Onsite Program Guide & Exhibitor Information

Exhibitor Guide INCLUDED!

Microscopy Society of America

Microanalysis Society

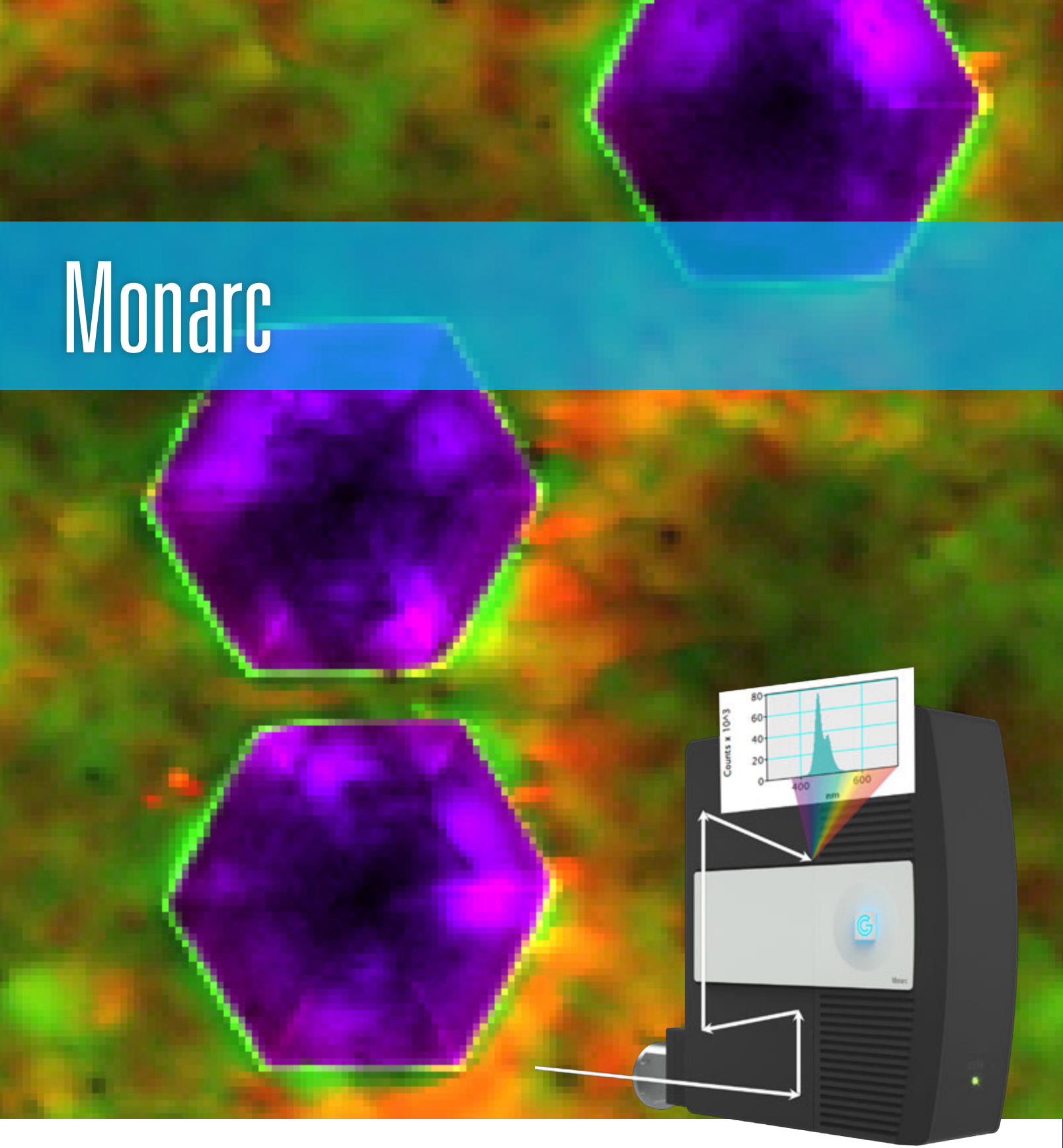
MSC SMC

M&M 2018 MICROSCOPY & MICROANALYSIS

August 5-9, 2018 • Baltimore, MD

www.microscopy.org/MandM/2018

Monarc



Introducing the Monarc Cathodoluminescence System

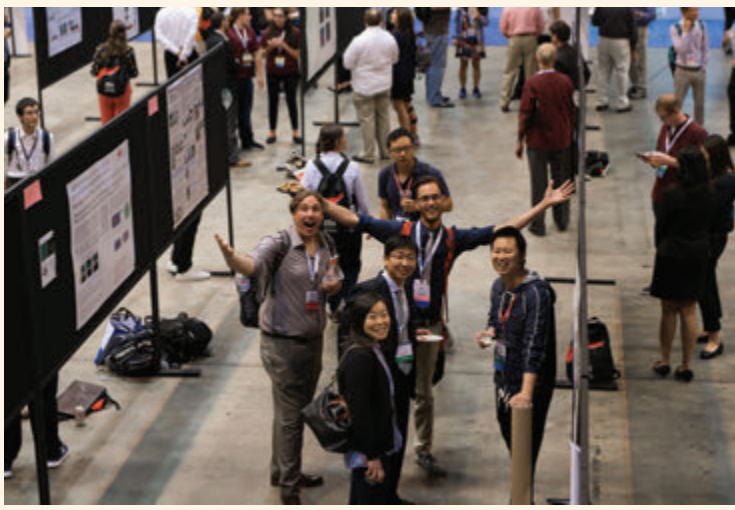
Redefining what's possible in CL microscopy

The Monarc™ offers the most powerful analysis of optical properties below the diffraction limit. Revealing the wavelength, angle, and polarization distributions of luminescence correlated directly with sample structure and composition at spatial resolutions better than 10 nm.

Image: Composite wavelength-filtered image extracted from a hyperspectral data cube acquired with the Monarc of a GaN/InGaN MQW sample with V-pit defects (R = 504 ± 2 nm, G = 435 ± 2 nm, V = 365 ± 2 nm).

GATAN

CONTENTS



M&M 2018
MICROSCOPY & MICROANALYSIS
August 5-9, 2018 • Baltimore, MD

Future Meeting Dates

M&M 2019 MICROSCOPY & MICROANALYSIS
August 4–8 • Portland, OR

August 2-6, 2020
MILWAUKEE, WI

August 1-5, 2021
PITTSBURGH, PA

July 31-August 4, 2022
PORTLAND, OR

July 23-27, 2023
MINNEAPOLIS, MN

Navigate the meeting like a pro with the M&M 2018 mobile app, powered by core-apps.com.

Mobile App

With the M&M 2018 mobile app, you can:

- Receive Up-to-the-Minute Meeting & Presenter Info
- Multi-Device Sync
- Receive Alerts
- See Exhibitors
- Make Your Schedule
- View Maps & Floor Plans
- Connect with Colleagues & Friends
- Join in on Social Media with #MM2018BAL
- And much, much more!

Downloading the App is Easy!

SEARCH: The App Store or Google Play for "M&M Annual Meeting"

Google play

Available on the App Store

SCAN:

For your Desktop, and all other web-enabled devices, point your browser to:

http://m.core-apps.com/msa_2018

(Blackberry users will be pointed to the Google Play store to download the mobile app. Windows devices will be able to see the web version, but it is not mobile-enabled.)

This Web version will allow you to search/view all meeting contents, as well as set your personal schedule and Favorites. Simply login (your personal/login information is not shared anywhere), and then your choices are synced to all your logged-in devices!

(You can elect to make your profile public within the app so others can find you, but you can determine what others see.)

Should you have any questions, please contact support@core-apps.com.

Welcome from the Society Presidents

On behalf of the Microscopy Society of America, the Microanalysis Society, and the Microscopical Society of Canada (Société de Microscopie du Canada) we welcome you to Baltimore, Maryland for Microscopy & Microanalysis 2018. Baltimore and its famous Inner Harbor promise to be an exciting venue with ample opportunity to visit old friends and to meet new colleagues with a common interest in microscope development and applications. The Inner Harbor features many attractions for families, including the National Aquarium and Maryland Science Center, the historic tall ships and U.S. Navy and Coast Guard museum vessels, and great dining opportunities, both on land and sea (harbor dinner cruises). We hope that you enjoy all that Charm City and its region have to offer.

The Program Committee, led by Yoosuf Picard, Alice Dohnalkova, James LeBeau and Nabil Bassim, has developed a comprehensive and exciting group of Symposia led by leaders in their respective fields of microscopy and analysis. As a group, the Symposia capture our members' diverse fields of research, including Advances in Instrumentation and Techniques Development, and Applications in the Biological and Physical Sciences. We encourage you to scan through this Call for Papers for a complete list of Symposia, and contribute to the program by submitting one or more scientific papers to the meeting. Presentations will include a range of platform and posters. New to our meeting this year will be provision of a small table for each poster presentation, which will allow presenters to use a laptop or other digital media format to present animations and movies of their data to enhance their presentations. The leadership of our Societies and the Program Committee feel that with the advancement of three-dimensional reconstruction and other techniques that are best illustrated by these modern dynamic styles, this will provide a unique opportunity for many poster presenters to fully illustrate their data.

The meeting itself will be preceded by our usual array of Sunday Short Courses, three Pre-Meeting Congresses, and our Sunday evening Opening Reception that provides an opportunity to network with colleagues and friends. Following the success of the Inaugural Pre-Meeting Congress in St. Louis led by our Early-career Professionals and Student Council, we will again have a Pre-Meeting Congress featuring the outstanding work done by students and post-doctoral Fellows attending the meeting. If you are an early-career scientist, please consider contributing to this Pre-Meeting Congress. The technical program will kick off with our annual Monday morning plenary session, featuring the major awards ceremonies for the sponsoring societies, the M&M meeting awards, and two exciting plenary talks. One plenary talk will be by Manu Prakash, inventor of the foldscope that has brought imaging to remote regions of the world for imaging of parasites and a range of diseases. The second plenary will be by Jon Larsen, author of "*In Search of Stardust: Amazing Micrometeorites and Their Terrestrial Imposters*" that provides amazing microscopy of micrometeorites found in common locations such as rooftops.

The M&M meeting also showcases the largest annual exhibition in microscopy and features the latest state-of-the-art instrumentation and accessories in microscopy and microanalysis. Educational opportunities throughout the week include tutorials covering select topics in physical and biological sciences, educational outreach sessions for students and teachers, our Technologists' Forum, and our ever-popular vendor tutorials, held Monday through Wednesday after the Exhibit Hall closes.

M&M 2018 is an opportunity to stay abreast of the latest technologies, hear about new developments in the techniques and applications of all areas of microscopy and microanalysis, and most importantly network with colleagues. We're pleased to spend this time together in Baltimore!

Robert Price
President,
Microscopy Society
of America

Masashi Watanabe
President,
Microanalysis Society

Joaquin Ortega
President, Microscopical
Society of Canada / Société
de Microscopie du Canada

M&M 2018 SPONSORS

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as of July 1, 2018

M&M 2018 ESSENTIAL MEETING & VENUE INFORMATION

Accessibility
If you require special accommodation in order to participate fully in the meeting, please ask to speak with the meeting manager, or email **MeetingManager@microscopy.org**. Requests made onsite at the meeting will be accommodated as much as possible.

Awards
Major Society Awards for MSA, MAS, and MSC-SMC, along with M&M student awards, will be presented at the Plenary Session immediately following the first Keynote Talk (Monday morning). For detailed listings of all awards, criteria, and award winners, please visit **http://microscopy.org/MandM/2018/**.

Cancellation and Refund Policy
No refunds will be issued for cancellations (for any reason) received on or after July 13, 2018, and no refunds will be issued on-site in Baltimore. E-mail: **MMRegistration@conferencemanagers.com**.

Food for Purchase
Inexpensive, portable breakfast and snack items are available for purchase in the convention center in the main registration lobby area (7:30 am – 10:30 am). Lunch concessions are available for purchase inside the exhibit hall during lunch hours (11:00 am – 2:00 pm).

Baltimore & Regional Visitor Information
Stop by the Visit Baltimore booth located inside the convention center, to pick up local information, including maps, dining guides and tour info, and visitor information on Baltimore and surrounding areas.

Internet & E-mail
Free wireless internet is available for M&M attendees in the Baltimore Convention Center. Stop by the MSA MegaBooth for a comfortable place to check your email and surf the web.

Job & Resume Postings/ Placement Office
(See MSA MegaBooth info on Page 23)
Post your company's or department's job listing, peruse posted resumes for that perfect job candidate, or post your own resume. Take advantage of thousands of microscopists and microscopy companies all gathered in one place! Go to the MSA MegaBooth (Exhibit Hall) for details.

M&M 2019 – Portland Information
Stop by for advance information on the 2019 M&M Meeting in Portland, Oregon! The 2019 table is located in the main registration area, and has visitors guides, maps, and other important information about the City of Roses.

MSA MegaBooth (Booth #1329)
(See complete details on Page 23)
Check out all that MSA has to offer its members and M&M attendees: Free Internet Café, book display from scientific publishers, updated information on the Certification Board, and a DVD Library. Register for the popular Vendor Tutorials, sign up for MSA Membership, check out recent editions of Microscopy Today, learn about Project MICRO, and join the Technologists' Forum.

Phone Numbers & Information
- Baltimore Convention Center Main: (410) 649-7000
- Exhibitor Services: **http://www.bccenter.org/index.php?target=74**
- Concentra Urgent Care: (410) 752-3010 (M-F 8a-5p); **www.concentra.com**
- Emergency Room (24 hours): University of Maryland Medical Center: (800) 492-5538

Proceedings
Conference Proceedings are distributed at Registration. All Full Meeting registrations include a free copy of the proceedings on digital medium. Hard-copy proceedings are available for purchase ($95) through Cambridge University Press (allow 12-16 weeks for delivery). Inquire at the Registration Desk or email: **MMProceedings@cambridge.org**.

MAS Booth
MAS has a membership and information booth located in the main registration foyer. Sign up for membership, get information on Society events at or after the M&M Meeting, and find out all it has to offer.

Smoking Policy
M&M 2018 is a smoke-free meeting. If you wish to smoke, you will need to go outside (street level).

Tote Bags
All non-Exhibitor Full Meeting Registrants are entitled to a meeting tote bag. Bags are distributed in the registration area.

Volunteer Room
The volunteer & student bursary office is in the 300 Show Office on the Registration level. Check in here for volunteer assignments and sign-outs.

M&M 2018
MICROSCOPY & MICROANALYSIS
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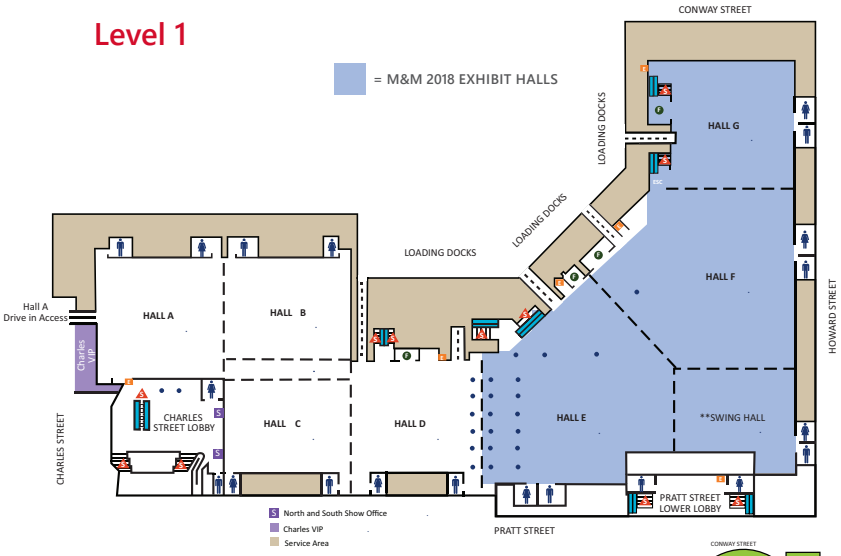
M&M 2018 BALTIMORE CONVENTION CENTER

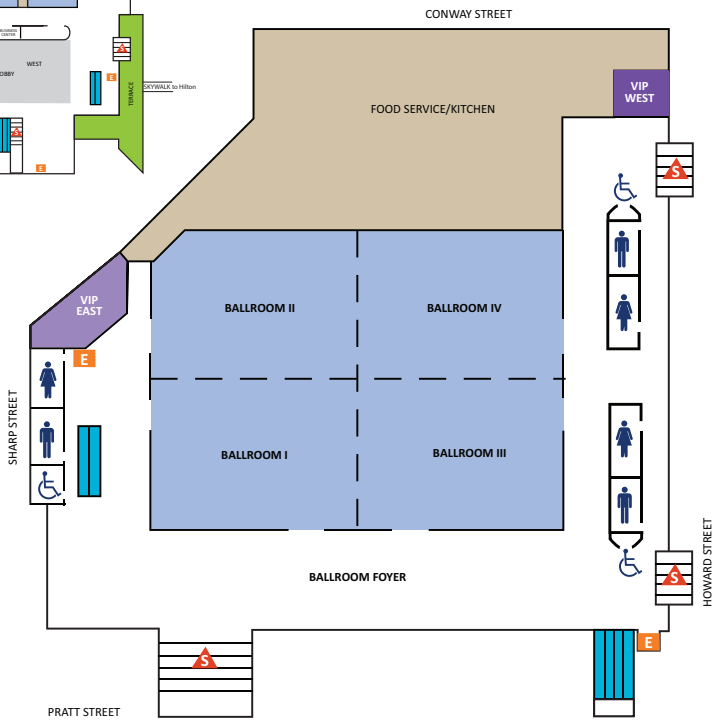
Level 1



Level 3

Level 4

The Baltimore Convention Center Ballroom is the location for the **Sunday Evening Welcome Reception** on Sunday, August 5, and also the location for the **Opening Plenary Session**, on Monday, August 6.



Unless indicated otherwise, all official conference events are located at the Baltimore Convention Center in downtown Baltimore, Maryland.

M&M 2018 REGISTRATION INFORMATION

Onsite Registration Desk

Baltimore Convention Center

The Sunday Social starts at 6:30 pm in the Ballroom (4th Level of the Convention Center). You must have your badge and ticket to enter the Reception.

Registration Hours:

Thursday, August 2*	3:00 pm – 5:00 pm
Friday, August 3*	8:00 am – 1:00 pm
Friday, August 3	1:00 pm – 6:00 pm
Saturday, August 4	8:00 am – 6:00 pm
Sunday, August 5	7:00 am – 7:30 pm
Monday, August 6	7:00 am – 6:00 pm
Tuesday, August 7	7:30 am – 5:00 pm
Wednesday, August 8	7:30 am – 5:00 pm
Thursday, August 9	7:30 am – 3:00 pm

**Exhibitors Only*

Commercial Exhibition Hours:

Monday, August 6	12:00 pm – 5:30 pm
Tuesday, August 7	10:00 am – 5:30 pm
Wednesday, August 8	10:00 am – 5:30 pm
Thursday, August 9	10:00 am – 2:00 pm

Exhibitor Move-In:

Thursday, August 2*	8:00 am – 4:00 pm
Friday, August 3	8:00 am – 4:30 pm
Saturday, August 4	8:00 am – 4:30 pm
Sunday, August 5	8:00 am – 4:30 pm

**Targeted Island Booths Only*

Exhibitor Move-Out:

Thursday, August 9	2:00 pm – 7:00 pm
Friday, August 10	8:00 am – 5:00 pm

Vendor Tutorial info:

Monday, August 6	5:45 - 6:45 pm
Tuesday, August 7	5:45 - 6:45 pm
Wednesday, August 8	5:45 - 6:45 pm

Attendees may register for free Vendor Tutorials at the MSA MegaBooth beginning at 12:00 noon on Monday, August 6. All Vendor Tutorial participants are required to sign up in advance. (First come, first served.) Availability is not guaranteed.

ATTENTION SPEAKERS and AWARDEES!

New reimbursement policies for 2018 are in place. Starting this year, no reimbursement cash or checks will be distributed onsite at the meeting. Turn in your completed reimbursement form onsite or send it post-meeting. Checks will be mailed (for U.S.-based participants) on first-come, first-served basis. Electronic payments (for non-U.S.-based participants) will be processed post-meeting.

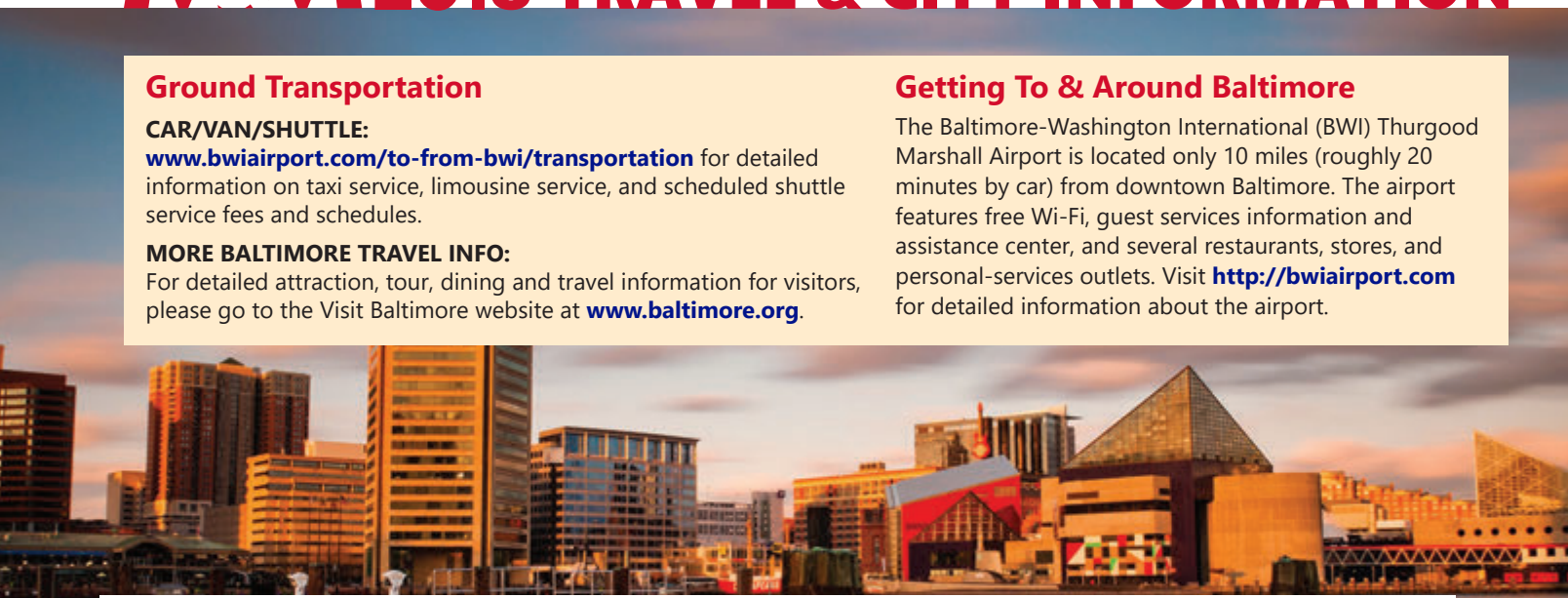
Ground Transportation

CAR/VAN/SHUTTLE:
www.bwiairport.com/to-from-bwi/transportation for detailed information on taxi service, limousine service, and scheduled shuttle service fees and schedules.

MORE BALTIMORE TRAVEL INFO:
For detailed attraction, tour, dining and travel information for visitors, please go to the Visit Baltimore website at **www.baltimore.org**.

Getting To & Around Baltimore

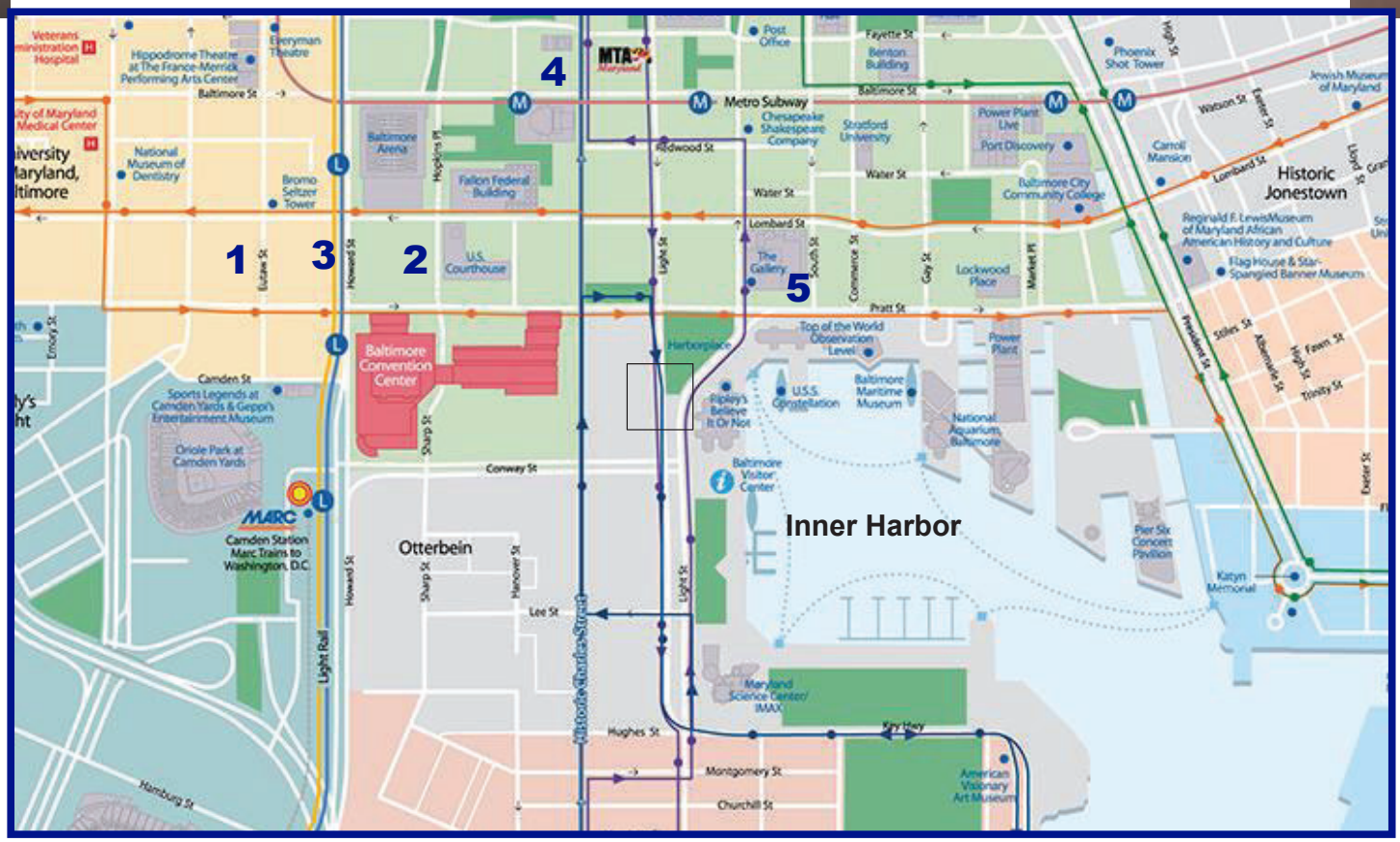
The Baltimore-Washington International (BWI) Thurgood Marshall Airport is located only 10 miles (roughly 20 minutes by car) from downtown Baltimore. The airport features free Wi-Fi, guest services information and assistance center, and several restaurants, stores, and personal-services outlets. Visit **http://bwiairport.com** for detailed information about the airport.



HOTEL MAP

1. Baltimore Marriott Inner Harbor at Camden Yards
2. Days Inn Baltimore Inner Harbor
3. Holiday Inn Inner Harbor
4. Lord Baltimore Hotel
5. Renaissance Harborplace

- Metro Line
- Light Rail
- MARC Train
- Water Taxis
- Visitors Center
- Charm City Circulator - Green Route
- Charm City Circulator - Orange Route
- Charm City Circulator - Purple Route
- Charm City Circulator - Banner Route



The velocity for stellar results

Introducing the Velocity™ EBSD Camera

The EDAX Velocity™ EBSD camera offers high-speed EBSD mapping with the highest indexing performance for all materials. Powered by a CMOS sensor, the Velocity™ camera combines fast acquisition with high sensitivity and low noise performance for optimal data collection and quality results.

- CMOS low-noise sensor
- > 3000 indexed points per second
- High-speed simultaneous EDS-EBSD collection
- 120 x 120 pixel images at high speeds
- Accurate and precise data on real-world samples

For more information about the Velocity™ EBSD camera and our portfolio of microanalysis tools, please join us at Booth #530 at M&M 2018

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M&M 2018 SOCIAL EVENTS

M&M 2018 Sunday Evening Social Event

Baltimore Convention Center – Ballroom Level (4th floor)

SUNDAY, AUGUST 5 | 6:30 PM - 9:00 PM

One ticket is included with most registrations (see Registration Page for details). Additional tickets: $50 each for adults; $25 each for children 12 and under.

**PLEASE NOTE: Onsite availability of tickets is not guaranteed. Register for the meeting and buy extra tickets early to be sure that you're able to attend.*

This year's welcome event at the Baltimore Convention Center will be a fun and informal get-together. Enjoy a delicious supper buffet and local brews; and catch up with friends and colleagues. After the reception, grab some old and new friends and head down to the Inner Harbor/Harborplace areas to continue the fun!

MAS Microanalysis Society

MAS Social Event – for MAS Members Only!

WEDNESDAY, AUGUST 8 | 6:30 PM - 9:00 PM

Stop by the MAS booth in the lobby to check your membership status and pick up your ticket for the MAS social event on Wednesday evening, August 8 – immediately following the MAS Business Meeting.

MSA Microscopy Society of America

Micrograph Competition

This micrograph competition promotes the innovative blending of art and science. Open to all forms of microscopic imaging, **this year, winners of of this competition will be selected by popular vote!** A maximum of three (3) cash awards will be presented. Winners and runners-up will have the chance to see their work published in a conference brochure for M&M 2019! Boards for posting your work will be in the M&M 2018 registration area. **Voting will be done through the M&M 2018 Mobile App.**

MSA Microscopy Society of America

Student Poster Awards

(Immediately following daily Poster Presentations & Happy Hours!)

Poster presentations are an excellent format for all participants to engage in intensive discussion with other researchers in the field. MSA provides cash awards to the most outstanding student posters (first author) each day (up to two in each of three categories). Student poster awards will be presented immediately following each day's poster session, in the Exhibit Hall.

M&M 2018 MEETING SCHEDULE

As of July 1. Please check the onsite program or your committee chair/liaison to confirm.

All events held at Baltimore Center Convention Center unless otherwise noted.

Friday, August 3, 2018	TIME	LOCATION
MSA Council	8:30 AM	Room 343

Saturday, August 4, 2018	TIME	LOCATION
MSA Council	8:30 AM	Room 343

Sunday, August 5, 2018	TIME	LOCATION
MAS Council	9:00 AM	Room 343
MSC-SMC Council Meeting	12:00 PM	Room 334
Microscopy Today Editors & Editorial Board	3:00 PM	Room 332
Sunday Welcome Reception	6:30 PM	Ballroom I-II (4th level)

Monday, August 6, 2018	TIME	LOCATION
Technologists' Forum Board	7:15 AM	Room 334
MSA Awards + Fellowship Committees	7:15 AM	Room 330
FIG Pharma Lunch Workshop on Data Integrity	12:15 PM	Rooms 335-336
MaM Editorial Board	12:15 PM	Room 340
MAS Meal with a Mentor	12:15 PM	Room 339
FIG: Diagnostic Microscopy	12:15 PM	Room 330
FIG: Focused Ion Beam	12:15 PM	Room 331
FIG: Atom Probe Field Ion Microscopy	12:15 PM	Room 334
International Committee	12:15 PM	Room 333
Technologists' Forum Business Meeting	3:30 PM	Room 334
MSA-CUP *Elements* Committee	4:15 PM	Room 333
Student Mixer	5:30 PM	Rooms 339-340
Vendor Tutorials in the Exhibit Hall *(Sign Up at MSA MegaBooth)*	5:45 - 6:45 PM	Exhibit Hall



M&M 2018 MEETING SCHEDULE

As of July 1. Please check the onsite program or your committee chair/liaison to confirm.

All events held at Baltimore Center Convention Center unless otherwise noted.

Tuesday, August 7, 2018

	TIME	LOCATION
MSA Local Affiliated Societies & MAS Affiliated Regional Societies	7:15 AM	Room 330
M&M 2019 – Program Planning for Symposium Organizers	10:00 AM	Room 329
MSC-SMC Business Meeting	12:15 PM	Room 347
FOM FIG Lunch Meeting	12:15 PM	Room 330
MSA Distintuished Scientist Awardees' Lectures	12:15 PM	Room 337
Microscopy Today Editorial Board Meeting	12:15 PM	Room 323
FIG: Cryo-preparation	12:15 PM	Room 333
FIG: Electron Microscopy in Liquids and Gases	12:15 PM	Room 331
FIG: Electron Crystallography	12 :15 PM	Room 334
FIG: MicroAnalytical Standards	12:15 PM	Room 332
FIG: 3D EM in the Biological Sciences	3:30 PM	Room 321
MSA Education Committee Meeting	3:30 PM	Room 334
FIG Business Meeting	3:30 PM	Room 333
Post-Doctoral Researchers' Reception	5:30 PM	Room 330
MSA Student Council	5:30 PM	Rooms 331-332
Vendor Tutorials in the Exhibit Hall *(Sign Up at MSA MegaBooth)*	5:45 – 6:45 PM	Exhibit Hall
Presidents' Reception *(Invitation Only)*	6:30 PM	Offsite

Wednesday, August 8, 2018

	TIME	LOCATION
MSA Certification Board	7:15 AM	Room 333
MSA Membership Committee	7:15 AM	Room 334
MSA Members' Meeting	12:15 PM	Rooms 343-344
MAS Business Meeting	5:15 PM	Room 337
Vendor Tutorials in Exhibit Hall *(Sign up at MSA MegaBooth)*	5:45 PM – 6:45 PM	Exhibit Hall
MAS Members Social *(See MAS Booth for Details)*	6:30 PM	Offsite

Thursday, August 9, 2018

	TIME	LOCATION
M&M Sustaining Members	8:30 AM	Room 330
MSA Standards Committee Meeting	12:15 PM	Room 333
M&M 2018 Wrap-Up & Debrief *(by invitation only)*	4:30 PM	Room 330

Thank you

to our sustaining members

3Scan

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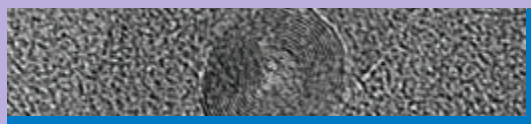
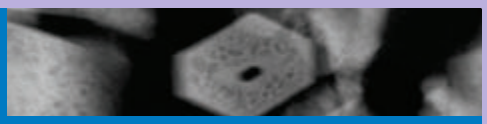
XEI Scientific, Inc.

(as of July 1, 2018)





Sample Preparation of Nanocomposites and Nanomaterials by *Ultramicrotomy*

a Powerful Alternative to FIB

Join us at the ***EMS Microscopy Academy*** and learn the latest techniques to reveal internal structures of composites and polymers being investigated with transmission electron microscopy (TEM) and scanning transmission electron microscopy (STEM).

Sample preparation workflow will be illustrated using the Leica EM UC7 Ultramicrotome, its EM FC7 Cryochamber, and the RMC PowerTome Ultramicrotome. Differences between FIB (Focussed Ion Beam) and ultramicrotomy samples will also be covered.

Who can benefit from this alternative?

- Composite and polymer research companies - especially from the automotive and aviation industries
- Materials scientists already working with ultramicrotomy
- FIB users preparing TEM lamellas

For more information, or to sign up for a workshop, please visit our website...

www.emsdiasum.com

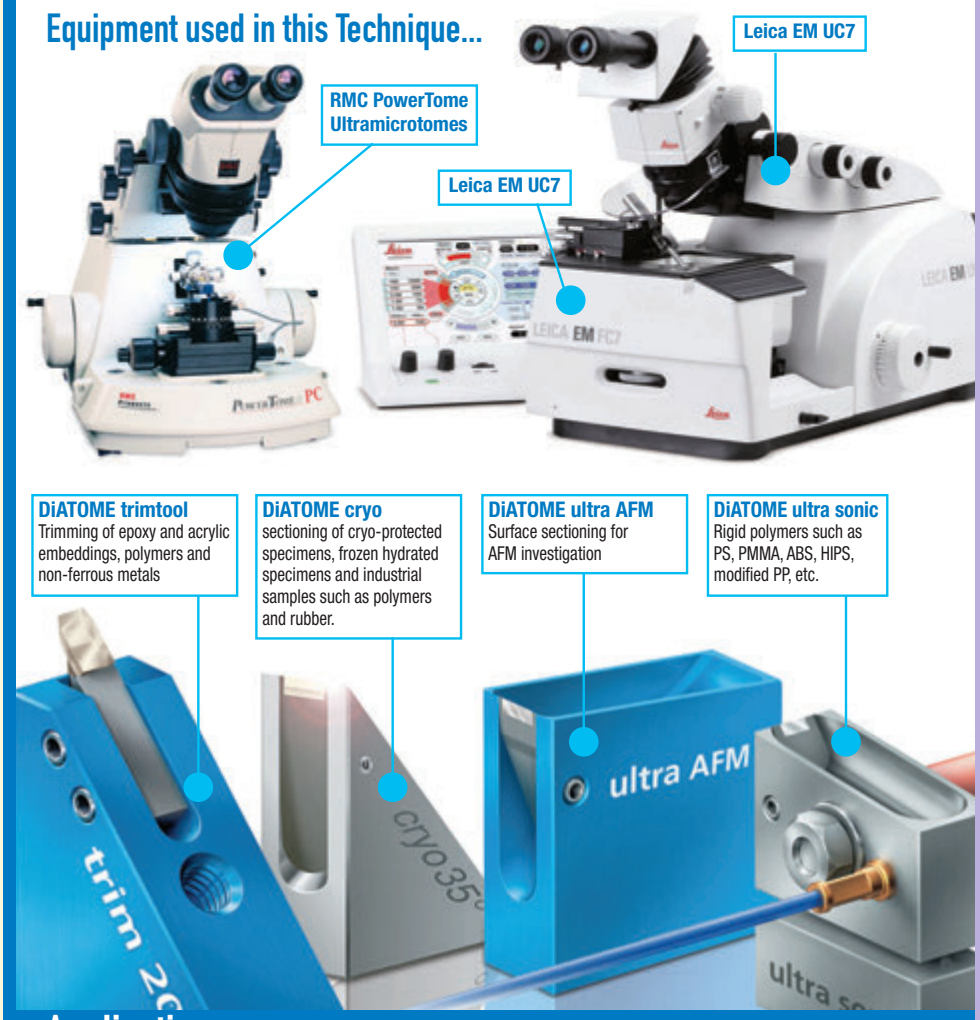
DiATOME U.S.

P.O. Box 550 • 1560 Industry Rd.
Hatfield, Pa 19440
Tel: (215) 412-8390
Fax: (215) 412-8450
email: sgkcck@aol.com

EMS Microscopy Academy

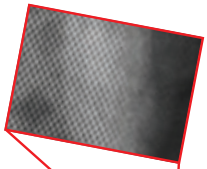
P.O. Box 550 • 1560 Industry Rd. • Hatfield, Pa 19440
Tel: (215) 412-8400 • Fax: (215) 412-8450
Toll Free: 800-523-5874 • email: sgkcck@aol.com

Equipment used in this Technique...

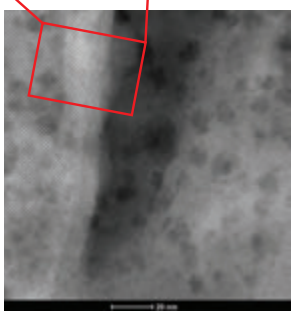


Applications...

Zeolite USY30 Crystal morphology
STEM analysis

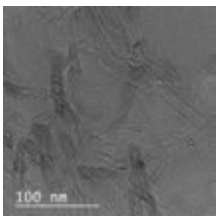


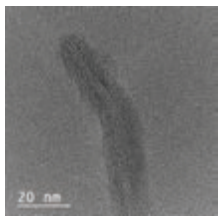
The mesopores (2-50 nm) and the crystalline micro-pores (0.7 nm) are clearly visualized.



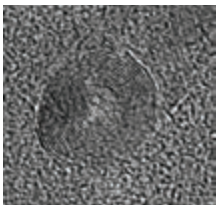
[110] Tom Willhammar, Sara Bals, EMAT Antwerpen

Epoxy loaded with amino-functionalized CNTs
TEM analysis





Good preservation of the interphase



Gravitational stroke!

