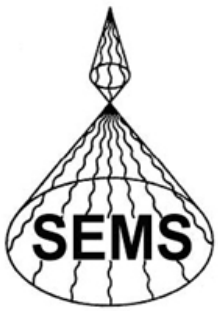
Proceedings of the Southeastern Microscopy Society



59th Annual Meeting

Chattanooga, TN
Doubletree Hilton Downtown
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Please Bring These Proceedings to the Meeting!

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The **Southeastern Microscopy Society** is a local affiliate of **The Microscopy Society of America** and **The Microanalysis Society**. The Proceedings are published for members and friends of the Southeastern Microscopy Society.
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Acknowledgements
As an affiliate of MSA and MAS, we benefit by support for MSA and MAS invited speakers and meeting expenses.

Our **Corporate Members and Exhibitors** are an integral part of our organization and make it possible for SEMS to have outstanding meetings. We thank them for their excellent service over the years and look forward to a bright and productive future.

Corporate Members and Exhibitors for this year's meeting as of this printing:

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Welcome from the President

Dear SEMS members,

With great pleasure, I welcome you to the 59th Annual Southeastern Microscopy Society Conference in Chattanooga, Tennessee. *The New York Times lists Chattanooga as one of the "Top 45 Places to Go*" in the World. Chattanooga is one of America's most breathtaking cities. Along with beautiful Chattanooga, we have an outstanding conference program awaiting your arrival. The conference program will offer an opportunity to explore downtown Chattanooga, presentations from invited speakers, the Ruska Award competition, commercial exhibits, social opportunities for mingling with fellow attendees, and so much more!

Registration opens at 10:00 a.m. on Wednesday, May 8. We will start conference events with an outing to the Tennessee Aquarium, rated as one of the best in the nation for guest satisfaction. Commercial exhibits will be open all afternoon, followed by the always enjoyable Corporate Mixer and poster exhibits. We have a fantastic program of presentations on Thursday morning and will continue afternoon. Once again, we have an exciting group of Ruska competitors and a fantastic line-up of invited speakers.

This year, we are pleased to welcome Miafong Chi (MAS Invited Speaker) from Oak Ridge National Laboratory and Kedar Narayan from The National Institutes of Health as our MSA-sponsored speakers. In addition, Evan Krystofiak from Vanderbilt University will be our Ann Ellis Speaker. Our Annual Banquet will feature a wonderful dinner on Thursday evening and an opportunity to be "entertained." The society's business breakfast will be held on Friday morning at 8:00 a.m., followed by the last group of presentations before officially closing the meeting.

Looking back on my years of membership in SEMS, I reflect on the memories and the importance of this great organization. I think about the many faces, the vendor socials, the mysterious images, and the judging conversations with Robert! Connecting with SEMS regularly meant I was educating myself on new products and trends and better positioned to serve my facility users. I am happy to be listed as a regular SEMS member because of the connections we share and the offerings of our regional microscopy society. If this is your first SEMS meeting, please know we are excited that you are with us! We hope that you will consider joining us and becoming more involved in SEMS as we work together to continue to host a fantastic meeting each year with even more opportunities for professional growth and development for the microscopy community.

One of our most valuable assets as a society is our people. I would be remised if I did not take the time to thank the hardworking executive council, the 2024 Local Arrangements Committee (Chair, Jay Jerome), and Program Committee members (Chair, Rachel Hart) for their commitment to making our time together in Chattanooga exceptional!

Finally, to all of you…our loyal SEMS members and corporate sponsors…thank you for your continued support of this wonderful organization!

Here's to another FANTASTIC meeting!

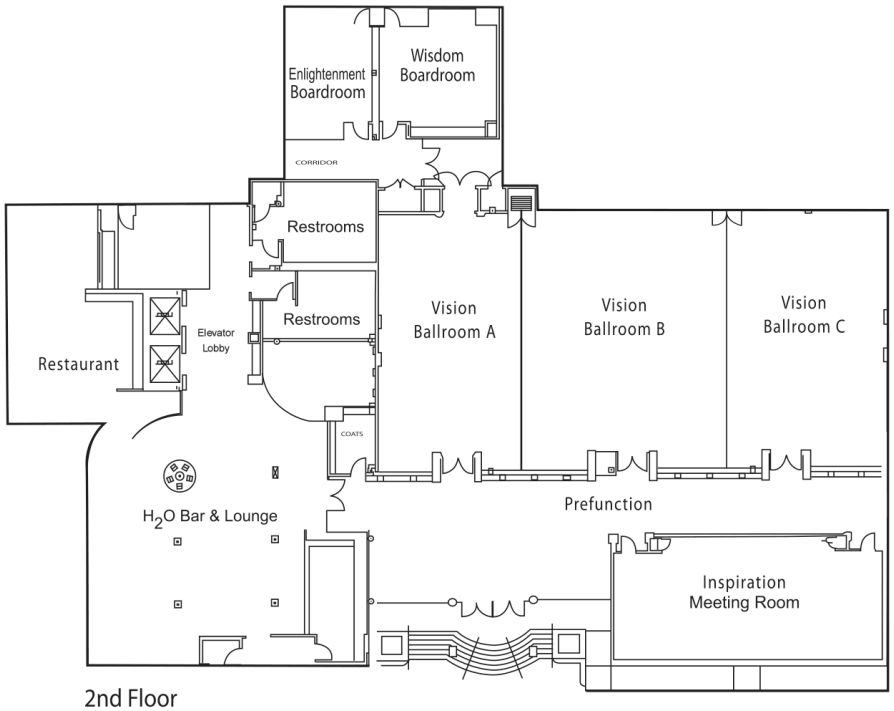
***Brandon M. Walker**, SEMS President 2024*

ATTENDING THE BANQUET?

BE PREPARED FOR MICROSCOPY JEOPARDY!!

After the meal at Thursday's Banquet, and before the Awards Presentations, we will have a round of Microscopy Team Jeopardy with prizes going to the winning table. Just a hint, some of the categories will include information from Thursday's talks and specific information about Vendor products. So, pay close attention to Thursday's talks and be sure to visit our Vendors and find out what is new in their product line.

1st Floor



2nd Floor

SEMS 2024 PROGRAM

WEDNESDAY, MAY 8, 2024

Registration – 10:00am to 4:30pm VISION *BALLROOM ATRIUM*

Vision Ballroom B and C will be available for Vendor Setup all day.

12:00 pm – 1:30 pm	**SEMS Executive Council Meeting** Wisdom Boardroom
2:30 pm – 3:30 pm	**Beverages available for Registered Attendees** Vision Ballroom B and C
2:00 pm – 5:00 pm	***Group visit to Tennessee Aquarium, advanced registration and payment required. Meet in Lobby of DoubleTree Hotel at 1:30 pm.***

6:00 pm – 8:00 pm **Corporate mixer** VISION *BALLROOM B AND C*

POSTERS

Posters: Please set up Wednesday afternoon or early Thursday morning.

