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Weekly Calendar

September 7-11, 2015

Departmental Colloquium

"Recoverability in Quantum Information Theory"

3:30 PM Thursday, September 10, 2015

109 Nicholson Hall

Mark Wilde
Physics and Astronomy, LSU

HOST: Jonathan Dowling

• Refreshments served at 3:10 PM in 232 (Library) Nicholson Hall •

The quantum relative entropy is a fundamental measure of distinguishability between two quantum states and serves as the foundation for virtually all known entropies in quantum physics. The fact that it is non-increasing with respect to quantum physical evolutions lies at the core of many optimality theorems in quantum information theory and has applications in other areas of physics, such as thermodynamics. In this colloquium, I will discuss an improvement of this entropy inequality in the form of a physically meaningful "remainder term." One of the main results can be summarized informally as follows: if the decrease in quantum relative entropy between two quantum states after a quantum physical evolution is relatively small, then it is possible to perform a recovery operation, such that one can perfectly recover one state while approximately recovering the other. This can be interpreted as quantifying how well one can reverse a quantum physical evolution. The proof relies on the method of complex interpolation, basic linear algebra, and the recently introduced Renyi generalization of a relative entropy difference. The theorem has a number of applications in quantum information theory, which have to do with providing physically meaningful improvements to many known entropy inequalities. Time willing, I will also discuss applications in quantum thermodynamics and to a refinement of the Heisenberg uncertainty principle.

Reference: http://arxiv.org/abs/1505.04661, accepted for publication in the Proceedings of the Royal Society A: Mathematical, Physical & Engineering Sciences.

Publications:

1. "Permanent-magnet energy spectrometer for electron beams from radiotherapy accelerators," David J. McLaughlin, **Kenneth R. Hogstrom, Robert L. Carver**, **John P. Gibbons**, Polad M. Shikhaliev, **Kenneth L. Matthews II**, Taylor Clarke, Alexander Henderson and Edison P. Liang, Med. Phys. **42**, 5517 (2015); http://dx.doi.org/10.1118/1.4928674.

2. "Quantum mechanics, strong emergence and ontological non-reducibility," Rodolfo Gambini, Lucia Lewowicz and **Jorge Pullin**, Found Chem (2015) 17:117-127. Springer Science + Business Media Dordrecht 2015.