



CMMS

Chesapeake Microscopy & Microanalysis Society

Quarterly
Newsletter
April - June 2019
Volume 1, Number 2

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President's Column



Spring, my favorite season, is finally here. I love the explosion of colors on the trees, the wide spectrum of more than fifty shades of green and the stimulating scent in spring. Oh, yes, I love the mild fragrance of spring flowers mixed with the scent of moist dirt saturated with spring rain. They jolt me out of the winter hibernation mode. At the end of each day, after spending many hours in the darkened electron microscope room, I would inhale deeply and let my eyes and nose be awakened by all the senses. Believe me, my nose is capable of suppressing the smells of car exhaust and trash in the street of downtown Baltimore and selectively amplifying the smells of spring. I always get a boost of energy to pick up my pace because I cannot wait to go home and check out what just popped out in my garden.

One of my colleagues once told me that I have the most wonderful job because I get to spend all day in front of the electron microscope and marvel at all the ingenious designs of cellular details. Ignoring the facts that I rarely get to spend "all day" in front of the microscope, I do believe it is a privilege to be an electron microscopist, to have the opportunity to see the unseen by the naked eye, to be entrusted with one (or more) sophisticated instrument that costs more than everything I own. And my husband won't even trust me with his lawn mower! Back in April, I got a chance to visit Natalia de Val's cryo EM lab at the NCI in Fredrick. I met Kunio Nagashima who I have known for more than ten years. Kunio told me that he first saw the HIV virus with Dr. Gallo in front of the electron microscope. It's funny that Kunio mentioned this to me because I also know the electron microscopist, Hélène Ohayon who saw the HIV virus for the first time with Dr. Montagnier at the Pasteur Institute in Paris. Hélène has already retired many years ago but I never forget the sparkle in her eyes when she told me the story. I saw the same sparkle in Kunio's eyes. What a privilege to be there at historical moments like these. Just imagine, before Kunio and Hélène prepared their grids, we did not even know about the existence of the HIV virus. I told Kunio that I am so envious. I also made a mental note to myself that we should do a better job to recognize the contribution of many unknown pioneers like Kunio and Hélène in our field.

In the second issue of our newsletter, we feature interviews with Drs. Rhonda Stroud and Ed Vicenzi. Both of them have a huge presence in our EM field. Rhonda will also be one of the speakers for the CMMS dinner in May. I would like the CMMS newsletter to continue featuring personalities in our community. Not only researchers but also technical staff, service engineers, vendors who tend to work behind the scene yet play important roles in our community. We are planning two events in May, the Current EM Techniques workshop and the CMMS dinner; both will be held in the University of Maryland Baltimore. We are considering changing the format of the Current EM Techniques workshop next year making this event a major scientific exchange event for our society. We would like to invite members of our community to submit abstracts (e.g., the abstract submitted to the M&M or other national meetings) and we would like to give the presentation opportunities to students and staff. The two symposia focusing on biology and material science will be run simultaneously. But we will have plenty of chances to mingle and socialize during the break time. I hope you will enjoy reading the newsletter as much as I do. As always, I would love to hear from our readers and members of CMMS. I hope to see you soon in one of our events in May.

Ru-ching Hsia
President of CMMS, 2018-2019
rhsia@umaryland.edu

NEW YEAR... NEW PRODUCTS

Our EMS New Products Bulletin for 2018 is now available and loaded with the latest innovative products for all fields of microscopy and general laboratory research.

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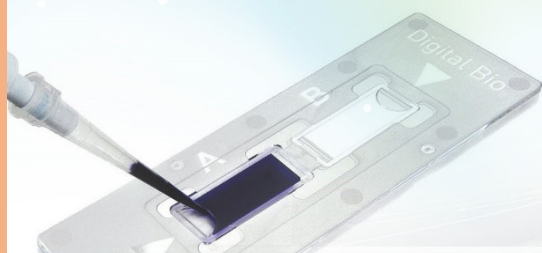
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ChesapeakeMicroscopySociety@gmail.com

Submission Deadline

Submission deadline for the July – September edition of the newsletter is August 10, 2019. Submit all potential articles, photos and information you would like to share with the local microscopy community to the following address.
ChesapeakeMicroscopySociety@gmail.com.

Cover Photo

Image courtesy of Joe Mowery – USDA ARS. TEM image of a sarcocyst embedded within snake muscle. The grayscale TEM image has been colorized to highlight the developing metrocytes (orange) which will eventually develop into mature bradyzoites (blue). Sarcocysts can only be identified to species based on TEM analysis of the patterns of the cyst wall (black).

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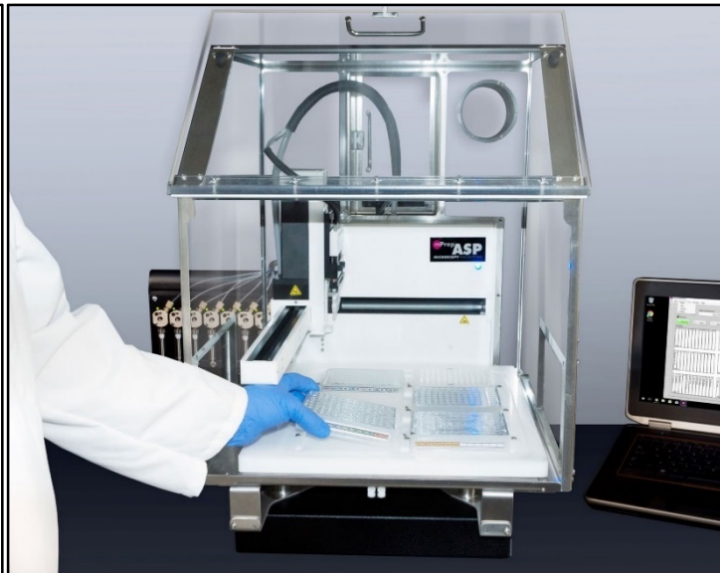


