

**JOINT INSTITUTE FOR MOLECULAR AND NANOSCALE INNOVATION (IMNI)  
AND DIVISION OF ENGINEERING****“The Bright Future of Mid-Infrared Photonics”**

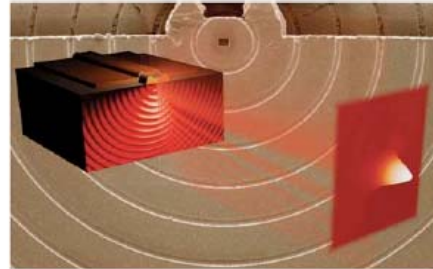
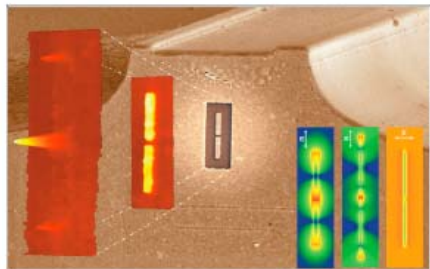
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**April 23, 2009**  
**Barus & Holley, Room 190**  
**10:00 AM**

**Abstract**

The field of photonics has reached an impressive level of maturity especially at wavelengths in the near-infrared and the visible. In comparison, mid-infrared (mid-IR) photonics is still in its infancy. The emergence of quantum cascade lasers (QCLs) as highly reliable, high performance coherent sources is opening up the field of photonics in the mid-IR and is revolutionizing important spectroscopic applications. These include pollution monitoring, medical diagnostics such as breath analysis, industrial process control and homeland security.

Conventional and novel applications in the mid-IR would benefit from advances in fiber technology, integration of photonic circuits and detection schemes, among other examples. In this seminar, the discussion will cover the recent developments that led to the demonstration of multi-Watt level and highly efficient QCLs as well as some unique physical phenomena taking place in these high power devices. The development of a broadly tunable laser source that has the potential to replace Fourier transform infrared spectrometers for chemical sensing applications will be summarized. We will conclude with a description of novel functionalities enabled by the integration of plasmonic nanostructures on a laser output facet.



*Two examples of plasmonic nanostructures integrated on the facet of an edge-emitting laser: a plasmonic laser antenna (left) used to create an ultra-bright nanospot for sensing applications and a two-dimensional plasmonic grating (right) used for beam collimation.*