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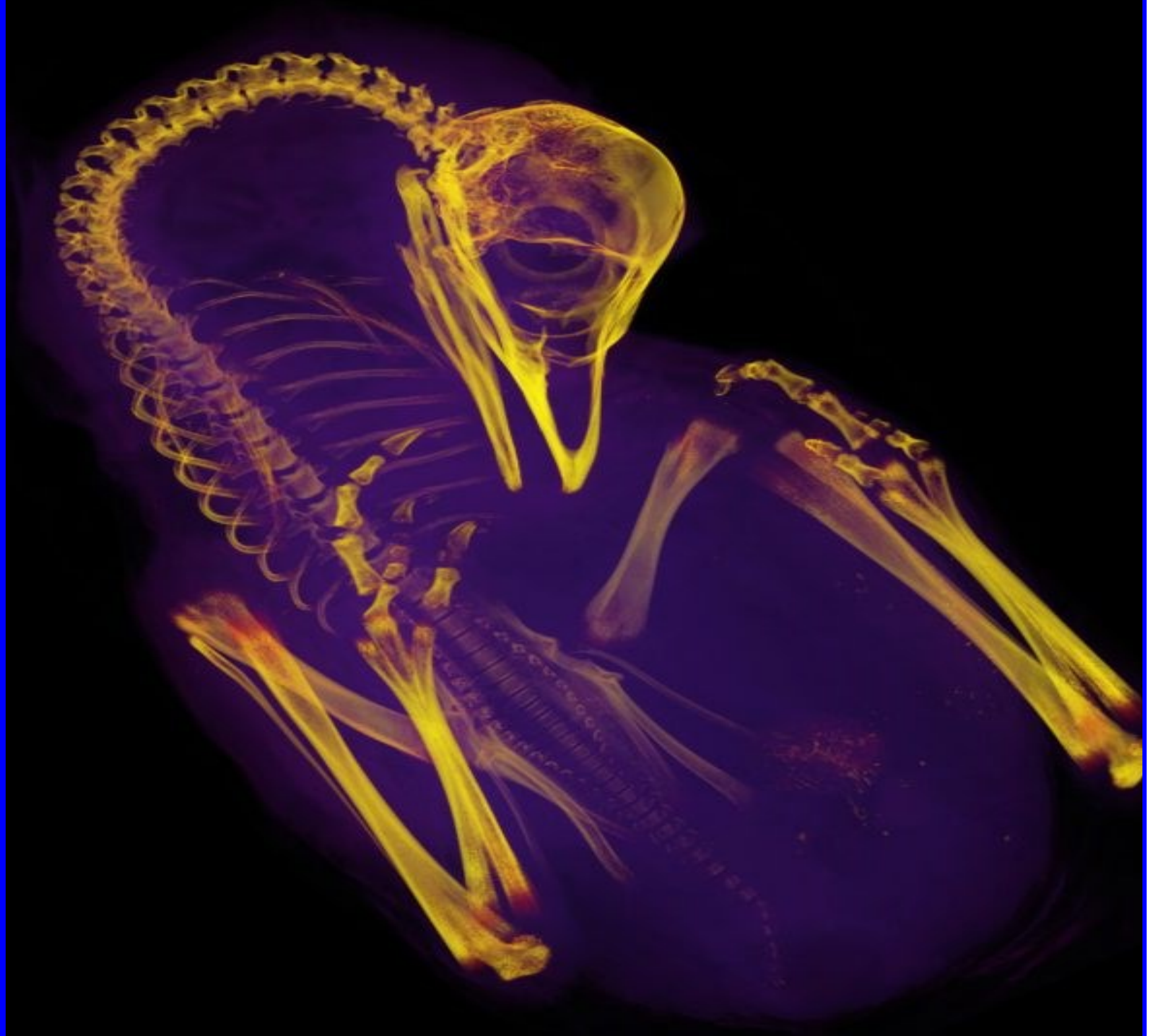
SPRING NEWSLETTER



Oklahoma Microscopy Society

Established 1977

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About the cover . . .

First Place 2020 Student Micrograph Contest

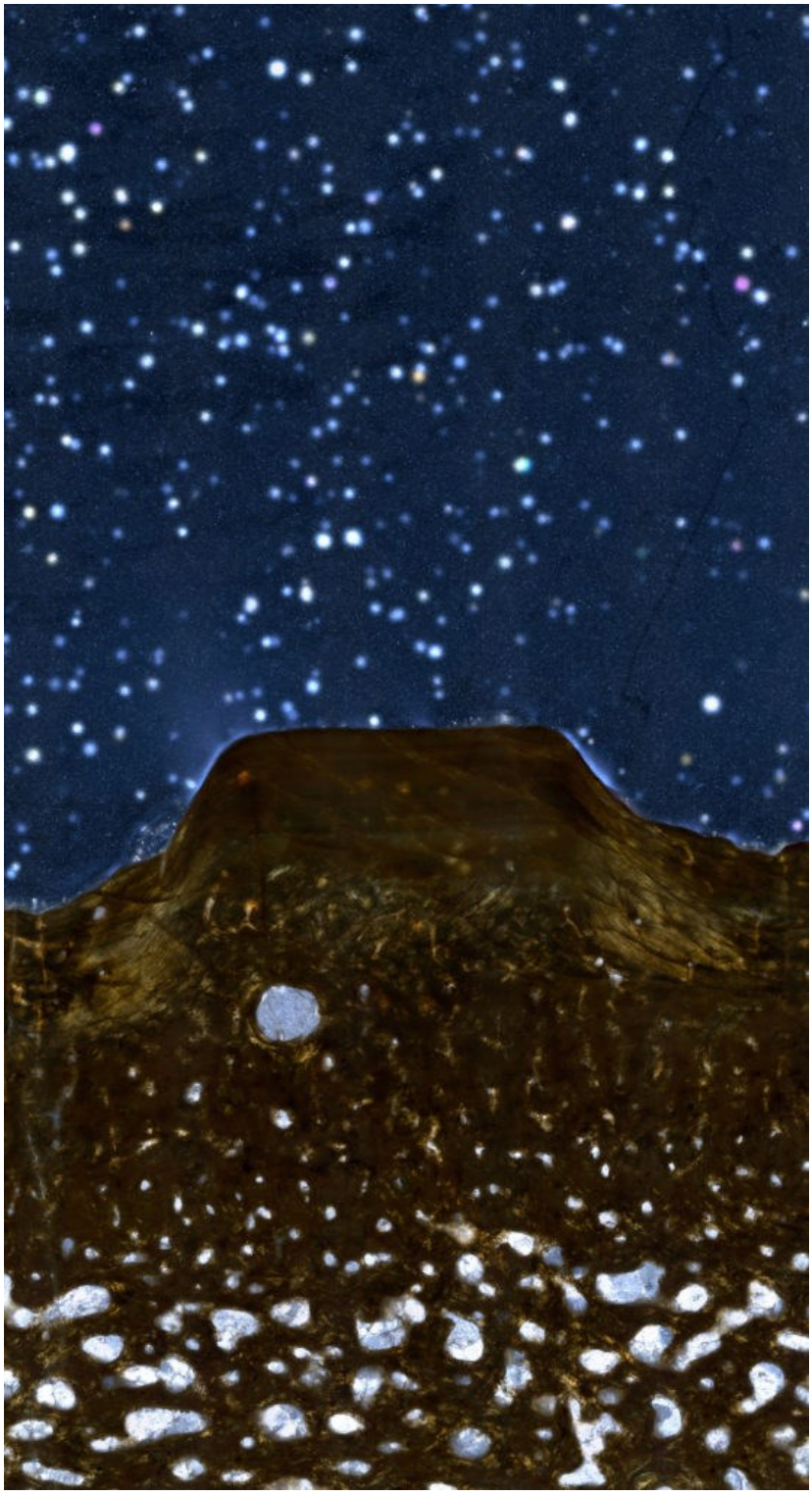
Todd L. Green, PhD Candidate
Department of Anatomy & Cell Biology, OSU Center for Health Sciences

Description: “This unhatched southern cassowary specimen (Casuarius casuarius) was micro-CT scanned; data were then visualized through digital rendering software. Colors are indicative of differing densities of bone and soft tissues (yellow = more dense; purple = less dense). The embryo is only about the size of a pear, though adults can grow to six feet in height. Cassowaries are a threatened group of flightless birds which inhabit the Wet Tropics of northeastern Australia and New Guinea.

2020 OMS Best Student Micrograph Contest 1st place winner Todd L. Green (left) and 2nd place winner Nathan Ong (right) are holding their winner micrographs and award plaques.

Second Place 2020 Student Micrograph Contest

Nathan Ong , PhD Candidate
Department of Anatomy and Cell Biology, OSU Center for Health Sciences



Title: Cosmic Turtle
Description: Cultures from around the globe have common myths that the world rests on the shell of a giant turtle, and it's easy to see why. I've spent hours blissfully lost among the mountains and valleys that grow on these shells. This is a paleohistological slide of a Late Cretaceous soft shelled turtle named *Helopanoplia*. It was imaged under cross-polarized light at 10x magnification, using a Zeiss Axioimager M2 motorized

The University of Oklahoma

SAMUEL ROBERTS NOBLE MICROSCOPY LABORATORY

March 30th, 2021

Greetings OMS Members,

It goes without saying that it has been a rough year for all of us as a whole but also for us microscopists. It has been just over a year ago that so many plans and activities were upended along with losses both work-related and personal. We've had to re-think how we go about our daily lives with an emphasis on keeping everyone safe and reflecting on what is truly most important in our lives.