Mert Kurttepeli, Sara Bals, EMAT Antwerpen

M&M 2018
MICROSCOPY & MICROANALYSIS

August 5-9, 2018 • Baltimore, MD

Council & Appointed Officers

2018 COUNCIL – OFFICERS & DIRECTORS

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Director	Melanie Ohi
Director	Yimei Zhu

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Placement Office	David W. Tomlin
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Technologists' Forum	Janice Pennington

FOCUSED INTEREST GROUPS

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3D Electron Microscopy in the Biological Sciences	Steven Ludtke
Aberration-Corrected Electron Microscopy	Juan Carlos Idrobo
Atom Probe Field Ion Microscopy	Arun Devaraj
Cryo-preparation	Kim Rensing
Diagnostic Microscopy	Greg Ning
Electron Crystallography and Automated Mapping Techniques	Alex Eggeman
Electron Microscopy in Liquids and Gas (EMLG)	Raymond R. Unocic
Facilities Operation & Management (FOM)	Christine A. Brantner
Focused Ion Beam	Srinivas Subramaniam
Pharmaceuticals	John-Bruce D. Green
MicroAnalytic Standards	Anette von der Handt

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Past President	Joshua Silverstein
President-Elect	A. Cameron Varano
Secretary	Jie Yang
Treasurer	Ethan L. Lawrence
Program Chair	William J. Bowman

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***Microscopy and Microanalysis* Editor in Chief**	John F. Mansfield
Onsite Program Guide Editor	Richard L. Martens
M&M 2018 Proceedings Editor	Gail J. Celio
***Microscopy Today* Editor**	Charles E. Lyman

M&M 2018 ANNUAL MEETING PROGRAM CHAIR

Yoosuf N. Picard

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Managing Director	Steven Jones
Program Manager	Ashley Carey
Meeting Management	Conference Managers
Meeting & Registration Managers	Nicole Guy, Maeve Carey, Corey Siembieda
Exhibition Management	Corcoran Expositions, Inc.
Exhibits & Sponsorship Managers	Doreen Bonnema, Mary Michalik

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1942	G.L. Clark	1967	Joseph J. Comer	1993	Michael S. Isaacson
1943	R. Bowling Barnes	1968	John H. Luft	1994	Robert R. Cardell
1944	R. Bowling Barnes	1969	Wilbur C. Bigelow	1995	Terence E. Mitchell
1945	James Hillier	1970	Russell Steere	1996	Margaret Ann Goldstein
1946	David Harker	1971	Robert M. Fisher	1997	C. Barry Carter
1947	William G. Kinsinger	1972	Daniel C. Pease	1998	Ralph M. Albrecht
1948	Perry C. Smith	1973	Benjamin Siegel	1999	David C. Joy
1949	F.O. Schmitt	1974	Russell J. Barrnett	2000	Kenneth H. Downing
1950	Ralph W.G. Wyckoff	1975	Gareth Thomas	2001	Ronald M. Anderson
1951	Robley C. Williams	1976	Etienne de Harven	2002	Stanley L. Erlandsen
1952	R.D. Heidenreich	1977	Thomas E. Everhart	2003	J. Alwyn Eades
1953	Cecil E. Hall	1978	Myron C. Ledbetter	2004	Sara E. Miller
1954	Robert G. Picard	1979	John Silcox	2005	M. Grace Burke
1955	Thomas F. Anderson	1980	Michael Beer	2006	W. Gray (Jay) Jerome
1956	William L. Grube	1981	John J. Hren	2007	Michael A. O'Keefe
1957	John H.L. Watson	1982	Lee Peachey	2008	William T. Gunning
1958	Max Swerdlow	1983	David B. Wittry	2009	David J. Smith
1959	John H. Reisner	1984	J. David Robertson	2010	David W. Piston
1960	D. Gordon Sharp	1985	Dale E. Johnson	2011	Nestor J. Zaluzec
1961	D. Maxwell Teague	1986	Robert M. Glaeser	2012	Janet H. Woodward
1962	Keith R. Porter	1987	Linn W. Hobbs	2013	Ernest L. Hall
1963	Charles Schwartz	1988	Jean Paul Revel	2014	Jeanette Killius
1964	Sidney S. Breese	1989	Ray W. Carpenter	2015	John F. Mansfield
1965	Virgil G. Peck	1990	Keith R. Porter	2016	Michael Marko
1966	Walter Frajola	1991	Charles E. Lyman	2017	Ian M. Anderson
		1992	Patricia Calarco		

MSA Microscopy Society of America Fellows

2018

Wen-An Chiou
Linn Hobbs
Elaine Humphrey
Kazuo Ishizuka
David Larson
Guillermo Solórzano-Naranjo
Judy Yang
Jian-Min Zuo

2017

David C. Bell
Paul E. Fischione
Christopher J. Kiely
Jeanette Killius
Laurence D. Marks
Peter Rez
Phillip E. Russell
Heide Schatten

2016

Helmut Gnaegi
Ernest L. Hall
David N. Mastronarde
Stuart McKernan
Renu Sharma
George D.W. Smith
Kenneth A. Taylor
James E. Wittig

2015

Rafal E. Dunin-Borkowski
Michael E. Davidson
E. Ann Ellis
Peter W. Hawkes
Miguel José-Yacamán
Kent L. McDonald
Stanley Frank Platek
Michael T. Postek
Susanne Stemmer
Michael M.J. Treacy

2014

Gianluigi Botton
Wah Chiu
Abhaya K. Datye
Marija Gajdardziska-Josifovska
Lucille A. Giannuzzi
Thomas F. Kelly
John F. Mansfield
Martha R. McCartney
Xiaoqing Pan
David W. Piston

2013

Timothy S. Baker
Nigel D. Browning
David J. DeRosier
Hamish L. Fraser
David A. Muller
Michael Radermacher
David J. Smith
Eric A. Stach

2012

Ulrich Dahmen
Margaret Ann Goldstein
Moon Kim
William J. Landis
Jingyue Liu
Beverly E. Maleeff
Robert L. Price
Frances M. Ross
David N. Seidman
Debra Sherman
Nan Yao

2011

Ueli Aebi
Philip E. Batson
Patricia G. Calarco-Isaacson
Peter A. Crozier
J. Alwyn Eades
Brendan J. Griffin
William T. Gunning, III
W. Gray Jerome
Richard D. Leapman
Hannes Lichte
Charles E. Lyman
Michael A. O'Keefe
George Perry
Robert B. Simmons
Janet H. Woodward

2010

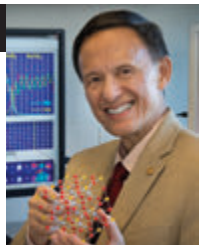
Ralph M. Albrecht
Lawrence F. Allard, Jr.
Kenneth H. Downing
Joseph I. Goldstein
Michael S. Isaacson
Michael K. Miller
George Pappas
Stephen J. Pennycook
John P. Petrali
Zhong L. Wang
David B. Williams

2009 *(Inaugural Class)*

Marc Adrian
Ronald M. Anderson
James Bentley
Mary Grace Burke
Ray W. Carpenter
C. Barry Carter
Albert V. Crewe
Marc De Graef
Vinayak P. Dravid
Jacques Dubochet
Patrick Echlin
Raymond F. Egerton
Marilyn G. Farquhar
Don W. Fawcett
Joachim Frank
Robert M. Glaeser
Audrey M. Glauert
Raymond Kenneth Hart
Hatsujiro Hashimoto
Richard Henderson
Peter B. Hirsch
Archibald Howie
Hugh E. Huxley
Takeo Ichinokawa
Sumio Iijima
Shinya Inoué
David C. Joy
Morris J. Karnovsky
Aaron Klug
Ondrej L. Krivanek
Myron C. Ledbetter
Dennis McMullan
Joseph R. Michael
Sara E. Miller
Terrence E. Mitchell
Thomas Mulvey
Dale E. Newbury
Gertrude Rempfer
Jean-Paul Revel
Harald Rose
F.O. Schmitt
Caroline Schooley
Ryuichi Shimizu
John Silcox
Robert Sinclair
S.J. Singer
Fritiof Sjostrand
Kenneth C.A. Smith
Avril V. Somlyo
John C.H. Spence
Alasdair C. Steven
Peter R. Swann
Gareth Thomas
Kiyoteru Tokuyasu
Nigel Unwin
Joseph S. Wall
Oliver C. Wells
Michael J. Whelan
Nestor J. Zaluzec
Elmar Zeitler
Yimei Zhu

Distinguished Scientist Awards

PHYSICAL SCIENCES (2018)



Yimei Zhu

Brookhaven National Laboratory

Prof. Yimei Zhu is Senior Physicist at Brookhaven National Laboratory (BNL) and Adjunct Professor at Columbia University and Stony Brook University. He received his BS from Shanghai Jiaotong University and PhD from Nagoya University. He joined BNL as Assistant Scientist in 1988, rising through the rank to become Tenured Senior Physicist in 2002. He is the founding director of the Institute for Advanced Electron Microscopy at BNL. His research interests include condensed matter physics of correlated electron systems and advanced electron microscopy including ultrafast microscopy instrumentation. He is an Inaugural Fellow and currently the Director for Physical Science of Microscopy Society of America, a Fellow of American Physical Society and a Fellow of American Association for the Advancement of Science. Zhu has published more than 500 peer-reviewed journal articles and delivered more than 300 invited talks at international conferences.

BIOLOGICAL SCIENCES (2018)

Richard D. Leapman

National Institutes of Health

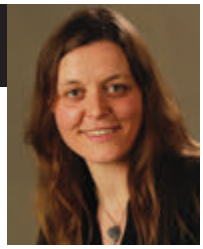
Richard Leapman obtained his B.A. and M.A. degrees in Natural Sciences, and his Ph.D. in physics from the University of Cambridge. He trained as a postdoctoral fellow in the Department of Materials at the University of Oxford, and then under the mentorship of Prof. John Silcox in the Department of Applied and Engineering Physics at Cornell University, where he contributed to the development of electron spectroscopy for the nanoscale characterization of materials. Dr. Leapman subsequently moved to NIH to develop methods based on scanning transmission electron microscopy and electron spectroscopy to determine the structure and chemical composition of cells and supramolecular assemblies. More recently, his group has developed techniques based on STEM tomography for determining 3D ultrastructure in thick sections of cells, as well as serial block face SEM approaches for determining nanoscale tissue architecture. Dr. Leapman received the Burton Medal from the Microscopy Society of America, the Samuel Wesley Stratton Award from the National Institute of Standards and Technology, and the Presidential Science Award from the Microbeam Analysis Society. He was elected a Fellow of the Microscopy Society of America in 2011. He is currently Editor of the Journal of Microscopy (Oxford), a member of the editorial boards of other microscopy and nanotechnology journals, and has served on national scientific advisory committees, including the one for the Advanced Photon Source at Argonne National Laboratory. Dr. Leapman has served as the Scientific Director of the intramural program of the National Institute of Biomedical Imaging and Bioengineering since 2006, and also heads NIBIB's Laboratory of Cellular Imaging and Macromolecular Biophysics.

	BIOLOGICAL SCIENCES	PHYSICAL SCIENCES
1975	Keith R. Porter	Robert Heidenreich
1976	L.L. Marton	Albert V. Crewe
1977	Robley C. Williams	James Hillier
1978	Thomas Anderson	Vernon E. Cosslett
1979	Daniel C. Pease	John M. Cowley
1980	George E. Palade	Gareth Thomas
1981	Sanford L. Palay	Vladimir K. Zworykin
1982	Richard M. Eakin	Benjamin M. Siegel
1983	Hans Ris	Otto Scherzer
1984	Cecil E. Hall	Charles W. Oatley
1985	Gaston Dupouy	Ernst Ruska
1986	F. O. Schmitt	Peter B. Hirsch
1987	Marilyn G. Farquhar	Jan B. LePoole
1988	Morris J. Karnovsky	Hatsujiro Hashimoto
1989	Don W. Fawcett	Elmar Zeitler
1990	Audrey M. Glauert	Gertrude F. Rempfer
1991	Hugh E. Huxley	Archibald Howie
1992	Fritiof Sjöstrand	Oliver C. Wells
1993	Jean-Paul Revel	Kenneth C.A. Smith
1994	Andrew P. Somlyo	Dennis McMullan
1995	Shinya Inoué	David B. Wittry
1996	Myron C. Ledbetter	John Silcox

	BIOLOGICAL SCIENCES	PHYSICAL SCIENCES
1997	S. J. Singer	Peter R. Swann
1998	Avril V. Somlyo	Michael J. Whelan
1999	Sir Aaron Klug	Takeo Ichinokawa
2000	K. Tokuyasu	S. Amelinckx
2001	Patrick Echlin	Thomas Mulvey
2002	Marc Adrian	Ryuichi Shimizu
2003	Joachim Frank	Harald Rose
2004	Robert M. Glaeser	Raymond F. Egerton
2005	Richard Henderson	Sumio Iijima
2006	Joseph S. Wall	John C.H. Spence
2007	Nigel Unwin	Terence E. Mitchell
2008	Alasdair C. Steven	Ondrej L. Krivanek
2009	Jacques Dubochet	Robert Sinclair
2010	George Papas	Michael S. Isaacson
2011	Ueli Aebi	Hannes Lichte
2012	Timothy S. Baker	Ulrich Dahmen
2013	David J. DeRosier	C. Barry Carter
2014	Wah Chiu	David J. Smith
2015	Michael W. Davidson	Peter W. Hawkes
2016	Kenneth H. Downing	George W. Smith
2017	David W. Piston	Nestor J. Zaluzec

Major Society Awards

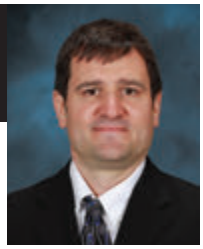
BURTON MEDAL AWARD (2018)



Lena F. Kourkoutis
Cornell University

Lena F. Kourkoutis is an Assistant Professor of Applied and Engineering Physics and James C. and Rebecca Q. Morgan Sesquicentennial Faculty Fellow at Cornell University. Her electron microscopy group focuses on understanding and controlling nanostructured materials, from complex oxides to materials for energy storage to biomaterials. They use advanced electron microscopes to study these systems atom-by-atom and develop new cryogenic techniques to gain access to low temperature electronic states as well as to study processes at liquid/solid interfaces. Kourkoutis received her undergraduate degree in Physics from the University of Rostock, Germany in 2003, and then moved to Ithaca where she was awarded a Ph.D. in 2009. As a Humboldt Research Fellow, she spent 2011-2012 in the Molecular Structural Biology Group at the Max Planck Institute of Biochemistry in Martinsried, Germany. She returned to Cornell University in 2012 and joined the Cornell Faculty in 2013. Kourkoutis is recipient of the 2013 Albert Crewe Award, a 2014 Packard Fellowship for Science and Engineering, a 2016 Presidential Early Career Award for Scientists and Engineers, and a 2017 NSF CAREER award. She is also a Kavli Fellow of the National Academy of Sciences.

MORTON D. MASER DISTINGUISHED SERVICE AWARD (2018)



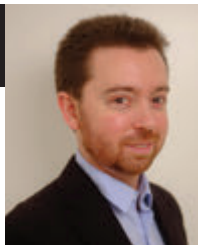
Donovan N. Leonard
Oak Ridge National Laboratory

Donovan N. Leonard has been a member of MSA since 1998. He is looking forward to his new role as Vice-Chair of the MSA Educational Resources (2018-2020) and is pleased to currently be the organizer of the MSA Physical Sciences Tutorials (2017-2019) and X90: Microscopy in the Classroom symposia (2018, 2010-2011). He has served on the MSA Executive Program Committee (2015, MAS Co-Chair), MSA Fellows Committee (2012-2015) and MSA Education Committee (2011-2014). Additionally, he has been an instructor for MSA In-Meeting workshop titled Nanomaterial Microscopy & Microanalysis (2008-2012) and will be instructor for a MSA Sunday Short Course titled Sample Preparation for High-Resolution EM of Materials (2018). He has been an active member of his local affiliated society, the Appalachian Region Microscopy Society (AReMS), since 1998 and served as President (2012-2014) and webmaster (2008-2014). Donovan is currently a Senior Technical Staff Member in the Materials Science & Technology Division at Oak Ridge National Laboratory. He received his Ph.D. in Materials Science & Engineering from North Carolina State University in 2002 and joined ORNL in 2007. Before ORNL he was tenure track faculty in the Physics & Astronomy Dept. of Appalachian State University and had worked for IBM in microelectronics packaging applications. His research now involves daily application of advanced microscopy and microanalysis methods to energy related materials at length scales from the atomic level to the macro scale. More specifically, aberration corrected scanning transmission electron microscopy (STEM) and electron energy loss spectroscopy (EELS) of quantum materials in addition to EPMA/WDS, EBSD and EDS analysis of materials critical for vehicle lightweighting, fossil, fusion and solar applications.

YEAR	RECIPIENT
1975	James Lake
1976	Michael S. Isaacson
1977	Robert Sinclair
1978	David C. Joy
1979	Norton B. Gilula
1980	John C.H. Spence
1981	Barbara J. Panessa-Warren
1982	Nestor J. Zaluzec
1983	Ronald Gronsky
1984	David B. Williams
1985	Richard D. Leapman
1986	J. Murray Gibson
1987	Ron A.Milligan
1988	A.D. Romig, Jr.
1989	Laurence D. Marks
1990	W. Mason Skiff
1991	Joseph R. Michael
1992	Kannan M. Krishnan
1993	Joseph A.N. Zasadzinski
1994	Jan M. Chabala
1995	Joanna L. Batstone
1996	Vinayak P. Dravid
1997	P.M. Ajayan
1998	Ian M. Anderson
1999	Zhong Lin Wang
2000	Eva Nogales
2001	Jian Min Zuo
2002	Nigel D. Browning
2003	Frances M. Ross
2004	Z. Hong Zhou
2005	David J. Larson
2006	David A. Muller
2007	Peter D. Nellist
2008	Steven J. Ludtke
2009	Eric A. Stach
2010	Sergei V. Kalinin
2011	Radostin Danev
2012	David S. Ginger
2013	John L. Rubinstein
2014	Maria Varela
2015	Andrew M. Minor
2016	Miaofang Chi
2017	Christopher J. Russo

YEAR	RECIPIENT
1992	Ronald M. Anderson
	G. W. Bailey
	Frances L. Ball
	M. Blair Bowers
	Deborah L. Clayton
	Joseph Harb
	Kenneth R. Lawless
	Morton D. Maser
	Caroline Schooley
	John H.L. Watson
1993	E. Laurence Thurston
1994	Richard F.E. Crang
1995	Raymond K. Hart
1996	José A. Mascorro
1997	William T. Gunning III
1998	Nestor J. Zaluzec
1999	Charles E. Lyman
2000	Barbara A. Reine
	Hildegard H. Crowley
2002	Beverly E. Maleeff
2003	M. Grace Burke
2004	Ralph M. Albrecht
2005	W. Gray (Jay) Jerome
2006	Jeanette Killius
2007	Robert L. Price
2008	Stuart McKernan
2010	Pamela F. Lloyd
2011	Janet H. Woodward
2012	Gina E. Sosinsky
2013	Caroline A. Miller
2014	Michael Marko
2015	JoAn Hudson
2016	Amanda Lawrence
2017	David W. Tomlin

ALBERT CREWE AWARD (2018)



Timothy Pennycook
Max Planck Institute for Solid State Research, Germany

Timothy J. Pennycook is a research scientist at the Max Planck Institute for Solid State Research in Stuttgart, Germany, working to develop new techniques in aberration corrected scanning transmission electron microscopy (STEM). He received his PhD in Physics from Vanderbilt University in 2012, combining density functional theory with STEM to investigate materials, uncovering the origin of colossal ionic conductivity in yttria-stabilized zirconia and, using dynamic STEM imaging, revealing the origin of white light emission from ultrasmall CdSe nanoclusters. As a Research Fellow with the University of Oxford, based at the SuperSTEM laboratory in Daresbury, he developed 3D spectroscopic imaging with optical sectioning, quantification of the atomic scale dynamics involved in solid state phase changes, and a new method of high efficiency ptychography for phase contrast imaging. In 2014 Pennycook joined the Faculty of Physics, University of Vienna, using STEM to study 2D materials, and in 2015 was awarded a Marie-Sklodowska-Curie Individual Fellowship to continue his research into ptychography. He has shown that electron ptychography offers not only the highest efficiency imaging in STEM, but also gives double resolution and much greater robustness to temporal incoherence than high resolution transmission electron microscopy, revealing a new route to low dose imaging of beam sensitive materials. In 2017 he moved to Stuttgart to further develop these techniques.

YEAR	RECIPIENT
2012	Wu Zhou
2013	Lena Fitting-Kourkoutis
2014	Jinwoo Hwang
2015	Meng Gu
2016	Ryo Ishikawa
2017	Pinshane Y. Huang

GEORGE PALADE AWARD (2018)

No 2018 awardee.

YEAR	RECIPIENT
2012	Gabriel C. Lander
2013	Peng Ge
2014	Ricardo C. Guerrero-Ferreira
2015	Alexey Amunts
2016	Dmitry Lyumkis
2017	Rengasayee Veeraraghavan

Major Society Awards

HILDEGARD H. CROWLEY OUTSTANDING TECHNOLOGIST AWARD FOR BIOLOGICAL SCIENCES (2018)

Anchi Cheng
New York Structural Biology Center

EDUCATION: B.S. Chemistry – National Taiwan University, Taipei, Taiwan, R.O.C. (1988) Ph.D. Chemistry – The Ohio State University (1995).

Anchi Cheng spent most of her undergraduate senior year in an X-ray crystallography lab that studies the bonding property of sulfur with hydrocarbon. She has a strong background I instrument and processing automation gained by the study of lipid phase transition at synchrotron radiation source facilities during her graduate study. As a postdoctoral research associate, she used electron crystallography to determine the structure of aquaporin 1 and connexin 43, where she became an expert user of TEM. In addition, she developed methods for evaluating the data distribution and an error analysis method based on bootstrap resampling. As her interests turned to technology development for cryo-TEM, she has become a key developer of software for automated molecular microscopy (Leginon) and building an integrated pipeline for data processing (Appion) in single-particle averaging, tomography, and two-dimensional crystal screening. Each of these developments was driven by different biological projects that she executed or oversaw. As a user-turned developer, she understands the importance of providing both robust automation as well as flexibility of user redirection.

YEAR	RECIPIENT
1993	Ben O. Spurlock
1994	*not awarded*
1995	Kai Chien
1996	*not awarded*
1997	John P. Benedict
1998	Hilton H. Mollenhauer
1999	John M. Basgen
2000	Nancy Crise Smith
2001	*not awarded*
2002	José A. Mascorro
2003	*not awarded*
2004	*not awarded*
2005	John J. Bozzola
2008	Thomas Deerinck
2009	Mary Morphew
2010	E. Ann Ellis
2011	Robert Grassucci
2012	Kunio Nagashima
2013	Robyn Roth
2014	Hong Yi
2015	Norman Olson
2016	Frank Macaluso
2017	Patricia S. Connelly

CHUCK FIORI OUTSTANDING TECHNOLOGIST AWARD FOR PHYSICAL SCIENCES (2018)

Chengyu Song
Lawrence Berkeley National Laboratory

Chengyu Song obtained his B.S. in Materials Science from Zhejiang University, China in 1989, and M.S. from Shanghai Institute of Ceramics, Chinese Academy of Sciences, where he first received trainings in electron microscopy. After finishing two-year visiting scholarship in Argonne National Laboratory, he joined National Center for Electron Microscopy (NCEM) at Lawrence Berkeley National Laboratory as a Research Associate in 1997, and had been a Senior Scientific Engineering Associate since 2005. NCEM is one of the world's foremost centers for electron microscopy. Having merged with the Molecular Foundry in 2014, it continues to provide user community with cutting-edge instrumentation and expertise. Chengyu has been a key operator of NCEM's state-of-art electron microscopes, such as 1 MeV Atomic Resolution Microscope, One Angstrom Microscope, and Transmission Electron Aberration-corrected Microscopes (TEAMs). Over the past two decades, he collaborated with hundreds of scientists and visitors from many part of the world, and trained over a thousand graduate students and post doctors from universities nationwide.

YEAR	RECIPIENT
1993	*not awarded*
1994	Bernard J. Kestel
1995	*not awarded*
1996	David W. Ackland
1997	Stanley J. Klepeis
1998	Charles J. Echer
1999	John C. Wheatley
2000	*not awarded*
2001	Conrad G. Bremer
2002	*not awarded*
2003	Edward A. Ryan
2004	Mark C. Reuter
2005	Chris Nelson
2008	*not awarded*
2009	Lynne Gignac
2010	*not awarded*
2011	*not awarded*
2012	*not awarded*
2013	K. Shawn Reeves
2014	Eddy Garcia-Meitin
2015	Masahiro Kawasaki
2016	*not awarded*
2017	Richard L. Martens

Microscopy Society of America

MSA MegaBooth in the M&M 2018 Exhibit Hall

Open during all exhibit hall hours

The **MSA MEGABOOTH** showcases all that MSA membership has to offer. If you are currently a member, stop by to catch up on all the new society developments. Member information available at Regular, Sustaining (corporate), and Student levels.

Sign up for **VENDOR TUTORIALS** here! These popular sessions are presented on Monday, Tuesday, and Wednesday evenings after the exhibit hall has closed for the day. Don't miss out – advance registration is required!

The **INTERNET CAFÉ** and **PHONE CHARGING STATION** are open to all meeting attendees during all exhibit hall hours. **Bring Your Own Device!** Lots of places to sit and rest your feet for a few minutes while you charge your mobile phone, check your email, put the finishing touches on your talk, or collaborate with colleagues.

The **TECHNOLOGISTS' FORUM** (TF): Attention Technologists! Stop by to find out how you can grow and develop your skills, your professional career, and your network by joining the Forum!

The **PLACEMENT OFFICE** is MSA's job-listing service. Post a job, peruse job listings, post a resume, and/or find that perfect candidate for your job opening. All for **FREE** during the meeting!

Check out the **BOOK DISPLAY** – publisher-donated books, divided into biological/physical topics. Several new titles added every year! Come and browse the newest titles.

CERTIFICATION BOARD – Find out about MSA's certification program for Electron Microscopy Technologists and how being certified can help you in your next job search!

MICROSCOPY TODAY and ***MICROSCOPY and MICROANALYSIS*** are the society's two publications – one a magazine format, the other a peer-reviewed scientific journal. Information for authors and advertisers is available here.

EDUCATIONAL OUTREACH – Includes MSA's educational outreach program. Browse the materials and find out how to start an outreach program in your local area. Get details on the special programming at the M&M meeting for educators and kids of all ages.

Visit the updated **Project MICRO** display to learn about this organization's education and outreach goals.

For more information, visit http://microscopy.org

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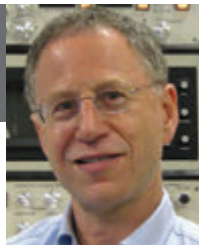
PAST PRESIDENTS

1968	L.S. Birks
1969	K.F.J. Heinrich
1970	R.E. Ogilvie
1971	A.A. Chodos
1972	K. Keil
1973	D.R. Beaman
1974	P. Lublin
1975	J.E. Colby
1976	E. Lifshin
1977	J.I. Goldstein
1978	J.D. Brown
1979	D.F. Kyser
1980	O.C. Wells
1981	J.R. Coleman
1982	R.L. Myklebust
1983	R. Bolon
1984	D.C. Joy
1985	D.E. Newbury
1986	C.G. Cleaver
1987	C.E. Fiori
1988	W.F. Chambers
1989	D.B. Wittry
1990	A.D. Romig, Jr
1991	J.T. Armstrong
1992	D.B. Williams
1993	T.G. Huber
1994	J.A. Small
1995	J.J. McCarthy
1996	D.E. Johnson
1997	J.R. Michael
1998	R.B. Marinenko
1999	J.J. Friel
2000	C.E. Lyman
2001	R.W. Linton
2002	G.P. Meeker
2003	E.S. Etz
2004	P.K. Carpenter
2005	I.H. Musselman
2006	R. Gauvin
2007	P.G. Kotula
2008	I.M. Anderson
2009	C. Johnson
2010	E.P. Vicenzi
2011	J.H.J. Scott
2012	J.F. Mansfield
2013-14	K.L. Bunker
2015-16	T.F. Kelly

Major Society Awards

DUNCUMB AWARD FOR EXCELLENCE IN MICROANALYSIS (2018)



Richard D. Leapman
National Institutes of Health

Richard Leapman received his education at Peterhouse, Cambridge University, UK, where he obtained a B.A. in Natural Sciences, followed by a Ph.D. in physics from the Cavendish Laboratory under the supervision of Prof. Vernon Ellis Cosslett. He then trained as a postdoctoral fellow in the Department of Materials at the University of Oxford, and also under the mentorship of Prof. John Silcox in the Department of Applied and Engineering Physics at Cornell University, where he contributed to the development of electron energy loss spectroscopy (EELS) for the nanoscale characterization of materials. Dr. Leapman subsequently moved to the National Institutes of Health to develop methods that combined scanning transmission electron microscopy (STEM) and EELS for analyzing the organization and composition of cells and supramolecular assemblies. More recently, his group has developed techniques based on STEM tomography for imaging the 3D ultrastructure of cells, as well as serial block face SEM approaches for determining nanoscale tissue architecture. Dr. Leapman received the Presidential Science Award from the Microbeam Analysis Society and was elected a Fellow of the Microscopy Society of America in 2011. He is currently an Editor of the Journal of Microscopy, a member of the editorial boards of other microscopy and nanotechnology journals, and has participated on national scientific advisory committees, including the one for the Advanced Photon Source at Argonne National Laboratory. Since 2006, Dr. Leapman has served as the Scientific Director of the intramural program of the National Institute of Biomedical Imaging and Bioengineering, NIH, where he also heads the Laboratory of Cellular Imaging and Macromolecular Biophysics.

PREVIOUS AWARDEES

2007	D.B. Williams
2008	J. I. Goldstein
2009	D.E. Newbury
2010	D.C. Joy
2011	J.R. Michael
2012	J. Bentley
2013	E. Lifshin
2014	O. L. Krivanek
2015	P. J. Statham
2016	David Muller
2017	Thomas F. Kelly

KURT F.J. HEINRICH AWARD (2018)

Yoosuf N. Picard
Carnegie Mellon University

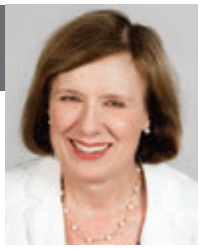
Professor Picard obtained a B.S. in Mechanical Engineering from Louisiana Tech University in 2001 and a Ph.D. in Materials Science and Engineering from the University of Michigan-Ann Arbor in 2006. During his graduate career, he was a Microsystems Engineering and Science Applications Fellow at Sandia National Laboratories where he researched focused ion beam applications as well as pulsed laser ignition phenomenon in energetic thin films. Following his doctoral research on materials modifications by femtosecond lasers, he was a National Research Council postdoctoral research associate at the U.S. Naval Research Lab (NRL), where he conducted electron microscopy studies of GaN devices, SiC thin films, and metal-oxide nanowires. He joined the faculty at Carnegie Mellon University (CMU) in 2009 as an assistant research professor in the Materials Science and Engineering Department and was later promoted to associate research professor in 2014. His research group develops and applies advanced electron microscopy methods for quantitative microstructural characterization and *in situ* analysis of defect behavior in nanoscale devices, ceramic surfaces and new metal alloys. Yoosuf continues to progress electron channeling contrast imaging (ECCI) for non-destructive defect identification, with interests in developing defect engineering strategies for bulk crystalline surfaces. He is an active member of the Minerals, Metals and Materials Society (TMS), Microscopy Society of America (MSA) and Microanalysis Society (MAS). He served as MAS Director (2015-2018) as well as a co-organizer for the MAS Topical Conferences on EBSD 2012, 2014 and 2016. He has also served as leader of the MSA "Electron Crystallography and Automated Mapping Techniques" focused interest group. He is the Program Chair for Microscopy and Microanalysis 2018. Yoosuf is editor for the journal *Microscopy and Microanalysis.* At Carnegie Mellon University, he advises the MSE Graduate Student Advisory Council and serves on the steering committee for the Energy Science Technology & Policy Master's degree program. Yoosuf teaches courses on materials characterization and electron microscopy for both undergraduate and graduate students. He has co-authored over 70 peer-reviewed publications and was a recipient of the Birks Award for best contributed paper at Microscopy and Microanalysis 2009.

PREVIOUS AWARDEES

1986	P.J. Statham
1987	J.T. Armstrong
1988	D.B. Williams
1989	R.D. Leapman
1990	R.W. Linton
1991	A.D. Romig, Jr.
1992	S.J. Pennycook
1993	P.E. Russell
1994	J.R. Michael
1995	E.N. Lewis
1997	R. Gauvin
1998	V.P. Dravid
1999	J. Bruley
2000	H. Ade
2001	C. Jacobsen
2002	D.A. Wollman
2005	M. Watanabe
2006	M. Toth
2007	G. Kothleitner
2008	P.G. Kotula
2009	D. Drouin
2010	H. Demers
2011	L.N. Brewer
2012	E.A. Marquis
2013	J.M. LeBeau
2014	B.P. Gorman
2015	P. Pinard
2016	Julien Allaz
2017	Andrew Herzing

Major Society Awards

PRESIDENTIAL SCIENCE AWARD (2018)



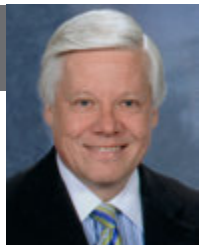
M. Grace Burke
University of Manchester, United Kingdom

Prof. M. Grace Burke is the Director of the Materials Performance Centre at the University of Manchester, where she leads investigations of materials' behavior in nuclear power systems, with particular emphasis on the role of microstructure. In addition to her MPC role, she was also Director of the Electron Microscopy Centre at the University of Manchester from 2012 through 2016. Prior to joining the University in late 2011, she acquired extensive experience in materials for power generation during a her career in the US nuclear industry with research positions at the Westinghouse Science and Technology Center, and the Bettis Atomic Power Laboratory in Pittsburgh, where she was the Consultant Scientist in Materials Technology. Including prior research experience at the US Steel Research Laboratory, she has over 35 years of expertise in steels, materials of construction for nuclear power plants, irradiation damage, SCC, and hydrogen embrittlement of structural alloys. She is particularly known for her application of advanced microscopy/ microanalysis techniques to nuclear materials research, and to the microstructural characterisation of complex materials. Her research into irradiation damage using AP-FIM provided the first evidence of the complex solute-enriched clusters responsible for the irradiation-induced hardening/degradation of welds in PWRs. Her current research continues to involve the application of advanced analytical TEM and in situ ATEM in liquids and gases to study the nanoscale phenomena leading to environment-sensitive degradation of structural alloys. Grace is a recognized expert in numerous international nuclear science and technology organisations including NUGENIA, ICG-EAC, and IGRDM. Grace is a Fellow of ASM International, the Institute of Materials, Minerals and Mining (UK), the Microscopy Society of America, and the Royal Microscopical Society.

PREVIOUS AWARDEES

1977	R. Castaing
1978	K.F.J. Heinrich
1979	P. Duncumb
1980	D.B. Wittry
1981	S.J.B. Reed
1982	R. Shimizu
1983	J. Philibert
1984	L.S. Birks
1985	E. Lifshin
1986	R.L. Myklebust
1987	O.C. Wells
1988	J.D. Brown
1989	J. Hillier
1990	T.E. Everhart
1997	D.B. Williams
1998	F.H. Schamber
1999	R.A. Sareen
2000	R.F. Egerton
2001	P.E. Batson
2002	K. Keil
2003	P.E. Russell
2004	J.T. Armstrong
2005	G. Slodzian
2006	B.J. Griffin
2007	R.D. Leapman
2008	T. F. Kelly
2009	J.R. Michael
2010	J.J. Donovan
2011	P.J. Statham
2012	N.J. Zaluzec
2013	P. Echlin
2014	H.L. Fraser
2015	M.R. Keenan
2016	M. Jercinovic
2017	Michael K. Miller

PRESIDENTIAL SERVICE AWARD (2018)



Vernon Robertson, JEOL

Vernon Robertson has been with JEOL USA for over 32 years and was appointed EPMA/ Surface Analysis Product Manager in early 2016 and will continue as SEM Technical Sales Manager, providing in-house and in the field, technical product support and customer applications support. Vern served as the senior SEM Applications Specialist at JEOL beginning in 1986. He was appointed National Laboratory Manager in 2004, and FEG SEM Product Manager in 2005. Vern received his B.Sc. in Geology with honors from the University of New Hampshire. His prior industrial experience included eight years of consulting in an independent testing lab specializing in industrial and environmental problem solving, with responsibilities including polarized light optical microscopy, and atomic emission and absorption spectroscopy SEM with EDS/ WDS and x-Ray diffraction. Vern was a recent member of the MAS (Microanalysis Society) Council serving as the Corporate Liaison.

PREVIOUS AWARDEES

1977	P. Lublin
1978	D.R. Beaman
1979	M.A. Giles
1980	A.A. Chodos
1981	R.L. Myklebust
1982	J. Doyle
1983	D.E. Newbury
1984	J.I. Goldstein
1985	M.C. Finn
1986	V. Shull
1987	D.C. Joy
1988	C.G. Cleaver
1989	W.F. Chambers
1990	C.E. Fiori
1991	T.G. Huber
1992	E.S. Etz
1993	H.A. Freeman
1994	J.L. Worrall
1995	R.W. Linton
1996	P. F. Hlava
1997	J.A. Small
1998	J.J. McCarthy
1999	T.G. Huber
2000	R.B. Marinenko
2001	C.E. Lyman
2002	J.F. Mansfield
2003	I.H. Musselman
2004	J.R. Michael
2005	G.P. Meeker
2006	H.A. Freeman
2007	P.K. Carpenter
2008	L.M. Ross
2009	V. Woodward
2010	S.A. Wight
2011	D.T. Kremser
2012	C. Johnson
2013	J.J. McGee
2014	I.M. Anderson
2015	S. McKernan
2016	H. Lowers
2017	Daniel Kremser

Outstanding Paper Awards for 2017

MAS OUTSTANDING PAPER AWARDS (2017)

These awards are presented annually to the authors of outstanding papers from the previous annual meeting in each of four categories.

RAYMOND CASTAING – BEST STUDENT PAPER AWARD:

Characterizing the Effectiveness of Atomic Layer Deposited Coatings for the Prevention of Glass Disease

Miriam Hiebert, University of Maryland

V.G. MACRES – BEST INSTRUMENTATION/SOFTWARE PAPER AWARD:

Using Scanning Transmission X-ray Microscopy to Reveal the Origin of Lithium Compositional Spatiodynamics in Battery Materials

Daan Hein Alsem, Hummingbird Scientific, Inc.

L.S. BIRKS – BEST CONTRIBUTED PAPER AWARD:

Numerical Modeling of Specimen Geometry for Quantitative Multiple Detector EDS

Weizong Xu, North Carolina State University

V.E. COSSLETT – BEST INVITED PAPER AWARD:

Recent Advances of the Open Source MULTEM Program to Provide Accurate and Fast Electron Microscopy Simulations

Ivan Pedro Lobato Hoyos, EMAT, University of Antwerp, Belgium

M&M 2018 MEETING AWARDS

M&M STUDENT SCHOLAR AWARDS – SPONSORED BY MSA

Qianying Guo, University of Alabama

Celesta Chang, Cornell University

Zoey Warecki, University of Maryland

Xue Rui, University of Illinois-Chicago

Matthew Hauwiller, University of California-Berkeley

Blanka Janicek, University of Illinois

Henry Ayoola, University of Pittsburgh

Yuanzhi Ma, Carnegie Mellon University

Robin White, Simon Fraser University, Canada

Supriya Koul, University of Central Florida

Vivek Garg, Indian Institute of Technology-Bombay, India

Jason Martineau, University of Utah

Elisah VandenBussche, University of Minnesota

Yifei Liu, The Ohio State University

Joseph Favata, University of Connecticut

Xuying Liu, University of Wisconsin

Justin Ondry, University of California-Berkeley

Jungjae Park, Korea Advanced Institute of Science and Technology, South Korea

Stavros Deligiannis, National Technical University of Athens, Greece

Christopher Hobbs, Trinity College Dublin, Ireland

Franziska Seifert, Leibniz Institute for Solid State and Materials Research Dresden, Germany

Josh Vincent, Arizona State University

Peng Dong, McMaster University, Canada

Murat Nulati Yesibolati, Technical University of Denmark

Anna Weiss, Carnegie Mellon University

Daniel Du, University of Minnesota

James Hart, Drexel University

Spencer Reisbick, University of Minnesota

Noah Schnitzer, University of Michigan

Sanaa Ben Djemaa, University of Tours, France

M&M STUDENT SCHOLAR AWARDS – SPONSORED BY MAS

Eric Hoglund, University of Virginia

Mandy Nevins, Rochester Institute of Technology

Yu Yuan, McGill University, Canada

Lucile Brunel-Duverger, Centre de Recherche et de Restauration des Musées, France

Quentin Stoyel, McGill University, Canada

Patrick Trampert, German Research Center for Artificial Intelligence, Germany

Laura Seifert, University of Arizona

Frédéric Voisard, McGill University, Canada

David Baek, Cornell University

Rachel White, The University of Alabama

M&M POSTDOCTORAL SCHOLAR AWARDS

Darius Pohl, Technische Universität Dresden, Germany

Yi Jiang, Cornell University

Wei Zhang, Brookhaven National Laboratory

Zhen Chen, Cornell University

Alejandra Londono-Calderon, Ames Laboratory

Jordan Hachtel, Oak Ridge National Laboratory

Emre Firlar, University of Illinois-Chicago

Paul Smeets, Northwestern University

Stephen House, University of Pittsburgh

Maureen Lagos, McMaster University, Canada

Jiashi Miao, The Ohio State University

M&M PROFESSIONAL TECHNICAL STAFF AWARDS

Zhiyuan Lu, Janelia Research Campus

Lisa Lowery, Sandia National Laboratories

Eric Formo, University of Georgia

Connon Thomas, Max Planck Florida Institute for Neuroscience

Microscopical Society of Canada/ Societe' de Microscopie du Canada Society Information

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Zygmunt Jakubek (2019)
Martin Couillard (2019)
Aycan Yurtsever, (2020)
Chloe van Oostende-Tripllet (2020)
Nabil Bassim (2020)
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Student Rep. to Council Sara Makaremi (2018)
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Bulletin Advert. Manag. Dianne Moyles
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PAST PRESIDENTS

Michael Robertson (2017)
Anja Geitmann (2015)
Randy Mikula (2013)
Daniel Beniac (2011)

AWARDS

Canadian Foundation for the Development of Microscopy – Bursary Winners:

1. Sara Makaremi, McMaster University, adviser prof. Jose Moran-Mirabal

2. Quentin Stoyel, McGill University, adviser prof. Raynald Gauvin

3. Christopher Schankula, McMaster University, adviser prof. Nabil Bassim

4. Hesham El-Sherif, McMaster University, adviser prof. Nabil Bassim

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BE PREPARED at the Baltimore Convention Center!

In case of fire, medical emergency, or another emergency situation,
Call 911 DIRECTLY or Building Safety at (410) 649-7055.

- If you call 911, immediately afterwards, use your cell phone or one of the ivory-colored "house" phones to alert Security about the location of the emergency.
- Tell them the type of emergency (fire, medical) and the location and level.
- Remain calm and follow directions.
- Use (410) 649-7055 to report any other Security concerns.

SEVERE WEATHER and EVACUATIONS

- Maryland frequently experiences severe thunderstorms during the summer months.
- If an evacuation order is issued, Emergency Broadcast System announcements will be made directing guests where and how to evacuate.

Should you encounter a suspicious package:

- Do not touch or move the package.
- Move away, locate the nearest ivory house phone, and call Security. Do not call 911. Do not use your cell phone.

Other Information:

The Baltimore Convention Center's **Lost and Found** Department may be reached from any ivory house phone, or from an outside/cell line at (410) 649-7055. Check M&M 2018 Registration first for any lost and found items.

An **EMERGENCY CARD** with important information and numbers is included on the back of your registration badge.

Notes

The C-flat™ Advantage

C-flat™ leads to better data sets.

Made with patent pending technology, C-flat™ provides an ultra-flat surface that results in better particle dispersion and more uniform ice thickness. Patterning is done using deep-UV projection lithography, ensuring the most accurate and consistent hole shapes and sizes down to submicron features. The precise methods by which C-flat™ is manufactured eliminate artifacts such as excess carbon and edges around holes.

C-flat™ is affordable

C-flat™ is available in 25, 50, and 100 packs at a per-grid price less than competing products.

Applications

C-flat holey carbon grids provide the ideal specimen support to achieve high resolution data in cryoTEM making C-flat the perfect choice for:

- Single particle analysis
- Cryo electron tomography
- Automated TEM analysis

...EMS has it!

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Electron Microscopy Sciences

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Hatfield, Pa 19440
Tel: (215) 412-8400 • Fax: (215) 412-8450
email: sgkcck@aol.com
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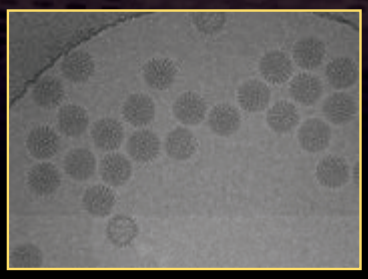
the premier holey carbon grid for cryo-transmission electron microscopy

C-FLAT™

Holey Carbon and Gold Grids for Cryo-TEM

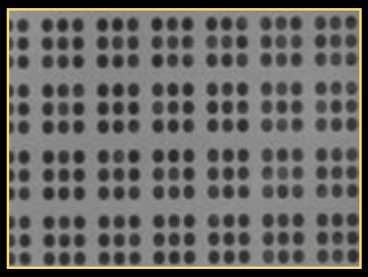
C-Flat™ is a clean, ultra-flat holey carbon film TEM grid primarily used for Cryo TEM and Automated TEM. With a variety of available hole diameters, mesh size, film thicknesses, and mesh material, there is a C-Flat™ product suitable for any application in the TEM.



Frozen-hydrated Bacteriophage Capsid (data acquired on CF-1.2/1.4-4C).

Consistent

Researchers around the world have reported that the ultra-flat surface of C-flat™ leads to even ice thickness and uniform particle distribution, allowing for superior 3-D reconstructions. 2 µm hole sizes are standard, but various hole sizes are available to accommodate different particle sizes and magnifications.



Compatible

C-flat™ provides a regular array of analysis sites compatible with automated data collection software such as Leginon. This compatibility, in combination with the more uniform ice thickness and particle distribution reported by numerous researchers, results in more high-quality target sites per grid.

