The MMS Scope

Minnesota Microscopy Society

Local affiliate of the **Microscopy Society of America**
and the **Microanalysis Society**

april 2017

In this Issue:

Spring Symposium:
Join us for an exciting Spring Symposium at the Science Museum's Discovery Hall. The fee for the symposium includes a pass to museum exhibits.
Register by Apr. 27!

Remember to vote:
Election of next year's officers will take place during the business meeting at the Spring Symposium.

Project MICRO:
The Project MICRO program took more scopes to area schools and museums through-out February and March. A big thank you to all who gave their time to a winter full of exciting microscopy demos! See pages 8-11 for a summary and pictures.

MINNESOTA MICROSCOPY SOCIETY
SPRING SYMPOSIUM

FRIDAY, MAY 5, 2017

SCHEDULE on MAY 5

7:30 – 8:15 a.m.	Registration, continental breakfast, vendor displays
8:15 – 8:30 a.m.	Welcome
8:30 – 9:30 a.m.	**Sara Miller, Duke University** *It's a Small, Small World: Electron Microscopy of Minute & Unusual Specimens*
9:30 – 10:30 a.m.	**Scott Burnett, Tony Erickson, Ecolab** *Biofilms in the Food & Beverage Industry*
10:30 – 11:00 a.m.	Break and vendor displays
11:00 – 12:00 p.m.	**Lucille Giannuzzi, L.A. Giannuzzi & Associates, LLC** *FIB Development and Applications through the Years*
12:00 – 1:30 p.m.	Lunch and vendor displays
1:30 – 1:45 p.m.	Business meeting
1:45 – 2:45 p.m.	**Xuejun (Jun) Wang, Nalco Water/Ecolab** *Visualization & Quantification of Biofilm Inhibition & Removal using Confocal Laser Scanning Microscopy*
2:45 – 3: 45 p.m.	**Daniel Grice, Materials Evaluation and Engineering** *Bacteria Eat Metal? - An Overview of Microbiologically-Influenced Corrosion*

LOCATION

Minnesota Science Museum
Discovery Hall (*one floor down from main level*)
St. Paul, MN **map it**
Parking: Science Museum or River Centre parking ramps

120 W. Kellogg Blvd. | 55102

RESERVATIONS

Member: $75 **Student/K-12 teacher:** $20 **Deadline:** Thursday, Apr. 27
Reservations may be made via PayPal by going to the MMS calendar page. Fee includes the meeting, buffet lunch, breakfast, coffee breaks and a free pass to Science Museum exhibits.

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continued

SPEAKER BIOS and ABSTRACTS

Sara Miller

Dr. Sara E. Miller is Professor in the Department of Pathology and Director of the Electron Microscopy (EM)/Immunoelectron Microscopy (IEM) Shared Resource at Duke University Medical Center in Durham, N.C. Dr. Miller is is current president of Society for Ultrastructural Pathology and she is past president of both the Microscopy Society of America and the Southeastern Microscopy Society. Dr. Miller received her B.S. (microbiology/ chemistry) and Ph.D. (microbiology) from the University of Georgia, and completed postdoctoral research at the University of North Carolina.

As electron microscopists, we are accustomed to working with tiny specimens; in fact, it's required. Sometimes, however, the material supplied to us to process is minuscule, even by our standards, and somehow, we're supposed to keep up with it during multiple steps and find it in the electron microscope. Examples include cytology specimens, 6-µm thick sections on a slide, invisible pellets of tissue culture cells, white blood cells from the heel stick of a premature infant, virus purified and banded on a gradient, tears, blister fluid, or other practically invisible samples. Techniques for managing almost invisible specimens will be described including the following:

Tiny-tipped tubes are available for concentrating small amounts of cells such as cytology specimens into a pellet, which can be encased in agar for holding them together and enlarging the mass so that it does not get lost during processing. Pointed BEEM capsules can also be used. Very small amounts of non-adherent cells, such as 200 µl of blood from a premature infant, can be processed in a capillary tube to produce a buffy coat for sectioning and examination of white blood cells or platelets. Another technique for keeping up with small numbers of cells such as those sorted from a FACS (fluorescence activated cell sorter) is to amplify the "invisible pellet" with 0.5 µl of red blood cells.

