



Other M: Innovative Microanalysis

presented by

**Midwest Microscopy and Microanalysis Society
(M³S)**

A local affiliate of the Microscopy Society of America and the Microanalysis Society

Friday, November 17th, 2017

**Baxter Healthcare Corporate
Headquarters, Deerfield, IL**
(Directions and map below)

**Please RSVP by Tuesday, November
14th**

**Email your contact information to:
Karl Hagglund
Secretary@midwestmicroscopy.org**

Onsite Registration Fee:

**Meeting Free for M³S members, \$20.00 for non-members, \$5.00 for students
(Fee includes M³S membership for 2018)**

We welcome vendor participation. Limited tables (6'x2') are available for \$100.

**Vendors - please contact Jason Mantei: (jason_mantei@baxter.com) to reserve your
table, and specify if you need a power outlet.**

8:00 - 9:00AM

Registration, Continental Breakfast will be served

9:00 - 9:10AM

Welcome and Opening Remarks

**9:10 - 10:00AM Surface Microscopy and Microanalysis in an Industrial Research and
Development Laboratory: General Electric Global Research Center**

Vincent Smentkowski, General Electric

The top few nanometers of a sample is defined as the surface. The surface is where most chemical reactions take place. There are many instances where the surface of materials are designed/functionalized in order to optimize properties and improve device performance; there are other instances where the surface becomes compromised and the material/device performance degrades. Auger Electron Spectroscopy (AES), X-ray Photoelectron Spectroscopy (XPS), and Time of Flight Secondary Ion Mass Spectrometry (ToF-SIMS) are the three most common, and commercially available, surface analysis techniques. These techniques provide complimentary information regarding the composition/microstructure of the surface of a sample. In this presentation, we will introduce AES, XPS, and ToF-SIMS, show typical data, and discuss how the data helped understand mechanisms and/or resolve material problems.

**10:00 - 10:30AM Mid-IR QCL Spectral Microscopy: Bringing Label-free, Video Rate Chemical
Imaging Modalities to the Materials and Life Sciences**

Jeremy Rowlette, Daylight Solutions

The Field of Mid-infrared Spectral Microscopy is advancing rapidly due in large measure to the commercialization of the Spero microscope, the first and only high-speed, high-definition microscope based on tunable quantum cascade lasers (QCL). The Spero microscope, now in its second generation, has significant speed, resolution and noise performance advantages over the early FTIR microscopes, which are enabling new applications in the Materials and Life Sciences. In this talk, we will present on the fundamentals of instrument operation followed by a discussion of several selected application examples including whole-slide

quantitative tissue imaging, efficient optimization of plasmonic nano-antennae arrays, multiplexed blood serum testing, and real-time microfluidic chemical reaction monitoring.

10:30 - 11:00AM Break & Visit with Vendors

11:00 - 11:45AM From Imaging to Analytics: Getting the Most out of Your X-Rays

Will Harris, Zeiss

The power of X-rays to diffract off the planes of a crystalline lattice has long been exploited by the XRD technique for determination of crystalline phases and structures in materials. Subsequently, the penetrating power of X-rays has also been leveraged, providing scientists with X-ray vision via radiography or tomography, with the opportunity to interrogate interior structures of samples nondestructively.

In modern X-ray microscopy (XRM), these behaviors of X-rays are now being combined and leveraged within a single laboratory-based instrument. Following a trend somewhat analogous to that which was encountered previously in SEM, wherein different electron contrast methods complemented with EDS and EBSD techniques turned the SEM from an imaging-only tool into a robust analytical platform, XRM is now expanding well beyond the classical limitations of X-ray CT or microCT. Specifically, XRM is extending the range of imaging modalities (now including phase contrast in addition to the well-known absorption contrast) and incorporating analytical diffraction information from polycrystalline samples.

Based on a technique initially developed at a few select synchrotron facilities worldwide, diffraction contrast tomography (DCT) is now available in the lab and leverages both the absorption-based and diffraction information from X-rays' interactions with a sample to reconstruct the crystalline microstructure in 3D. As a nondestructive method, this new analytical technique offers us the opportunity to observe phenomena which were never before possible in 3D: such as grain growth through annealing, studying the local effects of corrosion, coupling mechanical behavior with local grain structure, or correlating to complementary methods like 2D/3D EBSD. This talk will introduce LabDCT by means of examples, and how it complements and extends the range of imaging opportunities provided by XRM, spanning from materials to life sciences.