Our Ugly Bug program is now in its 24th year but it too was not immune to the pandemic as we have only recently sent out the photos and posters to our 2019 contestants. Fortunately, we were able to send out microscopes to the winners on time but were unable to provide our usual on-site visit and demos. Perhaps understandably, 2020 saw only 14 entries to our contest. On the bright side Dr. Tingting Gu, our incoming OMS Secretary-Treasurer, has secured a phenomenal deal that will allow us to give light microscopes with digital cameras as well as a zoological and botanical slide set to all 14 of the schools who entered! In addition, Dr. Scott Russell, our former treasurer and now current biological sciences representative, has the 2020 Ugly Bug images up on the site so please go check them out at www.uglybug.org/. We will be working diligently to get the word out that we are still going strong and hope to get more entries this year.

Finally, our spring meeting is just around the corner. In the tried-and-true technique of making lemonade out of lemons, we have put together a virtual platform to be held on Thursday and Friday, April 22nd and 23rd. While we would prefer to hold a more traditional on-site event, that is still not safe or advisable in our current climate. However, one advantage to a virtual-style meeting is that it allows us to bring in speakers remotely that we would not otherwise be able to host due to busy schedules and travel commitments. This year we have a world class list of speakers including leaders in the fields of super resolution light microscopy, cryo-EM and S/TEM. In addition, registration for the meeting is free! As such, there is no excuse not to virtually attend these meetings at home on your couch and learn about state-of- the-art microscopy techniques and research. See okmicroscopy.org/ for registration and more details regarding the meeting.

In closing, it would be premature to think the end is in sight but the continuing roll out of vaccines across the nation give us a tantalizing glimpse of a return to a 'new' normal as long as we can remain patient and see this through. Towards that end, we must push to keep the beam on in Oklahoma in the safest manner possible!

Regards,

Preston Larson

Samuel Roberts Noble Microscopy
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Register for OMS Spring 2021 Virtual Meeting

Registration is free

Students competitions and awards
for presentations and micrographs

Workshops:
"Interactive Image Analysis Mini-Workshop with ImageJ/FIJI"
Michael Anderson, Graduate Student at the Oklahoma State University Center for Health Sciences

2021 OMS SPRING MEETING PROGRAM

Thursday, April 22, 2021

8:45-9:00 am	Welcome Remarks
9:00-11:00 am	"Interactive Image Analysis Mini-Workshop with ImageJ/FIJI" Michael Anderson, Oklahoma State University Center for Health Sciences
11:00-11:30 am	"Advanced Damage Free SEM Sample Preparation Utilizing Broad Ion Milling" Rod Baird, Hitachi
11:30-12:00 pm	"F200: Your Passport into the World of CryoEM" Jaap Brink, JEOL
12:00-1:00 pm	Career Development Panel with Industry Guests Joshua Deal and Jacob Burnett from Nikon and Kyle Driscoll from Miltenyi
1:00-1:30 pm	"Thermofisher Quattro S and the Scios 2" Rick Passey, Thermofisher
1:30-2:00 pm	"Advances in Direct Electron Detection: Getting the Most Out of Your Microscope" Sahil Gulati, Gatan
2:00-2:30 pm	"Discover the Cutting Edge of Light Sheet Fluorescent Microscopy" Kyle Driscoll and Amanda Burke, Miltenyi
2:30-3:00 pm	"Utilizing True Dynamic CT Imaging for 3D Non-Destructive in situ Experimentation" Luke Hunter, TESCAN
3:00-3:30 pm	"Super Resolution at the Speed of Spinning Disk Confocal: Theory and Use of Optical Reassignment" Matt Mitschelen, Nikon
3:30-4:00 pm	"Recent Advances in EBSD Detector Technology" Matt Nowell, EDAX LLC
4:00-4:10 pm	Break
4:10-4:30 pm	"Spatial Distribution of Low Molecular Weight BPEI and PEG-BPEI Within Pseudomonas Aeruginosa Biofilms" Hannah Panlilio, Andrew Neel, and Charles Rice, Department of Chemistry and Biochemistry, University of Oklahoma
4:30-4:50 pm	"600-Da Branched Polyethyleneimine (BPEI) as a Potential Adjuvant to Neutralize E.coli LPS and Biofilm Virulence Factors" Neda Heydarian, Cassandra L. Wouters, Hannah Panlilio, and Charles Rice, Department of Chemistry and Biochemistry, University of Oklahoma

Friday, April 23, 2021

8:45-9:00 am	Welcome Remarks
9:00-10:00 am	"Antimicrobial and biomimetic metaloxide nanoparticles: synthesis, characterization and applications in healthcare" Dr. Fernando Esteban Florez, OU College of Dentistry, University of Oklahoma Health Sciences Center
10:00-11:00 am	"Frontiers in Cellular Cryo-Electron Tomography" Dr. Long Gui, Nicastro Lab, UT Southwestern Medical Center
11:00-11:20 am	"3D Confocal Microscopy: A Resourceful Strategy in the Classroom", Zinar Simsek and D. Vazquez-Sanroman, Anatomy and Cell Biology Oklahoma State University Center for Health and Sciences
11:20 -1 pm	Break
1:00-2:00 pm	"Seeing Beyond Port-Mortem: In-Situ Capabilities in the ESEM" Dr. Daniel Veghte, Center for Electron Microscopy and Analysis, The Ohio State University
2:00-3:00 pm	"Super-resolution Microscopy Developments for High-throughput, Deep-tissue and Correlative Imaging" Dr. Joerg Bewersdorf, Yale School of Medicine
3:00-4:00 pm	"Seeing Atoms: Unraveling Material's Functionality" Dr. Stephen Pennycook, University of Tennessee, Knoxville, TN, and a Distinguished Visiting Professor at the School of Physical Sciences and CAS Key Laboratory of Vacuum Sciences, University of Chinese Academy of Sciences, Beijing
4:00-4:30 pm	Closing Remarks and Award Ceremony

Interactive Image Analysis Mini-Workshop with ImageJ/FIJI

Michael Anderson

Oklahoma State University Center for Health Sciences.

Scientific imagery is colorful, stunning, and popularly known to inspire the imagination. Join us on a 2-hour interactive journey into the beautiful and intriguing realm of two-dimensional (2D) and three-dimensional (3D) visual research. This fascinating odyssey will begin with an introductory presentation to familiarize attendees with 2D and 3D objects (cells, embryos, organisms) and how they are scientifically measured for publication.

Traditional methods of manual tracing (objects/regions of interest) will be discussed and compared to modern techniques, using the sample library included with ImageJ. We will also record our steps of operation (macro recording) for measurement documentation and future use, the basis of writing advanced scripts. The interactive component of this workshop will require the (free) software JAVA and ImageJ (which can be installed quickly and easily).

This workshop can be enjoyed by spectating; however, we encourage everyone to download these free and safe (for install) software programs to participate with us. We will see you on April 22nd and April 23rd for the Oklahoma Microscopy Societies 2021 Virtual Meeting and hope to see you in the Interactive Image Analysis Mini-Workshop with ImageJ/FIJI!

Required software

1. Update or download JAVA (currently installed on most computers)
    a. https://java.com/en/
        i. Requires Java 8 or later

2. ImageJ / FIJI (FIJI stands for **F**iji **I**s **J**ust **I**mageJ)
    a. https://imagej.net/Downloads
        i. ImageJ will run on any system that has a Java 8 (or later) runtime installed. This includes, but is not limited to Windows XP, Vista, 7 or 8 with Java installed from java.com. Mac OS X 10.8 "Mountain Lion" or later with Java installed from java.com.

Timpano Student Presentation Award

awards are expense paid trip to MSA or MAS conference, and cash

What is the Timpano Award?

Michael Anderson
Graduate Student
Oklahoma State University
Center for Health Sciences
Tulsa, Okla

The Timpano award is presented each year at the Oklahoma Microscopy Society (OMS) conference to the student with the best oral presentation. My name is Michael Anderson and I was awarded this in 2018. I offered to write these sentences for OMS to advertise this wonderful opportunity because it was a transformative experience for me and my career. Upon receiving the Timpano award in 2018, OMS provided a paid trip to the Microscopy & Microanalysis conference in Baltimore. I was invited to a platform presentation and my abstract was published by the Cambridge Press in Microscopy and Microanalysis (doi.org/10.1017/S1431927618007274). The Timpano award has opened many experiences and opportunities that I otherwise would have miss out on. So, I encourage every with microscopy data/images to prepare an oral presentation and compete for the OMS 2021 Timpano award!