Focal pathology may be hard to find. However, since a confocal microscope does not require the beam to pass through the specimen, wet sections, made with a vibrating microtome, can be examined to select areas of pathology that can be cut out and embedded. Alternatively, a laser capture devise can be used to select individual cells of interest such as infected cells in tissue cultures or on slides. Also, a 6-µm section on a slide can be embedded in situ, and the section cut out and glued onto a blank block for cutting.

With the use of a Beckman Airfuge and EM-90 rotor (sole source), particles such as cell organelles or viruses can be pelleted directly onto filmed grids and negatively stained. Also, immune serum can be added to a virus suspension to aggregate them or to "glue" them onto a grid. In these ways, specimens too small for handling by routine methods can be kept up with and processed for EM examination.

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SPEAKER BIOS and ABSTRACTS

Scott Burnett

Dr. Scott Burnett is the Director of R&D for Ecolab's Food and Beverage, Latin America Division. He and his team are responsible for bringing innovations to the food manufacturing industry's sanitation, hygiene and food safety programs. Before joining Ecolab, Scott was the Corporate Sanitation Manager at Land O' Lakes and Corporate Manager of Quality and Food Safety at MOM Brands, both in Minnesota, USA. He brings experience in enhancing Food Safety and Quality programs at both corporate and plant levels. Scott has authored or coauthored 12 peer-reviewed scientific publications, has 4 issued patents, and has presented at more than 20 different technical forums. He is on the editorial review board of the *Journal of Food Protection and Food Protection Trends*.

Tony Erickson

Tony Erickson is a member of Ecolab's Food and Beverage CIP (Clean In Place) core technology and new product development team. He has worked extensively in the dairy and brewing segments on CIP innovation. His current focus has been on outcome-based cleaning and sanitizing programs aimed at control and removal of bacterial endospores and non-traditional biofilm in dairy processing.

As the global leader in water, hygiene and energy technologies and services, Ecolab responds nimbly to customers' needs. We partner with food manufacturing and food handling customers to help enable food safety and quality. Due to the heavy influence of microbes on food safety, microscopy provides a critical set of tools in our R&D and customer support functions.

Dr. Scott Burnett will discuss the characteristics of the types of biofilm seen in food processing and share recent work done by Ecolab characterizing how cleaning and sanitizing regimes can impact established biofilm. Tony Erickson will provide analysis of real-world case studies showing the positive impact biofilm control can provide in dairy processing.

We look forward to showing you more about how we help solve customers' problems.

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continued

SPEAKER BIOS and ABSTRACTS

Lucille Giannuzzi

Dr. Lucille A. Giannuzzi holds a B.E. in engineering science and M.S. in materials science and engineering from Stony Brook University. She received her Ph.D. from Penn State in metals science and engineering and was a postdoc at the PSU Center for Advanced Materials. Prof. Giannuzzi was at the University of Central Florida for 10 years where she was a recipient of an NSF CAREER award. She joined FEI Company as a product marketing engineer for seven years before founding her own consulting and product companies. Dr. Giannuzzi has applied focused ion beam and electron microscopy techniques to study the structure/property relationships in metals, alloys, ceramics, composites, polymers, minerals, bone/dental implants, irradiated, inorganic, and biological materials. She maintains professional affiliations in AVS, ACerS, ASM Intl., TMS, MRS, MSA, and MAS and is a Fellow of AVS and MSA. Dr. Giannuzzi has more than 125 (co)authored publications; several FIB-related patents, contributed to several invited book chapters, and is co-editor of a book entitled "Introduction to Focused Ion Beams."

