Some attention has been paid in recent papers to the Bishop-Phelps-Bollobás property [1] for operators between Banach spaces. This is a strong form of denseness of norm attaining operators. In this talk we survey very recent results in this direction for linear or nonlinear mapping.

References

- [1] M.D. Acosta, R.M. Aron, D. García and M. Maestre, *The Bishop-Phelps-Bollobás Theorem for operators*, J. Funct. Anal. 254 (2008) 2780-2799.
- [2] E. Bishop and R.R. Phelps, *A proof that every Banach space is subreflexive*, Bull. Amer. Math. Soc. 67 (1961) 97-98.
- [3] B. Bollobás, *An extension to the theorem of Bishop and Phelps*, Bull. London. Math. Soc. 2 (1970) 181-182.

Algebras of analytic functions: from Valencia to Buenos Aires

Daniel Carando

Universidad de Buenos Aires (Argentina)

We will review some results on the spectrum of the algebra of bounded type analytic functions obtained since Manolo's first visit to Buenos Aires in 2000. We will focus on the description of this spectrum developed in joint works with Manolo, Domingo García, Santiago Muro and Daniela Vieira.

Two results related to the Radon-Nikodým property

Bernardo Cascales

Universidad de Murcia

We revisit the Radon-Nikodým property (RNP) paying attention to two different sets of results: (a) a new index that tells us in the presence of a Gelfand derivative f for a vector measure how far is f from being a Bochner derivative.

(b) some applications for the Bishop-Phelps-Bollobás property.

Dynamics of the solutions of the water hammer equations

J. Alberto Conejero

Universitat Politècnica de València

A water hammer is a pressure wave that occurs, accidentally or intentionally, in a filled liquid pipeline when a tap is suddenly closed, or a pump starts or stops, or when a valve closes or opens. A water hammer wave propagates through pipes reflecting on features and boundaries. This phenomenon is governed by a pair of coupled quasi-linear partial differential equations of first order, that are usually solved using the method of characteristics.

In this note we provide a representation of the solution using an operator theoretical approach based on the theory of C_0 -semigroups and cosine operator functions, when considering this phenomenon on a compressible fluid along an infinite pipe. We provide an integro-differential equation that represents this phenomenon and it only involves the discharge. In addition, the representation of the solution in terms of a specific C_0 -semigroup lets us show that hypercyclicity and the topologically mixing property can occur when considering this phenomenon on certain weighted spaces of integrable and continuous functions on the real line.

This is a joint work with Carlos Lizama from the Universidad de Santiago de Chile and with Francisco Ródenas from the Universitat Politècnica de València.

References

- [1] J.A. Conejero, C. Lizama, and F. Ródenas, *Dynamics of the solutions of the water hammer equations*, Topology Appl. To appear.
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A super Bishop-Phelps-Bollobás property

Sheldon Dantas

Universitat de València

In 2014, Kim and Lee proved that a Banach space X is uniformly convex if and only if given $\varepsilon > 0$, there exists $\eta(\varepsilon) > 0$ such that whenever $x^* \in S_{X^*}$ and $x \in B_X$ satisfy $|x^*(x)| > 1 - \eta(\varepsilon)$, there is $x_0 \in S_X$ such that $|x^*(x_0)| = 1$ and $\|x_0 - x\| < \varepsilon$. This characterizes the uniformly convex Banach spaces from a Bishop-Phelps-Bollobás theorem point of view. We study this characterization for bounded operators.

Gabor Systems and Almost Periodic Functions

Carmen Fernández

Universitat de València

Given a Gabor frame in $L^2(\mathbb{R})$, we determine a non-countable generalized frame for the non separable space $AP_2(\mathbb{R})$ of the Besicovich almost periodic functions. Gabor type frames for suitable separable subspaces of $AP_2(\mathbb{R})$ are constructed. We show furthermore that Bessel-type estimates hold for the AP norm with respect to a countable Gabor system using suitable almost periodic norms of sequences.

Joint work with P. Boggiatto and A. Galbis.

Compact convex sets admitting a strictly convex function

Luis Carlos García Lirola

Universidad de Murcia

The aim of the talk is to study the class of compact convex subsets of a locally convex space admitting a strictly convex and lower semicontinuous function. This class has some links with some other class of compacta studied in topology such as the fragmentable. We prove that such a compact set is embeddable in a strictly convex dual Banach space endowed with its weak* topology. In addition, we find exposed points where such a function is continuous. The talk will be based on joint work with J. Orihuela and M. Raja.

Surjectivity of certain linear partial differential operators on spaces of scalar-valued and vector-valued distributions

Thomas Kalmes

Technische Universität Chemnitz (Germany)

For an open set $X \subseteq \mathbb{R}^d$ and a complex coefficient polynomial P in d variables surjectivity of the corresponding linear partial differential operator $P(D)$ on the space $\mathcal{D}'(X)$ of distributions over X has been characterized by Hörmander in 1962 by a combined property of X and P called strong P -convexity of X . Although this result is classical by now, there are only few differential operators for which there are evaluable conditions on X ensuring strong P -convexity of X .