A Modular, Open Source, Inexpensive, Cryo-Preparation System for Plunge and Slam-Freezing.
Evan Krystofiak, Vanderbilt University.

Aryl hydrocarbon receptor ligand supplementation impacts colitis-associated depressive-like behavior.
Raymond Bogdon, University of South Carolina School of Medicine, Columbia.

The Cryo-Electron Microscopy Facility (CEMF) at The University of Alabama at Birmingham.
Terje Dokland, University of Alabama at Birmingham.

THURSDAY MORNING, MAY 9, 2024

Registration – 10:00am to 4:30pm VISION *BALLROOM ATRIUM*

8:15 am – 8:30 am	**Welcome** *Brandon Walker,* ***President***
8:30 am – 8:45 am	***History of the SEMS Ruska Award*** *Jay Jerome,* ***Historian***
Session 1:	**RUSKA COMPETITION**
Moderator:	*Justin White*
8:45 am – 9:00 am	**Investigating the correlated dynamics of ribosomes and chromosomes in *Escherichia coli.*** *Chathuddasie Amarasinghe, University of Tennessee-Knoxville.*
9:00 am – 9:15 am	***Cancer Cachexia Increases Skeletal Muscle Lipid Deposition and Decreases Intramyocellular Lipid Droplet-Mitochondrial Contact.*** *Thomas Cardaci, University of South Carolina School of Medicine, Columbia.*
9:15 am – 9:30 am	**Investigating the thermal stability and alloying behavior of anisotropic core@shell metal nanoparticles on a metal oxide support.** *Thomas Egan, University of Central Florida.*
9:30 am – 9:45 am	**Fluorescence in Juvenile Spiders of Genus** *Neoscona***-An Observational Study.** *Mary Ann Garren, Blue Ridge Community College.*
9:45 am – 10:00 am	**Cell Based Sodium Alginate Microcapsules Within Ocular Diseases: A Proof of Concept.** *Chelsea Zizzi, University of South Carolina School of Medicine, Columbia*.
10:00 am - 10:30 am	***Break (Please visit Exhibitors and Posters)*** Refreshments are in Vision Ballroom B and C

<u>Session 2</u>:

Moderator: *Jay Jerome*

10:30 am – 11:15 am	***MSA Invited Speaker*** **Volume Electron Microscopy (vEM): Concepts, Correlations, and Computations.** *Kedar Narayan, Center for Molecular Microscopy, NIH*
11:15 am - 11:45 am	***Ann Ellis Invited Speaker*** **Tips for Acquiring Microscopy Equipment through Federal Grants.** *Evan Krystofiak, Vanderbilt University.*
11:45 am - 12:15 pm	**Everyday Multimodal TEM and STEM in Digital Micrograph 3.6.** *Fernando C. Castro, Gatan, Inc.*
12:15 pm –1:30 pm	**Lunch (*On your own*)**

THURSDAY AFTERNOON, MAY 9

Session 3:

Moderator: *Bob Price*

1:30 pm - 2:15 pm	***MAS Invited Speaker*** **Electron Microscopy Frontiers in Solid-State Battery Innovation.** *Miaofang Chi, Duke University & Oak Ridge National Laboratory.*
2:15 pm – 2:45 pm	**A Complete Compressed Sensing System For Scanning Electron Microscopy.** *E. L. Principe, PanoScientific, LLC.*
2:45 pm – 3:15 pm	**The STEP Initiative – A Materials Genome Project for Open Resource Sharing.** *Deborah F. Kelly, Pennsylvania State University.*
3:15 pm – 3:45 pm	***Break (Please visit Exhibitors and Posters)***

Session 4:

Moderator: *Rachel Hart*

3:45 pm – 4:15 pm	**Staphylococcus aureus bacteriophage 80*α*: from head to tail.** *Terje Dokland, University of Alabama at Birmingham.*
4:15 pm – 4:45 pm	**Physics…Schmysics! A straightforward guide to techniques that overcome diffraction limited resolution.** *Jay Jerome, Vanderbilt University Medical Center.*
4:45 pm – 5:15 pm	**Cryo-EM Screening of Apoferritin at 100 kV Using Hitachi's HT7800 Thermionic Transmission Electron Microscope.** *Heather Berensmann, Hitachi High-Tech America Inc.*
6:00 pm - 7:00 pm	**Social (Vision Ballroom B and C)**
7:00 pm – 9:30 pm	**Banquet, Team Microscopy Jeopardy, and Award Presentations.** ***Inspiration Meeting Room***

FRIDAY MORNING, MAY 10

8:00 am- 9:30 am **Business Breakfast**
Inspiration Meeting Room

Session 5:

Moderator: *Vania Almeida*

9:30 am – 10:00 am **The 'Greenest' and Most Cost-Effective Way to Image Arbuscular Mycorrhizal Fungi - A New Freshman Biology Lab Experience.**
Jonathan D. Hulse, Blue Ridge Community College.

10:00 am – 10:30 am **Revealing Collagen Orientation with A Portable, Cost-Effective and Label-Free Mueller Matrix Microscope.**
V.N. Du Le, University of Alabama in Huntsville.

10:30 am **Closing Remarks**: *Rachel Hart,* ***Incoming President***

RUSKA

Investigating the correlated dynamics of ribosomes and chromosomes in Escherichia coli

Chathuddasie Amarasinghe[1], Mu-Hung Chang[1], Jaana Männik[1], Scott T. Retterer[3] , Maxim O. Lavrentovich[1,2], and Jaan Männik[1]

[1]Department of Physics and Astronomy, University of Tennessee, Knoxville, TN, United States
[2]Department of Earth, Environment, and Physics, Worcester State University
[3]Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, Oak Ridge, TN, United States

Segregation of chromosomal DNA is essential but a poorly understood process in prokaryotic cells. It has been proposed that two newly replicated DNA strands in a cylindrically confined volume segregate due to entropic force. Alternatively, it has also been proposed that a reaction-diffusion system involving ribosomal dynamics drives nucleoids apart. This study aims to test these ideas in Escherichia coli bacteria. We employed high throughput fluorescence microscopy in microfluidic devices, quantitative image analysis, and polymer physics-based modeling to understand how the segregation process unfolds during the DNA replication cycle and understand the role ribosomes play in this process. Our results show that nucleoid occupied volume in the cell is smaller by a fixed constant volume than the cell volume, irrespective of whether the replication is ongoing or not. We find that a broadly distributed ribosomal distribution peaks at midcell at the early stages of the replication cycle, as expected by a reaction-diffusion system involving ribosomes. However, unlike the model prediction, the midcell accumulation of ribosomes does not lead to the formation of distinct nucleoid lobes in the early stages of replication. Instead, we find that the density of chromosomal DNA starts to decrease at midcell/mid nucleoid when about 60% replication is complete. Our results experimentally confirm the importance of ribosomal dynamics in driving two daughter chromosomes apart. However, the existing model requires improvement to account for their limited effect in the early replication cycle.