Clean

C-Flat™ uses no plastics or polymers in its production. This means C-Flat™ is shipped clean, so it's ready to use out of the box and requires no solvent washing steps prior to use, leading to less breakage of the holey carbon film.

Expanded Product Line

The breadth of applications in cryoTEM necessitate a wide range of holey carbon film patterns. And now, with the recent expansion of the product line, a C-flat™ holey carbon film is available for almost any application. Whether 600nm holes are needed for very high magnifications with ultra-high resolution cameras or large open areas are needed for larger specimens, C-flat™ is the perfect holey carbon grid.

M&M 2018

MICROSCOPY & MICROANALYSIS

August 5-9, 2018 • Baltimore, MD

Friday, August 3

All events at the Baltimore Convention Center unless otherwise indicated.

		ROOM
8:30 am	**MSA Council**	343

Saturday, August 4

8:30 am	**MSA Council**	343
8:30 am – 5:00 pm	**Pre-Meeting Congress**	
	X60 - Pre-Meeting Congress for Students, Post-Docs, and Early-Career Professionals in Microscopy and Microanalysis	345-346

Sunday, August 5

8:30 am – 5:00 pm	**Sunday Short Courses**	
	X10 - Exploring Cryo-Preparation Techniques for Biological Samples	321
	X11 - Advanced Focused Ion Beam Methods	322
	X12 - Practical Considerations for Image Analysis and ImageJ and Clemex Vision	323
	X13 - SerialEM for EM Data Acquisition	324
	X15 - Introduction to SEM with EDS: Imaging and Compositional Analysis	326
	X16 - Multivariate Methods and Image-processing for Quantitative Microscopy	330
8:30 am – 5:00 pm	**Pre-Meeting Congresses**	
	X61 - Standards and Reference Materials for Microanalysis	349-350
	X62 - Practical Challenges and Opportunities for *in situ/operando* Microscopy in Liquids and Gases	345-346
9:00 am	**MAS Council**	343
12:00 pm	**MSC-SMC Council Meeting**	334
3:00 pm	***Microscopy Today* Editors**	332
6:30 pm	**Sunday Welcome Reception**	Ballroom I-II (4th Level)

Monday, August 6

7:15 am	**MSA Awards + Fellowship Committees**	330
7:15 am	**Technologists' Forum Board**	334
8:30 am – 12:00 pm	**M&M 2018 Plenary Sessions**	Ballroom III-IV (4th Level)
	Opening Welcome	
	Plenary Talk #1: **Jon Larsen** **Project Stardust; Jazz Guitarist, Composer, Surrealist Painter, Author, Citizen Scientist** *Using Microscopy to Find Stardust Anywhere*	
	MAS Awards Presentation	
	MSC-SMC Awards Presentation	
	Coffee & Donuts Break	Ballroom Foyer (4th Level)
	MSA Awards Presentation	
	M&M Meeting Awards Presentation	
	Plenary Talk #2: **Manu Prakash, PhD** **Stanford University, Stanford, CA** *Every Child in the World Should Carry a Microscope in Their Pocket*	
12:00 pm – 1:30 pm	**Lunch Break**	
12:00 pm – 5:30 pm	**Exhibit Hall Open**	Halls E-F-G (Lower Level)

Monday, August 6 continued

		ROOM
12:15 pm	***MaM* Editorial Board**	340
12:15 pm	**MAS Meal with a Mentor**	339
12:15 pm	**Pharma FIG Lunch Workshop on Data Integrity**	345-346
12:15 pm	**FIG: Diagnostic Microscopy**	330
12:15 pm	**FIG: Focused Ion Beam**	331
12:15 pm	**FIG: Atom Probe Field Ion Microscopy**	334
12:15 pm	**International Committee**	333
1:30 pm – 3:00 pm	**P.M. Symposia & Sessions**	
	A01.1 - Professor Hatsujiro Hashimoto Memorial Symposium: Foundations in Imaging Crystals, Defects, and Atoms	341
	A03.1 - Four-dimensional Scanning Transmission Electron Microscopy (4D-STEM): From Scanning Nanodiffraction to Ptychography and Beyond	343
	A10.1 - The Joy of Scanning Electron Microscopy	328
	A11.1 - Solid-state X-ray Spectrometry at 50 Years	327
	A16.1 - Sterling Newberry Memorial Symposium on X-ray Imaging	323
	A17.1 - Surface and Subsurface Microscopy and Microanalysis	326
	B04.1 - Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals	350
	B07.1 - Pharmaceuticals: Imaging, Analysis, and Regulation of Medical Products and Devices	348
	P01.1 - Advances in Electron, X-ray and Neutron Spectro-imaging/ Holography of Energy Materials and Devices	336
	P02.1 - Atomically Thin 2D Materials: Recent Results and Challenges	338
	P05.1 - Minimizing Beam-sample Interactions by Modulating Electron Beams in Space and Time	344
	X43 - Biological Sciences Tutorial - Cryo-FIB: Overcoming the Hurdle of Sample Preparation for *in situ* Cryo-Electron Tomography	321
3:00 pm – 5:00 pm	**Monday Poster Presentations**	Exhibit Hall
	A03.P1 - Four-dimensional Scanning Transmission Electron Microscopy (4D-STEM): From Scanning Nanodiffraction to Ptychography and Beyond	
	A10.P1 - The Joy of Scanning Electron Microscopy	
	A11.P1 - Solid-state X-ray Spectrometry at 50 Years	
	A16.P1 - Sterling Newberry Memorial Symposium on X-ray Imaging	
	A17.P1 - Surface and Subsurface Microscopy and Microanalysis	
	B04.P1 - Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals	
	B07.P1 - Pharmaceuticals: Imaging, Analysis, and Regulation of Medical Products and Devices	
	All Post-Deadline Posters will be presented on this day.	
3:30 pm	**Technologists' Forum Business Meeting**	334
4:15 pm	**MSA-CUP Book Series Advisory Board Meeting**	333
5:00 pm	**Student Poster Awards**	Exhibit Hall
5:30 pm	**Student Mixer**	339-340
5:45 – 6:45 pm	**Vendor Tutorials** *(Sign Up at MSA MegaBooth)*	Exhibit Hall

Tuesday, August 7

7:15 am	**MSA Local Affiliated Societies & MAS Affiliated Regional Societies**	330
8:30 am – 10:00 am	**A.M. Symposia & Sessions**	
	A01.2 - Professor Hatsujiro Hashimoto Memorial Symposium: Foundations in Imaging Crystals, Defects, and Atoms	341
	A03.2 - Four-dimensional Scanning Transmission Electron Microscopy (4D-STEM): From Scanning Nanodiffraction to Ptychography and Beyond	343
	A09.1 - Data Analytics and Model-based Imaging for Microstructure and Physical Property Interpretations	342

Tuesday, August 7 continued

		ROOM
8:30 am – 10:00 am	**A.M. Symposia & Sessions (Cont'd.)**	
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	A16.2 - Sterling Newberry Memorial Symposium on X-ray Imaging	323
	A17.2 - Surface and Subsurface Microscopy and Microanalysis	326
	A18.1 - Vendor Symposium	322
	B01.1 - Microscopy and Analysis in Forensic Science	348
	B03.1 - 3D Structures: from Macromolecular Assemblies to Whole Cells (3DEM FIG)	349
	B04.2 - Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals	350
	P01.2 - Advances in Electron, X-ray and Neutron Spectro-imaging/ Holography of Energy Materials and Devices	336
	P02.2 - Atomically Thin 2D Materials: Recent Results and Challenges	338
	P04.1 - *In situ* Methods for Probing Properties and Dynamics in Materials	340
	P05.2 - Minimizing Beam-sample Interactions by Modulating Electron Beams in Space and Time	344
	X31.1 - Technologists' Forum Special Topic Session: Specimen Preparation for Correlative FIB-SEM and XRM	347
	X45.1 - Biological Sciences Tutorial–How to Get Funding for Instrumentation When Budgets Are Tight (Part I)	321
	X90.1 - Microscopy Outreach: Microscopy in the Classroom	324-325
10:00 am – 5:30 pm	**Exhibit Hall Open**	
10:00 am – 10:30 am	**Coffee Break**	Exhibit Hall
10:00 am	**M&M 2019 - Program Planning for Symposium Organizers**	329
10:30 am – 12:00 pm	**A.M. Symposia & Sessions (Cont'd.)**	
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	A02.1 - Atomic-scale Functional Imaging in Aberration-corrected Electron Microscopy	339
	A03.3 - Four-dimensional Scanning Transmission Electron Microscopy (4D-STEM): From Scanning Nanodiffraction to Ptychography and Beyond	343
	A04.1 - *In situ* Transmission Electron Microscopy in Liquid and Gas Cells	345-346
	A09.2 - Data Analytics and Model-based Imaging for Microstructure and Physical Property Interpretations	342
	A10.3 - The Joy of Scanning Electron Microscopy	328
	A11.3 - Solid-state X-ray Spectrometry at 50 Years	327
	A17.3 - Surface and Subsurface Microscopy and Microanalysis	326
	A18.2 - Vendor Symposium	322
	B01.2 - Microscopy and Analysis in Forensic Science	348
	B03.2 - 3D Structures: from Macromolecular Assemblies to Whole Cells (3DEM FIG)	349
	B04.3 - Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals	350
	P01.3 - Advances in Electron, X-ray and Neutron Spectro-imaging/ Holography of Energy Materials and Devices	336
	P02.3 - Atomically Thin 2D Materials: Recent Results and Challenges	338
	P03.1 - Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications	337
	P04.2 - *In situ* Methods for Probing Properties and Dynamics in Materials	340
	P05.3 - Minimizing Beam-sample Interactions by Modulating Electron Beams in Space and Time	344
	X45.2 – Biological Sciences Tutorial - How to Get Funding for Instrumentation When Budgets Are Tight (Part II)	321
	X90.2 - Microscopy Outreach: Microscopy in the Classroom	324-325
12:00 pm – 1:30 pm	**Lunch Break**	
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		ROOM
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12:15 pm	**MSA Distinguished Scientist Awardee Lectures**	337
12:15 pm	**FIG: Cryo-Preparation**	333
12:15 pm	**FIG: Electron Microscopy in Liquids and Gases**	331
12:15 pm	**FIG: Electron Crystallography**	334
12:15 pm	**FIG: MicroAnalytical Standards**	332
12:15 pm	**MSC-SMC Business Meeting**	347
1:30 pm – 3:00 pm	**P.M. Symposia & Sessions**	
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	A03.4 - Four-dimensional Scanning Transmission Electron Microscopy (4D-STEM): From Scanning Nanodiffraction to Ptychography and Beyond	343
	A04.2 - *In situ* Transmission Electron Microscopy in Liquid and Gas Cells	345-346
	A05.1 - Low-energy Electron and Particle Microscopies in Liquid, Gaseous, and Frozen Conditions	329
	A09.3 - Data Analytics and Model-based Imaging for Microstructure and Physical Property Interpretations	342
	A10.4 - The Joy of Scanning Electron Microscopy	328
	A11.4 - Solid-state X-ray Spectrometry at 50 Years	327
	A17.4 - Surface and Subsurface Microscopy and Microanalysis	326
	A18.3 - Vendor Symposium	322
	B01.3 - Microscopy and Analysis in Forensic Science	348
	B03.3 - 3D Structures: from Macromolecular Assemblies to Whole Cells (3DEM FIG)	349
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	P01.4 - Advances in Electron, X-ray and Neutron Spectro-imaging/ Holography of Energy Materials and Devices	336
	P02.4 - Atomically Thin 2D Materials: Recent Results and Challenges	338
	P03.2 - Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications	337
	P04.3 - *In situ* Methods for Probing Properties and Dynamics in Materials	340
	P05.4 - Minimizing Beam-sample Interactions by Modulating Electron Beams in Space and Time	344
	P09.1 - Microstructure and Mechanics Deformation Symposium	325
	X30.1 - Technologists' Forum: E. Ann Ellis Memorial Symposium	347
	X41 - Physical Sciences Tutorial - Entrepreneurship in the Microscopy Community	321
3:00 pm – 5:00 pm	**Tuesday Poster Presentations**	Exhibit Hall
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	A03.P2 - Four-dimensional Scanning Transmission Electron Microscopy (4D-STEM): From Scanning Nanodiffraction to Ptychography and Beyond	
	A09.P1 - Data Analytics and Model-based Imaging for Microstructure and Physical Property Interpretations	
	A10.P2 - The Joy of Scanning Electron Microscopy	
	A11.P2 - Solid-state X-ray Spectrometry at 50 Years	
	A17.P2 - Surface and Subsurface Microscopy and Microanalysis	
	A18.P1 - Vendor Symposium	
	B01.P1 - Microscopy and Analysis in Forensic Science	
	B03.P1 - 3D Structures: from Macromolecular Assemblies to Whole Cells (3DEM FIG)	
	B04.P2 - Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals	

Tuesday, August 7 continued

		ROOM
3:00 pm – 5:00 pm	**Tuesday Poster Presentations (Cont'd.)**	
	P01.P1 - Advances in Electron, X-ray and Neutron Spectro-imaging/ Holography of Energy Materials and Devices	
	P03.P1 - Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications	
	P04.P1 - *In situ* Methods for Probing Properties and Dynamics in Materials	
	P09.P1 - Microstructure and Mechanics Deformation Symposium	
	X90.P1 - Microscopy Outreach: Microscopy in the Classroom	
3:30 PM	**FIG: 3D EM in the Biological Sciences**	321
3:30 pm	**FIG Business Meeting**	333
3:30 pm	**MSA Education Committee**	334
5:00 pm	**Student Poster Awards**	Exhibit Hall
5:30 pm	**MSA Student Council**	331-332
5:30 pm	**Post-Doctoral Researchers' Reception**	330
5:45 pm	**Vendor Tutorials** *(Sign Up at MSA MegaBooth)*	Exhibit Hall
6:30 pm	**Presidents' Reception** *(Invitation Only)*	Offsite

Wednesday, August 8

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7:15 am	**MSA Membership Committee**	334
8:30 am – 10:00 am	**A.M. Symposia & Sessions**	
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	A03.5 - Four-dimensional Scanning Transmission Electron Microscopy (4D-STEM): From Scanning Nanodiffraction to Ptychography and Beyond	343
	A04.3 - *In situ* Transmission Electron Microscopy in Liquid and Gas Cells	345-346
	A05.2 - Low-energy Electron and Particle Microscopies in Liquid, Gaseous, and Frozen Conditions	329
	A09.4 - Data Analytics and Model-based Imaging for Microstructure and Physical Property Interpretations	342
	A10.5 - The Joy of Scanning Electron Microscopy	328
	A11.5 - Solid-state X-ray Spectrometry at 50 Years	327
	A17.5 - Surface and Subsurface Microscopy and Microanalysis	326
	B02.1 - Microscopy in Food Science: Bridging Biology and Materials Science	348
	B05.1 - Focused on Microbes!	347
	B08.1 - 3D Structure of Complex Soft Materials Derived From Electron Tomography	349
	P01.5 - Advances in Electron, X-ray and Neutron Spectro-imaging/Holography of Energy Materials and Devices	336
	P02.5 - Atomically Thin 2D Materials: Recent Results and Challenges	338
	P03.3 - Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications	337
	P04.4 - *In situ* Methods for Probing Properties and Dynamics in Materials	340
	P05.5 - Minimizing Beam-sample Interactions by Modulating Electron Beams in Space and Time	344
	P09.2 - Microstructure and Mechanics Deformation Symposium	325
	X42 - Physical Sciences Tutorial - Ultra-high Spatial Resolution EBSD: Transmission Kikuchi Diffraction (TKD) in the SEM	321
10:00 am – 5:30 pm	**Exhibit Hall Open**	
10:00 am – 10:30 am	**Coffee Break**	Exhibit Hall

Wednesday, August 8 continued

		ROOM
10:30 am – 12:00 pm	**A.M. Symposia & Sessions (Cont'd.)**	
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	A04.4 - *In situ* Transmission Electron Microscopy in Liquid and Gas Cell	345-346
	A05.3 - Low-energy Electron and Particle Microscopies in Liquid, Gaseous, and Frozen Conditions	329
	A07.1 - New Advances in Electron Energy Loss Spectroscopy and Allied Techniques	341
	A09.5 - Data Analytics and Model-based Imaging for Microstructure and Physical Property Interpretations	342
	A10.6 - The Joy of Scanning Electron Microscopy	328
	A11.6 - Solid-state X-ray Spectrometry at 50 Years	327
	A17.6 - Surface and Subsurface Microscopy and Microanalysis	326
	B02.2 - Microscopy in Food Science: Bridging Biology and Materials Science	348
	B05.2 - Focused on Microbes!	347
	B08.2 - 3D Structure of Complex Soft Materials Derived From Electron Tomography	349
	P01.6 - Advances in Electron, X-ray and Neutron Spectro-imaging/Holography of Energy Materials and Devices	336
	P02.6 - Atomically Thin 2D Materials: Recent Results and Challenges	338
	P03.4 - Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications	337
	P04.5 - *In situ* Methods for Probing Properties and Dynamics in Materials	340
	P07.1 - Planetary Building Blocks and the Techniques Needed to Analyze Them	324
	P09.3 - Microstructure and Mechanics Deformation Symposium	325
	X32.1 - Technologists' Forum Roundtable Session: Sample Preparation Strategies for Super-Resolution Correlative Electron Microscopy	350
	X44 - Biological Sciences Tutorial - Single-particle Cryo-EM: Data Processing Techniques for Obtaining Optimal Results	321
12:00 pm – 1:30 pm	**Lunch Break**	
12:15 pm	**MSA Members' Meeting**	343-344
1:30 pm – 3:00 pm	**P.M. Symposia & Sessions**	
	A02.5 - Atomic-scale Functional Imaging in Aberration-corrected Electron Microscopy	339
	A04.5 - *In situ* Transmission Electron Microscopy in Liquid and Gas Cells	345-346
	A07.2 - New Advances in Electron Energy Loss Spectroscopy and Allied Techniques	341
	A08.1 - Machine Learning & Compressive Sensing for Image Acquisition, Processing, and Reconstruction	342
	A12.1 - The FIB-SEM Laboratory: Sample Preparation and Beyond	328
	A13.1 - Pushing the Limits of Cryo-EM	349
	A14.1 - Quantitative Magnetic Characterization in the TEM	338
	A15.1 - Strain Analysis from Nano- to Micro-length Scales	327
	B06.1 - Imaging Life at New Frontiers of Spatiotemporal Resolution and Adaptive Microscopy	350
	P03.5 - Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications	337
	P04.6 - *In situ* Methods for Probing Properties and Dynamics in Materials	340
	P06.1 - Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing National and Synthetic Materials	329
	P07.2 - Planetary Building Blocks and the Techniques Needed to Analyze Them	324
	P08.1 - Spectroscopic and Imaging Studies in Heritage Science	326
	P09.4 - Microstructure and Mechanics Deformation Symposium	325
	X40 - Physical Sciences Tutorial - Scanning Nanobeam Diffraction	321
	X91 - Microscopy Outreach: Microscopy Explorations	322-323
10:00 am – 12:00 pm	**Wednesday Poster Presentations**	Exhibit Hall
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	A04.P1 - *In situ* Transmission Electron Microscopy in Liquid and Gas Cells	

Wednesday, August 8 continued

		ROOM
3:00 pm – 5:00 pm	**Wednesday Poster Presentations (Cont'd.)**	Exhibit Hall
	A05.P1 - Low-energy Electron and Particle Microscopies in Liquid, Gaseous, and Frozen Conditions	
	B05.P1 - Focused on Microbes!	
	B06.P1 - Imaging Life at New Frontiers of Spatiotemporal Resolution and Adaptive Microscopy	
	B08.P1 - 3D Structure of Complex Soft Materials Derived From Electron Tomography	
	P01.P2 - Advances in Electron, X-ray and Neutron Spectro-imaging/Holography of Energy Materials and Devices	
	P02.P1 - Atomically Thin 2D Materials: Recent Results and Challenges	
	P03.P2 - Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications	
	P04.P2 - *In situ* Methods for Probing Properties and Dynamics in Materials	
	P05.P1 - Minimizing Beam-sample Interactions by Modulating Electron Beams in Space and Time	
	P07.P1 - Planetary Building Blocks and the Techniques Needed to Analyze Them	
	P08.P1 - Spectroscopic and Imaging Studies in Heritage Science	
	P09.P2 - Microstructure and Mechanics Deformation Symposium	
4:00 pm	***Microscopy Today* Innovation Awards**	Exhibit Hall
5:00 pm	**Student Poster Awards**	Exhibit Hall
5:15 pm	**MAS Business Meeting**	337
5:45 pm	**Vendor Tutorials** *(Sign Up at MSA MegaBooth)*	Exhibit Hall
6:30 pm	**MAS Members' Social** *(See MAS Booth for Details)*	Offsite

Thursday, August 9

		ROOM
8:30 am	**M&M Sustaining Members**	330
8:30 am – 10:00 am	**A.M. Symposia & Sessions**	
	A02.6 - Atomic-scale Functional Imaging in Aberration-corrected Electron Microscopy	339
	A04.6 - *In situ* Transmission Electron Microscopy in Liquid and Gas Cells	345-346
	A06.1 - Mesoscale Correlative Microscopy and Imaging of Physical, Environmental, and Biological Sciences	322
	A07.3 - New Advances in Electron Energy Loss Spectroscopy and Allied Techniques	341
	A08.2 - Machine Learning & Compressive Sensing for Image Acquisition, Processing, and Reconstruction	342
	A12.2 - The FIB-SEM Laboratory: Sample Preparation and Beyond	328
	A13.2 - Pushing the Limits of Cryo-EM	349
	A14.2 - Quantitative Magnetic Characterization in the TEM	338
	A15.2 - Strain Analysis from Nano- to Micro-length Scales	327
	B06.2 - Imaging Life at New Frontiers of Spatiotemporal Resolution and Adaptive Microscopy	350
	P03.6 - Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications	337
	P04.7 - *In situ* Methods for Probing Properties and Dynamics in Materials	340
	P06.2 - Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing National and Synthetic Materials	329
	P07.3 - Planetary Building Blocks and the Techniques Needed to Analyze Them	324
	P08.2 - Spectroscopic and Imaging Studies in Heritage Science	326
	P09.5 - Microstructure and Mechanics Deformation Symposium	325
10:00 am – 2:00 pm	**Exhibit Hall Open**	
10:00 am – 12:00 pm	**Coffee Break + Poster Session**	Exhibit Hall
10:00 am – 12:00 pm	**Thursday Poster Sessions**	Exhibit Hall
	A02.P2 - Atomic-scale Functional Imaging in Aberration-corrected Electron Microscopy	
	A04.P2 - *In situ* Transmission Electron Microscopy in Liquid and Gas Cells	

Thursday, August 9 continued

		ROOM
10:00 am – 12:00 pm	**Thursday Poster Sessions (Cont'd.)**	Exhibit Hall
	A06.P1 - Mesoscale Correlative Microscopy and Imaging of Physical, Environmental, and Biological Sciences	
	A07.P1 - New Advances in Electron Energy Loss Spectroscopy and Allied Techniques	
	A08.P1 - Machine Learning & Compressive Sensing for Image Acquisition, Processing, and Reconstruction	
	A12.P1 - The FIB-SEM Laboratory: Sample Preparation and Beyond	
	A13.P1 - Pushing the Limits of Cryo-EM	
	A14.P1 - Quantitative Magnetic Characterization in the TEM	
	P04.P3 - *In situ* Methods for Probing Properties and Dynamics in Materials	
	P06.P1 - Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing National and Synthetic Materials	
	P09.P3 - Microstructure and Mechanics Deformation Symposium	
12:00 pm	**Student Poster Awards**	Exhibit Hall
12:00 pm - 1:30 pm	**Lunch Break**	
12:15 pm	**MSA Standards Committee**	333
1:30 pm – 3:00 pm	**P.M. Symposia & Sessions**	
	A02.7 - Atomic-scale Functional Imaging in Aberration-corrected Electron Microscopy	339
	A04.7 - *In situ* Transmission Electron Microscopy in Liquid and Gas Cells	345-346
	A06.2 - Mesoscale Correlative Microscopy and Imaging of Physical, Environmental, and Biological Sciences	322
	A07.4 - New Advances in Electron Energy Loss Spectroscopy and Allied Techniques	341
	A08.3 - Machine Learning & Compressive Sensing for Image Acquisition, Processing, and Reconstruction	342
	A12.3 - The FIB-SEM Laboratory: Sample Preparation and Beyond	328
	A13.3 - Pushing the Limits of Cryo-EM	349
	A14.3 - Quantitative Magnetic Characterization in the TEM	338
	A15.3 - Strain Analysis from Nano- to Micro-length Scales	327
	B06.3 - Imaging Life at New Frontiers of Spatiotemporal Resolution and Adaptive Microscopy	350
	P03.7 - Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications	337
	P04.8 - *In situ* Methods for Probing Properties and Dynamics in Materials	340
	P06.3 - Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing National and Synthetic Materials	329
	P07.4 - Planetary Building Blocks and the Techniques Needed to Analyze Them	324
	P08.3 - Spectroscopic and Imaging Studies in Heritage Science	326
	P09.6 - Microstructure and Mechanics Deformation Symposium	325
3:00 pm - 3:30 pm	**Coffee Break**	
3:30 pm - 5:00 pm	**Late P.M. Symposia (Cont'd.)**	
	A02.8 - Atomic-scale Functional Imaging in Aberration-corrected Electron Microscopy	339
	A06.3 - Mesoscale Correlative Microscopy and Imaging of Physical, Environmental, and Biological Sciences	322
	A07.5 - New Advances in Electron Energy Loss Spectroscopy and Allied Techniques	341
	A08.4 - Machine Learning & Compressive Sensing for Image Acquisition, Processing, and Reconstruction	342
	A13.4 - Pushing the Limits of Cryo-EMA14.4 - Quantitative Magnetic Characterization in the TEM	349
	A14.4 - Quantitative Magnetic Characterization in the TEM	338
	P04.9 - *In situ* Methods for Probing Properties and Dynamics in Materials	340
	P06.4 - Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing National and Synthetic Materials	329
	P08.4 - Spectroscopic and Imaging Studies in Heritage Science	326
4:30 pm	**M&M 2018 Wrap-Up & Debrief** *(by invitation only)*	333

WELCOME FROM THE PROGRAM CHAIRS

Welcome to Microscopy and Microanalysis 2018 in Baltimore, Maryland!

M&M 2018
MICROSCOPY & MICROANALYSIS
August 5-9, 2018 • Baltimore, MD

The Microscopy Society of America (MSA), the Microanalysis Society (MAS), and the Microscopical Society of Canada/Société de Microscopie du Canada (MSC/SMC) welcome you to Microscopy and Microanalysis 2018 (M&M 2018) in Baltimore, Maryland. As you have come to expect, M&M 2018 features the latest innovative applications and instrumentation developments in microscopy and microanalysis across the biological and physical sciences.

The M&M 2018 meeting features nearly 40 technical symposia, and numerous educational opportunities for students, technologists, and scientists in the form of courses, tutorials, Tech Forum and special panels on "Entrepreneurship in the Microscopy Community" and "Procuring Government Funding for Microscopy Instrumentation and Research." Pre-meeting events include Sunday short courses as well as pre-meeting congresses on microanalytical standards and electron microscopy in liquids/gases. MSA Student Council is organizing its second annual pre-meeting congress designed specifically for early career scientists.

We are pleased to feature Professor Manu Prakash, Assistant Professor in Bioengineering at Stanford University, who will speak on the very real possibility of how and why "Every Child in the World Should Carry a Microscope in Their Pocket." Our second plenary speaker is Jon Larsen, author of "In Search of Stardust," the first comprehensive popular science book on micrometeorites. His presentation will show how anyone can find micrometeorites in populated areas using simple tools and a microscope.

The Executive Program Committee and the dozens of symposia organizers have worked tirelessly to produce the technical program for M&M 2018. On behalf of the Executive Program Committee, MSA, MAS, MSC/SMC, and the numerous volunteers that organize this event, welcome to Baltimore and M&M 2018! Hope you have a great week!

Yoosuf Picard
PROGRAM CHAIR

Alice Dohnalkova
PROGRAM VICE-CHAIR

James LeBeau
MAS CO-CHAIR

Nabil Bassim
SMC/MSC CO-CHAIR

PLENARY SPEAKER

Jon Larsen, Project Stardust; Jazz Guitarist, Composer, Surrealist Painter, Author, Citizen Scientist

Jon Larsen is author of *"In Search of Stardust,"* the first comprehensive popular science book on micrometeorites. The book also features a photo atlas presenting hundreds of micrometeorites imaged by high-resolution color optical microscopy and by scanning electron microscopy. Historically, cosmic dust was thought to be discoverable only in pristine areas like Antarctica or isolated deserts. Larsen became the first individual to demonstrate how to find micrometeorites in populated areas, allowing any individual to find tiny extraterrestrial stones in their nearest rain gutter. Since 2008, Larsen has collected dust particles and empirically classified various terrestrial contaminants. Suspecting that some of his particles were micrometeorites, Larsen worked with Matthew Genge from the Imperial College of London in 2015 to verify that indeed some of the particles were of extraterrestrial origin. Since then, Larsen has facilitated a community-based network of researchers through a program called "Project Stardust" so that anyone can conduct independent field work and lab analysis to document their own discovery of micrometeorites. Larsen is also a self-trained and well-regarded guitarist, notably in the style of gypsy jazz inspired by Django Reinhardt, and has produced 450 jazz records with many prominent musicians throughout his musical career. Prior to composing music full-time, Larsen was a surrealist painter heavily influenced by Salvador Dali.

Using Microscopy to Find Stardust Anywhere

Jon Larsen[1], Matthew Genge[2] and Jan Braly Kihle[3]
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[2.] Department of Earth Science and Engineering, Imperial College London, London, UK
[3.] Institute for Energy Technology, Kjeller, Norway

Micrometeorites (MMs) are alien stones that are everywhere around us [1]. MMs (~200-400 μm in size) contain stardust older than our Sun and have travelled farther than anything else on Earth. They include matter derived from asteroids and comets, and they hold a wealth of information on the early formation of our solar system. Various example cosmic "spherules" found on Earth are shown in Figure 1(a).

In 2009 a MM literally landed on my table, catching both my attention and intrigue. I became further fascinated by MMs due to an interesting paradox: MMs are the dominant extra-terrestrial material that falls to Earth, yet they cannot be easily found. Historically, MMs could only be found in areas free of any anthropogenic influence, like remote deserts, glaciers and even the Antarctic. MMs fall to Earth at a rate of ~1 particle per square meter per year. Meteorite hunters have tried to build MM traps, but an ideal trap would need to be the size of a football field and have captured particles over decades.

As it turns out, such ideal traps already exist in populated areas: vinyl-covered flat roofs of decades old buildings with low security walls (Figure 1(b)). In 2010, I began collecting dust samples from roofs, roads and parking lots. Over 6 years, I conducted 1000 field searches in populated areas across 50 countries. Using a Zeiss binocular microscope and a custom-built photo rack, I exhaustively examined and classified thousands of particles by color, size and morphology. Recognizing common shapes for anthropogenic and naturally occurring terrestrial particles, I was able to isolate the best MM prospects. In 2015, working with meteorite researchers, scanning electron microscopy and electron microprobe analysis verified the first MM found in a populated area: a 270 μm barred olivine (similar example in Figure 2(a)). Verification and classification of MMs [2] requires careful consideration of particle morphology, composition (chondritic composition [3] example in Figure 2(a)) and microstructure (like magnetite dendritic formation shown in Figure 2(b)). Eventually, 500 MMs were classified [4].

In 2017, I authored and published the book, "In Search of Stardust: Amazing Micrometeorites and Their Terrestrial Imposters." This book is a collection of hundreds of example particles, including both urban MMs as well as various example anthropogenic and terrestrial particles [1]. My extensive travels and interactions with fellow meteorite enthusiasts propelled me to start Project Stardust [5], where amateur MM hunters can document their field search and the use of optical/electron microscopy to identify and analyse MMs. With a broom, a bag, a magnet and a microscope, you can truly find stardust anywhere!

References:
[1] J Larsen, “In search of stardust: amazing micrometeorites and their terrestrial imposters”, (Voyageur Press, Minneapolis, MN).
[2] MJ Genge, C Engrand, M Gounelle and S Taylor, Meteoritics & Planetary Science 43 (2008), p. 497.
[3] DE Brownlee, B Bates and L Schram, Meteoritics & Planetary Science 32 (1997), p. 157.
[4] MJ Genge, J Larsen, M Van Ginneken and MD Suttle, Geology 45 (2017), p. 119.
[5] J Larsen, Project Stardust, https://www.facebook.com/micrometeorites/

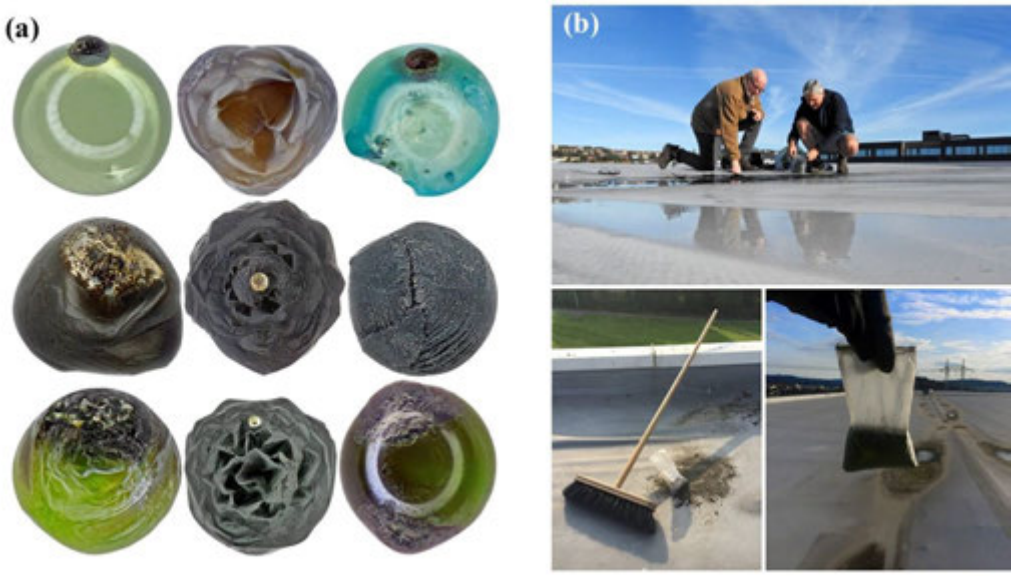


Figure 1. (a) Optical micrographs (OMs) of nine example micrometerorites (MMs): Upper-left - glass / Upper-middle - cryptocrystalline / Upper-right - glass / Middle-left - cryptocrystalline and glass / Middle-middle - cryptocrystalline / Middle-right - barred olivine / Lower-left – porphyritic / Lower-middle - cryptocrystalline / Lower-right- glass. (b) Photographs of Jon Larsen (right) with Morten Bilet conducting a MM search on the roof of BAMA, Oslo, Norway, with additional photographs of the tools.

	C	O	Mg	Al	Si	Ca	Fe
Example MM weight % from Ref. [1]	8.56	57.86	13.39	0.95	12.22	0.54	6.49
Example MM element/Si Ratio	0.70	4.73	**1.10**	**0.08**	1.00	**0.04**	**0.53**
Antarctic MM element/Si Ratio from Ref. [3]	--	--	**1.06**	**0.091**	1.00	**0.056**	**0.528**

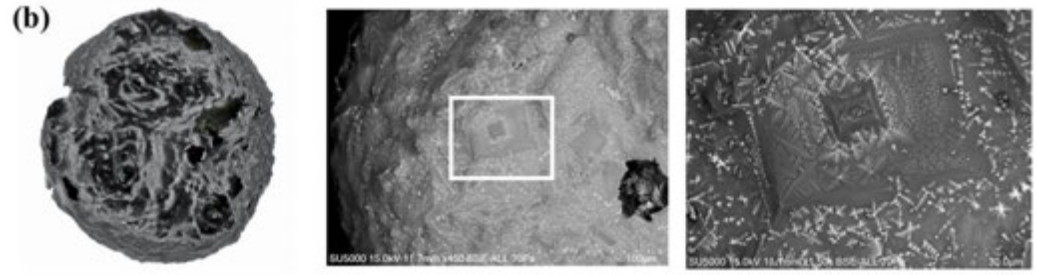


Figure 2. (a) OM of a typical barred olivine MM with a table of EDS-measured elemental composition by weight % [1] that indicates chondritic composition when compared by element/Si ratios to MMs obtained from the Antarctic [3]. (b) OM of a ~700 µm porphyritic olivine MM found at Nesodden, Akershus, Norway, with BSE micrographs indicating dendritic magnetite formation (bright features).

PLENARY SPEAKER

Manu Prakash, PhD, Stanford University

Manu Prakash is an Assistant Professor in the Department of BioEngineering at Stanford University. A prominent goal in the Prakash lab is inventing novel tools for "frugal science" applied to global health, and democratizing access to scientific experience. Prakash and Jim Cybulski, a Ph.D. student in the Prakash lab, co-invented the "Foldscope," a durable, ultra-low cost microscope made mostly of paper with optical quality comparable to conventional research microscopes. Prakash founded Foldscope Instruments in 2015, which handles large-scale production of Foldscopes for global distribution to educators and individuals of all ages. Tens of thousands of Foldscopes have been distributed to 135 countries, with an active online community of both adults and children posting their micrographs and sharing their experiences in scientific discovery. Prakash is a current Howard Hughes Medical Institute–Gates Faculty scholar, a 2016 MacArthur Fellow, one of the "Brilliant 10" featured by *Popular Science* in 2014, and a 2014 MIT Technology Review top 35 innovator under 35 years of age.

Every Child in the World Should Carry a Microscope in Their Pocket

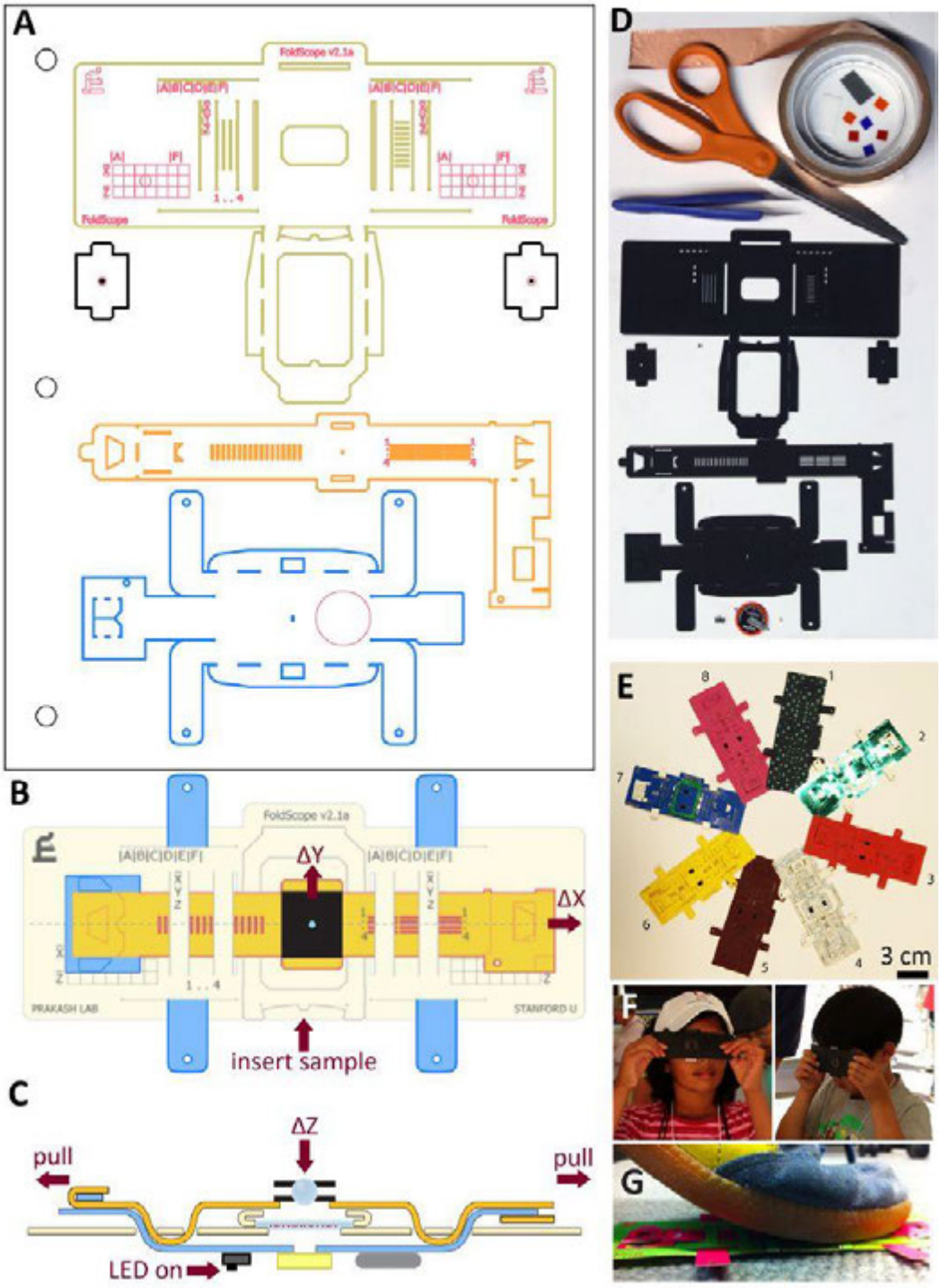
Manu Prakash[1]
[1.]Department of Bioengineering, Stanford University, Stanford, CA 94305, USA

In 2010, I was visiting a health clinic in India and I saw a photo of Mahatma Gandhi looking through a microscope to observe the bacteria that causes leprosy. Gandhi was wearing a dhoti and sitting on the ground, using an expensive European microscope that was impractical for rural India. But Gandhi knew this instrument was needed to help fight disease in his country. This image inspired me to discover new ways to develop low-cost scientific instruments that could be available for everyone, everywhere. Later, while in Thailand, I saw fluorescence microscopes laying on the floor unused because the researchers there were afraid of damaging such expensive equipment.

I decided to build a microscope at a cost of one dollar, yet still have the range of performance necessary to collect useful data. Working on the initial schematics during my flight from Thailand, the first prototype of such an instrument, the Foldscope, became a reality in 2014 [1]. The Foldscope can be assembled in seven minutes from pre-designed, punched cardstock (Figure 1). Folded together using Origami principles, the manually controlled stage has micron-scale positioning control and nanometer scale focusing precision, both by using your thumbs while the instrument is held to your eye. The optical microscope uses a cheap, spherical glass lens and a light emitting diode powered by a watch battery. These microscopes are the size of a bookmark, weigh 8 grams, and can provide magnifications from 140X up to 2,000X.

Jim Cybulski, my former graduate student and Foldscope co-inventor, founded Foldscope Instruments with me in December 2015. The vision for our company is to widely distribute scientific tools like Foldscope while developing online social platforms like "Microcosmos" [2] to allow information sharing and networking for any curious person interested in scientific exploration. Global distribution of Foldscopes across over 135 countries has allowed many activities, including: identification of microscopic eggs for agricultural pests in India, cataloguing the biodiversity of soil arthropods in the Amazon, detection of fake currency and medicine, and mapping pollen diversity in a city landscape. My hope is to extend "frugal science" in a variety of diagnostic tools, including paper-based centrifuges [3] and even realizing a $100 electron microscope.

For children, everything they touch, experience and hold has a microscopic component. Every living thing is made living cells, so just like with astronomy, when you look through a microscope lens, there are galaxies of things crawling around. Growing up in a small town in India, I deeply understand what access to simple but powerful scientific instruments could mean for any kid out there in the world. So, I passionately believe the very real possibility that every child in the world could and should carry a microscope in his/her pocket.