11:45AM - 12:10PM MMMS Business Meeting

12:10- 1:30PM Lunch & Visit with Vendors

1:30PM - 2:15PM SXES Soft X-ray Emission Spectroscopy... Coming Close To Doing the Impossible

Vern Robertson, JEOL USA

Recent advances in X-ray spectroscopy include the commercialization of a soft X-Ray emission spectrometer. Initially available only on EPMA's, this technology is now available on both EPMA and FEG SEMs. This new type of spectrometer not only can see very low energy lines (50eV-200eV) with high spectral resolution (0.3eV) and high sensitivity (<10ppm), it has the capability of detecting Li and at very low levels which has been the unattainable holy grail of many micro analysts. Its other key advantage is that it also provides chemical state analysis once only the realm of scanning Auger. Applications examples and comparisons to existing technologies will be discussed.

2:15 - 2:45PM Renishaw inVia: the Swiss Army Knife of Confocal Raman Systems

Tim Prusnick, Renishaw

Raman spectroscopy is an extremely versatile technique for characterizing the vibrational properties of materials, it is used in a wide variety of field ranging from 2D materials to the life sciences.

This talk will introduce the Renishaw's inVia confocal Raman microscope, a highly customizable research grade instrument designed to measure even the toughest samples and its application to analysis areas including carbon materials, semiconductors, pharmaceuticals, life sciences, geology and forensics highlighting that inVia system versatility is comparable to a swiss army knife, enabling you to get best results on all sample types.

Particular focus will be given to newer technological advances in Raman instrumentation and their application to modern research problems.

2:45 - 3:15PM Accelerating Materials Characterization with Machine Learning

Karl Husjak, Dravid Group, Northwestern University

Electron microscopy has emerged as an essential tool for the real-space investigation of material structure and composition at the nano-to-atomic scales. Tremendous advances in instrumentation and the computerization of microscope control have made such analysis routinely accessible for non-experts. However, radiation induced damage from long acquisitions can still preclude the imaging of many soft and hybrid soft/hard systems. Leveraging the stability of modern microscopes and computer control it is possible to design new acquisition schemes to take advantage of state-of-the-art Machine Learning techniques to reduce the accumulated dose and time-to-collect maps and images. In particular, analytical spectrum mapping with Energy Dispersive X-ray Spectrometry (EDS) and Electron Energy Loss Spectroscopy (EELS) can be accelerated by over an order of magnitude. Prospects for other imaging techniques and future avenues for improvement will be discussed.

3:15 - 3:20PM Closing Remarks

Directions to Baxter Corporate Headquarters: 1 Baxter Parkway, Deerfield Illinois, 60015

From South (O'Hare Airport): I-294 (Tri State Tollway) north to the merge with I-94 (west) towards Milwaukee. North on I-94 to Lake Cook Road exit. Turn left (west) to first light, Saunders Road. Turn right on Saunders to Baxter Parkway. Turn right on Baxter Parkway. Keep to the right. Follow the special event parking signs in the garage. See Deerfield Campus Map and proceed to "Cafeteria, Auditorium, Reception" building on ground level.

From South (Edens): North to the merge with I-94 (west) towards Milwaukee on Edens Spur. Exit on Deerfield Road. Turn left (west), then take left on Saunders Road. Turn left on Baxter Parkway. Keep to the right. Follow the special event parking signs in the garage. See Deerfield Campus Map and proceed to "Cafeteria, Auditorium, Reception" building on ground level.

From North (Milwaukee): From I-94 east, going south towards Chicago exit at Lake Cook Road exit. Turn right (west) to first light, Saunders Road. Turn right on Saunders to Baxter Parkway. Turn right on Baxter Parkway. Keep to the right. Follow the special event parking signs in the garage. See Deerfield Campus Map and proceed to "Cafeteria, Auditorium, Reception" building on ground level

