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Editorial

Dynamics, Operator Theory, and Infinite Holomorphy

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The works on linear dynamics in the last two decades show that many, even quite natural, linear dynamical systems exhibit wild behaviour. Linear chaos and hypercyclicity have been at the crossroads of several areas of mathematics. More recently, fascinating new connections have started to be explored: operators on spaces of analytic functions, semigroups and applications to partial differential equations, complex dynamics, and ergodic theory.

Related aspects of functional analysis are the study of linear operators on Banach spaces by using geometric, topological, and algebraic techniques, the works on the geometry of Banach spaces and Banach algebras, and the study of the geometry of a Banach space via the behaviour of some of its operators.

In recent years some aspects of the theory of infinite-dimensional complex analysis have attracted the attention of several researchers. One is in the general field of Banach and Fréchet algebras and Banach spaces of polynomial and holomorphic functions. Another is in a deep connection with the theory of one and several complex variables as Dirichlet series in one variable, Bohr radii in several variables, Bohnenblust-Hille constants, Sidon constants, domains of convergence, and so forth.

This special issue shows some new advances in the topics shortly described above.

The chaotic behaviour of the annihilation operator $\widehat{a}$ of a quantum harmonic oscillator is studied by X. Wu in the following sense. It is shown that the annihilation operator, defined on the Schwartz space of rapidly decreasing functions in $L^2(\mathbb{R})$, admits for any $0 < \varepsilon < 2$ an invariant linear manifold M (i.e., a vector subspace) consisting of vectors such that every pair (x, y) of distinct points in M is ε distributionally scrambled.

The notion of hypercyclicity (i.e., the existence of dense orbits) is thoroughly studied in recent years for linear operators. J. Bès and J. A. Conejero introduce a new notion of orbit for N-linear operators, which is alternative to the one given by K. Grosse-Erdmann and S. K. Kim for bilinear operators and which is inspired by difference equations. Under this new notion, they show that every separable infinite dimensional Fréchet space supports supercyclic N-linear operators, for each $N \geq 2$. For the bilinear case, they study the spaces of entire functions and the countable product of the scalar field, and they show that there are bilinear operators with residual sets of hypercyclic vectors.

A generalization of the notion of hypercyclic operator is the concept of convex-cyclic operator, introduced by H. Rezaei, which amounts to require the existence of a vector such that the convex hull generated by its orbit is dense in the space. F. León-Saavedra and M. del Pilar Romero-de la Rosa provide an example of a convex-cyclic operator T such that the power T^n fails to be convex-cyclic, which turns out to solve some open questions in the topic.

In the setting of infinite dimensional analysis one important field has been the study of Banach or Fréchet algebras of holomorphic functions. Intensive study has been made on the differential structure of the spectrum of holomorphic functions of bounded type. Another point of view, trying to obtain theorems of Banach-Stone type, has been made to study the homomorphisms between two spaces of holomorphic functions of bounded type for two different complex Banach spaces X and Y. V. Dimant et al. have focused on the study of the differential structure of $\mathscr{M}(\mathscr{H}_b(X), \mathscr{H}_b(Y))$,