OMS Spring 2021 Meeting Speakers:

Dr. Stephen Pennycook, National University of Singapore (retired)

Dr. Joerg Bewersdorf, Yale School of Medicine

Dr. Long Gui, Nicastro Lab, UT Southwestern Medical Center

Dr. Daniel Veghte, Center for Electron Microscopy and Analysis, The Ohio State University

Dr. Fernando Esteban Florez, OU College of Dentistry, University of Oklahoma Health Sciences Center

"Seeing Atoms: Unraveling Material's Functionality"

Dr. Stephen Pennycook, National University of Singapore (retired)

Dr. Pennycook is a Visiting Professor in the Materials Science and Engineering Dept., National University of Singapore, an Adjunct Professor in the University of Tennessee and Adjunct Professor in Vanderbilt University, USA. He is a world-leading microscopist, a pioneer of scanning transmission electron microscopy, and laid the foundation of both theoretical and experimental modern microscopy. His contributions to the development of the Z-contrast technique for incoherent imaging of materials at atomic resolution and leadership in developing sub-Angstrom resolution aberration-corrected electron microscopy led to the first images of single atoms of boron, carbon, nitrogen and oxygen (Cover of Nature, in 2010 and featured in 2014). https://greenenergy.nus.edu.sg/our_team/academic-staff/stephen-john-pennycook/

Seeing Atoms: Unraveling Material's Functionality

Stephen J. Pennycook

Department of Materials Science and Engineering, University of Tennessee, Knoxville, TN.
School of Physical Sciences and CAS Key Laboratory of Vacuum Sciences,
University of Chinese Academy of Sciences, Beijing.

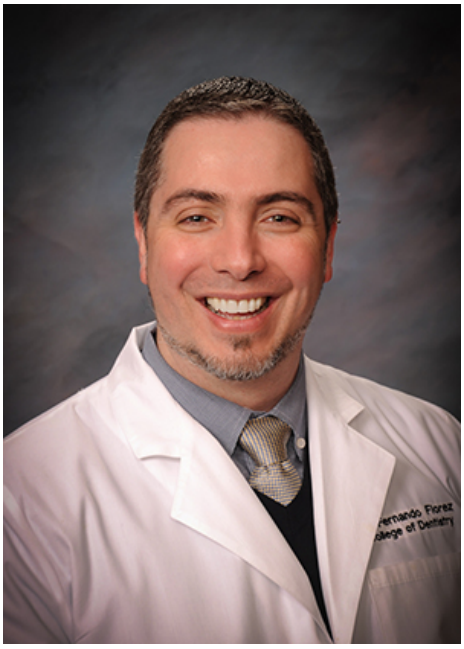
Abstract:

In Feynman's famous 1959 lecture "There's Plenty of Room at the Bottom," he challenged us to improve the electron microscope 100 times, so we could "just look at the thing." With the spectacular advances in aberration correction of the last decade, we have improved image resolution to well below 1 Å and gained the ability to see atoms directly, even light atoms. Through spectroscopy, we can even determine their bonding. A number of examples will be shown of things we can now see that were hidden before. Coupled with theoretical calculations, we can now unravel the origin of materials functionality at the fundamental atomic level. We can watch atomic diffusion within a solid, and understand the processes. We can identify active sites in a catalyst and understand how grain boundaries in CdTe solar cells improve cell efficiency. We can investigate the dynamics of nanoclusters, nanowires and defects in 2D materials. We can create improved oxide electronics, piezoelectric and thermoelectric materials. Today's aberration-corrected microscopes are changing the way materials science is done.

Bio:

Stephen J. Pennycook is an Adjunct Professor in the University of Tennessee, Knoxville, and Distinguished Visiting Professor at the University of the Chinese Academy of Sciences, Beijing. From 2015 to 2020 he was a Professor in the Materials Science and Engineering Dept., National University of Singapore. Previously he was a Corporate Fellow at Oak Ridge National Laboratory. He is a Fellow of the American Physical Society, the American Association for the Advancement of Science, the Microscopy Society of America, the Institute of Physics and the Materials Research Society and has received the Materials Research Society Medal, the Institute of Physics Thomas J. Young Medal and Award, the Materials Research Society Innovation in Characterization Award, and the Microscopy Society (Singapore) Antonie van Leeuwenhoek Award.

"Antimicrobial and biomimetic metaloxide nanoparticles: synthesis, characterization and applications in healthcare"



Dr. Fernando Esteban Florez, OU College of Dentistry, University of Oklahoma Health Sciences Center

Dr. Florez has significant research experience in the areas of biophotonics, development of medical devices for surface sterilization using UV-C LEDs, antimicrobial photodynamic therapy, metaloxide nanoparticles, nanostructured dental adhesive resins with antibacterial and bioactive properties, advanced microscopy techniques (SEM, TEM, Dual-FIB SEM, EDS), high-throughput bioluminescence assays. https://dentistry.ouhsc.edu/About/Faculty-Directory/Details/fernando-luis-esteban-florez

Antimicrobial and Biomimetic Metaloxide Nanoparticles: Synthesis, Characterization and Applications in Healthcare

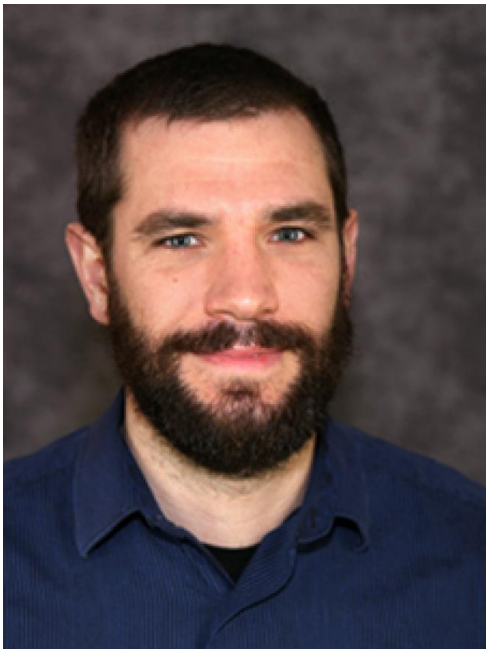
Fernando Esteban Florez

University of Oklahoma Health Sciences Center, OU College of Dentistry

Abstract:
Nanoparticles and nanostructures can be efficiently used to improve the surface and bulk properties of materials in the fields of Engineering, Medicine and Dentistry. However, simple incorporation of nanoparticles into commercially available materials has been shown to result in materials with inadequate properties. Consequently, modification and functionalization of nanoparticles is required to fabricate the state-of-the-art nanostructured composites with specific architectures, functionalities and superior mechanical, surface, chemical, physical and biological properties. This presentation will briefly describe the synthesis, doping (nitrogen, silver and fluorine), surface-modification and functionalization of titanium dioxide nanoparticles into polymers that are relevant in healthcare. Experimental nanoparticles and nanofilled polymer-based materials have been extensively characterized using cutting-edge scientific technologies including Helion-Ion Microscopy, Transmission Electron Microscopy, Energy Dispersive X-ray Spectrometry, Dual-Focused Ion Beam SEM, Micro-CT, Time-of-Flight Secondary Ion Spectrometry, Small-Angle X-ray Scattering and Small-angle Neutron Scattering. Experimental materials were also assessed regarding their mechanical, antimicrobial, biomimetic and biocompatibility properties.

Bio:
Dr. Fernando Luis Esteban Florez is currently an Assistant professor at the Department of Restorative Sciences, Division of Dental Biomaterials from The University of Oklahoma Health Sciences Center College of Dentistry. Dr. Esteban Florez holds a D.D.S. from the University of Marília (2002), a Master degree in Restorative Dentistry from the São Paulo State University Araraquara College of Dentistry (2009) and a Doctorate degree in Restorative Dentistry from the São Paulo State University Araraquara College of Dentistry (2012). In 2012, Dr. Esteban Florez became a postdoctoral fellow in the Division of Dental Biomaterials where he became faculty later in 2015. Dr. Esteban Florez holds research appointments at the São Paulo State University (UNESP), University of São Paulo (USP) and the University of Campinas (UNICAMP). Dr. Esteban Florez founded a startup company in Brazil, filled for six patents (international and national) and has a strong track record of funding from international, national and local agencies including FAPESP (PIPE phases 1 and 2, $ 300,000), OU Postdoctoral Stipend Award ($20,000), OCAST ($270,000), OSCTR ($75,000) and OU Growth Fund ($75,000), PHF ($100,000) and Norman VPR ($45,000). Dr. Esteban Florez' lines of research include the development of novel devices, assays and polymer-based biomaterials with antimicrobial (virus, fungi and bacteria) and biomimetic functionalities for dental and medical application, biophotonics, lasers in dentistry (low/high intensity level lasers), UVC decontamination and sterilization of surfaces for the control cross-contamination in healthcare and to prevent the spreading of infectious respiratory diseases in dental settings.

