YRS Plenary Talks
Conférences plénières YRS

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MATTHIAS CHRISTANDL, University of Copenhagen
Tensors: From Entanglement to Computational Complexity

The quantum state of a system of k particles can be viewed as a tensor of order k. Local stochastic operations on a quantum state correspond to the application of linear maps to the indices of the corresponding tensor and are studied in entanglement theory and implemented in current quantum information science experiments.

Interestingly, the notion of tensor transformation is at the heart of the study of the computational complexity of algebraic problems such as the multiplication of matrices. Strassen's breakthrough algorithm for the multiplication of d-by-d matrices that runs faster than your standard d^3 high-school algorithm, spurred a whole development of tensor theory.

I will review these connections and present a new family of quantum information-inspired functionals that can serve as obstructions for asymptotic tensor transformations. The functionals are the first of their kind, thereby solving a problem of Strassen from 1986.

MIHALIS DAFERMOS, Princeton University
On falling into black holes

The celebrated "black hole" spacetimes of Schwarzschild and Kerr play a central role in our current understanding of Einstein's general theory of relativity. Are these spacetimes stable, however, as solutions to the Einstein vacuum equations, in their exterior region? And what fate awaits physical observers who enter inside a "generic" black hole? It turns out that these two questions are intimately related and the answer to the second may be more disturbing than previously thought. This talk will try to explain how so.