CMMS

Chesapeake Microscopy & Microanalysis Society

Quarterly Newsletter

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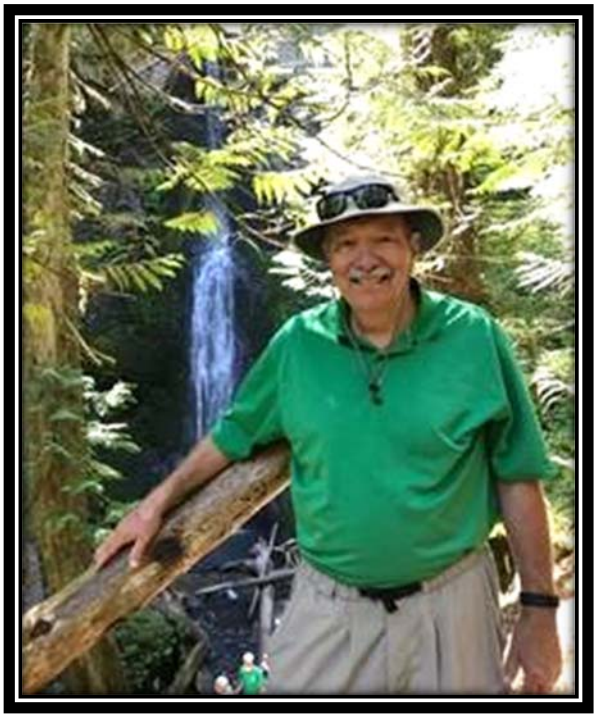
Cover Photo

"A recent Cryo-SEM from Gary Bauchan and Joe Mowery, showing a predatory mite feeding on a root-knot nematode which won the 2020 Soil Biodiversity Photo contest hosted by The Food and Agriculture Organization of the United Nations. Capturing this image required the development of a new cryo-SEM freezing chamber, where mites could be observed under a stereomicroscope feeding on nematodes and instantly frozen as soon as a feeding event was observed" Image captured on a Hitachi SU-7000 with the Quorum PP3010 Cryo Preparation System.

In Memoriam

USDA Research Geneticist Gary Bauchan shows an image of a Varroa mite on a honeybee. This talk was at the CMMS Spring Dinner Meeting on March 5, 2019. Gary was an excellent scientist, microscopist, speaker and wonderful person.

IN MEMORIAM



Dr. Gary R. Bauchan
Agricultural Research Service
U.S. Department of Agriculture
By Joe Mowery

I was devastated to learn on Wednesday afternoon (01/12/2021) that Dr. Gary R. Bauchan, had passed away from complications of Covid-19, which he acquired a week before Christmas.

Dr. Bauchan was engaged in research since 1976 and was an ARS scientist working at Beltsville for the past 38 years. During that time, he authored 253 publications including 182 peer-reviewed papers in addition to 71 symposium articles, popular press articles, training videos, book chapters and conference abstracts.

Dr. Bauchan was recognized as a worldwide expert in alfalfa genetics during his first 25 years at ARS. He was elected the President of the North American Alfalfa Improvement Conference in 1992 and served on the conference executive committee from 1988 until 2008. Dr. Bauchan received an Honorary Membership from the North American Alfalfa Conference in 2010 for "Outstanding contributions to the advancement of alfalfa improvement."

In 2007, Dr. Bauchan became the Director of the Electron & Confocal Microscopy Unit (ECMU) in the Soybean Genomics and Improvement Laboratory. In 2012, Dr. Bauchan coordinated the move of the ECMU into a newly renovated, $1.5 million space containing more than $3 million of scientific equipment including state-of-the-art transmission electron and scanning electron microscopes, a confocal laser scanning microscope, wide field fluorescence microscope, and a high-resolution digital video light microscope. Dr. Bauchan's leadership increased the productivity of the ECMU, leading to 146 peer-reviewed publications plus 60 other publications in the past 12 years.

Dr. Bauchan led the digitization of the ECMU photo collection. The websites http://idtools.org/id/mites/flatmites/ and http://idtools.org/id/mites/beemites/ contain several hundred scanning electron micrographs of flat mites and mites that attack bees found all around the world. Since it was launched in March 2012, the flat mite web page has had more than 130,000 visitors from 180 different countries and has proved to be an invaluable tool for researchers and regulatory officials from USDA-APHIS who want to identify mites.

Over the past 12 years, Dr. Bauchan participated in more than 200 different research projects at USDA, interacting with nearly every research unit on campus. He worked with federal scientists at USDA-APHIS, the National Park Service, Detroit Michigan's Belle Isle Aquarium, the American Museum in New York, the Field Museum in Chicago, States of California, Florida, Maryland, and Oregon Departments of Agriculture, Maryland's Department of Natural Resources, the National Academy of Sciences, the U.S. Geological Survey, and the Smithsonian Institute. He collaborated with scientists at over 18 different U.S. universities and scientists from 40 countries. He mentored 20 visiting scientists, 30 post-doctoral scientists, 16 graduate students and 3 undergraduate students.

I had the honor of being a colleague of Dr. Bauchan for the past 6 years. The man had an enormous amount of energy and always made our work interesting and fun. Dr. Bauchan's microscopy images were stunning, often bringing us to real worlds that seemed imaginary. There was no work he turned down, and there were no collaborators he ever turned away. He had a true passion for science, and he loved to talk about it over a strong cup of coffee. He was an ardent fan of the Orioles (and Tigers before he moved from Michigan), and he supported his community by being an active participant in the Boy Scouts and his local church. Dr. Bauchan had a kind heart—he was a guardian angel for many people in times of crisis.

Gary is survived by his wife Francine (with whom he renewed his wedding vows after 40 years of marriage in August last year), three sons (Stephen, Philip, Gregory) and grandchildren who brought him great joy.

He will be sorely missed.

Funeral services have not yet been announced but may be held in association with St. Joseph's Catholic Church in Beltsville, possibly virtual.

President's Column

Dear CMMS members and non-member readers. We have finally made it through this trying year. With 2020 over, we can look forward to eventually getting back to a somewhat normal daily routine as the months progress. With vaccinations occurring for SARS CoV-2, I hope that every one of you and your family members are healthy and safe. Perhaps by the fall of 2021 we will be back to a semi-normal existence as far as work and social life are concerned. We will grieve for all those lost to this pandemic and from other causes. I hope that each and every one of you had a quiet, restful and uneventful holiday season. My family did as little as possible and pretty much just stayed around the house.

Even with social distancing, not going to movies, and generally not getting to do many of our normal daily tasks, somehow my workload has tripled during the past nine months. One way I gauge how life is progressing is by following the growth of one of my previous technician's first child. She was born at the very end of 2019, and is now just over a year old and I have yet to meet her. While this is depressing, I do get weekly updates via text photos.

