Banach Spaces and Operators Between Them
Espaces de Banach et des opérateurs entre eux

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RAZVAN ANISCA, Lakehead University

The ergodicity of weak Hilbert spaces

The positive solution to the homogeneous Banach space problem, states that if a Banach space X has only one class of isomorphism of infinite-dimensional subspaces then X must be isomorphic to ℓ_2. It is therefore natural to investigate the complexity of the relation of isomorphism between infinite-dimensional subspaces of a given separable Banach space which is not isomorphic to ℓ_2. As defined by Ferenczi and Rosendal, a separable Banach space X is said to be *ergodic* if the relation E_0 is Borel reducible to isomorphism between subspaces of X. They conjectured that every separable Banach space not isomorphic to ℓ_2 must be ergodic.

We provide some additional support to this conjecture by proving that inside the regular class of weak Hilbert spaces, every Banach space which is not isomorphic to ℓ_2 is ergodic. We actually show that the same is true for the class of asymptotically Hilbertian spaces.

QINGYING BU, University of Mississippi

Orthogonally Additive Polynomials on Banach Lattices

This talk reports on joint work with G. Buskes. First we will give linearization of orthogonally additive n-homogeneous polynomials from a Banach lattice E to a Banach space Y through $\hat{\otimes}_{n,s,\pi}E/I_c$, the quotient of Banach space projective n-folder tensor product of E, and give linearization of regular orthogonally additive n-homogeneous polynomials from a Banach lattice E to a Banach lattice F through $\hat{\otimes}_{n,s,|\pi|}E/I_{oc}$, the quotient of Banach lattice projective n-folder tensor product of E. Then we will discuss the relationship beteween $\hat{\otimes}_{n,s,\pi}E/I_c$, $\hat{\otimes}_{n,s,|\pi|}E/I_{oc}$, and the n-concavification of E.

GERARD BUSKES, University of Mississippi

Positive tensor products and homogeneous polynomials

This talk reports on joint work with Q. Bu. it presents the vector lattice aspects of (orthogonally additive) n-homogeneous polynomials on Banach lattices. The main avenue to study such polynomials will be via orthosymmetric maps and a quotient of the space of symmetric polynomials, as well as the linearization of these to the Fremlin tensor product.

HÜLYA DURU, Istanbul University

Multiplication operators on vector-valued function spaces

Let E be a Banach function space on a probability measure space (Ω, Σ, μ). Let X be a Banach space and $E(X)$ be the associated Köthe-Bochner space. An operator on $E(X)$ is called a multiplication operator if it is given by multiplication by a function in $L^\infty(\mu)$. In the main result of this talk, we show that an operator T on $E(X)$ is a multiplication operator if and only if T commutes with $L^\infty(\mu)$ and leaves invariant the cyclic subspaces generated by the constant vector-valued functions in $E(X)$. As a corollary we show that this is equivalent to T satisfying a functional equation considered by Calabuig, Rodriguez, Sanchez-Perez in [Multiplication operators in Köthe - Bochner spaces. Journal of Mathematical Analysis and Applications,373(1)(2011),316-321].

(joint work with Arkady Kitover and Mehmet Orhon)

DANIEL FREEMAN, University of Texas
Schauder frames for Banach spaces

A Schauder frame for a Banach space X is a sequence $(x_i, f_i) \subset X \times X^*$ such that $\sum f_i(x)x_i = x$ for all $x \in X$. Frames can be thought of in some respect as redundant bases, and thus it is natural to consider what theorems for bases can be generalized to frames. We will discuss some recent results in this direction. This talk will cover joint work with K. Beanland and R. Liu.

ROBB FRY, Thompson Rivers University
C^1 fine approximation on Banach spaces

We consider the so-called C^1 fine approximation on Banach spaces. Specifically, given Banach spaces X and Y, a C^1 map $f : X \to Y$, and $\varepsilon : X \to (0, \infty)$ a continuous function, for $p \in (1, \infty] \cup \omega$ can we find a C^p smooth function $g : X \to Y$ so that

$$||f(x) - g(x)|| < \varepsilon(x),$$

and

$$||f'(x) - g'(x)|| < \varepsilon(x).$$

In general this turns out to be a surprisingly difficult problem which is closely related to the ability to approximate Lipschitz maps via Lipschitz, smooth maps with good control over the Lipschitz constant.

We discuss some classical and recent results.

ARKADY KITOVER, Community College of Philadelphia
The spectrum of disjointness preserving operators on rich subspaces of Banach lattices.

We describe the spectrum of restrictions of disjointness preserving operators on "rich" subspaces of Banach lattices. We call a closed linear subspace Y of a Dedekind complete Banach lattice X rich if for any band B in X and for any $\varepsilon < 0$ there is a $y \in Y$ such that $\|y\| = 1$ and $\|(I - P_B)y\| < \varepsilon$ where P_B is the band projection on band B. A classic example of a rich subspace is the Hardy space H^p, $1 \leq p < \infty$, considered as a subspace of L^p on the unit circle.

COENRAAD LABUSCHAGNE, University of the Witwatersrand
The Radon-Nikodym Property in Banach spaces via the Chaney-Schaefer l-tensor product

The Radon-Nikodym property in Banach spaces can be described by martingale convergence in Bochner spaces. We use ideas from measure-free martingale theory to extend this description to the Chaney-Schaefer l-tensor product. As an application, we give a representation of a set-valued measure of risk, defned on a Banach space-valued Orlicz heart.

CHRIS LENNARD, University of Pittsburgh
The closed, convex hull of every ai c_0-summing basic sequence fails the FPP for affine nonexpansive mappings.

