

# The MMS Scope

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

April 2023

## In This Issue:

### Spring Symposium

Join us May 5 from 8:30am to 4:00pm for an in-person Spring Symposium in an exciting **new location**. The theme this year is *Extreme Microscopy!* Register soon and plan to participate.

### MMS Member Dues

Please remember to submit your 2022-2023 membership dues.

### Vote for New Officers

Election of new officers will take place during the Spring Symposium.

### Past Event – Bakken MDC

Review the fun or see what you missed at March's tour of the Earl Bakken Medical Device Center at the UofM.



## 2023 Spring Symposium



Friday,  
May 5, 2023



**Extreme**  
Microscopy!



SYMPOSIUM SCHEDULE – 8:30 a.m. – 4:00 p.m. CT

8:30 – 9:15 a.m.	Registration, continental breakfast, vendor displays
9:15 – 9:30 a.m.	Welcome
<b>9:30 – 10:30 a.m.</b>	<b>Chris Own, Voxa</b>
<b>10:30 – 11:30 a.m.</b>	<b>Khalid Hattar, Univ. of Tennessee, Knoxville</b>
11:30 a.m. – 12:30 p.m.	Lunch and vendor displays
12:30 – 1:30 p.m.	Student/postdoc posters and vendor displays
1:30 – 1:45 p.m.	Business meeting
<b>1:45 – 2:45 p.m.</b>	<b>Jeff Havig, Univ. of Minnesota</b>
<b>2:45 – 3:45 p.m.</b>	<b>Sarick Matzen, Univ. of Minnesota</b>



### LOCATION ★ new! ★

[Minnesota Landscape Arboretum](#)

MacMillan Hall  
3675 Arboretum Dr.  
Chaska, MN 55318

► [Map](#)



**PARKING:** See map on next page for details.



### REGISTRATION

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

(Fee includes continental breakfast, boxed lunch, coffee/snacks)  
\$20 student/teacher

► [Click to register for symposium](#) **Deadline: Thursday, April 27**

► [Click to register for poster session](#) **Deadline: Friday, April 21**

See *Call for Posters* on the next page to learn more.

## Spring Symposium | 2023

"Extreme Microscopy!"

continued



### SYMPOSIUM PARKING

#### Address:

MacMillan Hall | 3675 Arboretum Dr., Chaska, MN 55318



### CALL FOR POSTERS

For the first time, the Minnesota Microscopy Society is seeking poster presentations for its annual Spring Symposium on May 5, 2023! We welcome posters showcasing work that incorporates any form of microscopy. Undergraduate and graduate students, as well as postdoctoral researchers are encouraged to participate.

#### Why present a poster?

1. **Network** – the small, casual forum means you have more opportunities to discuss your work with academic faculty, industry microscopists, and vendor representatives!
2. **Preparation for M&M July 2023 in Minneapolis!**
3. **Compete for a prize** – awards will be presented for Best Poster (students only) and Best Microscope Image (students and postdocs). Looks great on a resumé!

#### Poster requirements

- Incorporates microscopy images or data
- Maximum size is 28" x 36" (horizontal or vertical alignment)
- Maximum of two official presenters per poster

Register your poster here by April 21: <https://forms.gle/rcTF4mpji7xebtN67>

Questions? Contact Carol Johnson at [caroljohnson49@gmail.com](mailto:caroljohnson49@gmail.com).

## Spring Symposium | 2023

“Extreme Microscopy!”

continued



### SPEAKER BIOS & ABSTRACTS

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**Dr. Christopher Own** is founder and CEO of [Voxa](#), based in Seattle, Wash. Voxa specializes in accessible, field-portable and high-throughput analytical tools, serving research labs, industrial users, and the International Space Station for the benefit of humankind. Chris received his training at Northwestern University and has more than two decades of experience providing tools for broad areas including materials crystallography, gene sequencing, neuroscience, and aerospace, integrating high-performance computing and distributed networking solutions for both lab and industrial-scale scientific endeavors.



Chris Own

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#### ***Seeing the small in the vastness of space***

In the unforgiving research environment of the International Space Station, small things can kill. Unknown foreign object debris (FOD) causes potentially catastrophic emergencies for astronauts on board. The inability to identify such contaminants, often smaller than the eye can see, has halted orbital research and maintenance activities for months to years at a time.