For certain classes of polynomials P we give sufficient geometric conditions on X to be strongly P -convex. These results imply that contrary to the general case, for these polynomials surjectivity of $P(D)$ on $\mathcal{D}'(X)$ implies surjectivity of $P(D)$ on the space of vector-valued distributions $\mathcal{D}'(X, E)$, where E is a locally convex space such that E' is a nuclear Fréchet space with property (DN) .

On topological properties of Fréchet locally convex spaces with the weak topology

Manuel López Pellicer

Universitat Politècnica de València

A family \mathcal{N} of subsets of a topological space X is a network (k -network) in X if, whenever $x \in U$ ($K \subset U$ with K compact) and U open in X , then $x \in N \subset U$ for some $N \in \mathcal{N}$ ($K \subset \cup \mathcal{F} \subset U$ for some finite family $\mathcal{F} \subset \mathcal{N}$). A regular topological space X is a cosmic space (an \aleph_0 -space) if it has a countable network (countable k -network).

Michael proved that if E is a separable Banach space then its dual E' is a weakly \aleph_0 -space and he asked whether a separable Banach space E must be \aleph_0 -space in the weak topology. Clearly the answer is "yes" if $E = F \times G$, F' is a separable Banach space and G has Schur property. Corson proved that if X is a compact metric space, then $C(X, \mathbb{R})$ is an \aleph_0 -space in the weak topology if and only if X is countable.

We have proved that *if a locally convex space (lcs) E is weakly \aleph_0 -space then the strong dual E' of E is trans-separable if and only if every bounded set in E is Fréchet-Urysohn in the weak topology of E* . With this characterization and some extension of recent results of Barroso, Kalenda and Lin we have obtained that *if E is a Fréchet lcs and E' is its strong dual then:*

- (i) *If E' is separable it follows that E is a weakly \aleph_0 -space.* (This result is correct if E is a metrizable lcs or a (DF)-space).
- (ii) *If E is a weakly \aleph_0 -space not containing l_1 , then E' is trans-separable.*

From these properties, the coincidence of trans-separability and separability in metrizable lcs and the equivalence that a metrizable lcs E verifies the Heinrich density condition if and only if the bounded subsets of the strong dual E' are metrizable we obtained the next answer to Michael question for Banach spaces not containing copies of l_1 :

Let E be a Fréchet space satisfying the Heinrich density condition and not containing l_1 . E is a weakly \aleph_0 -space if and only if its strong dual E' is separable.

In particular, for a Banach space E not containing l_1 its strong dual E' is separable if and only if E is a weakly \aleph_0 -space. This result provides a direct proof for the property that the James tree space JT is not a weakly \aleph_0 -space.

Corson mentioned result has suggested to characterize when the weak*-dual of $C_c(X)$ is an \aleph_0 -space for wide classes of topological spaces X . For a Čech-complete Lindelöf space X we have proved that the following condition are equivalent: (a) X is Polish, (b) $C_c(X)$ is cosmic in the weak topology, (c) the weak*-dual of $C_c(X)$ is an \aleph_0 -space.

Joint work with S.S. Gabrielyan, J. Kąkol and A. Kubzdela.

Bishop-Phelps-Bollobás moduli of a Banach space

Miguel Martín

Universidad de Granada

The Bishop-Phelps-Bollobás moduli of a Banach space measure, for a given Banach space, what is the best possible Bishop-Phelps-Bollobás theorem in this space. We show that there is a common upper bound for these moduli for all Banach spaces and we present an example showing that this bound is sharp. We calculate the moduli for Hilbert spaces and other examples among them, $C(K)$ spaces and $L_1(\mu)$ spaces. Finally, we show that if a Banach space has the maximum possible value of any of the moduli, then it contains almost isometric copies of the real space $\ell_\infty^{(2)}$.

Some open problems in the geometry and structure of Banach spaces

Vicente Montesinos

Universitat Politècnica de València

We shall comment on some open problems in the geometry and structure of Banach spaces. The talk will have a survey flavour. The topics will range from basic linear structure (bases, complementability, operators,...), basic linear geometry (proximality, isometries, renormings,...), biorthogonal systems, smoothness, non-linear geometry, some nonseparable problems, and applications.

This is a joint work with A. J. Guirao (Universitat Politècnica de València) and V. Zizler (University of Alberta, Edmonton, Alberta, Canada).

Convexity in $C(K)$ spaces

Jose Pedro Moreno

Universidad Autónoma de Madrid

In this talk we will discuss some problems related to vector addition and diametric completion procedures of convex bodies in $C(K)$ spaces.

A Birthday Theorem for my Friend

José Orihuela

Universidad de Murcia

We present our birthday Theorem for Manuel Maestre, my friend, looking for a wonderful landscape.

