The MMS Scope

Minnesota Microscopy Society

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

March 2024

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MMS Events
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Spring Symposium
April 19th, 8:30 am-4:00 pm
MN Landscape Arboretum
- ➔ Speaker Bios
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  - ◆ Pinshane Huang
  - ◆ Jacob Ritz
  - ◆ Thomas Pengo
- ➔ **POSTER PRESENTATION OPPORTUNITY for** Undergraduate, graduate, and post-doctoral students. Click here for details.

Past Events:
- ➔ **Raptor Center Tour**

New MMS Officers

MMS Member Dues
Please remember to submit your membership dues for 2024 calendar year.
Click HERE to submit

MMS Annual Spring Symposium

DATE April 19th, 2024

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

REGISTRATION Registration deadline **April 11th**

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

THEME ***Super Resolution and Beyond!***

SCHEDULE

8:30 -9:15 am	Registration, breakfast, vendor displays
9:15 -9:30 am	Welcome
9:30 -10:30 am	Matthew Curtis-Zeiss
10:30-11:30 am	Pinshane Huang-U of IL
11:30-12:30 pm	Lunch & Vendor Displays
12:30-1:30 pm	Posters & Vendor Displays
1:30-1:45 pm	Business Meeting
1:45- 2:45 pm	Jacob Ritz-U of MN
2:45-3:45 pm	Thomas Pengo-U of MN
3:45-4:00 pm	Close

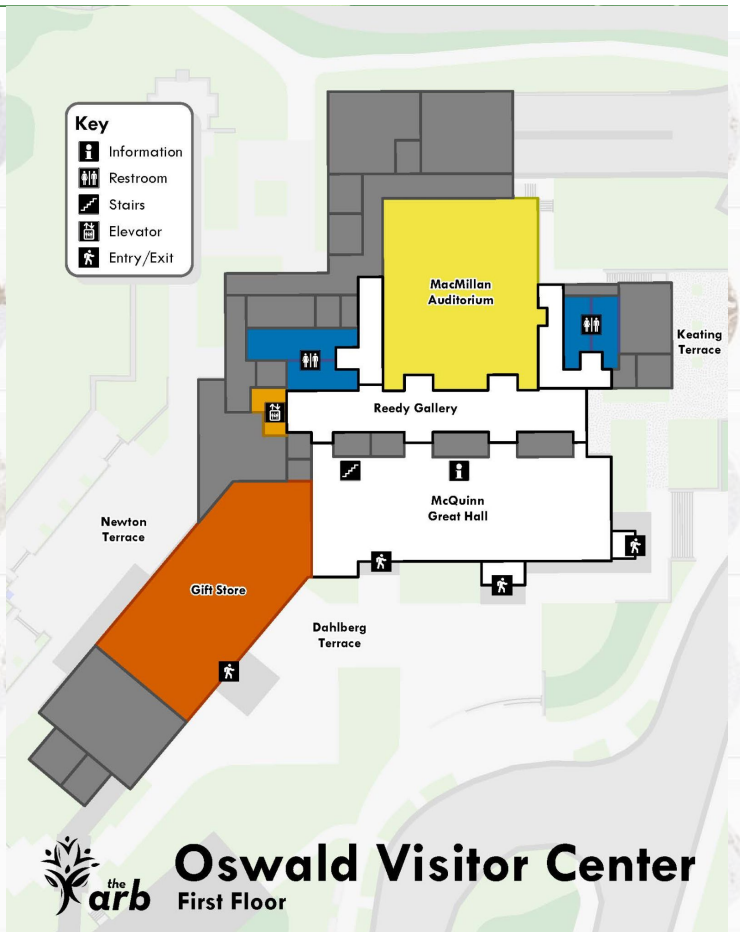
MMS Annual Spring Symposium *Location*

LANDSCAPE ARBORETUM

Super Resolution and Beyond!

POSTER PRESENTATION OPPORTUNITY!

Undergraduate, graduate, and post-doctoral students are encouraged to present their work at a poster session during the Spring Symposium. See MMS events page for more information.



Matthew Curtis *Speaker 1*

TITLE

Exploring the ZEISS Airyscan: Past, Present, and Future

ABSTRACT

Nearing its 10th anniversary, the Airyscan from ZEISS Microscopy was the first-of-its-kind spatial detector for laser scanning confocal systems. Originally serving as a gateway for easy-to-access superresolution, the detector has evolved steadily over the years to encompass other unique readout modes tailored to a variety of live cell applications. These milestones – and the overall history of development – are summarized with an eye towards the future.

SPEAKER BIO

Matt Curtis has served as a 3D Imaging Specialist for ZEISS Microscopy in the Midwest for over 12 years. Prior to that, he spent a decade at the bench [M.S. in Pathology, University of Nebraska; Ph.D. in Bioengineering, University of Illinois at Chicago] with concentrations on cell adhesion complexes, microfabrication, and cell/tissue scaffolds. Over the years, day-to-day usage of imaging techniques became less of an academic distraction and more of a professional interest. After a brief stint renovating/expanding an advanced microscopy facility in Chicago, Matt joined ZEISS in mid-2012.