Working with NASA scientists and spaceflight specialists, Voxa developed and deployed the first scanning electron microscope in space -- [Voxa's Mochii](#) -- to serve orbital research and mitigate flight risks on board the ISS. The process of preparing Mochii for deployment in the spaceflight environment was intense, with challenges never anticipated because terrestrial EM technology had never been considered in such an environment. Now on-board and operational as part of the ISS National Laboratory, Mochii is available for international researchers across disciplines to access the microscale in microgravity. Mochii is delivering exciting scientific and engineering results in the extreme environment of low Earth orbit, and is paving the way for new capabilities for future missions on the moon and beyond.

## Spring Symposium | 2023

“Extreme Microscopy!”

continued



### SPEAKER BIOS & ABSTRACTS

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**Dr. Khalid Hattar** is a new [Associate Professor](#) at the University of Tennessee, Knoxville, and Director of the Tennessee Ion Beam Materials Lab. Khalid has more than 18 years of experience in radiation damage effects and *in situ* electron microscopy in a large range of materials systems. He has developed a range of *in situ* techniques to explore the microstructural and property response of materials to combined extreme conditions at both the TEM and SEM length scale.



Khalid Hattar

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#### **Nanoscale evaluation of extreme environments**

Understanding the relationship between processing, structure, and properties of materials has been core to humanity's progress since the Stone Age. Recent advancements in nanoscale modification and characterization tools along with exponential growth in computational capabilities have greatly expanded our ability to understand and control the properties of materials down to the nanoscale. Ion beam tailoring of materials has become essential to most nanoscale processes to control the structure and subsequent properties of materials. Similarly, transmission electron microscopy (TEM) has become linked with nanoscale characterization.

This presentation will highlight capabilities developed to permit real-time nanoscale and microscale observation of materials exposed to MeV ion irradiation, keV gas implantation, quantitative mechanical loading, laser heating, gas or liquid environments, or various combinations thereof. These capabilities will be highlighted through a set of three experimental examples ranging from: 1) the effects of ion and laser irradiation in high-purity gold through structural metals to ceramic insulators; 2) *in situ* TEM techniques with nanoscale orientation image mapping to associate the dynamic evolution with multiscale modeling efforts; 3) advancements in TEM stages permit studies in gas, liquid, quantitative mechanical testing, and many more environments. Finally, the presentation will conclude with a discussion of the future direction of the *in situ* extreme environment field, generally, and the user facility at the Tennessee Ion Beam Materials Lab specifically.

## Spring Symposium | 2023

“Extreme Microscopy!”

continued



### SPEAKER BIOS & ABSTRACTS

**Dr. Jeff Havig** is a [Research Associate](#) in the fields of environmental geochemistry and geobiology in the Department of Plant and Microbial Biology (College of Biological Sciences) and the Department of Earth and Environmental Sciences (College of Science and Engineering) at the University of Minnesota. He is interested in the intersection of life-water-rock interactions, and how those interactions impact microbial communities and the environments in which they live, and how those interactions are preserved as biosignatures in the rock record. Jeff works across a range of environments, including lakes, glacier/periglacial systems, and hot springs in Yellowstone National Park. Jeff has worked across many of the hydrothermal areas in Yellowstone National Park for ~ 20 years, working with collaborators to characterize the hot spring environments, making links to help with looking for evidence for life in some of the most ancient rocks on Earth, making connections with origins of life research, and helping inform the search for evidence of past life on Mars.



Jeff Havig

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### ***Microscopy of Yellowstone siliceous sinters and geyserites: Preservation of biosignatures, possible hot spring deposits from 3.48 billion years ago, and the search for evidence of past life on Mars***

Yellowstone hot springs have been scientifically studied for more than 150 years starting with the Hayden Expedition in 1871, ultimately providing breakthroughs ranging from Taq Polymerase (an enzyme stable at high temperatures used to amplify DNA), to the first description of Archaea (the third branch of the tree of life). In many of the thermal features in Yellowstone, silica-saturated thermal water comes to the surface and then cools, driving the precipitation of siliceous sinters. In some cases, the eruptive splashing (geysing) of this water leads to the formation of geyserite – a mineral texture unique to hot springs. Here I will present results of scanning electron microscopy imaging (along with other complementary analytical techniques) of siliceous sinters and geyserites collected from thermal areas in Yellowstone National Park. I will discuss this imaging in the context of better understanding how textural and geochemical biosignatures are formed and preserved, showing how this work has helped with describing 3.48-billion-year-old hot spring deposits containing some of the earliest evidence for life on Earth, and how it can better inform our search for evidence of life on Mars.

