The MMS Scope

Minnesota Microscopy Society

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

March 2025

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MMS Events
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Spring Symposium
April 25th, 8:30 am-4:15 pm
MN Landscape Arboretum
- ➔ Speaker Bios
  - ◆ Kate Vanderburgh
  - ◆ Kirk Czymmek
  - ◆ Colin Ophus
  - ◆ Eduardo Rosa-Molinar
- ➔ **POSTER PRESENTATION OPPORTUNITY for** Undergraduate, graduate, and postdoctoral students. Click here to register your poster by April 20th.

Past Events:
- ➔ **MMS Trivia Night**

New MMS Officers

MMS Member Dues
Please remember to submit your membership dues for 2025 calendar year.
Click HERE to submit

MMS Annual Spring Symposium

DATE **Friday, April 25th, 2025**

LOCATION Minnesota Landscape Arboretum in MacMillan Auditorium
3675 Arboretum Drive
Chaska, MN 55318

REGISTRATION Registration deadline **April 17th**

COST Members $75, Non-Members $85, Students and K-12 Teachers $25

THEME ***Correlative Microscopy!***

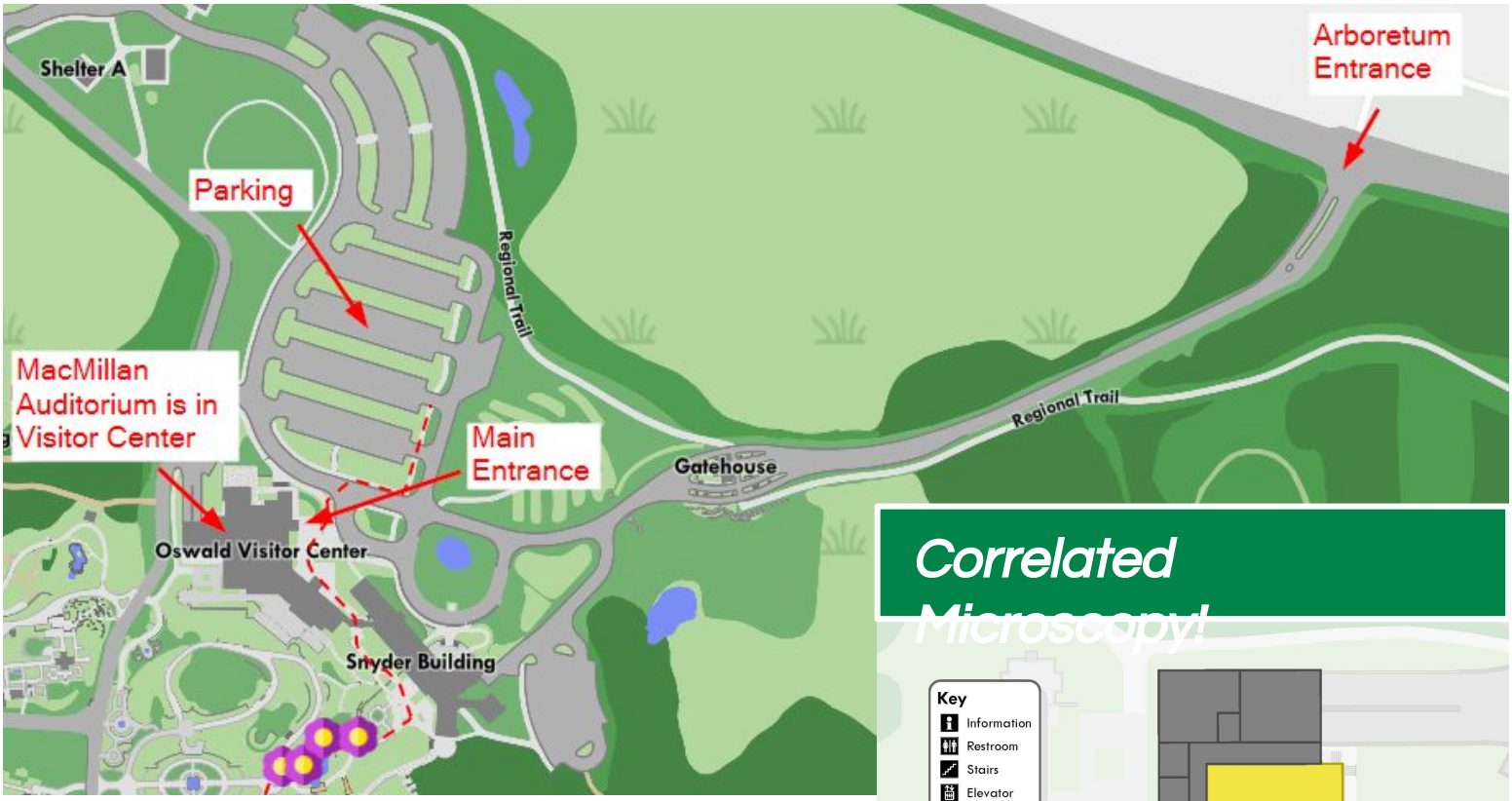
SCHEDULE

8:30 -9:15 am	Registration, breakfast, vendor displays
9:15 - 9:30 am	Welcome
9:30 -10:15 am	Kate Vanderburgh
10:15-11:15 am	Kirk Czymmek
11:15-12:45 pm	Lunch & Vendor Displays
12:45-1:00 pm	Business Meeting
1:00 - 2:00 pm	Colin Ophus
2:00 - 3:00 pm	Eduardo Rosa-Molinar
3:00 - 4:00 pm	Poster Session
4:00 - 4:15 pm	Close

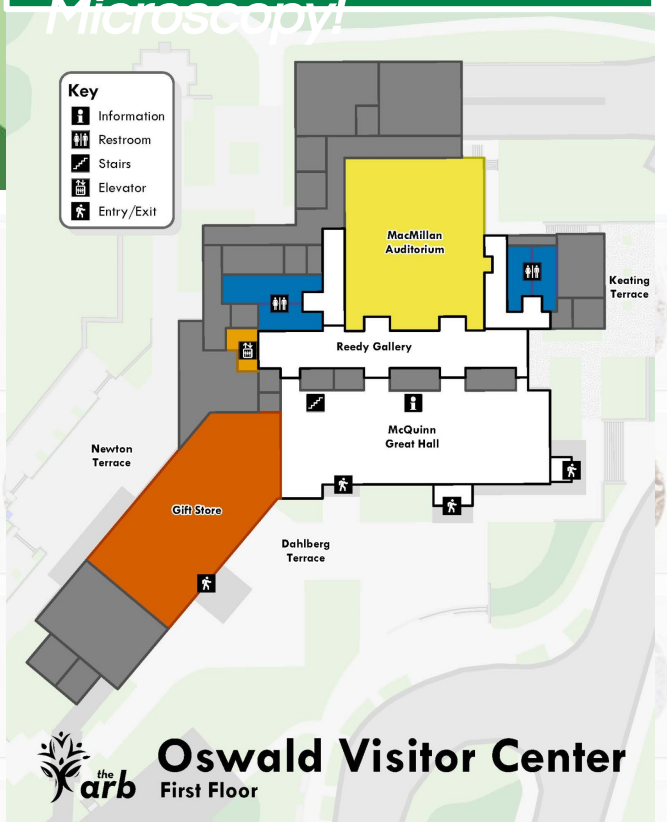
MMS Annual Spring Symposium

Location

LANDSCAPE ARBORETUM



Correlated Microscopy!



POSTER PRESENTATION OPPORTUNITY!

The Minnesota Microscopy Society is seeking poster presentations for its annual Spring Symposium! We welcome posters showcasing work that incorporates any form of microscopy. Undergraduate and graduate students, as well as postdoctoral researchers and lab technicians, are encouraged to participate.

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 20th:
https://forms.gle/D34YY13UJbiGkEcf8

Any questions, please contact Dan Westholm (dwesthol@css.edu)

Scan QR Code to register poster!