Focused ion beam (FIB) microscopy, specimen preparation, and nanoprototyping has witnessed numerous advances over the past 20+ years. First perceived as an expensive novelty, the FIB currently offers necessary and indispensable capabilities for any major research university, company, or national laboratory. FIB usage for site specific milling and deposition is now status quo. Standard specimen preparation protocol exists for high resolution transmission electron microscopy and other characterization analyses requiring minimal surface damage. Over the years, these techniques improved with an understanding and application of the fundamentals of ion-solid interactions. Successive FIB slicing followed by imaging and associated analytical methods enable 3D tomographic materials characterization containing morphology, microstructure, chemistry, and crystallography. The automation of these functions improves reliability, statistics, and throughput. Despite its maturity, FIB instrumentation and applications continue to develop. New sources emitting different ions species and beam currents allow materials characterization across the nano-, micro-, and macro- length scales. In addition, easier and faster micromanipulation methods performed outside the FIB optimize FIB instrumentation usage. In this lecture, FIB development and applications characterization and prototyping will be presented. Attention will be given to discoveries of structure/property relationships in materials possible only by FIB. In addition, the future of FIB will be discussed. Examples from metals, ceramics, polymers, composites, integrated circuits, minerals, biomaterials, and nuclear irradiated materials will be provided.

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SPEAKER BIOS and ABSTRACTS

Jun Wang

Dr. Xuejun (Jun) Wang is a Staff Scientist in the Research Analytical Group at Nalco Water, an Ecolab Company. Jun joined Research Analytical in June 2007 after he obtained his Ph.D. from the University of Notre Dame and did postdoc research with Paul Bohn, first at the University of Illinois, Urbana-Champaign then at Notre Dame. Jun has expertise in white light interferometry (WLI), confocal laser scanning microscopy (CLSM), surface analysis including XPS, AES and TOF-SIMS, and customized low-cost digital imaging.

Incoming water is the single largest component in the production of paper and related products. Contamination problems, due to ineffective water treatment, may not only manifest themselves on the machine, but also at the wastewater treatment plant. Freshwater microorganisms form biofilms that can lead to reduced efficiency and product quality on the process side of the mill operation and filter plugging, poor clarification, and effluent turbidity issues in the wastewater treatment plant. The inhibition and removal of biofilm using biocontrol programs is crucial to mitigating these problems. To determine the most effective strategy to eradicate biofilm in the effluent pipe, biofilm inhibition and removal was evaluated using confocal laser scanning microscopy (CLSM). By staining the biofilm with viability fluorescent dyes, a method was developed to quantify volume of live and dead cells, which can be used to compare different programs quantitatively. In addition, CLSM provides information about the distribution of organism in a biofilm and their susceptibility to biocides. Based on the biofilm inhibition and removal data, chlorine dioxide was determined to be the most effective approach to remove existing biofilm and keeping the pipe surface clean.

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SPEAKER BIOS and ABSTRACTS

Dan Grice

Dan Grice, P.E., is a Senior Materials Engineer with Materials Evaluation and Engineering, Inc. in Plymouth, Minn. Dan has expertise in failure analysis, materials characterization, product evaluation and materials research and development. In his current role, he specializes in evaluation of failures in metallic and nonmetallic materials by fracture, wear, and corrosion. Prior to joining MEE, Dan was the Manager of Metallurgical Services for IMR Test Labs in Lansing, N.Y. At IMR, he was responsible for a team of technicians and engineers performing routine testing and material characterization projects.

Dan received his B.S. in materials science and engineering in 2009 from the University of Wisconsin-Madison. As a student and professional, he has been active in ASM International, including serving as chair for the UW-Madison Material Advantage Chapter, the ASM Twin Tier Chapter, and the ASM Emerging Professionals Committee. Dan has been an active member of the ASM Failure Analysis Committee since 2010, and is currently the Emerging Professional representative on the Failure Analysis Society Board of Directors. He is a registered professional engineer in Minnesota.

Although one of the least-known and least-understood corrosion mechanisms, microbiologically-influenced corrosion (MIC) is among the most damaging in terms of total cost to society. Recent estimates indicate that the annual cost of corrosion in the United States is around $300 billion, and as much as 20% of that cost can by attributed to MIC. For the most part, microorganisms do not actually consume the metal, but rather create an environment that fosters the corrosion processes.