RUSKA

Cancer Cachexia Increases Skeletal Muscle Lipid Deposition and Decreases Intramyocellular Lipid Droplet-Mitochondrial Contact

Thomas D. Cardaci[1], Brandon N. VanderVeen[1], Alexander R. Huss[1], Brooke M. Bullard[1], James A. Carson[2], Robert L. Price[3], E. Angela Murphy[1]

[1]Department of Pathology, Microbiology, and Immunology, University of South Carolina School of Medicine, Columbia, SC
[2]Department of Physical Therapy, University of Tennessee Health Science Center, Memphis, TN
[3]Department of Cell Biology and Anatomy, University of South Carolina School of Medicine, Columbia, SC

Cancer cachexia is the unintentional loss of lean mass and directly contributes to functional dependency, poor treatment outcomes, and decreased survival in cancer patients. While the pathogenicity of cachexia is multifactorial, metabolic dysfunction remains a key contributor to its progression. Despite this, there is a lack of evidence investigating the role of altered skeletal muscle lipid homeostasis, lipid droplet (LD) dynamics, and LD-mitochondrial interactions in contributing to this wasting syndrome. Therefore, the purpose of this study was to investigate the impact of cancer cachexia on skeletal muscle metabolic dysfunction, intramyocellular LD content, LD morphology, and LD subcellular distribution, along with LD-mitochondrial interactions using the Lewis Lung Carcinoma (LLC) murine model. C57/BL6 male mice (n=20) were implanted with LLC cells [106] in the right flank or underwent sham surgery. Skeletal muscle was excised for transmission electron microscopy (TEM; *soleus*), oil red o/lipid staining (*tibialis anterior*), and protein (*gastrocnemius*) 25 days following implantation. Student's t tests were used to assess statistical differences ($p<.05$). TEM analysis unveiled LLC mice had greater number (232%; $p=0.006$) and size (130%; $p=0.023$) of intramyocellular lipid droplets further supported by increased oil-red o positive (87%; $p=0.011$) and 'very high' oil-red o positive (178%; $p<0.001$) fibers compared to controls. Additionally, morphological analyses of lipid droplets show increased elongation and complexity (aspect ratio: IMF: 9%, $p=0.046$) with decreases in circularity (circularity: SS: -6%, $p=0.042$) and roundness (roundness: Whole: -10%, $p=0.033$; IMF: -8%, $p=0.038$) as well as decreased lipid droplet-mitochondria touch (-15%; $p=0.006$), contact length (-38%; $p=0.036$), and relative contact (-86%; $p=0.004$). Further, dysregulation in lipid droplet regulatory proteins (perilipin-2, perilipin-5) in cachectic muscle ($p<0.05$) was observed. Collectively, these data demonstrate that cancer cachexia induces myosteatosis, alters lipid droplet morphology, and decreases mitochondrial interactions likely contributing to the decrements in skeletal muscle mass and function experienced by cancer patients.

This work was supported by grants from NIH/NCI F31CA278490 (TDC) and U01CA218578 (EAM), along with resources and equipment from the University of South Carolina Instrumentation Resource Facility.

RUSKA

Investigating the thermal stability and alloying behavior of anisotropic core@shell metal nanoparticles on a metal oxide support

Thomas Egan[1] and Gang Chen[1]
[1]Department of Chemistry, University of Central Florida, Orlando, FL 32816

In the design of advanced materials, it is often beneficial to incorporate two unique materials into a single composite structure so that their properties are synergistically enhanced. A common strategy in the field of catalysis is to decorate metal nanoparticles (NPs) onto support materials to improve their catalytic performance and stability. During the preparation of these composite materials, annealing at elevated temperatures is a required step for catalyst activation. While fine metal NPs are typically grown directly on the support, shape-controlled metal NPs are almost exclusively synthesized colloidally and must then be immobilized on the support surface. Annealing is then necessary to ensure strong NP-support interactions. During annealing, metal NPs are known to significantly change shape due to their unstable surface facets, diminishing their catalytic activity. Therefore, it is necessary to find ways to preserve their shape throughout the catalyst preparation process. Here, we investigate the shape stability of Au nanobipyramids (NBPs) on a TiO_2 support during annealing. Au NBPs are anisotropic NPs primarily enclosed by high-index surface facets, making them relatively unstable compared to other shaped metal NPs. By depositing thin shells of different metals (Ag, Pd, Pt), we find that their shape stability can be altered and even enhanced, while imparting improved catalytic properties. Transmission electron microscopy (TEM) and energy-dispersive X-ray (EDX) spectroscopy were used to monitor the shape and elemental distribution of Au@M NBPs (M = Ag, Pd, Pt) before and after annealing at increasing temperatures from 100ºC to 400ºC. We found that the onset of thermal reshaping occurs at higher temperatures as the lattice mismatch between Au and the shell metal increases.

This work was supported by the University of Central Florida (UCF) College of Sciences Seed grant. T.E. is supported financially by the UCF College of Graduate Studies Doctoral Research Support Award. The authors acknowledge the use of instruments from the Materials Characterization Facility of the Advanced Materials Processing and Analysis Center at UCF.

Fluorescence in Juvenile Spiders of the Genus *Neoscona* – An Observational Study

Mary Ann Garren, Student, Blue Ridge Community College, 180 W. Campus Dr, Flat Rock, NC, 28731

Neoscona is a genus of orb weaver spiders. There are eight species of *Neoscona* native to the US and Canada, though only three have a range that includes the mountains of Western North Carolina. Orb Weavers are characteristically known for their large, wheel-shaped, flat webs. Orb weavers range in size and color, but typically have large abdomens and long legs. Variation in the brightness of the abdominal colors within a species is not uncommon. An egg sac from an orb weaver was collected in late February of 2024, and observed microscopically through the later part of the incubation period and for several weeks after. The egg sac was observed to fluoresce blue under ultra-violet light prior to the hatching of the spiderlings. The juvenile spiders were observed to also fluoresce under ultraviolet light for a period of approximately one and a half to two weeks. This study documents the stages of development of a nest of juvenile *Neoscona*. Specimens were observed and photographically documented via dissection microscopy of live specimens as well light and polarized light microscopy of preserved specimens. The goal of this study is to document the developmental stages of juvenile *Neoscona* to allow for earlier identification of the species. Further research can be done to determine the method and cause of the change in fluorescence.

No external funding was provided for this experiment.