Kate Vanderburgh , Ph. D. *Speaker 1*

Sr. Product Specialist, Electron Microscopy & Microanalysis, Thermo Fisher Scientific

TITLE

Analytical Strategies Using SEM and Correlative Software for Comprehensive Characterization

ABSTRACT

Scanning electron microscopy (SEM) and its analytical techniques, including energy dispersive spectroscopy (EDS) and electron backscatter diffraction (EBSD) are widely used in the characterization of materials. EBSD is a powerful technique that enables the characterization of crystallographic structure, orientation and phase at the microscopic level. While its high-resolution data and detailed insights offer significant analytical value, EBSD is commonly viewed as a more involved characterization method. However, the TruePix direct electron EBSD detector and tight integration into the SEM workflow lowers the energy barrier to implementation providing enhanced analytical depth without added complexity.

SPEAKER BIO

Before joining Thermo in 2024, Kate managed the SEM, computerized tomography, and sample preparation tools at the Drexel University Materials Characterization Core. Kate has a B.E. In Chemical Engineering from Stevens Institute of Technology and a Ph.D. in Materials Science from Vanderbilt University followed by a postdoctoral research appointment at Lawrence Livermore National Laboratory. In addition to her experience in electron microscopy, she has an extensive background in the synthesis and characterization of nanomaterials for battery applications.

Kirk Czymmek , Ph. D. *Speaker 2*

Director, Advanced Bioimaging Laboratory, Donald Danforth Plant Science Center

TITLE

The Development of Advanced Imaging Approaches for Enabling Plant Research

ABSTRACT

My lab seeks to develop and optimize multiscale volume electron microscopy (vEM) and multiplex correlative approaches that enable new insights on the structure-function relationship and sub-cellular distribution of targeted molecules in plant research. However, unique challenges are faced with plant specimen due to their waxy cuticles, cell walls and air spaces which impede fixation and downstream sample preparation. Additionally, these same features induce optical aberrations for photon imaging and result in poorly conductive samples for volume electron microscopy, severely limiting accessibility for high-resolution interrogation in intact plants. To address these limitations, the application and optimization of multiscale microscopy for plants can serve as an invaluable approach to more easily relocate and image target structures and maintain context within bulk tissues. Improvements in cryo-workflows and heavy metal staining strategies for 3D vEM interrogation of plant samples is rapidly evolving. Resin-based electron microscopy preparations with improved heavy metal staining are highly amenable for vEM multiscale correlative workflows using x-ray microscopy (XRM) and along with nanoscale 3D reconstructions of whole plant cells. Cryo-workflows, the gold-standard in cellular preservation, allow imaging of bulk frozen-hydrated plant specimen using vEM without chemical pre-treatment and can be combined with cryo-fluorescence to identify critical cell targets. In all instances, artificial intelligence is routinely leveraged for both XRM and vEM datasets for improved image quality and/or segmentation. Multiplex microscopy simultaneously or sequentially visualizes an extended array of biomolecular probes within cells, thus providing high-dimensional physical mapping of numerous cellular phenotypes and components over heterogeneous tissues. While multiplex fluorescent probe labeling on cryo-sections and thin acrylic sections is well established in mammalian tissues, adoption in plants has been very limited. Strategies for the application of correlative multiplex microscopy using confocal and/or super-resolution imaging followed by back-scatter scanning electron microscopy plant samples will be described. Ultimately, the adoption and adaptation of these disparate multiscale and multiplex correlative approaches to address the specific challenges of plants is a “work in progress” but have shown tremendous potential in our ongoing efforts. Further development and dissemination of robust protocols will be instrumental in supporting the broader plant microscopy community.