Microorganisms, including bacteria, fungi, and microalgae, can accelerate the rates of corrosion processes or change the dominant corrosion mechanism through their presence and metabolic processes. MIC has been reported for almost all significant metal alloy systems and in applications including seawater, potable water, hydrocarbon fuels, food processing and sewage. This presentation will cover the mechanism for MIC, some of the significant organisms, methods for diagnosing the problem, and some of the mitigation techniques.

CALENDAR of EVENTS

4 NOV 2017 **Microscope Day** (9th year!)
Minnesota Science Museum
St. Paul, Minn.
12:00 – 4:00 p.m.

DON'T FORGET!

Election of MMS officers for 2017/2018 will be conducted during the business meeting following lunch.

Candidates proposed by the board:

- President Elect – Tony Anderson
- Secretary – Patti Sanft
- Treasurer – Bede Willenbring

* *Nominations will be accepted from the floor.*

THANK YOU

Project MICRO

Thank you once again, Project MICRO Volunteers!

Project MICRO had the busiest winter this year! We would not have succeeded without our dedicated volunteers. THANK YOU for all your time and enthusiastic help to inspire the next generation of microscopists!

We participated in the *Evenings@TheBakken* program at **The Bakken Museum** on Thursday, February 9 from 5:30 to 9:00 p.m. The Bakken Museum is an old, beautiful mansion on the west side of Lake Calhoun. This evening featured "Hot + Cold" night. We provided microscopes both inside and outside for 75 curious adult visitors who explored what made their hearts warm up and their heads cool off in this month of love and chills.

Thank you, volunteers **Steve Axdal**, **Burton and Muriel Gavin**, and **Jeff Payne**. Steve and Jeff get extra kudos for helping the few attendees willing to brave the cold outdoors in the name of microscopy! And thank you, Jeff, for providing photos.

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On Friday, February 10, we presented at **Poplar Bridge Elementary School** in Bloomington for STEAM Night from 5:30 to 7:30 p.m. Volunteers **Steve Axdal**, **Muriel Gavin**, **Stuart McKernan** and **Jeff Payne** served more than 100 young scientists and their families with enthusiasm and expertise. Below is a testimony to the great work of Project MICRO.

"*Thank you so much for bringing microscopes and microscopists to Poplar Bridge for our STEAM night. I have heard nothing but great things. Students are pressuring me to get the "Microscope Station" set up in our room. Today, a student brought in a soggy newspaper from his bus stop and said, "Mrs. Binning, I really want to look at this under a microscope so that I can see all the details." I heard students telling each other about their microphotographs. Students have been talking about the variety of sand on earth. The things I've heard go on and on. Thanks again for coming to our school.*"

-- Adele Binning, Science Specialist, Poplar Bridge Elementary

THANK YOU, cont'd

Project MICRO

On Friday, February 24, we demonstrated at **Echo Park Elementary** in Burnsville for Engineering Night from 6:00 to 7:30 p.m. Many classrooms were full of engineering, math and science activities. Our room was way down at the end of the hall, but one of the most visited. **Muriel Gavin**, **Jeff Payne** and **Stuart McKernan** served more than 100 enthralled students with families, satisfying their science curiosity. The school also borrowed 10 little microscopes from the Science Museum and provided three large boxes filled with interesting objects to view. Muriel helped with all the small microscopes, Jeff was in charge of our Leica stereoscope and photography, and Stuart demonstrated our Dino-light digital microscope. Many visitors did not want to leave our room activities. Thank you, Muriel, for providing photos and reporting this event.

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On Friday, March 10, we participated at **Eagle Creek Elementary** in Shakopee, in the evening. A continuous stream of young and not-so-young visitors kept our dedicated volunteers **Steve Axdal**, **Muriel Gavin**, and **Stuart and Janet McKernan** very busy. More than 60 visitors learned about microscopy from us. Several visitors were very dedicated and did not want to leave the microscopes. Thank you, Stuart, for taking the reigns in leading and reporting this event.