References:

[1] JS Cybulski, J Clements, and M Prakash, PloS one 9.6 (2014), p. e98781.
[2] M Prakash, Microcosmos, http://microcosmos.foldscope.com/
[3] MS Bhamla, B Benson, C Chai, G Katsikis, A Johri and MPrakash, Nature Biomedical Engineering. **1** (2017), p. 0009.

Figure 1. Foldscope design, components and usage. (A) CAD layout of Foldscope paper components on an A4 sheet. (B) Schematic of an assembled Foldscope illustrating panning, and (C) cross-sectional view illustrating flexure-based focusing. (D) Foldscope components and tools used in the assembly, including Foldscope paper components, ball lens, button-cell battery, surface-mounted LED, switch, copper tape and polymeric filters. (E) Different modalities assembled from colored paper stock. (F) Novice users demonstrating the technique for using the Foldscope. (G) Demonstration of the field-rugged design, such as stomping under foot. Reproduced from [1].

M&M 2018 SUNDAY SHORT COURSES

All M&M 2018 symposia, workshops, meetings, and official events will be held at the Baltimore Convention Center unless otherwise indicated.

Organizer: **Mike Marko, Wadsworth Center**

- These full-day courses run from 8:30 AM to 5:00 PM on Sunday, August 5th, 2018.
- A certificate of participation will be issued to each requesting participant, following the conclusion of the M&M 2018 meeting.
- Two (2) Continuing Microscopy Education Units are available (registration fee $10 for members; sign up at Registration Desk).
- Morning and afternoon coffee breaks are included (breakfast and lunch are on your own).
- Separate registration with additional fees is required (visit Registration Desk to sign up).

X10 – Exploring Cryo-Preparation Techniques for Biological Samples

LEAD INSTRUCTORS:
Danielle Jorgens, University of California-Berkeley;
Elizabeth Fischer, Rocky Mountain Laboratories/NIAID/NIH

ROOM 321

In this short course, a variety of topics covering a spectrum of biological sample preparation needs are reviewed, with special attention paid to cryo-preservation via high pressure freezing, plunge freezing, and cryosectioning. In addition, the course focuses on how to best prepare samples for the newest imaging tools and approaches in biological EM imaging, including correlative LM-EM, volume EM, cryo-SEM, and cryo-TEM. Tips and tricks on sample screening and sample-preparation artifacts are covered. Participants will walk through the "ins and outs" of how to prepare samples for their specific experiments. After the course, participants will be provided access to a library of on-line reference material.

X11 – Advanced Focused Ion Beam Methods

LEAD INSTRUCTORS:
Joseph Michael, Sandia National Laboratories;
Lucille Giannuzzi, EXpress LO, LLC

ROOM 322

The use of FIB instruments in materials- and biological-science laboratories is growing rapidly. The versatility and capabilities of these tools are also rapidly improving. This course will first cover ion/solid interactions, which are very important for a user of FIB instrumentation to understand. We discuss different ion sources and the various ions that are now commercially available in FIB instruments, and explore their benefits for a range of applications. We then discuss techniques of sample preparation for SEM and TEM, 3D applications, and micro- and nano-fabrication.

X12 – Practical Considerations for Image Analysis and ImageJ and Clemex Vision

LEAD INSTRUCTOR:
James Grande, General Electric Global Research

ROOM 323

This workshop covers a wide range of practical topics in the field of image analysis. Subjects cover in an easy-to-understand format so that users with little or no experience can understand how image analysis can provide extensive quantitative measurements that may lead to better understanding of material performance. Topics range from input devices to image-processing algorithms and how best to extract quantitative data. Treating image analysis as a problem-solving tool along with discerning key metrics within a microstructure is discussed through several real-life examples. Comparisons using ImageJ/Fiji and a commercial image analysis product are demonstrated.

X13 – SerialEM for EM Data Acquisition

LEAD INSTRUCTORS:
David Mastronarde, University of Colorado-Boulder;
Cindi Schwartz, Rocky Mountain Laboratories/NIAID/NIH;
Guenter Resch, Nexperion

ROOM 324

The course is intended to be of interest to both beginners and advanced users of SerialEM in both biological- and materials-science disciplines. Developed by David Mastronarde at the University of Colorado, SerialEM is open-source and widely used in TEM data acquisition. It is unique in its adaptability for many imaging techniques. The instructors explain installation and calibration of SerialEM, including use of direct-electron detectors and imaging energy filters, and cover imaging techniques such as tilt-series acquisition, low-dose imaging, single-particle acquisition, montaging, mapping, and STEM. We discuss advanced programming such as scripts (macros), plugins, and working with the navigator file or image data to extend SerialEM beyond its native capabilities. A demonstration specifically for course attendees will be performed in the exhibit hall.

X15 – Introduction to SEM with EDS: Imaging and Compositional Analysis

LEAD INSTRUCTORS:
Keana Scott, National Institute of Standards and Technology;
Nicholas Ritchie, National Institute of Standards and Technology

ROOM 326

This introductory-level course will cover basic SEM instrument operation, imaging modes, and compositional analysis with an energy-dispersive x-ray spectrometer. We approach the subject from the perspective of taking high-quality data that can be used to answer metrological, materials and compositional questions with a high degree of confidence. We discuss practical considerations and strategies for different types of applications. The course concludes with discussions of the latest SEM technologies, x-ray detector options, add-on tools, and image-analysis methods.

X16 – Multivariate Methods and Image-Processing for Quantitative Microscopy

LEAD INSTRUCTORS:
Stephen Jesse, Oak Ridge National Laboratory;
Alex Belianinov, Oak Ridge National Laboratory;
Suhas Somnath, Oak Ridge National Laboratory;
Christopher R. Smith, Oak Ridge National Laboratory

ROOM 330

Recent advances in microscopy hardware, statistical algorithms, and supporting information technology have made large volumes of high-veracity materials data easy to acquire. However, these hyperspectral data conceal pertinent information that is difficult to extract and interpret when the data size is large, complex, and corrupted by noise. In this tutorial, we demonstrate a set of open-source Python-based tools that will make image- and spectral-data processing significantly easier for beginners and experts alike. We showcase implementation, and highlight strengths and weaknesses, of various image-processing and machine-learning methods for a subset of real-world microscopy problems.

M&M 2018 PRE-MEETING CONGRESSES

X60 – Pre-Meeting Congress for Students, Postdocs, and Early-Career Professionals in Microscopy & Microanalysis

SATURDAY, AUGUST 4 • 8:20 AM – 5:30 PM • ROOM 345-346

INCLUDED IN REGISTRATION FEE:
Breakfast; AM & PM coffee breaks; Lunch; Offsite social events on Friday & Saturday evenings

Organized by

MSA Microscopy Society of America StC Student Council

ORGANIZERS:
William Bowman, Massachusetts Institute of Technology (Program Chair)
Bukola Obayomi, Arizona State University (Biological Sciences Co-Chair)
Matt Caputo, Youngstown State University (Physical Sciences Co-Chair)
Ethan Lawrence, Arizona State University (Social & Activities Chair)

The MSA Student Council presents the second annual X60 Pre-meeting Congress (PMC-X60) for Students, Postdocs, and Early-career Professionals in Microscopy & Microanalysis. In addition to the premier technical program, the PMC-X60 features informal get-togethers on Friday and Saturday nights so participants can meet in a relaxed setting. The PMC-X60 is organized by, and tailored to, students and early-career professionals, however, all M&M registrants are welcome to register. The PMC-X60 offers a highly interactive forum for participants to discuss their cutting-edge research, and to network and engage with peers ahead of the main meeting. Speakers have been invited from awardees to be honored at M&M 2018, giving attendees an opportunity to sample the best research of their peers in biological science, physical science, analytical science, and instrumentation. Contributed talks and posters give attendees an opportunity to share their work with peers in an intimate and casual setting. Further professional development opportunities include a luncheon featuring a panel of recent graduates currently working in industry, academia, policy, and government labs.

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TSS microscopy

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Lehigh Microscopy School

X61 – Standards and Reference Materials for Microanalysis

SUNDAY, AUGUST 5 • 8:30 AM - 5:00 PM • ROOM 349-350

INCLUDED IN REGISTRATION FEE:
Breakfast, AM & PM coffee breaks, Lunch

Organized by the Focused Interest Group on MicroAnalytical Standards (FIGMAS)

ORGANIZERS:
Julien M. Allaz, University of Colorado
Anette von der Handt, University of Minnesota
Owen K. Neill, University of Michigan

The congress consists of three main topics, each with a set of invited speakers from academic and federal institutions as well as industry (title of each talk to be announced at the congress):

1. Standard-based and Standard-less Best Practices
- Nicholas Ritchie, National Institute of Standards and Technology
- Philippe Pinard, Oxford Instruments
- Steve Seddio, Thermo Fisher Scientific

2. Standard Maintenance and Availability
- Cathy Johnson, Mager Scientific
- Tim Rose, Smithsonian Institution - National Museum for Natural History
- Gene Rodek, SPI

3. Sourcing and Creating Future Standard Materials
- Steve Wilson. U.S. Geological Survey
- William Nachlas, Syracuse University

The congress consists of talks, posters and round-table discussions. Each session will have abundant time for open discussion. At the end of the congress, posters will be set up for informal interaction with the authors and participants.

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X62 – Practical Challenges and Opportunities for *In Situ/Operando* Microscopy in Liquids and Gases

SUNDAY, AUGUST 5 • 8:30 AM - 5:00 PM • ROOM 345-346

INCLUDED IN REGISTRATION FEE:
Breakfast, AM & PM coffee breaks, Lunch

Organized by the Focused Interest Group in Electron Microscopy in Liquids and Gases

ORGANIZERS:
Patricia J. Kooyman, University of Cape Town, South Africa
Houlin Xin, Brookhaven National Laboratory
Raymond R. Unocic, Oak Ridge National Laboratory
Ethan Lawrence, Arizona State University
Joshua Vincent, Arizona State University

Advances in the development and implementation of platforms for *in situ/operando* liquid and gas phase S/TEM experimentation have brought forth new research opportunities in the physical and life sciences, where it is now feasible to routinely image static and dynamic processes of materials behavior in their native liquid or gas environments, at high spatial resolution and under external stimuli such as temperature, electric fields, or reactive gases or liquids. The aim of this PMC will be to address the practical challenges associated with performing in situ and operando experiments in combination with high-speed detectors and big data analytics. Topics covered within this PMC include:

- Developments in liquid and gas cell systems
- Temperature and pressure measurements
- High speed imaging/direct electron detectors/data storage
- Big data analytics
- Integration with multimodal techniques
- Electron beam interactions

The PMC consists of invited talks and a poster session.

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A01 - Professor Hatsujiro Hashimoto Memorial Symposium: Foundations in Imaging Crystals, Defects, and Atoms

ORGANIZERS:
Satoshi Ichikawa, Osaka University, Japan
Masashi Watanabe, Lehigh University

ROOM 341 – BALTIMORE CONVENTION CENTER

MONDAY	1:30 PM
TUESDAY	8:30 AM, 10:30 AM, and 1:30 PM 3:00 PM Poster Session

Professor Hatsujiro Hashimoto is one of the pioneers in imaging crystalline solids by transmission electron microscopy (TEM). His many achievements include the development of TEM instruments and holders, pioneering work in atomic-scale imaging and early contributions in understanding diffraction contrast based on dynamical diffraction theory. In addition, Professor Hashimoto performed in situ observations at elevated temperatures as high as 3000°C in the 1960s, fabricated an environmental TEM instrument with a gas reaction chamber and challenged the field to image single atoms using spectrometry techniques in TEM. His tremendous scientific contributions influenced scientists not only in Japan but also across the world. This symposium is dedicated to the memory of Professor Hashimoto and features technical aspects spanning a broad range of topics representative of the significant breadth and scope of his work and achievements.

A02 - Atomic-Scale Functional Imaging in Aberration-Corrected Electron Microscopy

ORGANIZERS:
Miaofang Chi, Oak Ridge National Laboratory
Jing Tao, Brookhaven National Laboratory
Marta Rossell, Electron Microscopy Center, Switzerland

ROOM 339 – BALTIMORE CONVENTION CENTER

TUESDAY	10:30 AM and 1:30 PM
WEDNESDAY	8:30 AM, 10:30 AM, and 1:30 PM 3:00 PM Poster Session
THURSDAY	8:30 AM, 1:30 PM, and 3:30 PM 10:00 AM Poster Session

S/TEM capabilities of probing structure and chemistry at atomic resolution are routine in microscopy labs owing to the successful invention and implementation of aberration correctors two decades ago. Accompanying the high spatial resolution is the developments of new and revisited imaging and spectroscopy techniques stimulated by the use of aberration correctors along with the emerging new detectors and data analytics. Notably, the recent advancements in differential phase contrast imaging, precise measurements of atomic positions, atomic-scale holography, high resolution tilt-series tomography, depth sectioning with high convergence angles, and 4D data acquisition provides new imaging capabilities for not only structure and chemistry, but also functionalities of materials, bringing about a transformation in the way the materials being understood and designed. This symposium fosters discussions on recent and future developments and applications of aberration-corrected S/TEM.

A03 - Four-Dimensional Scanning Transmission Electron Microscopy (4D-STEM): From Scanning Nanodiffraction to Ptychography and Beyond

ORGANIZERS:
Colin Ophus, Lawrence Berkeley National Laboratory
David Muller, Cornell University

ROOM 343 – BALTIMORE CONVENTION CENTER

MONDAY	1:30 PM 3:00 PM Poster Session
TUESDAY	8:30 AM, 10:30 AM, and 1:30 PM 3:00 PM Poster Session
WEDNESDAY	8:30 AM

STEM experiments that utilize full reciprocal space images of the diffracted converged electron beam at each probe position are becoming increasingly common, due to the widespread adoption of high speed direct electron detectors. These experiments range from micrometer to atomic scale, including measurements of local physical properties, statistical characterization of atomic distributions, phase retrieval methods, and many others. These experiments can also generate an enormous quantity of data, requiring efficient analysis codes and new data handling methods. In this symposium, we cover a wide range of 4D-STEM experiments, and studies examining both their promise and their limitations.

A04 - *In Situ* Transmission Electron Microscopy in Liquid and Gas Cells

ORGANIZERS:
B. Layla Mehdi, University of Liverpool, United Kingdom
Damien Alloyeau, CNRS - Paris Diderot University, France
Niels de Jonge, INM - Leibniz Institute for New Materials, Germany
Larry Allard, Oak Ridge National Laboratory

ROOM 345-346 – BALTIMORE CONVENTION CENTER

TUESDAY	10:30 AM and 1:30 PM
WEDNESDAY	8:30 AM, 10:30 AM, and 1:30 PM 3:00 PM Poster Session
THURSDAY	8:30 AM and 1:30 PM 10:00 AM Poster Session

This symposium discusses the multi-disciplinary challenges and opportunities of in situ transmission electron microscopy (TEM) and scanning TEM (STEM) in liquid- and gas cells. These techniques are used in many fields including electrochemistry, catalysis, energy storage, nanomaterial synthesis, geology, soft materials, and structural- and cell biology. This symposium covers the applications of these techniques, new methods to improve imaging and quantitative analyses, spatial resolution,

hardware and software methods needed for improved temporal resolution, and the role of electron-beam effects.

A05 - Low-Energy Electron and Particle Microscopies in Liquid, Gaseous, and Frozen Conditions

ORGANIZERS:
Andrei Kolmakov, National Institute for Standards and Technology
Olga Ovchinnikova, Oak Ridge National Laboratory
Xiao-Ying Yu, Pacific Northwest National Laboratory
Debbie Stokes, Thermo Fisher Scientific, The Netherlands

ROOM 329 – BALTIMORE CONVENTION CENTER

TUESDAY 1:30 PM
WEDNESDAY 8:30 AM and 10:30 AM
3:00 PM Poster Session

Scanning as well as wide-field electron microscopy and spectroscopy at (near-) atmospheric pressure and in the liquid or frozen state have recently demonstrated impressive progress in biomedical, environmental, and energy-related research under realistic conditions. In addition to ESEM and cryo-SEM, breakthroughs in the development of electron transparent, molecularly impermeable membranes integrated into microfluidic/gas flow cells and micro-reactors have increased the range of innovative applications of low energy electron and ion microscopies and analytical techniques such as SIMS, XPS, AES, CL, EDS, and EBSD. This symposium highlights progress, technical developments and application trends of these novel approaches, serving to increase the visibility of new emerging tools and vendors.

A06 - Mesoscale Correlative Microscopy and Imaging of Physical, Environmental, and Biological Sciences

ORGANIZERS:
Xiao-Ying Yu, Pacific Northwest National Laboratory
Si Chen, Argonne National Laboratory
Nestor J. Zaluzec, Argonne National Laboratory

ROOM 322 – BALTIMORE CONVENTION CENTER

THURSDAY 8:30 AM, 1:30 PM, and 3:30 PM
10:00 AM Poster Session

Mesoscale connects the microscopic and macroscopic worlds, encompassing large differences in size, arrangement, complexity, and operating principle. This symposium promotes latest scientific findings and emerging techniques for mesoscale observations built upon microanalysis, microscopy, and correlative imaging. Besides electron/optical microscopy and spectroscopy used in various microanalysis, synchrotron-based X-ray microscopy or spectroscopy in conjunction with electron microscopy presents new opportunities to study chemical composition, biology, and material ultrastructure. Contributions in biology, catalysis, energy storage, and materials sciences and presentations noting technical and scientific advancement of correlative spectroscopy and microscopy are discussed.

A07 - New Advances in Electron Energy Loss Spectroscopy and Allied Techniques

ORGANIZERS:
Juan Carlos Idrobo, Oak Ridge National Laboratory
Ian MacLaren, University of Glasgow, United Kingdom
Maria Varela, Universidad Complutense de Madrid, Spain

ROOM 341 – BALTIMORE CONVENTION CENTER

WEDNESDAY 10:30 AM and 1:30 PM
THURSDAY 8:30 AM, 1:30 PM, and 3:30 PM
10:00 AM Poster Session

Electron Energy Loss Spectroscopy has been a key tool for the analysis of materials in the (scanning) transmission electron microscope since the introduction of suitable spectrometers in the 1970s. The field continues to expand and develop rapidly, both by the efforts of academic researchers and the equipment manufacturers. This symposium provides a venue for the discussion of the latest advances in the field of EELS in the (S)TEM.

A08 - Machine Learning & Compressive Sensing for Image Acquisition, Processing, and Reconstruction

ORGANIZERS:
Andrew Stevens, Pacific Northwest National Laboratory
Volkan Ortalan, Purdue University
Rowan Leary, Cambridge University, United Kingdom

ROOM 342 – BALTIMORE CONVENTION CENTER

WEDNESDAY 1:30 PM
THURSDAY 8:30 AM, 1:30 PM, and 3:30 PM
10:00 AM Poster Session

This symposium is concerned with the use of advanced statistical, mathematical, and computational methods for computational/compressive sensing; tomographic, ptychographic, and other reconstructions; and data cleaning/refinement techniques such as denoising and super-resolution. Papers focus on important topics in both machine learning and adaptive/computational sensing — especially their application to the acquisition and refinement of microscope data (e.g. images, spectrographs, ptychographs). The symposium covers new microscope designs that depend on computational recovery techniques and other novel post facto machine learning and computational techniques to improve data quality or recover a minimum of useful information possibly by leveraging data across multiple sensors. Our target audience is generic microscope users, to introduce new techniques to the community and facilitate communication leading to their adoption.

A09 - Data Analytics and Model-based Imaging for Microstructure and Physical Property Interpretations

ORGANIZERS:
Lawrence Drummy, U.S. Air Force Research Laboratory
Charles Bouman, Purdue University
Vinayak Dravid, Northwestern University
Alex Belianinov, Oak Ridge National Laboratory

ROOM 342 – BALTIMORE CONVENTION CENTER

TUESDAY	8:30 AM, 10:30 AM, and 1:30 PM 3:00 PM Poster Session
WEDNESDAY	8:30 AM and 10:30 AM

This symposium covers a breadth of topics from emerging multi-modal microscopy techniques, to modern processing methods after the data has been collected. Machine learning methods discussed here focuses on transforming the raw collected signal into physically interpretable results — the data connection to material properties. Specific attention is paid to selecting and applying models in order to guide optimal strategy for extracting useful, scientifically relevant information. The symposium also features new algorithmic and software developments for data denoising, object tracking, correlative analysis, and data management for end use.

A10 - The Joy of Scanning Electron Microscopy

ORGANIZERS:
Raynald Gauvin, McGill University, Canada
Dale Newbury, National Institute of Standards and Technology

ROOM 328 – BALTIMORE CONVENTION CENTER

MONDAY	1:30 PM 3:00 PM Poster Session
TUESDAY	8:30 AM, 10:30 AM, and 1:30 PM 3:00 PM Poster Session
WEDNESDAY	8:30 AM and 10:30 AM

First introduced commercially in 1965, the scanning electron microscope (SEM) has evolved into a core microscopy characterization tool for thick (electron-opaque) specimens, capable of imaging nanometer-scale features with a variety of contrast mechanisms: topographic, compositional, crystallographic, magnetic, and electrical potential. Augmented with energy dispersive X-ray spectrometry (EDS) and electron backscatter diffraction (EBSD), SEM can characterize morphology, elemental composition, and crystal structure. Recently, amazing capabilities using STEM-in-SEM have been demonstrated making the SEM more valuable than ever for materials characterization. This symposium presents a comprehensive overview of SEM as a problem-solving tool whose capabilities are still being developed and extended.

A11 – Solid State X-ray Spectrometry at 50 Years

ORGANIZERS:
Paul Carpenter, Washington University
Edward Vicenzi, Smithsonian Institution
Katherine Burgess, U.S. Naval Research Laboratory
Nicholas Ritchie, National Institute of Standards and Technology

ROOM 327 – BALTIMORE CONVENTION CENTER

MONDAY	1:30 PM 3:00 PM Poster Session
TUESDAY	8:30 AM, 10:30 AM, and 1:30 PM 3:00 PM Poster Session
WEDNESDAY	8:30 AM and 10:30 AM

50 years ago, Fitzgerald, Keil, and Heinrich published the first results obtained from an energy-dispersive X-ray spectrometer (EDS) in Science. From identification of unknown materials to compositional mapping and quantitative microanalysis, EDS has advanced our understanding of an enormous range of materials and is used worldwide in microanalysis and microscopy laboratories. The symposium links historical and technical developments of solid state X-ray instrumentation, data processing, applications, and emerging detection systems. Perspectives on the developments in EDS from a technological and educational perspective are featured, including invited and contributed presentations from the inventor, vendor, and scientific communities.

A12 - The FIB-SEM Laboratory: Sample Preparation and Beyond

ORGANIZERS:
Joshua F. Einsle, University of Cambridge, United Kingdom
Marco Cantoni, École Polytechnique Fédérale de Lausanne, Switzerland
Timothy Burnett, University of Manchester, United Kingdom

ROOM 328 – BALTIMORE CONVENTION CENTER

WEDNESDAY	1:30 PM
THURSDAY	8:30 AM and 1:30 PM 10:00 AM Poster Session

The modern FIB-SEM microscope combines the high-resolution scanning electron microscopy (SEM) analytical techniques and the site-specific nanoscale milling capabilities of a focused ion beam (FIB). In this symposium, presentations cover novel studies and ongoing developments combining the nanofabrication capabilities of the FIB-SEM with analytical characterization and/or in situ testing. Research across a broad range of materials applications is presented with the intent of contributors and attendees to share knowledge on optimal utilization of this technology. This symposium highlights that the FIB-SEM is more than a transitory step on the way to other microscopic modalities, but truly, a laboratory space in its own right.

ANALYTICAL SCIENCES SYMPOSIA continued

A13 - Pushing the Limits of Cryo-EM

ORGANIZERS:
Mike Marko, Wadsworth Center
Anchi Cheng, New York Structural Biology Center

ROOM 349 – BALTIMORE CONVENTION CENTER

WEDNESDAY 1:30 PM
THURSDAY 8:30 AM, 1:30 PM, and 3:30 PM
10:00 AM Poster Session

Cryo-EM provides single-particle maps with resolution in the 3 angstrom range, and sub-tomogram-averaged maps in the 1nm range, all with the sample in a near-native, hydrated state. This symposium highlights technology and applications, with invited speakers who are key to the latest developments, and includes contributed papers from participants in this exciting field.

A14 - Quantitative Magnetic Characterization in the TEM

ORGANIZERS:
Darius Pohl, IFW Dresden, Germany
Ben McMorran, University of Oregon
Martha McCartney, Arizona State University
Sebastian Schneider, IFW Dresden, Germany

ROOM 338 – BALTIMORE CONVENTION CENTER

WEDNESDAY 1:30 PM
THURSDAY 8:30 AM, 1:30 PM, and 3:30 PM
10:00 AM Poster Session

In this symposium, transmission electron microscopy techniques for imaging magnetic fields, such as Lorentz microscopy, differential phase-contrast (DPC), electron holography, and electron energy-loss magnetic chiral dichroism (EMCD), are emphasized. As functional magnetic materials continue to decrease in size, surfaces and interfaces play a growing significance on novel nanoscale magnetic phenomena. Further, skyrmions and topological insulators have recently received widespread interest leading to an increasing demand for high resolution quantitative magnetic measurements in combination with local structural characterization. With recent advances in mind, this symposium's goal brings together experimentalists involved in applying/developing magnetic techniques and those involved in simulations and/or the development of theory to explain quantitatively magnetic phenomena with TEM.

A15 - Strain Analysis from Nano- to Micro-Length Scales

ORGANIZERS:
Brendan Foran, The Aerospace Corporation
Ling Pan, Intel Corporation
Guoda Lian, IBM East Fishkill

ROOM 327 – BALTIMORE CONVENTION CENTER

WEDNESDAY 1:30 PM
THURSDAY 8:30 AM and 1:30 PM
(This symposium has no poster session.)

This symposium focuses on the application of microscopy and microanalysis techniques to investigate strain across various length scales. For example, transmission EM-based methods such as geometric phase analysis, precession nano-beam diffraction and dark field holography are providing significant insights on nanoscale strain in transistor devices. Scanning electron microscopy-based methods like high-resolution electron backscatter diffraction (HR-EBSD) and transmission Kikuchi diffraction (TKD) are achieving excellent strain sensitivity and nanometer resolution, respectively. X-ray scattering methods and Raman spectroscopy are bridging the micro and nano length scales. Contributions highlight developments in strain measurements and mapping approaches from across a wide range of technological applications and materials systems including (but not limited to) semiconductors, ceramics, and metals.

A16 - Sterling Newberry Memorial Symposium on X-Ray Imaging

ORGANIZERS:
Jeffrey Davis, PNDetector
Nikolaus Cordes, Los Alamos National Laboratory
Eric Telfeyan, General Electric
Richard Wuhrer, Western Sydney University, Australia

ROOM 323 – BALTIMORE CONVENTION CENTER

MONDAY 1:30 PM
TUESDAY 8:30 AM
3:00 PM Poster Session

This symposium is held in honor of one of the pioneers of X-ray microscopy and founders of the Microscopy Society of America, Sterling Newberry. In honor of his work, this symposium focuses on imaging and X-ray microscopy. Contributions include imaging using focused probe techniques such as μXRF and μXRD, correlative imaging techniques and direct applications of X-ray imaging to solving complex problems in materials science and engineering. The symposium also features contributions on new detectors, software and analytical tools for X-ray imaging.

A17 - Surface and Subsurface Microscopy and Microanalysis

ORGANIZERS:
Vincent S. Smentkowski, General Electric
John A. Chaney, The Aerospace Corporation
Chanmin Su, Bruker Corporation-Nano Division
Xiao-Ying Yu, Pacific Northwest National Laboratory

ROOM 326 – BALTIMORE CONVENTION CENTER

MONDAY	1:30 PM 3:00 PM Poster Session
TUESDAY	8:30 AM, 10:30 AM, and 1:30 PM 3:00 PM Poster Session
WEDNESDAY	8:30 AM and 10:30 AM

Surface properties such as composition, uniformity, thickness, and topography dictate the performance of many systems. The surface analyst is asked to detect and image species present in ever-lower concentrations and within ever-smaller spatial and depth dimensions. This symposium emphasizes state-of-the-art surface analysis and interpretation methods encompassing all aspects of surface mass spectrometry; scanning probe microscopy; and nano-scale chemical and physical property analysis via TERS, IR, and other probe-based techniques. We also cover advanced data analysis tools; correlative imaging (e.g., AFM and SEM; AFM and SIMS; etc.); the use of complementary surface analytical instrumentation to perform a complete analysis of complex material systems; and surface analytical challenges.

A18 - Vendor Symposium

ORGANIZERS:
Luisa Amelia Dempere, University of Florida
Andreas Holzenburg, University of Texas-Rio Grande Valley

ROOM 322 – BALTIMORE CONVENTION CENTER

TUESDAY	8:30 AM, 10:30 AM, and 1:30 PM 10:00 AM Poster Session

This symposium is a forum for vendors to highlight advances in the development and improvement of their products. It covers new methods and technologies that advance the fields of microscopy and microanalysis for both physical and biological sciences and provides a forum for an exchange of ideas and best practices.

B01 - Microscopy and Analysis in Forensic Science

ORGANIZERS:
Keana Scott, National Institute for Standards and Technology
Robert Pope, Department of Homeland Security
Eric Steel, National Institute for Standards and Technology

ROOM 348 – BALTIMORE CONVENTION CENTER

TUESDAY 8:30 AM, 10:30 AM, and 1:30 PM
10:00 AM Poster Session

Symposium topics include the application of various microscopy and spectroscopy techniques in forensic case samples and research. The techniques of interest are, but not limited to, electron and ion microscopy, X-ray microanalysis, confocal microscopy, atomic force microscopy, FT-IR imaging, Raman mapping, neutron scattering, and 3D surface metrology. Topics include case histories and the type of evidence presented for examination, identification, and characterization of trace evidence and sample preparation for microscopic examination. Also included are the interpretation of case-related microscopic and spectral results, forensic research topics, and preparation and presentation of the results of microscopic analyses of trace evidence for court testimony.

B02 - Microscopy in Food Science: Bridging Biology and Materials Science

ORGANIZERS:
Almut Vollmer, Utah State University
Nabil Youssef, Utah State University

ROOM 348 – BALTIMORE CONVENTION CENTER

WEDNESDAY 8:30 AM and 10:30 AM
(This symposium has no poster session.)

Recent advances in instrumentation have promoted the revival of microscopy in food science, an area not traditionally covered at microscopy meetings, yet of broad practical importance. This symposium gives an overview of how various microscopy techniques have been utilized to gain a deeper understanding of complex food systems at the interface of biology and materials science. Scientists from industry, academia, and government use this symposium as a platform to exchange ideas and expertise in a research field that heavily depends on interdisciplinary approaches.

B03 - 3D Structures: From Macromolecular Assemblies to Whole Cells (3DEM FIG)

ORGANIZERS:
Joaquin Ortega, McGill University, Canada
Michael Radermacher, University of Vermont
Teresa Ruiz, University of Vermont

ROOM 349 – BALTIMORE CONVENTION CENTER

TUESDAY 8:30 AM, 10:30 AM, and 1:30 PM
3:00 PM Poster Session

Our understanding of the 3D structure and functional subtleties of complex biological systems has skyrocketed due to recent advances in EM imaging technology and hybrid methodologies. This symposium highlights structural studies of macromolecules, microorganisms, cells, and tissues using state-of-the-art high-resolution techniques. These techniques include electron crystallography, single particle cryo-EM, helical reconstruction, STEM; AFM, X-ray crystallography, and molecular modeling. Biological topics of interest include cellular architecture, metabolism, trafficking, communication, and division; gene regulation, transcription, and translation; host-pathogen interactions and virus structure; in situ studies using TEM and SEM, and all aspects of structure-function studies of biological assemblies.

B04 - Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants, and Animals

ORGANIZERS:
Greg Ning, Pennsylvania State University
Ru-Ching Hsia, University of Maryland-Baltimore
Trace Christensen, Mayo Clinic

ROOM 350 – BALTIMORE CONVENTION CENTER

MONDAY 1:30 PM
3:00 PM Poster Session
TUESDAY 8:30 AM, 10:30 AM, and 1:30 PM
3:00 PM Poster Session

Microscopy is critically important in the ongoing research, detection, diagnosis and treatment of diseases. Advances in microscopy techniques provide us with an improved ability to diagnose and study the origins and development of diseases in human, plant and animal specimens. This symposium is an opportunity to share information on the microscopic investigation of cells, tissues and entire organisms in clinical, diagnostic and research laboratories. Emphasis is placed on using latest or innovative sample processing techniques or instrumentation in both clinical and research laboratories.

B05 - Focused on Microbes!

ORGANIZERS:
Alice Dohnalkova, Pacific Northwest National Laboratory
Xiao-Ying Yu, Pacific Northwest National Laboratory

ROOM 347 – BALTIMORE CONVENTION CENTER

WEDNESDAY 8:30 AM and 10:30 AM
3:00 PM Poster Session

Microscopy and microanalysis are important in understanding and characterizing all aspects of microbiology and systems biology including bacteria, fungi, and other microbes. We present on all topics of environmental processes but not limited to: microbial interactions with metals and minerals, with plant root and leaf; symbionts, pathogens and immune reactions, and biofilm formation on various surfaces. Contributions including novel optical and electron microscopic tools and method development, educational outreach, and scientific findings in microbial interactions are presented.

B06 - Imaging Life at New Frontiers of Spatiotemporal Resolution and Adaptive Microscopy

ORGANIZERS:
Jay Potts, University of South Carolina Medical School
Teng-Leong Chew, Janelia Research Facility (Howard Hughes Medical Institute)

ROOM 350 – BALTIMORE CONVENTION CENTER

WEDNESDAY 1:30 PM
3:00 PM Poster Session
THURSDAY 8:30 AM and 1:30 PM

This symposium presents three important frontiers that have recently transformed optical imaging, including (i) the various methods in breaking the diffraction limit to achieve super-resolution microscopy, (ii) the renaissance of selective plane illumination (light sheet) microscopy and (iii) the integration of adaptive methods into optical microscopy to correct for the heterogeneity in refractive indices, dynamic changes in sample size during development of living specimens. These technologies have in turn ushered in an era of big data and promises to image life on scales previously thought impossible. In this symposium, we highlight the exciting possibilities and hurdles faced by modern optical microscopy. In addition, the symposium covers new developments and techniques used to image life as never before.

B07 - Pharmaceuticals: Imaging, Analysis, and Regulation of Medical Products and Devices

ORGANIZERS:
Jason Mantei, Baxter
Gianpiero Torraca, Amgen

ROOM 348 – BALTIMORE CONVENTION CENTER

MONDAY 1:30 PM
3:00 PM Poster Session

This symposium presents diverse content related to the research, development, manufacture, and use of pharmaceuticals and medical products/devices. Content features the use of advanced techniques to address the unique problems that arise during drug discovery, vaccine research, formulation, biocompatibility, production, product life-cycle, and eventual patient use. In-depth technical presentations describe the development of methods specially optimized for use with these real-world materials and biological systems, including hybrid and correlative techniques. Additionally, given the proximity of the conference to regulatory bodies in the US, there is a secondary focus on discussing and understanding regulations and data integrity concerns as they specifically apply to the pharmaceutical industry.

B08 - 3D Structure of Complex Soft Materials Derived from Electron Tomography

ORGANIZERS:
Deborah Kelly, Virginia Tech Carilion Research Institute
Steven Ludtke, Baylor College of Medicine
Elizabeth Wright, University of Wisconsin

ROOM 349 – BALTIMORE CONVENTION CENTER

WEDNESDAY 8:30 AM and 10:30 AM
3:00 PM Poster Session

Electron tomography (ET) is trailblazing the resolution revolution in the EM field. Recent advances in sample preparation, instrumentation and methodology have widened the scope of ET to reveal information at sub-nanometer resolution and target length scales in the micrometers. This symposium highlights leading scientific and technological developments in structural studies of complex systems in biology and materials science, using the widest possible range of ET imaging approaches and their integration with complementary techniques. Applications and developments covering (but not limited to) aberration-corrected, energy-filtered TEM and STEM, phase plates, diffraction, and holography, are presented. Contributions include complementary approaches such as correlative light-electron microscopy, X-ray tomography, serial-block face SEM/AFM, and novel processing tools — including sub-volume alignment, classification and averaging.

P01 - Advances in Electron, X-ray and Neutron Spectro-imaging/Holography of Energy Materials and Devices

ORGANIZERS:
Feng Wang, Brookhaven National Laboratory
Chongmin Wang, Pacific Northwest National Laboratory
Kazuo Yamamoto, Japan Fine Ceramics Center, Japan
Michael Toney, Stanford University

ROOM 336 – BALTIMORE CONVENTION CENTER

MONDAY	1:30 PM
TUESDAY	8:30 AM, 10:30 AM, and 1:30 PM
	3:00 PM Poster Session
WEDNESDAY	8:30 AM, 10:30 AM, and 1:30 PM
	3:00 PM Poster Session

In order to address fundamental questions related to energy storage and conversion, there have been significant efforts in developing electron, X-ray and neutron techniques with improved spatial and temporal resolution and chemical sensitivity. These efforts better resolve the dynamic structural and chemical changes within materials, at interfaces and in devices. Developments in sample environment and in situ capabilities open new opportunities for probing proton, lithium, oxygen, and other charge/mass carriers, and tracking their transport in liquid, solid and across liquid-solid/solid-solid interfaces. This symposium focuses on recent advances in electron, X-ray, and neutron spectro-imaging/holography techniques for characterizing materials, interfaces and devices related to energy and nuclear applications, such as electrochemical energy storage, fuel cells, photocatalysis, photovoltaics, thermoelectrics and nuclear energy systems.

P02 - Atomically Thin 2D Materials: Recent Results and Challenges

ORGANIZERS:
Raul Arenal, Universidad de Zaragoza, Spain
Quentin Ramasse, SuperSTEM Laboratory, United Kingdom

ROOM 338 – BALTIMORE CONVENTION CENTER

MONDAY	1:30 PM
TUESDAY	8:30 AM, 10:30 AM, and 1:30 PM
WEDNESDAY	8:30 AM and 10:30 AM
	3:00 PM Poster Session

Recently, 2D materials, down to atomically thin crystals, have been a clear point of interest for research. This significant interest comes mainly from the attractive electronic, optical and mechanic properties (among others) that this kind of materials can display; as well as a vast number of potential applications. TEM techniques (structural and analytical modes) have provided major advances in the study of these materials, including, very rich information at the atomic scale. This symposium focuses on the state-of-the-art, current challenges and perspectives of TEM studies in these materials. Studies employing other characterization techniques, including Raman and infrared spectroscopy, XPS, photoluminescence, cathodoluminescence and scanning probe microscopy are also presented alongside contributions calling upon theoretical modeling to predict the properties and structure of these fascinating materials.

P03 - Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications

ORGANIZERS:
Zonghoon Lee, Ulsan National Institute of Science and Technology, Korea
Moon Kim, University of Texas-Dallas

ROOM 337 – BALTIMORE CONVENTION CENTER

TUESDAY	10:30 AM and 1:30 PM
	3:00 PM Poster Session
WEDNESDAY	8:30 AM, 10:30 AM, and 1:30 PM
	3:00 PM Poster Session
THURSDAY	8:30 AM and 1:30 PM

With recent advances in synthesizing 0D and 1D materials with various morphology for their specific needs, they are now poised to make disruptive advances in energy, nano-electronics, health, and environment-related areas. These low dimensional materials are also stimulating new applications in many new areas. This symposium covers various aspects of advanced 0D and 1D materials including synthesis, properties and characterization by TEM, STEM, spectroscopy, diffraction, in situ methods and other surface analytical techniques, theoretical modeling, and technological applications. Presentations include areas of nanoparticles, nanowires and nanotubes, growth morphology, defects, surfaces, interfaces, and new and emerging applications.

P04 - *In Situ* Methods for Probing Properties and Dynamics in Materials

ORGANIZERS:
Sanjit Bhowmick, Bruker Corporation-Nano Division
Chaoying Ni, University of Delaware
Andrew Minor, University of California-Berkeley and Lawrence Berkeley National Laboratory

ROOM 340 – BALTIMORE CONVENTION CENTER

TUESDAY	8:30 AM, 10:30 AM, and 1:30 PM 3:00 PM Poster Session
WEDNESDAY	8:30 AM, 10:30 AM, and 1:30 PM 3:00 PM Poster Session
THURSDAY	8:30 AM, 1:30 PM, and 3:30 PM 10:00 AM Poster Session

In situ methods inside electron microscopes provide unique insight into the dynamics of materials in response to external stimuli at the micrometer, nanometer, and atomic scale. Recent advances in microscopy techniques, analytical detectors, high-speed cameras, and computing resources are able to provide unprecedented insights and fundamental understanding of intrinsic behavior of materials, assemblies and devices as they are exposed to mechanical forces, heating, photon irradiation, electromagnetic fields. The focus of this symposium brings together those in the microscopy and characterization community that are active in the development and application of in situ methods. Presentations include key developments in the discoveries, techniques, and experimental methods that aid in the fundamental understanding of properties and mechanisms of small-scale materials, assemblies, and devices.

P05 - Minimizing Beam-Sample Interactions by Modulating Electron Beams in Space and Time

ORGANIZERS:
Christian Kisielowski, Lawrence Berkeley National Laboratory
Joerg Jinschek, The Ohio State University
David Flannigan, University of Minnesota
Hector Calderon, Instituto Politécnico Nacional, Mexico

ROOM 344 – BALTIMORE CONVENTION CENTER

MONDAY	8:30 AM
TUESDAY	8:30 AM, 10:30 AM, and 1:30 PM
WEDNESDAY	8:30 AM 3:00 PM Poster Session

In high-resolution electron microscopy objects are actively altered by the intense electron irradiation that is necessary to reach single atom sensitivity. In these circumstances, a control of beam-sample interactions is no longer a commodity but a necessity. It is of outstanding interest to develop new tools and concepts that strive for a stricter control of the probing electron beam in space and time in order to optimize the detection of every scattering event. Further, new insights on the physical mechanisms of beam-matter interaction is critical for atomic scale imaging. This symposium presents the exercise of improved control of electron beam-induced alterations of soft and hard matter with the goal to reveal its genuine state. Efforts to further our understanding of the fundamental effects of the electron on different environments and at interfaces are also presented, as well as topics discussed in the 2017 Radiation Damage Pre-Meeting Congress.

P06 - Applications of Integrated Electron Probe Microscopy and Microanalysis in Characterizing Natural and Synthetic Materials

ORGANIZERS:
Kat Crispin, Pennsylvania State University
Colin MacRae, CSIRO, Australia
Owen Neill, University of Michigan

ROOM 329 – BALTIMORE CONVENTION CENTER

WEDNESDAY	1:30 PM
THURSDAY	8:30 AM, 1:30 PM, and 3:30 PM 10:00 AM Poster Session

Electron beam instruments have been merging with other techniques to extract information such as bonding, valence, and density-of-state, which, combined with elemental analysis, offers new insights into the structure and chemistry of natural and synthetic materials. Researchers now have access to an analytical toolbox enabling characterization in a range of controlled environments (liquid and gas) and conditions (elevated temperatures to liquid helium). This symposium showcases synergies of new and emerging techniques, while highlighting recent advances in areas such as optical analysis using Raman spectroscopy, cathodoluminescence, soft X-ray spectrometry, and others. Contributions covering some or all of these new developments and re-emerging technologies are presented.

