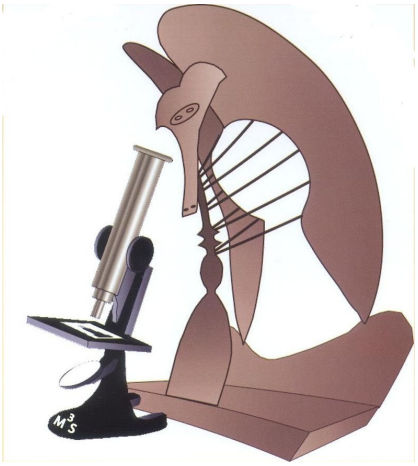

Final Announcement and Schedule

A One-Day Workshop on

Spectroscopy Techniques for Materials and Biological Electron Microscopy

presented by

Midwest Microscopy and Microanalysis Society (M^3S)

A local affiliate of the Microscopy Society of America (MSA)
and the Microanalysis Society (MAS)

Friday November 4th, 2011

Baxter Healthcare – Corporate HQ
1 Baxter Parkway
Deerfield, IL 60015

Please RSVP by Friday, October 28th
Email your contact information to:

Ke-Bin Low
(kebinlow@uic.edu)
(Tel: (312) 355 2087)

Onsite Registration Fee:
Free to M^3S members, $20.00 for non-members, $5.00 for students
(M^3S membership for 2012 included in fee)
Breakfast and lunch are included.

We welcome vendor participation. Tables for literature and exhibits will be available. Please contact us for details.

Vendors who have already registered include DMS Inc, EDAX, FEI, Gatan, Hitachi, JEOL, Oxford and Thermo-Fisher Scientific.

Program Schedule:

08:00 – 08:50	Registration & Continental Breakfast
08:50 – 09:00	Welcome / Opening remarks
09:00 – 10:00	**MAS Tour Speaker, Robert Simmons**, Georgia State University – *'Microorganisms and You: A Tale of Cohabitation'*
10:00 – 10:30	Coffee Break / Exhibits
10:30 – 11:15	**Nestor Zaluzec**, Argonne National Laboratory – *'Advances in Spectroscopic Characterization of Nanoparticles in Electron Optical Instruments'*
11:15 – 12:30	**David Gosztola**, Argonne National Laboratory – *'Optical Characterization of Nanomaterials using Temporal and Spatial Spectroscopic Techniques'*
12:30 – 13:30	Lunch / Exhibits
13:30 – 14:15	**David McComb**, Ohio State University – '*Probing complex interfaces and nanostructures using analytical electron microscopy'*
14:15 – 14:30	Coffee Break
14:30 – 15:15	**Ray Twesten**, Gatan Inc. – *'Recent Advances in EELS Instrumentation and Analysis: High-Speed Spectroscopy with Extended Energy and Dynamic Range'*
15:15 – 16:00	**Chris Jacobsen**, Northwestern University / Argonne National Laboratory – *'X-ray Absorption and Fluorescence Spectrum Imaging of Biomaterials'*

Abstracts

MAS Tour Speaker, Robert Simmons, Georgia State University
'Microorganisms and You: A Tale of Cohabitation'

Many microorganisms are primarily recyclers. Their main function in the environment is to break down complex materials, which allows the components to be re-used by other organisms. These complex materials include dead plants, dead animals, building materials, valued artifacts of civilization and any number of other things. Problems arise when these organisms invade the built environment such working/ living spaces or even the air handing systems of our vehicles. Various methods, such as air sampling, surface cultures and bulk sample analysis have been used to estimate the density of organisms in a given environment. Volumetric sampling may indicate high levels of fungi or one particular fungus in a building compared to the outdoor environment or some predetermined standard. This method may indicate the presence of viable fungal conidia or hyphal fragments in the air column but it cannot identify sites of fungal colonization. Surface cultures may indicate the presence of viable fungal propagules but do not prove colonization. Surface sampling for light microscopy using clear adhesive tape mounts may demonstrate the presence of colonizing fungi. The methodology, such as types of tape and optics employed may affect the results obtained. Examination of tape samples from environmental surfaces may show the level of colonization and, in many cases, allow for identification of colonizing species. Electron microscopy studies of suspect materials may determine the nature of surface features and types of microbial contamination not readily identifiable in the light microscope. Suspect materials may be shown to be biological in nature or non-biological surface. Microanalysis of materials may yield clues to the origin of non-biological contamination. Rapid and accurate analysis of suspect materials on indoor surfaces is vital to the identification of potential microbial colonization sites. These data may be used as an aid to determining an appropriate course of action.