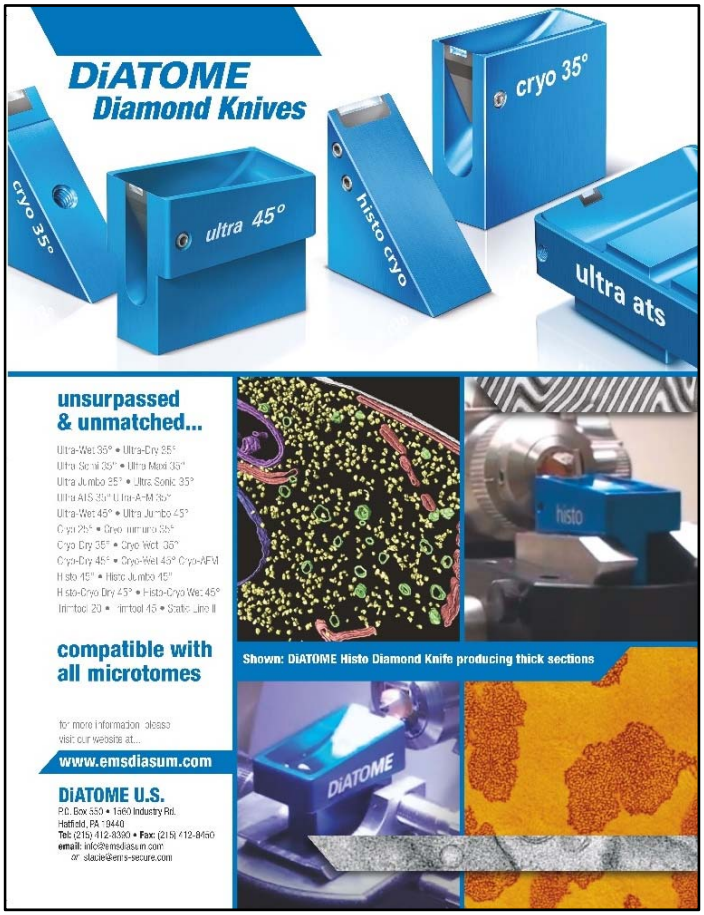
During 2021, we want to reach out to members of local colleges, universities, government entities and industry to invite any microscopy-minded persons to become more involved with microscopy to strengthen the society. Future issues will continue to spotlight regional microscopists and microscopy related persons. If you know someone that should be featured in the newsletter, please let us know. Most technicians do not get the recognition they deserve, and they typically do most of the work.

I hope to see many of you at the 2021 MSA/MAS meeting in Pittsburgh (if it does not turn out to be completely virtual). If the conference is virtual once again, I will get to see your individual presentations at a leisurely pace, instead of rushing from room to room. Although, I must admit that I like the excitement of going into the wrong room and seeing a talk about something that I don't know much about and learning something new.

We will continue to publish as much information as we can about online microscopy resources for training, education and enhancement. As always, please feel free to contact us if you have any suggestions or feedback.

I am sending you best wishes for health and happiness.

Robert K. Pope
President of CMMS, 2020
January 12, 2021



CMMS Contact Information

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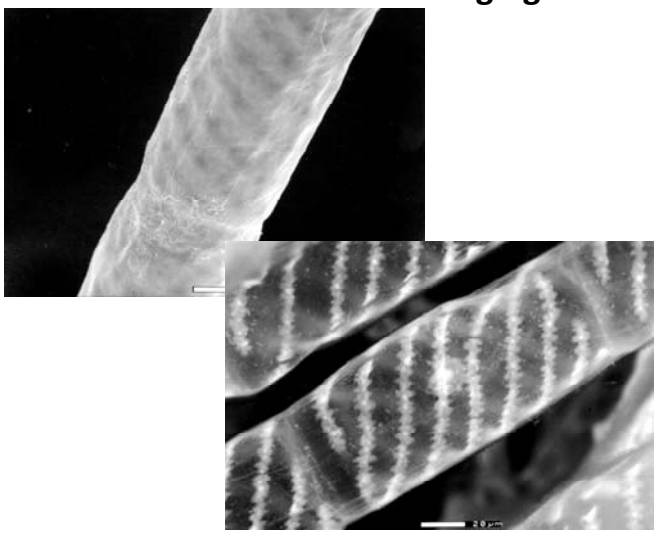
Submission Deadline

Submission deadline for the January - March edition of the newsletter is February 28, 2021. Submit all potential articles, photos and information you would like to share with the local microscopy community to the following address. ChesapeakeMicroscopySociety@gmail.com.

Coated vs Uncoated Imaging



Freeze Dried, coated (left) and uncoated (right) Spirogyra cells.
Notice the spiral chloroplasts with starch granules inside uncoated Spirogyra cells that have been stained with iodine (right) that are not visible with coating (left). Images taken on an ElectroScan Type III at the University of Southern Mississippi by Robert Pope and Scott Collins.

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Upcoming Microscopy Meetings

FCEM 2021 - Frontiers in Cryo-Electron Microscopy
February 2-5 • Online Conference
http://www.keystonesymposia.org/ks/Online/Events/2021B1/Details.aspx?EventKey=2021B1

FOM2021 - Focus on Microscopy 2021 - Online Conference
March 28-31 • Online Conference
http://focusonmicroscopy.org/

BIOPHOTONICS CONGRESS: Optics in the Life Sciences
Novel Techniques in Microscopy
April 12-15 • Vancouver, British Columbia, Canada
https://www.osa.org/en-us/meetings/osa_meetings/osa_biophotonics_congress/program/

MICROSCOPY, HISTOPATHOLOGY AND ANALYTICS
Apr 24-27 • Fort Lauderdale, Florida, United States
https://www.osa.org/es-es/meetings/global_calendar/events/microscopy_histopathology_and_analytics/

IUMAS-8 — 8TH MEETING OF THE INTERNATIONAL UNION OF MICROBEAM ANALYSIS SOCIETIES
May 24-28 • Banff, Alberta, Canada
https://www.microbeamanalysis.eu/events/event/74-iumas-8-8th-meeting-of-the-international-union-of-microbeam-analysis-societies

GORDON RESEARCH SEMINAR — THREE-DIMENSIONAL ELECTRON MICROSCOPY
June 13-18 • Newry, ME, United States
https://www.grc.org/three-dimensional-electron-microscopy-conference/2021/

GORDON RESEARCH SEMINAR — TISSUE MICROSTRUCTURE IMAGING
July 18-23 • Stonehill College, Easton, MA, United States
https://www.grc.org/tissue-microstructure-imaging-conference/2021/

MICROSCOPY AND MICROANALYSIS 2021
August 1-5 • Pittsburgh, PA
https://www.microbeamanalysis.eu/events/event/47-microscopy-microanalysis-2021

For M&M 2021:

(A11) Symposium Title: Portable- or Laboratory-based Approaches to Analysis in Cultural Heritage

Symposium Description: Scientific analysis of heritage objects is critical to learning about the technologies used for their manufacture and providing information about their meaning to previous cultures. It involves analysis of the macro/microstructure and the distribution of chemical phases within objects. This knowledge informs their conservation and public exhibition, and increases our understanding of other cultures. A range of portable and laboratory approaches for non-destructive or minimally invasive techniques is available. This symposium explores the applications and results obtained using different analytical instruments through invited and contributed presentations from students, conservators, conservation scientists, and other interested researchers in the field.

- Portable- or laboratory-based XRF, FTIR, NIR or Raman
- Correlative laboratory-based optical, electron microscopy, or atomic force microscopy
- Other relevant or emerging approaches of portable or laboratory-based approaches will be considered

Invited Speakers:

Andrea Centrone
National Institute of Standards and Technology (NIST)
"Nanoscale IR spectroscopy: From principles to nanoscale imaging and Identification of Metal Soaps"

Alice Knaf
Yale University
"Novel Portable Laser Ablation Sampling in Cultural Heritage"

Aaron N. Shugar
Buffalo State College
"Advancements in portable and lab based XRF instrumentation for analysis in cultural heritage: A change in perspective."

Joan M. Walker
National Gallery of Art (NGA)
"On the surface: evaluating reflectance FTIR spectroscopy for materials characterization in cultural heritage research"

Edward P. Vicenzi
Smithsonian Institution
"Quantitative Analysis of Obsidian and Determination of Source Provenance Using an Analytical Dual Beam SEM"

Admir Masic, Massachusetts Institute of Technology (MIT), Talk TBD

For further details contact symposium organizers:
Thomas Lam, Ph.D. Smithsonian Institution, Museum Conservation Institute (LamT@SI.edu)
Barbara Berrie, Ph.D. National Gallery of Art (B-Berrie@NGA.gov)

“FOCUS” ON A LOCAL MICROSCOPIST

Dr. Dale Newbury

CMMS: Would you briefly introduce yourself to the members of our local community? What was your training background, and how did you come to be a microscopist?