P07 - Planetary Building Blocks and the Techniques Needed to Analyze Them

ORGANIZERS:
Tom Zega, University of Arizona
Michelle Thompson, NASA Johnson Space Center
Emma Bullock, Carnegie Institution for Science

ROOM 324 – BALTIMORE CONVENTION CENTER

WEDNESDAY	10:30 AM and 1:30 PM 3:00 PM Poster Session
THURSDAY	8:30 AM and 1:30 PM

After successful missions to collect solar wind (NASA Genesis), cometary dust (NASA Stardust), and asteroidal regolith (JAXA Hayabusa) and with the successful launches of the JAXA Hayabusa2 and NASA OSIRIS-REx missions, the planetary-materials community is firmly within the era of sample return. This symposium presented the use of microscopy and related techniques to explore the origins of planetary materials. Contributions discuss a range of topics including but not limited to: current analytical approaches, developments in new characterization strategies, developments in spatial and spectral resolution for pushing spectroscopic detection sensitivity and precision, and new protocols for sample handling.

PHYSICAL SCIENCES SYMPOSIA continued

P08 - Spectroscopic and Imaging Studies in Heritage Science

ORGANIZERS:
Edward Vicenzi, Smithsonian Institution
John Mansfield, University of Michigan
Thomas Lam, Smithsonian Institution

ROOM 326 – BALTIMORE CONVENTION CENTER

WEDNESDAY 1:30 PM
3:00 PM Poster Session
THURSDAY 8:30 AM, 1:30 PM, and 3:30 PM

The application of microscale and nanoscale characterization techniques to the examination of cultural heritage materials has greatly enhanced our understanding of the processes that formed, and subsequently transformed those materials to their present state. Understanding the chemistry and morphology of heritage materials from the macro/mesoscopic scale to the microscale is of critical importance for our increasingly deeper levels of knowledge of the interaction between objects and their environment. This symposium includes invited and contributed presentations from students, conservators, conservation scientists, researchers, and those from other disciplines who have an interest in the preservation of cultural heritage.

P09 - Microstructure and Mechanics Deformation Symposium

ORGANIZERS:
Frank Muecklich, Saarland University, Germany
James Martinez, NASA Johnson Space Center

ROOM 325 – BALTIMORE CONVENTION CENTER

TUESDAY 1:30 PM
3:00 PM Poster Session
WEDNESDAY 8:30 AM, 10:30 AM, and 1:30 PM
3:00 PM Poster Session
THURSDAY 8:30 AM and 1:30 PM
10:00 AM Poster Session

This symposium focuses on the further development of advanced 2D microstructure analysis as well as the application and development of tomographic techniques and 3D microstructure analysis including sophisticated 3D data evaluation. It is important to consider the measurement of mechanical properties in conjunction with methods for visualizing a material's microstructure and its evolution during processing or deformation. Small-scale mechanical techniques such as ex situ and in situ compression, tension, bending or indentation generate fundamental insight into deformation processes that can be paired with structural techniques such as atom-probe tomography, electron tomography, synchrotron tomography and related digital image correlation methods are presented.

Special Educational Opportunities

X90 Microscopy in the Classroom: Strategies for Education and Outreach

ORGANIZER:
Donovan Leonard, Oak Ridge National Laboratory

ROOM 324-325 – BALTIMORE CONVENTION CENTER

TUESDAY 8:30 AM and 10:30 AM
WEDNESDAY 3:00 PM Poster Session

X91 Microscopy Explorations (Formerly "Family Affair")

ORGANIZERS:
Elaine Humphrey, University of Victoria, Canada
Janet Schwarz, University of Vermont
Pat Connelly, National Institutes of Health

ROOM 322-323 – BALTIMORE CONVENTION CENTER

WEDNESDAY 1:30 PM

X92 Project MICRO - Outreach

ORGANIZERS:
Elaine Humphrey, University of Victoria, Canada
Caroline Schooley
Janet Schwarz, University of Vermont
Pat Connelly, National Institutes of Health

M&M 2018 EXHIBIT HALL – MSA MEGABOOTH (#1329) – BALTIMORE CONVENTION CENTER

Exhibit Hall Hours

The Technologists' Forum is a committee dedicated to the growth and development of technologists within the Microscopy Society of America. The Forum organizes a symposium, special topics/lecture workshops, and roundtable discussion, and staffs an exhibit booth at the annual M&M meeting. A semi-annual newsletter, website, and bulk e-mailer are used to increase contact among its members and expand their participation within MSA. Forum services that are available to members include the Microscopy Facilities Directory. The Forum also sponsors the Professional Technical Staff Awards which is a competitive program to encourage participation of the technologists at the annual meeting.

X30 - Technologists' Forum: E. Ann Ellis Memorial Symposium

ORGANIZERS:
Andreas Holzenburg, University of Texas-Rio Grande Valley
Janice G. Pennington, University of Wisconsin-Madison

ROOM 347 – BALTIMORE CONVENTION CENTER

TUESDAY 1:30 PM

"If we don't have a protocol, we are developing one," said Ann Ellis when interviewing for the position of research scientist in the Microscopy & Imaging Center at Texas A&M University. After she joined the team when asked how she liked it, she responded, "Oh, this is my dream job." What did she get so excited about? Helping faculty, staff and students with their specimen preparation and imaging needs; teaching theory (never without a strong hands-on component); developing new protocols to improve specimen preparation methodology to enable data acquisition to those who otherwise could afford it; imparting knowledge on ultrastructural pathology; and engaging in outreach efforts. And she did it with a passion second to none. Ann dedicated her life to electron microscopy and specimen preparation, and to the Microscopy Society of America and local affiliate societies alike, such as her all-time favorite, the Southeastern Microscopy Society – otherwise known as SEMS.

This symposium celebrates the life of Ann Ellis with talks covering research studies that benefited and still benefit from Ann's input and approach, or simply echo her passion for it.

X31 - Technologists' Forum Special Topic Session: Specimen Preparation for Correlative FIB-SEM and XRM

ORGANIZER:
Caroline Miller, Indiana University School of Medicine

ROOM 347 – BALTIMORE CONVENTION CENTER

TUESDAY 8:30 AM

3D characterization and modeling of microstructures at levels of light and electron microscopy has had a surge in interest and activity across a variety of scientific fields. Correlative work using FIB-SEM and XRM microscopes are being used to gain the necessary data and understanding of different types of microstructures from the materials to the biological world. A thorough knowledge of specimen preparation is required to achieve the maximum amount of correct information from these microscopes, while avoiding artifacts. It is important to examine surface features that represent structures not modified due to specimen preparation. The purpose of this special session will look at the specimen preparation needed for this type of correlative microscopy.

X32 - Technologists' Forum Roundtable Session: Sample Preparation Strategies for Super-Resolution Correlative Electron Microscopy

ORGANIZER:
Janice G. Pennington, University of Wisconsin-Madison

ROOM 350 – BALTIMORE CONVENTION CENTER

WEDNESDAY 10:30 AM

This roundtable session will cover basic steps needed to correlate super-resolution fluorescence microscopy and electron microscopy with emphasis on PALM, iPALM and STORM. Proper balance of fixatives as well as specific infiltration and embedding protocols are necessary to preserve the fluorophore as well the ultrastructural integrity of the sample. Choosing the correct fluorescent label will be discussed as well as alignment of the fluorescent and EM data sets. This discussion will be good for attendees who are new to these techniques.

T M&M 2018 TUTORIALS

The physical sciences and biological sciences tutorials serve mainly as educational tools for attendees of the annual M&M meeting, by offering to a select number of researchers the opportunity to give extended lectures on practical aspects of certain microscopy techniques, methods, and computations. Generally focused on cutting-edge and/or immediately relevant microscopy, these tutorials give speakers opportunities to venture well beyond the cursory introductory material of platform presentations, which results in providing attendees with an in-depth and practical understanding of a given technique.

Physical Sciences Tutorials

ORGANIZER:
Donovan Leonard, Oak Ridge National Laboratory

One Continuing Education Microscopy Unit (CEMU) is available for each Physical Sciences Tutorial attended. Inquire at registration desk about CEMU fees.

X40 - Scanning Nanobeam Diffraction

INSTRUCTOR: Colin Ophus, Lawrence Berkeley National Laboratory

ROOM 321 – BALTIMORE CONVENTION CENTER

WEDNESDAY 1:30 PM

Traditional scanning transmission electron microscopy (STEM) detectors are large, single pixels that integrate a subset of the transmitted electron beam signal scattered from each electron probe position. These transmitted signals are extremely rich in information, containing localized information on sample structure, composition, phonon spectra, three-dimensional defect crystallography and more. Conventional STEM imaging experiments record only 1-2 values per probe position, throwing away most of the diffracted signal information. With the introduction of extremely high speed direct electron detectors, we can now record a full image of the diffracted electron probe at each position, producing a four-dimensional dataset we refer to as a 4D-STEM experiment. This tutorial describes the challenges and opportunities created by 4D-STEM.

X41 - Entrepreneurship in the Microscopy Community

INSTRUCTOR: John Domiano, Protochips

ROOM 321 – BALTIMORE CONVENTION CENTER

TUESDAY 1:30 PM

Several entrepreneurs from the microscopy community will be in attendance for a round table Q&A with tutorial attendees on topics including, but not limited to:

- Instrumentation development and commercialization
- Practical steps to take when starting your own microscopy based business
- Panel discussion on business start-up best practices
- Role of local affiliated microscopy societies in bringing microscopists and businesses together

X42 - Ultra-High Spatial Resolution EBSD: Transmission Kikuchi Diffraction (TKD) in the SEM

INSTRUCTOR: Scott D. Sitzman, The Aerospace Corporation

ROOM 321 – BALTIMORE CONVENTION CENTER

WEDNESDAY 8:30 AM

Introduction to TKD: What distinguishes TKD from conventional EBSD, to its benefit and detriment from the standpoint of both the researcher and the practitioner.

- Hardware, software and SEM requirements & considerations
- TKD sample preparation
- Advice for high quality data collection

Biological Sciences Tutorials

ORGANIZER:
Tommi A. White, University of Missouri

X43 - Cryo-FIB: Overcoming the Hurdle of Sample Preparation for In Situ Cryo-Electron Tomography

INSTRUCTOR: Miroslava Schaffer, Max Planck Institute of Biochemistry, Germany

ROOM 321 – BALTIMORE CONVENTION CENTER

MONDAY 1:30 PM

In recent years, Cryo-Focused Ion Beam (Cryo-FIB) milling of frozen hydrated specimen has become a key technique for in situ Cryo-Electron Tomography, immensely broadening the scientific questions which can be tackled. However, the obtainability of results hinges strongly on the quality of the preparation and its reproducibility. In this tutorial, we will present the technique developments at Max Planck in Martinsried and show what is needed for reliable, high-quality specimen preparation. We will discuss the critical issues of the preparation workflow, including:

- Hardware requirements
- Optimizing freezing conditions
- Different milling strategies
- Protective coatings
- Obtaining homogeneously thin, large field-of-view lamellas
- Avoiding contamination
- Improving sample conductivity
- The influence of different specimen
- Tips and tricks

TUTORIALS continued

X44 - Single-Particle Cryo-EM: Data Processing Techniques for Obtaining Optimal Results

INSTRUCTOR: Ali Punjani, University of Toronto

ROOM 321 – BALTIMORE CONVENTION CENTER

WEDNESDAY 10:30 AM

Single-particle cryo-EM is a powerful method for resolving near-atomic resolution of 3D structures of a wide variety of biologically important molecules, including membrane proteins and GPCRs. As data collection and sample preparation mature, and the use of cryo-EM expands, expertise and tools for data processing are critical for achieving state-of-the-art results at high resolutions. In this tutorial, we present a workflow of data processing methods and advanced algorithms available in the cryoSPARC software package for single particle cryo-EM, guiding the audience through processing stages including:

- Motion correction of microscope movies
- Picking single particles from micrographs
- Cleaning and sorting particle stacks in 2D
- Solving multiple heterogenous structures in 3D
- Refinement of structures and validation
- Advanced refinement techniques to improve resolution
- Tips and tricks

X45 - How to Get Funding for Instrumentation When Budgets are Tight (Parts I and II)

INSTRUCTORS - PART I:
Amelia Dempere, University of Florida
James LeBeau, North Carolina State University
Vonnie Shields, Towson University
Frank Macaluso, Albert Einstein College of Medicine
Christine Brantner, George Washington University

INSTRUCTORS - PART II:
Robert Kokoska, Life Sciences Division, US Army Research Office
Guebre Tessema, National Facilities and Instrumentation Program, National Science Foundation
Malgorzata Klosek, Office of Research Infrastructure Programs, National Institutes of Health
Christine Brantner, George Washington University

ROOM 321 – BALTIMORE CONVENTION CENTER

TUESDAY 8:30 AM and 10:30 AM

Do you have questions about how to land an instrumentation grant for a new high-pressure freezing device or a replacement electron microscope? Then these are the tutorials for you! Decreases in federal and institutional budgets, along with increased competition for those resources, have made it more difficult to obtain funding for equipment. How can you maximize your chances for success? What does a funded grant application look like versus a not-funded one? These two tutorial sessions (Parts I and II) will provide you with advice from two different angles: agency officials and successful grant applicants. Come and hear the tips and tricks that they have to share. Be sure to bring your questions.

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Scientific Program Information

Monday, August 6, 2018

M&M 2018

MICROSCOPY & MICROANALYSIS

August 5-9, 2018 • Baltimore, MD

PLENARY LECTURES AND AWARDS

SESSION CHAIRS:
Robert L. Price, President, Microscopy Society of America
Masashi Watanabe, President, Microanalysis Society
Joaquin Ortega, President, Microscope Society of Canada/ Société de Microscopie du Canada
Yoosuf N. Picard, M&M 2018 Program Chair

MONDAY 8:30 AM ROOM: BALLROOM III-IV

8:30 AM **OPENING WELCOME:**
Robert Price, MSA President
Masashi Watanabe, MAS President
Joaquin Ortega, MSC-SMC President

8:45 AM **1** **M&M PLENARY LECTURE** (Invited)
Every Child in the World Should Carry a Microscope in Their Pocket
Manu Prakash; Stanford University

9:45 AM **MAS Awards Presentation**

10:00 AM **MSC-SMC Awards Presentation**

10:15 AM **Coffee Break, Ballroom Foyer**

10:45 AM **MSA Awards Presentation**

11:00 AM **M&M Meeting Awards Presentation**

11:15 AM **2** **M&M PLENARY LECTURE** (Invited)
Using Microscopy to Find Stardust Anywhere; Jon Larsen, Jazz guitarist, Composer, Surrealist Painter, Author, Citizen Scientist

A ANALYTICAL SCIENCES SYMPOSIA – Monday Afternoon

A01.1 Professor Hatsujiro Hashimoto Memorial Symposium: Foundations in Imaging Crystals, Defects, and Atoms

SESSION CHAIRS:
Satoshi Ichikawa; Osaka University, Japan
Masashi Watanabe; Lehigh University

PLATFORM SESSION
Monday: 1:30 PM • Room: 341

1:30 PM **3** (Invited) *My Sixty Years Spent with Professor Hatsujiro Hashimoto;* **M Shiojiri**; Kyoto Institute of Technology, Japan

2:00 PM **4** (Invited) *Atomic Resolution Imaging of Dislocations in AlGaN and the Efficiency of UV LEDs;* **CJ Humphreys**, RA Oliver, FC-P Massabuau; University of Cambridge, United Kingdom, SL Rhode; Imperial College London, United Kingdom, MK Horton; University of California-Berkeley, TJ O'Hanlon; University of Cambridge, United Kingdom, A Kovacs; Forschungszentrum Jülich, Germany, MS Zielinski; Attolight AG, Switzerland *et. al.*

2:30 PM **5** *Defect Evolution in GaAs-Based Low-Mismatch Heterostructures;* **A Gangopadhyay**, A Maros, N Faleev, MR McCartney, DJ Smith; Arizona State University

2:45 PM **6** *Analytical TEM Characterization of Source/ Drain Contacts in Advanced Semiconductor Devices;* **J Li**, A Carr, T Yamashita, V Basker, N Saulnier, J Gaudiello; IBM Research, H Niimi; GLOBALFOUNDRIES, O Gluschenkov; IBM Research *et. al.*

A03.1 Four-Dimensional Scanning Transmission Electron Microscopy (4D-STEM): From Scanning Nanodiffraction to Ptychography and Beyond

SESSION CHAIRS:
David Muller; Cornell University
Colin Ophus; Lawrence Berkeley National Laboratory

PLATFORM SESSION
Monday: 1:30 PM • Room: 343

1:30 PM **7** (Invited) *A Next-Generation Electron Microscopy Detector Aimed at Enabling New Scanning Diffraction Techniques and Online Data Reconstruction;* **IJ Johnson**, AM Minor, C Ophus, A Selvarajan, DE Skinner, T Stezelberger, CS Tindall, K Bustillo; Lawrence Berkeley National Laboratory *et. al.*

2:00 PM **8** *Correlation of Strain and Elemental Distribution at the Interface Using Simultaneous Energy-Filtered High-Speed 4D STEM Diffraction Imaging and EDS;* **A Pakzad**, P Longo; Gatan Inc.

2:15 PM **9** *Thick (3D) Sample Imaging Using iDPC-STEM at Atomic Scale;* **I Lazić**, EG Bosch, E Yücelen, R Imlau, S Lazar; Thermo Fisher Scientific, Netherlands

2:30 PM **10** (Invited) *Scanning Convergent Beam Electron Diffraction (CBED): The Essential Questions of Why, What, and How?;* **J-M Zuo**, Y-T Shao; University of Illinois-Urbana-Champaign

A10.1 The Joy of Scanning Electron Microscopy

SESSION CHAIRS:
Raynald Gauvin; McGill University, Canada
Dale Newbury; National Institute of Standards and Technology

PLATFORM SESSION
Monday: 1:30 PM • Room: 328

1:30 PM **11** (Invited) *Some Thoughts on Point Spread Functions, Resolution and Image Quality;* MC Nevins; RK Hailstone; Rochester Institute of Technology, MD Zotta, **E Lifshin**; SUNY Polytechnic Institute

Scientific Program

A ANALYTICAL SCIENCES SYMPOSIA – Monday Afternoon *continued*

2:00 PM **12** *My Joy of Research in SEM;* **R Gauvin**; McGill University, Canada

2:15 PM **13** (M&M Student Scholar) *Visualizing Astigmatism in the SEM Electron Probe;* **MC Nevins**; Rochester Institute of Technology, MD Zotta; SUNY Polytechnic Institute, RK Hailstone; Rochester Institute of Technology, E Lifshin; SUNY Polytechnic Institute

2:30 PM **14** *Detection Systems of Ultra-High-Resolution SEMs;* **J Jiruše**, M Havelka, J Polster, P Sytař, J Páral, J Kološová; TESCAN Brno, Czech Republic

2:45 PM **15** *'High Resolution' Is Often Sought in SEM Imaging, But Establishing Visibility May Be the Challenge: Always Ask "What Might I Be Missing?";* **DE Newbury**; National Institute of Standards and Technology

A11.1 Solid-State X-Ray Spectrometry at 50 Years

SESSION CHAIRS:
Paul Carpenter; Washington University
Katherine Burgess; U.S. Naval Research Laboratory

PLATFORM SESSION
Monday: 1:30 PM • Room: 327

1:30 PM **16** (Invited) *The Beginnings of EDS in EPMA;* **K Keil**; University of Hawai'i-Mānoa

2:00 PM **17** (Invited) *The Early Days of EDS Development (and One Questionable Legacy);* **FH Schamber**; retired

2:30 PM **18** *Uncertainty Propagation for Energy Dispersive X-Ray Spectrometry;* **NWM Ritchie**, D Newbury; National Institute of Standards and Technology

2:45 PM **19** *CUBE: The SDD Preamplifier for Excellent Energy-Resolution and High Count-Rate Performance;* **L Bombelli**; XGLab S.R.L., Bruker Nano Analytics, Italy, C Fiorini; Politecnico di Milano, Italy, T Frizzi; XGLab S.R.L., Bruker Nano Analytics, Italy

A16.1 Sterling Newberry Memorial Symposium on X-Ray Imaging

SESSION CHAIRS:
Richard Wuhrer; University of Western Sydney
Nik Cordes; Los Alamos National Laboratory

PLATFORM SESSION
Monday: 1:30 PM • Room: 323

1:30 PM **20** (Invited) *The Munich Compact Light Source: Biomedical Research at a Laboratory-Scale Inverse-Compton Synchrotron X-Ray Source;* **B Günther**; Max-Planck-Institute of Quantum Optics, Germany, KS Morgan; Monash University, Australia, K Achterhold, F Pfeiffer, M Dierolf, R Gradl, E Eggl; Technical University of Munich, Germany, C Jud; Technical University of Munich, Germany *et. al.*

2:00 PM **21** *Micro-Focused Five-Dimensional X-Ray Imaging with the Color X-Ray Camera;* **JM Davis**, J Schmidt, M Huth; PNDetector, GmbH, Germany, R Hartmann; PNSensor, GmbH, Germany, H Soltau; PNDetector, GmbH, Germany, L Strüder; University of Siegen, Germany

2:15 PM **22** *A New Method for Characterizing 3D Microstructures Using Lab-Based Diffraction Contrast Tomography;* **H Bale**, W Harris, S Kelly; Carl Zeiss X-Ray Microscopy, N Gueninchault, J Sun, E Lauridsen; Xnovo Technology ApS, Denmark

2:30 PM **23** (Invited) *X-Ray Detectors – In Heaven and on Earth;* **L Strueder**; PNSensor GmbH, Germany, H Soltau; PNDetector GmbH, Germany, P Holl, R Hartmann, D Schlosser; PNSensor GmbH, Germany, A Niculae, M Huth, J Davis; PNDetector GmbH, Germany

A17.1 Surface and Subsurface Microscopy and Microanalysis

SESSION CHAIRS:
Xiao-Ying Yu; Pacific Northwest National Laboratory
Vincent S. Smentkowski; General Electric Global Research Center
John A. Chaney; The Aerospace Corporation
Chanmin Su; Bruker-Nano Inc.

PLATFORM SESSION
Monday: 1:30 PM • Room: 326

1:30 PM **24** (Invited) *What do Cells and Photovoltaic Materials Have in Common? TOF-SIMS Tandem MS Imaging and the Identification of Chemistry at < 100nm Resolving Power;* **GL Fisher**; Physical Electronics

2:00 PM **25** *Secondary Ion Mass Spectrometry on the Helium Ion Microscope: Methodologies for Analysis of Nanomaterials;* **J-N Audinot**, F Vollnhals, P Gratia, S Eswara, P Philipp, T Wirtz; Luxembourg Institute of Science and Technology, Luxembourg

2:15 PM **26** (Invited) *Surface Characterization of Biologically-Related Systems with Imaging TOF-SIMS and Complementary Techniques;* **L Gamble**, T Angerer, D Graham, E Chudler; University of Washington

2:45 PM **27** *Ablation and Microstructure Imaging of Dentin-Enamel Junction Using Focused Electron Beam in an Environmental Scanning Electron Microscope;* **D Zhao**, R Seyedmahmoud, JD McGuire, Y Wang, MP Walker, JP Gorski; University of Missouri-Kansas City

B BIOLOGICAL SCIENCES SYMPOSIA – Monday Afternoon

B04.1 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals

SESSION CHAIRS:
Gang (Greg) Ning; Pennsylvania State University
Ru-Ching Hsia; University of Maryland-Baltimore
Trace Christensen; Mayo Clinic

PLATFORM SESSION
Monday: 1:30 PM • Room: 350

1:30 PM **28** *Ultrastructural Analysis of Platelets During Storage in Different Buffers*; **R-C Hsia**, R Kaur, R Schuh; University of Maryland-Baltimore, A Saladino; University of Maryland, J Klinedinst; G Fiskum; University of Maryland-Baltimore

1:45 PM **29** (Invited) *Characterization of Calcium Phosphosilicate (Hydrate) Nanoparticles: Novel Organic-Inorganic Composite Nanomaterial for Drug and Diagnostic Delivery;* **JH Adair**; Pennsylvania State University

2:15 PM **30** (Invited) *Zap-and-Freeze Electron Microscopy Captures Synaptic Vesicle Exocytosis with Unprecedented Temporal Precision;* GF Kusick; Johns Hopkins University, M Chin; Dartmouth University, **S Watanabe**; Johns Hopkins University

2:45 PM **31** *Revealing Mechanisms of Microvesicle Biogenesis in Breast Cancer Cells via* In Situ *Microscopy;* **JM Noble**, N Vidavsky, LM Roberts, A Chiou3, MJ Paszek, C Fischbach, LA Estroff, LF Kourkoutis; Cornell University

B07.1 Pharmaceuticals: Imaging, Analysis, and Regulation of Medical Products and Devices

SESSION CHAIRS:
Jason Mantei; Baxter Healthcare
Gianpiero Torraca; Amgen

PLATFORM SESSION
Monday: 1:30 PM • Room: 348

1:30 PM **32** (Invited) *The Role of Microscopy and Imaging in the Manufacture of Products for the Healthcare Industry;* **N Zupec**; Baxter Healthcare Corporation

2:00 PM **33** *Quantitative Characterization of Crystallization in Amorphous Solid Dispersion Drug Tablets Using X-Ray Micro-Computed Tomography;* **S Zhang**; DigiM Solution LLC, J Neilly; AbbVie Inc., A Zhu, J Chen; DigiM Solution LLC, G Danzer; AbbVie Inc.

2:15 PM **34** (Invited) Comparison of Ensemble and Single Molecule Methods for Particle Characterization and Binding Analysis of a PEGylated Single Domain Antibody; **L Obenauer-Kutner**, LA Schneeweis; Bristol-Myers Squibb, Inc.

2:45 PM **35** *The Role of the Protein Corona in the Uptake Process of Nanoparticles;* **I Lieberwirth**, M Kokkinopoulou, S Han, J Simon, K Landfester; MPI for Polymer Research, Germany, V Mailänder; Johannes Gutenberg University Mainz, Germany

P PHYSICAL SCIENCES SYMPOSIA – Monday Afternoon

P01.1 Advances in Electron, X-Ray and Neutron Spectro-Imaging/Holography of Energy Materials and Devices

SESSION CHAIRS:
Kazuo Yamamoto; Japan Fine Ceramics Center, Japan
Toshiaki Tanigaki; Hitachi Ltd., Japan

PLATFORM SESSION
Monday: 1:30 PM • Room: 336

1:30 PM **36** (Invited) *Advances in Electron Holography for High-Resolution Electromagnetic Field Study;* **T Tanigaki**, H Shinada; Hitachi, Ltd., Japan

2:00 PM **37** (M&M Student Scholar) *Measuring Surface Charge on a Single Nanoparticle in Liquids Using Off-Axis Electron Holography;* H Sun, **MN Yesibolati**, M Beliggia, K Mølhave, T Kasama; Technical University of Denmark, Denmark, S Kathmann; Pacific Northwest National Laboratory, S Lagana; Technical University of Denmark, Denmark

2:15 PM **38** *Electron Holography, a Routine Application Workflow;* **E Voelkl**; Holowerk LLC, A Ponce; University of Texas-San Antonio

2:30 PM **39** *Optical Modulator P/N Junction Mapping by Electron Holography and Scanning Capacitance Microscopy;* **Y-Y Wang**, J Nxumalo, J Jeon, K Barton, K Nummy; GLOBALFOUNDRIES Inc.

2:45 PM **40** In Situ *Electron Holography Study of Grain Boundaries in Cerium Oxide;* **C Phatak**; Argonne National Laboratory, X Xu, S Haile; Northwestern University

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P PHYSICAL SCIENCES SYMPOSIA – Monday Afternoon *continued*

P02.1 Atomically Thin 2D Materials: Recent Results and Challenges

SESSION CHAIRS:
Quentin M Ramasse; SuperSTEM Laboratory, United Kingdom
Raul Arenal; University of Zaragoza, Spain

PLATFORM SESSION
Monday: 1:30 PM • Room 338

1:30 PM **41** (Invited) *A Review of Defects in Metal Dichalcogenides: Doping, Alloys, Interfaces, Vacancies and Their Effects in Catalysis & Optical Emission;* **M Terrones**; The Pennsylvania State University

2:00 PM **42** *Understanding High Contact Resistance in MoS2 FETs Using STEM-EELS;* **RJ Wu**, KA Mkhoyan; University of Minnesota

2:15 PM **43** *Tailoring Thermal Expansion Coefficient of Transition Metal Dichalcogenides via Alloy Engineering;* **X Hu**, A Behranginia, S **Öğüt**, A Salehi, R Klie; University of Illinois-Chicago

2:30 PM **44** *Site Selective Growth of Noble Metal Atoms on Two-Dimensional MoS2 Nanosheets;* **J Xu**, X Li, J Liu; Arizona State University

2:45 PM **45** *Low and Ultra-Low Energy Scanning Electron Microscopy of 2D Transition Metal Dichalcogenides: Experiments and Simulations; E Mikmeková; Institute of Scientific Instruments, Czech Republic, M Lejeune; Université de Picardie Jules Verne, France, A Paták,* **I Müllerová,** L Frank, B Daniel, I Konvalina, T Říháček; Institute of Scientific Instruments, Czech Republic *et. al.*

P05.1 Modulating Electron Beams in Space and Time to Probe for Structure and Function of Soft and Hard Matter

SESSION CHAIRS:
Christian Kisielowski; Lawrence Berkeley National Laboratory
Hector Calderon; National Polytechnic University (IPN), Mexico

PLATFORM SESSION
Monday: 1:30 PM • Room: 344

1:30 PM **46** (Invited) *Implementing Sparse Sub-Sampling Methods for Low-Dose/High Speed STEM;* **ND Browning;** University of Liverpool, United Kingdom, L Bramer; Pacific Northwest National Laboratory, A Stevens; OptimalSensing, L Kovarik, A Liyu; Pacific Northwest National Laboratory, BL Mehdi; University of Liverpool, United Kingdom, H Yang; Lawrence Berkeley National Laboratory, ME Gehm; Duke University et. al.

2:00 PM **47** *High-Speed/Low-Dose Analytical Electron Microscopy with Machine Learning and Multi-Objective Dynamic Sampling;* **KA Hujsak,** E Roth, W Kellogg; Northwestern University, LF Drummy; U.S. Air Force Research Laboratory, VP Dravid; Northwestern University

2:15 PM **48** *Radiation Response and Recovery of Gd2Ti2O7 Pyrochlore;* **MT Janish,** TG Holesinger, BP Uberuaga, MM Schneider, C Kreller, JA Valdez, KJ McClellan, DD Byler; Los Alamos National Laboratory et. al.

2:30 PM **49** *Atomic Structure, Defects, and Stacking of Clay Particles by Low-Dose, High Resolution (Cryo)-TEM;* **ML Whittaker,** C Kisielowski, EA Montabana, B Gilbert; Lawrence Berkeley National Laboratory, JF Banfield; University of California-Berkeley

T TUTORIALS – Monday Afternoon

X43.1 Cryo-FIB: Overcoming the Hurdle of Sample Preparation for *In Situ* Cryo-Electron Tomography

SESSION CHAIR:
Tommi A. White; University of Missouri

PLATFORM SESSION
Monday: 1:30 PM • Room: 321

1:30 PM **50** (Invited) *Cryo-FIB: Overcoming the Hurdle of Sample Preparation for* In Situ *Cryo-Electron Tomography;* **M Schaffer**; Max Planck Institute of Biochemistry, Germany

A ANALYTICAL SCIENCES POSTER SESSIONS – Monday Afternoon

A03.P1 Four-Dimensional Scanning Transmission Electron Microscopy (4D-STEM): From Scanning Nanodiffraction to Ptychography and Beyond

POSTER SESSION
Monday: 3:00 PM • Room: Exhibit Hall

POSTER # 1
3:00 PM **51** *Direct Observation of SRO Effect of Ti-6Al Alloy Using Energy-Filtered TEM and Scanning Nanobeam Electron Diffraction;* **R Zhang**, R Traylor, T Pekin; University of California-Berkeley, B Ozdol, C Ophus; Lawrence Berkeley National Laboratory, A Minor; University of California-Berkeley

POSTER # 2
3:00 PM **52** *Integrating S/TEM Imaging Modality Simulations with Mesocale Material Simulations: A Case Study with Phase Field;* **S Singh**, M De Graef; Carnegie Mellon University

POSTER # 3
3:00 PM **53** *Simultaneous iDPC and ADF STEM Imaging at the Limit of Contrast and Resolution;* **I Lazić**, E Yücelen, EG Bosch; Thermo Fisher Scientific, Netherlands

POSTER # 4
3:00 PM **54** Extracting Thickness and Tilt from 4D-STEM Datasets to Model the Influence on ABF images; **A Kumar**; North Carolina State University, CS Chang; Cornell University, ED Grimley; North Carolina State University, Z Chen; Cornell University, JM LeBeau; North Carolina State University

POSTER # 5
3:00 PM **55** Microstructural Analysis of Polycrystalline Er:YAG Using Automated Crystal Orientation Mapping; E Ortega, **D Sanchez**, D Sardar, J Arellano-Jimenez, A Ponce; University of Texas-San Antonio

POSTER # 6
3:00 PM **56** 4D Analytical STEM with the pnCCD; **M Huth**; PNDetector GmbH, Germany, H Soltau; PNDetector GmbH, Germany, M Simson, R Ritz; PNDetector GmbH, Germany, H Ryll; PNSensor GmbH, Germany, GT Martinez, JG Lozano, PD Nellist; University of Oxford, United Kingdom *et. al.*

A10.P1 The Joy of Scanning Electron Microscopy

POSTER SESSION
Monday: 3:00 PM • Room: Exhibit Hall

POSTER # 7
3:00 PM **57** *Voltage Contrast Imaging with Energy-Controlled Signal in an FE-SEM;* **Y Hashimoto**, S Takeuchi, T Sunaoshi, Y Yamazawa; Hitachi High-Technologies Corporation, Japan

POSTER # 8
3:00 PM **58** *The Powder-Pack Boriding and Nitriding Process: Microstructural Characterization of Boride and Nitride Layers on ARMCO Pure Iron;* MO Domínguez; IS Marmolejo; Universidad Autónoma del Estado de Hidalgo- Sahagún, Mexico, ME Espinosa; Tecnológico de Monterrey, Mexico, MÁF Rentería, **LEM Martínez**; Universidad Autónoma del Estado de Hidalgo-Sahagún, Mexico, AA Flores; Universidad Autónoma del Estado de Hidalgo, Mexico

POSTER # 9
3:00 PM **59** *Grain Evolution in Thermally Aged Cast and Hot Isostatic Pressed Inconel 625;* **EM Getto**, B Tobie; United States Naval Academy, E Bautista, A Bullens; Purdue University, D Gandy; Electric Power Research Institute, JP Wharry; Purdue University

POSTER # 10
3:00 PM **60** *Structural Analyses of a Spherulite Mineral Using SEM, CL, and EDX;* **M Shiono**, M Sakaue, S Tomita; Hitachi High-Technologies Corporation, Japan

POSTER # 11
3:00 PM **61** *Determination of Triclinic Bravais Lattice by Means of EBSD Pattern;* M Han, **G Zhao**; East China Jiaotong University, China

POSTER # 12
3:00 PM **62** *Bravais Lattice of TiAl Determined from a Single Electron Backscatter Diffraction Pattern;* M Han, **G Zhao**; East China Jiaotong University, China

POSTER # 13
3:00 PM **63** *Identification of SiC Crystals Based on 3D Reconstruction Using EBSD Technique;* M Han, **G Zhao**; East China Jiaotong University, China

POSTER # 14
3:00 PM **64** *Insights into the Structure of the Ligand Capping Layer of Inorganic Nanostructures via Multi kV Electron Microscopy Analysis;* **E Formo**, T Salguero; University of Georgia, JY Howe, T Sunaoshi, A Muto; Hitachi High-Technologies America Inc.

POSTER # 15
3:00 PM **65** *Characterization by Raman and Scanning Electron Microscopy of LiNbO3 Powders Obtained by Mechanochemical and Calcination Route;* FE Rojas-González, **J Carrillo-Pesqueira**, O Hernández-Negrete, R Carrillo-Torres, ME Alvarez-Ramos, J Hernández-Paredes; Universidad de Sonora, Mexico

POSTER # 16
3:00 PM **66** *Rapid Diagnosis of Soil Nutrients Using Microscopic Techniques;* D Tripathi; CSIR-National Environmental Engineering Research Institute, India, MO Alonso Pérez; El Colegio de Michoacán, Mexico, DK Tiwari; Catedrático Conacyt, Mexico, **SE Borjas Garcia**; Universidad Michoacana de San Nicolás de Hidalgo, Mexico

POSTER # 17
3:00 PM **67** *The Effects of Evactron® Plasma Cleaning on Moxtek® X-Ray Windows;* E Moskowska; XEI Scientific, Inc., J Wong, M Almond; Moxtek Inc., **B Armbruster**, R Vane; XEI Scientific, Inc.

POSTER # 18
3:00 PM **68** *EDS and VP-SEM: Practical Considerations and Challenges;* **J Rafaelsen**, T Nylese; EDAX Inc.

A11.P1 Solid-State X-Ray Spectrometry at 50 Years

POSTER SESSION
Monday: 3:00 PM • Room: Exhibit Hall

POSTER # 19
3:00 PM **69** *Measurement of Elemental Composition of FeNi and SiGe Thin Films by Electron Probe Microanalysis with Stratagem Software;* **V-D Hodoroaba**; Federal Institute for Materials Research and Testing (BAM), Germany, KJ Kim; Korea Research Institute of Standards and Science (KRISS), Republic of Korea

POSTER # 20
3:00 PM **70** *Microstructure Characterization of Microalloyed 5xxx Aluminum Alloys with Er and Zr Using*

Scientific Program

A ANALYTICAL SCIENCES POSTER SESSIONS – Monday Afternoon *continued*

Analytical Transmission Electron Microscopy and Synchrotron X-Ray Fluorescence Microscopy; **X Wu**; Beijing University of Technology, China, S Chen, B Lai; Argonne National Laboratory, H Huang, S wen, K Gao, W wang, Z nie; Beijing University of Technology, China *et. al.*

POSTER # 21
3:00 PM **71** *Analysis of Mesoporous Iridium Oxide Thin Films by the Combined Methodical Approach SEM/EDS/STRATAGem;* R Sachse; Technical University of Berlin, Germany, A Hertwig; Federal Institute for Materials Research and Testing (BAM), Germany, R Kraehnert; Technical University of Berlin, Germany, **V-D Hodoroaba**; Federal Institute for Materials Research and Testing (BAM), Germany

POSTER # 22
3:00 PM **72** *Composition and Thickness Mapping Using STEM EDS;* **M Falke**; Bruker, Germany, J Kraxner; Graz University of Technology, Austria, R Terborg; Bruker, Germany, G Kothleitner, W Grogger; Graz University of Technology, Austria

POSTER # 23
3:00 PM **73** *Energy Dispersive X-Ray Spectroscopic Analysis of Al-Cu-Fe Quasicrystalline Thin Film Layer;* **K Smith**, A Baker, J Beckey, C Mankos, C Li; Clarion University

POSTER # 24
3:00 PM **74** *Dynamically Templated Acquisition of EDS X-Ray Spectral Images Using Electron Image Contrast;* **SM Seddio**; Thermo Fisher Scientific

POSTER # 25
3:00 PM **75** *Comparing Quantitative Results of Zeta Factor Method Using Various Values of Ionization Cross-sections;* **M Morita**, I Onishi; JEOL Ltd., Japan

POSTER # 26
3:00 PM **76** *Systematic Error Determination of ζ-Factor Quantification in XEDS Analysis;* E Barabino; Technical University of Eindhoven, Netherlands, **T Withaar**, B Freitag; Thermo Fisher Scientific, Netherlands

POSTER # 27
3:00 PM **77** *New Approaches to Determine K Line Ratios of Pure Elements;* **R Terborg**, F Reinhardt; Bruker Nano GmbH, Germany, F Nitsche; Bruker, Germany, T Wolff; Bruker Nano GmbH, Germany

POSTER # 28
3:00 PM **78** *Soft Matter X-Ray Microanalysis in the Analytical Electron Microscope;* M Ovsyanko, E Yucelen, E Pechnikova; Thermo Fischer Scientific, Netherlands, M Meiken Falke; Bruker Nano GmbH, Germany, Q Chen; University of Illinois - Urbana-Champaign, **NJ Zaluzec**; Argonne National Laboratory

POSTER # 29
3:00 PM **79** (M&M Student Scholar) *Secondary Fluorescence Correction of 3D Heterogeneous Materials for Quantitative X-Ray Microanalysis;* **Y Yuan**; McGill University, Canada, H Demers; Hydro-Quebec's Research Institute, Canada, R Gauvin; McGill University, Canada

A16.P1 Sterling Newberry Memorial Symposium on X-Ray Imaging

POSTER SESSION
Monday: 3:00 PM • Room: Exhibit Hall

POSTER # 30
3:00 PM **80** In Situ *Imaging of Materials Using X-Ray Tomography*; **BM Patterson**, NL Cordes, K Henderson; Los Alamos National Laboratory, X Xiao; Argonne National Laboratory, N Chawla; Arizona State University

POSTER # 31
3:00 PM **81** *Using Micro-Computed Tomography to Investigate Powder Distribution Trends Within 3D Binder-Jet Printed SS316 Parts;* **E Stevens**; University of Pittsburgh, J Barnes; The Barnes Group Advisors, M Chmielus; University of Pittsburgh

POSTER # 32
3:00 PM **82** *High-Efficiency Fast X-Ray Imaging Detector Development at SSRF;* H Xie; Shanghai Institute of Applied Physics, CAS, China, C Zhao; Shanghai Institute of Optics and Fine Mechanics, CAS, China, **G Du**, H Luo; Shanghai Institute of Applied Physics, CAS, China, W Xu; Shanghai Institute of Optics and Fine Mechanics, CAS, China, T Xiao; Shanghai Institute of Applied Physics, CAS, China

POSTER # 33
3:00 PM **83** *Novel Sub-eV High Throughput Laboratory Micro-XAS (X-ray Absorption Spectrometer) for Chemical State Analysis through XANES and EXAFS;* **W Yun**, S Seshadri, S Lewis, J Gelb, S Lau; Sigray, Inc., J Kirz; Lawrence Berkeley National Laboratory

POSTER # 34
3:00 PM **84** *4D and* In Situ *X-Ray Microscopy for Studying Damage Evolution in Materials Across Multiple Length Scales;* **W Harris**, H Bale, S Kelly, B Hornberger; Carl Zeiss X-Ray Microscopy

POSTER # 35
3:00 PM **85** *Full-Field X-Ray Nanoscopy Developed at SSRF;* **B Deng**, Y Ren; Shanghai Synchotron Radiation Facility (SSRF), China

A17.P1 Surface and Subsurface Microscopy and Microanalysis

POSTER SESSION
Monday: 3:00 PM • Room: Exhibit Hall

POSTER # 36
3:00 PM **86** *Characterization of Si Surface by SEM-SXES Using Low Incident Voltage;* **Y Yamamoto**, H Takahashi, T Murano, N Kikuchi; JEOL Ltd., Japan, N Erdman; JEOL USA Inc.