Cell Based Sodium Alginate Microcapsules Within Ocular Diseases: A Proof of Concept

Chelsea Zizzi, Jay D. Potts

Sodium alginate is a natural polymer that has been widely used as a drug delivery system due to its controlled-release qualities and low cellular toxicity. These capsules are effective at transporting therapeutics in various diseased animal models. Retinitis pigmentosa is an incurable genetic disease affecting the retina, which causes gradual blindness as the disease progresses. In our study, we injected cell-based sodium alginate capsules into the vitreous cavity of C57BL/6 and Pde6brd10/J mice to observe the migration of these capsules in both wildtype and diseased mouse models over a course of 2 weeks. Our intention was to utilize the slow-release factor of sodium alginate and to prove the possibility of retinal regeneration using arising retinal pigmented epithelial cells or adipose stem cells. We observed that there seems to be a proximal effect from these cell-based microcapsules on the ganglion cell layer as well as these cells affecting the lens. While our work is in the preliminary stages, this project shows that cell-based sodium alginate microcapsules are a viable source to treat ocular diseases. This work was supported by the National Institute of General Medical Sciences of the National Institutes of Health under Award Number P20GM103499 and the Jack and Miriam Webb Research Fund

POSTER

A Modular, Open Source, Inexpensive, Cryo-Preparation System for Plunge and Slam-Freezing

Evan Krystofiak[1,2], Spencer Rothfuss[3], Shannon Kordus[4,5]
[1]Cell Imaging Shared Resource,
[2]Department of Cell and Developmental Biology, and [3]Department of Biochemistry, Vanderbilt University,
[4]Department of Pathology, Microbiology, and Immunology, Vanderbilt University Medical Center,
[5]Veterans Affairs, Nashville, TN, 37232

Cryo-based EM techniques are becoming increasingly important for a variety of fields, while national facilities and regional facilities exist to serve the microscopy community, sample preparation largely falls om individual labs. Current cryo-preparation systems are expensive and may represent a significant barrier for entry for many universities or labs, we seek to make a system that is both low cost and easy to use. To facilitate cryo-adoption across a spectrum of academic institutions around the country, we developed a low-cost, open-source, and easy to assemble plunge and slam freezing system to make cryo-EM techniques broadly available. This freezing device consists of a pneumatic cylinder controlled by an Arduino based controller. The cylinder head can be easily configured for either slam freezing SEM stubs, freeze-fracture planchettes, or clipped grids. For plunge freezing, the freezing head can hold any magnetic tweezer. Single sided blotting is controlled by a stepper motor that rotates filter paper onto the grid in a magnetic clutch system preventing excessive blotting force on the sample. A nitrogen vapor chimney system is employed for freezing the can accommodate either an ethane cup or a copper freezing anvil. The system, as configured, has a total parts cost of ~$800 and can be assembled in a couple of hours. The modular nature of the system also lends itself to exploring novel freezing mechanisms. Initial results showed good vitrification of microtubules and bacteria. In the 2nd year of development, we are seeking user groups to adopt this open-source technology and provide feedback on operation, prototypes will be provided at no cost.

This work was supported by a Microscopy Society of America's Strategic Initiatives Grant

POSTER

Aryl hydrocarbon receptor ligand supplementation impacts colitis-associated depressive-like behavior `

Raymond Bogdon, Kasie Roark, Archana Saxena, Chandani Mitchell, Michele Hailey, Shanieka Staley, Prakash Nagarkatti, Mitzi Nagarkatti, Philip Brandon Busbee
Department of Pathology, Microbiology, and Immunology, University of South Carolina School of Medicine, Columbia, SC 29209, USA

Colitis is an inflammatory bowel disease (IBD) with increased incidences of depression in patients. The mechanisms that define this comorbidity remain poorly understood. Our lab previously showed supplementation with indole-3-carbinol (I3C), an aryl hydrocarbon receptor (AhR) ligand, can reduce disease severity in models of colitis. We aimed to determine the behavioral impact I3C supplementation has on colitis-induced depression via alterations in the gut metabolome. Colitis was induced in using the dextran sodium sulfate (DSS) method and treatment groups were given a regimen of 40 mg/kg I3C as previously reported. Untargeted metabolomic studies revealed quinolinic acid (QA), a metabolite produced by the kynurenine (KYN) pathway and linked to depression, was found to be significantly reduced in I3C-treated mice when compared to colitis controls. To determine the effects of I3C and QA modulation on depressive-like behavior, colitis mice were treated with either I3C or an inhibitor of a major enzyme involved in QA production. Depressive-like behavior was measured using the Tail Suspension Test (TST) method, along with evaluation of neural biomarkers of depression (dopamine, BDNF, GFAP) and stabilization of the blood brain barrier (BBB). Results showed I3C reduced depressive-like behavior and altered select biomarkers associated with depression. These studies provide evidence that AhR can be a potential therapeutic target for both colitis and colitis-associated depression.

This work was supported by NIH grant P20GM103641.

MSA INVITED SPEAKER

Volume electron microscopy (vEM): Concepts, Correlations and Computations

Kedar Narayan, Center for Molecular Microscopy, Frederick National Laboratory, National Cancer Institute, NIH.

Named one of the “top 7 technologies to watch” by Nature in 2023 - on par with CRISPR anywhere and the James Webb telescope - volume electron microscopy (volume EM or vEM) describes a set of high-resolution imaging techniques that can reveal new and unexpected aspects of cell biology by capturing the 3D structure of cells, tissues and small model organisms at nanometer resolutions. Here I discuss concepts, correlative approaches and computational aspects of vEM workflows, as well as examples of applications from the wet and dry components of our research group. Located at the Frederick National Laboratory, Center for Cancer Research Volume Electron Microscopy has developed and deployed cutting-edge instrumentation and computational solutions to help address important questions in cancer and cell biology.

ANN ELLIS INVITED SPEAKER

Tips for Acquiring Microscopy Equipment through Federal Grants.

Evan Krystofiak[1,2], Jenny Schafer[1,2], [1]Cell Imaging Shared Resource and [2]Department of Cell and Developmental Biology, Vanderbilt University, Nashville, TN, 37232

Modern microscopy requires complicated, expensive equipment to support the complex and often challenging scientific questions being investigated. Oftentimes the only reasonable way to acquire new microscopes be it confocal, super-resolution, or electron microscopes is through federal grants. Some of the most commonly used funding mechanisms include the NIH S10 and the NSF MRI. Both programs can fund a wide variety of microscopes and equipment and are available annually. The Cell Imaging Shared Resource at Vanderbilt University has successfully employed the NIH S10 mechanism for both light and electron microscopes, here we share some insights that we gleamed from both successful and unsuccessful federal grant applications.

We have observed that our successful grants typically have the following characteristics: 1) applying to the correct funding mechanism (S10 vs MRI), 2) properly justifying the instrumentation being proposed, 3) having an appropriately sized and funded userbase, 4) having a well-reasoned instrument management plan, and 5) having sufficient institutional support. While the S10 and MRI are very similar programs in terms of what types of equipment they fund, the grants are scored and reviewed by different criteria. For the S10, we find that there is a large emphasis on how the new equipment will accelerate existing NIH funded studies. The MRI, by comparison, is looking at broad impacts of the equipment on the community. All instrumentation proposed for either grant needs to be thoroughly justified, this includes answers to the following: why this type of equipment is needed by the major user group, why the specific make and model is ideal, and why no existing equipment locally can do the tasks needed? Demonstration data from the microscope being proposed should be included and, if possible, demonstration data from similar microscopes that were not selected. The userbase of the equipment should ideally already be using similar equipment either locally or through outside collaborations. Grant funding for each major user is also a crucial consideration. The equipment should be housed in a core facility or shared resource to maximize research impact. There should be a complete plan on how to train users, maintain the equipment, and fund the instrumentation for at least 5 years. Institutional support can vary depending on which funding mechanism is used but should include a location where the equipment will be housed and a guarantee that the space will be suitable for the equipment with proper environment (low noise levels, vibrations, etc) and all the utilities the microscope may require. Carefully spelling out each of these criteria makes these large and complicated grants easier to review and discussed by the study section.

