

Arizona Imaging and Microanalysis Society presents

Microscopy Conference Program

March 30, 2018

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President's Note

Dear Conference Attendees,

It is with great pleasure that we welcome each one of you to the 2018 Arizona Imaging and Microanalysis Society Conference. We are honored to have recruited an excellent group of speakers covering a wide range of imaging topics and look forward to learning more about their exciting microscopy research.

I'd like to thank all of those whose generous support have made this conference possible and each one of you for not only attending the meeting but for bringing your expertise to our gathering. It is through your commitment and knowledge that we are able to exchange ideas, collaborate and continue growing as a society. I would like to extend a special thank you to the Microscopy Society of America (MSA) for providing generous funding through their Tour Speaker Program which has allowed us to bring in remarkable speakers and to the Imaging Core Facility of Northern Arizona University for supporting and hosting this event. I would also like to thank all of our vendors for their continuing support of AIMS, we truly appreciate all of the funding they provide that allows us to cover meeting costs. I encourage you to take a moment to stop by their exhibits today and say hello and learn more about the cutting edge microscopy products they offer. Finally, I must thank Page Baluch, AIMS Secretary and Past President, for the enormous amount of time and effort she has put in to make this year's conference a success.

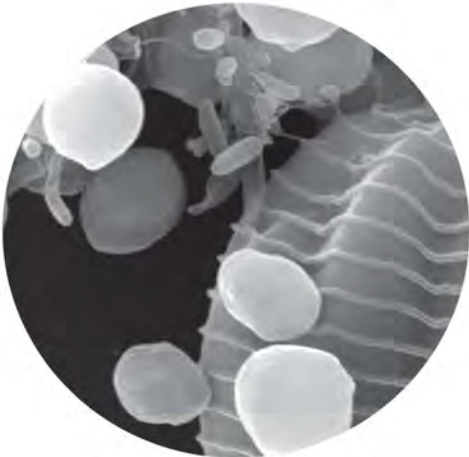
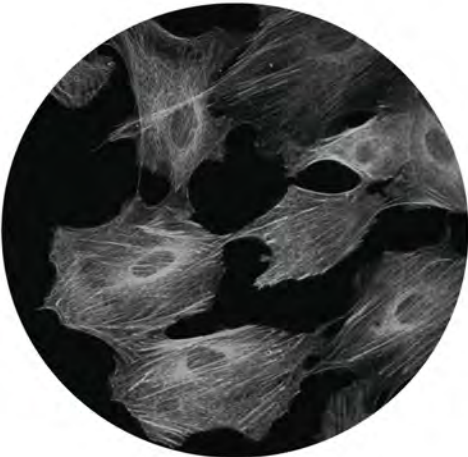
Thank you all for being an important part of the AIMS community, I hope you enjoy the meeting!

Sincerely,

A handwritten signature in black ink, appearing to read 'Aubrey Funke', with a stylized, cursive script.

Aubrey Funke, M.S.
Arizona Imaging and Microanalysis Society President

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President’s Note. *inside cover*

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for more information about participating and attending!

PMCx60 | Saturday, August 4, 2018

Join us for the 2nd annual Pre-meeting Congress (PMCx60) featuring the best biological and physical sciences microscopy & microanalysis research from young scientists.

The Pre-meeting Congress highlights will include:

Friday Evening Welcome Reception

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Saturday Technical Program

Be the first to hear Award-Winning research from the M&M 2018 Student and Postdoctoral Scholars, as well as Early Career Major Award Winners at the Baltimore Convention Center.

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Enjoy lunch and panel discussion featuring recent graduates and industry professionals providing insight into today's job search.

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for event and sponsorship details,
visit microscopy.org/students/x60.cfm

AIMS 2018 Conference Program

March 30, 2018

All sessions will be held in the Dubois Center Ballroom at Northern Arizona University

Check-In 10:30 - 11:30 a.m.

Opening remarks 11:30 - 11:45 a.m.
Aubrey Funke, AIMS President

Geometric Effects on Light Driven Photocatalytic Micromotors 11:45 - 12:45 p.m.
Dylan Nicholls, Postdoctoral Research Scholar, Department of Physics, NAU, Flagstaff Az

Buffet Lunch - Dubois Center Ballroom, NAU 12:45 - 2:00 p.m.

**Chewing the Fat: The Role of Microscopy in Uncovering the Role of Lysosomes
in Atherosclerotic Cellular Lipid Accumulation** 2:00 - 3:00 p.m.
Jay Jerome, Microscopy Society of America Past-President, MSA Sponsored Speaker,
Co-Director of the Cell Imaging Shared Resource, Vanderbilt University, Nashville, TN

Afternoon Break 3:00 - 4:00 p.m.
Vendor Exhibits and Student/Vendor Poster Session

**Slime Molds and Cotton: Using EM Cyro-Preservation Techniques to Study the
Deposition of the Cellulose Extracellular Matrix in Relation to Structure
Function and Development**, 4:00 - 5:00 p.m.
Mark Grimson Senior Scientist, W.L.Gore and Associates, Inc., Flagstaff, Az

Student Awards and Announcements 5:00 - 5:15 p.m.