## Spring Symposium | 2023

"Extreme Microscopy!"

continued



### SPEAKER BIOS & ABSTRACTS

**Dr. Sarick Matzen** is a [soil and environmental geochemist](#) specializing in better understanding trace metal cycling in environmental systems. Sarick received a B.A. in Environmental Science from Hampshire College (Amherst, MA) and a Ph.D. in Environmental Science, Policy, and Management at the University of California, Berkeley. He is currently a NASA-funded postdoctoral researcher at the University of Minnesota. He draws on diverse research experiences, including nuclear waste disposal at Lawrence Livermore National Lab, community-based soil remediation on urban farms in California, cycling of limiting nutrients in Earth's oceans, and habitability of extraterrestrial ocean worlds, to investigate how the chemical form of contaminants and nutrients explains their landscape-scale transport.



Sarick Matzen

### ***Microscopy helps reveal how iron from deep sea hydrothermal vents feeds carbon-fixing phytoplankton in surface waters***

Iron (Fe), a limiting nutrient for phytoplankton productivity, connects deep sea hydrothermal vents to surface ocean waters. Supply by sediments and dust deposition are typically considered the main sources of iron to the oceans, but recent work suggests hydrothermal vents could also be an important source of iron to the surface ocean via upwelling at high latitudes. Dissolved iron concentrations in hydrothermal fluids are a million times those of surrounding ocean water. Considerable amounts of iron (>90%) precipitate close to vent sources, but in a major breakthrough, the international GEOTRACES program revealed signatures of hydrothermally derived iron transported across deep ocean basins worldwide. Models show that through density-controlled upwelling, this iron could support up to 10% of primary production in the North Pacific Ocean and up to 30% in the Southern Ocean. It remains unclear how some iron persists in dissolved form in the water column rather than being sequestered into sinking particles. The fate of iron likely depends on speciation and aggregate size, with organic ligand-bound iron, pyrite, and iron oxyhydroxide nanoparticles all having different lifetimes in hydrothermal plumes. Critical processes constraining export of iron from vent sources to open ocean waters occur within the first ~100 km of plume evolution.

We worked with hydrothermal plume particle samples from the Rainbow vent system (Mid Atlantic Ridge) to show that aggregates of morphologically uniform iron oxyhydroxide nanoparticles dominate iron speciation within the first 70 km of dispersing plume evolution. In this low-sulfur system, iron oxyhydroxides dominate despite ubiquity of pyrite in hydrothermal plumes on a global scale. Here, aggregates consist of iron oxyhydroxide nanoparticles held in a carbon matrix composed of organic and inorganic carbon. We will compare speciation of >0.2  $\mu\text{m}$  to <0.2  $\mu\text{m}$  particles to reveal how speciation varies with particle size, asking if pyrite might be present in smaller size fractions. We use synchrotron-based methods (bulk extended X-ray absorption fine structure spectroscopy, X-ray fluorescence spectromicroscopy, and scanning transmission X-ray microscopy) and electron microscopy. These results increase our understanding of export mechanisms delivering iron to open ocean and surface waters.



## MEMBER DUES

The Society is collecting dues. Please remember to submit your 2023 calendar year membership dues. *Thank you!*



## PROJECT MICRO

No updates.



## NEW MMS OFFICERS

Election of MMS Officers for 2023/2024 will be conducted during the Spring Symposium.

Candidates proposed by the board:

- **President-elect:** Erik Stephenson
- **Treasurer:** Dave Burleson
- **Secretary:** Patti Sanft

### Erik Stephenson, 3M

Erik is a Research Engineer working in the metrology lab 3M's Transportation & Electronics Business Group, running for the position of President-elect. He spent the last seven years investigating defects and empowering others to succeed through microscopy. He believes victory is achieved not solely by champions, but by everyone: From their team and cheering fans to their rivals pushing them even further. Erik obtained his B.A. in chemistry from Knox College in Illinois (*Go Prairie Fire!*) and enjoys spending his free time fishing, getting lost in the woods, and playing D&D.