SPEAKER BIO

Dr. Kirk Czymmek received his doctorate in the Department of Botany and Plant Pathology at Michigan State University in 1993 followed by a postdoctoral position at the DuPont Company in CR&D Plant Molecular Genetics group. In 1997 he joined the University of Delaware (UD), established the UD Bio-Imaging Center at the Delaware Biotechnology Institute and was an Associate Professor in Biological Sciences with research in fungal cell biology and plant pathogenesis. In 2012 he joined ZEISS to build global world-class application, demonstration and training centers and served as a Global Vice President. In 2019, Dr. Czymmek joined the Donald Danforth Plant Science Center as a Principal Investigator and Director the Advanced Bioimaging Laboratory to apply and develop advanced microscopy tools for plant research. With over 30 years of advanced microscopy experience, he has expertise in most forms of light, x-ray and electron microscopy, including super-resolution microscopy, cryo-techniques and correlative microscopy. Dr. Czymmek has over 125-refereed publications focused on developing and applying cutting-edge microscopy tools for imaging cells, tissues and biomaterials.

Colin Ophus , Ph. D. *Speaker 3*

Associate Professor, Dept. of Materials Science & Eng., Stanford

TITLE

New Dimensions in Scanning Transmission Electron Microscopy

ABSTRACT

Scanning transmission electron microscopy (STEM) has become an essential tool for materials science research, where it has been applied to atomic-scale imaging, diffraction, spectroscopy, and 3D tomography of many materials. Recent STEM development has been driven by hardware aberration correction, better holders and microscope optics, direct electron detectors, and rise of computational imaging and powerful data science methods. In this seminar, I will show how advanced detectors and computational methods enable 4D-STEM studies which improve signal-to-noise, resolution, and statistical power of STEM measurements. Examples shown will include structural characterization of metallic alloys, complex ferroelectric oxides, 2D heterostructures, weakly-scattering soft matter samples, and materials for energy applications. I will demonstrate results of atomic electron tomography (AET) experiments, where the 3D position and species of every atom can be identified in nanoscale samples. I will emphasize the important role of developing open-source algorithms, codes, and simulation methods to promote robustness, reusability, and repeatability for scientific studies. I will also show how modern deep learning methods can remove one of the ultimate limits of STEM experiments, by inverting measurements in the presence of strong multiple scattering of the electron beam.

SPEAKER BIO

Colin Ophus is an Associate Professor in the Department of Materials Science and Engineering at Stanford University. He is also the L&S Family Center Fellow in Energy and Sustainability, in the Precourt Institute for Energy. He was awarded a US Department of Energy (DOE) Early Career award in 2018, and the Burton medal from the Microscopy Society of America (MSA) in 2022. His research focuses on experimental methods, reconstruction algorithms, and software codes for simulation, analysis, and instrument design of scanning transmission electron microscopy (STEM). He advocates for open science, develops open-source scientific software, and is the editor-in-chief for the interactive web-based scientific journal Elemental Microscopy. https://colab.stanford.edu/

Eduardo Rosa-Molinar, Ph. D. *Speaker 4*

Washington University in Saint Louis School of Medicine

TITLE

Organelle profiling coupled with in-situ "modular tools" for correlated field emission scanning electron microscopic imaging technologies

ABSTRACT

Nuclear chromatin of benign (noncancerous) central nervous system (CNS) cells influences gene expression, DNA replication, repair, and normal function. Malignant (cancerous) CNS cells show alterations in nuclear chromatin organization, such as DNA methylation and histone post-translational modifications, which result in stability alterations in gene expression and other functions that the nucleus performs, such as DNA replication and repair.

While these nuclear chromatin alterations in cancerous CNS cells are typically visualized using light microscopy to establish tumor classification and malignancy, little is known about alterations in nuclear chromatin organization leading to the development of CNS tumor cell invasion and metastasis.

In my presentation, I will present a strategy to map nuclear chromatin within the nucleus of noncancerous and cancerous CNS cells using organelle profiling coupled with in-situ "modular tools" for correlated field emission scanning electron microscopic (FE-SEM) imaging technologies. The in-situ "modular tools" include specialized stages and attachments that facilitate in-situ ultramicrotomy, high-throughput fluorescence, and electron microscopic imaging within the FE-SEM chamber, thus enabling real-time analysis of processes such as heating, resistance, specialized detectors like energy dispersive spectroscopy, electron backscatter diffraction, and X-ray fluorescence

To facilitate the study, access, and exploration of nanoscale chromatin alterations within rare pediatric primary and metastatic CNS tumors and surrounding non-cancerous tissue, we are building two-dimensional (2-D) and three-dimensional (3-D) raw and analyzed image datasets on GitHub as each is reviewed and approved for dissemination. These datasets will be accessible at https://github.com/AlexsLemonade/OpenPBTA-analysis.