POSTER # 37
3:00 PM **87** *The Powder-Pack Boriding Process: A Microstructure Comparison of Boride Layers Formed on AISI 4150 and M2 Steels;* MA Flores-Rentería, M Ortiz-Domínguez, **I Simón-Marmolejo**, LE Martínez-Martínez, J Zuno-Silva; Universidad Autónoma del Estado de Hidalgo- Sahagún, Mexico, A Arenas-Flores; Universidad Autónoma del Estado de Hidalgo, Mexico, A Cruz-Avilés; Universidad Autónoma del Estado de Hidalgo- Sahagún, Mexico

POSTER # 38
3:00 PM **88** *Additive Manufacturing Methods for Soft Magnetic Composites (SMCs);* **N Benack**, T Wang, K Matthews, M Taheri; Drexel University

POSTER # 39
3:00 PM **89** *Exploring the Differences in Spatial Resolution between Auger and EDS Elemental Mapping;* **CR Thurber**; Honeywell

POSTER # 40
3:00 PM **90** *Characterization of PM10 Particles by SEM-EDS;* **R Ramirez-Leal**, M Cruz-Campas, H Estuardo-Moreno; Sonora State University, Mexico

POSTER # 41
3:00 PM **91** *Morphology and Elemental Composition of Fine Particulate Matters PM10 by SEM-EDS;* **R Ramirez-Leal**, M Cruz-Campas, H Estuardo-Moreno; Sonora State University, Mexico

POSTER # 42
3:00 PM **92** *Metals Characterization by Principal Component EDS Analysis and EBSD;* **J Morrow**, K Thompson; Thermo Fisher Scientific

POSTER # 43
3:00 PM **93** *Analysis of Nitride Layers on ARMCO Pure Iron: The Powder-pack Nitriding Process;* M Ortiz-Domínguez; Universidad Autónoma del Estado de Hidalgo- Sahagún, Mexico, OA Gómez-Vargas; Instituto Tecnológico de Tlalnepantla, Mexico, I Simón-Marmolejo, MÁ Flores-Rentería, LE Martínez-Martínez, **A Cruz-Avilés**; Universidad Autónoma del Estado de Hidalgo- Sahagún, Mexico, MÁ Paredes-Rueda; Instituto Tecnológico de Tlalnepantla, Mexico

POSTER # 44
3:00 PM **94** *Resolving Multilayer Structure of Pressure Sensitive Adhesive by Atomic Force Microscopy (AFM);* H Duan, **S Qin**; Avery Dennison Corp.

POSTER # 45
3:00 PM **95** *Microscopic Characterization of IBM Star Polymers at High-Temperature for Water Membrane Applications;* **J-Y Cho**, J Le; National Research Council Canada, Y-H Na; IBM Almaden Research Center, M Sadrzadeh; University of Alberta, Canada, A Myles; National Research Council Canada

POSTER # 46
3:00 PM **96** *Microanalysis of Carbon and Glass Fiber Obtained by Resin Transfer Molding Process to Manufacture Blades for Wind Turbines;* **EE Vera Cardenas**; Instituto Tecnológico de Pachuca, Mexico, AI Martinez Perez; Universidad Politécnica de Pachuca, Mexico, C Rubio Gonzalez, S Ledesma Ledesma, JA Banderas Hernandez; Centro de Ingeniería y Desarrollo Industrial, Mexico, G Luis Raya; Universidad Politécnica de Pachuca, Mexico

POSTER # 47
3:00 PM **97** *A Multiple Hits Correction Factor for Atom Probe Tomography;* **DJ Larson**, TJ Prosa, E Oltman, DA Reinhard, B Geiser, RM Ulfig, A Merkulov; CAMECA

POSTER # 48
3:00 PM **98** *XPS Study of Corrosion Deposit in Stainless Steel Hardfacing*; E Huape; Universidad Michoacana de San Nicolás de Hidalgo, Mexico, M Sánchez; Technological University of Chihuahua Sur, Mexico, A Medina, H Guillermo-Carreón, **S Eduardo-Borjas**, R Huirache, L Béjar; Universidad Michoacana de San Nicolás de Hidalgo, Mexico

B BIOLOGICAL SCIENCES POSTER SESSIONS – Monday Afternoon

B04.P1 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals

POSTER SESSION
Monday: 3:00 PM • Room: Exhibit Hall

POSTER # 49
3:00 PM **99** *Automated Rapid Preparation of Tissue Specimens for TEM Pathology;* **TE Strader**; Microscopy Innovations, LLC, NR Stewart, BK August; University of Wisconsin, SL Goodman; Microscopy Innovations, LLC

POSTER # 50
3:00 PM **100** *Analysis of Ultrastructural Properties of Lung and Pancreatic Injury after Severe Acute Pancreatitis in Wild-Type and Surfactant Protein D Knockout Mice;* **H Chen**; The Pennsylvania State University, J Yu, G Wang; SUNY Upstate Medical University

POSTER # 51
3:00 PM **101** *Cell Viability of Hydrothermally Synthesized Mn0.75Zn0.25Fe2O4 Coated with Thetraethyl Orthosilicate (TEOS);* SE Almanza-Morales; Universidad Politécnica de Pénjamo, Mexico, AV Coria-Tellez; El Colegio De Michoacán A. C., Mexico, DK Tiwari; El Colegio de Michoacán, Mexico, **SE Borjas-Garcia**; Universidad Michoacana de San Nicolás de Hidalgo, Mexico

POSTER # 52
3:00 PM **102** *Identification of Premature Senescence Cells in the Brain of the HIV-1 Transgenic Rat (HIV-TG Rat);* **F Denaro**; Morgan State University, F Benedetti; University of Maryland School of Medicine, S Davinelli; University of Molise-Campobasso, Italy,

Scientific Program

B BIOLOGICAL SCIENCES POSTER SESSIONS – Monday Afternoon *continued*

G Scapagnini; University of Molise, Italy, D Zella, O Latinovic; University of Maryland School of Medicine

POSTER # 53
3:00 PM **103** *Impact of Physiological Neutral pH on Morphology of* Francisella tularensis *– An Electron Microscopic Study;* **CM Wastella**, D Williamson, G Kirimanjeswara, G Ning; Pennsylvania State University

POSTER # 54
3:00 PM **104** *Woman Versus Machine: Using the EMS Poly III Embedding Unit as a Novel Approach to Tissue Processing;* **LG Gunther-Cummins**, X Nishku, FP Macaluso; Albert Einstein College of Medicine

POSTER # 55
3:00 PM **105** *Correlative Computational Image Analysis of Blood Drop Drying Patterns;* **S Sharma**, N Oxman; Massachusetts Institute of Technology

POSTER # 56
3:00 PM **106** *Bioprocessing and Tissue Interactions of Elongated Mineral Particles, EMP, Following Inhalation Exposure;* U Graham, **A Dozier**, C Wang, J Fernback; CDC-National Institute for Occupational Safety and Health

POSTER # 57
3:00 PM **107** *Optimization of Automated Immuno EM for Both Pre- and Post-Embedding Labeling;* **P Marques**, J Strong; University of Maryland-Baltimore, T Strader; Microscopy Innovations, R-C Hsia; University of Maryland-Baltimore

POSTER # 58
3:00 PM **108** *Upregulation of Antioxidant Enzymes in Pancreatic Cancer Cells and Tissues;* **SG Nyaga**; Morgan State University, K Hazel; Johns Hopkins Medical Institute, B Akobundu; Brown University, F Denaro; Morgan State University

POSTER # 59
3:00 PM **109** *Age-Related Cytological Changes of Fibroblast Cell and Fila Olfactoria in Fish:* [*Pseudapocryptes lanceolatus* (Bloch and Schneider)]; SK Sarkar, S Jana, S Barman, **SK De**; Vidyasagar University, India

B07.P1 Pharmaceuticals: Imaging, Analysis, and Regulation of Medical Products and Devices

POSTER SESSION
Monday: 3:00 PM • Room: Exhibit Hall

POSTER # 60
3:00 PM **110** In Situ *Observation of Lyophilization Process in Environmental Scanning Electron Microscope;* **Ľ Vetráková**, V Neděla, J Runštuk; Institute of Scientific Instruments of the CAS, Czech Republic

POSTER # 61
3:00 PM **111** *Economic and Easy Manufacturing Method to Obtaining Dental Pieces;* MDC Aragon-Duarte, MH Bocanegra, **A Reyes-Rojas**, JA Duarte-Moller, HE Esparza-Ponce; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 62
3:00 PM **112** *Tracing the Uptake of Gold in Toxoplasma with STEM-EDX*; **L Xing**, J-G Zheng, T Aoki, R Andrade; University of California-Irvine

POSTER # 63
3:00 PM **113** *The Establishment of a Cryo-EM Facility and Workflows to Support Pipeline Projects at Genentech;* **A Estevez**, C Arthur, A Rohou, C Ciferri; Genentech

POSTER # 64
3:00 PM **114** *Enhancement of pDNA Uptake and Expression in H441 Cells by Using PLGA Nanocarriers;* CA Gutiérrez-Valenzuela; University of Sonora, Mexico, P Bojang; University of Arizona, **RJ Rodríguez-Cordova**, KY Hernández-Giottonini, R Esquivel; University of Sonora, Mexico, KS Ramos, R Guzman-Z; University of Arizona, A Lucero-Acuña; University of Sonora, Mexico

POSTER # 65
3:00 PM **115** *PLGA Nanoparticles Loaded with 1,10-epoxyparthenolide for Potential Applications in Tuberculosis Therapies;* **KY Hernández-Giottonini**, CA Gutiérrez-Valenzuela, RJ Rodríguez-Córdova, A Garibay-Escobar, P Zavala-Rivera, A Lucero-Acuña; Universidad de Sonora, Mexico

POSTER # 66
3:00 PM **116** *Preparation of PLGA Nanoparticles Loaded with Oxytetracycline Hydrochloride for its Possible Application Against Brucellosis Infection;* **RJ Rodríguez-Cordova**, KY Hernández-Giottonini, CA Gutiérrez-Valenzuela; Universidad de Sonora, Mexico, J De la Vega; National Autonomous University of Mexico, R Esquivel, P Zavala-Rivera; Universidad de Sonora, Mexico, B Arellano-Reynoso; National Autonomous University of Mexico, A Lucero-Acuña; Universidad de Sonora, Mexico

POSTER # 67
3:00 PM **117** *Topography and Morphology of A Hydrogel Enriched with Allantoin For Biomedical Proposes;* RA Saucedo-Acuña, **ML Barrios-De La O**, KL Tovar-Carrillo, EG Ordoñez-Casanova, C Rodríguez-Rodríguez; Universidad Autónoma de Ciudad Juárez, Mexico

POSTER # 68
3:00 PM **118** *Microstructural Characterization of Biosynthesized ZnO Nanostructures Using* Jatropha-dioica *Aqueous Extract;* M Villanueva-Ibáñez, R González Montes-de-Oca, VP Camargo Pérez, PN Olvera-Venegas, AI Martínez Pérez; Universidad Politecnica de Pachuca, Mexico, **EE Vera Cárdenas**; Insitiuto Tecnologico de Pachuca, Mexico

POSTER # 69

3:00 PM **119** *New Approach for High Quality Cross Sectioning in Tablets Using Broad Argon Ion Beam with LN2 Sample Cooling;* **R Kawano**, Y Hasebe, Y Yamaguchi; JEOL Ltd., Japan, N Manabe; Tohoku Medical and Pharmaceutical University, Japan, N Erdman; JEOL USA, INC., S Asahina; JEOL Ltd., Japan

POSTER # 70

3:00 PM **120** *Developing Physicochemical Characterization and* In Vitro *Release Test Methods to Probe Drug Release Mechanism from Multivesicular Liposomes;* **S Manna**, Y Wang, J Zheng, Y Wu, P Petrochenko, B Koo, L Chen, Y Dong; U.S. Food and Drug Administration *et. al.*

POSTER # 71

3:00 PM **121** *Scientific Considerations for an* In Vitro *Bioequivalence Approach for Ultrasound Contrast Agent Products: How Size Distribution and Total Volume of Microbubbles Affect Its Echogenicity;* **B Koo**, B Qin, Y Liu, Y Wu, S Choi, D Kozak, J Zheng; U.S. Food and Drug Administration

POSTER # 72

3:00 PM **122** *Micro-Encapsulation of Probiotic Metabolites and Magnetic Nanoparticles Inside Liposomes Using Microfluidic Devices;* **LM Montes-de-Oca**; Universidad Michoacana de San Nicolás de Hidalgo, Mexico, F Cuellar; Universidad Autónoma de Nuevo León, Mexico, M Rodríguez-Nieto; Universidad Michoacana de San Nicolás de Hidalgo, Mexico, R Rodríguez-López, SA Espinoza; Universidad Autónoma de San Luis Potosí, Mexico, G Espinosa; Universidad Michoacana de San Nicolás de Hidalgo, Mexico, P Barrón-González, JL Menchaca; Universidad Autónoma de Nuevo León, Mexico

POSTER # 73

3:00 PM **123** *Embedding Silicon Dioxide Nanospheres for Homogeneous Incorporation onto a Resin Matrix;* **L Baez-Castillo**; Universidad de Sonora, Mexico, E Ortiz-Rascón; CONACYT - Universidad de Sonora, Mexico, I López-Miranda, RC Carrillo-Torres, ME Álvarez-Ramos; Universidad de Sonora, Mexico

Notes

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Tuesday Program

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MICROSCOPY & MICROANALYSIS

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A ANALYTICAL SCIENCES SYMPOSIA – Tuesday Morning

A01.2 Professor Hatsujiro Hashimoto Memorial Symposium: Foundations in Imaging Crystals, Defects, and Atoms

SESSION CHAIRS:
Satoshi Ichikawa; Osaka University, Japan
Masashi Watanabe; Lehigh University

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 341

8:30 AM **124** (Invited) *Contributions to High Resolution and* In Situ *Electron Microscopy;* **R Sinclair**, Y Liu, S Lee, AL Koh; Stanford University

9:00 AM **125** *A Novel Technique for* In Situ *TEM Characterization of Precipitates in Alloys;* **J Rao**; University of Maryland, X Zhang; Harbin Institute of Technology, China, V Ocelík, D Vainchtein, JT De Hosson; University of Groningen, Netherlands, S-C Liou, W-A Chiou; University of Maryland

9:15 AM **126** *Whys and Wherefores of Open Aperture ESTEM for* In Situ *Catalyst Reaction Studies;* **ED Boyes**, PL Gai; University of York, United Kingdom

9:30 AM **127** (Invited) *In Memory of the Late Professor Hatsujiro Hashimoto: Toward the Realization of His Dream;* **Y Takai**; Osaka University, Japan

A03.2 Four-Dimensional Scanning Transmission Electron Microscopy (4D-STEM): From Scanning Nanodiffraction to Ptychography and Beyond

SESSION CHAIRS:
Ben McMorran; University of Oregon
Ian Johnson; Lawrence Berkeley National Laboratory

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 343

8:30 AM **128** (Invited) *Tuning STEM: Tailoring the Incident Probe, Scattering Dynamics and Detector Geometry for Maximum Specimen Information;* **J Etheridge**, W Chao, ED Boejesen, Y Guo, M Krajnak, W Li, C Zheng; Monash University, Australia

9:00 AM **129** *Mapping Polarity, Toroidal Order, and the Local Energy Landscape by 4D-STEM;* **KX Nguyen**; Cornell University, S Salahuddin; University of California-Berkeley, DA Muller, Y Jiang, MC Cao, P Purohit; Cornell University, AK Yadav; University of California-Berkeley, J Junquera; University of Cantaberia, Spain *et. al.*

9:15 AM **130** *Three-Dimensional Polarization by Means of Scanning HOLZ-CBED Technique;* **R dos Reis**; Lawrence Berkeley National Laboratory, S-L Hsu; University of California-Berkeley, C Ophus; Lawrence Berkeley National Laboratory, R Ramesh; University of California-Berkeley, J Ciston; Lawrence Berkeley National Laboratory

9:30 AM **131** (Invited) *Imaging Structure and Magnetisation in New Ways Using 4D STEM;* **I MacLaren**, M Nord, S Conner, D McGrouther; University of Glasgow, United Kingdom, C Allen; Diamond Light Source Ltd, United Kingdom, R Bali; Helmholtz-Zentrum Dresden-Rossendorf, Germany

A09.1 Data Analytics and Model-Based Imaging for Microstructure and Physical Property Interpretations

SESSION CHAIRS:
Lawrence F. Drummy; U.S. Air Force Research Laboratory
Alex Belianinov; Oak Ridge National Laboratory

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 342

8:30 AM **132** (Invited) *Atomic Manipulation on a Scanning Transmission Electron Microscope Platform Using Real-Time Image Processing and Feedback;* O Dyck; Oak Ridge National Laboratory, S Kim; Pusan National University, Republic of Korea, A Borisevich, BM Hudak, AR Lupini, SV Kalinin, **S Jesse**; Oak Ridge National Laboratory

9:00 AM **133** *Custom Scan Control and Time Resolved Signal Acquisition for High Resolution SEM Imaging;* **WC Lenthe**; Carnegie Mellon University, J-C Stinville, MP Echlin, Z Chen, TM Pollock, S Daly; University of California-Santa Barbara, M De Graef; Carnegie Mellon University

9:15 AM **134** *Rapid Atomic-Resolution Image Analysis: Towards Near-Instant Feedback;* OS Ovchinnikov, A O'Hara; Vanderbilt University, SV Kalinin, S Jesse, **A Borisevich**; Oak Ridge National Laboratory, ST Pantelides; Vanderbilt University

9:30 AM **135** *Towards Real Time Quantitative Analysis of Supported Nanoparticle Ensemble Evolution Investigated by Environmental TEM;* **DN Zakharov**, Y Lin; Brookhaven National Laboratory, R Mégret; University of Puerto Rico, S Yoo; Brookhaven National Laboratory, P Voorhees; Northwestern University, JP Horwath, EA Stach; University of Pennsylvania

9:45 AM **136** *Metallic Copper Clusters Decorating Cu Ferrites Revealed by Deep Data Analysis;* **P Kikongi**, N Dumaresq, FB Lavoie, R Gosselin, N Braidy; Université de Sherbrooke, Canada

Scientific Program

A ANALYTICAL SCIENCES SYMPOSIA – Tuesday Morning *continued*

A10.2 The Joy of Scanning Electron Microscopy

SESSION CHAIRS:
Dale Newbury; National Institute of Standards and Technology
Raynald Gauvin; McGill University, Canada

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 328

8:30 AM **137** (Invited) *EBSD: Now Spanning Centimeters to Nanometers!*; **J Michael**, J Carroll; Sandia National Laboratories

9:00 AM **138** *Complementarity of On-Axis Transmission Kikuchi Diffraction and Forward Scatter Diffraction Imaging in SEM;* **E Brodu**, E Bouzy; LEM3, France

9:15 AM **139** (M&M STUDENT SCHOLAR) *Transmission Kikuchi Diffraction of the Thermally Grown Oxide on Grain-Refined NiAl-Zr;* **RE White**, ML Weaver; The University of Alabama

9:30 AM **140** *Non-Local Denoising of EBSD Patterns for Enhanced Indexing;* **DJ Rowenhorst**, P Brewick; U.S. Naval Research Laboratory

9:45 AM **141** *Applying SEM, EPMA and EBSD Analytic Techniques on Solder Joint for Microelectronic Package Development;* T-T Chou, R-W Song, **J-G Duh**; National Tsing Hua University, Taiwan

A11.2 Solid-State X-Ray Spectrometry at 50 Years

SESSION CHAIRS:
Edward Vicenzi; Smithsonian Institution
Nicholas Ritchie; National Institute of Standards and Technology

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 327

8:30 AM **142** (Invited) *Comprehensive Quantitative Elemental Microanalysis with Electron-Excited Energy Dispersive X-Ray Spectrometry (EDS): 50 Years Young and Getting Better Every Day!;* **DE Newbury**, NWM Ritchie; National Institute of Standards and Technology

9:00 AM **143** (Invited) *Using Micro-Beam Techniques to Infer Meteorite Abundances of the Jurassic;* **CE Caplan**, GR Huss, HA Ishii, JP Bradley; University of Hawai'i, P Eschbach; Oregon State University, B Schmitz; University of Lund, Sweden, K Nagashima; University of Hawai'i

9:30 AM **144** *Coordinated Nano-Scale EDS and EELS Measurements of Lunar Space-Weathered Material;* **KD Burgess**, RM Stroud; U.S. Naval Research Laboratory

9:45 AM **145** *Chemical Compound Classification by Elemental Signatures in Castle Dust Using SEM Automated X-Ray Particle Analysis;* **DL Ortiz-Montalvo**; National Institute of Standards and Technology, EP Vicenzi; Smithsonian Institution, NW Ritchie; National Institute of Standards and Technology, CA Grissom; Smithsonian Institution, RA Livingston; University of Maryland, Z Weldon-Yochim; University of Delaware, JM Conny, SA Wight; National Institute of Standards and Technology

A16.2 Sterling Newberry Memorial Symposium on X-Ray Imaging

SESSION CHAIRS:
Jeff Davis; PNDetector GmbH, Germany
Nik Cordes; Los Alamos National Laboratory

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 323

8:30 AM **146** *Combining 3D X-Ray Techniques; Computed Tomography and Fluorescence;* **BM Patterson**, NL Cordes, GJ Havrilla, K Henderson; Los Alamos National Laboratory

8:45 AM **147** *Blob-Based Algebraic Reconstruction Technique for Computed Laminography;* **P Trampert**, T Dahmen, P Slusallek; German Research Center for Artificial Intelligence, Germany

9:00 AM **148** *Next Generation of Instruments Required - Not Just X-Ray Imaging but Combined EDS, CL, GSR, XRM, XRD and Raman Systems;* **R Wuhrer**; Western Sydney University, Australia, K Mason; Eastern Analytical SPRL, Hungary, K Moran; Moran Scientific Pty Ltd, Australia

9:15 AM **149** In Situ *Dynamic X-Ray Tomography in the Laboratory;* **A Merkle**, M Boone, D Van Loo; XRE nv, Belgium

9:30 AM **150** (Invited) *Soft X-Ray Microscopy: History, Status, and Future;* **H Ade**; North Carolina State University

A17.2 Surface and Subsurface Microscopy and Microanalysis

SESSION CHAIRS:
John A. Chaney; The Aerospace Corporation
Vincent S. Smentkowski; General Electric Global Research Center
Chanmin Su; Bruker-Nano Inc.
Xiao-Ying Yu; Pacific Northwest National Laboratory

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 326

8:30 AM **151** (Invited) *Imaging the Endoplasmic Reticulum within Individual Mammalian Cells with Secondary Ion Mass Spectrometry;* **ML Kraft**, CE Chini; University of Illinois - Urbana-Champaign, GL Fisher; Physical Electronics, Inc, MM Tamkun; Colorado State University

9:00 AM **152** *Improving the Understanding of Catalytic Processes Using Field Emission Techniques: The Case of NO+H2 on Pd-Au;* C Barroo, **TV de Bocarmé**; Université Libre de Bruxelles, Belgium

9:15 AM **153** (Invited) *TOF-SIMS Analysis with High Lateral and High Mass Resolution in Parallel;* F Kollmer; IONTOF GmbH, Germany, **N Havercroft**; IONTOF Inc., A Henss; Justus-Liebig University Giessen, Germany, W Paul, H Arlinghaus, R Möllers, E Niehuis; IONTOF GmbH, Germany

9:45 AM **154** *Understanding Conditions Affecting Background in Atom Probe Tomography with Implications for Analysis of Hydrogen;* **TJ Prosa**; CAMECA Instruments, Inc.

A18.1 Vendor Symposium

SESSION CHAIRS:
Andreas Holzenburg; The University of Texas-Rio Grande Valley
Luisa Amelia Dempere; University of Florida

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 322

8:30 AM 155 *S9000X – Next Generation of Ultra-High-Resolution SEM for Enhanced Analysis and Xe Plasma FIB for Ultra-Fast and Gentle Sputtering;* M Havelka, J Jiruše, T Hrnčíř, J Polster, **R Váňa**, S Záchej; TESCAN Brno, Czech Republic

8:45 AM 156 *Removal of Ga Implantation on FIB-Prepared Atom Probe Specimens Using Small Beam and Low Energy Ar+ Milling;* **CS Bonifacio**; E.A. Fischione Instruments Inc., KP Rice, TJ Prosa; CAMECA Instruments, ML Ray; E.A. Fischione Instruments Inc., TF Kelly; CAMECA Instruments, PE Fischione; E.A. Fischione Instruments Inc.

9:00 AM 157 *Influence of SEM Deposited Protection Layers on FIB Induced Amorphous Damage of TEM Lamella Prepared by ExSolve WTP;* **MR Najarian**, M Gordillo, G Dutrow; Thermo Fisher Scientific

9:15 AM 158 *A Versatile All-in-One Automated Processor for Electron Microscopy;* **TE Strader**; Microscopy Innovations, LLC, NR Stewart; University of Wisconsin, BK August, SL Goodman; Microscopy Innovations, LLC

9:30 AM **159** *Cryo-EM Workflow Optimization;* **M Kuijper,** M de Jonge; Thermo Fisher Scientific, Netherlands, J Mitchels; Thermo Fisher Scientific, Czech Republic, S Konings; Thermo Fisher Scientific, Netherlands, O Shanel; Thermo Fisher Scientific, Czech Republic, R vd Ploeg; Thermo Fisher Scientific, Netherlands

B BIOLOGICAL SCIENCES SYMPOSIA – Tuesday Morning

B01.1 Microscopy and Analysis in Forensic Science

SESSION CHAIRS:
Keana Scott; National Institute of Standards and Technology
Robert Pope; U.S. Department of Homeland Security
Eric Steel; National Institute of Standards and Technology

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 348

8:30 AM **160** (Invited) *The FBI Laboratory Toolmark Topography Analysis Research for Objectively Qualifying the Degree of Similarity between Toolmarks;* **HJ Seubert**, ED Smith; U.S. Federal Bureau of Investigation

9:00 AM **161** *Evaluation of Lateral and Depth Resolutions of Light Field Cameras;* **S Yoon**, P Bajcsy, M Litorja, JJ Filliben; National Institute of Standards and Technology

9:15 AM **162** *Root Cause Failure Analysis of Polyethylene Tubing Utilizing Microscopy;* **EI Garcia-Meitin**, M Jablonka; The Dow Chemical Company

9:30 AM **163** (Invited) *Classification Strategies for Fusing UV/Visible Absorbance and Fluorescence Microspectrophotometry Spectra from Textile Fibers;* **SL Morgan**; University of South Carolina, N Fuenffinger; Indiana University Purdue University-Indianapolis, JV Goodpaster; George Washington University, EG Bartick; University of South Carolina

B03.1 3D Structures of Macromolecular Assemblies, Cellular Organelles, and Whole Cells

SESSION CHAIRS:
Teresa Ruiz; University of Vermont
Joaquin Ortega; McGill University, Canada
Michael Radermacher; University of Vermont

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 349

8:30 AM **164** (Invited) *Cryo-EM: a New Tool for Drug Development;* **P da Fonseca**; MRC Laboraroty of Molecular Biology, United Kingdom

9:00 AM **165** *Integrative Structure and Functional Anatomy of a Nuclear Pore Complex;* **I Nudelman**, MP Rout; Rockefeller University, SJ Kim; University of California-San Francisco, J Fernandez-Martinez, Y Shi, W Zhang; Rockefeller University, SJ Ludtke; Baylor College of Medicine, CW Akey; Boston University School of Medicine *et. al.*

Scientific Program

B BIOLOGICAL SCIENCES SYMPOSIA – Tuesday Morning *continued*

9:15 AM **166** (Invited) (RALEIGH & CLARA MILLER AWARD) *Structural Characterization of Emerging Pathogenic Human Parvoviruses;* **M Mietzsch**, M Agbandje-McKenna, M Luo, JC Yu, S Kailasan, M Ilyas, P Chipman; University of Florida, D Sousa; Florida State University *et. al.*

9:45 AM **167** *Using Reconstruction Statistics to Predict the Number of Images Required for Single Particle Analysis;* **B Heymann**; National Institutes of Health

B04.2 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals

SESSION CHAIRS:
Gang (Greg) Ning; The Pennsylvania State University
Ru-Ching Hsia; University of Maryland Baltimore
Trace Christensen; Mayo Clinic

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 350

8:30 AM 168 *A Multi-Microscopy Approach to Discover the Feeding Site and Host Tissue Consumed by* Varroa destructor *on Host Honey Bees;* S Ramsey; University of Maryland, C Gulbronson; Oak Ridge Institute for Science and Education, J Mowery, R Ochoa; U.S. Department of Agriculture, D vanEnglesdorp; University of Maryland, **GR Bauchan**; U.S. Department of Agriculture

8:45 AM 169 (Invited) *Studying Manometric Anatomy to Understand Structural Heart Disease at the Organ Scale;* **AF Liang**, VR Mezzano, A Leo-Macias, EA Pascual, C Petzold, K Dancel-Manning, G Morley, M Delmar; New York University Langone Health

9:15 AM 170 *Correlated Wide-Scale Imaging of Tissue Sections on Glass Slides for Histology and Ultrastructural Pathology by Backscatter Electron Scanning Microscopy;* **M Reichelt**, M Sagolla, C Austin, P Caplazi, J Webster; Genentech

9:30 AM 171 *Retinal Ultrastructural and Microvascular Defects in Decorin Deficient* (Dcn-/-) *Mice;* **RR Lim**, S Gupta, DG Grant, PR Sinha, RR Mohan, SS Chaurasia; University of Missouri

9:45 AM 172 (M&M POSTDOCTORAL SCHOLAR) *Atomic Resolution STEM Imaging of Human Enamel Crystallites and Characterization of its Localized Impurities;* **PJ Smeets**, K DeRocher; Northwestern University, MJ Zachman, BH Goodge, LF Kourkoutis; Cornell University, D Joester; Northwestern University

P PHYSICAL SCIENCES SYMPOSIA – Tuesday Morning

P01.2 Advances in Electron, X-Ray and Neutron Spectro-Imaging/ Holography of Energy Materials and Devices

SESSION CHAIRS:
Chongmin Wang; Pacific Northwest National Laboratory
Peter Crozier; Arizona State University

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 336

8:30 AM 173 (Invited) *Probing Functionality for Energy Related Materials;* Opportunities for Advanced Electron Microscopy; **PA Crozier**; Arizona State University

9:00 AM 174 *Electron Holography Study on Vortex Beam Phases in Real Space;* **K Harada**, K Shimada, YA Ono, Y Iwasaki, K Niitsu, D Shindo; RIKEN, Japan

9:15 AM 175 *Diffraction Contrast Scanning Transmission Electron Microscopy – A Bend-Contour-Free Way to Image Dislocations, Voids and Precipitates;* **Y Zhu**; Pacific Northwest National Laboratory, C Ophus; Lawrence Berkeley National Laboratory, MB Toloczko, DJ Edwards; Pacific Northwest National Laboratory

9:30 AM **176** (M&M STUDENT SCHOLAR) *Advanced Methods to Enable 4D Imaging of Polymer Electrolyte Fuel Cells by X-Ray Computed Tomography;* **RT White**, S Eberhardt, Y Singh, D Ramani, FP Orfino; Simon Fraser University, Canada, M Dutta; Ballard Power Systems, Canada, E Kjeang; Simon Fraser University, Canada

9:45 AM **177** *Depth Dependence Investigation of Manganese Charge State in Oxygen-Deficient LSMO Thin Films;* **AN Penn**, A Kumar; North Carolina State University, R Trappen, G Cabrera, MB Holcomb; West Virginia University, JM LeBeau; North Carolina State University

P02.2 Atomically Thin 2D Materials: Recent Results and Challenges

SESSION CHAIRS:
Raul Arenal; University of Zaragoza, Spain
Quentin M Ramasse; SuperSTEM Laboratory, United Kingdom

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 338

8:30 AM **178** (Invited) *Synthesis and Advanced Characterization of Layered Platelets by Self-assembly of Long-chain Amines;* V Nicolosi, S-H Park, JC Zhang, J Coelho, S Metel, H Nerl, C Downing, **A Seral-Ascaso**; Trinity College Dublin, Ireland

9:00 AM **179** *Atomistic Insights into Thermolysis and Growth of Two-Dimensional MoS_2 Using* In Situ *Electron Microscopy;* **X Sang**, X Li, DB Geohegan, K Xiao, R Unocic; Oak Ridge National Laboratory

9:15 AM **180** *Anisotropic Lithiation and Sodiation of ReS_2 Studied by* In Situ *TEM;* **J Wu**, Q Li, Y Xu, Z Yao, J Kang, X Liu, C Wolverton, M Hersam; Northwestern University *et. al.*

9:30 AM **181** (Invited) *(Supra)Molecular Approaches to 2D Materials: from Self-Assembly to Molecule-Assisted Liquid-Phase Exfoliation;* **A Ciesielski**, P Samori; University of Strasbourg, France

P04.1 *In Situ* Methods for Probing Properties and Dynamics in Materials

SESSION CHAIR:
Chaoying Ni; University of Delaware

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 340

8:30 AM **182** (Invited) *Scanning TEM EBIC Imaging of Resistive Memory Switching Processes;* **B Regan**, J Lodico, WA Hubbard; University of California-Los Angeles

9:00 AM **183** *A Novel Template for In Situ Microscopy to Reveal Ferroelectric Switching Mechanisms Across Length Scales;* **R Dhall**, M Cabral, A Kumar, JM LeBeau; North Carolina State University

9:15 AM **184** *Electron Beam Effects on Silicon Oxide Films – Structure and Electrical Properties;* **KK Neelisetty**; Karlsruhe Institute of Technology, Germany, S Gutsch; IMTEk Nanotechnologie, Germany, A Molinari; Karlsruhe Institute of Technology, Germany, A Vahl; Technische Fakultät der CAU Kiel, Germany, F von Seggern, X Mu, KV Chakravadhanula, T Scherer; Karlsruhe Institute of Technology, Germany *et. al.*

9:30 AM **185** (Invited) In Situ *TEM Probing of Ferroelectric Switching under Electrical Bias;* **X Pan**, L Li, M Xu, S Dai, T Blum; University of California-Irvine

P05.2 Modulating Electron Beams in Space and Time to Probe for Structure and Function of Soft and Hard Matter

SESSION CHAIRS:
David Flannigan; University of Minnesota
Joerg Jinschek; The Ohio State University

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 344

8:30 AM **186** (Invited) *Imaging and Electron Energy-Loss Spectroscopy with Single Nanosecond Electron Pulses;* M Picher, K Bücker; University of Strasbourg, CNRS, France, T LaGrange; Ecole Polytechnique Fédérale de Lausanne, Switzerland, **F Banhart**; University of Strasbourg, CNRS, France

9:00 AM **187** (Invited) *Use of a Direct Electron-Detection Camera in Ultrafast Electron Microscopy for Low Dose Rate Time-Resolved Imaging;* Y-J Kim, **O-H Kwon**; Ulsan National Institute of Science and Technology (UNIST), Republic of Korea

9:30 AM **188** *Stroboscopic High-Duty-Cycle GHz Time-Resolved Microscope: First Proof of a Picosecond Beam Operated at GHz Level on a 200 keV Beamline;* **A Liu**, C Jing, A Kanareykin, Y Zhao; Euclid Techlabs, B Reed, D Masiel; IDES, Y Zhu; Brookhaven National Laboratory, J Lau; National Institute for Standards and Technology

9:45 AM **189** *New Interference Experiment with Asymmetric Double Slits by 1.2 MV FE-TEM;* **K Harada**; RIKEN, Japan, T Akashi; Hitachi, Ltd., Japan, K Niitsu, K Shimada, YA Ono, D Shindo; RIKEN, Japan, H Shinada; Hitachi, Ltd., Japan, S Mori; Osaka Prefecture University, Japan

TF TECHNOLOGISTS' FORUM SYMPOSIA – Tuesday Morning

X31.1 Technologists' Forum Special Topic Session: Specimen Preparation for Correlative FIB-SEM and XRM

SESSION CHAIR:
Caroline Miller; Indiana University - Purdue University Indianapolis

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 347

8:30 AM **190** (Invited) *Navigating the Fog: A Correlated XRM and FIB-SEM Imaging Pipeline for the Rapid and Precise Spatial Targeting of Rare Structures in Biological Samples;* **MS Joens**, DJ Geanon, PO Bayguinov, KJ Lavine, JA Fitzpatrick; Washington University School of Medicine

9:00 AM **191** (Invited) *Correlative Workflow in the Characterization of Advanced Coatings;* **S Shahbazmohamadi**; University of Connecticut

T TUTORIALS – Tuesday Morning

X45.1 How to Get Funding for Instrumentation When Budgets are Tight (Parts I and II)

SESSION CHAIR:
Christine A Brantner; George Washington University

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 321

8:30 AM **192** (Invited) *Development of an Acquisition Instrumentation Program;* **LA Dempere**, M Manuel; University of Florida

Scientific Program

T TUTORIALS – Tuesday Morning *continued*

8:45 AM **193** (Invited) *Acquisition of a Microscope for* In Situ *Studies of Hard and Soft Matter;* **JM LeBeau**, EC Dickey, DL Hesterberg, V Augustyn, AC Brown; North Carolina State University

9:00 AM **194** (Invited) *A New Field Emission Scanning Electron Microscopy Facility with STEM and EDS Capabilities for Interdisciplinary Research and Education at Towson University,* Fisher College of Science and Mathematics; **VD Shields**, MS Devadas, RM Kolagani, VN Smolyaninova, AJ Williams; Towson University

9:15 AM **195** (Invited) *A Guide to Submitting a Successful NIH S10 Shared Instrumentation Grant Application;* **FP Macaluso**; Albert Einstein College of Medicine

9:30 AM **196** *Roundtable Discussion;* **Christine Brantner**; George Washington University

O MICROSCOPY OUTREACH SESSIONS – Tuesday Morning

X90.1 Microscopy in the Classroom

SESSION CHAIR:
Donovan N. Leonard; Oak Ridge National Laboratory

PLATFORM SESSION
Tuesday: 8:30 AM • Room: 324-325

8:30 AM **197** *Introduction;* **Donovan N. Leonard**; Oak Ridge National Laboratory

9:00 AM **198** *Using a Tabletop Scanning Electron Microscope as an Outreach Tool to Engage the Public with Cutting-Edge Research;* F Lu, AL Gillian-Daniel, **JL Hunter**, N Abbott; University of Wisconsin-Madison

9:30 AM **199** *The Secrets of the Blue Morpho Butterfly: Applying the National Museum of Natural History Resources to Create Novel Science Activities;* **JP Hurtado Padilla**; Smithsonian National Museum of Natural History

A ANALYTICAL SCIENCES SYMPOSIA – Tuesday Morning *continued*

A01.3 Professor Hatsujiro Hashimoto Memorial Symposium: Foundations in Imaging Crystals, Defects, and Atoms

SESSION CHAIRS:
Satoshi Ichikawa; Osaka University, Japan
Masashi Watanabe; Lehigh University

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 341

10:30 AM **200** (Invited) *Improving the STEM Spatial Resolution Limit;* **OL Krivanek**, AL Bleloch, N Dellby, TC Lovejoy; Nion Company, C Shi; Nion Company, China, W Zhou; University of Chinese Academy of Sciences, China

11:00 AM **201** *Anchoring and Localizing Single Metal Atoms for Better Catalysis;* **J Liu**; Arizona State University

11:15 AM **202** *Imaging of Single Vacancies and Dopant Complexes in Aluminum Nitride;* **TB Eldred**, JS Harris, JN Baker, DL Irving, JM LeBeau; North Carolina State University

11:30 AM **203** *Atomic Resolution Imaging and Quantitative Elemental Mapping of the Misfit Dislocation Core Phase in Multicomponent Oxides;* **N Bagués**; The Ohio State University, J Santiso; Catalan Institute of Nanoscience and Nanotechnology (ICN2), CSIC and BIST, Spain, BD Esser, REA Williams, DW McComb; The Ohio State University, Z Konstantinovic; University of Belgrade, Serbia, L Balcells, F Sandiumenge; Institute of Materials Science of Barcelona, ICMAB-CSIC, Spain

11:45 AM **204** *Differential Potential Distribution Observation in Transmission Electron Microscope with Conventional Thermal Electron Gun;* K Sasaki; UACJ Corporation, Japan, **H Sasaki**; Furukawa Electric Co. Ltd., Japan, S Saito; Chemical Analysis Research Section, Japan

A02.1 Atomic-Scale Functional Imaging in Aberration-Corrected Electron Microscopy

SESSION CHAIRS:
Miaofang Chi; Oak Ridge National Laboratory
Marta D. Rossell; Empa, Switzerland

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 339

10:30 AM **205** (Invited) *Extracting Local Quantitative Atomic-Resolution Strain Information from High-Precision STEM Data of Supported Nanocatalysts;* **AB Yankovich**, T Nilsson Pingel, M Jørgensen, H Grönbeck, E Olsson; Chalmers University of Technology, Sweden

11:00 AM **206** *Identification of Rapid Oxygen Exchange through Site-Dependent Cationic Displacements on CeO_2 Nanoparticles;* **EL Lawrence**, BD Levin, TM Boland, SLY Chang, PA Crozier; Arizona State University

11:15 AM **207** *Revealing the Surface Effect at Atomic Scale in Silver Hollandite;* **X Hu**, L Wu; Brookhaven National Laboratory, J Huang, AC Marschilok, ES Takeuchi, KJ Takeuchi; Stony Brook University, Y Zhu; Brookhaven National Laboratory

11:30 AM **208** *Quantification of Structural Correlation in STEM Images Using the Projected Pair Distribution Function;* **MJ Cabral**, EC Dickey, JM LeBeau; North Carolina State University

11:45 AM **209** *Deep Learning for Atomically Resolved Imaging;* **M Ziatdinov**, O Dyck, S Jesse, SV Kalinin; Oak Ridge National Laboratory

A03.3 Four-Dimensional Scanning Transmission Electron Microscopy (4D-STEM): From Scanning Nanodiffraction to Ptychography and Beyond

SESSION CHAIRS:
Joanne Etheridge; Monash University, Australia
Peter Nellist; Oxford University, United Kingdom

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 343

10:30 AM **210** (Invited) *Scanning Electron Diffraction – Crystal Mapping at the Nanoscale;* **P Midgley**, D Johnstone; University of Cambridge, United Kingdom

11:00 AM **211** *Insights into Texture and Phase Coexistence in Polycrystalline and Polyphasic Ferroelectric HfO_2 Thin Films Using 4D-STEM;* **ED Grimley**, S Frisone; North Carolina State University, T Schenk, MH Park; NaMLab gGmbH, Germany, CM Fancher; Oak Ridge National Laboratory, T Mikolajick; NaMLab gGmbH, Germany, JL Jones, JM LeBeau; North Carolina State University

11:15 AM **212** (Invited) *Low Dose Defocused Probe Electron Ptychography Using a Fast Direct Electron Detector;* **CS Allen**; University of Oxford, United Kingdom, P Wang; Nanjing University, China, AI Kirkland; University of Oxford, United Kingdom, M Danaie; Diamond Light Source, United Kingdom

11:45 AM **213** *Sample Thickness Limitations in Defocused Electron Probe Ptychography;* **AM Blackburn**, A Frencken; University of Victoria, Canada

A04.1 *In Situ* Transmission Electron Microscopy in Liquid and Gas Cells

SESSION CHAIR:
Larry Allard; Oak Ridge National Laboratory

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 345-346

10:30 AM **214** (Invited) *Atomic-Resolution Imaging of Heterogeneous Catalysts at Work;* **S Helveg**; Haldor Topsøe A/S, Denmark, I Chorkendorff, CD Damsgaard; Technical University of Denmark, Denmark, JR Jinschek; Ohio State University, CF Elkjær, SP Jespersen, S Vendelbo; Haldor Topsøe A/S, Denmark, B Hendriksen; Thermo Fisher Scientific, Netherlands *et. al.*

11:00 AM **215** In Situ *Scanning Transmission Electron Microscopy with Atomic Resolution under Atmospheric Pressures;* **S Dai**, S Zhang, G Graham, X Pan; University of California-Irvine

11:15 AM **216** (M&M STUDENT SCHOLAR) *Atomic-Resolution Operando Observations of Nanostructured Pt/CeO_2 Catalysts Performing CO Oxidation;* **JL Vincent**, PA Crozier; Arizona State University

11:30 AM **217** *The Merits of* In Situ *Environmental STEM for the Study of Complex Oxide Catalysts at Work;* Y Zhu, E Jensen, PK Sushko, L Kovarik; Pacific Northwest National Laboratory, D Melzer; Technical University of Munich, Germany, C Ophus; Lawrence Berkeley National Laboratory, M Sanchez-Sanchez; Technical University of Munich, Germany, J Lercher; Technical University of Munich, Pacific Northwest National Laboratory, Germany *et. al.*

11:45 AM **218** *Pressure Induced Effects During* In Situ *Characterization of Supported Metal Catalysts;* **MR Nielsen**; Technical University of Denmark, Denmark, X Liu; Synfuels China Technology Co., China, JB Wagner, CD Damsgaard, TW Hansen, M Schumann, AD Jensen, JM Christensen; Technical University of Denmark, Denmark

A09.2 Data Analytics and Model-Based Imaging for Microstructure and Physical Property Interpretations

SESSION CHAIRS:
Charles A. Bouman; Purdue University
Alex Belianinov; Oak Ridge National Laboratory

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 342

10:30 AM **219** (Invited) *Dynamic Determination of Phase Diagrams by Active Machine Learning;* **I Takeuchi**; University of Maryland

Scientific Program

A ANALYTICAL SCIENCES SYMPOSIA – Tuesday Morning *continued*

11:00 AM **220** *Grains and Strains from Cepstral Analysis of 4D-STEM Nano-Diffraction Datasets;* **E Padgett**, P Cueva, ME Holtz, E Langenberg, D Ren, HD Abruña, D Schlom, DA Muller; Cornell University

11:15 AM **221** *Correlation of c-Axis Orientation of α-Titanium Grains with Polarized Light Optical Microscopy Intensity Profiles;* **K-W Jin**, M De Graef; Carnegie Mellon University

11:30 AM **222** (Invited) *Indexing of Large SEM Diffraction Data Sets Using a Dictionary Approach;* **M DeGraef**; Carnegie Mellon University

A10.3 The Joy of Scanning Electron Microscopy

SESSION CHAIRS:
Raynald Gauvin; McGill University, Canada
Dale Newbury; National Institute of Standards and Technology

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 328

10:30 AM **223** (Invited) *The Joy in Imaging the Auger Electron Signal in a FESEM Using a Segmented Annular BSED and Stage Bias;* **BJ Griffin**, AA Suvorova; The University of Western Australia, Australia, DC Joy; Oak Ridge National Laboratory, JR Michael; Sandia National Laboratories

11:00 AM **224** *Energy-Momentum Spectroscopy by Highly Parallelized Wavelength- and Angularly-Resolved Cathodoluminescence in the Scanning Electron Microscope;* M Bertilson, **DJ Stowe**, T Worsely, T Franklin, L Muray, M Hsueh, JA Hunt; Gatan Inc

11:15 AM **225** *Joy of Scanning with Electron and X-Ray Imaging;* **PT Pinard**, S Burgess, A Hyde, J Holland, P Statham; Oxford Instruments NanoAnalysis, United Kingdom

11:30 AM **226** *DELTA – A Novel Ultra-Low Voltage SEM for Electron Spectroscopic Imaging;* **RR Schroeder**; Heidelberg University Hospital, Germany, M Pfannmöeller; Heidelberg University, Germany, D Preikszas; Carl Zeiss Microscopy, Germany, I Wacker; Heidelberg University, Germany, B Schindler, M Schnell, C Hendrich, J Wensorra; Carl Zeiss Microscopy, Germany *et. al.*

11:45 AM **227** *Statistical Analysis of Secondary Electron Spectroscopic Images Using Ultra-Low Energies Reveal Nanoscale Surface Morphology of Functional Organic Blends;* J Kammerer; Heidelberg University, Germany, R Alkarsifi, C Videlot-Ackermann, O Margeat; Aix Marseille Université, France, B Schindler; Carl Zeiss Microscopy GmbH, Germany, I Wacker; Heidelberg University, Germany, J Ackermann; Aix Marseille Université, France, RR Schröder; Heidelberg University, Germany, **M Pfannmöeller**; Heidelberg University, Germany *et. al.*

A11.3 Solid-State X-Ray Spectrometry at 50 Years

SESSION CHAIRS:
Katherine Burgess; U.S. Naval Research Laboratory
Paul Carpenter; Washington University

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 327

10:30 AM **228** (Invited) *The Maia Detector Journey: Development, Capabilities and Applications;* **CG Ryan**; CSIRO, Australia, DJ Paterson, MD de Jonge, DL Howard; Australian Synchrotron, Australia, R Dodanwela; CSIRO, Australia, GA Carini; SLAC National Accelerator Laboratory, DA Pinelli; Brookhaven National Laboratory, L Fisher; CSIRO, Australia *et. al.*

11:00 AM **229** (Invited) *Next For EDS? SDD Arrays, GeDDs, and a 40-Year Paradigm Overturned;* **RB Mott**; XrayMaps.Com

11:30 AM **230** *X-Ray Microanalysis at High Count Rate with Latest Generation Silicon Drift Energy Dispersive Spectrometer;* PT Pinard, **S Burgess**, JQ Zhang, J Holland, P Statham; Oxford Instruments NanoAnalysis, United Kingdom

11:45 AM **231** *Very Large-Area EDS Spectral Images: Impact of Latest Silicon Drift Detector Technology;* **JJ McCarthy**; University of Wisconsin-Madison, JF Konopka; Thermo Fisher Scientific

A17.3 Surface and Subsurface Microscopy and Microanalysis

SESSION CHAIRS:
Vincent S. Smentkowski; General Electric Global Research Center
John A. Chaney; The Aerospace Corporation
Chanmin Su; Bruker-Nano Inc.
Xiao-Ying Yu; Pacific Northwest National Laboratory

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 326

10:30 AM **232** (Invited) *Auger Electron Spectroscopy – History and Applications in Materials Characterization with Emphasis on Medical Devices;* **S Raman**, L LaVanier, J Moskito, D Madamba; EAG Laboratories

11:00 AM **233** *Spherical Particles in $Al_{65}Cu_{20}Fe_{15}$ Alloy Prepared by Arc Melting;* **C Li**, C Carey; Clarion University, D Li, M Caputo; Youngstown State University, H Hampikian; Clarion Univeristy

11:15 AM **234** (Invited) *Recent Developments in XPS – Microspectroscopy, Spectromicroscopy, Lateral and Depth Information towards Cutting-Edge Solid Electrolytes and Biomaterials;* **JDP Counsell**; Kratos Analytical Ltd, United Kingdom, DJ Surman, C Moffitt; Kratos Analytical Inc.