“Seeing Beyond Port-Mortem: In-Situ Capabilities in the ESEM”



Dr. Daniel Veghte, Center for Electron Microscopy and Analysis, The Ohio State University

Dr. Veghte is a Senior Research Associate-Engineer at CEMAS and has developed instrumentation used for collecting and analyzing aerosol particles, leading to a wide range of knowledge in conventional and novel sample preparation techniques. He has analyzed many different materials through working in two different user facilities, where he managed instrumentation and tackled projects ranging from high-resolution analysis to complex in-situ experiments. https://cemas.osu.edu/people/veghte.2

Seeing Beyond Port-Mortem: In-Situ Capabilities in the ESEM

Daniel Veghte

Center for Electron Microscopy and Analysis, The Ohio State University

Abstract:
Traditionally electron microscopy is utilized as a tool to characterize samples after preparation ex-situ. Advances in technology have allowed for greater flexibility of the sample condition in the microscope. With a large vacuum chamber, the SEM is ideally suited to be treated as an experimental chamber that happens to have high resolution imaging capabilities – opening up the possibilities of what can be done. Multiple in-situ stages ranging from heating/cooling to mechanical testing can be used with the low-vacuum imaging to understand a wide range of materials. With careful thought about sample preparation and stage design almost any process is able to be characterized in-situ. Along with performing the experiment in-situ, the suite of analytical techniques (EDS, EBSD, CL, etc.) can be used to further characterize samples during the experiment. In this talk we will discuss experiments that have used a combination of in-situ, analytical, and correlative techniques across a wide range of fields. Capabilities ESEM allow dynamic experiments to understand what happens during an experiment, not just trying to determine what possibly occurred by post-mortem analysis.

Bio:
Daniel Veghte is a Senior Research Associate at the Center for Electron Microscopy and Analysis (CEMAS) at The Ohio State University where he works closely with research groups from across campus and manages the SEM and FIB systems. Throughout Daniel's career, he has developed instrumentation used for collecting and analyzing aerosol particles, leading to a wide range of knowledge in conventional and novel sample preparation techniques. He has analyzed many different materials through working at multiple different user facilities, where he managed instrumentation and tackled projects ranging from high-resolution analysis to complex *in-situ* experiments. He earned his Ph.D. in Chemistry from The Pennsylvania State University. Daniel did his postdoctoral work at the Environmental Molecular Sciences Laboratory at Pacific Northwest National Laboratory where he studied atmospheric particles collected from field sites across the globe (including Oklahoma!).

“Frontiers in Cellular Cryo-Electron Tomography”

Dr. Long Gui, Nicastro Lab, UT Southwestern Medical Center

Dr. Gui is a Postdoctoral research in Dr. Daniela Nicastro’s Lab. The Nicastro Lab uses cryo-electron tomography to visualize the 3D ultra-structure of cells, organelles (such as cilia), and macromolecular complexes. https://www.utsouthwestern.edu/labs/nicastro/

Frontiers in Cellular Cryo-Electron Tomography

Long Gui

UT Southwestern Medical Center

Bio:
Dr. Long Gui is a Postdoctoral research in Dr. Daniela Nicastro's Lab. The Nicastro Lab uses cryo-electron tomography to visualize the 3D ultra-structure of cells, organelles (such as cilia), and macromolecular complexes.
https://www.utsouthwestern.edu/labs/nicastro/

"Super-resolution Microscopy Developments for High-throughput, Deep-tissue and Correlative Imaging"

Dr. Joerg Bewersdorf, Yale School of Medicine

Dr. Bewersdorf is a Professor of Cell Biology and of Biomedical Engineering at Yale University. An optical physicist/biophysicist by training, Dr. Bewersdorf has been a long-time contributor to the field of super-resolution light microscopy development and the application of these techniques to cell biological questions. https://medicine.yale.edu/profile/joerg_bewersdorf/

Super-resolution Microscopy Developments for High-throughput, Deep-tissue and Correlative Imaging

Joerg Bewersdorf

Yale School of Medicine

Bio:

Joerg Bewersdorf is a Professor of Cell Biology and of Biomedical Engineering at Yale University. He received his Master's degree (Dipl. Phys., 1998) and his doctoral degree in physics (Dr. rer. nat., 2002) training with Dr. Stefan W. Hell at the Max Planck Institute for Biophysical Chemistry in Goettingen, Germany. After 4 years at The Jackson Laboratory in Bar Harbor, Maine, he relocated his research group to Yale University in 2009. An optical physicist/biophysicist by training, Dr. Bewersdorf has been a long-time contributor to the field of super-resolution light microscopy development and the application of these techniques to cell biological questions.

Timpano Competition Participants

Spatial Distribution of Low Molecular Weight BPEI and PEG-BPEI Within Pseudomonas Aeruginosa Biofilms

Hannah Panlilio, Andrew Neel, Charles Rice

Department of Chemistry and Biochemistry, University of Oklahoma

Abstract:

Chronic wound healing is often exacerbated by infections and about 90% of chronic wounds are aggravated by biofilms. Bacterial biofilms are communities of microorganisms enclosed in a protective extracellular polymeric substance. Biofilm formation is one of many resistance mechanisms that pathogens employ to evade existing therapeutics. Furthermore, it is reported that wound healing is delayed by biofilm formation. Among the biofilm-forming pathogens is *Pseudomonas aeruginosa*, a Gram-negative bacterium that easily spreads in healthcare settings. Multidrug resistant (MDR) *P. aeruginosa* infections are among the most serious threats that the Centers for Disease and Prevention (CDC) listed in their 2019 Annual Report. However, previous findings from our laboratory demonstrate that against MDR *P. aeruginosa*, the potency of β-lactam antibiotics can be restored with 600 Da branched polyethylenimine (BPEI). In addition, evidence suggests that 600 Da BPEI can also disrupt pre-formed biofilms. The hydrophilic nature of 600 Da BPEI and its cationic charge likely cause it to interact with anionic targets in the biofilms. However, 600 Da BPEI still creates toxicity concerns that cannot be overlooked. As a result, 600-Da BPEI was modified by attaching a low-molecular-weight polyethylene glycol (PEG) group, resulting in PEG-BPEI. In this study, PEG-BPEI was found to also have an antibiofilm activity against *P. aeruginosa*. In addition, the antibiofilm activity of 600 Da BPEI and its derivative was further characterized via fluorescence studies and microscopy imaging. Data collected via crystal violet assay suggest that biofilm biomass reduction is dose dependent. Furthermore, a biofilm model more suited for wound healing analysis was applied in this study to move the potential therapeutic use of these molecules forward. We envision 600 Da BPEI as a topical agent applied to acute and chronic wounds to combat susceptible and resistant pathogens and reduce the bacterial burden in wound infections.

Title: 600-Da branched polyethyleneimine (BPEI) as a potential adjuvant to neutralize *E.coli* LPS and biofilm virulence factors.

Authors: *Neda Heydarian*, Cassandra L. Wouters, Hannah Panlilio, Charles V. RicePhD*

Abstract:

Escherichia coli (E.coli) is a Gram-negative bacterium with certain strains that are responsible for mortality and morbidity in medical device-related infections. Due to formation of biofilms, *E.coli* infections are difficult to eradicate. These biofilms protect the bacteria from severe environmental conditions by embedding the microbes in extracellular polymeric substances (EPS) matrix. The *E.coli* biofilms result in formation of stubborn and chronic wound infections due to the development of antibiotic resistance. Current antimicrobial agents are narrow-spectrum macromolecules with restricted efficacy against biofilms. Likewise, *E.coli* lipopolysaccharide (LPS) causes excessive inflammation in wounds and delays wound healing. Toll-like receptor 4 (TLR4) primarily recognizes, and is activated by bacterial endotoxin, leading to signaling events that eventually culminate with the release of inflammatory cytokines. In humans, uncontrolled production of inflammatory responses induced by bacterial endotoxin develops severe physiological responses and causes endotoxin shock and impaired wound repair. There is a need for new therapeutic adjuvants with effective drug delivery mechanism to disrupt *E.coli* biofilm growth, alleviate wound infection, and improve healing activity. Recent studies in our lab show that 600-Da BPEI is able to facilitate the uptake of drugs and lower drug influx barrier as a potentiator in bacteria and bacterial biofilm. Additionally, it has been shown that BPEI can suppress interleukin-8 (IL-8) production in response to endotoxin induction and reduce inflammation. Inflammation reduction helps prevent many acute ulcers from becoming chronic wounds and alleviates the risk of recurrent infection and tissue necrosis. In the current study, the ability of BPEI to neutralize *E.coli* lipopolysaccharide (LPS) and disrupt *E.coli* biofilms has been demonstrated. Also, we show the effect of BPEI treatment on the expression profile of *E.coli* virulence genes involved in biofilm formation. Overall, we propose that BPEI is a multi-functional agent that can reduce biofilm formation, lower LPS-induced inflammation, eliminate *E.coli* pathogenicity, and eventually speed up wound healing.

3D Confocal Microscopy: a resourceful strategy in the classroom

[1]***Simsek Z. MS***, [1]Vazquez-Sanroman D., PhD

[1]Anatomy and Cell Biology department, Oklahoma State University Center for Health and Sciences.