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MICROSCOPY RELATED JOBS

Position, Institute and Laboratory	Brief Description	More information
RESEARCH ASSOCIATE I- ELECTRON MICROSCOPIST NCI/National Research Technology Program, Frederick, MD Cryo EM Lab	Cryo EM Lab has two research assistant positions open seeking detail-oriented individuals with bachelor degree and a minimum of two years of experience with Cryo-EM, Cryo-electron tomography, and high resolution single-particle analysis. Responsibilities include the use and maintenance of TEM microscopes, Titan Krios, Talos Arctica, T12, T20, Talos L120C and Sample preparation for cryo-EM studies and negative stain screening.	https://leidosbiomed.csod.com/ats/careersite/jobdetails.aspx?site=4&c=leidosbiomed&id=365 https://leidosbiomed.csod.com/ats/careersite/jobdetails.aspx?site=4&c=leidosbiomed&id=364 Inquiry: Natalia de Val devalaldan2@mail.nih.gov Group Leader, Cryo EM
RESEARCH ASSISTANT University of Maryland Baltimore ELECTRON MICROSCOPY CORE IMAGING FACILITY (EMCIF)	A research assistance position will be open in UMB EMCIF conducting EM related research in a laboratory setting. The primary responsibilities include TEM/SEM specimen processing, ultramicrotome sectioning, sputter coating, critical point drying, immunolabelling and examination of specimen by using TEM and SEM. Knowledge and skills with advanced EM techniques such as cryo EM sample preparation, cryo EM, CLEM, 3-D EM, etc. will be considered favorably	Inquiry: Ru-ching Hsia rhsia@umaryland.edu Director: EMCIF, UMB
CELLULAR IMAGING SALES & APPLICATIONS ACCOUNT EXECUTIVE Boston, Chicago, San Diego, Houston Molecular Devices	Molecular Devices is seeking a Sales Professional responsible for the sales activities associated with the ImageXpress Pico Automated Imaging platform in the Boston territory. The incumbent will be required to build and maintain strong customer relationships directed toward growing Molecular Devices' market share, revenue and profitability year over year	https://danaher.taleo.net/careersection/external/jobdetail.ftl?job=MOL002341&lang=en&sns_id=google Inquiry: Janice Ceresa Janice.Ceresa@dhrdiagnostics.com Sr. Recruiter, Danaher - Life Sciences & Diagnostics
NANOTECHNOLOGY CONSULTANT Boston Leica Microsystems	This position effectively leverages the support resources within and outside of Leica in order to be as efficient and effective in the selling process. The incumbent must demonstrate rigorous time and territory management practices and actively dedicates time to sales prospecting to grow the opportunity funnel for the future	https://danaher.taleo.net/careersection/external/jobdetail.ftl?job=LEI004672&lang=en&sns_id=google Inquiry: Janice Ceresa Janice.Ceresa@dhrdiagnostics.com Sr. Recruiter, Danaher - Life Sciences & Diagnostics

Remember to send your future job openings to
CMMS for inclusion on the website and newsletter!
ChesapeakeMicroscopySociety@gmail.com

SPOTLIGHT ON A CMMS SPEAKER

Dr. Rhonda Stroud
Head of Nanoscale Materials Section
Naval Research Laboratory



Dr. Rhonda Stroud at the South Pole holding a MAS banner

Dr. Rhonda Stroud is the Head of the Nanoscale Materials Section at the Naval Research Lab, where she oversees the DoD's most advanced electron microscope facility for nanoscale materials characterization. Her research interests span many classes of materials, from quasicrystals and oxide electronics to aerogel nanocomposites and nanoparticles formed in supernovae. She received her B.A. in physics from Cornell University in 1991, and her Ph.D. in physics from Washington University in St. Louis in 1996. She is a fellow of both the American Physical Society and the Meteoritical Society, and has an asteroid named in her honor by the International Astronomical Union. She serves on the NASA Planetary Science Division Advisory Committee, and is President of the Microanalysis Society.

Q (CMMS): Hi, Rhonda, I want to thank you for agreeing to give a talk at our CMMS dinner in May. I know you are well known in the worlds of material science and meteorites, and you are the current

president of the Microanalysis Society. For those who are not familiar with you though, would you mind briefly introducing yourself to the members of our local community? What was your training background, and how did you come to be a microscopist?

A (Stroud): I started using electron microscopy in graduate school to characterize Ti-based quasicrystals and related metallic glasses. It was a bit of a non-traditional start, as I learned to index quasicrystal electron diffraction patterns in six dimensions before I knew how to index a diffraction pattern in simple FCC metal.

My skills in electron microscopy and looking at disordered materials landed me a postdoc at the Naval Research lab working on disorder in thin film colossal magnetoresistant oxides. I didn't decide to specialize full time in electron microscopy until after I had been a staff member at NRL for a couple of years, and realized that NRL needed more electron microscopy and not another oxide film growth person.

Q (CMMS): Could you briefly describe what your research focus is at the Naval Research Laboratory (if you are allowed to elaborate)? What samples do you work on, what types of instrument do you have, and what techniques are performed in your lab?

A (Stroud): I lead a group dedicated to electron, ion and x-ray beam characterization and modification of materials at the micron to single atom scale. About half of the work we do is NASA-sponsored work on the structure of materials from space, and half addresses the structure of nanomaterials being developed for optical, electronic or other applications. Our primary tools are a JEOL 2200FS field emission TEM, Nion UltraSTEM-200X aberration-corrected scanning transmission electron microscope, and two focused ion beam microscopes. We also use scanning transmission x-ray microscopes, usually at the Advanced Light Source in Berkeley, and collaborate with researchers at the Carnegie Institution for Science on NanoSIMS measurements of the isotopic compositions of our planetary materials samples.

Q (CMMS): I know there is an asteroid named after you. Would you share with us the story behind it?

A (Stroud): Yes, Asteroid 8468Rhondstroud is named for me. Every once in a while I get on line, and check the trajectory calculations for where it is in space. But don't worry, it doesn't have an Earth-crossing orbit. It hangs out between Mars and Jupiter with the rest of main belt asteroids. The International Astronomical Union is responsible for the naming of asteroids, based on recommendations from the person who discovered them. I was recommended because of the pioneering work I did developing focused ion beam methods for enabling coordinated nanoscale analysis of nanoparticles from stars and other planetary materials.

Q (CMMS): You have quite an accomplished career in material science. What do you consider is the high point of your career and the best achievement so far?

A (Stroud): That's hard to say. I've had the chance to work on lot of really interesting materials. Right now, I'm really excited about a result that was just published in *Science Advances* demonstrating the molecular doping of nanodiamond. This is collaboration between NRL and the University of Washington, using high pressure, high temperature conversion of carbon aerogels to make diamonds. The microscopy at NRL was crucial to demonstrating that not just Si, but even volatiles like Argon or other noble gases can be incorporated into nanodiamonds directly, without having to resort to ion implantation. This has potential applications in quantum computing, and bioimaging, and also helps to explain how nanodiamonds with noble gases may have formed in the early solar system.