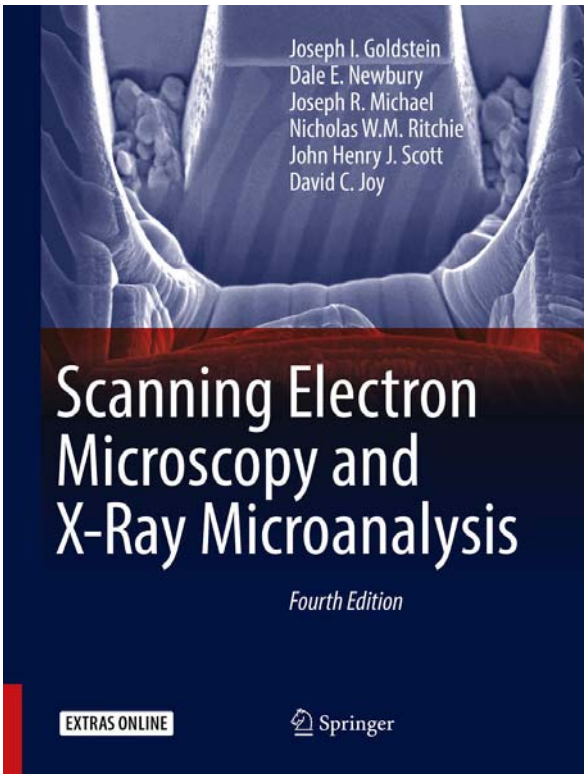
DN: I am Dale Newbury, (DPhil, Oxford), National Institute of Standards and Technology (NIST) Fellow, MAS Fellow and MSA Fellow.

After completing my B.S in Metallurgy and Materials Science at Lehigh University in 1969, I was fortunate to be awarded a Marshall Scholarship from the British Government for study in the United Kingdom. I was accepted as a graduate student at the University of Oxford, Dept. of Materials Science, working under the supervision of Dr. Peter Hazzledine. I originally intended to do my doctoral work on high beam energy transmission electron microscopy using the new MeV TEM being installed in the Materials Science department, which I was assured would be ready for operation when I arrived in the fall of 1969 according to the acceptance letter I received from Prof. Sir Peter Hirsch, the department chairperson. When I left three years later, the MeV TEM was just being qualified for operation. In the meantime, I had engaged with the scanning electron microscope and built my thesis work on that platform. The first SEM I ever encountered was during my initial tour of the department conducted by Dr. Hazzledine, and just after he said “And this is our first SEM”, it immediately caught fire! The smoke coming from the stack of Brandenburg power supplies in the hallway resulted in a response by several notable people, including Dr. David Joy, employing fire extinguishers, after which they resumed work on the SEM! This was not the first time they had had this problem. I thought this was an auspicious start! My thesis work investigated the phenomenon of superplasticity in fine-grained metal alloys and involved using the SEM to observe deformation of alloys with micrometer-sized grains deformed in situ using a special miniature tensile testing stage. Additionally, electron channeling contrast imaging and electron channeling pattern orientation and degradation measurement were applied to examine the deformation of the individual grains. Much of this work involved new technique development, and it could not have been done without the extraordinary help of David Joy, who had defended his DPhil thesis on the day I arrived at Oxford and stayed on as a post-doc. David and I worked together many, many evenings and we could disassemble and reassemble a Cambridge Instruments Stereoscan Mark 1 in 30 minutes, occasionally several times in an evening, as we developed new ways to measure and employ electron channeling patterns. I will be forever grateful to him for his aid and inspiration.

While in Oxford, I met Dr. Harvey Yakowitz of the U.S. National Bureau of Standards (NBS, now NIST) who was visiting the Materials

Department to discuss SEM magnetic contrast with David Joy. Harvey encouraged me to apply for an NBS National Research Council Post-doc to work on SEM research opportunities. I joined the Metallurgy Division of NBS in the fall of 1972, and we studied magnetic domains in materials using the SEM with the recently discovered technique of magnetic contrast (Type 2), including in situ elastic strain effects on domains in Fe-3% Si transformer steel using a tensile stage.

After my post-doc, I joined Kurt Heinrich's group in the Analytical Chemistry Division of NBS to work on secondary ion mass spectrometry (SIMS) using an Applied Research Laboratories ion microprobe. Kurt's group included luminaries such as Bob Myklebust and Chuck Fiori. Kurt was one of the authors on the original paper reporting the use of energy dispersive X-ray spectrometry (EDS) on an electron beam instrument (the resolution was 600 eV at MnKa!). Kurt, Bob, and Chuck were enthusiastically involved with exploring X-ray microanalysis with the new EDS technology using one of the first generation ORTEC EDS detectors, including developing some of the first computer-aided analysis software. Their enthusiasm was infectious, and eventually I left the SIMS area and focused my efforts on SEM and X-ray microanalysis, with side forays into electron energy loss spectrometry on the analytical electron microscope with Richard Leapman at the National Institutes of Health (again with Chuck who had transferred to NIH before eventually returning to NIST where he finished his tragically shortened career). After Kurt moved to head the NBS International Affairs Office in 1979, I served as group leader for Microanalysis Research until 1994, and I have been an NIST Fellow since then.



Dr. Dale Newbury is one of the authors of the classic text 'Scanning Electron Microscopy and X-Ray Microanalysis', a book described as "…a reference text that no SEM or EPMA laboratory should be without. (Thomas J. Wilson, Scanning, Vol. 27 (4), July/August, 2005)".

CMMS: Could you briefly describe the focus of your research? What type of EM specimens do you work with?

DN: I have always had interest in the broad range of microanalysis techniques, and my years as group leader for microanalysis research enabled me to be closely involved with techniques that use primary excitation and imaging with photons, ions and electrons followed by spectrometry with photons, ions, and electrons. My particular interest for many years has been scanning electron microscopy (SEM) and electron-excited X-ray microanalysis with energy dispersive spectrometry (EDS) as applied to a broad range of problems in materials science, forensic science, and environmental science

(e.g., particle characterization). Again, my SEM/EDS work is greatly indebted to particular people, especially Chuck Fiori, who working with Bob Myklebust and Carol Swyt-Thomas, developed the powerful EDS software platform Desktop Spectrum Analyzer (DTSA) (Chuck said, while demonstrating an early version of DTSA to me, "Do you know what this is? It is a paper writing machine!" And he was right!) After Chuck's tragic death, Bob and Carol developed and maintained DTSA until retiring, and this extraordinary software tool would have faded away as operating systems evolved without the arrival at NIST of another extraordinary individual, Nicholas Ritchie. Inspired by DTSA, which was restricted to an early version of the Mac operating system, Nicholas developed from scratch an entirely new version, DTSA-II, which could operate on any computer platform that supported Java. Incorporating the latest NIST databases of electron and X-ray data, DTSA-II contains important advances such as an embedded Monte Carlo electron trajectory simulation, which enables accurate simulation of challenging specimen geometries. Working closely with Nicholas, my role has been to test DTSA-II with analysis challenges that cover a wide range of problems:

[1] Newbury, D. E. and Ritchie, N. W. M., "Review: Performing Elemental Microanalysis with High Accuracy and High Precision by Scanning Electron Microscopy/Silicon Drift Detector Energy Dispersive X-ray Spectrometry (SEM/SDD-EDS)", J. Materials Science 50 (2015) 493-518.

[2] Newbury, D. E. and Ritchie, N. W. M., "Quantitative Electron-Excited X-Ray Microanalysis of Borides, Carbides, Nitrides, Oxides, and Fluorides with Scanning Electron Microscopy/Silicon Drift Detector Energy-Dispersive Spectrometry (SEM/SDD-EDS) and NIST DTSA-II", Microscopy and Microanalysis 21 (2015) 1327-1340.

[3] Newbury, D. E. and Ritchie, N. W. M., "Measurement of Trace Constituents by Electron-Excited X-ray Microanalysis with Energy-Dispersive Spectrometry", Microscopy and Microanalysis 22 (2016) 520-535.

