MAR09-2008-000562

Abstract for an Invited Paper
for the MAR09 Meeting of
the American Physical Society

Nanoscale Spectroscopy with Optical Antennas

LUKAS NOVOTNY, University of Rochester

Antennas are devices that efficiently convert localized energy to free propagating radiation, and vice versa. They are a key enabling technology in the microwave and radiowave regime but their optical analogue is greatly unexplored. In order to understand antenna-coupled light emission and absorption we use a single molecule as an elementary light emitting device. With an optical antenna in the form of a simple gold particle we are able to increase the emission efficiency by more than a factor of 10. However, for very short distances between particle and molecule the fluorescence yield drops drastically because of nonradiative energy transfer. A simple gold particle is not an efficient optical antenna and it can be expected that favorably designed nanoplasmonic structures will yield much higher enhancement. Optical antennas can be employed as light sources for high-resolution optical microscopy and spectroscopy. We demonstrate vibrational (Raman scattering) and nonlinear imaging with spatial resolutions down to 10nm.