BACKGROUND: A major challenge of modern cell biology is to popularize basic concepts of structures and functions of living cells, to introduce people to the scientific method, to stimulate inquiry, and to analyze and synthesize concepts and paradigms. The traditional microscope-based, teacher-focused program in histology education is very much dependent on having adequate numbers and equal qualities of human histological slides and requires several qualified educators who can provide simultaneous close supervision at individual microscope workstations. Therefore, accessibility of 3D images from histological preparations such as skin cells can represent a tool for creating an available collection of 3D-digitalized histological specimens.

AIM: to capture a 3D-image from skin cells using a Leica Confocal Microscope.

METHODS: Epi microscope is used for 2D images. In Epi florescence fluorophore in whole tissue, gets excited whereas, in confocal microscope fluorophore get excited in narrow depth of tissue, provides several different levels of the images to create 3D images. Samples were observed in 40X lenses. Image J and Leica Las software is used to capture the images.

RESULTS: Samples were taken from rat epithelium layers; with 2D images superficial layers of the sample was identified, whereas all individual layers of epithelium tissue were identified. Image J helped us to capture the images

APLICATIONS TO MY RESEARCH: The ability of applying microscopic advancements to current day purposes has become even more evident in the modern world. Specifically, using microscopy in identifying cell structures in different histology specimens is more needed now than ever to assist in the global pandemic. Using confocal microscopy in my PhD work to identify the morphology of protein brain derived neurotrophic factor (BDNF) I am interested in, helps me to carry this knowledge to make a difference in my classes I teach at community college. Courses I teach have histology chapters and 3D structures of cells make student comprehend in much better level.

Vendor Presentations

Utilizing True Dynamic CT Imaging for 3D Non-Destructive In Situ Experimentation

Luke Hunter

TESCAN

Abstract:

Time-resolved 3D imaging with X-rays has rapidly emerged as an essential technique to understand materials evolution, facilitating in situ investigations ranging from mechanical deformation to fluid flow in porous materials. Imaging of dynamic processes is one of the key applications at synchrotron micro-CT beamlines, extending the limits of temporal resolution further and further. However, access to those facilities is often limited and operational costs are quite high.

In the laboratory, image quality and spatial resolution have been significantly improved, unfortunately, this has often been at the cost of temporal resolution. Recent developments at TESCAN XRE have made it possible to visualize and inspect 3D dynamic processes in the laboratory with a temporal resolution below 10 seconds.

In this talk we explore the general technique of micro-computed tomography and the challenges and innovations that have led to the development of dynamic CT, highlighting a number of applications across materials science, life science and geoscience applications.

Bio:

Luke Hunter is the regional product manager for North and South America for TESCAN's Micro-CT product lines. He joined TESCAN in the summer of 2019 and has over a decade of experience in the X-ray microscopy and Micro-CT industries, as an application specialist, applications team manager, and solutions marketing manager. He received his master's degree from University of California, Berkeley (Berkeley, CA USA) in Mechanical Engineering and his bachelor's degree in Mechanical Engineering from Washington State University (Pullman, WA USA).

TESCAN is a global supplier of scientific instrumentation and microscopy solutions, headquartered in Brno, Czech Republic. The company is focused on research, development and manufacturing of scientific instruments and laboratory equipment including electron- and ion microscopy, micro-CT.

F200: Your Passport into the World of CryoEM

Jaap Brink

JEOL

Abstract:
The F200 can be configured with several pole pieces meaning the scope can be tailored to its function and the requirements. These pole pieces can even be retrofitted in the field allowing for a simply repurposing of the microscope. For cryo a dedicated crop pole piece, CRP, exists that allows for imaging in either TEM or STEM of a biological sample in the vitrified state, but also for an EDS to be used for some analytical capability. The CRP has a special purpose cryo-box that completely surrounds the sample and minimizes the rate of ice contamination to better than 5Å/hour. Thus, frozen-hydrated samples can be observed for hours on end without significant loss of contrast due to the buildup of water. The CRP has a wide gap allowing for imaging of untitled samples to high resolution, yet at the same time also allowing for tomography at tilt angles up to +/- 70º.
In addition, the F200 can be outfitted with hole-free phase plates, which yields images with unsurpassed contrast. These phase plates can be used in single particle workflows but also in tomography. The phase plates are fully integrated in the software on both the microscope and the external control software.

Bio:

Dr. Jaap Brink, TEM Biological Applications Manager
Dr. Brink obtained his Ph.D. in 1988 in the Netherlands under guidance of professor Ernst van Bruggen, he moved to Houston, where he worked till 2002 as a research associate, a post-doctoral position, at the Baylor College of Medicine in Houston, Texas under professor Wah Chiu. He joined JEOL USA, Inc. in September 2002 as the TEM Biological Applications Manager and since 2009 has been TEM Product Manager for Life Sciences.

Super Resolution at the Speed of Spinning Disk Confocal: Theory and Use of Optical Reassignment

Matt Mitschelen

Nikon

Abstract:
Interaction of excitation point-spread functions (PSFs) and emission PSFs create the potential for light microscopy resolution beyond the traditional diffraction limit. Multiple methods have been proposed and implemented, but optical reassignment of emission light to its origin can occur instantaneously and be supplemented with computational methods rather than relying on them entirely. Here we describe the theory and implementation of optical reassignment in the Yokogawa CSU-W1 SoRa spinning disk confocal (SDC), and how using an SDC as a super-resolution platform on Nikon's imaging systems maximizes speed, resolution, and integration of other optical techniques into experiments ill-suited for most super-resolution modalities.

Bio:

Matt started his career studying the electrophysiology of Drosophila neuromuscular junctions at Cornell University. After a break from research to teach high school biology in rural Africa, he returned to research at the University of Oklahoma Health Sciences Center. Studies of the neuroendocrinology and vascular pathology of memory loss led him to advanced microscopy techniques including stereology. For the past seven years, he has served as a Senior Biosystems Applications Manager at Nikon. His role is responsible for internal and external training on everything from educational scopes to super-resolution and multiphoton systems. He also teaches the optical theory and software techniques that translate images into reliable data. This training helps ensure a customer's investment in Nikon is a tailored solution to their unique, evolving needs.

Discover the Cutting Edge of Light Sheet Fluorescent Microscopy

Kyle Driscoll and Amanda Burke

Miltenyi

Abstract:

The UltraMicroscope Blaze is the only fully automated light sheet microscope for imaging large or multiple cleared samples. It covers the range from analyzing entire mice to multiple organs and organoids with subcellular resolution. The combination of our pioneering UltraMicroscope technology with cutting-edge light sheet optics ensures excellent data quality. The UltraMicroscope Blaze received the Wiley Analytical Science Award 2021 in the category "Spectroscopy and Microscopy" less than a year after the instrument's introduction to the market.

Bio:

Kyle Driscoll:

Kyle joins us from Miltenyi Biotec as the Advanced Imaging Specialist. He received his B.S. and Ph.D. from Michigan Technological University, where his thesis work focused on immune-oncology and drug discovery. After graduating in 2017, he then moved to Chicago, IL where he accepted a position as the Filed Application Scientist for Sartorius dealing with their high throughput imaging system. Following a short stint there, he then moved on to become the Advanced Biosystems Specialist for Nikon instruments where he amassed expertise in various imaging techniques ranging from fluorescent microscopy to super-resolution.

Amanda Burke:

Amanda received her PhD from LSU-Pennington Biomedical in Neurobiology where her thesis work focused on neural mapping and phenotyping of cells driving food-motivated behaviors. Amanda went on to do a post-doc at Scripps Research where she identified and characterized novel neural ensembles involved in drug addiction and compulsivity.

Amanda has been with Miltenyi Biotec for nearly 3 years. In February of this year, Amanda transition to an FAS role from Miltenyi' s Science Team where she was the subject matter expert for light sheet microscopy and had worked diligently to support our entire UMII customer base.

Advances in Direct Electron Detection: Getting the Most Out of Your Microscope

Sahil Gulati

Gatan

Abstract:

The direct electron detection technology has provided a dramatic improvement in the quality of images for cryo-electron microscopy (cryo-EM) leading to the resolution revolution. The exponentially rising demand for cryo-EM and a relative shortage of high-end TEMs has necessitated the need for speed in cryo-EM data collection. It is important to consider that both imaging throughput and image quality go hand-in-hand to measure a detector's overall performance. Here we discuss along with basics some of the ongoing developments at Gatan Inc. which can significantly impact the quality and efficiency of your cryo-EM data collection.

Bio:

Sahil Gulati received a Ph.D. in Pharmacology and Structural biology from Case Western Reserve University in 2018 and later joined the Department of Ophthalmology at the University of California Irvine as a postdoctoral researcher. Sahil joined Gatan Inc. in the year 2019, and currently oversees the development of global marketing strategies to drive life science business growth and sales effectiveness worldwide. Sahil is deeply involved in developing improved methods and software for cryo-electron microscopy, cryo-electron tomography, and electron diffraction on energy-filtered direct electron detectors.