[4] Newbury, D. E. and Ritchie, N. W. M., Electron-Excited X-ray Microanalysis at Low Beam Energy: Almost Always an Adventure!, Micros. Microanal. 22 (4) 735-753 (2016).

[5] Newbury, D. E. and Ritchie, N.W.M., "An Iterative Qualitative–Quantitative Sequential Analysis Strategy for Electron-Excited X-ray Microanalysis with Energy Dispersive Spectrometry: Finding the Unexpected Needles in the Peak Overlap Haystack", Microscopy and Microanalysis, 24 (2018) 350-373.

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

DN: I was extremely fortunate very early in my career to become involved with the Lehigh University Microscopy School, thanks to the founder, the late Prof. Joe Goldstein (a man for whom an asteroid was named in honor of his extraordinary work on meteorites as a means to study phase equilibria!). This annual microscopy school, begun in 1970, has provided instruction to thousands of students from throughout the world, and perhaps of even more importance produced the series of textbooks entitled Scanning Electron Microscopy and X-ray Microanalysis, now in its fourth edition (SEMXM4, Joseph I. Goldstein, Dale E. Newbury, Joseph R. Michael, Nicholas W.M. Ritchie, John Henry J. Scott, and David C. Joy, Springer, New York, 2018). Teaching in this course for 48 years has been incredibly valuable and stimulating for me in so many ways, leading to ideas for my personal research as well as being a wonderful conduit to transfer this learning to the community.

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?

DN: Do good work!

CMMS: Can you tell us about some of the awards you have won throughout your career?

- 1969-1972: Marshall Scholarship, awarded by the Parliament of the United Kingdom to study at Oxford University/St. Catherine's College/Dept. of Metallurgy & Materials Science
- 1972-73: National Research Council Post-doctoral Fellow at the National Bureau of Standards, Gaithersburg, MD
- 1972: Hardy Gold Medal of the Metallurgical Society, AIME
- 1980: Department of Commerce Bronze Medal
- 1981: Department of Commerce Silver Medal
- 1983: Microbeam Analysis Society, Presidential Award for Service
- 1986: Arthur S. Flemming Award (Washington Jaycees)
- 1986: Department of Commerce Gold Medal
- 1987: Industrial Research 100 Award ("Compositional Mapping")
- 1988: Macres Award for the Outstanding Paper on Instrumentation at the annual conference of the Microbeam Analysis Society
- 1990: Birks Award for the Outstanding Scientific Paper at the annual conference of the Microbeam Analysis Society
- 1991: Edward Uhler Condon Award for distinguished written exposition, NIST
- 1993: Microbeam Analysis Society, Presidential Award for Scientific Achievement
- 1994: Samuel Wesley Stratton Award for outstanding research achievement NIST, 1994
- 2009: Duncumb Award for Excellence in Microanalysis, Microbeam Analysis Society
- 2009: Fellow of the Microscopy Society of America (Inaugural Class)
- 2010: Department of Commerce Gold Medal
- 2018: Fellow of the Microanalysis Society (Legends Class)

CMMS: Now for the fun questions. What are the strangest EM samples you have ever encountered? What are the most difficult EM specimens you have ever worked with? What are the worst mistakes you have ever made? Do you have any fun anecdotes to share?

DN: I have always enjoyed the "Sherlock Holmes" aspect of solving problems with microscopy and microanalysis ("Micro-man", who looked like silhouette of Sherlock, was the symbol of EPASA, the "Electron Probe Analysis Society of America", the predecessor of MAS.), especially the challenge of exploring difficult problems where macroscopic failures are the result of microscopic events. Of the many challenging problems that came my way, my favorite was participating in the effort that successfully explained the microscopic mechanisms that caused the failure of aluminum wire connections in household electrical circuits, leading to localized heating and occasionally causing destructive residential and commercial fires. In the 1960s, sharply increased prices for copper due to international political turmoil led to substitution of aluminum for household wiring. Aluminum seemed to be a reasonable substitute, since it had excellent conductivity and was already extensively used for large-scale electrical transmission lines. However, within a few years of its introduction in millions of newly constructed buildings, household (and commercial) fires were reported that originated at overheated electrical junction boxes. This was a rare, but destructive event, that was hard to duplicate

in the laboratory. An NBS/NIST engineering colleague, Mr. Sidney Greenwald, set up thousands of electrical junction boxes with thermal monitoring in order to capture a few examples of failures, especially early in the event before the evidence was destroyed by the severe overheating. The preparation of these macroscopic junction box structures to find the critical microscopic details was performed by an extraordinary NBS/NIST metallographer, Mr. Charles Brady. With his wonderful cross sections, SEM/EDS revealed the problem to arise from reaction zones created at the local contact points of the aluminum wire with the steel screw and post of the electrical box, leading to the reaction of aluminum with the iron of the steel fitting, causing the formation of layers of Al-Fe intermetallic compounds (e.g. FeAl3). The elevated resistivity of these intermetallic compounds resulted in local resistive heating in a positive feedback situation, leading to runaway thermal effects, which in extreme cases could generate a sufficient temperature rise to actually melt the aluminum wire (6600 C), an unintentional "fail-safe"! In actual residential installation within a wall, the severely heated junctions could cause adjacent wooden structures to ignite, a particularly dangerous situation since the fire was inside a wall unobserved. [1] Newbury, D.E. and Greenwald, S., "Observations on the Mechanism of High Resistance Junction Formation in Aluminum Wire Connections, National Bureau of Standards J. of Research, 85 (1980) 429-440. [2] Newbury, D.E., " What is Causing Failures of Aluminum Wire Connections in Residential Circuits?", Anal. Chem., 54 (1982) 1059A-1064A.

Strangest: Trinitite (glass created by the first atomic bomb test, "Trinity", July 16, 1945, Jornada del Muerto, Alamogordo, NM). Albert J. Fahey, Cynthia J. Zeissler, Dale E. Newbury, Jeff Davis, and Richard M. Lindstrom, "Post-detonation nuclear debris for attribution", Proceedings of the National Academy of Science, vol 107, no. 47, 2010, 20207-20212.

Worst mistake: Losing Jeff Davis from NIST, who has continued his interesting career in Germany, although no longer involved with X-ray spectrometry and microanalysis.

In 2018, Dr. Dale Newbury was made an inaugural Fellow of the Microanalysis Society, "For outstanding leadership and sustained contributions to understanding the limits of x-ray microanalysis methods and instrumentation for accurate micro- and nano-analysis". Here he is accepting his award from Masashi Watanabe, then President of MAS.

Calling all Biological Electron Microscopists

2021 Pre-meeting Congress (PMC X61)

"Contemporary Electron Microscopy Advances in Biomedical Research "

August 1st, 2021, Sunday, Pittsburgh, Pennsylvania.

- One whole day of meeting (four sessions) committed to the discussion of the progress and innovation in biomedical EM
- Present the same M&M abstract at the PMC and reach out to more peers in biological EM community
- Abstract format and submission follow the same guideline as M&M abstracts.

https://diagnosticbiologicalmicroscopy.com/pmc-x61/

QUESTIONS? Contact 2021 PMC Program Chair Ru-ching Hsia
rhsia@umaryland.edu

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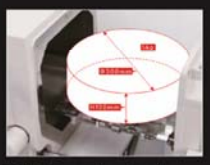
Magnication: 800x



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Welcome to 2021

Ru-ching Hsia

Welcome to the Year of Ox!

2020 quietly faded away in our household. No party horns, no clinking of champagne glasses. My husband and I gave each other a hug and wished all our loved ones in various parts of the globe to continue to be safe and healthy. According to the Chinese zodiac, following the chaotic and stressful Year of the Rat, 2021 will be the Year of the Ox, an animal that often appears in Chinese fables for its characteristic honesty, diligence and persistence. It is my wish that the hard working and mild tempered Ox will bring peace and normality back in 2021.