Nestor Zaluzec, Argonne National Laboratory
'*Advances in Spectroscopic Characterization of Nanoparticles in Electron Optical Instruments'*

Spectroscopy in electron-optical instrumentation is undergoing a transformation in capabilities. Part of this is due to advances in the detector systems, the remainder is due to the evolution of our electron-optical tools and how they are interfaced to ancilliary devices. Modern electron-optical instruments are now allowing us unprecedented capabilities for probing the nature of how nanomaterials are characterized today. In this overview we will discuss the latest advances in high collection angle x-ray energy dispsersive spectroscopy (XEDS) where solid angles in excess of π steradians have been achieved and a direct comparison with conventional detectors and geometries will be discussed for both the TEM/STEM and SEM. In addition, we will compare and contrast this with electron energy loss spectroscopy (EELS) highlighting the merits and limitations of both technologies with respect to nanomaterials characterization in the TEM/STEM. Finally, time permitting we will consider the propects of studying electronic excitations in plasmonic, excitonic and hybrid systems.

David Gosztola, Argonne National Laboratory
'Optical Characterization of Nanomaterials using Temporal and Spatial Spectroscopic Techniques'

Spectroscopic techniques such as ultrafast transient absorption, and confocal Raman microscopy have proven to be very useful for investigating novel nanoscale materials which often have fundamentally different optical properties compared to the bulk. One striking example is the detection of high-frequency acoustic vibrations in metal nanoparticles when excited with femtosecond laser pulses. Such metal nanoparticles are of particular interest because they have the potential to be used in a variety of sensing applications. The challenge has been to precisely characterize and control the crystallinity and geometry of such nanostructures. So far, the decay of these vibrations has been dominated by dephasing due to variations in nanoparticle size. Such inhomogeneities can be eliminated by performing measurements on single nanoparticles deposited on a substrate, but unknown interactions between the nanoparticles and the substrate make it difficult to interpret the

results of such experiments. The effects of inhomogeneous damping can be reduced by using bipyramidal gold nanoparticles with highly uniform sizes suspended in solution. Area mapping using confocal Raman spectroscopy allows for both highly selective chemical imaging along with high spatial resolution. In combination with X-ray nanobeam analysis, a new theory for breakaway oxidation in high temperature alloys was developed after detecting metallic nano-networks in oxide layers which results in locally accelerated oxidation. This new oxidation model can be used to design new alloys with improved oxidation/corrosion resistance at high temperatures

David McComb, Ohio State University
'Probing complex interfaces and nanostructures using analytical electron microscopy'

Electron energy-loss spectroscopy (EELS) when performed in the scanning transmission electron microscope (STEM) is, arguably, the only technique that can provide information of chemistry and bonding in solid materials with near atomic scale spatial resolution. The method has been widely utilized for the study of atomically sharp engineered interfaces grown by thin film deposition methods. Applying STEM-EELS to the study of interfaces in natural materials and real devices is a more complex challenge. In this talk I will use a number of examples to illustrate the insights that can be gained into the structure-property relationships in plasmonic nanostructures, multilayer films for solid oxide fuel cells (SOFCs), mineralised tissue, wear debris in tissue and organic solar cells. The common aspect in all of these studies is the need to probe hard/soft or soft/soft interfaces between inorganic and organic materials. This presents considerable challenges associated with sample preparation, electron beam damage and achievable spatial resolution. I will show that it is possible in many cases to obtain both qualitative and quantitative chemical information that can significantly enhance our understanding in these complex systems.

Ray Twesten, Gatan Inc.
'Recent Advances in EELS Instrumentation and Analysis: High-Speed Spectroscopy with Extended Energy and Dynamic Range'

The acquisition of high-quality EELS data in the transmission electron microscope (TEM) presents many challenges not experienced by most TEM acquisition modes. The central challenges are dose efficiency and dynamic range. For EELS, the range of intensities of interest in a single spectrum can often span 6 to 7 orders of magnitude making recording problematic. Since the spectrum is recorded in parallel, EELS acquisition can be very dose efficient, but only if the acquisition device can be read out quickly and efficiently. To address these issues, we have developed a next generation post-column energy filter, the GIF Quantum®, which excels at energy filtered imaging but also incorporates several new features that allow the optimal collection of energy-loss spectra generated by the high-brightness electron sources currently available. Key features of the GIF Quantum® include a new CCD camera design that achieves high spectra readout rates (>1 kHz) with very little overhead, and a system of electrostatic deflectors that allows the nearly simultaneous (<10µs delay) recording of dual energy-loss ranges with microsecond exposure control. These deflectors enable the optimized acquisition of both high-energy core-loss electrons together with the zero-loss and low-loss electron signal. In this talk, we will present details and advantages afforded by these new developments and show application data collected under optimized conditions.

Chris Jacobsen, Northwestern University / Argonne National Laboratory
'X-ray Absorption and Fluorescence Spectrum Imaging of Biomaterials'

X-ray microscopes allow one to image many micrometer thick, hydrated specimens at 20-100 nm spatial resolution. In fluorescence analysis, one can see trace metals down to the parts-per-billion range, while in absorption spectroscopy one can see oxidation states and functional groups in molecules. This talk will outline capabilities available at the Advanced Photon Source at Argonne, and it will also describe the use of multivariate statistical and pattern recognition analysis techniques to deal with data complexity. Example applications in biology and environmental science will be highlighted.

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.