Q (CMMS): In your opinion, what was the most challenging part of your job? What is the most important training that helped you with your career?

A (Stroud): The part I find most challenging is deciding when the results are good enough to publish. It is always more fun to gather more data than it is to write papers, and there is always some aspect of the work that could be improved with a bit more data or analysis. It's important to remember that it is ok to publish a work in progress, because nearly all research is a work in progress. You know that saying, "If there's no picture, it didn't happen?" in research it's "If

there's no paper, it didn't happen". In five years, no one remembers who presented an idea first at a conference. All they have to go on is what made it into print.

The training that I found most helpful is my basic physics. I collaborate constantly with people from a very wide range of disciplines from physics and materials science to chemistry, geology, electrical engineering, and even biology. A basic grounding in physics gives you a way to identify the key qualitative factors that influence a problem, and to do quantitative "reality checks", or order of magnitude estimates. So even if I am not an expert in all those different areas, I can try to hone in on the central question that the microscopy might be able to answer in a given cross-disciplinary collaboration.



Rhonda discussing TEM with former Director of the White House Office of Science and Technology Policy John Holdren.

Q (CMMS): I know you are very committed to help young and women scientists. Do you have any words of advice for the junior members of our EM community when they choose a career path in industry, academia or government?

A (Stroud): First, I would say that being an electron microscopist is a really fun thing to be. When I was just starting out at NRL, a senior physicist told me he wouldn't "touch EM with a ten foot pole", because he thought you couldn't be a scientific leader and also be a "characterization" person. You had to be the device designer, or the theorist to be the leader. I disagreed then, and still do today. Skills in electron microscopy give you flexibility to work on a lot of different types of materials, and leading is more about thinking about the bigger picture than it is

about your particular scientific specialization. When I think about who the people in the Microanalysis Society are, I would say what unites us is that we are all problem solvers at heart. We use our various tools and methods to answer all sorts of puzzles about the physical world. So for the new members of the EM community, I would say, find the problems you can solve, and start solving!

Second, I would say that there are real differences between working industry, academia and government, and even among government labs. Working in industry can be really rewarding if you want to see the near term impact of your work on the world. To do basic research at a university or a government lab, you have to have a lot of patience for failed experiments, failed grant proposals and for long, uncertain pathways from publication to application. But if basic research is your thing, the joy of being the first one to solve some fundamental puzzle can make all the time and effort worth it. Figure out which of those things--- real, immediate impact, or fundamental advances over a longer timeline, is more satisfying to you.

Q (CMMS): Do you have any suggestion for future CMMS events or what CMMS can do to promote EM techniques or help the career advancement of our members?

A (Stroud): Take advantage of what the national societies have to offer. MAS has a program to help early career microanalysts get more advanced training

or collaborate with a more senior MAS member, through our Goldstein Scholar Awards. Check out the description on the MAS webpage, and consider applying. Let MAS help promote activities of the local society—the MAS web and social media teams are happy to promote content about events and accomplishments from the local societies.



Dr. Rhonda Stroud with her Nion UltraSTEM-200X



Present and former members of the Stroud laboratory at Microscopy and Microanalysis 2018 in Baltimore Maryland



Want your event to be published in the CMMS Newsletter or Website?

SUBMIT a microscopy event HERE

05/30-05/31	UMB Current EM Technique Workshop --- Multi-modality imaging	University of Maryland Baltimore	https://www.dental.umaryland.edu/core-imaging/workshops-and-courses/current-em-techniques-workshop-multi-modality-imaging/
05/30	UMB-CMMS Joint Dinner	Univ. Maryland Baltimore	https://www.dental.umaryland.edu/umb-cmms-dinner/
06/10-06/14	GWNIC Correlative Light and Electron Microscopy Workshop	George Washington Univ.	https://nic.gwu.edu/clem-workshop
06/24-06/27	Quantitative Microanalysis topical conference (QMA 2019)	University of Minnesota, Minneapolis	https://the-mas.org/events/topical-conferences/qma-2019/
07/11-07/12	Bio EM Sample Processing Minicourse	Univ. Maryland Baltimore	https://www.dental.umaryland.edu/core-imaging/workshops-and-courses/
08/04-08/08	Microscopy & Microanalysis annual Meeting	Portland Convention Center	https://www.microscopy.org/MandM/2019/
09/17-09/18	Cryo EM Sample Prep Minicourse	University of Maryland Baltimore	https://www.dental.umaryland.edu/core-imaging/workshops-and-courses/
10/09-10/10	NanoDay 2019 & Electron Microscopy Workshops	University of Maryland College Park NanoCenter	http://nanocenter.umd.edu/nanoday
10/18	CMMS Fall Social 6:00-9:00 PM Let's make it a family event!	<u>Maryland Space Grant Consortium Observatory</u>	https://chesapeakemicroscopy.org/events/
10/23-10/25	Immuno EM- Principles & Practice Minicourse	Univ. Maryland Baltimore	https://www.dental.umaryland.edu/core-imaging/workshops-and-courses/

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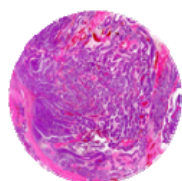
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**Chesapeake Microscopy
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UMB-CMMS

Joint Dinner

Date: May 30, 2019

Time: 5:00 to 8:30 PM

LOCATION

University Maryland Baltimore

Southern Management

Campus Center

621 West Lombard Street Baltimore

Program:

5:00 PM - 5:30 PM	Social, drinks and snacks
5:30 PM - 6:00 PM	Registration
6:00 PM - 7:00 PM	Dinner
7:00 PM - 7:40 PM	Rhonda Stroud US Naval Research Laboratory From The Earth to the Cosmos and back to the Electron Microscope
7:40 PM - 8:20 PM	Jiwen Zheng U.S. FDA Center for Devices and Radiological Health Use of Cryogenic Electron Microscopy for Morphological Characterization of Drug Products and Devices
8:20 PM - 8:30 PM	CMMS Business

Cost:

	Pre-register	At the Door
CMMS Member	\$30	\$35
Non-Member	\$35	\$40
CMMS Student Member	\$10	

More Information:

<https://www.dental.umaryland.edu/UMB-CMMS-Dinner/>



2019 UMB Current Electron Microscopy Techniques Workshop

Multi-Modality Imaging

05/30 – 31, 2019

Southern Management Campus Center, University of Maryland Baltimore
3rd Fl, 621 West Lombard Street, Baltimore MD 21201

Final Program

May 30 th , 2019			
Start	End		Speaker
8:30	9:00	Registration	
9:00	9:10	Introduction & Opening	Ru-ching Hsia
9:10	10:00	Acceleration of Neuroscience Research Discovery by Incorporation of Multiple Modalities Microscopic Data	Anastas Popratiloff <i>GWU</i>
10:00	10:30	Coffee/Tea break	
10:30	11:20	Reverse Engineering Alligator Gar Fish Scales: Where Biology meets Materials Science meets Mineralogy	Ken Livi <i>JHU</i>
11:20	12:10	Going Back to the Basics-Best Practices in Digital Imaging Acquisition	Jason Hill <i>Nikon</i>
12:10	13:30	Lunch break	
13:30	14:15	Target Material Selection for Sputter Coating of SEM Samples	Rod Heu <i>Rave Scientific</i>
14:15	15:00	Break	
15:00	17:00	Instrument Demo will be held at the EMCIF, Center for Innovative Biomedical Resources (CIBR), 685, West Baltimore St. HSF1, 6th floor. To avoid overcrowding in each demo station, four 30-min demo sessions with a maximum of 5 participants can be pre-scheduled via signup genius. See table on page 14 for the list of instruments and signup links.	
17:30	20:30	<u>Joint Dinner with Chesapeake Microscopy & Microanalysis Society</u> <u>(separate registration required)</u> Rhonda Stroud , NRL “From the Earth to the Cosmos and back in the Electron Microscope” Jiwen Zheng , FDA “Use of Cryogenic Electron Microscopy for Morphological Characterization of Drug products and Devices”	
May 31 st , 2019			
9:00	9:50	Transforming Sample Into Data – Multi Modality Imaging	Alice Fengxia Liang <i>NYU</i>
9:50	10:40	Molecular multimodal imaging in neuro-oncology	Pavlos Anastasiadis <i>U M Baltimore</i>
10:40	11:10	Coffee/Tea break	
11:10	12:00	Exploring the True Structure of Tissue with 3D Electron Microscopy	Tara Nylese <i>Thermo Fisher</i>
12:00	13:30	Lunch break	
13:30	14:15	Multi-Modality FIB SEM + Analytics for 2D and 3D Life Sciences Applications	Lucille Giannuzzi <i>Tescan</i>
14:15	15:00	Break	
15:00	17:00	Instrument Demo, continued	
https://www.dental.umaryland.edu/core-imaging/workshops-and-courses/current-em-techniques-workshop-multi-modality-imaging/			

2019 UMB Current Electron Microscopy Techniques Workshop INSTRUMENT DEMONSTRATION

The Instrument Demo of the Current EM Technique Workshop (3 to 5 PM, May 30/31) is **open to CMMS dinner attendees**. Instrument demo is located at the Electron Microscopy Core Imaging Facility (EMCIF), Center for Innovative Biomedical Resources (CIBR, 685 W Baltimore St, yellow building in the map). Plan to arrive early to see some of the instrument demo before CMMS dinner. Demo signup is highly recommended to avoid overcrowding

Instrument	Vendor	Signup Genius
ASP1000, Auto Specimen Processor	Microscopy Innovations	Demo Signup
ARTOS 3D Array Tomography Solutions	Leica Microsystems	Demo Signup
EM GP2 Grid Plunger	Leica Microsystems	Demo Signup
AutoSAMDRI-931 Critical Point Dryer	Tousimis	Demo Signup
Portable Plasma Cleaner	ibss Groups	Demo Signup
Hitachi TP4000 Tabletop SEM	Angstrom Scientific	Demo Signup
EMS 150V Plus Ultra-Fine Coater	EMS	Demo Signup
EasiGlow & Hi Vac Coater	Ted Pella	Demo Signup

UMB Campus Map



- SMC Campus Center, 621 W. Lombard St.
- CIBR, HSF1, 6th floor, 685 W. Baltimore St.
- Penn St Garage, 120 S. Penn St.
- Pratt St. Garage, 646 W. Pratt St.
- Bressler Research Building, 655 W. Baltimore St.
- UMB Health Sciences & Human Services Library

Parking can be found along major streets around UMB campus. Street parking is free after 6 PM. Two parking garages close by are indicated in brown on the map.

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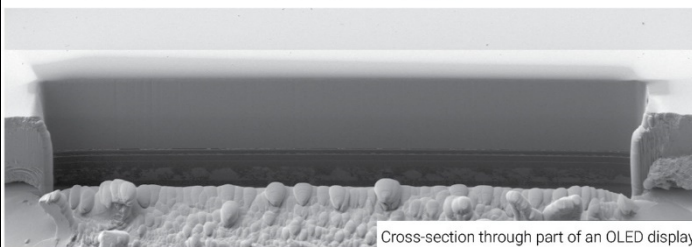


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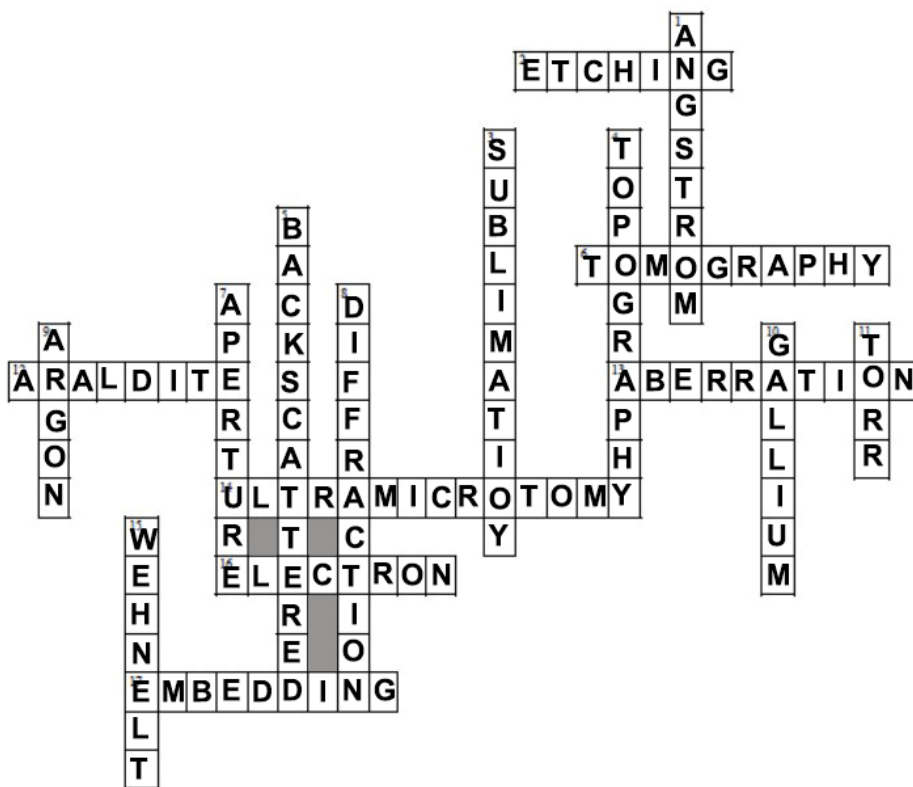
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Answers to last Months Quarterly Microscopy Crossword Puzzle