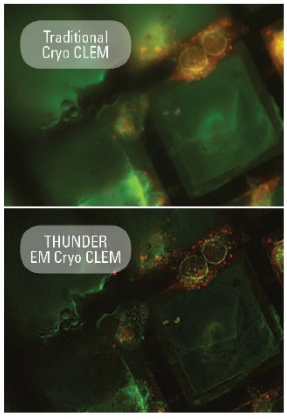
Another of my new year's wish for 2021 is the success of the Pre-Meeting Congress (PMC) for biomedical EM (https://diagnosticbiologicalmicroscopy.com/pmc-x61/). I have been working on this meeting along with several other colleagues in the Diagnostic and Biomedical Focused Interest Group (DBM-FIG) for two years now. The idea of this meeting is to bring together biological electron microscopists, vendors and engineers to discuss the innovations and advances in biological EM involving complex tissues. Despite many advances in cryo EM sample preparation, cryo and 3D EM in recent years, 90% of the EM research I conduct every day, mostly on specimens such as kidney, heart, liver, and brain tissues, still relies on chemical fixation, dehydration and resin embedding at room temperature. Protocols we follow for processing these specimens are still largely similar to the methods developed in the 1960's. They require manual operation, are time consuming and imprecise. However, I went into an uncharacteristic defensive mode recently when someone referred to room temperature EM techniques as "out of date" and "not leading edge". We must remember that, not only these techniques have provided all the fundamental information that modern day cell biology is based on, but they also remain very relevant and essential in biomedical research today. Nonetheless, I will readily admit that biomedical EM desperately needs some makeover and re-alignment. The aim of this PMC is to bring everyone under one roof to discuss and strategize the future of biological EM. I think we need to have more up-to-date protocol manuals and training courses. In the PMC program, we have specifically scheduled a round table discussion at the end of the day with vendors, engineers and microscopists as panelists. It is my hope that this PMC in 2021 will foster collaboration and boost innovation toward the development of new instrumentation and techniques for biological EM sample processing of complex tissues. Please spread the word and join us in this crusade.

With my eyes closed on this sunny January morning as I take a deep breath of crisp winter air, I imagine that I can converse with an ultramicrotome. When I say "*Cut*", the ultramicrotome answers back politely "*At what thickness?*" Imagine listening to the beeps of the ultramicrotome after we give a command of "*Advance*" and the block face of the resin gradually moves right up to the diamond knife. I look forward to the day that we can drop a tissue specimen in a chute in front of the processor and wait for the resin blocks to come out at the other end. Yes, I have great hopes for 2021, it is the beginning of a brighter future as we have all grown wiser and stronger after the COVID-19 pandemic

From Eye to Insight

Leica MICROSYSTEMS

CRYO-EM MICROSCOPY SAMPLE PREPARATION AND WORKFLOW SEMINAR & DEMONSTRATION



NEW! THUNDER IMAGER EM CRYO CLEM

The new THUNDER Imager EM Cryo CLEM from Leica utilizes a new, exclusive opto-digital method called Computational Clearing that eliminates the haze of traditional cryo widefield images by algorithmically removing the out-of-focus data without compromising the raw image data. This results in crystal clear visualization of cryo images without the haze, and provides precise identification of structures-of-interest.

SEMINAR: Tuesday, February 18, 2020
Bodian Room (2-200)/1830 E. Monument St.
1:30 PM
Refreshments provided - Please RSVP!

Presenter: Louise Bertrand
Product Performance Manager, Widefield

Guest Speaker: Gleb Shtengel, PhD
Senior Scientist, Janelia Farm Research Campus

HANDS-ON DEMONSTRATIONS:
February 18-21, 2020

Building Rangos/855 N. Wolfe St.
Room G36
Please RSVP to schedule your time!

HOSTED BY:

Shigeki Watanabe, PhD
Dept. of Cell Biology

Scot Kuo, PhD
Director, Microscope Facility

SCAN HERE TO RSVP:

For more information or to RSVP, please visit https://www2.leica-microsystems.com/JHU-CLEM, or contact:

Paula McGuire, Account Manager - Widefield
(443) 257-2941
paula.cranfill@leica-microsystems.com

Mark Kukucka, Account Manager - EM Sample Prep
(410) 443-1761
Mark.Kukucka@leica-microsystems.com

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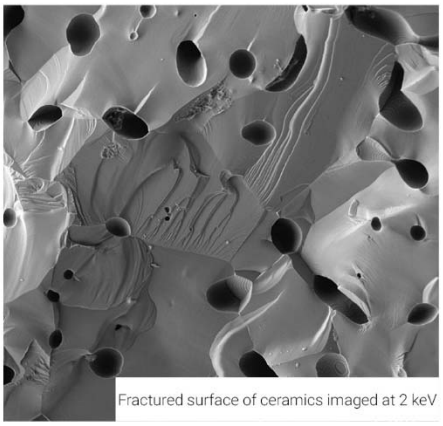
NEW FIELD-FREE UHR SEM

Ultra-High Resolution Scanning Electron Microscope (SEM) takes materials characterization to the next level



Fractured surface of ceramics imaged at 2 keV

Find out more at **www.tescan.com**

Angstrom Scientific, Inc. distributes key products to complement and support electron Microscopy and EM sample prep equipment. Specifically:

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Leica MICROSYSTEMS From Eye to Insight

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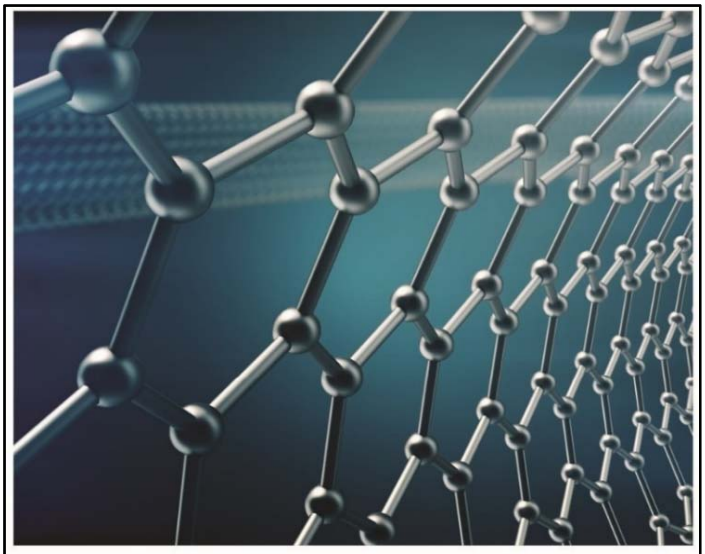

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MICROSCOPY RELATED JOBS

Position, Institute, Laboratory	Brief Description	More information
CryoEM Staff Scientist **Howard Hughes Medical Institute** **Janelia Research Campus** Ashburn, Virginia, United States	Essential Duties and Responsibilities for this position include: • Help maintain and operate various equipment • Properly handle various samples • Work closely with users to generate data on user-provided cryo grids • Help maintain and transfer data • Take a leading role in collaboration projects from sample preparation to data collection and image processing • Help train users and/or new employees • Participate in or initiate method developments	https://hhmi.wd1.myworkdayjobs.com/en-US/External/job/Janelia-Research-Campus/CryoEM-Staff-Scientist_R-186
Materials Characterization & Processing FIB Research Scientist **Materials Characterization and Processing (MCP) facility** **Johns Hopkins University**	The successful applicant will be responsible for operation, training, technical support, and maintenance of a 2 year old Helios G4 UC FIB within the MCP and 10% personal research time. Secondary responsibility would be to support the TEM and µCT Managers. Specific required FIB experiences are: 1) TEM sample preparation, 2) 3D EDX and EBSD data acquisition and processing, 3) cryo-FIB applications and 4) quantitative EDX analysis with standards. **The job is offered at two levels;** Research Faculty Level - PhD Research Specialist Level - Masters Degree or equivalent	For Faculty Level: https://apply.interfolio.com/81133 For Specialist Level: https://jobs.jhu.edu/job/Baltimore-Materials-Characterization-&-Processing-FIB-Laboratory-Manager-MD-21218/697922700/

