



PHYSICS & ASTRONOMY WEEKLY CALENDAR

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202 NICHOLSON HALL
Louisiana State University
Baton Rouge, Louisiana 70803-4001

WEEKLY CALENDAR

October 13, 2008

Department Colloquium

"Quantum-limited measurements: One physicist's crooked path from quantum optics to quantum information"

3:40 PM, October 16, 2008
109 Nicholson Hall

Carlton Caves
University of New Mexico
Host: Jonathan Dowling

• Refreshments served at 3:15 PM in 201 Nicholson Hall •

Quantum information science has changed our view of quantum mechanics. Originally viewed as a nag, whose uncertainty principles restrict what we can do, quantum mechanics is now seen as a liberator, allowing us to do things, such as secure key distribution and efficient computations, that could not be done in the realistic world of classical physics. Yet there is one area, that of quantum limits on high-precision measurements, where the two faces of quantum mechanics remain locked in battle. Using my own career as a convenient backdrop, I will trace the history of quantum-limited measurements, from the use of nonclassical light to improve the phase sensitivity of an interferometer, to the modern perspective on how quantum entanglement can be used to improve measurement precision, and finally to how to do quantum metrology without entanglement.

Bio:

Carlton M. Caves is a Distinguished Professor in the Department of Physics and Astronomy at the University of New Mexico. He received the Ph.D. in Physics from the California Institute of Technology in 1979. He worked at Caltech as a postdoctoral Research Fellow through 1981 and as a Senior Research Fellow in Theoretical Physics from 1982 through 1987. From 1988 till 1992 he was Associate Professor of Electrical Engineering and Physics at the University of Southern California, moving to his present position at UNM in 1992. He was awarded the 1990 Einstein Prize of the Society for Optical and Quantum Electronics for his work on nonclassical light and is a Fellow of the American Physical Society. He is the author of over 110 scientific papers on topics in gravitation theory, quantum optics, nonlinear dynamics, and quantum information science. His present research is concentrated on quantum measurement theory, quantum information theory, and classical and quantum chaos.

Publications:

"Radio-frequency spectroscopy of a strongly imbalanced Feshbach-resonant Fermi gas," Martin Veillette, Eun Gook Moon, Austen Lamacraft, Leo Radzihovsky, Subir Sachdev, and **D. E. Sheehy**, et al., *Physical Review A* 78, 033614 (2008).

"Energy resolved computed tomography: first experimental results," **P. M. Shikhaliev**, *Physics in Medicine and Biology*, v. 53 (2008), pp. 5595-5613.

"Three Bodies Bind even when Two do not: Efimov States and Fano Resonances in Atoms and Nuclei", **A. R. P. Rau**, *Advances in Atomic, Molecular and Optical Science*, ed. E. Krishnakumar (Allied Publishers, New Delhi, 2008).

"Geometric phases and Bloch-sphere constructions for $SU(N)$ groups with a complete description of the $SU(4)$ group," D. Uskov and **A. R. P. Rau**, *Phys. Rev. A* 78, 022331 (2008).