Everyday Multimodal TEM and STEM in DigitalMicrograph 3.6

Fernando C. Castro[1], [1]Gatan, Inc., Pleasanton, CA 94588

The recent release of DigitalMicrograph 3.60 represents a significant step forward in elevating the multimodal TEM and STEM capabilities available from Gatan. First, DigitalMicrograph 3.60 coincides with the release of the new ClearView camera, a CMOS scintillator camera offering expanded control over camera imaging modes to improve image and diffraction data signal-to-noise, acquire high-speed *in-situ* video, or carry out high-throughput 4D STEM experiments at 1,600 fps. Second, version 3.60 formalizes several new hardware and software capabilities for STEM experiments into eaSI™ technology, which represents the powerful and easy-to-use workflow in DigitalMicrograph to combine, synchronize, and link STEM dataset acquisition and analysis for multimodal experimentation. This presentation will review many of the new features in DigitalMicrograph 3.60 that can be leveraged for standard TEM imaging, *in-situ* 4D STEM, simultaneous EDS and EELS, multimodal spectrum image analysis, and more.

MAS INVITED SPEAKER

Electron Microscopy Frontiers in Solid-State Battery Innovation

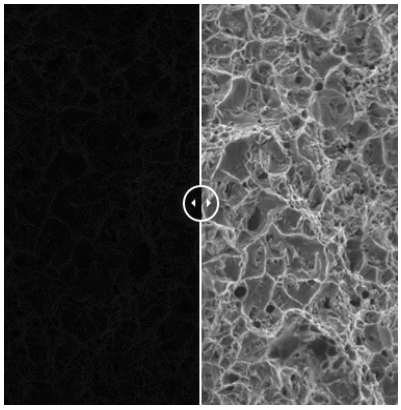
Miaofang Chi, Mechanical Engineering and Materials Science, Duke University, Durham, NC and Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, Oak Ridge, TN.

Solid-state batteries are regarded as one of the most promising next-generation energy storage solutions, offering unparalleled safety and significantly higher energy densities than traditional batteries. Nonetheless, their full potential is limited by challenges at interfaces such as sluggish ion transport, dendrite formation, and mechanical integrity during electrochemical cycling. In my presentation, I will discuss these challenges and highlight the essential role of Scanning Transmission Electron Microscopy (STEM) in analyzing solid-state battery interfaces. Our case studies demonstrate how STEM, coupled with Electron Energy Loss Spectroscopy (EELS), provides profound insights into complex battery interfaces. I will start with a pivotal study that investigates lithium dendrite formation within solid electrolytes, a major concern in the application of solid-state batteries. By employing low-loss EELS, we visualize electronic structures at grain boundaries, fostering the development of advanced engineering strategies. Furthermore, we uncovered distinct ion mobility within protonated garnet solid electrolytes using correlative neutron and electron spectroscopy, showcasing the potential of garnets as a selective barrier in aqueous lithium batteries. Additionally, quantifying ion conduction at single interfaces has been challenging; we demonstrate that monochromated EELS can measure ion concentration and activation energy at interfaces, quantifying ion conductivity and highlighting the major origins of ion conductivity in solid-state interfaces in general. The presentation will conclude with an exploration of the promising roles of sodium-based solid electrolytes in flow batteries and a discussion of the future of microscopy in addressing the related challenges.

A Complete Compressed Sensing System For Scanning Electron Microscopy

E.L. Principe, J.J. Hagen, K.M. Scammon, B.W. Kempshall, PanoScientific, LLC., Cocoa, FL, 32926

An approach to overcome barriers to practical Compressed Sensing (CS) implementation in serial scanning electron microscopes (SEM) or scanning transmission electron microscopes (STEM) is presented which integrates scan generator hardware specifically developed for CS, a novel and generalized CS sparse sampling strategy, and an ultra-fast reconstruction method, to form a complete CS system for 2D or 3D scanning electron microscopy. The system is capable of producing a wide variety of highly random sparse sampling scan patterns with any fractional degree of sparsity from 0-99.9% while not requiring fast beam blanking. Reconstructing a 2kx2k or 4kx4k image requires ~150-300ms. For 2D applications, up to 90% sparsity is practical (10X faster, 10X lower dose). For 3D applications (e.g., FIB-SEM tomography, 3D STEM), 97% sparsity is feasible! The ultra-fast reconstruction, using our own Adaptive Real-Time Inpainting (ARTI) method, means it is possible to view a fractional dose reconstructed image in near realtime. This commercially available CS platform upgrade for a standard SEM or STEM provides a framework to explore the rich environment of those use cases which benefit from the combination of faster acquisition and reduced probe interaction derived from the application of CS electron microscopy. Further details and examples may be found at: www.panoscientific.com.



CS in serial scanning instruments involves sampling a minority fraction (i.e., 10%) of the full pixel density while allowing a faithful reconstruction of the object. Faithful reconstruction requires a high degree of statistical randomness in the sparse sampling strategy. Executing a highly random, high speed, precise scan pattern has presented a barrier to implementing a practical CS Scan Generator (CSSG) for scanning probe microscopy. Our CSSG is a combination of hardware and novel CS sampling methods. The optimal solution was to employ a space-filling curve (SFC) as a "slow" carrier signal modulated by a "fast" randomized signal. In this manner, a programmatic highly randomized pattern may be invoked with any fractional degree of sparsity and with a high geometrical degree of freedom (DOF) in 2D or 3D. The method does not generally require any beam blanking along the scan path! The patented methods will be described, and we will discuss how easily the system can be integrated with an existing SEM or STEM. The extremely good performance is attributed to, in large part, local randomness enabled by these patented methods. We will present image results in biological, semiconductor and material science use cases. We will also discuss our forward-looking applications such as real-time 3D SEM, fast CS Electron Photogrammetry, and Structurally Modulated ARTI (SMARTI). SMARTI utilizes an even stronger artificial intelligence model for CSSG reconstruction.

Figure 1. Left side: 90% Sparse scan. Right side: CSSG Reconstruction of ductile fracture surface. See www.panoscientific for dynamic version of slider

The STEP Initiative – A Materials Genome Project for Open Resource Sharing

Deborah F. Kelly[1,2,3*], William J. Dearnaley[1,2,3], Liza-Anastasia DiCecco[1,2,3], and Jennifer L. Gray[3]

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[2]Center for Structural Oncology, Pennsylvania State University, University Park, PA, United States.
[3]Materials Research Institute, Pennsylvania State University, University Park, PA, United States.