### Dave Burleson, Ecolab

Dave is a Program Leader on the Laboratory Information Management Systems (LIMS) team at Ecolab. Before joining the LIMS team in 2016, Dave worked in Ecolab's Eagan Analytical Services for 12 years as an analytical chemist and microscopist. Dave has served in various roles on the MMS board since 2015, including President in 2016-2017, and Treasurer since 2018. He received his Ph.D. in chemistry from the University of Minnesota. In his free time, he likes to run, hike, camp, travel, and drink craft beer.



### Patti Sanft, Uponor North America

Patti is running for the position of Secretary on the MMS board. She is an Analytical Chemist at Uponor in Apple Valley that makes cross-linked polyethylene pipes for the plumbing industry. Prior to Uponor, Patti was an Analytical Chemist at H.B. Fuller Company in Vadnais Heights working with adhesives. She specializes in material properties testing including rheology, thermal analysis, and imaging with all types of microscopes. Patti has been Secretary on the MMS board for more than 15 years.

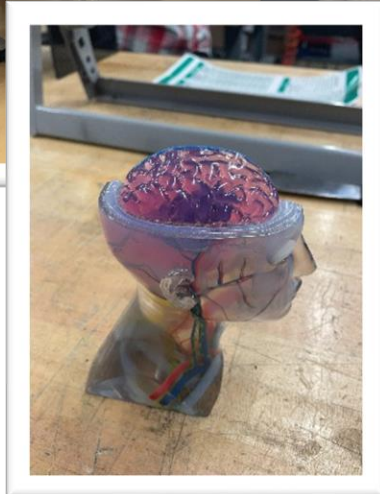
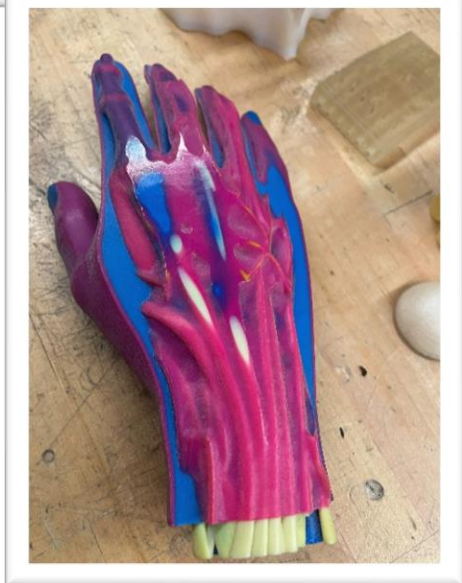
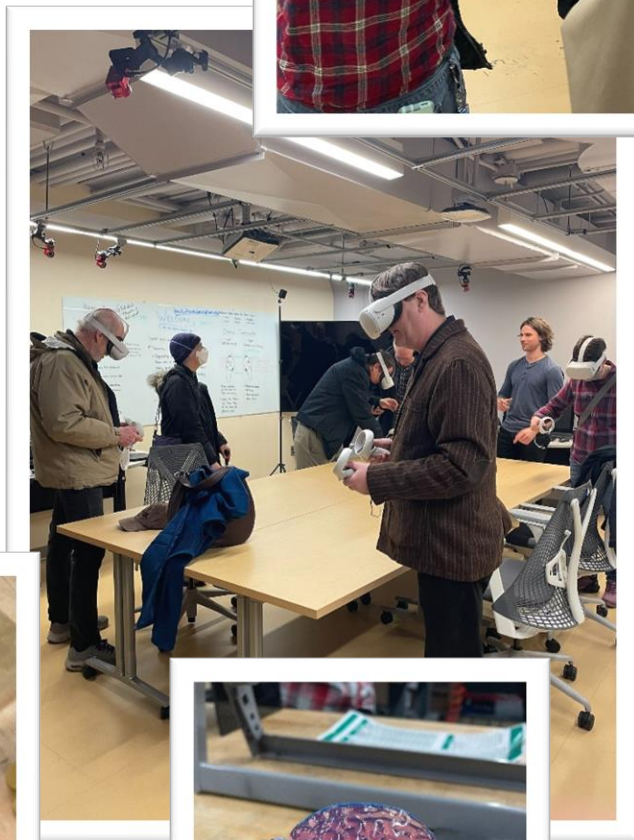
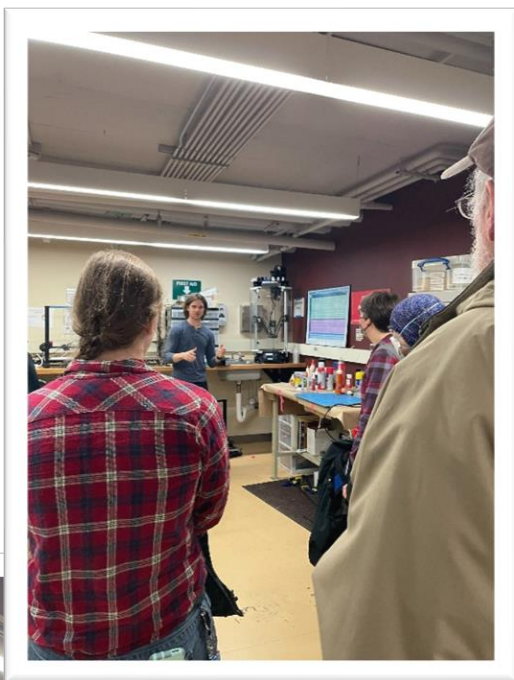




