Yale Institute for Nanoscience and Quantum Engineering

Friday, September 16, 2011

12:00 to 1:00 p.m.

J. Robert Mann, Jr. Engineering Student Center
10 Hillhouse Avenue - Dunham Lab 107
Light lunch will be served at 11:45 a.m.

Professor Hui Cao

Department of Applied Physics
Faculty of Arts and Science, Yale University

"A New Light Source for Imaging"

A variety of imaging applications require increasingly bright illumination sources. Conventional thermal light sources (light bulbs) are being replaced by light emitting diodes (LEDs), superluminescent diodes (SLDs) and lasers. Unfortunately the spatial coherence of light from SLDs and lasers leads to speckle noise that distorts images. Such image corruption limits the general use of lasers in applications ranging from modern microscopy to digital light projectors to optical radar. We recently demonstrated that random lasers can have low spatial coherence while maintaining high intensities. Here, we show that random laser illumination can indeed eliminate coherent artifacts and generate speckle-free images. This work is done in collaboration with Prof. Michael Choma of Yale Medical School.

Professor Sean E. Barrett

Department of Physics and Applied Physics
Faculty of Arts and Science, Yale University

"Recent Progress in Magnetic Resonance Imaging of Hard and Soft Solids"

Magnetic resonance imaging (MRI) of solids is rarely attempted because the broader MR linewidths, compared to that of ^{1}H in water, limit both the spatial resolution and the signal-to-noise ratio. Basic research, stimulated by the quest to build a quantum computer (and supported by YINQE Seed Funding), gave rise to a unique MR pulse sequence that offers a solution to this long-standing problem. The 'quadratic echo' significantly narrows the broad MR spectrum of solids. Applying field gradients in synch with this line-narrowing sequence opens a fresh approach to the MRI of hard and soft solids with high spatial resolution. Here we show that this technique can be used for three-dimensional MRI of ^{31}P in *ex vivo* bone and soft tissue samples. Future applications for example, to geology, and to the physics of granular matter) will be discussed.

HOST: Professor Paul Fleury