Quarterly Photo Contest Winner

Image courtesy of **Tagide deCarvalho**, Director of the Keith R. Porter and Nanolmaging Facilities at the University of Maryland, Baltimore County.

Polysiphonia, red algae, stained with acridine orange. Image was collected using a Leica SP5 confocal microscope. Huygens (SVI), Imaris (Bitplane) and Adobe Photoshop were used for image processing).

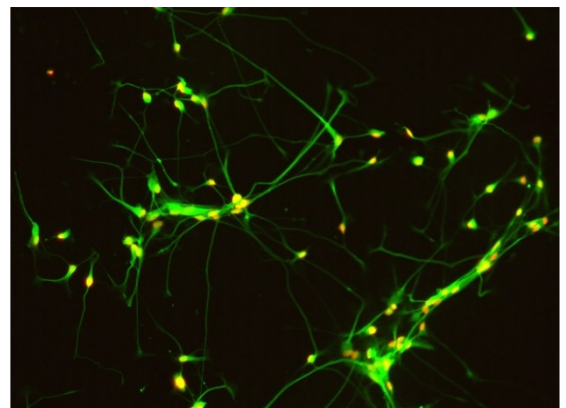


Other Images Submitted



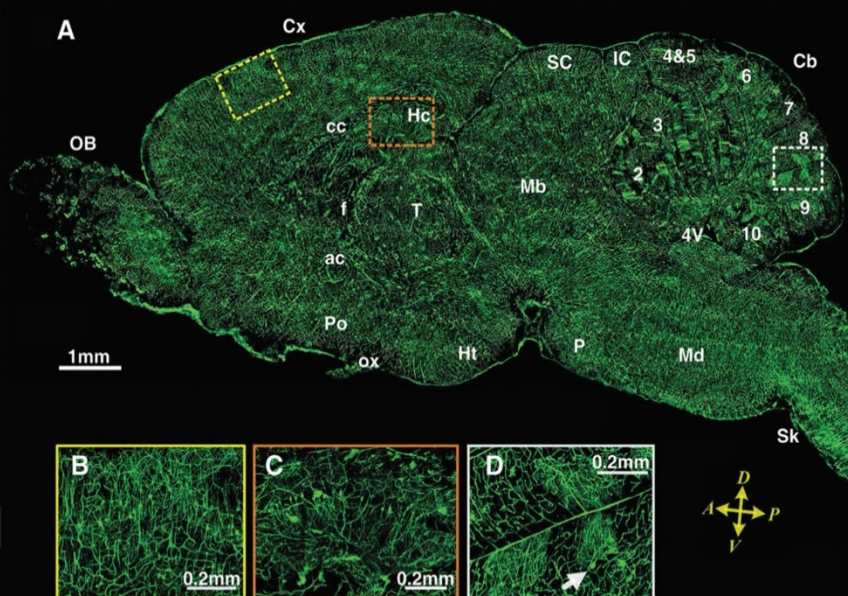
Image courtesy of **Shiliang (Stephen) Zhang** at the Confocal and Electron Microscopy Core at the National Institute on Drug Abuse, NIH. Unexpected glutamatergic excitatory axon terminals (dark green) from the ventral tegmental area make synaptic contacts on a dendrite of a parvalbumin neuron (magenta) involved in aversion. From art view, all kind of cellular organelles at the ultrastructural level look like diverse groups of sea animals sadly jumping out of the contaminated river. They are not happy and rewarding!

Image courtesy of **C. Kaneski** at Ulrike Hoffman's Lab, at the National Institute of Diabetes and Digestive and Kidney Diseases, NIH. Human embryonic stem cells, differentiated to cortical neurons and stained with mouse monoclonal antibody against β III-tubulin (TUJ1, Covance), a neuronal specific marker, which was detected with goat anti-mouse Alexa 488. The nuclei were counterstained with DAPI and the image pseudo-colored. The merge shows neurons in green and the nuclei in yellow. Imaged at 20X.



Submit images to <https://chesapeakemicroscopy.org/gallery/> for listing on the website and inclusion in the Quarterly photo contest. Contest winner receives a free ticket to a CMMS dinner. Deadline for receipt for the next contest is August 11, 2019.

YOU'LL FIND **DiATOME** AT THE
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Creating a High Resolution Atlas of the Mouse Brain...

(A) A sagittal image reconstructed from a stack of 100 virtual sagittal sections (total thickness of 0.1 mm). These sections were transformed from the original coronal sections. The sagittal image was located in the right hemisphere about 0.4 mm lateral to the middle. Almost all major regions of the brain can be seen in this image, e.g., the Olfactory Bulb (OB), Cerebral Cortex (Cx), Hippocampus (Hc), Fornix (f), Anterior Commissure (ac), Thalamus (T), Cerebellum (Cb), Midbrain (Mb), Pons (P), Medulla (Md), Corpus Callosum (cc), Superior Colliculus (SC), Inferior Colliculus (IC), Hypothalamus (Ht), Preoptic Area (Po), Optic Chiasm (ox), 4th ventricle (4V) and nine lobules of the cerebellum (Arabic numerals, 2 to 10). The three regions inside the different colored rectangle in (A) are the positions of (B), (C) and (D), which illustrate the cerebral cortex, hippocampus and cerebellum, respectively. In the reconstruction of sagittal image, no dislocation was observed along the D-V axis, i.e., the coronal sections are inherently aligned along the A-P axis.