As new imaging modalities continue to reveal unique insight of biological processes, we can begin to forecast the next big breakthroughs in modern science. Using state-of-the-art instruments, such as powerful electron microscopes, we can now better prepare for global pandemics by rapidly supplying the pharmaceutical industry with structural information for the effective design of vaccine and therapeutics [1]. In light of the impetus for open access resource sharing among the academic community, new materials and tools can also be made available to foster greater collective discoveries. Our team is working to address this issue through the development of a materials resource sharing program, the STEP (Substrate Testing and Evaluation Performance) Initiative. This project serves to complement the "resolution revolution" that is sweeping the life sciences community in electron microscopy (EM) while fostering the "real-time revolution" making waves in liquid-EM. Founded in new federal interest in the CHIPS and Science Act and the Materials Genome project, we are developing a systematic workflow to springboard the use of advanced materials for molecular biology applications [2,3]. Determining nanoscale features among flexible biological assemblies remains challenging in cryo-electron microscopy (EM), whereas liquid-EM may provide a natural complement to fulfill this long sought-after goal.

Through the resources at the Materials Research Institute at Pennsylvania State University, we are working to compare silicon nitride (SiN) and graphene-based materials to conventional EM substates. General workflows include: (1) materials testing; (2) data collection using ultra-fast direct electron detectors; (3) computational analysis; and (4) data curation for materials sharing. While each emerging method has its benefits and challenges, developing and testing of alternative substrates holds great potential to improve knowledge of biological entities. For instance, the use of graphene enclosures to prepare cryo-EM samples may eliminate the disruptive forces of the air-water-interface. Correspondingly, the use of ultra-thin SiN may enhance image contrast to better serve downstream image processing routines. Early results on rotavirus double-layered particles (SA-11 strain) showed that SiN-carbon-based enclosures formed sufficient layers of vitreous ice over large regions of the viewing areas [4]. This sandwich configuration appears to eliminate the air-water-interface, although this issue is still being tested. Images recorded at different magnifications showed high resolution signal in the images. In parallel, the same enclosures were tested for liquid-EM imaging and achieved strikingly similar success. Equally important, experiments performed using graphene oxide support films showed initial success for the virus particles enclosed in a liquid

environment. Based on these promising new findings, we expect the STEP Initiative to provide a much-needed materials resource sharing program for the research community.

References:

1. A. Walls et al., Cell 181 (2020), p. 281-292.
2. N.A. Alden et al., Small 15 (2019) https://doi.org/10.1002/smll.201900918
3. G.M. Jonaid et al., Microscopy and Microanalysis 28 (2022) p. 361–370.
4. L-A. DiCecco et al., Journal of Visualized Experiments (2022) https://doi.org/10.3791/63856

Staphylococcus aureus bacteriophage 80α: from head to tail

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Staphylococcus aureus is an opportunistic human pathogen and a leading cause of antibiotic-resistant infections. Genes encoding antibiotic resistance and virulence factors in *S. aureus* are often carried on mobile genetic elements (MGEs), including plasmids, bacteriophages, and chromosomal islands. Transduction by bacteriophages represent the main mechanism of horizontal transmission of MGEs in *S. aureus*. *S. aureus* pathogenicity islands (SaPIs) are a group of MGEs that are mobilized at high frequency in the presence of specific "helper" phages, such as 80α, and are packaged into virions made from phage structural proteins.

Like other dsDNA phages of the *Caudovirales*, 80α consists of a head, or capsid, attached to a tail via a head-to-tail connector that includes a portal at one vertex of the capsid. At the tip of the tail, a complex baseplate forms the primary attachment point for the phage during infection. We have used cryo-electron microscopy in combination with focused 3D reconstruction methods to determine high-resolution structures of 80α and SaPI1 capsids, connectors, tails and baseplates.

Normal 80α capsids are icosahedral, 60 nm in diameter and have *T*=7 architecture, whereas capsids formed in the presence of SaPI1 are smaller, 45nm, with *T*=4 architecture. The portal, which constitutes the entry and exit point for the DNA, is a dodecameric ring embedded at one fivefold vertex of the capsid. Below the portal is a dodecameric adaptor structure that connects to the sixfold symmetric tail via a hexameric tail completion protein. Using focused, asymmetric reconstruction, we have resolved the DNA and the terminator protein inside the tail, as well as parts of the trimeric tape measure protein. We have also determined structures of the baseplate and its associated receptor binding proteins.

Our structures provide insights into the assembly and size determination, DNA packaging and infection processes in this important group of bacteriophages.

This work was supported by National Institutes of Health grant R01 AI083255 to T.D. The UAB cryo-EM facility is supported by the UAB Institutional Research Core Program, UAB Heath Science Foundation and NIH grant S10 OD024978 to T.D.

Physics…Schmysics! A straightforward guide to techniques that overcome diffraction limited resolution.

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Since its invention around 1590, the light microscope as we know it has evolved with advances in illumination sources, optics, and detectors. However, even with bright coherent light sources, highly aberration corrected lenses, and sensitive detectors, observation of very small objects is limited. This limitation is primarily imposed by the wavelength of the illumination source. Thus, the physical nature of photons inhibits the direct observation of very small objects and their relationship to each other. This limitation, however, assumes that we are observing a full field of view simultaneously and that the only information we have about objects in the field is what we directly observe. If we free ourselves from these constraints, the possibility of reconstructing higher resolution images becomes feasible. An early innovation was fluorescence microscopy, which provides high contrast to specific objects of interest and obscures unwanted objects. Another innovation was scanning a sample with a focused beam to lessen interaction of light waves emitted from adjacent objects. More recent techniques have included using knowledge of the optical properties of the sample and microscope to remove diffraction produced interference. These creative approaches have given rise to the field of nanoscopy, techniques that provide information about a sample from frequencies higher than the diffraction limits.

Once freed from the confines of diffraction, there are multiple approaches available for collecting and displaying image information. These include both direct imaging methods and indirect ones. In indirect methods, algorithms are applied to data to tease out and display high resolution information. The major categories of nanoscopy now currently available commercially will be reviewed. The presentation includes the general principles behind the techniques and the pros and cons of each. The goal is to help microscopists determine if nanoscopy is the correct approach for their project and, if so, which of the myriad techniques best suits their needs.

Cryo-EM Screening of Apoferritin at 100 kV Using Hitachi's HT7800 Thermionic Transmission Electron Microscope

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[2.] Fred Hutchinson Cancer Center, Electron Microscopy Shared Resource, Seattle, WA USA.