Entropy in linear dynamics

Alfred Peris

Universitat Politècnica de València

We introduce notions of topological entropy for the dynamics of linear operators on Banach spaces, and we obtain some basic results and examples. One candidate for concept of entropy within this framework is the natural generalization of Bowen's entropy for the dynamics on compact sets, by taking supremum with respect to all compact subsets of the Banach space. For instance, power bounded operators have zero Bowen entropy, and some conditions are given for an operator T on a Banach space X to have infinite entropy, which can be improved when X is a Hilbert space. A second candidate for entropy is based on Bowen's too, but eliminating the "expansiveness effect". We study this notion for the particular case of weighted backward shifts, give conditions for infinite entropy, and we show an example of a hypercyclic shift that has entropy zero.

This is joint work with F. Bayart and V. Müller.

Stability of many body quantum dissipative systems

David Pérez García

Universidad Complutense de Madrid

The physics of many materials is modeled by quantum many-body systems with local interactions. If the model of the system is sensitive to noise from the environment, or small perturbations to the original interactions, it will not properly model the robustness of the real physical system it aims to describe, or be useful when engineering novel systems for quantum information processing. We will show in this talk that local observables and correlation functions of local dissipative quantum systems are stable to local perturbations if the dynamics is rapidly mixing and has a unique fixed point. No other condition is required.

Joint work with T.S. Cubitt, A. Lucia, S. Michalakis and M.M. Wolf.

Several aspects of Dirichlet series in Banach spaces

Antonio Pérez Hernández

Universidad de Murcia

The study of Dirichlet series with coefficients in (complex) Banach spaces is a recent topic which, either motivated by well-known results in the scalar case or new problems that arise in the infinite-dimensional setting, has led to results in which classical properties of Banach spaces show up, namely the cotype and the analytic Radon-Nikodým property. We will review some of these results and the ideas involved.

This is a joint work with A. Defant and P. Sevilla.

Summability properties and factorization of homogeneous polynomials

Enrique A. Sánchez Pérez

Universitat Politècnica de València

Summing inequalities for multilinear operators often lead to norm-domination inequalities. However, sometimes domination inequalities do not allow us to construct factorization schemes for the corresponding maps. Recall that, in the most relevant linear cases - p -summing operators, $(q, 1)$ -summing operators from $C(K)$ -spaces-, domination and factorization hold together; in fact they can be understood as the same property. In this talk, we will present several factorization schemes associated to suitable modifications of the usual summability properties that are the natural polynomial versions of Pietsch and Pisier Factorization Theorems. We will show also some examples and applications.

Lineability, Manolo and spaceability

Juan B. Seoane Sepúlveda

Universidad Complutense de Madrid

For the last decade there has been a generalized trend in Mathematics on the search for *large* algebraic structures (linear spaces, closed subspaces, or infinitely generated algebras) composed of mathematical objects enjoying certain *special* properties. Some of the earliest results in this directions date back to a famous theorem by V. I. Gurariy (1966), in which he showed that the set of Weierstrass' monsters (continuous nowhere differentiable functions) contains (up to the zero function) an infinite dimensional linear space. Manolo (together with other authors) was one of the first who started this new trend that, later, caught the eye of many researchers and has also had a remarkable influence in Real and Complex Analysis, Set Theory, Operator Theory, Summability Theory, Polynomials in Banach spaces, Hypercyclicity and Chaos, general Functional Analysis, and (recently) even in Probability Theory. We shall discuss some results by Manolo in this field and show how much he positively influenced this topic.

Tchakaloff's theorem and K -integral polynomials on a Banach space

Ignacio Zalduendo

Universidad Torcuato di Tella (Argentina)

In finite dimensions, Tchakaloff's theorem gives an exact quadrature formula for polynomials of bounded degree with respect to a compactly supported measure.

In the infinite-dimensional setting, an analogous statement entails some form of equivalence between a w^* -compactly supported measure and an (infinite) linear combination of deltas. We study two forms (a strong and a weak version) of Tchakaloff's theorem on a Banach space. The strong form leads us to define and study K -integral polynomials.

The content of this talk is joint work-in-progress with Damián Pinasco.

Posters

Differentiability on L^p of a positive vector measure

Lucía Agud

Universitat Politècnica de València

We study the properties of Gâteaux, Fréchet, uniformly Fréchet and uniformly Gâteaux smoothness of the space $L^p(m)$ of scalar p -integrable functions with respect to a X -valued positive vector measure m . We also give conditions about the space X , or about $L^1(m)$, whose are inherited by the L^p spaces.

Joint Work with J.M. Calabuig, S. Lajara, and E.A. Sánchez-Pérez

Some remarks on greedy approximation

Pablo Manuel Berná Larrosa

Universitat Politècnica de València

In this work we will study an algorithm of approximation, the Greedy Algorithm, respect some bases introduced by Konyagin and Temlyakov. Moreover, we will show new recent ideas that will allow us to characterize the greedy basis and obtain new results.

Frequently hypercyclic translation semigroups

Marina Murillo Arcila

Universitat Politècnica de València

Frequent hypercyclicity for translation C_0 -semigroups on weighted spaces of continuous functions is studied. The results are achieved by establishing an analogy between frequent hypercyclicity for the translation semigroup and for weighted pseudo-shifts and by characterizing frequently hypercyclic weighted pseudo-shifts on spaces of vanishing sequences. Frequently hypercyclic translation semigroups on weighted L_p -spaces are also characterized.