DiATOME QUALITY AND INNOVATION APPLIED...

Micro-Optical Sectioning Tomography to Obtain a High-Resolution Atlas of the Mouse Brain

Existing imaging tools have limitations for brainwide mapping of neural circuits at a mesoscale level. In collaboration with DiATOME, researchers developed a Micro-Optical Sectioning Tomography (MOST) system utilizing a DiATOME Diamond Knife that can provide micron tomography of a centimeter-sized whole mouse brain.

Slicing was performed by moving the specimen to generate ribbons, and each ribbon was simultaneously imaged. The illuminating beam passed through a beam splitter, mirror and objective to irradiate the ribbon. The imaging beam collected by the objective and passed through the mirror, beam splitter and tube lens was then recorded by a line-scan CCD.

A 3D structural dataset of a Golgi-stained whole mouse brain at the neurite level was obtained. The morphology and spatial locations of neurons and traces of neurites were clearly distinguished. Researchers found that neighboring Purkinje cells were sticking to each other.

Acknowledgement

Micro-Optical Sectioning Tomography to Obtain a High-Resolution Atlas of the Mouse Brain Anan Li, Hui Gong, Bin Zhang, Qingdi Wang, Cheng Yan, Jingpeng Wu, Qian Liu, Shaoqun Zeng, Qingming Luo

Britton Chance Center for Biomedical Photonics, Wuhan National Laboratory for Optoelectronics—Huazhong University of Science and Technology, Wuhan 430074, P. R. China.

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SPOTLIGHT ON A LOCAL MICROSCOPIST

Dr. Edward Vicenzi
Research Scientist
Smithsonian Museum
Conservation Institute



Dr. Edward Vicenzi

Q (CMMS): What was your training background?

A (Vicenzi): My training is in Earth sciences. I spent undergraduate summers in the field assisting mineral and petroleum exploration crews. I then conducted a field and analytical study of an ocean island volcano in the Galapagos archipelago. That work led me to my first hands-on exposure to operating an early generation electron microprobe, which I found an interesting, and in some regards antiquated technology (the stationary beam could not be scanned & don't ask about the output). I then performed laboratory experiments whose run products were millimeter-scale and required a scanning electron beam and x-ray microanalysis to sort out the results.

Q (CMMS): How did you come to be a microscopist?

A (Vicenzi): During a postdoctoral fellowship in Australia I was exposed to quantitative microanalysis using a proton microprobe. That was an eye-opening experience! I loved the melding of surface physics and technological issues required to make a measurement all in an effort to learn more about the science behind

a specimen. With the seed for becoming a professional microanalyst planted, I moved to Princeton University where a multidisciplinary imaging and analysis center was being constructed. While there I used WDS-EPMA, SEM/EDS, and the scanning probe microscope to examine a variety of scientific to high technology engineering materials. An opportunity to join the National Museum of Natural History came around, and after some time of analyzing extraterrestrial specimens (among other natural samples) moved to the intersection of science with history, art, and culture at the Smithsonian's Museum Conservation Institute. My trajectory is an example of an odd but enjoyable career path that is probably not atypical for those who use microscopy to earn a living.

Q (CMMS): Could you briefly describe what your research focus is at the Smithsonian? What samples do you work on, what types of instrument do you have, and what techniques are performed in your lab?

A (Vicenzi): I use imaging and analysis techniques at the microscale to help reveal the origin and history of museum specimens. The materials I examine are either from research collections, accessioned in the national collections, or are related in some way to the object of interest. In any given week, I could be looking at mineralogically-based cultural heritage materials (e.g. jades, environmental Mn oxides, corroded iron meteorites), metallic objects (e.g. early photographs, pre-Columbian gold, medieval metal wrapped textiles), or analyzing iron-age glasses.

For many projects I use a pair of atmospheric methods before introducing a specimen into the SEM chamber, namely digital light microscopy and imaging portable XRF spectrometry. Light microscopy allows one to create a digital height map of the specimen coupled with surface color information. Portable XRF gives one an overview of compositional variability for tender to hard x-rays ($>Na/Mg K\alpha$) as any softer x-rays are heavily absorbed by the atmosphere.

At the Museum Conservation Institute, I use a large chamber SEM that has been optimized for imaging and microanalysis of cultural heritage materials. Apart from electron imagery, we use dispersive multispectral cathodoluminescence (CL) to capture color images that record defects and impurities in

ceramic materials. Hyperspectral electron beam x-ray imaging is routine for nearly all specimens followed by standards-based EDS to determine quantitative composition where possible. We also use a micro-X-ray fluorescence spectrometry to quantify minor and trace element compositions, and use a constant velocity sub-stage to raster specimens under the photon beam to generate XRF images under high vacuum. In cases where some level of molecular information is needed for hydrated or carbon-based materials, reflectance FTIR microscopy may be employed in spot analysis or mapping modes

Q (CMMS): What do you consider is the high point of your career and the best achievement so far?

A (Vicenzi): Big science is a term that is used to describe massively expensive projects that require a large team of investigators. I was fortunate to participate in the preliminary examination team for NASA's Stardust mission that returned samples of a comet to Earth in 2006. The team was both international and large, involving almost 200 scientists. While data will continue to be generated for years to come from these specimens, the excitement of shared expertise during the preliminary period leading up to publication of the first results was palpable. I would therefore rate the experience as a high in terms of science thrill.



Ed Vicenzi at work at the Smithsonian Institution.

Q (Hsia): What was the most challenging part of your job? What is the most important training that helped you with your career?

A (Vicenzi): Challenges in my job involve shifting gears from project to project sometimes several times within a given week. It can cause whiplash of the mind!

After encountering countless problems involved with failed measurements and instrument malfunctions I have come to appreciate patience in the laboratory. Not becoming overwhelmed by annoyance is not part of formal training but is critically important nonetheless for enjoying your work.

Q (CMMS): Do you have any words of advice for the junior members of our EM community when they choose a career path in industry, academia or government?

A (Vicenzi): Practical advice: seek paid internships and fellowships in any laboratory setting where you have an interest. General advice: keep an open mind about your scientific motivation. What interests you most today may not be your central passion a few years or more down the road.

Q (CMMS): Do you have any suggestion for future CMMS events or what CMMS can do to promote EM techniques or help the career advancement of our members?

