



# The MMS Scope

Minnesota Microscopy Society

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

April 2022

## In this Issue:

### Spring Symposium

Join us for the return of the in-person Spring Symposium on May 20 from 7:30am to 3:00pm. The theme this year is *Sample Preparation*. Register soon and plan to participate.

### MMS Member Dues

Please remember to submit your annual 2022 membership dues.

### Past Events

View highlight slides from the virtual Winter Research Extravaganza, *Hold the Mayo!*

## MINNESOTA MICROSCOPY SOCIETY ANNUAL SPRING SYMPOSIUM

FRIDAY, MAY 20, 2022



SYMPOSIUM SCHEDULE – ★ in person! ★

7:30 a.m. – 3:00 p.m.

7:30 – 8:15 a.m. Registration, continental breakfast, vendor displays

8:15 – 8:30 a.m. Welcome

**8:30 – 9:30 a.m. Katherine Igowsky, MNBCA**  
*Sample Preparation in the Forensic Laboratory*

**9:30 – 10:30 a.m. Vern Robertson, JEOL**  
*How Hydrocarbon Contamination and Sample Prep Techniques Affects Imaging and Microanalysis on an FEG SEM/EPMA, Especially at Low kVs*

10:30 – 11:30 a.m. Break and vendor displays

11:30 a.m. – 12:30 p.m. Lunch and vendor displays

12:30 – 12:45 p.m. Business meeting

**12:45 – 1:45 p.m. Mary Buckett, 3M**  
*From Smart Phones to Silicones – Sample Preparation from an Industrial Lab Perspective*

**1:45 – 2:45 p.m. Shiba Dandpat, Lumicks USA**  
*Real-time imaging of dynamic single-molecule interactions: from DNA binding proteins to molecular motors*

2:45 p.m. Raffle and social time



### LOCATION

Science Museum of Minnesota  
Discovery Hall  
St. Paul, MN

► [Map](#)



120 W Kellogg Blvd,  
St Paul, MN 55102



### REGISTRATION

**Cost:** \$75 for MMS members

Fee includes continental breakfast, boxed lunch (choose from 4 options at registration link below), and coffee/snacks.

► [Click to register](#)

### PLEASE NOTE:

Attendees must follow the Science Museum's current [COVID-19 safety measures and requirements](#) to enter the building. During the event, well-fitted face masks worn over the nose and mouth will be required while in Discovery Hall except when eating and drinking.

## Spring Symposium | 2022

*"Sample Preparation"*

continued



### SPEAKER BIOS & ABSTRACTS

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**Katherine Igowsky** (Katie) has worked for the Bureau of Criminal Apprehension (BCA) for 17 years. She started out at the Minnesota BCA working in conjunction with the Regional FBI Mitochondrial DNA program as a hair examiner. She continues to work for the BCA in the Trace Evidence Section and serves as the technical leader. She analyzes and compares trace materials in criminal cases such as glass, tape, fibers, hair, using various microscopic techniques, including polarized light microscopy (PLM), Fourier transform infrared microscopy (FTIR), microspectrophotometry (MSP) and scanning electron microscopy (SEM/EDS). In addition to her laboratory duties, Katie also processed crime scenes as a member of the BCA crime scene team.



Katherine Igowsky

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### ***Sample Preparation in the Forensic Laboratory***

Materials such as tape, hairs, glass, fibers, etc., are examined to establish connections in crimes. They can help establish that a suspect was at a crime scene, that a suspect was in contact with a victim, that the suspect's vehicle was at the crime scene, etc. These materials are analyzed using various microscopic techniques including polarized light microscopy (PLM), Fourier transform infrared (FTIR) microscopy, microspectrophotometry (MSP), and scanning electron microscopy (SEM/EDS). Preparation of this wide range of materials requires many different sample preparation techniques. This presentation will give an overview of some of the materials tested in the forensic laboratory, instrumental techniques used, sample preparation techniques, and how these types of analyses are used to solve crimes.

## Spring Symposium | 2022

"Sample Preparation"

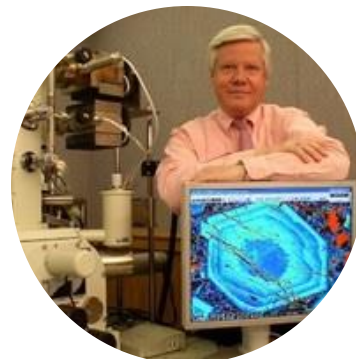
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### SPEAKER BIOS & ABSTRACTS

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**Vern Robertson** has been with JEOL USA for more than 32 years and was appointed EPMA/Surface Analysis Product Manager in early 2016 and will continue as SEM Technical Sales Manager, providing in-house and in-the-field technical product support and customer applications support. Vern served as the senior SEM Applications Specialist at JEOL beginning in 1986. He was appointed National Laboratory Manager in 2004, and FEG SEM Product Manager in 2005. Vern received his B.Sc. in Geology from the University of New Hampshire. His prior industrial experience includes eight years of consulting in an independent testing lab specializing in industrial and environmental problem solving, with responsibilities including polarized light optical microscopy, and atomic emission and absorption spectroscopy SEM with EDS/WDS and X-ray diffraction. Vern was a recent member of the MAS (Microanalysis Society) Council.



