

# **UNH Materials Science Seminar**

11:10-12:00, Thursday, May 1, 2008

Kingsbury Hall S145

University of New Hampshire

## **Mid-Infrared Optoelectronic Materials**

**Professor Daniel Wasserman**

**University of Massachusetts, Lowell**

The mid-infrared (3-30 $\mu\text{m}$ ) has become a burgeoning and dynamic field both for fundamental exploration and more applied research in fields such as health and the environment, security and defense, communication, and sensing. Much of the recent interest in the mid-IR can be directly attributed to the rapid advances in mid-IR sources, specifically the quantum cascade laser (QCL). As the QCL continues to develop, fundamental challenges such as wavelength range, wall-plug efficiency, tunability, and surface emission, are faced. I will discuss recent work with mid-IR sources which demonstrates avenues to tackling these challenges and developing the next generation of mid-IR sources. Specifically, I will discuss recent results for mid-IR emission from InAs self-assembled quantum dots and QCLs with integrated nonlinearities for intracavity frequency conversion.

While the subfield of mid-IR photonics centered around emitters (and to a lesser extent, detectors) has experienced phenomenal growth of late, the mid-IR does not boast the "optical infrastructure" of more established wavelengths,

such as the telecom and visible ranges. I will discuss recent results in the field of mid-IR plasmonics and how these novel devices can not only serve as a bridge between electronics and photonics, but how they may also form the basis of a novel class of electro-optic devices, augmenting the mid-IR optical infrastructure. I hope to show that the mid-IR's 27 $\mu$ m width belies its capacity for exciting new research and applications, both fundamental and applied.

Dr. Wasserman received his Sc.B. in 1998 from Brown University (Summa Cum Laude, Phi Beta Kappa, with Honors). He received his PhD from the Department of Electrical Engineering at Princeton University in 2004 for his dissertation "Quantum Dots: Mid-Infrared Luminescence, (110) Growth, Single-Dot Electroluminescence and Cleaved-Edge Alignment". At Princeton, Dr. Wasserman was a Francis Upton Fellow and a National Science Foundation Graduate Fellow. Upon receipt of his Ph.D, Dr. Wasserman was named a Princeton University Council on Science and Technology Post-Doctoral Fellow, and worked on QC laser physics, novel mid-IR detection and modulation devices, and InAs QD mid-IR emitters in the Princeton University Mid-IR Photonics group. Dr. Wasserman is currently an Assistant Professor of Physics and Associate Director of the Photonics Center at the University of Massachusetts Lowell.

Host: Professor Karsten Pohl