11:45 AM **235** *Observation of Lithium Fluorescence X-Ray Utilizing Superconducting Tunnel Junction Array X-Ray Detector Toward* In Situ *Mapping Analyses of Precipitated Metal Lithium in Solid Electrolytes of Li-ion Batteries;* **M Ukibe**, G Fujii, S Shiki, M

Ohkubo; National Institute of Advanced Industrial Science and Technology, Japan

A18.2 Vendor Symposium

SESSION CHAIRS:
Luisa Amelia Dempere; University of Florida
Andreas Holzenburg; The University of Texas-Rio Grande Valley

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 322

10:30 AM **236** *Tilt-Free EBSD;* **T Vystavěl**, P Stejskal; Thermo Fisher Scientific, Czech Republic, C Stephens; Thermo Fisher Scientific, United Kingdom, M Unčovský; Thermo Fisher Scientific, Czech Republic

10:45 AM **237** *The Benefits and Applications of a CMOS-based EBSD Detector;* **J Goulden**, P Trimby, A Bewick; Oxford Instruments, United Kingdom

11:00 AM **238** *Introducing Lumis -A Novel EBSD detector;* **CJ Stephens**, Z Pesic; Thermo Fisher Scientific, United Kingdom

11:15 AM **239** *Optimizing the Nion STEM for In Situ Experiments;* **MT Hotz**; Nion Company, HW Zandbergen; Delft University of Technology, Netherlands, OL Krivanek, G Corbin, N Dellby, TC Lovejoy, GS Skone; Nion Company, J-D Blazit; Université Paris Sud, France *et. al.*

11:30 AM **240** *Sub-Å STEM Resolution from 30-300kV;* M Bischoff, M Niestadt, V Altin, A Henstra, P Tiemeijer, B Freitag, C Maunders; Thermo Fisher Scientific, Netherlands, P Hartel; Corrected Electron Optical Systems GmbH, Germany, **E Van Cappellen**; Thermo Fisher Scientific, Netherlands *et. al.*

11:45 AM **241** *Latest Developments in Environmental SEM Systems;* **EJR Vesseur**; Thermo Fisher Scientific, Netherlands

B BIOLOGICAL SCIENCES SYMPOSIA – Tuesday Morning *continued*

B01.2 Microscopy and Analysis in Forensic Science

SESSION CHAIRS:
Keana Scott; National Institute of Standards and Technology
Robert Pope; U.S. Department of Homeland Security
Eric Steel; National Institute of Standards and Technology

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 348

10:30 AM **242** (Invited) *Microscopy to Support Trace Screening of Contraband, Including Explosives and Illicit Drugs;* **J Verkouteren**, E Sisco; National Institute of Standards and Technology

11:00 AM **243** *Optimization of Forensic Analyses with Latest Generation EDS and EBSD on Multi-Function SEMs;* **M Hiscock**; Oxford Instruments NanoAnalysis, United Kingdom

11:15 AM **244** *Detection and Characterization of Heavy-Metal-Free (HMF) Gunshot Residues Using CL, EDS and Raman together with XRD;* K Mason; Eastern Analytical sprl, Hungary, **R Wuhrer**; Western Sydney University, Australia

11:30 AM **245** *Advantages of Micro-XRF in Forensic Science: From Large Areas to Minute Amounts;* M Buegler, F Reinhardt, **S Scheller**, R Tagle, T Wolff; Bruker Nano GmbH, Germany

11:45 AM **246** *The Necessity of Standards in an ISO 17025 Accredited Bioforensic Electron Microscopy Laboratory;* **BM Leroux**, RK Pope; National Bioforensic Analysis Center

B03.2 3D Structures of Macromolecular Assemblies, Cellular Organelles, and Whole Cells

SESSION CHAIRS:
Joaquin Ortega; McGill University, Canada
Michael Radermacher; University of Vermont
Teresa Ruiz; University of Vermont

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 349

10:30 AM **247** (Invited) *Structural Snapshots of a Dynamic Process in the Regulation of P-Rex, a Metastatic Factor;* JN Cash; University of Michigan, S Ravala, JJ Tesmer; Purdue University, **MA Cianfrocco**; University of Michigan

11:00 AM **248** *Cryo-EM Reveals a Unique BRCA1 Complex in Metastasis;* **AC Varano**, N Alden, W Dearnaley, DF Kelly; Virginia Tech

11:15 AM **249** *Correlative Light and 3D Electron Microscopy of Subnuclear Structures;* **CS Lopez**, J Riesterer, K Loftis, S Kwon, G Thibault, M Williams, B Johnson, JW Gray; Oregon Health & Science University

11:30 AM **250** *High Pressure Freezing Airway Smooth Muscle Tissue at Physiological Length for Analysis of Contractile Filaments;* **TL Lavoie**, ML Dowell, JR Austin, J Solway; University of Chicago

11:45 AM **251** *Electron Tomography of Hydroxyapatite Platelets in* Atractosteus spatula *Boney Scales*; **KJ Livi**; Johns Hopkins University, T Lancon, C Bouchet-Marquis; Thermo Fisher Scientific

Scientific Program

B BIOLOGICAL SCIENCES SYMPOSIA – Tuesday Morning *continued*

B04.3 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants, and Animals

SESSION CHAIRS:
Gang (Greg) Ning; The Pennsylvania State University
Ru-Ching Hsia; University of Maryland-Baltimore
Trace Christensen; Mayo Clinic

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 350

10:30 AM **252** *Structural Changes in Sodium Channel-Rich Nanodomains Contribute to the Progression of Atrial Fibrillation;* A Greer-Short, T Hund, **R Veeraraghavan**; The Ohio State University

10:45 AM **253** (Invited) *Application of Microscopy Technologies for Nanomaterial Characterization and Biological Quantification;* G Cheng, Y Xia, W Li, M Nisic, S Hao, **S-Y Zheng**; The Pennsylvania State University

11:15 AM **254** (Invited) *Volume EM of Pathological Deposits – Array Tomography and FIBSEM Nanotomography on Weakly Metalized Routine Samples;* **I Wacker**; Heidelberg University, Germany, C Dittmayer; Charité University Hospital, Germany, J Schroeder; Regensburg University Hospital, Germany, RR Schröder; Heidelberg University Hospital, Germany

11:45 AM **255** *Compositional and Engineering Adaptations in Dentine Explored by Analytical STEM;* **V Srot**, B Bussmann; Max Planck Institute for Solid State Research, Germany, B Pokorny; Environmental Protection College, Slovenia, M Watanabe; Lehigh University, PA van Aken; Max Planck Institute for Solid State Research, Germany

P PHYSICAL SCIENCES SYMPOSIA – Tuesday Morning *continued*

P01.3 Advances in Electron, X-Ray and Neutron Spectro-Imaging/ Holography of Energy Materials and Devices

SESSION CHAIRS:
Michael Toney; Stanford Synchrotron Radiation Light Source
Esther Takeuchi; Stony Brook University

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 336

10:30 AM **256** (Invited) *The Importance of Combined Spatio-Temporal Characterization: From* In Situ *to* Operando *Diffraction Measurements of* $Li/Li_{1.1}V_3O_8$ *Batteries;* **E Takeuchi**, Q Zhang, A Bruck; Stony Brook University, D Bock; Brookhaven National Laboratory, K Takeuchi, A Marschilok; Stony Brook University

11:00 AM **257** *Insights into Structural Evolution of a Solid Electrolyte Interphase Using Thin Window Si Membrane Negative Electrodes;* **VP Oleshko**, S Takeuchi, WR McGehee, E Strelcov, D Gundlach, N Zhitenev, CL Soles, JJ McClelland; National Institute of Standards and Technology

11:15 AM **258** (M&M POSTDOCTORAL SCHOLAR) *Rate-Dependent Reversal of Lithium Concentration During Intercalation into* Li_xFePO_4 *Nanoparticles;* **W Zhang**, L Wu; Brookhaven National Laboratory, H-C Yu; Michigan State University, J Bai, Y Zhu; Brookhaven National Laboratory, K Thornton; University of Michigan, F Wang; Brookhaven National Laboratory

11:30 AM **259** (Invited) In Situ *S/TEM of Li-Ion Batteries: Lithium Metal and Sn Anode Interfacial Processes;* **KL Jungjohann**, KL Harrison, S Goriparti, W Mook, AJ Leenheer, K Zavadil; Sandia National Laboratories

P02.3 Atomically Thin 2D Materials: Recent Results and Challenges

SESSION CHAIRS:
Quentin M Ramasse; SuperSTEM Laboratory, United Kingdom
Raul Arenal; University of Zaragoza, Spain

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 338

10:30 AM **260** (Invited) *Measurement of Optical Excitations in Low-Dimensional Materials by Using a Monochromated Electron Source;* **R Senga**; National Institute of Advanced Industrial Science and Technology, Japan, T Pichler; University of Vienna, Austria, K Suenaga; National Institute of Advanced Industrial Science and Technology, Japan

11:00 AM **261** *Low-loss EELS Investigations on Atomically Thin* $Mo_xW_{(1-x)}S_2$ *Nanoflakes for Delving into Their Optoelectronic Properties;* M Pelaez-Fernandez; University of Zaragoza, Spain, YC Lin, K Suenaga; National Institute of Advanced Industrial Science and Technology (AIST), Japan, **R Arenal**; University of Zaragoza, Spain

11:15 AM **262** *Multipolar Surface Plasmons in 2D* $Ti_3C_2T_x$ *Flakes: an Ultra-High Resolution EELS with Conventional TEM and* In Situ *Heating Study;* **S Lopatin**, JK El-Demellawi, HN Husam; KAUST, Saudi Arabia

11:30 AM **263** *Localized Plasmon Response Engineering in B- and N-Doped Graphene;* FS Hage, D Kepaptsoglou; SuperSTEM Laboratory, United Kingdom, T Hardcastle; University of Leeds, United Kingdom, M Gjerding; Techincal University of Denmark, Denmark, K Winther; Technical University of Denmark, Denmark, JA Amani, HC Hofsaess; Georg-August-Universitat Goettingen, Germany, KS Thygesen; Technical University of Denmark, Denmark, **Q Remasse**; SuperSTEM Laboratory, United Kingdom, *et. al.*

P03.1 Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications

SESSION CHAIR:
Moon Kim; University of Texas-Dallas

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 337

10:30 AM **264** (Invited) *Noble-Metal Nanostructures as Artificial Enzymes: Controlled Synthesis and Electron Microscope Characterizations;* **X Xia**, H Ye; Michigan Technological University

11:00 AM **265** *Nanostructured TiO_2 Support Effect on Hydrothermal Stability of Platinum Based Catalysts;* **X Lu**, W Tang, P-X Gao; University of Connecticut

11:15 AM **266** (M&M STUDENT SCHOLAR) *Correlative Structure-Bonding and Stability Studies of Pt/γ-Al_2O_3 Catalysts*; **H Ayoola**, WA Saidi, JC Yang, Q Zhu, CS Bonifacio, MP McCann, MT Curnan, SD House; University of Pittsburgh *et. al.*

11:30 AM **267** *Importance of Co-Catalyst Dispersion in Pt-Functionalized Graphitic Carbon Nitride Photocatalysts;* **DM Haiber**, PA Crozier; Arizona State University

11:45 AM **268** *Experimental Evidence for the Existence of an Iridium Sesquioxide Metastable Phase during ETEM Studies of Methane Steam Reforming on an Ir/$Ce_{0.9}Gd_{0.1}O_{2-x}$ Catalyst;* **T Epicier**, M Aouine, FJC Santos Aires, L Massin, P Gélin; Université de Lyon, France

P04.2 *In Situ* Methods for Probing Properties and Dynamics in Materials

SESSION CHAIR:
Andrew Minor; Lawrence Berkeley National Laboratory

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 340

10:30 AM **269** (Invited) *Very Fast Tomography in the (E)TEM to Probe Dynamics in Materials during* Operando *and* In Situ *Experiments;* **T Epicier**, H Banjak; Université de Lyon, INSA-Lyon, Université C. Bernard Lyon 1, France, A-S Gay; IFP Energies nouvelles, France, T Grenier, S Koneti, V Maxim, L Roiban; Université de Lyon, INSA-Lyon, Université C. Bernard Lyon 1, France

11:00 AM **270** In Situ *Atomic-Resolution Observations of Oxide-Reduction Induced Formation of Nano-Holes in Cu_2O Thin Films;* **X Chen**, D Wu, L Zou, Q Yin, H Zhang; State University of New York, DN Zakharov; Brookhaven National Laboratory, EA Stach; University of Pennsylvania, G Zhou; State University of New York

11:15 AM **271** *Elastic Properties of Cerium Oxide Nanocubes from* In Situ *TEM Compression Tests and DFT+U Simulations;* L Joly-Pottuz, T Epicier; Université de Lyon, INSA-Lyon, France, T Albaret; Université de Lyon, Université Claude Bernard Lyon I, France, M Cobian; Université de Lyon, Ecole Centrale de Lyon, France, DD Stauffer; Bruker Nano, Inc., **K Masenelli-Varlot**; Université de Lyon, INSA-Lyon, France

11:30 AM **272** (Invited) *Deformation Localization in Metallic Glasses Studied by* In Situ *TEM Deformation;* **C Gammer**; Erich Schmid Institute of Materials Science, Austria, TC Pekin, C Ophus, AM Minor; Lawrence Berkeley National Laboratory, J Eckert; Erich Schmid Institute of Materials Science, Austria

P05.3 Modulating Electron Beams in Space and Time to Probe for Structure and Function of Soft and Hard Matter

SESSION CHAIRS:
Hector Calderon; National Polytechnic University (IPN), Mexico
Christian Kisielowski; Lawrence Berkeley National Laboratory

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 344

10:30 AM 273 (Invited) *Understanding Ziegler-Natta Catalyst Structure via Low-dose Transmission Electron Microscopy;* **DF Yancey**; Dow Chemical, C Kisielowski; Lawrence Berkeley National Laboratory, P Specht; University of California-Berkeley, S Rozeveld, J Kang, P Nickias; Dow Chemical

11:00 AM 274 *Analytical STEM Investigation of the Post-Synthetic Modification (PMS) of Metal- Organic Frameworks (MOFs): Metal- and Ligand-Exchange in UiO-66*; **LR Parent**; Northwestern University, MS Denny; University of California-San Diego, JP Patterson; Eindhoven University of Technology, Netherlands, P Abellan; SciTech Daresbury, United Kingdom, QM Ramasse; SuperSTEM Laboratory, United Kingdom, F Paesani, SM Cohen; University of California-San Diego, NC Gianneschi; Northwestern University

11:15 AM 275 *Utilizing Low-Dose Transmission Electron Microscopy for Structure and Defect Identification in Group III – Nitride Electronic Devices;* **P Specht**; University of California-Berkeley, M Luysberg; Research Centre Juelich, Germany, J Chavez; University of California-Berkeley, TR Weatherford; Naval Postgraduate School, TJ Anderson, AD Koehler; U.S. Naval Research Laboratory, C Kisielowski; Lawrence Berkeley National Laboratory

11:30 AM 276 (Invited) *Observing Catalyst Structures and Dynamics at Atomic Resolution;* M Ek, LP Hansen; Haldor Topsøe A/S, Denmark, F-R Chen; National Tsing-Hua University, Taiwan, D van Dyck; University of Antwerp, Belgium, C Kisielowski; Lawrence Berkeley National Laboratory, JR Jinschek; Ohio State University, **S Helveg**; Haldor Topsøe A/S, Denmark

Scientific Program

T TUTORIALS – Tuesday Morning *continued*

X45.2 How to Get Funding for Instrumentation When Budgets are Tight (Parts I and II)

SESSION CHAIR:
Christine A Brantner; George Washington University

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 321

10:30 AM **277** (Invited) *Opportunities for Instrumentation Funding – U.S. Army Research Office;* **R Kokoska**; U.S. Army Research Laboratory - U.S. Army Research Office

10:50 AM **278** (Invited) *The Major Instrumentation Program at the National Science Foundation;* **G Tessema**; National Science Foundation

11:10 AM **279** (Invited) *NIH's Shared Instrumentation Program: The More I Know, the Better My Chances;* **M Klosek**; National Institutes of Health

11:30 AM **280** *Roundtable Discussion;* **Christine Brantner**; George Washington University

O MICROSCOPY OUTREACH SESSIONS – Tuesday Morning *continued*

X90.2 Microscopy in the Classroom

SESSION CHAIR:
Donovan N. Leonard; Oak Ridge National Laboratory

PLATFORM SESSION
Tuesday: 10:30 AM • Room: 324-325

10:30 AM **281** *Introduction;* **Donovan N. Leonard**; Oak Ridge National Laboratory

11:00 AM **282** *Scanning Electron Microscopy in High School Engineering Research;* **MA Boyer**; North Penn High School

11:30 AM **283** *Using the Hitachi TM3030 SEM to Engage Learners at All Levels in One of America's Most Challenging Regions;* **DE Menshew**; James C. Enochs High School

MSA DISTINGUISHED SCIENTIST AWARDEE LECTURES

12:15 - 1:15 PM - Room 337

Lunch served to first 100 participants

DISTINGUISHED SCIENTIST - PHYSICAL
Yimei Zhu, Brookhaven National Laboratory

Exploring Quantum Materials Far from Equilibrium with Ultrafast Electrons

DISTINGUISHED SCIENTIST - BIOLOGICAL
Richard Leapman, National Institutes of Health

Quest to Determine Subcellular Structure and Composition with Focused Electron Probes

A ANALYTICAL SCIENCES SYMPOSIA – Tuesday Afternoon

A01.4 Professor Hatsujiro Hashimoto Memorial Symposium: Foundations in Imaging Crystals, Defects, and Atoms

SESSION CHAIRS:
Satoshi Ichikawa; Osaka University, Japan
Masashi Watanabe; Lehigh University

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 341

1:30 PM **284** (Invited) *Professor Hatsujiro Hashimoto: My Great Mentor as a Pioneer of Electron Microscopy;* **Y Bando**; National Institute for Materials Science, Japan

2:00 PM **285** *CBED Investigations of Boron Monoarsenide Crystals;* **Y Lan**; Morgan State University

2:15 PM **286** *DBI Phase Measurements of Amorphous Materials for Thickness and Structure Factor Determination;* **R Herring**; University of Victoria, Canada

2:30 PM **287** *HREM and Analytical TEM of the Rapidly Solidified Microstructure Evolved at the Extremes of the Coupled Crystal Growth Regime in Hypo-Eutectic Al-Cu Alloys;* V Bathula, S Khana, **JM Wiezorek**; University of Pittsburgh

2:45 PM **288** *Examination of the Structural Quality of InAsSbBi Epilayers Using Cross Section Transmission Electron Microscopy;* **RR Kosireddy**, ST Schaefer, AJ Shalindar; Arizona State University, PT Webster; Kirtland Air Force Base, SR Johnson; Arizona State University

A02.2 Atomic-Scale Functional Imaging in Aberration-Corrected Electron Microscopy

SESSION CHAIRS:
Jing Tao; Brookhaven National Laboratory
Miaofang Chi; Oak Ridge National Laboratory

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 339

1:30 PM **289** (Invited) *Unusual Structural Transformation in $LiMn_2O_4$ Cathode Revealed by Atomic-Scale STEM Characterization;* **L Gu**; Beijing National Laboratory for Condensed Matter Physics, Institute of Physics, Chinese Academy of Sciences, China

2:00 PM **290** (M&M STUDENT SCHOLAR) *Direct Imaging of Tilt Relaxation from the Interface in Epitaxially Strained Ca_2RuO_4 Thin Films Using ABF-STEM;* **CS Chang**, ME Holtz, HP Nair, J Ruf, K Shen, D Schlom, DA Muller; Cornell University

2:15 PM **291** *Atomistic Understanding of Interface Structures and Properties in Self-Assembled and Vertically Aligned Nanocomposite Thin Films by Advanced Scanning Transmission Electron Microscopy;* **P Lu**; Sandia National Laboratories, L Zhou; Ames Laboratory, J Ihlefeld; University of Virginia, W Pan; Sandia National Laboratories

2:30 PM **292** *Unique Line Defect Discovered in $BaSnO_3$ Thin Film;* **H Yun**, JS Jeong, KA Mkhoyan; University of Minnesota

2:45 PM **293** *High Resolution Scanning Transmission Electron Microscopy of Normal and Inverse Spinel Regions in Epitaxially Grown $CoFe_2O_4$;* **AH Trout**, IV Pinchuk; The Ohio State University, W Amamou; University of California, REA Williams; Center for Electron Microscopy and Analysis, RK Kawakami, DW McComb; The Ohio State University

A03.4 Four-Dimensional Scanning Transmission Electron Microscopy (4D-STEM): From Scanning Nanodiffraction to Ptychography and Beyond

Session Chairs:
Ian MacLaren; Glasgow University, United Kingdom
Chris Allen; Diamond Light Source

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 343

1:30 PM 294 (Invited) *Exploring the Limits of Focused-Probe STEM Ptychography;* **PD Nellist**, GT Martinez, C O'Leary; University of Oxford, United Kingdom, L Jones; Trinity College Dublin, Ireland

2:00 PM 295 (M&M POSTDOCTORAL SCHOLAR) *Breaking the Rayleigh Limit in Thick Samples with Multi-Slice Ptychography;* **Y Jiang**, Z Chen, IE Baggari, LF Kourkoutis, V Elser, DA Muller; Cornell University

2:15 PM 296 (M&M POSTDOCTORAL SCHOLAR) *RealS-Space Demonstration of 0.4 Angstrom Resolution at 80 keV via Electron Ptychography with a High Dynamic Range Pixel Array Detector;* **Z Chen**, SM Gruner, V Elser, DA Muller, Y Jiang, Y Han, P Deb; Cornell University, H Gao; Cornell University, University of Chicago *et. al.*

2:30 PM 297 *High Dose Efficiency Atomic Resolution Phase Imaging with Electron Ptychography;* **TJ Pennycook**; Max Planck Institute for Solid State Research, Germany, GT Martinez, PD Nellist; University of Oxford, United Kingdom, JC Meyer; University of Vienna, Austria

2:45 PM 298 *Low Dose Imaging by STEM Ptychography Using Pixelated STEM Detector;* **R Sagawa**, Y Kondo, H Hashiguchi; JEOL Ltd., Japan, T Isabell; JEOL USA Inc., R Ritz, M Simson, M Huth, H Soltau; PNDetector GmbH, Germany *et. al.*

Scientific Program

A ANALYTICAL SCIENCES SYMPOSIA – Tuesday Afternoon *continued*

A04.2 *In Situ* Transmission Electron Microscopy in Liquid and Gas Cells

SESSION CHAIR:
Damien Alloyeau; CNRS - Paris Diderot University, France

PLATFORM SESSION
Tuesday: 1:30 PM • Room:345-346

1:30 PM **299** (Invited) *Using Sub-Sampling / Inpainting to Control the Kinetics and Observation Efficiency of Dynamic Processes in Liquids;* **ND Browning**; University of Liverpool, United Kingdom, L Luzi; Rice University, L Bramer; Pacific Northwest National Laboratory, BL Mehdi; University of Liverpool, United Kingdom, AJ Stevens; Optimal Sensing, ME Gehm; Duke University, L Kovarik, H Mehta; Pacific Northwest National Laboratory *et. al.*

2:00 PM **300** (ROBERT P. APKARIAN AWARD - PHYSICAL SCIENCES) *Anisotropic Nanoscale Galvanic Replacement Reactions Studied by Liquid Cell Scanning Transmission Electron Microscopy;* **H Sun**, MN Yesibolati, SA Canepa, K Mølhave; Technical University of Denmark, Denmark

2:15 PM **301** (M&M STUDENT SCHOLAR) *Using Graphene Liquid Cell Electron Microscopy to Elucidate Nanocrystal Etching Mechanisms;* **MR Hauwiller**, L Frechette; University of California-Berkeley, MR Jones; Rice University, JC Ondry, P Geissler, AP Alivisatos; University of California-Berkeley

2:30 PM **302** (Invited) *Liquid Phase Electron Microscopy of Soft Matter;* **JP Patterson**, H Wu, A Ianiro, H Su, ACC Esteves, R Tuinier, H Friedrich, NAJM Sommerdijk; Eindhoven University of Technology, Netherlands

A05.1 Low-Energy Electron and Particle Microscopies in Liquid, Gaseous, and Frozen Conditions

SESSION CHAIR:
Olga Ovchinnikova; Oak Ridge National Laboratory

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 329

1:30 PM **303** *Liquid Cell Crystallization and* In Situ *Imaging of Thiamethoxam by Helium Ion Microscopy;* A Pawlicki; University of Tennessee-Knoxville, MJ Burch, A Levlev; Oak Ridge National Laboratory, JD Fowler; Syngenta Crop Protection, OS Ovchinnikova, **A Belianinov**; Oak Ridge National Laboratory

1:45 PM **304** (Invited) *3D Nanostructures Grown via Focused Helium Ion Beam Induced Deposition;* **A Belianinov**, OS Ovchinnikova, MJ Burch, A Ievlev, S Kim; Oak Ridge National Laboratory, MG Stanford, K Mahady, BB Lewis; University of Tennessee *et. al.*

2:15 PM **305** (Invited) *Observation of Adsorption and Desorption of Water Molecules with Ambient SIMS;* **J Matsuo**; Kyoto University, Japan

2:45 PM **306** In Situ *Heating in SEM and FIB/SEM Systems;* **P Wandrol**, L Novák, M Wu; Thermo Fisher Scientific, Czech Republic, EJ Vesseur; Thermo Fisher Scientific, Netherlands, T Vystavěl; Thermo Fisher Scientific, Czech Republic

A09.3 Data Analytics and Model-based Imaging for Microstructure and Physical Property Interpretations

SESSION CHAIRS:
Vinayak P. Dravid; Northwestern University
Lawrence F. Drummy; U.S. Air Force Research Laboratory

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 342

1:30 PM **307** (Invited) *3D Analysis of Large Volumes Through Automated Serial Sectioning;* **DJ Rowenhorst**, L Nguyen, RW Fonda; U.S. Naval Research Laboratory

2:00 PM **308** *Light Optical Microscopy Based Automated 3D Serial Sectioning Enables Defect Analysis in Large Volumes of Additively Manufactured Alloy Samples;* **V Sundar**, S Ganti, B Turner, B Davis; UES Inc.

2:15 PM **309** *Real-Time Tomography with Interactive 3D Visualization Using* tomviz; **R Hovden**, J Schwartz; University of Michigan, C Harris; Tomviz, C Quammen; University of Michigan, S Waldon; Tomviz, P Ercius; Lawrence Berkeley National Laboratory, M Hanwell; Tomviz, Y Jiang; Cornell University

2:30 PM **310** (Invited) *Atomic Electron Tomography: Adding a New Dimension to See Single Atoms in Materials;* **J Miao**; University of California-Los Angeles, H Zeng; University at Buffalo, C Ophus, P Ercius; Lawrence Berkeley National Laboratory, Y Yang, J Zhou, X Tian, Y Yang; University of California-Los Angeles *et. al.*

A10.4 The Joy of Scanning Electron Microscopy

SESSION CHAIRS:
Dale Newbury; National Institute of Standards and Technology
Raynald Gauvin; McGill University

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 328

1:30 PM **311** (Invited) A Review of Electron Channeling Contrast Imaging for Non-Destructive Defect Analysis of Crystalline Solids; **YN Picard**; Carnegie Mellon University

2:00 PM **312** *Grain Size Analysis in Lithium Aluminate Ceramics;* **BR Johnson**, N Canfield, JV Crum, B McCarthy; Pacific Northwest National Laboratory

2:15 PM **313** *Orientation Mapping by Electron Channeling (OMEC) and Hybrid Stage/Beam-Rocked Electron Channeling Patterns;* BD Myers, **KA Hujsak**, VP Dravid; Northwestern University

2:30 PM **314** In Situ *Monitoring TEM Specimen Preparation with Different Electron Detectors in a SEM-FIB System;* **J-G Zheng**; University of California-Irvine

2:45 PM **315** *Role of the Angular Distribution of Backscattered Electrons in Low Energy Scanning Electron Microscope;* **I Müllerová**, L Frank, I Konvalina, E Mikmeková; Institute of Scientific Instruments, Czech Republic

A11.4 Solid-State X-Ray Spectrometry at 50 Years

SESSION CHAIRS:
Nicholas Ritchie; National Institute of Standards and Technology
Paul Carpenter, Washington University

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 327

1:30 PM **316** (Invited) *Energy Resolution at the Fano Limit: The Benefits of the Principle of Sideward Depletion for Solid State X-Ray Spectrometry;* **J Schmidt**, JM Davis, M Huth; PNDetector GmbH, Germany, R Hartmann; PNSensor GmbH, Germany, H Soltau; PNDetector GmbH, Germany, L Strüder; PNSensor GmbH, Germany

2:00 PM **317** *Check of the Performance of EDS Systems Attached to the SEM with the Test Material EDS-TM001/2 and Evaluation Software Package EDS Spectrometer Test - Application, Experiences and Updates;* **V-D Hodroaba**; Federal Institute for Materials Research and Testing (BAM), Germany, R Terborg; Bruker Nano GmbH, Germany, M Procop; Federal Institute for Materials Research and Testing (BAM), Germany

2:15 PM **318** *The Standard-Based f-ratio Quantitative X-Ray Microanalysis Method for a Field Emission SEM;* **C Teng**, H Demers, R Gauvin; McGill University, Canada

2:30 PM **319** *The P/B-Method, About 50 Years a Hidden Champion;* **F Eggert**; EDAX Inc., Ametek Materials Analysis Division, Germany

2:45 PM **320** *Applications of Combined Transmission Kikuchi Diffraction and STEM-SDD X-ray Analysis in Irradiated Materials;* **CM Parish**, K Wang, P Edmondson, DT Hoelzer, Q Smith, Y Katoh; Oak Ridge National Laboratory

A17.4 Surface and Subsurface Microscopy and Microanalysis

SESSION CHAIRS:
Chanmin Su; Bruker-Nano Inc.
Xiao-Ying Yu; Pacific Northwest National Laboratory
John A Chaney; The Aerospace Corporation
Vincent S. Smentkowski; General Electric Global Research Center

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 326

1:30 PM **321** (Invited) *Multidimensional Imaging of Surfaces with Ringing Mode of Atomic Force Microscopy;* **I Sokolov**, ME Dokukin; Tufts University

2:00 PM **322** *Nanoscale Hyperspectral Characterization of Source Rock in Unconventional Reservoirs Using Photo-Induced Force Microscopy;* **SL Eichmann**; Aramco Services Company, D Nowak; Molecular Vista, D Jacobi; Aramco Services Company, NA Burnham; Worcester Polytechnic Institute

2:15 PM **323** (Invited) *Multimodal Chemical and Functional Imaging of Nanoscale Transformations Away from Equilibrium;* AV Levlev, P Maksymovych, SV Kalinin, **OS Ovchinnikova**; Oak Ridge National Laboratory

2:45 PM **324** *Nanoelectrochemistry and Nanoelectrics at Electrode/Electrolyte Interface;* **Z Huang**, P De Wolf, B Pittenger; Bruker Nano Surfaces

A18.3 Vendor Symposium

SESSION CHAIRS:
Andreas Holzenburg; The University of Texas-Rio Grande Valley
Luisa Amelia Dempere; University of Florida

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 322

1:30 PM **325** *Aquiring High-Quality Microscopic Images Through Silicon Without Damaging the Finished Product;* **R Bellinger**; Olympus Corporation

1:45 PM **326** *Laser Scanning Confocal Microscopy 3D Surface Metrology Applications;* **M Hong**, G Meng; Olympus Corporation

2:00 PM **327** *Chromatic Line Confocal Sensor Technology in High-Speed 3D and Deep Depth of Focus 2D Imaging Applications;* **J Saily**, FocalSpec, Inc.