CMMS
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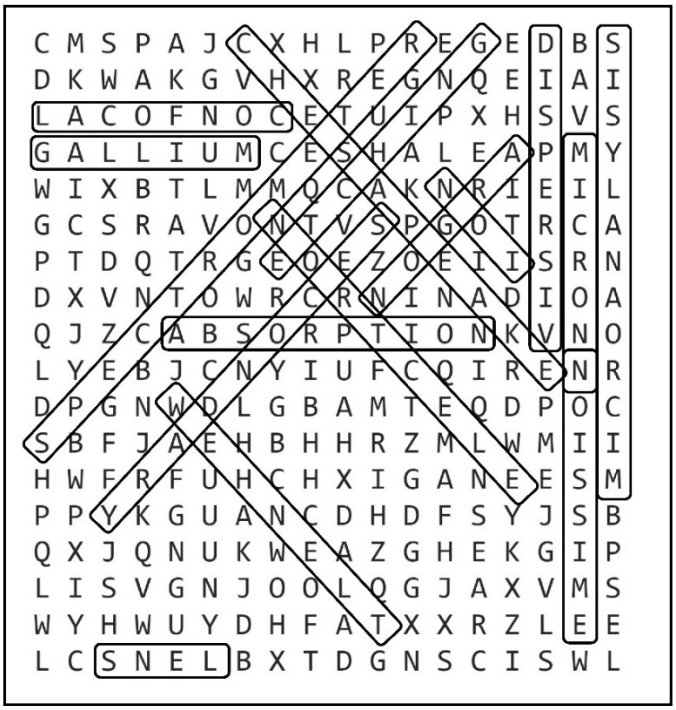
Answers to Puzzle from Last Issue



Related Links

Chesapeake Microscopy and Microanalysis Society
www.chesapeakemicroscopy.org

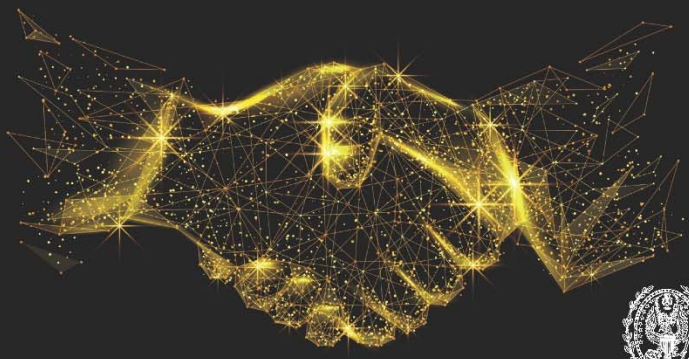
Microscopy Society of America
www.msa.org

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



Scientific Partners Distinguished Lecture Series

GEORGETOWN UNIVERSITY
Georgetown University Medical Center

Frederick National Laboratory for Cancer Research

January 26, 2021

Christopher Albanese, Ph.D.
Professor of Oncology, Radiology and Pathology
Director, Preclinical Imaging Research Laboratory (PIRL)
Executive Director, Center for Translational Imaging (CTI)
Lombardi Comprehensive Cancer Center, Georgetown University

"Mechanisms Underlying Drug Resistance in GI Cancers"

February 9, 2021

Deus Bazira, Dr.PH., M.P.H., M.B.A.
Co-Director and Associate Professor of Medicine
Center for Global Health Practice and Impact
Georgetown University Medical Center

"Optimizing Data-to-Care Outcomes to Achieve HIV Epidemic Control in Haiti and Cameroon"

March 2, 2021

Jeffrey Lifson, M.D.
Director, AIDS and Cancer Virus Program
Frederick National Laboratory for Cancer Research

"Viral Vignettes from the AIDS and Cancer Virus Program"

March 26, 2021

Ulrich Baxa, Ph.D.
Senior Microscopist, National Cryo-EM Program, Cancer Research Technology Program
Frederick National Laboratory for Cancer Research

Jana Ognjenovic, Ph.D.
Scientist II, National Cryo-EM Program, Cancer Research Technology Program
Frederick National Laboratory for Cancer Research

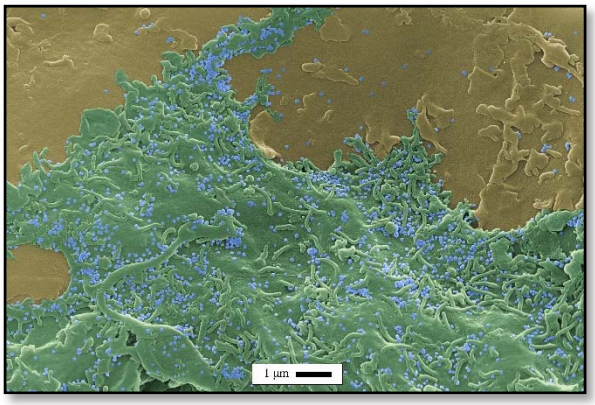
"National Cryo-EM Overview"

May 7, 2021

Ligia A. Pinto, Ph.D.
Director, Vaccine, Immunity and Cancer Program
Frederick National Laboratory for Cancer Research

"Immunogenicity of HPV Vaccines: What Have We Learned and Where Are We Going?"

Previous Issue Cover Photo



Scanning Electron Micrograph of tissue culture cells infected with Severe Acute Respiratory Syndrome Corona Virus-2 (SARS CoV-2), the virus that causes COVID-19. The Vero cells were infected with one virus particle for every 100 Vero cells present. After two days, the cells were inactivated to preserve structure, harvested and sterility tested to demonstrate that no live virus remained. The Vero cells can be seen in green and tan, with blue-purple virus particles budding out of the heavily infected (green) Vero cell. The virus particles can be seen sticking to the surface of less infected (tan) Vero cells.

This work was funded under Agreement No. HSHQDC-15-C-00064 awarded to Battelle National Biodefense Institute (BNBI) by the Department of Homeland Security (DHS) Science and Technology (S&T) Directorate for the management and operation of the National Biodefense Analysis and Countermeasures Center (NBACC), a Federally Funded Research and Development Center. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of DHS or the U.S. Government. The DHS does not endorse any products or commercial services mentioned in this presentation. In no event shall the DHS, BNBI or NBACC have any responsibility or liability for any use, misuse, inability to use, or reliance upon the information contained herein. In addition, no warranty of fitness for a particular purpose, merchantability, accuracy or adequacy is provided regarding the contents of this document.

Classics Corner

Robert K. Pope took this photo in 2005 of a Phillips CM 10 Transmission Electron Microscope at the Hospital in Strasbourg France.

