An Operator Algebraic Approach
to Non-signaling Correlations

**Vern Paulsen, Simone Severini, Dan Stahlke,
Ivan G. Todorov, Andreas Winter**

Queen's University Belfast, United Kingdom
`i.todorov@qub.ac.uk`

Non-signalling correlations describe the joint probabilistic behaviour of two (spacially separated and non-communicating) parties during the conduct of a physical experiment. They are probability distributions associated with the possible outcomes of such an experiment, and different physical theories (e.g. relativistic quantum mechanics, non-relativistic quantum mechanics, or generalised probabilistic theories) give rise to different classes of correlations. In the past several years, it became apparent that these classes of correlations are closely related to the tensor theory of operator systems – objects, studied in operator algebra theory since the 1960's. In this talk, I will give an overview of the connections between operator systems and non-signalling correlations. I will describe how in the special case of synchronous correlations certain C*-algebras and their traces can be used to provide characterisations of correlation classes, leading to quantum versions of the well-known chromatic number of a graph, and I will explain the connection of the Tsirelson Problem in quantum theory with the Connes Embedding Problem in operator algebra theory.