Recent Advances in EBSD Detector Technology

Matt Nowell

EDAX LLC

Abstract:

Electron Backscatter Diffraction has become an established microanalysis technique for the characterization of crystalline materials in the Scanning Electron Microscope (SEM). EBSD provides information about the crystal orientation, grain boundary structure, grain morphology, phase distribution, and local deformation character. Recent advances in EBSD detection technology have enabled new approaches in data collection. Traditionally EBSD has used CCD cameras optically coupled to a phosphor screen for detection. New high-speed CMOS cameras allow users to collect more data faster, which leads to improved throughput, finer data sampling, and larger area analysis. New direct electron detectors remove the phosphor screen and optical path from the collection chain. This detection technology offers improved sensitivity and image sharpness compared to phosphor-based approaches. In this talk, examples of both high-speed and direct detection will be presented.

Bio:

Matt Nowell is the EBSD Product Manager at EDAX and has a passion for EBSD and microstructural characterization. Matt joined TexSEM Labs (TSL) upon graduation from the University of Utah in 1995 with a degree in Materials Science and Engineering. At TSL, he was part of the team that pioneered the development and commercialization of EBSD and OIM. After EDAX acquired TSL in 1999, he joined the applications group to help continue to develop EBSD as a technique, and integrate structural information with chemical information collected using EDS.

Within EDAX, Matt has held several roles, including product management, business development, customer and technical support, engineering, and applications support and development. Matt has published over 70 papers in a variety of application areas. He greatly enjoys the opportunity to interact with scientists, engineers, and microscopists to help expand the role that EBSD plays in materials characterization. In his spare time, Matt enjoys playing golf and pondering if changing the texture of his clubs will affect his final score.

2020 The Timpano Award

The First Prize: Mehrnoush Nourbakhsh-Rey from the University of Oklahoma

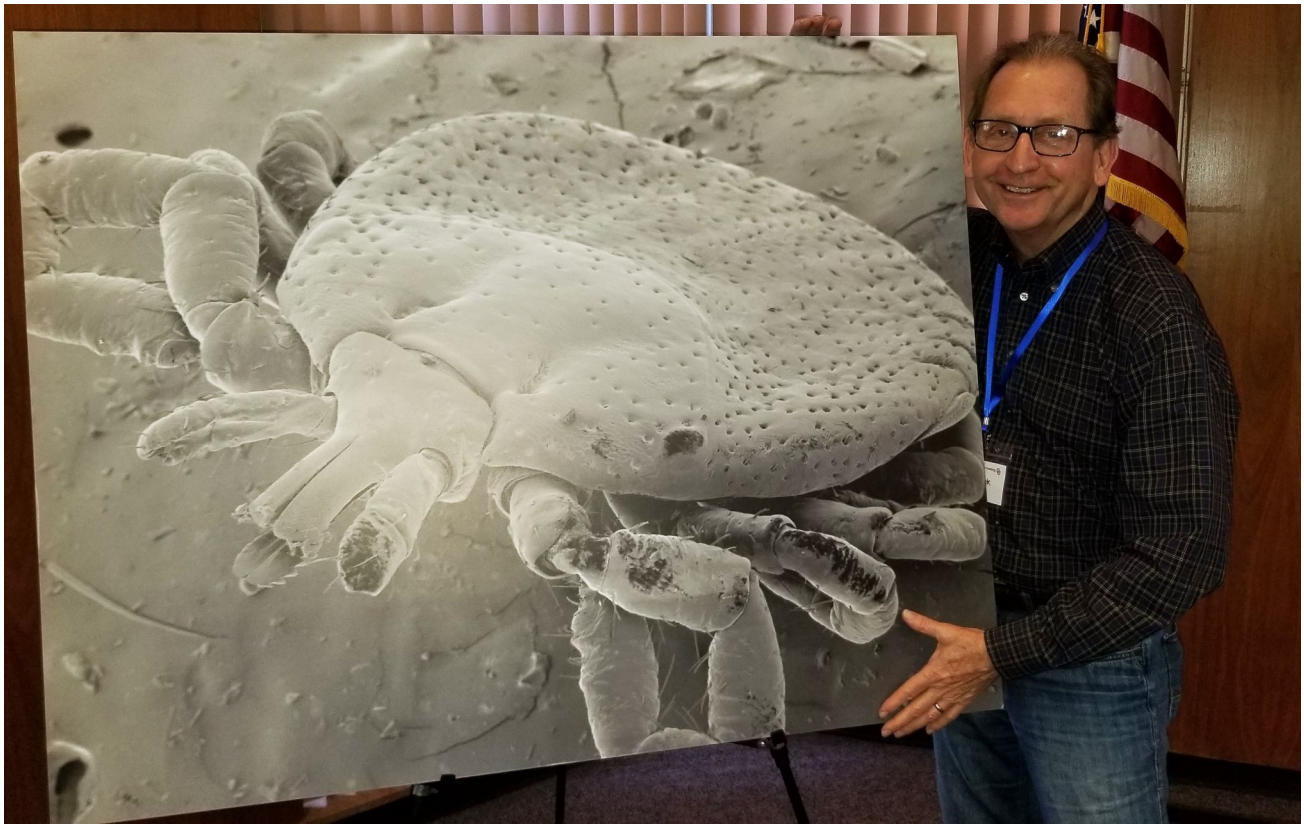
Oral presentation title: ***Metabolism Sensing Mechanisms in the Electric Organ Cells of a Weakly Electric Fish*.**

The Second Prize: Nathan Donahue from the University of Oklahoma

Oral Presentation title: ***Characterizing and Fine-tuning Nanomaterials for Biomedical Applications.***

Pictured from left to right: 2020 Keynote speaker Dr. Roger Mailler, University of Tulsa, Mehrnoush Nourbakhsh-Rey, Nathan Donahue, Keynote speaker Dr. Josep Rizo, University of Texas Southwest Medical Center, Dr. Tingting Guo.

Dr. Bill Meek retired from Oklahoma State University Center for Health Sciences in 2020, after 35 years of service. We wish him the best!



Upcoming microscopy meetings . . .

Oklahoma Microscopy Society

Fall Meeting 2021

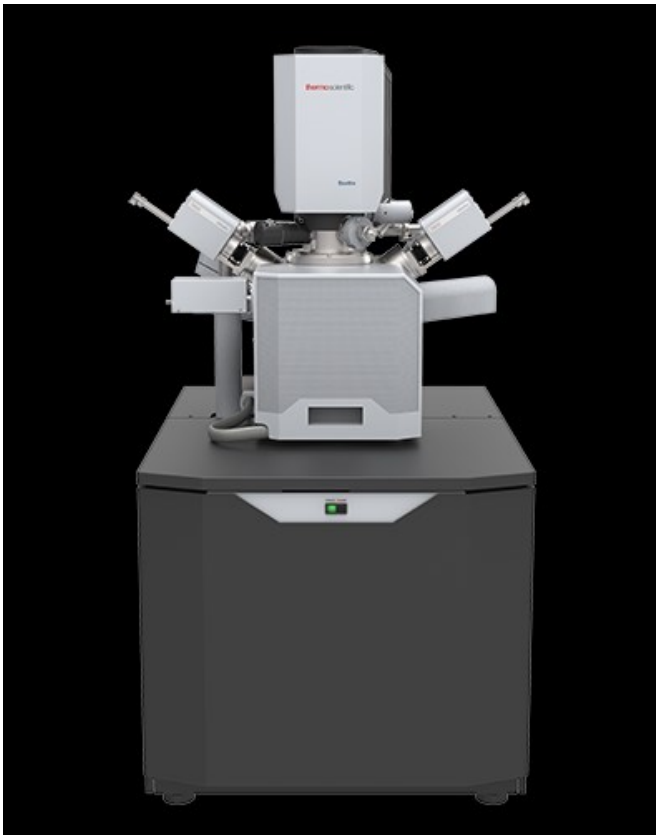
The 2021 Technical Meeting of the Oklahoma Academy of Science is tentatively scheduled to be held on November 5, 2021 at East Central University in Ada, OK. Registration and call for presentations will take place in late Summer 2021.

M&M 2021

MICROSCOPY & MICROANALYSIS

August 1-5, 2021 • Pittsburgh, PA

University of Oklahoma's Thermofisher Quattro S



Thermofisher Quattro S from:

https://www.thermofisher.com/us/en/home/electron-microscopy/products/scanning-electron-microscopes/quattro-esem.html

Delivery of our Thermofisher Quattro S on Friday, February 12th, 2021.

The Samuel Roberts Noble Microscopy Laboratory at the University of Oklahoma is pleased to announce the acquisition of a Thermofisher Quattro S Environmental Scanning Electron Microscope. This will be the first environmental SEM housed at the Noble Microscopy Lab and in addition to environmental and low vacuum modes, our Quattro configuration also includes beam deceleration, SE, Low-Vacuum SED and DBS Detectors, a Cooling/Heating Stage (-20-60^{o}C), Energy Dispersive Spectroscopy along with ColorSEM, an integrated plasma cleaner and an Electron Backscattered Diffraction system. This versatile, flexible and high-resolution imaging system allows samples to be examined in their natural state and supports *in situ* experiments. The microscope was delivered on February 12th but due to the winter storm the following week and some necessary facilities modifications, installation has been delayed slightly. However, we hope to be up and running very soon! If anyone has any questions about the microscope's capabilities or inquiries about usage, please contact Preston Larson (plarson@ou.edu) or visit www.ou.edu/microscopy for more information!