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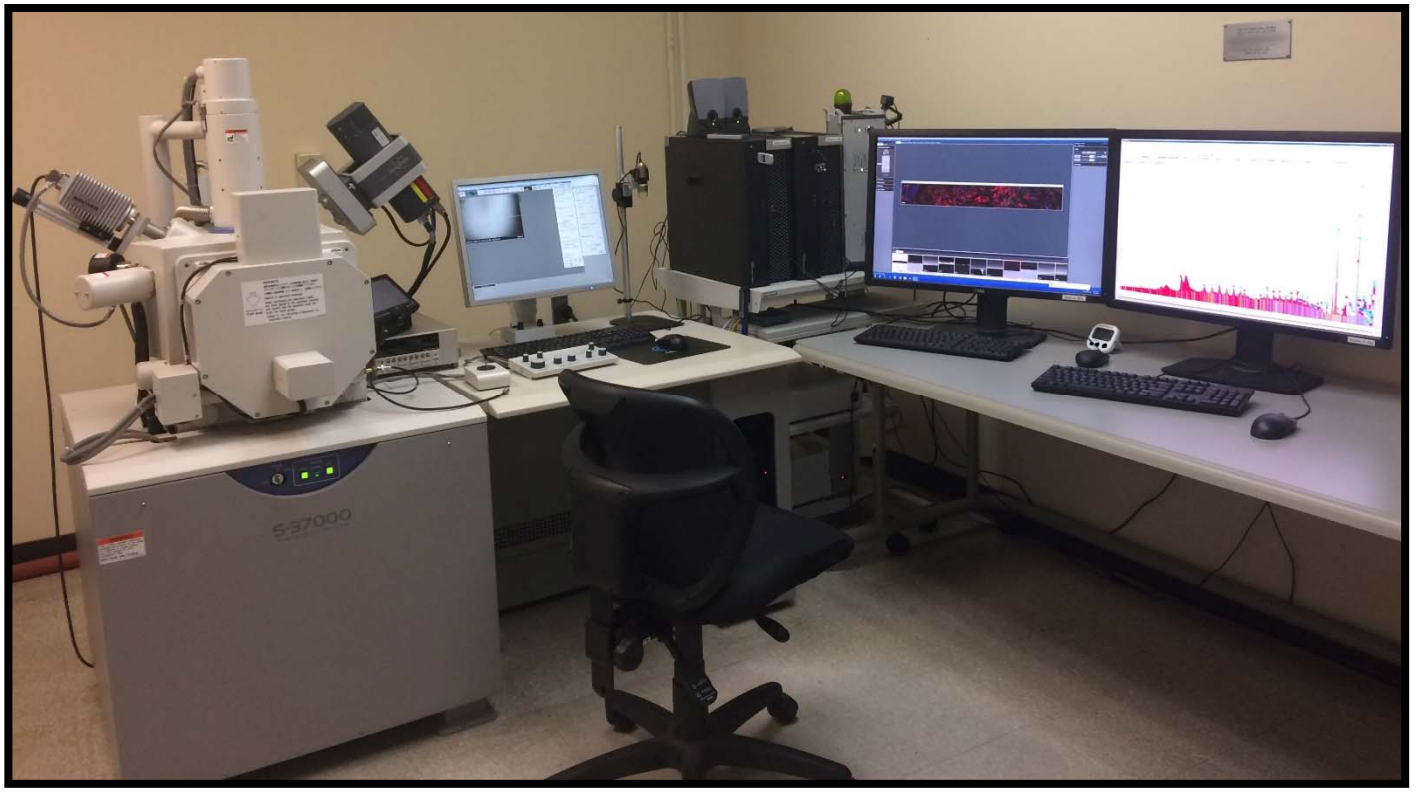
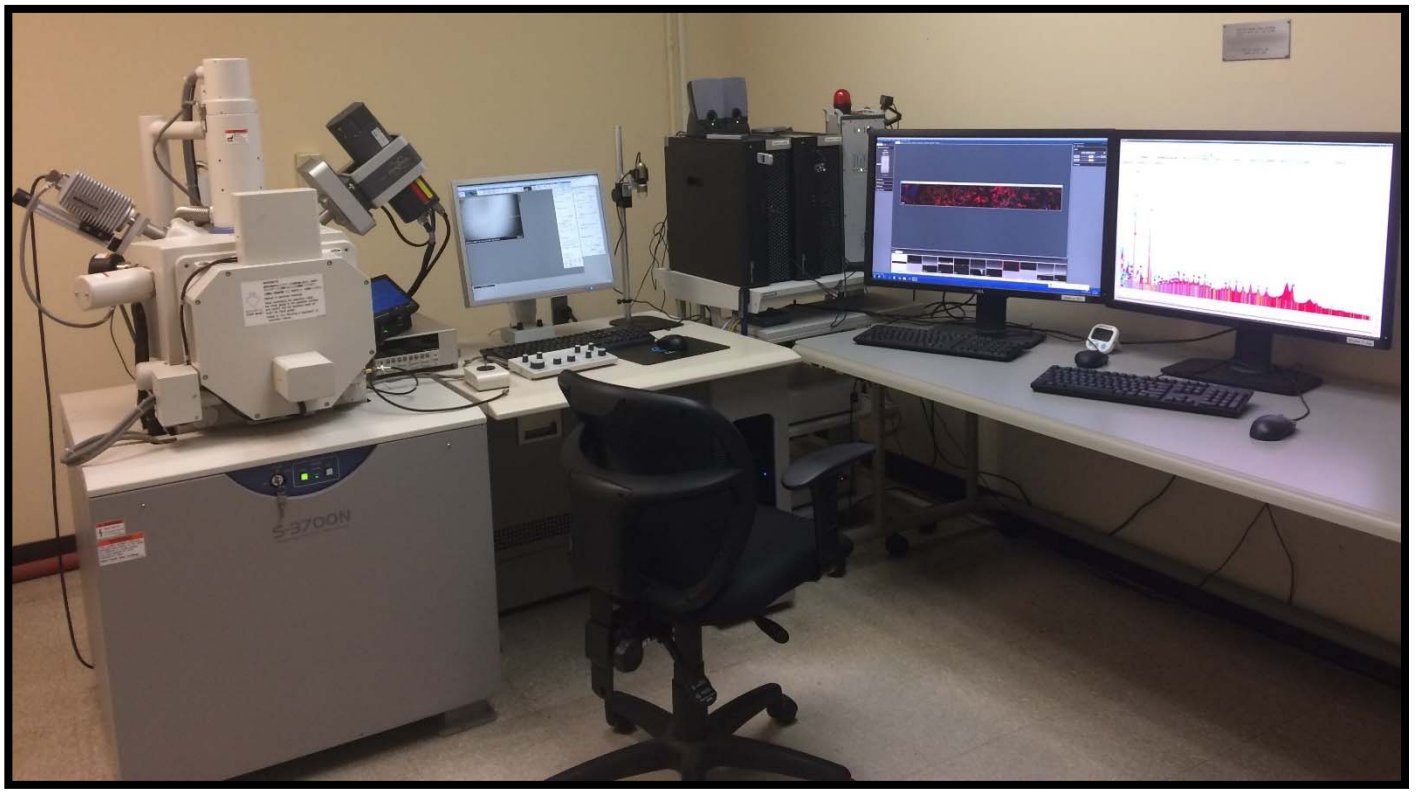
Microcourses	Harvard Medical School	https://www.youtube.com/c/Microcourses/videos
MyScope Microscopy Training	Microscopy Australia	https://myscope.training/
Guidance for Quantitative Confocal Microscopy	Olympus	https://www.olympus-lifescience.com/en/resources/webinars/ocap-guidance-for-quantitative-confocal-microscopy/
Electron Microscopy		
TEM for materials science	Swiss Federal Institute of Technology Lausanne	https://www.coursera.org/learn/microscopy
Nanotechnology: A Maker's Course	Duke University, NCSU, UNC	https://www.coursera.org/learn/nanotechnology
Getting started in cryo-EM	Caltech	https://www.coursera.org/learn/cryo-em
Imaging SARS-COV-2 safely: Protecting the microscopy community	Francis Crick Institute	https://www.crick.ac.uk/whats-on/webinarimaging-sars-cov-2-safely-protecting-the-microscopy-community
EDS in the TEM: Fundamentals & Principles	EDAX	https://www.workcast.com/register?cpak=4418894060457230&elq_mid=33818&elq_cid=10009956
Energy-dispersive X-ray spectroscopy		
EDS Mapping: Data Collection, Representation, Extraction & Mining	EDAX	https://www.workcast.com/register?elq_mid=25834&elq_cid=10009956&cpak=9199173860181816&elqTrackId=9b1cfbdb5a9745d0b14762378544fbfb&elq=6adbd887cbd34f3e8e340203e2074643&elqaid=25834&elqat=1&elqCampaignId=16597
Art, Science, Microscopy and EDS	Oxford Instruments	https://view6.workcast.net/register?cpak=1267585229168117&referrer=wastt
Image Processing & Analysis		
Image Processing and Analysis for Life Scientists	Swiss Federal Institute of Technology Lausanne	https://www.edx.org/course/image-processing-and-analysis-for-life-scientists
Introduction to Machine Learning	Duke University	https://www.coursera.org/learn/machine-learning-duke
Image Analysis with Fiji	University of Liverpool	http://pcwww.liv.ac.uk/~cci/reveal_ia/ImageAnalysisWithFiji.html
Introductory Python Tutorials for Image Processing	Zeiss/Apeer Micro	https://www.youtube.com/playlist?list=PLHae9ggVvqPgyRQQOtENr6hK0m1UquGaG&mkt_tok=eyJpIjoiWmpVMU16azVOMlEzTmpBMSIsInQiOiI3YWI0dlRJN2EyOWI6NXlPME5UY1VDUlZ3aFd4eVwvTGdcL09cLzUrQURkVDhWMkU5alh6MytHMGFVTnU4Vmpra2ZvY3NlMEkxeFZnSmRwTWppb1wvTk5FZnc9PSJ9
Image and Video Processing: From Mars to Hollywood with a Stop at the Hospital	Duke University	https://www.coursera.org/learn/image-processing
Fundamentals of Digital Image & Video Processing	Northwestern University	https://www.coursera.org/learn/digital
Bioimage Analysis Course	iBiology	https://www.ibiology.org/online-biology-courses/bioimage-analysis-course/
Beginner's Guide to Colouring EM Images	Microscopy Australia	https://micro.org.au/events/webinar-beginners-guide-to-colouring-em-images/

