

# UNH Materials Science Seminar

11:00-12:00, Thursday, February 2, 2006

DeMeritt Hall 209B

University of New Hampshire

## Fabrication and Measurement of Semiconductor Detectors for Astronomy

Richard M. Osgood, III, Ph.D.

Lincoln Laboratories

Pixelated detectors, including charge-coupled devices (CCDs) and avalanche photodiodes (APDs), are of great interest for astronomy and x-ray measurements. We discuss the fabrication, test, and delivery of these imagers. We discuss CCD parameters important for astronomy and x-ray applications, including specialized blooming control (for some implementations, capable of holding off the full moon) and full well capacity. We have found that the architecture of the blooming drain, formed by specialized implants, strongly impacts the resolution of the CCD, and have developed a unique method for testing the CCD resolution. We discuss advantages (i.e., high dynamic range, speed) of and challenges (i.e., reset time) presented by fabricating Geiger-mode APD arrays.

Dr. Richard M. Osgood III graduated from Stanford University with a PhD in Applied Physics in 1996, and has worked in many major areas of applied physics and electrical engineering: semiconductor detectors, magnetic thin films, materials (metals and semiconductors), magneto-optics, laser ablation, AR coating development (theory), x-ray scattering, and superconductivity. At MIT Lincoln Laboratory, Dr. Osgood has developed blooming control technology for MIT Lincoln Laboratory's charge-coupled devices (CCDs), created a statistical

model of APD effective quantum efficiency, and worked on APD development. Dr. Osgood has also participated in system analysis of a biodetection system. At the 3M Company in St. Paul, MN, Dr. Osgood created a product concept, based on laser ablation, which resulted in an image which appeared to "float". As a postdoctoral scientist at Argonne National Laboratory, Dr. Osgood developed the theory of diffuse magnetic x-ray scattering from magnetic thin films. As a graduate student, Dr. Osgood worked for Prof. B. M. Clemens in the Materials Science and Engineering department on magnetic thin films and x-ray scattering, and re-discovered the second order magneto-optical effect in anisotropic magnetic thin films (terms proportional to the magnetization squared were found to be large and important). Before attending graduate school, Dr. Osgood worked for almost one year in a theoretical physics group at the P.N. Lebedev Institute in Moscow, Russia (the former Soviet Union).

**Host – Jim Harper 862-1962**