Constitution & Bylaws of the OMS

Article I. NAME

The name of this organization shall be the Oklahoma Microscopy Society. The acronym shall be OMS. OMS is a non-profit organization.

Article II. PURPOSE

The purpose of OMS shall be the advancement of the science of microscopy in Oklahoma and nationally by:

encouraging the dissemination of knowledge of microscopy including its technology and instrumentation.

promoting the free exchange of ideas and data among interested individuals and

encouraging interdisciplinary interaction between microscopists.

Article III. MEMBERSHIP

Section 1. Types:

Regular membership shall be open to any person who has an interest in microscopy.

Corporate membership shall be open to any commercial or non-profit organization that has an interest in microscopy. A member organization may designate one representative to receive all privileges of membership. Other members of the same organization may become regular members.

Honorary membership may be given to a person named an Honorary member by vote of the Executive Committee.

Section 2. Enrollment: Any eligible person or organization may make application for membership to the Executive Committee of OMS. Completed application forms shall be submitted to the Secretary-Treasurer of OMS with one year's dues.

Section 3. Privileges: All members have the right to vote at any business meetings held by OMS and to hold elective office.

Section 4. Dues:

Annual dues shall be five dollars for Regular membership for students, fifteen dollars for Regular membership for non-students, and fifty dollars for Corporate membership.

Dues shall become payable on July 1 of each year for the following twelve months.

Any member that is delinquent in payment of dues for a period of six months shall be dropped from membership. Members thus dropped may be reinstated thereafter by paying one year's delinquent dues and the current year's dues.

Article IV. MEETINGS

At least one business meeting per year shall be held. The time(s) and place(s) of such meetings shall be designated by the Executive Committee and duly announced. Business meetings shall be conducted according to Robert's Rules of Order.

Article V. OFFICERS

Section 1. The officers of OMS shall be a President, a President-Elect, a Secretary-Treasurer, a Member-at Large for Biological Sciences, a Member-at Large for Physical Sciences, and a Member-at Large for student members. These officers shall perform the duties prescribed by these bylaws and by the parliamentary authority adopted by the Society.

Section 2. Duties:

a. The President shall preside at all meetings of the Executive Committee and business meetings of the OMS and promote the interests of OMS both within the state and nationally.

b. The President-Elect shall assist the President, substitute for him/her when necessary, perform any duties assigned by the President and be responsible for organizing the regular spring workshop/seminar.

c. The Secretary-Treasurer shall maintain records of OMS and communicate with members. This officer shall be custodian of OMS funds, collect all dues, notify members delinquent in membership and account for OMS funds in accordance with accepted business practice.

d. Members-at-Large shall represent their respective constituents.

Section 3. Term of Office:

The President, President-Elect, and Members-at-Large shall each serve for one year beginning July 1 and ending June 30 of the following year.

The Secretary-Treasurer shall serve for two consecutive years beginning July 1 and ending July 30 of the second following year.

Section 4. Election: Officers shall be elected as prescribed in Article VII of these bylaws.

Section 5. Vacancies: If the President cannot serve, the President-Elect shall immediately succeed to that office. If the President-Elect or any other officer cannot serve for any reason, the Executive Committee shall appoint a person to serve pro tem in the vacant office. Any such appointed officer shall be replaced by one duly elected at the next annual election in May.

Article VI. EXECUTIVE COMMITTEE

Section 1. Composition: The Executive Committee shall consist of the officers of OMS, plus the Newsletter Editor ex officio who shall be without vote.

Section 2. Duties:

The Executive Committee shall conduct the business of OMS as specified herein and otherwise as neces-

sary, and shall advise the membership on matters concerning the management of OMS. It shall appoint the Newsletter Editor.

The Executive Committee shall hold not fewer than two meetings annually, on call of the President or a majority of its members.

Article VII. ELECTIONS

Section 1. Nominations of officers except the President shall be made by a nominating Committee appointed by the President and approved by the Executive Committee. This Committee shall consist of five persons, at least one of whom is from the field of Biological Sciences and one from the field of Physical Sciences. Nominations may be solicited from the membership at any time.

Section 2. The Nominating Committee shall present a slate of consenting candidates (two for each office) to the President prior to the spring general business meeting. The President and Secretary-Treasurer shall announce this list to the membership at the spring general business meeting. Additional nominations of persons willing to serve may be solicited from the floor at this time.

Section 3. The Secretary-Treasurer shall prepare and mail ballots to all members by May 15 and shall accept ballots until May 31.

Section 4. Ballots shall be counted by at least two Executive Committee members and may be reviewed by the entire board if deemed necessary. In each case the candidate receiving the largest number of votes shall be declared elected. Any tie shall be resolved by vote of the combined Executive and Nominating Committees. Results shall be announced by the Secretary-Treasurer at the next business meeting or by mail to all members.

Article VIII. AD HOC COMMITTEE

The President shall appoint ad hoc committees as necessary or helpful in managing affairs of OMS. Committee members shall be considered automatically discharged at the end of the appointing President's term of office unless the new President specifically requests that they continue. The committee itself shall continue until its purpose has been fulfilled or it is dissolved by vote of the executive board or the membership at large.

Article IX. AMENDMENTS

Section 1. Amendments may be suggested at any OMS business meeting. However, amendments to these bylaws may be formally proposed in only two methods:

By the Executive Committee or

By petition of ten percent of the members.

Section 2. The proposed amendment shall then be promptly submitted by mail to the membership by the Secretary-Treasurer, along with the signed statement of reasons for support and/or opposition. Returned ballots shall be ac-

cepted by the Secretary-Treasurer for three weeks after the date of mailing. The Executive Committee shall count the ballots and the amendment(s) shall be declared ratified if a two-thirds majority of the votes cast is favorable.

Section 3. Any member who so desires may be present at the counting of such ballots.

Article X. DISSOLUTION

In the event of the dissolution of the OMS, upon the discharge of all its debts and obligations, any remaining assets shall be given to such tax-exempt scientific organization as the Executive Committee may determine. In no case shall any assets be used for the direct benefit of any member of OMS.

Oklahoma Microscopy Society

Membership Application/Renewal Form

for 2020-2021

NOTE: For USPS, please return this form with a check. (for Paypal option see bottom of page.)

Name: _____

Business Phone: _____

FAX: _____

Email: _____

Institution: _____

Address: _____

_____

Check here if Address is New/Revised: _____

Membership in Affiliated Societies:

MSA _____

MAS _____

OAS _____

Microscopy Interests:

Physical Sciences _____

Biological Sciences _____

Other _____

Membership Dues:

Type:

Corporate ($50.00) _____

Professional ($15.00) _____

Student ($5.00) _____

Amount Enclosed: _____

Please enclose a check for one year's dues (**July 1, 2020 - June 30, 2021**) made out to: "Oklahoma Microscopy Society" and mail to address below:

Tingting Gu, OMS Secretary-Treasurer
Samuel Roberts Noble Microscopy Lab
770 Van Vleet Oval, GLCH rm 136
University of Oklahoma
Norman, OK 73019
Email: tingting.gu-1@ou.edu (use also for any address or membership information updates)

N**OTE:** You can pay by Paypal at:
http://www.ou.edu/research/electron/oms/paypaldues.html

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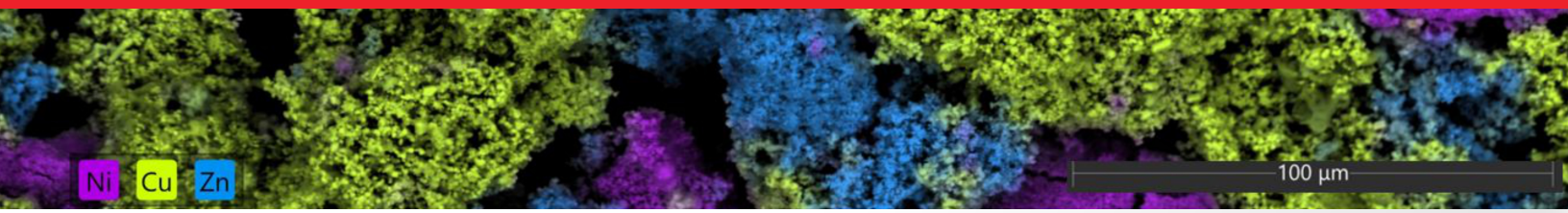