Vern Robertson

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### ***How Hydrocarbon Contamination and Sample Prep Techniques Affects Imaging and Microanalysis on an FEG SEM/EPMA, Especially at Low kVs***

As the scale of things we would like to image and analyze with an SEM or EPMA become smaller and smaller, there is a huge advantage to using an FEG SEM or FEG EPMA at low accelerating voltages and higher beam currents to maintain X-ray counting statistics, and reduce the excitation volume of where the BSE and X-rays are emitted from. The advantage is that you do not have a significant loss of probe diameter at those conditions. Using a low kV with a lower beam current allows one to image at an ultra-high resolution and surface sensitivity.

All of these benefits come with some serious complications and limitations. The first of which is carbon (often referred to as hydrocarbon) contamination. The other factors include sample preparation and sample conductive coatings. In this talk I will present ways to clean the C contamination that may be on the samples, which is sample dependent, and the best ways to prevent C contamination in the first place. I will also address the side effects of the sample prep procedures.

## Spring Symposium | 2022

*"Sample Preparation"*

continued



### SPEAKER BIOS & ABSTRACTS

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**Mary Buckett** is currently a Lead Research Specialist in the Corporate Research Analytical Laboratory at 3M Company. She has worked her whole career at 3M in the Transmission Electron Microscopy (TEM) Lab, primarily developing characterization methods for new materials technology, competitive analysis, and protecting intellectual property. Mary has particular expertise in sample preparation methods for all types and combinations of materials. She is the recipient of 13 patents and 21 records of invention at 3M, and has coauthored 78 technical publications. Prior to 3M, Mary was at Argonne National Laboratory (Chicago, IL), and was an NSF Fellow at the National Research Institute for Metals (Tsukuba, Japan). She received a B.S. in materials science and engineering from the University of Wisconsin-Madison, and a Ph.D. in materials science and engineering from Northwestern University (Evanston, IL).



Mary Buckett

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#### ***From Smart Phones to Silicones – Sample Preparation from an Industrial Lab Perspective***

From an industrial analytical lab's point-of-view, there is constant pressure to optimize the quality vs. throughput timing of our work. It's not a stretch to realize that each of these considerations has the potential of derailing an entire effort. So, how can we minimize the risk of this happening? One critical, yet under-appreciated, consideration is the sample preparation step. Get this step right on the first attempt and you have a good chance of producing a good quality result while minimizing the throughput time, and ultimately keeping the analytical costs manageable.

I'd like to share some of the learnings from working 28 years in 3M's Corporate Research Analytical Laboratory. Sample preparation – especially the use of microtomy – from the first handoff to the final form that goes into the analytical instrument (TEM, SEM, AFM, IR, SIMS, etc.) will be covered for investigations of new technology/product developments, competitive teardowns, defect analysis, and quantitative metrology.

## Spring Symposium | 2022

"Sample Preparation"

continued



### SPEAKER BIOS & ABSTRACTS

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**Shiba Dandpat** works as an Application Scientist for LUMICKS. He has a background in RNA biochemistry and single-molecule biophysics. Prior to joining LUMICKS, Shiba received his Ph.D. in chemistry from the University of Michigan at Ann Arbor, working on bacterial RNA structures for understanding their role in gene regulation.



Shiba Dandpat

#### ***Real-Time Imaging of Dynamic Single-Molecule Interactions: From DNA Binding Proteins to Molecular Motors***

Biological processes emerge from mechanisms at the molecular scale. While biophysical techniques (e.g., X-ray crystallography, cryoEM) with bulk biochemical assays (e.g., enzymatic reactions, fluorescent reporters) have helped to better understand emergent structure-function relationships, the complete picture of molecular-scale mechanisms is often missed. In addition, the existing techniques often do not provide tools to observe and manipulate a biological system simultaneously and understand mechanisms from the molecular to the cellular level.

In this talk, I will introduce a single-molecule imaging tool, the [C-Trap](#), which enables users to observe and manipulate biological systems in real-time. This technology combines two Nobel prize-winning ideas (optical tweezers and super-resolution STED microscopy), integrated with easy-to-use microfluidics, that allows users to perform single-molecule studies on a broad range of biological systems. I will present some case studies to highlight the role of C-Trap in looking at DNA/RNA-proteins interactions, proteins/RNA-structure dynamics, nucleic acid/protein condensates, and single-cell studies. The presented case studies and workflows serve as a framework for measuring and visualizing complex and dynamic biological systems, that would be extremely challenging to study using conventional biophysical techniques. Although most of the current applications fall into the biophysics realm, a variety of applications are emerging in material science, nanoscience, and broader biology field every day.