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A very special THANK YOU goes to **Jeff Payne**, our **Project MICRO Director**, who recruits, organizes and leads our events! He also hauls our equipment around and stores it all at his house. His endless dedication to our outreach program is above and beyond the call of duty. Project MICRO works amazingly well because of Jeff!

MMS - Project MICRO is 21 years young! 1996 to 2017!

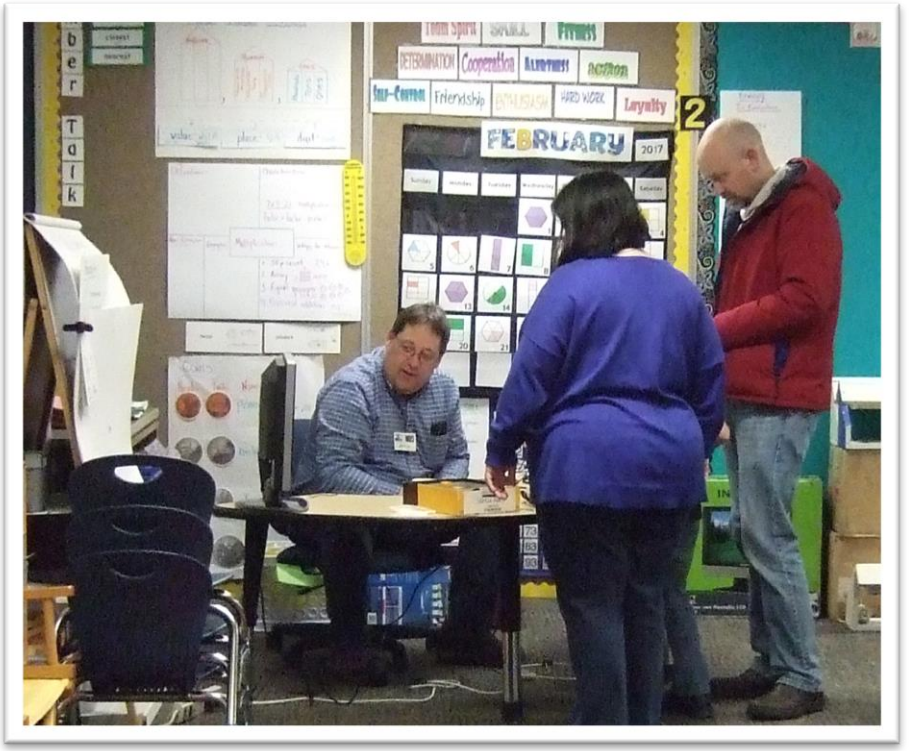
Cheers!

PROJECT MICRO PHOTO ALBUM

Couple enjoying magnified ice chunks.

Visitor loving microscopy.

PROJECT MICRO PHOTO ALBUM - 2



Jeff Payne showing microscopy to teachers.

Stuart McKernan's digital microscope station.

Muriel Gavin's small scopes station.

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Bldg. 201-B-S-03, St. Paul, MN 55144;
(651) 736-5993; smckernan@mmm.com

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Bldg. 201-BE-16, St. Paul, MN 55144-1000;
(651) 733-2352; jjpayne@mmm.com

Corporate Liaison: Jason Heffelfinger, Medtronic,
6700 Shingle Creek Pkwy, Brooklyn Ctr, MN 55350;
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4763 Decatur Ave N, New Hope, MN; 55428
(763) 533-0649; webmaster@mnmicroscopy.org

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MINNESOTA MICROSCOPY SOCIETY | MEMBERSHIP FORM

All microscopists are urged to support their Society at one of the membership levels offered below. Often, supervisors will support MMS memberships out of their project budget because they recognize that it is a very inexpensive way to maintain and increase the skills of their microscopists. If you have been a member over the years and recognize the value of MMS to the community of microscopists it serves, consider upgrading your membership this year to the Patron or Sustaining level. Thank you.

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