Business Meeting 5:15 - 5:45 p.m.
Annual society general meeting (open to the public)

SPEAKER ABSTRACTS

Slime Molds and Cotton: Using EM Cryo-Preservation Techniques to Study the Deposition of the Cellulose Extracellular Matrix in Relation to Structure, Function and Development

Mark Grimson

Cellulose is the world's most abundant renewable material, and it exists within plant cell walls as crystalline fibrils. These are formed by a plasma membrane-associated protein complex that acts as a nanoscale fibril spinning machine. Using a variety of non-conventional EM techniques to fill the many knowledge gaps about how this fascinating and economically important natural manufacturing process is regulated by the cell, two model organisms were employed: The cellular slime mold *Dictyostelium discoideum* and *Gossypium sp.* (cotton). The primary purpose of these EM studies is to probe the structure and function of the cellulose synthesis complex using cryo-preparative and processing techniques, rather than the traditional chemical fixations normally used for biological applications.

Cryo-preservation techniques employ the rapid-freezing of samples (i.e. the vitrification of water to form glass-like ice: ~0.1 and 1.0 milliseconds) as a means to stabilize and immobilize the specimen in a hydrated state prior to the further processing of the sample for EM (i.e. freeze-substitution). One downside to cryo-preservation is the depth of vitrification, which is on the order of 10µm before ice crystals begin to form and disrupt fine structure. Chemical fixation, by comparison, is slow (seconds to minutes) and dependent on the wave-front of aldehyde fixative to diffuse into the organism, allowing time for cellular organelles and components to move, or be altered, before cross-linking occurs. This can be made worse by the fact that many organisms have hydrophobic coatings on their surfaces (e.g. cuticles, oils, waxes, etc.), making chemical penetration even slower.

Although cryo-preservation techniques have limitations, the results in appropriate biological

samples are far superior to chemical fixation in the preservation of both ultrastructure and immunosensitivity. It is hoped that this introduction to low-temperature EM techniques will encourage more microscopists to apply these methods to their respective samples.

Chewing the Fat: The Role of Microscopy in Uncovering the Role of Lysosomes in Atherosclerotic Cellular Lipid Accumulation

Jay Jerome

Atherosclerosis is a multifactorial disease but a key component is abnormal lipid metabolism by macrophages in the artery wall. Understanding why excess lipid, particularly cholesterol, accumulates within macrophages in atherosclerosis is a key research goal designed to elucidate therapeutic means to reduce excess lipid. Lipids are difficult to analyze microscopically because lipid probes are limited and lipids do not stand up well to many methods of processing material for microscopic evaluation. Thus, the majority of atherosclerosis research centers around biochemical, physiological or molecular genetic approaches. However, the lack of microscopy observation of structural changes related to biochemical, physiological or genetic manipulation has led to misinterpretation of results. Using examples from our own research, we highlight how correlating quantitative microscopy data with data from other modalities greatly expands the depth of understanding dysfunctional lipid metabolism seen in atherosclerosis disease progression and elucidates key roles for macrophage lysosomes in the disease process.

Geometric Effects on Light Driven Photocatalytic Micro-Motors

Dylan Nicholls

The targeted design of photoactive, swimming micro-particles and the effects of fuel concentration, pH of suspending media and particle geometry were investigated. Of particular interest is that the various TiO₂ particle geometries exhibit geometry-dependent motion. The individual swimmers were made from a

Dylan Nicholls con't

common and inexpensive photocatalyst TiO₂, and when exposed to both hydrogen peroxide and ultraviolet (UV) light, the colloids self-propel. Thus, the swimmers can be respectively activated and deactivated by exposure to UV light and subsequent removal. In order to achieve a particular type of desired swimming behavior, we carefully constructed particles with specified morphology and material composition. The active TiO₂ particles serve as a basis for desired attributes such as long-term stability, tunability, energy efficiency, and controllable motion for applications in hydrogen fuel cells, targeted drug delivery systems, and environmental remediation.

Speaker Biographies

Mark J. Grimson, PhD

Senior Research Scientist
W.L. Gore and Associates, Inc., Flagstaff, Az

Dr. Mark Grimson is currently the lead electron microscopist for the Medical Products Division of W.L. Gore and Associates in Flagstaff. Prior to this position he was Director of the Texas Tech University Imaging Center for 25 years, where he taught SEM and TEM, developed cryo-techniques, and performed service work for the campus. He also enjoyed a small, funded research program studying how the deposition patterns of cellulose are controlled by the organism to determine not only cell shapes, but its final morphology as well.

Jay Jerome, PhD

Department of Pathology, Microbiology and Immunology. Vanderbilt University, Nashville TN

Jay Jerome is a member of the faculty at Vanderbilt University in the department of Pathology, Microbiology and Immunology. He is a fellow of the Microscopy Society of America, American Heart

Association and American Association for the Advancement of Science and a past President of the Microscopy Society of America. He is co-director of Vanderbilt's Cell Imaging Shared Resource and has an active research program in lipid metabolism. His interest is in quantification of structure as a means of correlating structure changes with metabolic alterations.

Dylan Nicholls, PhD

Postdoctoral Researcher, Northern Arizona University

Dr. Dylan Nicholls is a Postdoctoral Research Scholar and Lab Manager working with Dr. John Gibbs at Northern Arizona University. His research expertise involves surface and interface physics at the atomic level and micro-particle interactions. His current research focuses on Glancing Angle Deposition fabrication and analysis of tunable, self-propelled micro-motors. These micro-motors have potential applications in targeted drug delivery systems, physical break-up of blood clots, hydrogen fuel cells and environmental remediation.

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