A (Vicenzi): A future event featuring tour speakers from both the Microanalysis Society and Microscopy Society of America hosted by CMMS could be combined with local presenters.

Q (CMMS): What is the weirdest sample you have looked at using microscopy?

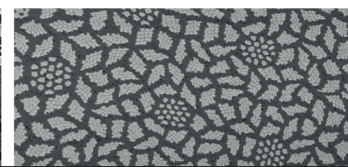
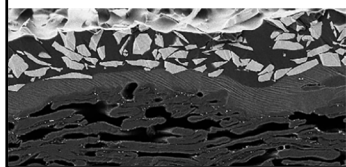
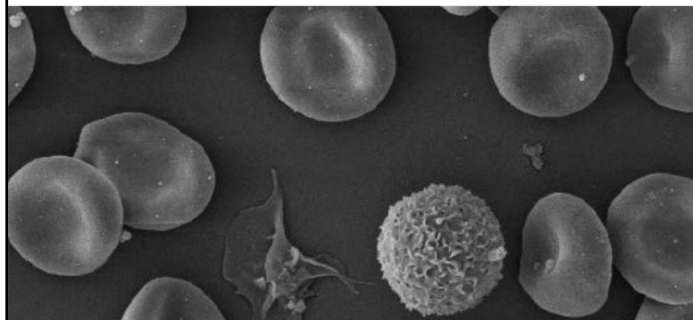
A (Vicenzi): I was sent a sample for cathodoluminescence imaging thought to be extraterrestrial. It turned-out to be a vanadium slag, the ceramic waste from smelting ore. So compositionally, a vanadium-based material could be considered weird, not to mention rare asteroids hyper-enriched in vanadium!

I once conducted a short term study for an entity interested in the impact of shampoos and conditioners on human hair using force microscopy. When I asked about reference materials I was told I would be provided with "virginal" hair donated by someone who purportedly had never used any commercial hair products. While perhaps routine in that industry, it was a singular reference standard in my experience!

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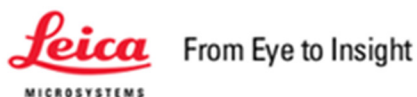


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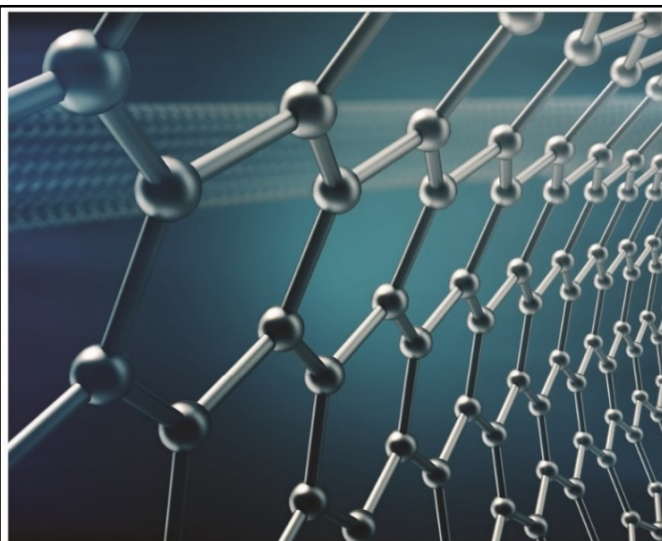
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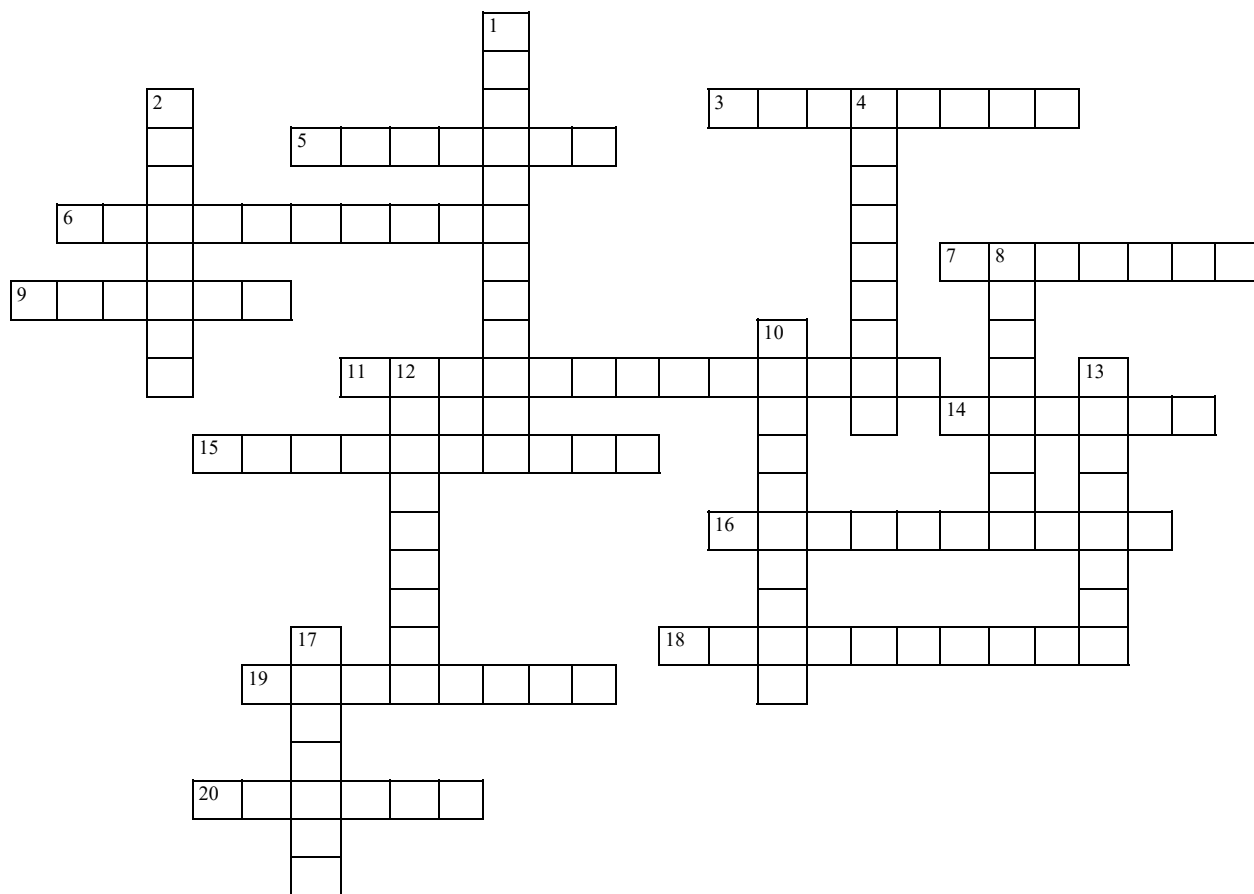
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Quarterly Crossword Puzzle for Electron Microscopists



