Journées d'Analyse Fonctionnelle et Harmonique

Bâtiment M2, Salle de Réunions

Thomas RANSFORD (Laval): *Pseudospectra and unitary invariants.*

The pseudospectra of a matrix are the level curves of the norm of its resolvent. This notion has become a useful tool in the study of the evolution of the powers of a matrix. In this talk I shall discuss to what extent the norms of matrix powers are actually determined by pseudospectra, as well as some connections with the theory of unitary invariants.

Jonathan PARTINGTON (Leeds): *Harmonic analysis and approximation in Hardy spaces in* 2 *and* 3 *real dimensions.*

We describe some approximation problems in Hardy spaces, of which the solutions are expressible in terms of operator theory. We explain the standard two-dimensional situation in detail, and then describe an extension to three dimensions using the Hardy spaces defined by E. Stein, which consist of gradients of real harmonic functions. This gives an approach to approximate recovery problems for harmonic functions from incomplete boundary values. This is joint work with B. Atfeh, L. Baratchart and J. Leblond.

Dan TIMOTIN (Bucharest): *Sums of eigenvalues of selfadjoint compact operators.*

The Horn conjecture concerning the eigenvalues of a sum of selfadjoint matrices has been recently proved by Klyachko and Knutson-Tao. We discuss the conjecture and show how one can extend it to compact operators. This is joint work with Hari Bercovici and Wing Suet Li.

Kristian SEIP (Trondheim): *Landau's necessary density conditions for LCA groups.*

H. Landau's necessary density conditions for sampling and interpolation of bandlimited functions on $\mathbb{R}^d$ may be viewed as a general principle resting on a basic fact of Fourier analysis: The complex exponentials e^{ikx} (k in $\mathbb{Z}$) constitute an orthogonal basis for $L^2([-\pi,\pi])$. We extend Landau's conditions to the setting of locally compact abelian (LCA) groups, relying in an analogous way on the basics of Fourier analysis. The technicalities—in either case of an operator theoretic nature—are however quite different. Our proofs are based on a comparison principle of J. Ramanathan and T. Steger. Based on joint work with Karlheinz Gröchenig and Gitta Kutyniok.

Charles BATTY (Oxford): *H^∞-calculus and perturbations.*

The notion of (bounded) H^∞-calculus of an (unbounded) sectorial operator was introduced by McIntosh in the 1980s and it has recently become very important for operator theory methods in differential equations. Kalton has shown that bounded H^∞-calculus is preserved by "relatively triangular" perturbations.
We will discuss these notions, and the corresponding concepts for strong strip-type operators which include the logarithms of sectorial operators and the generators of C_0-groups.

Markus HAASE (Delft): *Transference principles and their consequences.*

Very generally speaking, a transference principle is a method to deduce information about an abstract situation from information about a concrete instance of it. In our case we shall look at general operator (semi-)groups (on the abstract side) and the shift (semi)group on $L^p(\mathbb{R})$. These transference principles have their orgin in a 1968 paper of Calderón about ergodic maximal inequalities. Calderón's ideas were subsequently generalized by Coifman and Weiss and — after the invention of UMD spaces in the beginninge 1980's — by Berkson, Gillespie and Muhly. About that time, McIntosh had just invented what is now called the H^∞-calculus of a sectorial operator, initiating a development which eventually led to the understanding that the singular integrals associated with (semi)groups considered so

far could all be viewed as operators of the form $f(A)$, where A is the generator of the (semi)group and f is some function on its spectrum. The transference principle would then account for the boundedness of $f(A)$ under the hypothesis that the result is true for the shift group. After a celebrated result of Dore and Venni from 1987, Clément Prüss and Hieber realized the importance of the transference principle for the question of maximal regularity, at the time the most virulent problem in abstract evolution equations.
As it appears today, large parts of the theory of abstract evolution equations can be dealt with by functional calculus methods. New transference principles were proved recently, abandoning the restrictive condition of uniform boundedness of the group and leading to a deeper understanding of central theorems as well as the resolution of old problems in the field of cosine functions.