Quarterly Microscopy Puzzle

Spot the Difference for Electron Microscopists



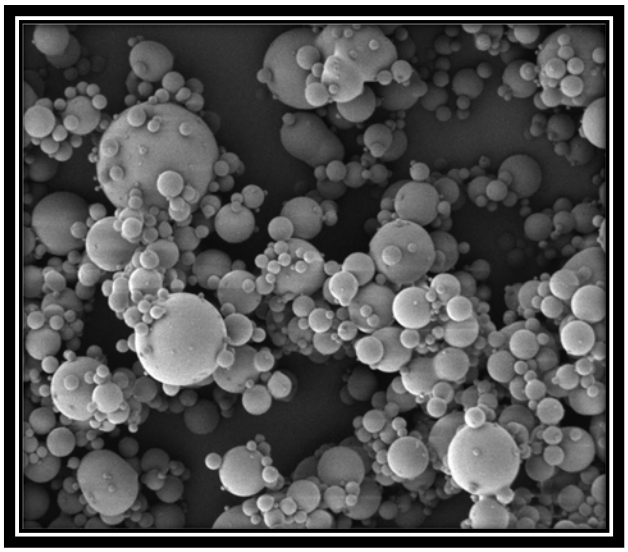


Are you a Microscopist?

Guess the material from the images below?

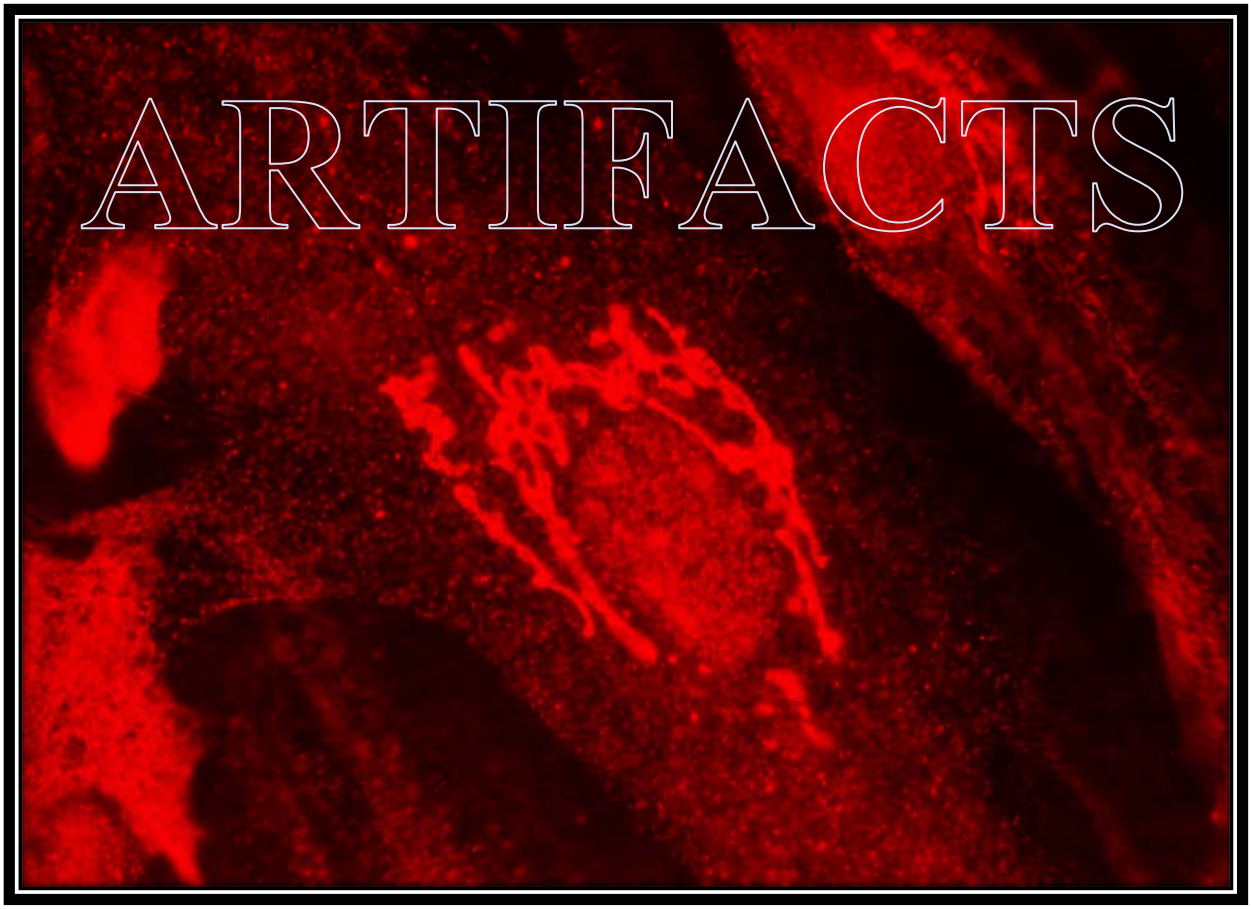
Send responses to ChesapeakeMicroscopySociety@gmail.com

All that guess correctly will be listed in the next newsletter.



FEATURED PHOTOGRAPH

by Robert K. Pope



I have shown this image at every talk I have given since I captured this image in 1997.
Hint: This labelling is simply artifact.

The traditional fluorescence image above (not confocal) demonstrates specific antibody staining using one of several antibodies we prepared against the protein supervillin.

This particular antibody labels the endoplasmic reticulum (ER) surrounding the nucleus.

Without understanding how cells work, you would say that this is where the protein supervillin is localized. However, several other anti-supervillin antibodies showed staining at the inner surface of the plasma membrane (at the cell periphery).

Knowing about you're sample, in this case, the protein sequence, and understanding that the protein supervillin is a cytoplasmic protein that is translated on free ribosomes (does not bind to the ER), is paramount to understanding what is real, and what is artifact.

This is commonly observed when clients are presented with images without explanation. Everyone needs a basic understanding of what they should see, to properly interpret what has been imaged.