This work was partly supported by funds from the McDonnell Center for Cellular and Molecular Neurobiology at Washington University in Saint Louis School of Medicine.

SPEAKER BIO

Eduardo Rosa-Molinar is a Fellow of the American Association for the Advancement of Science and has held multiple leadership roles in academic societies, committees, and editorial boards. His research identified gap junctions in distinct cellular niches, including heterotypic excitatory "mixed synapses" in the spinal cord, which combine electrical and chemical synapse properties. His work was facilitated by the development of a novel reagent that mitigates sample damage caused by electron-beam-induced heating and charging, allowing for precise nanoscale chemical analysis of beam-sensitive biological materials.

In 2019, he founded TransynaptiX LLC, a minority-owned company focused on developing, optimizing, validating, and disseminating reagents, workflows, and in-situ modular tools for FE-SEM imaging. These tools support real-time ultramicroscopy and high-throughput fluorescence and electron microscopy within the FE-SEM chamber. Since its founding, he has filed five triadic patent families, three of which have been awarded. A licensing evaluation agreement has recently been signed to explore commercialization opportunities for these technologies.

New MMS Officers

Election of MMS Officers for 2025-26 will be conducted during the Spring Symposium.

MMS Board Officer Recommendations:

President elect: **Elise Imbertson, 3M**

Treasurer: **Dave Burleson**

Secretary: **Patti Sanft**

Elise Imbertson, 3M

Elise is a Research Scientist working in the Corporate Research Analytical Laboratory at 3M. She has specialized in Atomic Force Microscopy and related Scanning Probe Microscopy techniques for the past 11 years, working to characterize a wide variety of materials. She also is an expert in developing sample preparation methods such as ultra-microtomy. She obtained her B.S. in Material Science from the University of Minnesota and enjoys spending time with her partner Heather, dog Sunny, and lizard Phoenix.

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 2016-17, 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 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 the past 14 years.

MMS Virtual Trivia Night by Gail Celio

This year's MMS (Virtual) Winter Social Mixer/Tours and Trivia introduced to the processes of making gin and jigsaw puzzles. For the latter, modern mass-produced puzzles are cut into pieces with a stainless-steel punch instead of a saw! Then the trivia contest pitted Team Portobello against Team Shiitake. It was anyone's game throughout, with only a 2-point difference or less at the end of each round (some half-points were granted). Team Shiitake kept their razor-edge lead to the end of the game,
winning 14-12.5. Thank you to everyone who attended and participated!

Round 3 – Q2: THE SIMS (4)

Round 1 – Question 5

- This item's thickness is measured in points, or 0.001 inch. Common ones are often 35-55 pt, those with pieces of clothing, patches, or equipment fragments can be 100-180pt or greater. What are these items that can feature athletes or actors?

•TRADING CARDS

Round 4 – Question 1

- Which of these fields of play has the smallest area center circle?
- A) NHL hockey rink
- B) FIFA soccer field
- C) USA lacrosse field

•A) NHL HOCKEY RINK (30 FT DIAM)

- (soccer and lacrosse fields are both 30 ft radius)

MMS Cash Flow Summary

1/01/2024 through 12/31/2024

Financial Update

INCOME			
	Donations to MMS		0.00
	Dues		
	Corporate	2000.00	
	Patron	465.00	
	Regular	200.00	
	Student	0.00	
	Sustaining	300.00	
	Total Dues		2, 965.00
	Interest Income		464.04
	Miscellaneous Income		125.00
	Meeting Income		670.00
	Spring Symposium Income		4, 415.00
	TOTAL INCOME		8,640.82
EXPENSES			
	Credit Card Fees (MMS)		223.63
	MMS Sponsored Donations		400.00
	Insurance		181.84
	Meeting Expenses		
	MMS Reg. Meeting Expenses	1,262.70	
	Total Meeting Expenses		1,262.70
	Miscellaneous		0.00
	Newsletter		240.00
	Website		335.34
	Project Micro		45.51
	Spring Symposium Expenses		7,606.53
TOTAL EXPENSES			10,293.55
OVERALL TOTAL			-1,652.73