In 2004 Dowling, Lennard and Turett showed that every non-weakly compact, closed, bounded, convex (c.b.c.) subset K of $(c_0, \|\cdot\|_\infty)$ is such that there exists a $\|\cdot\|_\infty$-nonexpansive mapping T on K that is fixed point free. This mapping T is generally not affine. It is an open question as to whether or not on every non-weakly compact, c.b.c. subset K of $(c_0, \|\cdot\|_\infty)$ there exists an affine $\|\cdot\|_\infty$-nonexpansive mapping S that is fixed point free.

In a recently accepted joint paper with Veysel Nezir, we prove that if a Banach space contains an asymptotically isometric (ai) c_0-summing basic sequence $(x_n)_{n\in\mathbb{N}}$, then the closed convex hull of $(x_n)_{n\in\mathbb{N}}$, $E := \overline{co}(\{x_n : n \in \mathbb{N}\})$, fails the fixed point property for affine nonexpansive mappings. Moreover, we show that there exists an affine contractive mapping $U : E \longrightarrow E$

that is fixed point free. Furthermore, we prove that for all sequences $\overrightarrow{b} = (b_n)_{n\in\mathbb{N}}$ in $\mathbb{R}$ with $0 < m := \inf_{n\in\mathbb{N}} b_n$ and $M := \sup_{n\in\mathbb{N}} b_n < \infty$, the closed, bounded, convex subset $E = E_{\overrightarrow{b}}$ of c_0 defined by

$$E := \left\{ \sum_{n=1}^{\infty} t_n f_n : 1 = t_1 \geq t_2 \geq \cdots \geq t_n \downarrow_n 0 \right\} ,$$

where each $f_n := b_n e_n$, is such that there exists an affine contractive mapping $U : E \longrightarrow E$ that is fixed point free.

DENNY LEUNG, National University of Singapore
Disjointness preserving operators on function spaces

An operator mapping between spaces of (vector-valued) functions is said to be *disjointness preserving* if it maps any pair of disjoint functions to disjoint functions. A bijection T so that both T and T^{-1} are disjointness preserving is said to be *biseparating*. In this talk, I will present results on characterizing disjointness preserving and biseparating linear operators, mainly for maps between spaces of differentiable functions.

TIMUR OIKHBERG, University of California - Irvine
On almost commuting matrices

We prove that, for certain classes of matrices A and B, the following holds: for any $\varepsilon > 0$ there exists $\delta > 0$ so that, if $|||AB - BA|||_p < \delta$, there are commuting matrices A' and B' such that $|||A - A'|||_p + |||B - B'|||_p < \varepsilon$. Here, $||| \cdot |||_p$ is the normalized Schatten p norm, defined via $|||X|||_p = (\sum_i \sigma_i(X)^p/n)^{1/p}$, where $(\sigma_i(X))_{i=1}^n$ are the singular numbers of the $n \times n$ matrix X. This is a joint work with Mustafa Said from UCI.

MEHMET ORHON, Mathematics and Statistics Dept., University of New Hampshire
Reflexivity of Banach C(K)-modules via the reflexivity of Banach lattices

It is well known that a Banach lattice is reflexive if and only if it does not contain any subspace isomorphic to l^1 or to c_0 (Lozanovskii). Let K be a compact Hausdorff space and let $C(K)$ be the complex-valued continuous functions on K. Suppose X is a finitely generated Banach $C(K)$-module. We show that X is reflexive if and only if X does not contain any subspace isomorphic to l^1 or to c_0. The proof uses Lozanovkii's Theorem. On the other hand, the well known James space provides an example that shows the hypothesis that X is finitely generated cannot be relaxed in general.
(joint work with Arkady Kitover)

ALEXEY POPOV, University of Alberta
Norm closed operator ideals in Lorentz sequence spaces

In this talk, we will discuss the structure of closed algebraic ideals in the algebra of operators acting on a Lorentz sequence space. This is a joint work with A. Kaminska, E. Spinu, A. Tcaciuc, and V. G. Troitsky.

HASKELL ROSENTHAL, University of Texas at Austin
The log of an operator with spectrum the unit circle

Let X be a complex Banach space and T a bounded linear operator on X with spectrum equal to the unit circle, so that $T + I$ is one-one with dense range. It is proved that there exists a bounded linear operator S on X so that $e^S = T$. (A new proof is also given for the old known result that if one assumes instead that the spectrum is a proper subset of the unit circle,then such an S exists).

ANTON SCHEP, University of South Carolina
Inequalities for the spectral radius of Hadamard and Krivine products of positive operators.

Recently K.M.R. Audenaert, and Roger A. Horn and Fuzhen Zhang proved inequalities between the spectral radius of Hadamard products of finite nonnegative matrices and the the spectral radius of their ordinary matrix product. We will prove these inequalities in such a way that they extend to infinite nonnegative matrices A and B that define bounded operators on sequence spaces. One of the inequalities extends to an inequality of the spectral radius of the Krivine product $A^{\frac{1}{2}} \cdot B^{\frac{1}{2}}$ of arbitrary positive operators A and B on Banach lattices.

EIGENIU SPINU, University of Alberta
Disjointly homogeneous Banach lattices

A Banach lattice is said to be disjointly homogeneous if every two disjoint seminormalized sequences have subsequences which are equivalent. We will discuss the geometry of such lattices and consider operator ideals on them.

BENTUO ZHENG, the University of Memphis
Bounded Compact Approximation Property for Quotients of $\mathcal{L}_\infty$

A Banach space X is said to have the bounded compact approximation property if the identity operator on X can be approximated by bounded compact operators uniformly on compact subsets of X. In this talk, we show that if X is a closed subspace of $\mathcal{L}_\infty$ with the bounded compact approximation property, then $\mathcal{L}_\infty/X$ has the bounded compact approximation property.