To comprehensively address a diverse spectrum of specialties, cryo-EM incorporates a multitude of techniques; one of which is single particle analysis (SPA). During the SPA workflow, protein specimens must be evaluated through a screening process to determine whether resources should be committed towards high-resolution data collection. This screening process entails an iterative trail-and-error approach, making it one of the largest bottlenecks within the SPA workflow. Transmission electron microscopes (TEMs) are routinely employed to acquire representative images of the respective protein particles. However, the process of screening vitrified proteins using a low-kV thermionic (tungsten, LaB_6 source) TEM can present inherent challenges; one of which can be maintaining a stable, low-temperature environment within the microscope column. In order to evaluate the efficacy of Hitachi's HT7800 thermionic TEM, vitrified apoferritin was screened utilizing Hitachi's novel retractable cold finger design in conjunction with SerialEM automated collection software.

Hitachi's new retractable cold finger features an innovative blade configuration which provides a large, encapsulating, surface area above and below the sample. These blades provide both sample protection, as an anti-contamination device, as well as temperature control, by keeping the surrounding environment cold, approx. -185 ˚C. However, as the nomenclature suggests, when not in use, the blades can be quickly retracted, thereby expanding the multi-purpose TEM's potential for a versatile array of applications including, but not limited to, EDS, tomography, diffraction, BF/DF STEM, etc. This retractable design worked in tandem with SerialEM [1] in order to streamline the entire data acquisition process. Following setup completion and configuring the targeted drift rate to 0.8 nm/sec, SerialEM captured a total of 1,090 images with an average rate of ~242 holes/h. To further evaluate Hitachi's HT7800 TEM for SPA screening applications, visual representations capturing the vitrified apoferritin particles at various time interval were examined. Nearly 9 hours after the transfer holder was inserted into the microscope, the condition of the ice and particle quality stayed virtually unchanged. Demonstrating the ability to maintain a stable, low-temperature environment within the microscope column, indicating the HT7800 TEM as a suitable screening tool for apoferritin.

References:

1. Mastronarde, David N. *Journal of Structural Biology*, vol. 152, no. 1, Oct. 2005, pp. 36–51, https://doi.org/10.1016/j.jsb.2005.07.007.

The ‘Greenest’ and Most Cost-Effective Way to Image Arbuscular Mycorrhizal Fungi - A New Freshman Biology Lab Experience

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Arbuscular Mycorrhizal Fungi (AMF) belong to the phylum *Glomeromycota* and are known to inhabit the roots of 80-90% of land plants. AMF are asexual, obligate endophytic symbionts of plants. They are known to sequester phosphorus and water for the host plant, as well as activate the induced systemic resistance defense pathway. In return, the plant host provides sugars, other nutrients, and a niche for the fungi. AMF harbor endophytic bacteria in the genus *Glomerobacter*, making this a unique example of a tertiary endosymbiosis. Traditionally, imaging AMF in the host plant required the use of hazardous stains, and expensive, professional microscopes. This study provides a user-friendly procedure that does not use toxic stains, minimizes waste, and utilizes cost-effective microscopic techniques. The procedures have been conveniently designed for college freshman students. The goal of this study is to educate a new generation of biologists on the importance of these fungi, while at the same time, train them in ‘green’ microscopy.

No external funding was provided for this work. Internal funding by Blue Ridge Community College was gratefully appreciated.

Revealing Collagen Orientation with A Portable, Cost-Effective and Label-Free Mueller Matrix Microscope

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Collagen is the most predominant protein in the extracellular matrix (ECM) of human epithelial tissues (skin, intestine, cervix, ect.). Collagen stiffness can induce cancer differentiation whereas cancer patients have an increase in collagen abundance. Subsequently, collagen has been recognized as an important biomarker for several cancer types and for preterm labor, and detecting collagen features has a significant diagnostic value in management of different diseases in epithelial tissues. However, standard microscopy techniques cannot reveal details of collagen structure, a task requiring the time-consuming histopathological analysis. It is well-known that collagen has strong birefringent properties with its refractive index depending on the polarization direction. Therefore, a label free polarization imaging technique can be utilized to characterize collagen birefringence and orientation. Studies have shown that polarimetric imaging techniques utilizing Mueller matrix formalism are simple and cost-effective and can relay information about collagen properties and mechanical properties by measuring its birefringence making such techniques ideal candidates for clinical translation. Our laboratory previously developed a confocal laser scanning microscopy system that can provide co-registration of second harmonic generation of collagen and Mueller matrix imaging and showed that collagen orientation changes insignificant during pregnancy term in mouse model. This talk will introduce our recent effort in transitioning MMI technology into a portable and cost-effective microscope to visualize collagen features of human skin melanoma.

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2006 **Sangmi Lee**
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2007 **Jennifer Seltzer**
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2007 **Tao Wu**
Georgia Tech

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Johnny L. Carson	2000
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E. Ann Ellis	2008
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Robert Simmons	2011
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1986-87	Glenn Cohen
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1988-89	Danny Akin
1989-90	Johnny Carson
1990-91	Janet Woodward
1991-92	Charles Mims
1992-93	Charles Humphrey
1993-94	Sandra Silvers
1994-95	JoAn Hudson
1995-96	Jay Jerome
1996-97	Mark Farmer
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1998-99	Robert Price
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2000-01	Jim Sheetz
2001-02	Glenn Cohen
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2018-19	Brandon Walker
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1972-76	Gene Michaels
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1984	Bill Lushbaugh	Deborah Clayton
1985	Bill Lushbaugh	Johnny Carson
1986	Janet Woodward	Johnny Carson
1987	Janet Woodward	Sandra Silvers
1988-89	Betty Ruth Jones	Sandra Silvers
1990-91	Vera Larke	Sandra Silvers
1992	Beth Richardson	Sandra Silvers
1993-94	Beth Richardson	Jill Trefz
1995	Beth Richardson	Luanne Rigsby
1996-97	Jill Trefz	Luanne Rigsby
1998	Vera Larke	Luanne Rigsby
1999	Vera Larke	Margarette Reed
2000-02	Mary Ard	Greg Erdos
2003-05	Mary Ard	Karen Kelley
2006-22	Cynthia Goldsmith	Karen Kelley
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1988	David Steflik
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1992	JoAn Hudson (P)
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1996	Cathy Kelloes (B)
1997	Mark Riggler (P)
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2016	Terri Bruce
2017	Brandon Walker
2017	Eric Formo
2018	Paul Eason
2018	Eric Formo
2019	Paul Eason
2019	Deniz Ballero
2020	Eric Woods
2020	Deniz Ballero
2021	Eric Woods
2021	Deniz Ballero
2022	Brandon Walker
2022	Deniz Ballero
2023	Rachel Hart
2023	Deniz Ballero
2024	Treva Brown
2024	Justin White

P=Physical, B=Biological

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1990-1993	E. Ann Ellis
1994	Janet Woodward
1995	Johnny Carson
1996- 2002	E. Ann Ellis

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2008 - 2009	John Shields

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1996 -	Charles Humphreys

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1996 - 2000	Cathy Kelloes
2001-	Jay Jerome

Photographer

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2006 -	Dayton Cash

Website Contact

2019-2021	Karen Kelly
2021-	Mary Ard

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1994-97	John Bonnici
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2003-05	Betty Sutlive
2006-09	William Monroe
2010	Hilary Hicks
2011	Hilary Hicks/John Donlon
2012-13	John Donlon
2014-17	Rich Fiore
2018-22	Rick Hirsche
2023-	Chris Watters