## PAST EVENT: Earl Bakken Medical Device Center Tour

MMS toured the Earl Bakken Medical Device Center on the University of Minnesota Twin Cities Campus in March. They have a wide variety of resources to help scientists and engineers rapidly prototype ideas for innovation in medical device technology via numerous 3D printing capabilities. Their Innovation Fellows program helps to train Fellows to be leaders in the med-tech industry. And their virtual reality lab helps doctors and others with multiple ways to visualize anatomy, determine fit of a device within a patient, or allow a surgeon to plan a surgery with complex anatomy.

*Thanks to everyone who attended!*







## MMS CORPORATE SPONSORS

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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If any sponsors are missing from this list, please contact Jason Heffelfinger (763-514-1021, [jason.r.heffelfinger@medtronic.com](mailto:jason.r.heffelfinger@medtronic.com)).



## MMS SUSTAINING & PATRON MEMBERS

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.

### MMS Sustaining Members

Mary Buckett	3M, St. Paul	Jeffrey Salisbury	Mayo Clinic, Rochester
Michael Coscio	Medtronic (retired)	Bede Willenbring	retired, New Hope
Lloyd Meissner	ESi, Plymouth		

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**Past-president:** Gail Celio, University Imaging Centers, Univ. of Minnesota, 35 Snyder Hall, 1475 Gortner Ave., St. Paul, MN 55108, [celio001@umn.edu](mailto:celio001@umn.edu)

**President-elect:** Erik Stephenson, Transportation & Electronics Business Group Lab, 3M Center, 236-GA-50, St. Paul, MN 55144; (651) 733 2283; [ehstephenson@mmm.com](mailto:ehstephenson@mmm.com)

**Secretary:** Patricia Sanft, Uponor, 5925 148th St. West, Apple Valley, MN 55124; [patricia.sanft@uponor.com](mailto:patricia.sanft@uponor.com)

**Treasurer:** David Burleson, Ecolab, 655 Lone Oak Dr., ESC F64, Eagan, MN 55121; (651) 795-5887; [david.burleson@ecolab.com](mailto:david.burleson@ecolab.com)

**Student Representative:** open

**MSA Representative:** Gail Celio, University Imaging Centers, Univ. of Minnesota, 35 Snyder Hall, 1475 Gortner Ave., St. Paul, MN 55108, [celio001@umn.edu](mailto:celio001@umn.edu)

**Project MICRO Director:** Jeff Payne, retired, St. Paul, MN 55144-1000; (651) 733-2352; [jeffreose.payne@gmail.com](mailto:jeffreose.payne@gmail.com)

**Corporate Liaison:** Jason Heffelfinger, Medtronic, 6700 Shingle Creek Pkwy, Brooklyn Ctr, MN 55350; (763) 514-1021; [jason.r.heffelfinger@medtronic.com](mailto:jason.r.heffelfinger@medtronic.com)

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**Newsletter Editor:** Maria Graff, St. Paul, MN; [mariagraff@me.com](mailto:mariagraff@me.com)

## Other Board Members

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## MINNESOTA MICROSCOPY SOCIETY | MEMBER INFORMATION 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.

Dr  Mr  Mrs  Ms  First Name \_\_\_\_\_ Last Name \_\_\_\_\_

Affiliation \_\_\_\_\_ Phone (\_\_\_\_) \_\_\_\_\_

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Payment: Check  PayPal

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