

**MS&E 803 Special Topics Section 4 Spring 2015**  
**Advanced X-ray Scattering**

Instructor: Paul Evans (evans@engr.wisc.edu)  
Monday, Wednesday and Friday, 9:55-10:45 AM room 235 MS&E  
Course Number 16366

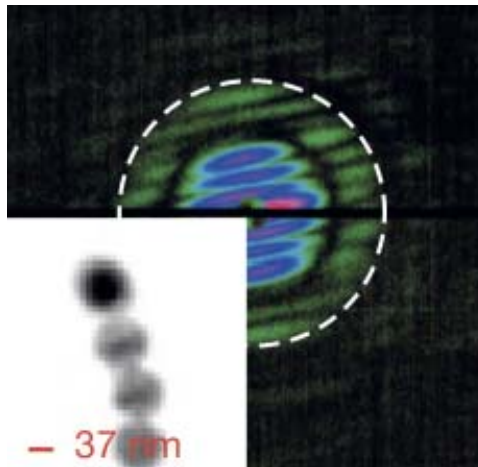
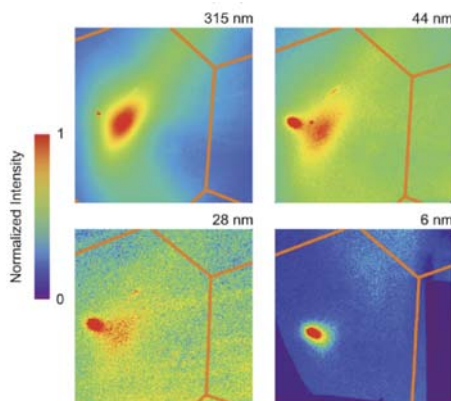
This special topics course will introduce the fundamentals of modern x-ray scattering, emphasizing physical and mathematical underpinnings and applications to the analysis of materials. The topics covered include diffraction, scattering, and imaging techniques that can be used to characterize the structure, magnetism, and other atomic- and nanometer-scale properties of materials.

The coursework will consist of lectures, several homework assignments, participation in demonstrations of selected techniques, a mid-term examination, and a final paper.

**Topics:**

- *Diffraction* (surface scattering and truncation rods, coherent scattering, diffuse scattering from thermal fluctuations and defects, dynamical diffraction and x-ray standing waves, diffraction from thin films and nanostructures)
- *X-ray imaging* (x-ray microscopy, contrast mechanisms, coherent diffraction imaging)
- *Materials analysis using scattering* (small angle scattering, x-ray reflectivity)
- *Magnetic scattering, resonant scattering, and spectroscopy* (resonant and non-resonant magnetic scattering, x-ray absorption spectroscopy, inelastic scattering)
- *X-ray optics* (monochromators, mirrors, focusing, optics for conventional and synchrotron radiation x-ray sources)

G. Gopalakrishnan, M. V. Holt, K. M. McElhinny, J. W. Spalenka, D. A. Czaplewski, T. U. Schulli, and P. G. Evans, Phys. Rev. Lett. **110**, 205503 (2013).



N. D. Loh, *et al.* Nature **486**, 513 (2012).

**More information is available from the instructor or on the course homepage at:**  
**<https://ay14-15.moodle.wisc.edu/prod/course/view.php?id=825> (login as visitor).**