## MEMBER DUES

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The Society is collecting dues. Please remember to submit your 2022 calendar year membership dues.

*Thank you!*



## PROJECT MICRO

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No updates: Project Micro is on hold.



## PAST EVENT HIGHLIGHT: Virtual Mayo Tour & Talks

On February 24, the Minnesota Microscopy Society hosted *Hold the Mayo!* – a Virtual Winter Research Extravaganza. Attendees joined online for a virtual tour of the Mayo Clinic Microscopy Facility and presentations on dissection of brain architecture and chemistry using state-of-the-art microscopy. The event was hosted by our next MMS president, **Jeffrey Salisbury, Scientific Director, Mayo Microscopy and Cell Analysis Core**, and it also included talks from members of the Mayo research staff.

**Minnesota Microscopy Society**  
**Hold the Mayo!**  
 Winter Research Extravaganza

Discovery in Human Health  
 and Disease Through  
 Cutting Edge Microscopy

Covid-19 Virus

**Brief Highlights**

- Rigorous Training Program for Core Staff
- CAP, CLIA, and NY State Certification
- Intramural and Extramural Business both Research and Clinical
- Development of New Clinical Tests
- 10% / yr Growth in Services
- Significant Extramural Funds for Core Instrumentation and Digital Image Analysis Infrastructure
- Recognized Nationally as a Standard of Excellence in Microscopy
- Staff of ~24 FTE
- 14<sup>th</sup> Floor Guggenheim Bldg - 5 TEMs, 2 SEMs SBFSEM, Optical and Flow Instrumentation
- Operate on a Break-Even Direct Budget of >\$3.5M

Recording... You are viewing Jeffrey Salisbury's screen 3:27:25 View Options

Remove Spotlight  
 Jeffrey Salisbury

Unmute Start Video Security Participants Chat Share Screen Polls Pause/Stop Recording Live Transcript Breakout Rooms Reactions End



Hold the Mayo! - 2

# Microscopy in Mayo's Architecture



Panel on 2<sup>nd</sup> Floor Plummer Building Elevator Door  
Hermes (?) Greek God of Doorways



Henry Plummer  
Physician and Architect of the Group Practice



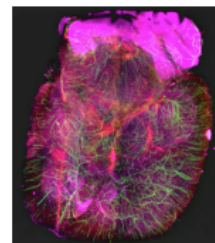
Panel from Foundation House Balfour Hall-Stained Glass showing an Investigator at the RCA 1A TEM



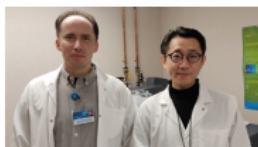
**Virtual Tour of Microscopy Facility**  
**Jeffrey L. Salisbury, Ph.D.**  
Scientific Director – Mayo Microscopy and Cell Analysis Core



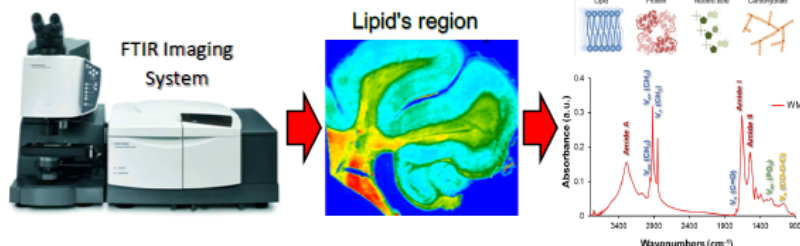
**"Chronic Alcohol Exposure Compromises Attention and Avidity for Natural Rewards: A 3D Brain-wide Remodeling of Neural Activation."**  
**Lee R. Peyton, Ph.D.**  
Mayo Molecular Pharmacology and Experimental Therapeutics



(Right) Optical section of a mouse brain stained with FITC-albumin-gelatin (green) and nuclear stain To-Pro 3 (magenta) imaged using a 2.5x objective with a Zeiss Lightsheet 7.



**"IR Microspectroscopy as a Tool to Study Biochemical Changes in Neurological Disorders"**  
**Alex Gakh, Ph.D. and Yong Guo, Ph.D.**  
Mayo Neurology Research







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Corporate Sponsors are the backbone of financial support for the Society. These members make it possible for the Society to support Project Micro and to cover many expenses of the regular meetings and the Spring Symposium. MMS gratefully acknowledges the corporate sponsorships provided by the following companies. To become a Corporate Sponsor, complete and return the MMS membership form at the end of the newsletter.

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The Minnesota Microscopy Society would like to express sincere thanks to our Sustaining and Patron Members. These members provide financial support to the organization above the standard membership fee. This additional support makes it possible for MMS to maintain its financial well being. To become a Patron or Sustaining Member, complete and return the MMS membership form at the end of the newsletter.

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