Across

3. An inert gas that can be liquefied and used as a cryogen for cryo EM operation
5. A major diamond knife manufacturer based in Switzerland
6. An arsenic containing buffer used for traditional biological EM sample processing
7. An organic solvent commonly used to replace water in biological specimens during EM sample processing
9. A space devoid of matter, in which all air and other gases have been removed
11. How much an image is enlarged by a microscope
14. A heavy metal that is a common staining and fixing agent used in the preparation of biological EM specimens
15. Specimen stage for the TEM that allows the specimen to be traversed and tilted simultaneously
16. The distance between two identical adjacent points in a wave
18. The shortest distance between two points on a specimen that can still be distinguished by a microscope
19. A manufacturer of critical point dryers based in Rockville, Maryland
20. Ionized gas atoms used to remove surface contaminants and impurities

Down

1. Phenomenon which occurs when high-energy radiation is absorbed by a molecule and when this molecule emits light of a longer wavelength than that absorbed
2. The separation of an object or material into two or more pieces under the action of stress
4. The emission of energy as electromagnetic waves or as moving subatomic particles that can travel through space and penetrate various materials
8. The metal component of common electron microscope filaments
10. An aberration occurs when the electrons in the primary beam are exposed to a non-uniform magnetic field as they spiral around the optic axis
12. A word used to describe the structure of ice that is formed by rapid cooling
13. A process to preserve biological tissues by inactivating any ongoing biochemical reactions
17. Also called electromotive force, it is a quantitative expression of the potential difference in charge between two points in an electrical field

*Compiled by Ru-ching Hsia, 05/10/2019
Answer key will be published 06/01/2019*

Solve this puzzle online: <https://crosswordlabs.com/view/2019-05-10-6>

Access past puzzle and answer key: <https://chesapeakemicroscopy.org/crossword>

Recent CMMS Meeting

CMMS SPRING DINNER MEETING AT THE CARNEGIE INSTITUTES FOR SCIENCE, GEOPHYSICAL LABORATORY

On Tuesday March 5th, members of the Chesapeake Microscopy Society gathered at the Carnegie Institution of Science for the CMMS Spring Dinner. Catering was Mediterranean food provided by Mezze, and during dinner informal talks were given by each of the Board of Directors about their role in the Society. Following dinner, the group

adjourned to the adjacent seminar room to listen to two talks. The first talk was by Gary Bauchan from the USDA about parasitic mites on honey bees, and how cryo-SEM and TEM techniques reveal that the mites feed on bee fat, not their blood as previously thought. He even brought along a 3D printed mite scaled up to human size, to give us an idea of what it would be like to be attacked by one ourselves! The second talk was by Andrew Steele of the Carnegie Institution of Science, who told us about Martian meteorites, and how they can be used to help us search for life on Mars. While no life has yet been detected on the Red Planet, meteorites are samples of the Martian surface that can tell us about the presence of water and organic compounds that potentially form the building blocks of life.



CMMS Communications Officer Joe Mowery demonstrates the new CMMS website.

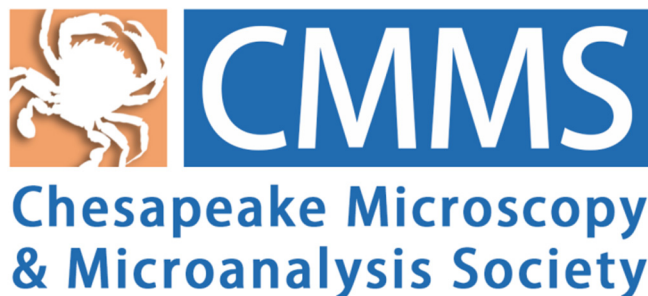
<https://chesapeakemicroscopy.org/>



USDA Research Geneticist Gary Bauchan shows an image of a Varroa mite on a honeybee.



Carnegie scientist Andrew Steele shows one of the tools used for making measurements on Mars – the Curiosity Rover – to compare with the results we get from meteorites.



Recent Local Events

12th Annual FIB SEM Meeting

George Washington University

May 6th – May 7th 2019



The 2019 FIB SEM workshop was held at George Washington University on the 6th and 7th of May. The 12th iteration of the meeting was another great one (kudos to the organizers: Keana Scott from NIST, Ken Livi from JHU and Nabil Bassim from McMaster University, Canada), with a unique mix of tutorials and user and vendor presentations, both oral and posters, highlighting exciting new FIB technology and applications. There were lots of sidebar discussions amongst fellow FIBers, and a very lively Happy Hour event following the first day of the meeting. The next annual workshop FIB SEM 2020 will be on April 23 & 24, 2020 at the Kossiakoff Center at the Advanced Physics laboratory (APL), Laurel, MD. Mark your calendars for this event in this growing and exciting field. See <http://www.fibsem.net/c5/> for details.

Upcoming Microscopy Related Meetings

2019

Lehigh Microscopy School
June 2-7, Bethlehem, PA

Microscopy & Microanalysis 2019
August 4-8 - Portland, OR

Geological Society of America
September 22-25 – Phoenix, AZ

American Society for Cell Biology
December 7-11 – Washington DC

2020

American Microscopical Society Annual Meeting
Jan 3-7 - Austin TX

13th Annual FIB SEM Meeting
April 23-34, Laurel, MD

AASP -The Palynological Society
May 27-27 – Baton Rouge, LA

Microscopy & Microanalysis 2020
August 2-6 - Milwaukee, WI

American Society for Cell Biology
December 5-9 – Philadelphia, PA

Related Links

Chesapeake Microscopy and Microanalysis Society
www.chesapeakemicroscopy.org

Microscopy Society of America
www.msa.org

Microanalysis Society
www.microbeamanalysis.org

American Microscopical Society
www.amicros.org

AASP – The Palynological Society
www.palynology.org

Geological Society of America
www.geosociety.org