

# Probabilistic Operator Algebra Seminar

Organizer: Dan-Virgil Voiculescu

November 1     **Adrian Ioana**, UCSD

Title: *Almost commuting matrices and stability for product groups*

I will present a result showing that the direct product group  $G = \mathbb{F}_2 \times \mathbb{F}_2$  is not Hilbert-Schmidt stable. This means that  $G$  admits a sequence of asymptotic homomorphisms (with respect to the normalized Hilbert-Schmidt norm) which are not perturbations of genuine homomorphisms. While this result concerns unitary matrices, its proof relies on techniques and ideas from the theory of von Neumann algebras. We will also explain how this result can be used to settle in the negative a natural version of an old question of Rosenthal concerning almost commuting matrices. More precisely, we derive the existence of contraction matrices  $A, B$  such that  $A$  almost commutes with  $B$  and  $B^*$  (in the normalized Hilbert-Schmidt norm) but there are no matrices  $A', B'$  close to  $A, B$  such that  $A'$  commutes with  $B'$  and  $B'^*$ .