S(E)EMS MEETING LOCATIONS

May 1964 Atlanta, GA
Jan 1965 Gainesville, FL
May 1965 Atlanta, GA
Sept 1965 Birmingham, AL
May 1966 Atlanta, GA
Dec 1966 Tallahassee, FL
May 1967 Atlanta, GA
Dec 1967 Auburn, AL
June 1968 Atlanta, Ga
Dec 1968 Knoxville, TN
May 1969 Athens, GA
Dec 1969 Tampa, FL
Apr 1970 Gainesville, FL
Dec 1970 Atlanta, GA
1971
Dec 1971 Atlanta, GA (*original planned for Del Ray Beach, FL but moved at last minute to boost attendance; almost canceled because of snow in Atlanta*)
1972
1973 Athens, GA
1974 Chapel Hill, NC
1975 Atlanta, GA
1976 Boca Raton, FL
1977 New Orleans, LA (*joint with Louisiana, New Orleans, and Texas Societies*)
1978 Augusta, GA
1979 Athens, Ga
1980 Raleigh, NC
1981 Atlanta, GA (*joint with Alabama, Louisiana, Mississippi and AREMS societies*)
1982 Charleston, SC (*joint with South Carolina Society*)
1983 Athens, GA
1984 Birmingham, AL
1985 Augusta, GA
1986 Columbia, SC
1987 Savannah, GA
1988 Athens, GA
1989 Clemson, SC
1990 Charlotte, NC (*joint with AREMS and NCSEMMA*)
1991 Gainesville, FL
1992 Athens, GA (*joint with AREMS*)
1993 Birmingham, AL
1994 Charleston, SC
1995 Atlanta, GA
1996 Greenville, SC (*joint with AREMS*)
1997 Columbia, SC
1998 Atlanta (*MSA meeting*)
1999 Gainesville, FL
2000 Gulf Shores, AL
2001 Clemson, SC
2002 Athens, GA
2003 Columbia, SC
2004 Savannah, GA (*MSA meeting*)
2005 Pensacola, FL
2006 Gatlinburg, TN
2007 Decatur, GA
2008 Pensacola, FL
2009 Athens, GA
2010 Charleston, SC
2011 Decatur, GA
2012 Cocoa Beach, FL
2013 Greenville, SC
2014 Columbia, SC
2015 Decatur, GA
2016 Pensacola Beach, FL
2017 Athens, GA
2018 Columbia, SC
2019 Chattanooga, TN
2020 Jacksonville, FL *cancelled because of COVID*
2021 Virtual Meeting, *COVID*
2022 Jacksonville, FL
2023 Athens, GA
2024 Chattanooga, TN

SEMS (SEEMS) MEETING HOST/LAC CHAIR
(Host through 1975; Local Arrangements after 1975)

YEAR	MEETING HOST/LAC CHAIR	PROGRAM CHAIR
1964	Anthony Kattine	Anthony Kattine
January 1965	William Callahan	Edward Nathane
May 1965	John L. Brown	John L. Brown
September 1965	Marshall Hartley, Robert Miller Ivan Roth	John Shackleford
May 1966		Martin D. Hicklin
December 1966		J. Michael Price
May 1967		
December 1967		E. C. Mora
June 1968		W. G. Campbell
December 1968		Ronald C. Fraser
May 1969		Ivan Roth
December 1969		Norvel McClung
April 1970		Derick Dove
December 1970		Carey S. Callaway
1971		
December 1971		Edward DeLamater
1972		Derek B. Dove
1973		George Leeper
1974	Don Misch	Malcolm Brown
	EMSA Meeting in Atlanta: Eleanor Southwick, Chair; Ray Hart,	Co-Chair
1975	Jim Hubbard	Sylvia Whitfield
1976	David Vickers	Edward Delamater
1977	None identified	Allen Raworth (Tim Croley, LSEM)
1978	Dale Bockman	Ben Spurlock
1979	Gene Michaels	Ivan Roth
1980	Kenneth Muse	Jerry Paulin
1981	Patriciana Hurd	Betty Ruth Jones, Elsa O'Donnell-Alvelda
	Jim Hubbard (EMSA 1981 meeting Atlanta)	
1982	William Green	Tim Fitzharris
1983	Tim Fitzharris	Ivan Roth
1984	Sandy Silvers	Deborah Clayton
1985	David Steflik	Ben Spurlock
1986	Tim Sullivan, Art Dewey	Tom Borg
1987	Charles Sutlive, Ray Hart	Mary Beth Thomas
1988	Danny Akin	Janet Woodward
1989	Elaine Richardson	Elaine Richardson

1990	Mary Beth Thomas	Johnny Carson
1991	Henry Aldrich	Henry Aldrich
1992	Charles Humphrey	Charles Mims
1993	Jim Sheetz	Danny Akin
1994	William B. Greene	Danny Akin
1995	Randolph Taylor	Janet Woodward
1996	JoAn Hudson, Mike Sullivan	Jay Jerome, Tom Richards
1997	Bob Price	JoAn Hudson
1998	*No Meeting* - MSA in Atlanta (SEMS had a session at the meeting)	
1999	Greg Erdos	E. Ann Ellis
2000	Bill Monroe	Jim Sheetz
2001	JoAn Hudson	Bob Price
2002	Buddy Steffens/John Shields	Charles Mims
2003	Bob Price	Jay Jerome
2004	*No meeting*, SEMS hosted MSA in Savannah GA	
2005	Jim Sheetz	William Monroe
2006	*Joint with ASB*, John Shields & Judy King - Liaisons	
2007	Cynthia Goldsmith, Charles Humphrey, Robert Simmons	
2008	Cynthia Goldsmith	John Shields
	Amanda Lawrence	Charles Humphrey
	Bill Monroe	
2009	John Shields	Charles Mims
	Mary Ard	
	Beth Richardson	
2010	Bryan Majkrzak	Giselle Thibaudeau
	Robert Price	
2011	Cynthia Goldsmith	Charles Humphrey
	Charles Humphrey	John Shields
	Robert Simmons	
2012	John Donlon	John Shields
		Robert Simmons
2013	Dayton Cash	Richard Brown
2014	Bob Price	Jay Jerome
2015	Cynthia Goldsmith	Heather Evans-Anderson
	Robert Simmons	John Shields
2016	Amanda Lawrence	Luisa Amelia Dempere
2017	John Shields/Mary Ard	Terri Bruce
2018	Bob Price	Jay Jerome
2019	Cynthia Goldsmith	Paul Eason
2020	*Cancelled because of COVID*	
2021	Paul Eason	Luisa Amelia Dempere
2022	Paul Eason	Terri Bruce
2023	John Shields/Deniz Ballero/	Mary Ard
	Bob Monteverde	
2024	Jay Jerome	Rachel Hart