

# Joint Event

## APPLIED MATHEMATICS COLLOQUIUM *AND* QUANTUM INFORMATION PROCESSING SEMINAR

### A COUNTER-EXAMPLE TO ADDITIVITY: USING ENTANGLEMENT TO BOOST COMMUNICATION CAPACITY

**Matthew Hastings**

Los Alamos National Laboratory

**ABSTRACT:**

Suppose Alice is using a noisy quantum channel to send classical information to Bob. For example, she might send single photons over a fiber optic line. How should she do this? In particular, should she use entanglement or should she send unentangled input states? The additivity conjecture in quantum information theory states that it is never useful for her to use entanglement. In fact, there are several related additivity conjectures, depending on the use of entanglement for different tasks. I will present a counter-example to one of these conjectures, the minimum output entropy conjecture, implying that all of these conjectures are false, and that in some circumstances Alice can increase the communication capacity by using entangled states.

**MONDAY FEBRUARY 9<sup>TH</sup> 2009**

**4:30 PM**

**Building 4, Room 237**

*Refreshments at 4:00 PM in Building 2, Room 349  
(Applied Math Common Room)*

Applied Math Colloquium: <http://www-math.mit.edu/amc/spring09>

Math Department: <http://www-math.mit.edu>



Massachusetts Institute of Technology  
Department of Mathematics  
Cambridge, MA 02139