

# Physics Colloquium

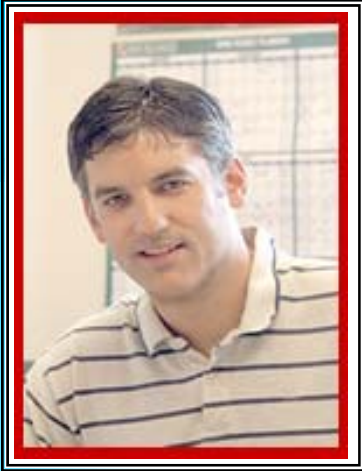
Michigan Technological University

Thursday, April 17, 2008

4:00 - 5:00 pm

Room 139, Fisher Hall

Sponsored by the Society of Physics Students



## Quantum Information Networks of Atoms and Photons

Christopher Monroe

Joint Quantum Institute and University of Maryland  
Dept. of Physics

### ABSTRACT

Quantum information science deals with the processing of quantum states, with potential gains from the massive parallelism inherent to quantum superpositions and quantum entangled states. A collection of electromagnetically trapped atomic ions are the most promising candidate for a quantum information processor, with each ion storing a single quantum bit (qubit) of information. All of the fundamental quantum operations have been demonstrated on this system, and the central challenge now is how to scale the system to larger numbers of qubits. Nearby ion qubits can be coupled through their Coulomb repulsion, and distant ions can be coupled through the interference of emitted photons. I will discuss several options and issues for such atomic quantum networks, along with state-of-the-art experimental progress.

### BIOGRAPHY

Dr. Monroe is Professor of Physics at the University of Maryland; he also has an appointment in the Joint Quantum Institute, a collaborative venture between UMD, NIST and the Laboratory for Physical Sciences. He has published over 75 papers, which have more than 6000 citations. Recent articles have appeared in *Science*, *Nature*, *Physical Review Letters*, and *Scientific American*. Dr. Monroe's education includes a high school diploma from Detroit Catholic Central and a PhD in physics from the University of Colorado at Boulder, where he was advised by Carl Wieman.