MMS Corporate Sponsors

Corporate Sponsors are the backbone of financial support for MMS. These Members make it possible for the Society to support Project Micro and cover many expenses of 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 or go to https://mnmicroscopy.org/membership.

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If any sponsors are missing from this list, please contact Jason Heffelfinger (jason.r.heffelfinger@medtronic.com).

MMS Sustaining Members and Patrons

The Minnesota Microscopy Society sincerely thanks our Sustaining and Patron Members. These Members provide financial support to the organization above the standard membership. This additional support makes it possible for MMS to maintain financial well-being. To become a Patron or Sustaining Member, complete and return the MMS membership form at the end of the newsletter or go to https://mnmicroscopy.org/membership.

MMS Sustaining Members

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Michael Coscio	Medtronic (retired)
Vanessa Krake	Colder Products Company
Jeffrey Salisbury	Dacha Works
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MMS Board & Officers 2024-2025

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Past President: Dan Westholm, The College of St. Scholastica, Duluth, MN dwesthol@css.edu

President Elect: Rachel Heussner, Carl Zeiss Microscopy; rachel.heussner@zeiss.com

Secretary: Patricia Sanft, Uponor, Apple Valley, MN; patricia.sanft@uponor.com

Treasurer & Website: David Burleson, Ecolab, St. Paul, MN; david.burleson@ecolab.com

MSA Representative: Gail Celio, University Imaging Centers, U of MN, St. Paul, MN; celio001@umn.edu

Project MICRO Director: Jeff Payne, retired, St. Paul, MN; jeffrose.payne@gmail.com

Corporate Liaison: Jason Heffelfinger, Medtronic, Brooklyn Center, MN; jason.r.heffelfinger@medtronic.com

Newsletter Editor: Danielle Westholm, Duluth, MN; dmwestholm@gmail.com

Other Board Members

Tony Anderson, Medtronic
Fridley, MN; tony.m.anderson@medtronic.com

Mary Buckett, 3M
St. Paul, MN; mibuckett@mmm.com

Cristina Foley, 3M
St. Paul, MN; cfoley2@mmm.com

Mike Odlyzko, U of MN
Minneapolis, MN; michael.odlyzko@umn.edu

Sue Okerstrom, Lichen Labs, LLC
Duluth, MN; sue@lichenlabs.net

Jeff Salisbury, Mayo Clinic
Rochester, MN; salisbury@mayo.com

Doug Stauffer, Bruker
Eden Prairie, MN; douglas.stauffer@bruker.com

Dehua Yang, Ebatco
Eden Prairie, MN; dyang@ebatco.com

Join Or Renew Your Membership

Annual membership follows the January 1 to December 31 calendar year. To join or renew your membership, please visit https://mnmicroscopy.org/membership. There is also a membership information form on the webpage that we ask everyone complete once per year to ensure we have your latest contact information. If you would rather renew your membership via check, please complete the form below and mail it to our Treasurer.

All microscopists are urged to support their society at one of the membership levels below. Often supervisors will support MMS memberships out of department budgets because they recognize it is an inexpensive way to maintain and increase the skills of their microscopists. If you have been a member for a while and recognize the value of MMS to the microscopist community, consider upgrading your membership to Patron or Sustaining.

MINNESOTA MICROSCOPY SOCIETY | MEMBER INFORMATION FORM

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Street Address _____

City _____ State _____ Zip _____

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☐MSA Member ☐MAS Member

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☐Check - Make payable to **MMS** and mail to our Treasurer:

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846 Arlington Ave W
St. Paul, MN 55117
Email: treasurer@mnmicroscopy.org