Pinshane Huang *Speaker 2*

TITLE

Electron ptychography for deep sub-angstrom resolution without an aberration corrector

ABSTRACT

Sub-angstrom resolution has long been confined to aberration-corrected electron microscopy, where it is a powerful tool for understanding the structure and chemistry of materials at the atomic scale. I will discuss how we achieve 0.44 angstrom spatial resolution without an aberration corrector in a conventional scanning transmission electron microscope, nearly quadrupling the resolution set by the microscope optics. This high resolution is enabled using a high dynamic range detector for full-field ptychography, combined with reconstruction using mixed-states, which we believe account for effective losses of coherence resulting from the instrumental instabilities. Counterintuitively, we find that, rather than being detrimental, geometric aberrations can benefit electron ptychography because they produce structured beams that are more dose-efficient for ptychography than focused, aberration-free probes. This work indicates new frontiers to advance electron ptychography by expanding the types of electron microscopes and optical conditions that are compatible with sub-angstrom materials characterization. Most importantly, our results demonstrate that expensive aberration correctors are no longer required to achieve atom-by-atom imaging, a significant step towards democratizing access to high-end electron microscopy.

SPEAKER BIO

Pinshane Y. Huang is an Associate Professor and Racheff Faculty Scholar in the Department of Materials Science and Engineering at the University of Illinois, Urbana-Champaign, where she is also the Associate Director of the Materials Research Laboratory. Pinshane holds a Ph.D. in Applied and Engineering Physics from Cornell University, and B.A in Physics from Carleton College. Her research is focused on transmission electron microscopy and spectroscopy of two-dimensional and nanoelectronic materials.

Jacob Ritz *Speaker 3*

TITLE

How We Use Different Fluorescent Probes to Study Biological Systems using Single-Molecule Microscopy

ABSTRACT

The diffraction of visible light prevents us from obtaining conventional fluorescence images with a resolution beyond ~250nm, which is not enough to visualize subcellular structures critical to cellular function. In contrast, Single Molecule Localization Microscopy (SMLM) allows us to track individual molecules and make images with a resolution of ~20nm, significantly increasing the scope of study that can be done with microscopy. These techniques rely on fluorescent probes that blink or change color so the signal of individual molecules can be isolated from that of the bulk. Most of these switching mechanisms rely on ultraviolet light for this color change, but this is fatal to cells and can produce artifacts in biological study. Our lab has leveraged new color changing mechanisms of BODIPY and silicon rhodamines to obtain super-resolution images of biological structures without UV or toxic additives that are harmful to cells. I will discuss how these dyes change color and how we leveraged that to study lipid droplet metabolism.

SPEAKER BIO

Jacob Ritz is a senior PhD student in Elias Puchner's lab in the School of Physics and Astronomy at the University of Minnesota Twin Cities Campus. The Puchner Lab specializes in chemical, optical, and computational technique development for single-molecule study of biological systems. Jacob got his undergraduate degree in physics at the University of California, Irvine before continuing his study in Minnesota. He works to advance single-molecule microscopy by developing new optical techniques as well as studying the photochemical behavior of different fluorescent molecules.

Thomas Pengo *Speaker 4*

TITLE

Bridging the quest for the ultimate resolution and addressing the challenges of scale

ABSTRACT

The ultimate quest for resolution in microscopy has pushed the limits of life sciences, material sciences, optical sciences and computational sciences. In the process, the challenges have evolved over time and now more than ever, the fourth pillar of science, computation, is more relevant than ever before. Access to larger scale computation has brought answering questions that were previously out of reach within grasp. The rapid popularization of Artificial Intelligence has now raised fundamental questions on how to incorporate this new family of tools into our research, beyond the already impressive performance of Deep Learning methods around, e.g. segmentation and denoising. This not only has pushed the boundaries of what's possible, but also offers a new avenue to bring advanced methods within reach of the non-specialist. Here, we'll attempt to paint a picture of how we touch all of these aspects in our work.

SPEAKER BIO

Thomas Pengo is co-Director of Research Informatics at the Minnesota Supercomputing Institute, Director of the Masonic Institute for the Developing Brain Informatics Group, and chair of the BioImaging North America Image Informatics working group. At the U of M, he leads a team of scientists whose passion is to bridge computational methods and scientific pursuit. His own research focuses around the analysis of microscopic images, across scales from nano- to meso-scale. His formal training is in Computer Engineering, then focusing on image analysis and microscopy through his professional career. He has 18 years of experience in the field and has co-authored over 50 publications.

Raptor Center Tour 2/27/24

The MMS toured the Raptor Center at the University of Minnesota in February. The group visited the rehabilitation facility, saw live demonstrations of a Harris's Hawk and Barn Owl, and even observed micrographs of avian blood cells and parasites!

New MMS Officers

Election of MMS Officers for 2024-25 will be conducted during the Spring Symposium.

CANDIDATES PROPOSED BY THE BOARD

President elect: **Rachel Huessner**

Treasurer: **Dave Burleson**

Secretary: **Patti Sanft**

Rachel Huessner, ZEISS Microscopy

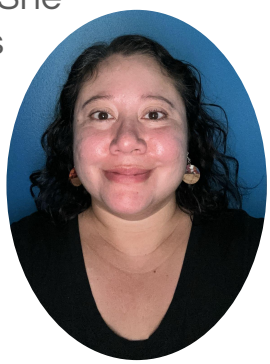
Rachel Heussner first developed an interest in microscopy over nearly a decade in academic research. From humble beginnings manually counting cell nuclei to characterizing collagen architectures and cancer cell migration, she gradually realized that the tools used to observe microscopic events had become more engaging than the research outcomes themselves. After completing a PhD in Biomedical Engineering from the University of Minnesota, Rachel joined ZEISS Microscopy. In her role as Account Manager, she has enjoyed exploring a breadth of imaging applications encompassing optical, electron, and X-ray-based modalities for life science research. Rachel lives in Golden Valley, MN, where she spends weekends discovering local bike trails and breweries with her husband and dog.

Dave Burleson, Ecolab

Dave is a Program Leader on the Laboratory Information Management Systems (LIMS) 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 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.



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

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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.

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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.

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