Yale Institute for Nanoscience and Quantum Engineering

Friday- January 17, 2014

12:00 to 1:00 p.m.

Becton Seminar Room

Light lunch will be served at 11:45 a.m.

Professor Sean Barrett

Departments of Physics and Applied Physics, Yale University

" Doing more with less: Accelerating multidimensional NMR and MRI experiments using iterated maps"

Techniques that accelerate data acquisition without sacrificing the advantages of fast Fourier transform (FFT) reconstruction could benefit a wide variety of imaging modalities. Here we discuss an approach for reconstructing multidimensional nuclear magnetic resonance (NMR) spectra and MR images from sparsely-sampled time domain data, by way of iterated maps. This method exploits the computational speed of the FFT algorithm and is done in a deterministic way, by reformulating any a priori knowledge or constraints into projections, and then iterating. In this talk we explain the motivation behind this approach, the formulation of the specific projections, the benefits of using a 'QUasi-Even Sampling,plus jiTter' (QUEST) sampling schedule, and various methods for handling noise. Applying the iterated maps method to real 2D NMR and 3D MRI of solids data, we show that it is flexible and robust enough to handle large data sets with significant noise and artifacts.

Professor Fengnian Xia

Department of Electrical Engineering, Yale University

"Graphene Photonics and Plasmonics "

Graphene has been intensively explored by physicists and engineers due to its unique photonic and electronics properties. In this talk, I will first address the physics of light-graphene interaction within the single-electron framework, followed by a discussion of light excitation of collective oscillations of the carriers, i.e., plasmons in graphene. I will cover a variety of photonic devices based on these two mechanisms of light-graphene interaction, such as high-bandwidth photodetectors, optical modulators, electro-magnetic wave shielding, optical filters, and linear polarizers. Finally I will discuss a few promising future research directions on photonics using graphene and other two-dimensional materials.

HOST: Paul Fleury