Eva GALLARDO (Zaragoza): *On the connected component of compact composition operators on the Hardy space.*

It is well known that composition operators acting on the classical Hardy space $\mathcal{H}^2$ (as well as on many other function spaces) have been studied extensively during the past few decades. Presently some of the most long-standing open questions in this field are related to the topological structure of the set $\mathrm{Comp}(\mathcal{H}^2)$ consisting of all composition operators acting on $\mathcal{H}^2$ endowed with the operator norm metric. Apart from its operator-theoretic significance, this area of study gains interest from the fact that the map $\varphi \mapsto C_\varphi$ provides a remarkable embedding of analytic self-maps of $\mathbb{D}$ into the space of bounded operators on $\mathcal{H}^2$, therefore inducing a natural topology on the unit ball of $\mathcal{H}^\infty$.
The investigation of the topological structure of $\mathrm{Comp}(\mathcal{H}^2)$ was initiated by Berkson, and continued by MacCluer and Shapiro and Sundberg. Central problems considered in their work were determining the isolated elements of $\mathrm{Comp}(\mathcal{H}^2)$ and also relating the structure of $\mathrm{Comp}(\mathcal{H}^2)$ to the compactness properties of its members. In particular, it was shown that the collection of all compact composition operators on $\mathcal{H}^2$ is arcwise connected. On the other hand, the authors gave various examples of non-compact composition operators that cannot be connected to the compacts. Moreover, it was shown that certain highly non-compact composition operators can be even isolated in $\mathrm{Comp}(\mathcal{H}^2)$.
In this talk, we will discuss recent results concerning the structure of $\mathrm{Comp}(\mathcal{H}^2)$, and we will show that there exist non-compact composition operators in the connected component of the compact ones on the classical Hardy space $\mathcal{H}^2$, answering a question posed by Shapiro and Sundberg in 1990. To that end, we will establish an improved version of a theorem of MacCluer, giving a lower bound for the essential norm of a difference of composition operators in terms of the angular derivatives of their symbols. One of the main tool used are Aleksandrov–Clark measures.
(Joint work with María J. González, Pekka Nieminem and Eero Saksman).

Michael DRITSCHEL (Newcastle): *Transfer function realization for C^*-correspondence valued Schur-Agler classes.*

Using the test function formalism of Jim Agler, Scott McCullough and I developed a realization theory for scalar valued functions in Schur-Agler classes over very general domains, and also considered related problems in interpolation. Muhly and Solel likewise developed a realization theory for W^*-correspondence valued functions in what abstractly corresponds to the case of the unit disk with a single test function. We discuss recent efforts with Joe Ball, Tirtha Bhattacharyya, Sanne ter Horst and Chris Todd to unify these.

Maria ROGINSKAYA (Göteborg): *On the invariant subspace problem.*

The invariant subspace problem is a classical problem of Operator Theory: It has been conjectured that any operator on asufficiently regular vector space over complex numbers has a (non-trivial) invariant subspace. This conjecture has been disproved on a Banach space first by Per Enflo, and then on another Banach space by Charles Read. While methods

attempted to prove the conjecture right are mainly analytical, the constructions of the counterexamples invoke ideas of more combinatorial nature.
In this talk I'll present a joint (Sophie Grivaux and the speaker) attempt to understand the combinatorial ideas behind Read's construction and adjust them to the Hilbert space (for which the Invariant subspace problem remains unsolved).

Yura LYUBARSKII (Trondheim): *Gabor superframes from Hermite functions.*

Vladimir MÜLLER (Prague): *On weakly wandering vectors.*

Let T be an operator acting on a Hilbert space H. A vector $x \in H$ is called weakly wandering for T if there exists an increasing sequence (n_k) such that the vectors $T^{n_k}x$ are mutually ortogonal. The notion originated in the ergodic theory. Among others it was proved by U. Krengel that any unitary operator without eigenvalues has a dense subset of weakly wandering vectors. We will discuss the existence of weakly wandering vectors for power bounded operators and show that these vectors exist for all power bounded operators with peripheral spectrum large enough.

Stanislav SHKARIN (Belfast): *Universal elements for non-linear operators and their applications.*