



Topics in Microscopy

presented by

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

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

Friday, November 18th, 2016

**Baxter Healthcare Corporate
Headquarters, Deerfield, IL**

(Directions and map below)

**Please RSVP by Tuesday, November
15th**

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 2017)**

**We welcome vendor participation. Tables are available for \$100. Please contact Jason
Mantei:(jason_mantei@baxter.com)**

8:00 - 9:00AM

Registration, Continental Breakfast will be served

9:00 - 9:15AM

Welcome and Opening Remarks

**9:15 - 10:00AM Applications of Optical Coherence Tomography for Nondestructive Evaluation of
Materials**

Jim Slepicka, Engineering Specialist, Baxter International

Of the various tomographic imaging methods that have become commonplace such as confocal microscopy, computed tomography (CT), and magnetic resonance imaging (MRI), Optical Coherence Tomography (OCT) has perhaps undergone the most rapid technical development, finding use in an ever-widening range of applications. While relatively new, OCT is filling a long sought-after gap in depth-resolved optical imaging techniques. While its use over the past 25 years has been primarily as a diagnostic tool for ophthalmology and pathology, its role in nondestructive evaluation (NDE) of materials and structures is gaining wider acceptance as new approaches and novel uses are explored. This is due to its relative simplicity, high resolution and speed, non-contact/non-destructive nature, and flexibility in application, not to mention affordability. Some typical applications include inspection of composites and multi-layer films, characterization of coatings and particles, surface profilometry, and visualization of two-phase flows.

10:00 - 10:45AM Cryo-Electron Microscopy of biological and soft matter samples: an overview

**Reiner Bleher, Ph.D. Research Assistant Professor NUANCE Center, EPIC, Northwestern
University**

Sample processing for electron microscopy often includes chemical fixation and dehydration, or drying, which can introduce unwanted artifacts, e.g. shrinkage, distortion, and extraction to specimens. Cryo electron microscopy is the method of choice when samples need to be observed in pristine, hydrated, and unaltered condition. This talk will give an overview of sample preparation methods and workflows for cryo-TEM and cryo-SEM of biological and soft-matter samples. Some techniques will be presented with examples of cryo-EM research at the Northwestern University Atomic and Nanoscale Characterization Experimental Center (NUANCE).

10:45 - 11:15 **Break - Visit with Vendors**

11:15 - 11:45AM **It's not all blots & arrays yet. The continued need for electron microscopes in pathology diagnosis**

Clive Wells, Director of the Electron Microscopy Facility, Medical College of Wisconsin

In the last few decades new and improved techniques have contributed significantly to better diagnosis and understanding of many disease processes. Molecular biology techniques such as RNA and DNA hybridization and PCR have made it possible to identify specific genetic markers of disease conditions including hereditary defects, infectious agents and neoplasms. Immunohistochemistry has become routine in the diagnosis of neoplasia and flow cytometry is a routine and efficient technique for measuring ploidy. The importance of these techniques is clear, however, there remains a continued need for the traditional morphological observation techniques. These still comprise the backbone of pathology diagnosis. Among this group of techniques electron microscopy, especially TEM, continues to be a valuable tool when applied selectively. This presentation will attempt to highlight some of these for TEM in pathology diagnosis.

11:45- 12:15PM **MMMS Business Meeting**

12:15- 1:30PM **Lunch - Visit with Vendors**

1:30 - 2:15PM **Basic Digital Imaging and Image Formats**

W. Gray (Jay) Jerome, Ph.D., Vanderbilt University School of Medicine

Most microscopy is now digital image based yet many microscopists do not fully understand basic digital image concepts. This talk covers, in a general, easy to follow manner, the basics of digital imaging in order to provide the microscopist with sufficient information to avoid common pitfalls. The field of "scientific" digital imaging is only a small subset of digital imaging. There are lots of things you can do in digital imaging that you should not do in scientific imaging because it destroys the integrity of your data; the image. Unfortunately, with modern digital imaging it is far too easy to inadvertently alter the image without even knowing that you have done so. In this talk, we review the basics of a digital image and discuss how to match the microscope parameters and image capture parameters in order to maximize image fidelity. We will also discuss post image processing and how these can affect the image data. Finally, the basics of image formats (JPEG, TIFF) are critical but not always understood, so we include a discussion of the appropriate uses of these formats. The image information is the data and not understanding basic "scientific" digital imaging can lead to accumulation of artefactual errors.

2:15 - 2:45PM **Multi-scale microscopy**

Christopher J. Gilpin, Director LifeScience Microscopy Facility, Purdue University

Correlative microscope has begun to mature in recent years. Inevitably, when science attempts to correlate results from different imaging modalities the question of scale arises. Ultimately the goal is to be able to seamlessly cross scales however when there is a need to move from meters (whole human) to atomic scale difficulties arise. The goal of this presentation is to explore some of the modalities currently in use and to attempt to describe how tie together results from different scales.

2:45 - 3:30PM **Chemical identification at the nanoscale: basics and applications of surface-enhanced Raman spectroscopy (SERS)**

Anne-Isabelle Henry, PhD, Research Assistant Professor, Northwestern University

Raman spectroscopy is a well-known analytical tool for scientists to identify compounds in a label-free, non-destructive manner. Yet, its lack of sensitivity poses serious limitations to its use on dilute or low-volume samples where only few molecules are probed. Localized surface plasmons -such as the ones exhibited at the surface of gold or silver nanostructured materials hit by visible light- provide a way to considerably boost the Raman signal intensity, in what is known as surface-enhanced Raman spectroscopy (SERS). As such, SERS embodies the chemical specificity of Raman, with great molecular sensitivity - down to the single molecule level. This impressive sensitivity combined to the variety of available substrates make SERS a very appealing technique for biosensing, among other applications. In this talk I will cover the basics of Raman and SERS, discuss recent progress and applications relative to glucose and biomarkers detection. Trained in physical chemistry (B.S. from Paris-Sud

University, France & Ph.D. from Pierre and Marie Curie University, France) and condensed matter chemistry (M.S. from Paris-Sud University), I have approached problems at the nexus of chemistry and materials science. Since joining Northwestern University, I have been invested in leveraging the metal-organic interface to solve chemical and biological sensing problems.

3:30 - 3:35PM 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

