Preserver problems
Problèmes de préservation
(Org: **Chi-Kwong Li** (College of William and Mary), **Shaun Lui** (Manitoba) and/et **Yiu-Tung Poon** (Iowa State University))

MOHAMED BENDAOUD, Moulay Ismail University
Local spectra-preserving nonlinear transformations on operators

In this talk, we determine the structures of nonlinear transformations on the space of matrices that respect the local spectra of certain algebraic operations. Related problems on the algebra of all bounded linear operators on a Banach space and local invertibility preserver problems are also discussed.

ANTONIA DUFFNER, Universidade de Lisboa
Preservers and converters of immanant functions

A linear map T defined on $M_n(F)$ preserves a function f if $f(T(X) = f(X)$ for all X $\in M_n(F)$. In this talk I will present some recent results on preservers of an immanant on some subsets of $M_n(C)$, where the immanant function associated with an irreducible complex character χ is the function $d_\chi : M_n(c) \longrightarrow M_n(C)$ defined by

$$d_\chi(A) = \sum_{\sigma \in S_n} \prod_{i=1}^{n} a_{i\sigma(i)}.$$

NATHANIEL JOHNSTON, University of Waterloo
Preservers of Unextendible Product Bases and the Local Distinguishability of Quantum States

In quantum information theory, unextendible product bases (UPBs) are sets of quantum states that exhibit strange entanglement properties. For example, although the states in a UPB contain no entanglement, they exhibit nonlocal properties such as the fact that they can not be distinguished with local operations and classical communication. In this talk, we investigate the preservers of UPBs (i.e., given a UPB, we ask the question of which local operators map it to a UPB). In many cases, the only such preservers are the local unitary operators, and in these cases a stronger form of local indistinguishability can be proved.

CHI-KWONG LI, College of William and Mary
Preservers on tensor product of matrices and vectors

We discuss some recent results and problems on linear maps leaving invariant functions and relations on tensor (Kronecker) product of matrices and vectors.

LAJOS MOLNAR, University of Debrecen
Transformations on density operators preserving quantum relative entropy or related quantities

Wigner's famous theorem on quantum mechanical symmetry transformations asserts that every bijective map on the set of all rank-one projections (that represent pure quantum states) on a Hilbert space which preserves the so-called transition probability is implemented by a unitary or an antiunitary operator. Motivated by this result we consider maps on the space of density operators (that represent mixed quantum states) which preserve different sorts of quantum relative entropy or certain related quantities (e.g., Jensen-Shannon divergence, f-divergence, quasi-entropy, Holevo bound) and describe their structure.

MARKO OREL, University of Primorska
Preserver Problems and Graph Theory

A map that preserves a binary relation can be interpreted as a graph homomorphism. In this talk I will present few techniques related to graph theory that can be used to solve some preserver problems. The main emphasis will be on adjacency preservers on various types of matrices over a finite field.

EDWARD POON, Embry-Riddle University
Preserving entangled states

A pure state on a bipartite system is said to be maximally entangled if all of its Schmidt coefficients are equal. Such states feature prominently in quantum information theory. We present a complete characterization of linear maps preserving maximally entangled states.

YIU-TUNG POON, Iowa State University
Pseudospectra of special operators and Pseudosectrum preservers

Denote by $\mathcal{B}(H)$ the Banach algebra of all bounded linear operators on a complex Hilbert space H. Let $A \in \mathcal{B}(H)$, and denote by $\sigma(A)$ the spectrum of A. For $\varepsilon > 0$, define the ε-pseudospectrum $\sigma_\varepsilon(A)$ of A as

$$\sigma_\varepsilon(A) = \{z \in \sigma(A+E) : E \in \mathcal{B}(H),\ \|E\| < \varepsilon\}.$$

In this talk, the pseudospectra of several special classes of operators are characterized. As an application, complete descriptions are given of the maps of $\mathcal{B}(H)$ leaving invariant the pseudospectra of $A \bullet B$ for different kind of binary operations $\bullet$ on operators such as the difference $A - B$, the operator product AB, and the Jordan product $AB + BA$.

PETER SEMRL, University of Ljubljana
Invertibility preservers

We will present a structural result for linear preservers of invertibility on central simple algebras. The main tool in the proof is the localization technique for linear preservers on matrix spaces which has been recently developed in a joint paper with Leiba Rodman.

MING CHENG TSAI, University of Sun Yat-Sen
Preserver problems on convex combinations of positive elements

In this talk, we study the maps ϕ on positive operators of Schatten p-classes ($1 < p < +\infty$), which preserve the p-norms of convex combinations. On the other hand, we characterize serval classes of transformations which preserve the norm of geodesics on positive definite matrices under different Riemannian metrics. These geodesics are naturally the convex combinations of positive definite matrices in these manifolds. Finally, we establish the transformations sending geodesics into geodesics on these Riemannian manifolds and other related results.