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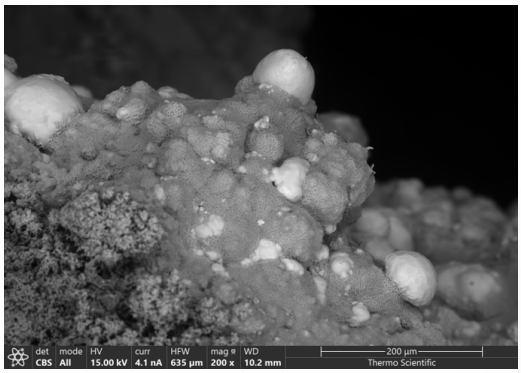
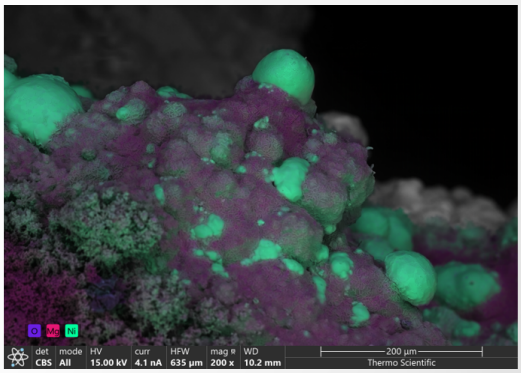
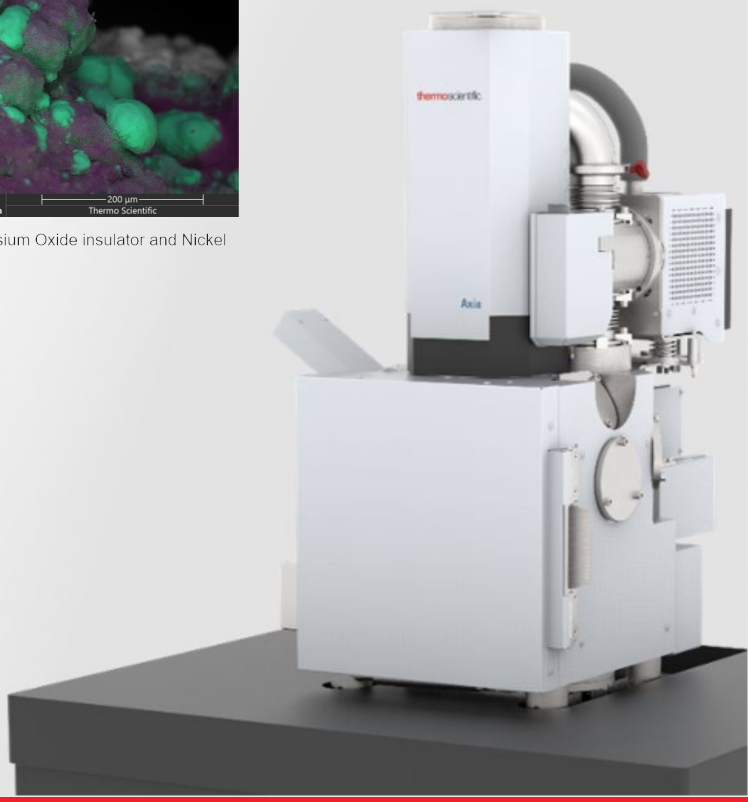
http://www.thermofisher.com/axia-chemisem



BSD SEM Image



ChemiSEM Overlay Showing Magnesium Oxide insulator and Nickel



*Scan QR code to receive a **FREE** Starbucks gift card and receive future announcements about how Thermo Fisher Scientific continues to innovate for the future.

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Easy handling based on full automation

The UltraMicroscope Blaze enables seamless switching between different objectives and magnification lenses, and automated sample release with the click of a button, whilst keeping images sharp with the autofocus feature.

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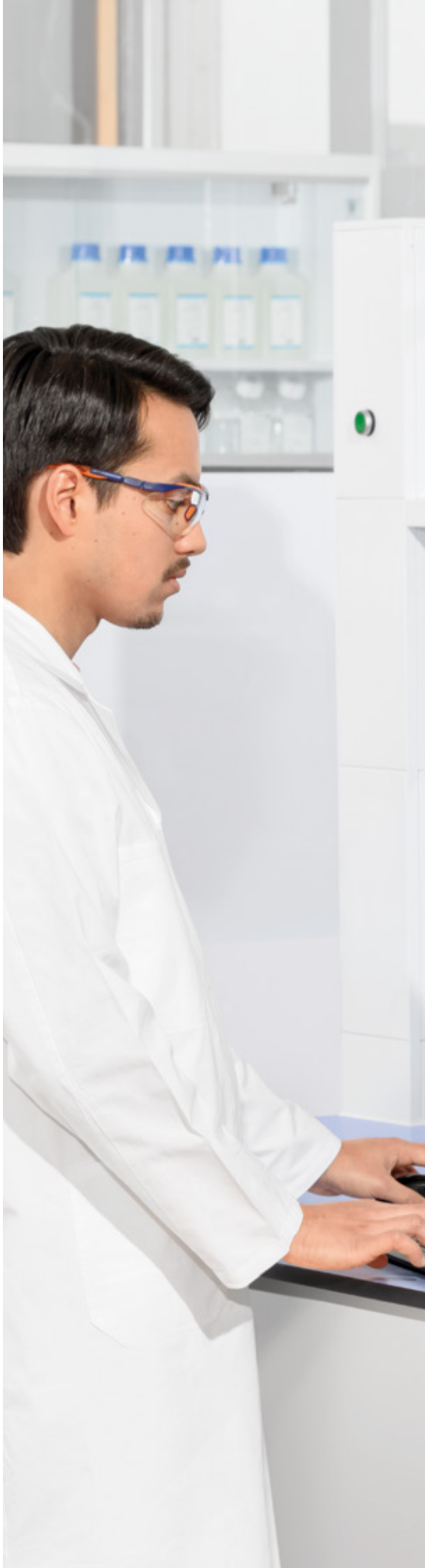

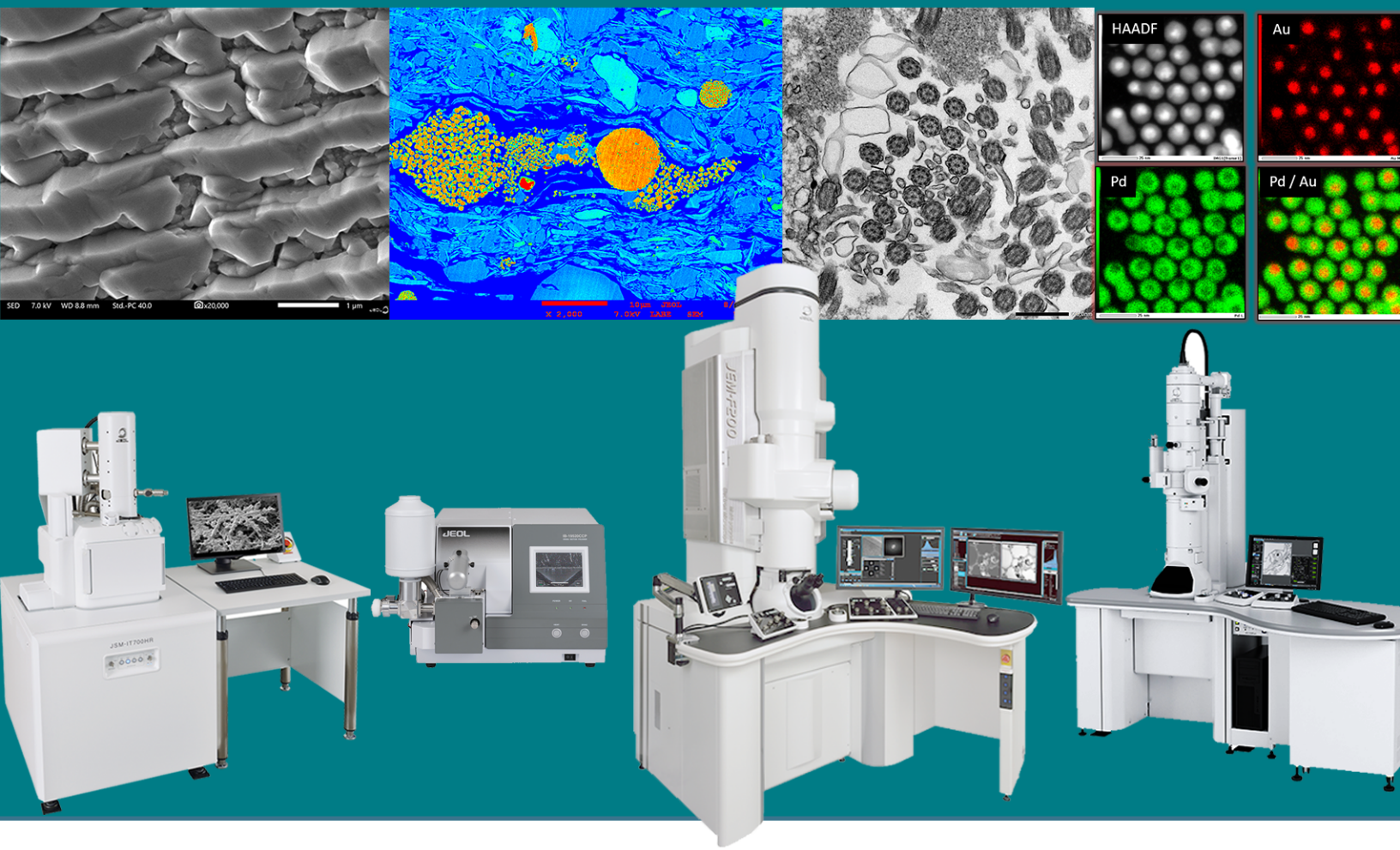

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