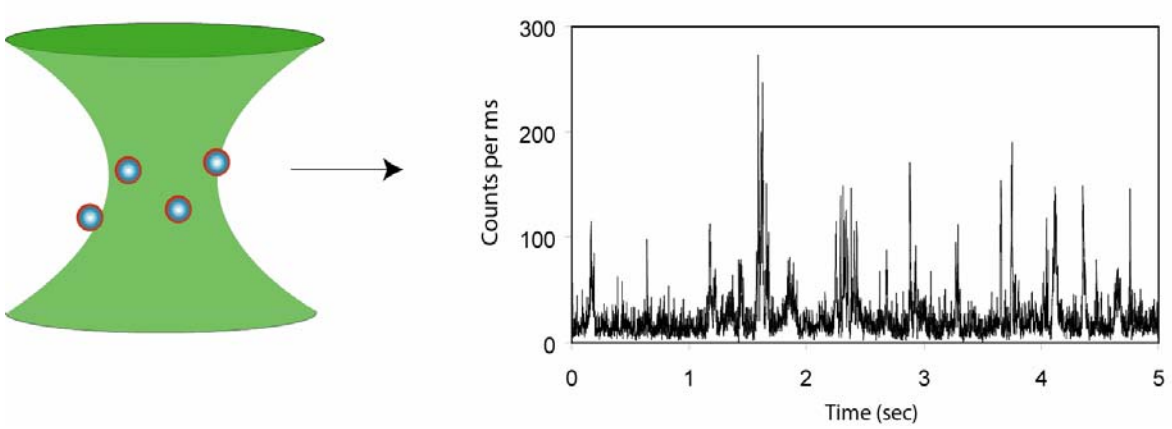
AMO Seminar



Friday, November 30, 2007
3:30 pm

Conference Room (123), Small Hall Physics Building

Single Molecules and Large Fluctuations in Nanobiotechnology

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Single molecule measurements have improved our understanding of many biological and chemical processes because they show rare and intermediate states not easily visible with ensemble measurements. Detection at this limit is possible when $N = CV \sim 1$, where C is the molecular concentration and V is the observation volume, with typical values for V being less than a femtoliter (10^{-15} L). At this scale, signal fluctuations from the detection of single molecules tend to be larger than the mean signal, enabling single molecule analysis. Examples of this include fluorescence measurements with a tightly focused laser beam and ionic current measurements through biological nanopores (i.e. alpha hemolysin). We are interested in studying biological and bio-inspired systems at the limit of large fluctuations. Several different systems we study include biological nanopores (alpha hemolysin and PA63 anthrax protein), nanometer-sized liposome containers for encapsulating water-soluble molecules, single mitochondria extracted from human cells, and micron-sized water droplets that serve as single molecule "test tubes". I will present results from all of these projects.

Figure: Dye loaded liposomes (diameter ~60 nm) diffuse through a tightly focused laser beam (waist ~500 nm) resulting in a noisy fluorescence signal that can be used to characterize the liposomes.