Louis Brus will give 3 lectures during his visit, described below:

**Lecture 1 — Chemistry and Physics of Colloidal Semiconductor Nanocrystals**

Monday, March 16 at 3 p.m.
McLennan Physical Labs, Room 102
60 St. George Street

This talk describes in broad terms the field of colloidal semiconductor nanocrystals, including the original observation of quantum size effects in the 1980s, the critical importance of high quality organometallic chemical synthesis, self-assembled materials made from nanocrystals, quantum size and electrostatic models, the luminescence and “blinking” of single nanocrystals, and finally the growing importance of nanocrystals in biological imaging.

**Lecture 2 — Molecules Interacting with Ag Nanocrystal Plasmons: Single Molecule Raman Scattering and Charge Transfer Photochemistry**

Wednesday, March 18 at 3 p.m.
McLennan Physical Labs, Room 202
60 St. George Street

30 nm Ag particles act as almost idea “nano-antennas” for visible light. Two touching 30nm Ag nanocrystals exhibit a junction “hot spot” in their local electromagnetic field enhancement. If a molecule is chemisorbed in the junction and also electronically resonant with the laser, this enhancement is sufficient to enable single molecule Raman spectroscopy. The Ag metal “hot hole” coherent optical polarization also photo-oxidizes adsorbed stabilizing citrate anions, thus charging the nanocrystals. This creates a cathodic photovoltage, which can be observed as open circuit photovoltage in a electrochemical cell containing nanocrystals adsorbed on a transparent electrode. Photovoltage creates enhanced reduction of Ag+ in solution, and thus the nanocrystal grows in size. Photovoltage-driven Ostwald
ripening causes growth of aqueous colloidal 70nm single nanocrystal prisms from 8nm Ag seeds, under room lights in the presence of air.

Lecture 3 — Optical Properties of Carbon Nanotubes and Single Sheet Graphene

Thursday, March 19 at 1 p.m.
Lash Miller Chemical Labs, Room 159
80 St. George Street

We explore the fundamental nature and dynamics of excited electronic states in single wall carbon nanotubes (SWNT). Near infrared two photon luminescence excitation spectra quantitatively reveal strongly bound exciton excited states in semiconducting tubes. In order to characterize metallic and semiconducting individual tubes, we observe both resonant Rayleigh and Raman scattering. Single sheet graphene is a semi-metal whose Fermi level is strongly shifted by environmental chemical doping. This is revealed by the Raman spectrum. Basal plane chemical reactions, including the attack of H atoms, are described for single and few layer graphenes.

For more information on this lecture series please contact Emanuel Istrate.