2:15 PM **328** *Insights on Sample Topography in EDX Spectroscopy with Annular SDD Detectors;* **A Schöning**, R Lackner, A Bechteler, A Liebel, JM Davis, A Niculae, H Soltau; PNDetector GmbH, Germany

Scientific Program

B BIOLOGICAL SCIENCES SYMPOSIA – Tuesday Afternoon

B01.3 Microscopy and Analysis in Forensic Science

SESSION CHAIRS:
Keana Scott; National Institute of Standards and Technology
Robert Pope; U.S. Department of Homeland Security
Eric Steel; National Institute of Standards and Technology

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 348

1:30 PM **329** (Invited) *Rapid Neutron Activation Analysis of Fissile Material Traces at the High Flux Isotope Reactor;* **DC Glasgow**, J Knowles; Oak Ridge National Laboratory

2:00 PM **330** *Forensic Soil Analysis Using the Electron Microprobe: The Markice-Bowling Case;* **S Singletary**; Robeson Community College, H Hanna; University of North Carolina-Chapel Hill

2:15 PM **331** *TEM Quantification of Amphibole in Asbestos Containing Materials: A Summary of Data 20 Years in the Making;* **S Compton**; MVA Scientific Consultants

2:30 PM **332** (Invited) *Forensic Palynology in the United States: The Search for Geolocation;* **AR Laurence**; U.S. Customs and Border Protection

B03.3 3D Structures of Macromolecular Assemblies, Cellular Organelles, and Whole Cells

SESSION CHAIRS:
Michael Radermacher; University of Vermont
Teresa Ruiz; University of Vermont
Joaquin Ortega; McGill University, Canada

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 349

1:30 PM **333** *Breaking Barriers of FIB-SEM for Large Volume Connectomics and Cell Biology;* **CS Xu**, KJ Hayworth, S Pang; Howard Hughes Medical Institute, Z Lu; Dalhousie University, Canada, HF Hess; Howard Hughes Medical Institute

1:45 PM **334** *The National Cryo-EM Facility;* **U Baxa**, TJ Edwards, H Wang, M Hutchison, S Subramaniam; Frederick National Laboratory for Cancer Research

2:00 PM **335** (Invited) *Molecular Clustering of Skeletal and Cardiac Ryanodine Receptor;* J Lobo, S Dhindwal, **M Samso**; Virginia Commonwealth University

2:30 PM **336** (Invited) *Eukaryotic Hibernating Ribosome Dimers are Maintained by a Kissing Loop Formed by Ribosomal RNA;* W Huang, D Krokowski, M Hatzoglou, **D Taylor**; Case Western Reserve University

B04.4 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals

SESSION CHAIRS:
Gang (Greg) Ning; The Pennsylvania State University
Ru-Ching Hsia; University of Maryland-Baltimore
Trace Christensen; Mayo Clinic

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 350

1:30 PM **337** (Invited) *Directional Growth of Optic Nerve Axons and Processive Gliogenesis;* **SL Bernstein**, Y Guo, Z Mehrabian; University of Maryland-Baltimore

2:00 PM **338** (Invited) *Acceleration of Neuroscience Research Discovery by Incorporation of Large Area/Volume Microscopic Data Workflows;* **A Popratiloff**, C Clarkson, Z Motahari, C Brantner; George Washington University

2:30 PM **339** *Antibiotics Induced Mitochondrial Toxicity: "a Neglected Factor Possibly Contributing to Tumorigenesis and Neurodegeneration";* **RL Elliott**, X Jiang; Sallie A. Burdine Breast Foundation

2:45 PM **340** *Quantifying Chromatin Fractal Dimension through ChromEM Staining;* **Y Li**, A Eshien, R Bleher, VP Dravid, V Backman; Northwestern University

P PHYSICAL SCIENCES SYMPOSIA – Tuesday Afternoon

P01.4 Advances in Electron, X-Ray and Neutron Spectro-Imaging/ Holography of Energy Materials and Devices

SESSION CHAIRS:
Feng Wang; Brookhaven National Laboratory
Laura Schelhas; Stanford Synchrotron Radiation Light Source

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 336

1:30 PM **341** (Invited) *Understanding Crystallization Pathways of MnOx Polymorph Formation via* In Situ *X-Ray Scattering;* B-R Chen; SLAC National Accelerator Laboratory, G Ceder; University of California-Berkeley, MF Toney, LT Schelhas; SLAC National Accelerator Laboratory, W Sun; Lawrence Berkeley National Laboratory, DA Kitchaev; Massachusetts Institute of Technology, JS Mangum; Colorado School of Mines, V Thampy; SLAC National Accelerator Laboratory, **K Stone**; Stanford University, *et. al.*

2:00 PM **342** *Atomic Resolution Transmission Electron Microscopy of Perovskite Nanoparticle Surfaces Exposed to Gas Environments at Elevated Temperatures;* **B Levin**, A Cardenas, JM Weller, A Dopilka, PA Crozier; Arizona State University

2:15 PM **343** *Dynamic Surface Reconstruction of 2D Ruddlesden–Popper Halide Perovskite under e-Beam Irradiation;* **HJ Jung**, CC Stoumpos, MG Kanatzidis, VP Dravid; Northwestern University

2:30 PM **344** In Situ *Observations of Recrystallization in $CuInSe_2$ Solar Cells via STEM;* **C Li**, PA van Aken, ES Sanli; Max Planck Institute for Solid State Research, Germany, H Strange; Technische Universität Berlin, Germany, M-D Heinemann, D Greiner, N Schäfer, R Mainz; Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Germany, *et. al.*

2:45 PM **345** *The Effect of Spark Plasma Sintering on Microstructure Evolution in Thermoelectric Materials;* **X Zhang**, Z-Z Luo, S Sarkar, MG Kanatzidis, VP Dravid; Northwestern University

P02.4 Atomically Thin 2D Materials: Recent Results and Challenges

SESSION CHAIRS:
Raul Arenal; University of Zaragoza, Spain
Quentin M Ramasse; SuperSTEM Laboratory, United Kingdom

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 338

1:30 PM **346** (Invited) *Graphene Hybrids and Extended Defects: Revealing 3D Structures and New Insights to Radiation Damage;* **JC Meyer**, T Susi, J Kotakoski, C Hofer, K Mustonen, A Mittelberger, M Monazam; University of Vienna, Austria, A Hussain; Aalto University, Finland *et. al.*

2:00 PM **347** *Mapping the 3D Structure of Corrugated "Cardboard" MoS_2;* **MC Cao**; Cornell University, J Suh; University of Chicago, E Padgett, Z Chen; Cornell University, C Park, J Park; University of Chicago, DA Muller; Cornell University

2:15 PM **349** (M&M STUDENT SCHOLAR) *Stacking, Strain & Stiffness of 2D Transition Metal Dichalcogenides Quantified through Reciprocal Space;* **N Schnitzer**, SH Sung, R Hovden; University of Michigan

2:30 PM **349** *Mapping Strain and Relaxation in 2D Heterojunctions with Sub-Picometer Precision;* **Y Han**; Cornell University, J Park; University of Chicago, S Gruner, D Muller, K Nguyen, M Cao, P Cueva, MW Tate; Cornell University *et. al.*

2:45 PM **350** *TEM and SAXS Investigation of Self-Assembled 2D Structures of PbS Quantum-Dots Deposited onto Different Underlying Substrates;* **SA Mansour**, T Thirunvukka, B Aissa; Hamad Ben Khalifa University, Qatar

P03.2 Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications

SESSION CHAIR:
Zonghoon Lee; Ulsan National Institute of Science and Technology (UNIST), Republic of Korea

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 337

1:30 PM **351** (Invited) In Situ *TEM Study on Sub-10 nm Materials;* T Xu, Y Shen, C Zhu, Q Zhang; SEU-FEI Nano-Pico Center, China, H Zheng; Lawrence Berkeley National Laboratory, **L Sun**; SEU-FEI Nano-Pico Center, China

2:00 PM **352** (MSA PROFESSIONAL TECHNICAL STAFF MEMBER AWARD - PHYSICAL SCIENCES) *Utilizing Conventional and* In Situ *Electron Microscopy to Gain Insights Into the Release of Silver Nanomaterials in Aquatic Ecosystems;* **E Formo**, C Potterf, H Walters; University of Georgia, M Yang; Georgia Institute of Technology, R Unocic, D Leonard, M Pawel; Oak Ridge National Laboratory

2:15 PM **353** In Situ *Atomic-Scale Observation of Intermediate Pathways of Melting and Crystallization of Supported Bi-Nanoparticles in the TEM;* J Li, **LD Francis**; International Iberian Nanotechnology Laboratory (INL), Portugal

2:30 PM **354** (M&M STUDENT SCHOLAR) *Dynamics and Removal Pathway of Edge Dislocations in Imperfectly Attached Nanocrystal Pairs; Towards Design Rules for Oriented Attachment;* **JC Ondry**, MR Hauwiller, P Alivisatos; University of California-Berkeley

P04.3 *In Situ* Methods for Probing Properties and Dynamics in Materials

SESSION CHAIR:
Oden Warren; Bruker Nano Surfaces

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 340

1:30 PM **355** (Invited) *Influence of Chemical Bonding on the Variability of Diamond-Like Carbon Nanoscale Adhesion: An* In Situ *TEM/Nanoindentation and Molecular Dynamics Study;* **RW Carpick**, RA Bernal; University of Pennsylvania, P Chen; National Chung Cheng University, Taiwan, JD Schall; Oakland University, JA Harrison; U.S. Naval Academy, Y-R Jeng; National Chung Cheng University, Taiwan

2:00 PM **356** *Anomalous Tensile Detwinning in Twinned Metallic Nanowires;* **G Cheng**; North Carolina State University, S Yin, H Gao; Brown University, Y Zhu; North Carolina State University

2:15 PM **357** *Method for Extracting True Stress from TEM* In Situ *Compression Testing;* **H Qu**, KH Yano, PV Patki, JP Wharry; Purdue University

2:30 PM **358** (Invited) In Situ *TEM Investigation of Mechanically Induced Phase Transformations in Nanoscale Composites;* **N Mara**, Y Chen; University of Minnesota, N Li; Los Alamos National Laboratory, S Yadav; Indian Institute of Technology, Madras, India, J Wang; University of Nebraska, X-Y Liu; Los Alamos National Laboratory, A Misra; University of Michigan

Scientific Program

P PHYSICAL SCIENCES SYMPOSIA – Tuesday Afternoon *continued*

P05.4 Modulating Electron Beams in Space and Time to Probe for Structure and Function of Soft and Hard Matter

SESSION CHAIRS:
Joerg Jinschek; The Ohio State University
David Flannigan; University of Minnesota

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 344

1:30 PM **359** (Invited) *Utilizing Electron Beam Control and Radiation Chemistry during Liquid Cell Electron Microscopy to Image Protein Aggregates in their Native Hydrated State;* **TJ Woehl**; University of Maryland

2:00 PM **360** *Sample Dependent Resolution of Transmission Electron Microscopy in Water or Ice;* **N de Jonge**; INM – Leibniz Institute for New Materials, Germany

2:15 PM **361** *Investigation of* In Situ *Radiation Effects in Liquid Cell Electron Microscopy;* **E Firlar**; University of Illinois-Chicago, N Karabin; Northwestern University, A Bogdanowicz, Y Nadkarni; University of Illinois-Chicago, EA Scott; Northwestern University, R Shahbazian-Yassar, T Shokuhfar; University of Illinois-Chicago

2:30 PM **362** *Role of Electron Illumination on the Image Resolution and Sensitivity of Catalysts Immersed in Gas Environments;* **SP Jespersen**, S Helveg; Haldor Topsoe, Denmark, CD Damsgaard; Technical University of Denmark, Denmark, M Ek; Lund University, Sweden, B Hendriksen, L Mele, P Dona; Thermo Fisher Scientific, Netherlands, J Jinschek; Ohio State University

2:45 PM **363** *TEM Characterization of the Edges of $CsPb_2Br_5$ Perovskite Crystals;* **HA Calderon**; Instituto Politecnico Nacional ESFM, Mexico, F Robles-Hernandez, Y Wang, VG Hadjiev, J Bao; University of Houston

P09.1 Microstructure and Mechanics Deformation

SESSION CHAIRS:
Frank Muecklich; Saarland University, Germany
James Martinez; NASA Johnson Space Center

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 325

1:30 PM **364** (Invited) *Visualizing and Quantifying Deformation Microstructures in Cold Sprayed Materials;* **LN Brewer**, T Liu; The University of Alabama, JD Leazer, JF Schiel, SK Menon; Naval Postgraduate School

2:00 PM **365** *Microstructure of a High Strength AZ91 Alloy Processed by Severe Plastic Deformation;* **Q Xu**; University of Delaware, A Ma, Y Li; Hohai University, China, C Ni; University of Delaware

2:15 PM **366** *TEM Observation of Deformation under Nanoindentation in Single Crystal Ni-Based Superalloys;* **AS Khalil**; Tabbin Institute for Metallurgical Studies, Egypt, G Fuchs; University of Florida, J Turner, C Song, B Ozdol; Lawrence Berkeley National Laboratory, A Minor; University of California, S Vachhani; Bruker

2:30 PM **367** *Deformation Microstructures in Individual Cold Sprayed Al-Cu Alloy Particles Studied via Precession Electron Diffraction and Transmission Kikuchi Diffraction;* **T Liu**; The University of Alabama, JD Leazer; Naval Postgraduate School, LN Brewer; The University of Alabama

2:45 PM **368** *SEM and TEM Characterization of Plastic Deformation Structures in Aluminum by EBSD, TKD, and PED-based Orientation Imaging Techniques;* **P Nowakowski**; E.A. Fischione Instruments, Inc., J Wiezorek, V Bathula; University of Pittsburgh, S Mielo; E.A. Fischione Instruments, Inc., S Khanal; University of Pittsburgh, C Bonifacio, P Fischione; E.A. Fischione Instruments, Inc.

TF TECHNOLOGISTS' FORUM SESSIONS – Tuesday Afternoon

X30.1 Tech Forum: E. Ann Ellis Memorial Session

SESSION CHAIRS:
Andreas Holzenburg; University of Texas-Rio Grande Valley
Janice G. Pennington; University of Wisconsin-Madison

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 347

1:30 PM **369** (Invited) *Pictorial Reminiscences of E. Ann Ellis;* **B Maleef**; GlaxoSmithKline plc.

1:45 PM **370** (Invited) *E. Ann Ellis: A Life Dedicated to STEM/STEAM Outreach;* **CB Johnson**; Lone Star College, Z Luo; Fayetteville State University, H Kim, R Littleton, T Stephens, M Pendleton; Texas A&M University, C Savva; University of Leicester, United Kingdom, S Vitha; Texas A&M University *et. al.*

2:00 PM **371** (Invited) *"Seeing" iPSCs in the Retina During Retinal Repair in Diabetic Retinopathy;* **MB Grant**; University of Alabama-Birmingham

2:15 PM **372** (Invited) E. Ann Ellis Roundtable Discussion of Energy Dispersive Spectroscopy Revisited; **E Rosa-Molinar**; The University of Kansas

2:30 PM **373** (Invited) *Regulation of Extracellular Matrix in* C. elegans: *Lessons in Sweating the Small Stuff*; **RD Schultz**; Texas A&M University Health Science Center, EA Ellis; Texas A&M University, TL Gumienny; Texas Woman's University

T TUTORIALS – Tuesday Afternoon

X41.1 Entrepreneurship in the Microscopy Community

SESSION CHAIR:
Donovan N. Leonard; Oak Ridge National Laboratory

PLATFORM SESSION
Tuesday: 1:30 PM • Room: 321

1:30 PM **374** (Invited) Entrepreneurship in the Microscopy Community; **J Damiano**; Protochips Inc.

Scientific Program

A ANALYTICAL SCIENCES POSTER SESSIONS – Tuesday Afternoon

A01.P1 Professor Hatsujiro Hashimoto Memorial Symposium: Foundations in Imaging Crystals, Defects, and Atoms

POSTER SESSION
Tuesday: 3:00 PM • Room: Exhibit Hall

POSTER # 74
3:00 PM **375** *TEM/SAED Study of $Mn_2CrGaAl$ and CoFeCrGe Heusler Alloys;* **X-Z Li**, W-Y Zhang, Y-L Jin, DJ Sellmyer; University of Nebraska

POSTER # 75
3:00 PM **376** *SIS-HOLZ Strain Measurements Through the Thickness of a Si Crystal;* M Norouzpour, **R Herring**; University of Victoria, Canada

POSTER # 76
3:00 PM **377** *TEM Investigation on Eutectic Phase Formation in Ni-30Cr Filler Metal 52XL;* **C-H Li**, M Shao, C Fink, JC Lippold, JR Jinschek; The Ohio State University

POSTER # 77
3:00 PM **378** *Structural Determination of Gr2GaC Nanolaminates by Electron Microscopy: Resistant Materials Under Thermal Damage;* **S Bakardjieva**, J Plocek, J Kupcik; Institute of Inorganic Chemistry of the CAS, Czech Republic, J Vacik; Nuclear Physics Institute of the CAS, Czech Republic

POSTER # 78
3:00 PM **379** *Identification of Chemical Dopants in $YBa_2Cu_3O_{7-d}$ by Electron Probe Microanalyzer;* **Z Luo**; Fayetteville State University

POSTER # 79
3:00 PM **380** *Porous and Lamellar Molybdenum Oxide MonoCrystalline with Hexagonal Structure;* **CE Ornelas**; Universidad Michoacana de San Nicolás de Hidalgo, Mexico, F Paraguay-Delgado, O Solis-Canto; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, J Lara-Romero; Universidad Michoacana de San Nicolás de Hidalgo, Mexico

POSTER # 80
3:00 PM **381** *The Growth Kinetics of Sucrose in Presence of Glucose in an Isothermal Continuous-Flow Reactor Using a Photomicroscopic Method*; **L-D Shiau**; Chang Gung University, Taiwan

A03.P2 Four-Dimensional Scanning Transmission Electron Microscopy (4D-STEM): From Scanning Nanodiffraction to Ptychography and Beyond

POSTER SESSION
Tuesday: 3:00 PM • Room: Exhibit Hall

POSTER # 81
3:00 PM **382** *GPU-Accelerated Matrix Exponentiation for 5-D STEM-DCI Simulations;* **S Singh**, M De Graef; Carnegie Mellon University

POSTER # 82
3:00 PM **383** *Fast and Low Dose Electron Ptychography;* B Song, J Song; Nanjing University, China, L Zhou; Nanjing University, China, C Allen; University of Oxford, United Kingdom, H Sawada; JEOL Ltd, Japan, F Zhang; Southern University of Science and Technology, China, X Pan; University of California, AI Kirkland; University of Oxford, United Kingdom, **P Wang**; Nanjing University, China, *et. al.*

POSTER # 83
3:00 PM **384** *Thick (3D) Sample STEM Imaging at Nano Scale: iDPC and ADF Simultaneously;* EG Bosch, **I Lazić**, E Yücelen, P Trompenaars; Thermo Fisher Scientific, Netherlands

POSTER # 84
3:00 PM **385** *4D-STEM Differential Phase Contrast Microscopy across Ferroelectric Domain Walls;* **D Mukherjee**; The Pennsylvania State University, C Ophus, J Ciston; Lawrence Berkeley National Laboratory, Z Mao; Tulane University, V Gopalan, N Alem; The Pennsylvania State University

POSTER # 85
3:00 PM **386** *Observation of Anisotropic Charge Density Wave in Layered 1T-$TiSe_2$;* **Q Qiao**; Temple University, Y Zhu; Brookhaven National Laboratory, S Zhou; University of Pennsylvania, J Tao; Brookhaven National Laboratory, J-C Zheng; Xiamen University, China, L Wu; Brookhaven National Laboratory, ST Ciocys; Drexel University, M Iavarone; Temple University *et. al.*

A09.P1 Data Analytics and Model-Based Imaging for Microstructure and Physical Property Interpretations

POSTER SESSION
Tuesday: 3:00 PM • Room: Exhibit Hall

POSTER # 86
3:00 PM **387** *A Simple Method to Estimate Local Absolute Thickness Using Scanning Transmission Electron Microscopy;* **Y Yu**; National Energy Technology Laboratory, M De Graef; Carnegie Mellon University, PR Ohodnicki; National Energy Technology Laboratory

POSTER # 87
3:00 PM **388** *QSAED3, a Program for Quantification and Processing of SAED Patterns;* **X-Z Li**; University of Nebraska

POSTER # 88
3:00 PM **389** *Orientation Mapping by Electron Channeling (OMEC) of Polycrystals Using a Stage-Rocked Big-Data Approach;* **KA Hujsak**, BD Myers, VP Dravid; Northwestern University

POSTER # 89
3:00 PM **390** *Crystal Phase Mapping by Scanning Precession Electron Diffraction and Machine Learning Decomposition;* HW Ånes, IM Andersen, **ATJ van Helvoort**; Norwegian University of Science and Technology, Norway

POSTER # 90
3:00 PM **391** *Plasma Focused Ion Beam Curtaining Artifact Correction by Fourier-Based Linear Optimization Model;* **CW Schankula**, CK Anand, ND Bassim; McMaster University, Canada

POSTER # 91
3:00 PM **392** *Using Virtual Reality (VR) for Real Time Tomography Exploration of Nanoparticles;* M Kim; University of Texas-Dallas, J Brink; JEOL USA, Inc., **A Klick**; University of Texas-Dallas

POSTER # 92
3:00 PM **393** *Automated Quadrat Analysis Technique for Particle Dispersion Quantification in Oxide Dispersion Strengthened Alloys;* **AC Weiss**, TT Sibley, BA Webler, YN Picard; Carnegie Mellon University

POSTER # 93
3:00 PM **394** *Characterization of Materials Properties by EBSD, EDS and AFM;* **J Goulden**; Oxford Instruments NanoAnalysis, United Kingdom, P Pinard; Oxford Instruments, United Kingdom, A Gholinia; University of Manchester, United Kingdom, M Kocun, R Proksch; Asylum Research

POSTER # 94
3:00 PM **395** *Detection of Noise Level and Resonance Frequency Shifting Through of Principal Component Analysis (PCA) in Simulated Dataset of Band Excitation Scanning Probe Microscopy (BE-SPM);* **CA Rosero-Zambrano**, FJ Basante; South Colombian International Logistics Center, Servicio Nacional de Aprendizaje (National Apprentice Service) – SENA, Colombia

POSTER # 95
3:00 PM **396** *Optimizing the Workflow for FTIR Microspectroscopy of Microplastics Present in Environmental Samples;* **I Robertson**; Perkin Elmer Limited, United Kingdom

A10.P2 The Joy of Scanning Electron Microscopy

POSTER SESSION
Tuesday: 3:00 PM • Room: Exhibit Hall

POSTER # 96
3:00 PM **397** *Crystal Grain Observation Using a Segmented Backscattered Electron Detector;* **T Osuka**, M Hara; JEOL Ltd., Japan, N Erdman; JEOL USA, Inc., S-I Kitamura; JEOL Ltd., Japan

POSTER # 98
3:00 PM **399** *Facets on Spherical Particles in $Al_{65}Cu_{20}Fe_{15}$ Alloy;* **C Carey**; Clarion University of Pennsylvania, S Touster, Z Lavin; Clarion High School, R Bouch, H Hampikian, C Li; Clarion University of Pennsylvania

POSTER # 99
3:00 PM **400** *Electron/Ion Channeling Contrast Imaging and Grayscale Image Analysis Using 3C-SiC Twin Structures;* **T Borsa**, B Van Zeghbroeck; University of Colorado-Boulder

POSTER # 100
3:00 PM **401** *High-Temperature BSE and EBAC Electronics for ESEM;* W Joachimi, M Hemmleb, U Grauel; point electronic GmbH, Germany, Z-J Wang; Fritz Haber Institute of the Max Planck Society, Germany, M Willinger; Eidgenössische Technische Hochschule Zürich, Switzerland, **G Moldovan**; point electronic GmbH, Germany

POSTER # 101
3:00 PM **402** *Effective Degradation of Humic Acids in Water by Zero Fenton Process;* NO dos Santos, JC Spadotto, **G Solórzano**; Pontifical Catholic University of Rio de Janeiro, Brazil, L Campos; University College London, United Kingdom, LAC Teixeira; Pontifical Catholic University of Rio de Janeiro, Brazil

POSTER # 102
3:00 PM **403** *Sensitivity Analysis of Simulated Backscattered Electron Emission against Electron Dosage of Buried Semiconductor Features;* **M Mukhtar**, B Thiel; SUNY Polytechnic Institute

POSTER # 103
3:00 PM **404** (M&M STUDENT SCHOLAR) Exemplar-Based Inpainting Based on Dictionary Learning for Sparse Scanning Electron Microscopy; **P Trampert**; German Research Center for Artificial Intelligence, S Schlabach; Karlsruhe Institute of Technology, Germany, T Dahmen, P Slusallek; German Research Center for Artificial Intelligence

POSTER # 104
3:00 PM **405** *Scanning Electron Microscope, an Essential Equipment for Failure Analysis;* **M Panzenböck**; Montanuniversität Leoben, Austria

A11.P2 Solid-State X-Ray Spectrometry at 50 Years

POSTER SESSION
Tuesday: 3:00 PM • Room: Exhibit Hall

POSTER # 105
3:00 PM **406** *Quantitative Compositional Stage Mapping and Cluster Analysis;* **PK Carpenter**; Washington University

POSTER # 106
3:00 PM **407** *Quantitative Compositional Mapping and Multivariate Statistical Analysis: An EDS Approach;* **SM Seddio**; Thermo Fisher Scientific, PK Carpenter; Washington University

Scientific Program

A ANALYTICAL SCIENCES POSTER SESSIONS – Tuesday Afternoon *continued*

POSTER # 107
3:00 PM **408** *A New Approach: Quantitative Imaging Spectrometry for Iron Oxide Analysis;* **JM Davis**, J Schmidt, M Huth; PNDetector, GmbH, Germany, R Hartmann; PNSensor, GmbH, Germany, H Soltau; PNDetector, GmbH, Germany, L Strüder; University of Siegen, Germany

POSTER # 108
3:00 PM **409** *EDS Analysis at Low Beam Currents Facilitated by a Large Area Silicon Drift Detector;* JJ McCarthy; University of Wisconsin-Madison, **JF Konopka**; Thermo Fisher Scientific

POSTER # 109
3:00 PM **410** *Quantitative Elemental Mapping of Alkali Activated Slag Cement;* **NA Alharbi**, RK Hailstone, B Varela; Rochester Institute of Technology

POSTER # 110
3:00 PM **411** *Solid State X-Ray Fluorescence Spectrometry at the J Paul Getty Museum 1977-78;* **J Twilley**; Stony Brook University

POSTER # 111
3:00 PM **412** *Combined Energy Dispersive Spectrometry/ Wavelength Dispersive Spectrometry Analysis of Geological Materials Using an Electron Probe Microanalyzer;* **E Bullock**; Carnegie Institution of Washington

POSTER # 112
3:00 PM **413** *The Performance of Energy-Dispersive X-Ray Analysis at High Temperatures Using a Windowless Multi-detector XEDS System;* C Mitterbauer, **M Ovsyanko**, Y Rikers, B Freitag; Thermo Fisher Scientific, Netherlands

POSTER # 113
3:00 PM **414** *Silicon Drift Detectors in Electron Microscopy – An Over 20-year History with a Bright Future;* **A Liebel**, A Schöning, A Bechteler, K Hermenau; PNDetector GmbH, Germany, K Heinzinger; PNSensor GmbH, Germany, L Strüder; University of Siegen, Germany, A Niculae; PNDetector GmbH, Germany, H Soltau; PNDetector, Germany

POSTER # 114
3:00 PM **415** *Quantitative Analysis of Energy-Dispersive Spectra Acquired with Large Solid Angle Detectors;* **R Terborg**, M Falke; Bruker Nano GmbH, Germany, T Mohr-Westheide; Museum für Naturkunde, Berlin, Germany, T Salge; Natural History Museum, London, United Kingdom

POSTER # 115
3:00 PM **416** *Structural Characterization of $Cu_{10}Mo$ alloy Synthesized by Mechanical Alloying;* O Hernández, L Béjar, A Medina, **SE Borjas**; Universidad Michoacana de San Nicolás de Hidalgo, Mexico

A17.P2 Surface and Subsurface Microscopy and Microanalysis

POSTER SESSION
Tuesday: 3:00 PM • Room: Exhibit Hall

POSTER # 116
3:00 PM **417** *Visualization of Impurities on the Surface of Frozen Samples by Environmental Scanning Electron Microscopy*; **Ľ Vetráková**, V Neděla, J Runštuk; Institute of Scientific Instruments of the CAS, Czech Republic

POSTER # 117
3:00 PM **418** *Study of Molecular Composition and Chemical Group Presents in Plants Extracts By Using Mass Spectrometry and FTIR;* EE Rizo Tafolla; Instituto Tecnológico de La Piedad, Mexico, DK Tiwari; CONACYT-El Colegio de Michoacán, Mexico, D Tripathi; CSIR-National Environmental Engineering Research Institute (NEERI), India, **SE Borjas Garcia**; Universidad Michoacana de San Nicolás de Hidalgo, Mexico

POSTER # 118
3:00 PM **419** *Analysis of Raman Spectroscopy and SEM of Carbon Nanotubes Obtain by CVD;* **L Bejar**, A Alberto-Mejia; Universidad Michoacan de San Nicolas de Hidalgo, Mexico, C Parra; Universidad Tecnico Federico Santa Maria, Chile, C Aguilar; Universidad Tecnica Federico Santa Maria, Chile, A Medina; Universidad Michoacan de San Nicolas de Hidalgo, Mexico, SE Borjas; Universidad Michoacana de San Nicolas de Hidalgo, Mexico, JL Bernal; Instituto Tecnologico de Orizaba, Mexico

POSTER # 119
3:00 PM 420 *Characterization of Carbon Nanotubes with TiO_2 by the (CVD) Chemical Vapor Deposition Method*; AA Mejia, L Bejar; Universidad Tecnica Federico Santa Maria, Mexico, C Parra, C Aguilar; Universidad Tecnica Federico Santa Maria, Chile, A Medina; Universidad Tecnica Federico Santa Maria, Mexico, **E Huape-Padilla**; Universidad Michoacan de San Nicolas de Hidalgo, Mexico, SE Borjas; Universidad Michoacana de San Nicolas de Hidalgo, Mexico, JL Bernal; Instituto Tecnologico de Orizaba, Mexico

POSTER # 120
3:00 PM **421** *Preparation of a Model Platinum/Gamma-Alumina Catalyst for* In Situ *Environmental TEM Experiments;* **M McCann**, H Ayoola, JC Yang; University of Pittsburgh

POSTER # 121
3:00 PM **422** *Synthesis and Characterization of Silica Nanoparticles Obtained by Additions of Amino Acids into the Stöber Reaction;* **FJ Carrillo-Pesqueira**, RC Carrillo-Torres, ME Alvarez-Ramos, J Hernández-Paredes; Universidad de Sonora, Mexico

POSTER # 122
3:00 PM **423** *The Benefits of Consistently Orientated Samples for Coincident Data Collection;* **A Halfpenny**, C Mattinson, W Bohrson; Central Washington University, K Merigot; Curtin University, Australia

POSTER # 123
3:00 PM **424** *Comparative Study of TiN/SiC and CrN/SiC Multilayer Systems Produced by PVD;* **JL Bernal**; National Institute of Technology of Mexico, Mexico, AI Martínez; Universidad Politécnica de Pachuca, Mexico, EE Vera; National Institute of Technology of Mexico, Mexico, A Garcia; Universidad Autonoma de San Luis Potosi, Mexico

POSTER # 124
3:00 PM **425** *Modification of Microstructure of Pure Al Using Shot Peening Treatment*; **L Xu**, K Shin; Changwon National University, Republic of Korea

POSTER # 125
3:00 PM **426** *Microstructural Study of Internal Oxidation of Dilute Ni-Al Alloys*; **O Hernandez-Negrete**; University of Sonora, Mexico, A Martinez-Villafañe; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 126
3:00 PM **427** *Effect of Ultrasonic Shot Peening on Microstructural Evolution of Duplex Stainless Steel S32750;* **S Liu**, K Shin; Changwon National University, Republic of Korea

POSTER # 127
3:00 PM **428** *Synthesis and Characterization of HfC/SiC Ceramic Nanoparticles;* LG Ceballos-Mendivil; Universidad Autónoma de Sinaloa, Mexico, JC Tánori-Córdova; Universidad de Sonora, Mexico, JA Baldenebro-López, RA Soto-Rojo, **FJ Baldenebro-Lopez**; Universidad Autónoma de Sinaloa, Mexico

POSTER # 128
3:00 PM **429** *Effect on Microstructure and Nanoindentation of a AlCoFeMoNi High Entropy Alloy;* **FJ Baldenebro-Lopez**; Autonomous University of Sinaloa, Mexico, CD Gomez-Esparza; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, H Camacho-Montes; Autonomous University of Cuidad-Juarez, Mexico, R Martínez-Sánchez; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 129
3:00 PM **430** *Synthesis and Characterization of TiO2/C Composite for Photocatalytic Degradation of Dyes;* LG Ceballos-Mendivil; Universidad Autónoma de Sinaloa, Mexico, JC Tánori-Córdova, D Vargas-Hernández; Universidad de Sonora, Mexico, HI Villafán-Vidales; Universidad Nacional Autónoma de México, Mexico, A Cruz-Enriquez, JA Baldenebro-López, RA Soto-Rojo, **FJ Baldenebro-López**; Universidad Autónoma de Sinaloa, Mexico

A18.P1 Vendor Symposium

POSTER SESSION
Tuesday: 3:00 PM • Room: Exhibit Hall

POSTER # 130
3:00 PM **431** *An Evaluation of Beam-Damage Zone in Si Wafer Machined by Gatan MicroPREPTM Laser-Ablation;* **WW Zhao**; GLOBALFOUNDRIES, U.S. Inc., Y Wang; Gatan, C Bennett, PS Pichumani, G Walker, K Eaton; GLOBALFOUNDRIES, U.S. Inc., MH Shearer; Gatan, L Dumas; GLOBALFOUNDRIES, U.S. Inc. *et. al.*

POSTER # 131
3:00 PM **432** *High Throughput Automatic Elemental Analysis System Using Conventional SEM-EDS;* **S Suzuki**, M Morita, Y Ohta; JEOL Ltd., Japan

POSTER # 132
3:00 PM 433 *High Performance Silicon Drift Detectors for Energy Dispersive Spectroscopy;* **A Pahlke**, F Dams, R Fojt, M Fraczek, L Höllt, J Knobloch, N Miyakawa; KETEK GmbH, Germany

POSTER # 133
3:00 PM 434 *Using a Residual Gas Analyzer to Monitor Plasma Cleaning of SEM Chambers and Specimens;* **RA Vane**, M Cable; XEI Scientific, Inc.

POSTER # 134
3:00 PM 435 *The Power of Electron Diffraction Phase Analysis and Pattern Simulations Using the ICDD® Powder Diffraction File™ (PDF-4+);* **A Gindhart**, T Blanton, J Blanton, S Gates-Rector; International Centre for Diffraction Data

POSTER # 135
3:00 PM 436 *A 120 kV Transmission Electron Microscope Series for Both Life Science and Material Science Fields;* **K Tamura**, T Kubo, I Nagaoki, H Mise, A Wakui, M Wayama, H Matsumoto, T Yaguchi; Hitachi High-Technologies Corporation, Japan

POSTER # 137
3:00 PM 437 *Development of an Easy-to-Use Cryo-Electron Microscope for Simultaneous Observation of SEM and Transmission Images;* Y Ose; Hitachi High-Technologies Corporation, Japan, J Usukura; Nagoya University, Japan, M Osumi; Japan Women's University, Japan, T Sunaoshi, Y Tamba, Y Nagakubo, J Azuma, R Tamochi; Hitachi High-Technologies Corporation, Japan et. al.

POSTER # 138
3:00 PM 438 *Single Particle Analysis with Highly Coherent Electron Source from Cold Field Emission Gun;* **N Hosogi**, T Fukumura, Y Shimizu, H Iijima; JEOL Ltd., Japan

Scientific Program

B BIOLOGICAL SCIENCES POSTER SESSIONS – Tuesday Afternoon

B01.P1 Microscopy and Analysis in Forensic Science

POSTER SESSION
Tuesday: 3:00 PM • Room: Exhibit Hall

POSTER # 139
3:00 PM **439** *TEM and EDX of Metallic Nanoparticles in e-Cigarette Aerosol;* **HO Colijn**; Ohio State University, VB Mikheev; Battelle Memorial Institute

POSTER # 140
3:00 PM **440** *How to Improve Soil Anti-Adhesion by Studying the Micro-Topography of a Beetle Cuticle;* **EA Favret**; Instituto Nacional de Tecnología Agropecuaria, Argentina, O Tesouro, L Venturelli, M Roba, A Romito, LM Setten; Instituto Nacional de Tecnología Agropecuaria, Argentina

POSTER # 141
3:00 PM **441** *Capability of Electron Microscopy in Forensic Science;* **M Kotrly**; Institute of Criminalistics Prague (ICP), Czech Republic

POSTER # 142
3:00 PM **442** *Localization and Quantification of Total UV Absorbing Compounds in Chinese Elm* (Ulmus parvifolia); **V Ferchaud**, Y Qi, L Chin; Southern University and A&M College

B03.P1 3D Structures of Macromolecular Assemblies, Cellular Organelles, and Whole Cells

POSTER SESSION
Tuesday: 3:00 PM • Room: Exhibit Hall

POSTER # 143
3:00 PM **443** *High Resolution Atomic Force Microscopy Visualization of Fibrinogen Unfolding on Modified Graphite;* **EV Dubrovin**, NA Barinov, DV Klinov; Federal Research and Clinical Center of Physical-Chemical Medicine, Russian Federation

POSTER # 144
3:00 PM **444** *The ASM Study of Elastic Properties of Rat Fibroblasts, Lacking Vimentin;* A Vakhrusheva; M.V. Lomonosov Moscow State University, Russian Federation, V Zhuikov; Federal Scientific Center-Biotechnology, Russian Academy of Sciences, Russian Federation, S Endzhievskaya, A Minin; Institute of Protein Research, Russian Academy of Sciences, Russian Federation, **OS Sokolova**; M.V. Lomonosov Moscow State University, Russian Federation

POSTER # 145
3:00 PM **445** *Projection Structures of DNA-DPS Co-Crystals are Determined by the Length of the Incorporated DNA;* A Moiseenko; M.V. Lomonosov Moscow State University, Russian Federation, K Tereskina, N Loiko; Russian Academy of Sciences, Russian Federation, Y Danilova; M.V. Lomonosov Moscow State University, Russian Federation, Y Krupyansky; Russian Academy of Sciences, Russian Federation, **OS Sokolova**; M.V. Lomonosov Moscow State University, Russian Federation

POSTER # 146
3:00 PM **446** *Multiple Conformations of the Compact Dinucleosomes: Analysis by Electron Microscopy;* M Valieva, O Chertkov, M Karlova, M Kirpichnikov, A Feofanov, **OS Sokolova**; Lomonosov Moscow State University, Russian Federation, V Studitsky; Fox Chase Cancer Center

POSTER # 147
3:00 PM **447** *Cryo-EM Structure of the Single-Ring Chaperonin from Bacteriophage OBP* P. fluorescence; TB Stanishneva-Konovalova, P Semenuyk; M.V. Lomonosov Moscow State University, Russian Federation, Y Pechnikova; Thermo Fisher Scientific, Netherlands, LP Kurochkona; Shemyakin-Ovchinnikov Institute of Bioorganic Chemistry, Russian Academy of Sciences, Russian Federation, **OS Sokolova**; M.V. Lomonosov Moscow State University, Russian Federation

POSTER # 148
3:00 PM **448** *Observed Structural Heterogeneity of Human Hepatitis B Virus Surface Antigen Particles by Cryo-Electron Microscopy*; **JR Gallagher**, AK Harris; National Institutes of Health

POSTER # 149
3:00 PM **449** *Three-Dimensional Structure Analysis of Cell Nuclei in Mice Cerebellar CortexUsing Array Tomography;* **M Suga**; JEOL Ltd. and RIKEN CLST, Japan, K Ohta; Kurume University, Japan, H Nisioka; JEOL Ltd. and RIKEN CLST, Japan, M Nakamura, K Suzuki; JEOL Ltd., Japan, K Konishi, T Nonaka; Nikon Corporation, Japan, S Kume; RIKEN CLST, Japan *et. al.*

B04.P2 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals

POSTER SESSION
Tuesday: 3:00 PM • Room: Exhibit Hall

POSTER # 150
3:00 PM **450** *Micro-Morphological Characterization of Fresh* Cannabis Sativa L. *Roots After Lead Exposure Using Low Temperature Method for ESEM;* **V Nedela**, E Tihlarikova; Institute of Scientific Instruments of the CAS, Czech Republic, B Đorđević, N Slamova; Mendel University in Brno, Czech Republic

POSTER # 151
3:00 PM **451** *Improved Biological Tissue Preparation Procedure for Scanning Electron Microscopic Imaging;* H Alsudani, **S Ghoshroy**, J Quattro, M Greenwold, R Sawyer; University of South Carolina

POSTER # 152
3:00 PM **452** *The Use of Scanning Electron Microscopy for the Analysis of Bacteriophage Binding to* Acinetobacter baumanii; **BM Leroux**; National Bioforensic Analysis Center, M Henry, B Biswas; Navy Medical Research Center, RK Pope; National Bioforensic Analysis Center

POSTER # 153
3:00 PM **453** *ATP Depletion Impairs Activity-Dependent Ultrafast Endocytosis at Hippocampal Synapses;* **Q Gan**, S Watanabe; Johns Hopkins School of Medicine

POSTER # 154
3:00 PM **454** *Using Humanized Mice to Evaluate the Pathogenesis of Variola Virus and Ebola Virus;* **CS Goldsmith**; U.S. Centers for Disease Control and Prevention (CDC), CL Hutson, BH Bird, CP Drew, V Olson, CF Spiropoulou, SR Zaki, JM Ritter; Centers for Disease Control and Prevention (CDC)

POSTER # 155
3:00 PM **455** (M&M STUDENT SCHOLAR) *Fluorescence Microscopy as a Tool for Nanomedicine-Cell Interactions Study: Input of Particle Design and of Analytical Strategy;* **S Ben Djemaa**, I Chourpa, M Pacaud, K Hervé-Aubert, S David, E Allard-Vannier, E Munnier; University of Tours, France, A Ignatova; Russian Academy of Sciences, Russian Federation *et. al.*

POSTER # 156
3:00 PM **456** *Whole-Mount Dual Labeling of Regenerating Bone and Vasculature in Axolotl Appendages;* L DiMartino, R Montoro, **R Dickie**; Towson University

POSTER # 157
3:00 PM **457** *In Sit*u Investigation of Calcium Oxalate Mineralization; **DJ Banner**, E Firlar, K He, J Finlay, R Shahbazian Yassar, T Shokuhfar; University of Illinois-Chicago

POSTER # 158
3:00 PM **458** *Conserved Structural Anatomy Between Divergent Viral Capsid Nanoparticles for Vaccine Design;* **DM McCraw**, NM Gulati, ML Myers, AK Harris; National Institutes of Health

POSTER # 159
3:00 PM **459** *Light on the Biomineralization of Ferritin;* **S Narayanan**; University of Illinois at Chicago, E Firlar, T Foroozan, N Farajpour, L Covnot, RS Yassar, T Shokuhfar; University of Illinois-Chicago

P PHYSICAL SCIENCES POSTER SESSIONS – Tuesday Afternoon

P01.P1 Advances in Electron, X-Ray and Neutron Spectro-Imaging/ Holography of Energy Materials and Devices

POSTER SESSION
Tuesday: 3:00 PM • Room: Exhibit Hall

POSTER # 161
3:00 PM **460** *Amorphous Structure Analysis of Si Anode for Li Ion Battery;* **Y Shimo**; Toyota Motor Corporation, Japan, A Hirata; Tohoku University, Japan, H Yamasaki, H Yamaguchi, K Sato; Toyota Motor Corporation, Japan

POSTER # 162
3:00 PM **461** *Analyzing Lithium Ion Battery Materials with Valence EELS;* **FC Castro**, VP Dravid; Northwestern University

POSTER # 163
3:00 PM **462** *Using* Ex Situ *TEM to Understand the Effect of Different Oxidative Environments on Small Metal Particle Morphology;* **CE Kliewer**, GN Kiss, SL Soled; ExxonMobil

POSTER # 164
3:00 PM **463** *Practical Electroanalytical Measurements in Liquid Cell TEM;* **K Karki**, DH Alsem, N Salmon; Hummingbird Scientific

POSTER # 165
3:00 PM **464** *Atomic-Level Characterization of Thermoelectric* $La_{1/3}Nb_{O3}$*;* **D Kepaptsoglou**; SuperSTEM, United Kingdom, J Baran; University of Bath, United Kingdom, F Azough; University of Manchester, United Kingdom, M Molinari; University of Huddersfield, United Kingdom, S Parker; University of Bath, United Kingdom, R Freer; University of Manchester, United Kingdom, Q Ramasse; SuperSTEM, United Kingdom

POSTER # 166
3:00 PM **465** *Aberration-Corrected Scanning Transmission Electron Microscopy of Single Crystals and Chemically-Gradient NMC Cathodes;* **S Sharifi-Asl**; University of Illinois-Chicago, G Chen; Lawrence Berkeley National Laboratory, J Croy, M Balasubramanian; Argonne National Laboratory, R Shahbazian-Yassar; University of Illinois-Chicago

POSTER # 167
3:00 PM **466** *Developing Model Cathodes to Study Interfacial Ion Diffusion;* **K Bilash**, JR Jokisaari, RF Klie; University of Illinois-Chicago

POSTER # 168
3:00 PM **467** *Oxygen Ion Conductivity and Composition at the Grain Boundaries of Ca Doped* CeO_2*;* **BM Hauke**, BDA Levin, PA Crozier; Arizona State University

Scientific Program

P PHYSICAL SCIENCES POSTER SESSIONS – Tuesday Afternoon *continued*

P03.P1 Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications

POSTER SESSION

Tuesday: 3:00 PM • Room: Exhibit Hall

POSTER # 169

3:00 PM **468** *Electron Microscopy and X-Ray Diffraction Analysis of Titanium Oxide Nanoparticles Synthesized by Pulsed Laser Ablation in Liquid;* J Donėlienė, A Galdikas; UAB "Modern E-Technologies", Lithuania, **V-D Hodoroaba**; Federal Institute for Materials Research and Testing (BAM), Germany, M Rudzikas; UAB "Modern E-Technologies", Lithuania, S Rades, I Dörfel, B Peplinski, M Sahre; Federal Institute for Materials Research and Testing (BAM), Germany *et. al.*

POSTER # 170

3:00 PM **469** *Microstructural Analysis of Si Frameworks Induced by Electrochemical (De)Alloying Process*; **D-S Ko**; Samsung Advanced Institute of Technology, Republic of Korea, K Ogata; Samsung Research Institute of Japan, Japan, S Jeon, C Jung, J Lee, S Sul, H-G Kim, JK Shin; Samsung Advanced Institute of Technology, Republic of Korea

POSTER # 171

3:00 PM **470** *Controlling the Deposit of Gold Nanoparticles and Area Coverage on Glass Substrates by a Multistep Method;* **PE Cardoso-Avila**, JL Pichardo-Molina, MM Martinez-Garcia; Centro de Investigaciones en Óptica, Mexico

POSTER # 172

3:00 PM **471** *Imaging of Aluminum Nanoparticles Embedded in an Amorphous Sapphire Substrate Using Plasmon Energy-loss Electrons in TEM;* **Y Wu**, JM Callahan; Boise State University

POSTER # 173

3:00 PM **472** *Electron Microscopy Studies of SnO_2 Nanoparticles with Quantum Dots Dimensions Produced Using Ultrasonic Sonochemical Agitation;* M Gómez, J Solís, P Alvarado; Facultad de Ciencias, Universidad Nacional de Ingenieria, Peru, N Kramsky, **D Acosta**; Universidad Nacional Autónoma de México, Mexico

POSTER # 174

3:00 PM **473** *Automation of Image Processing for Nano-Beam Diffraction Measurements;* **D Homeniuk**; Nanotechnology Research Center, National Research Council of Canada, Canada, F Paraguay-Delgado; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, M Malac, M Hayashida; Nanotechnology Research Center, National Research Council of Canada, Canada

POSTER # 175

3:00 PM **474** *Characterization of Ligand Exchange in 2D Hybrid Molecule-Nanoparticle Superlattices;* **S Hihath**, C McCold; University of California-Davis, K March, J Hihath; Arizona State University

POSTER # 176

3:00 PM **475** *Pr^{3+}/Yb^{3+}: $NaGdF_4$@Yb^{3+}: $NaYF_4$Core / Shell Nanocrystals: Synthesis, Microstructure and Quantum-Cutting Luminescence;* **Y Wang**; Fujian Institute of Research on the Structure of Matter, CAS, China

POSTER # 177

3:00 PM **476** *Graphene as Reinforcement Agent in Aluminum Alloy 7075 Matrix Composite by Using Mechanical Milling;* E Cuadros-Lugo, I Estrada-Guel, J Herrera-Ramirez; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, C López-Meléndez; Universidad La Salle Chihuahua (ULSA), Mexico, **C Carreño-Gallardo**; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 178

3:00 PM **477** *Green Synthesis of Silver Nanoparticles Using Valeriana Officinalis Aqueous Extract;* F Mares-Briones, MS Aguilar, SE Borjas-Garcia, N Fletes, GA Rosas; Universidad Michoacana de San Nicolás de Hidalgo, Mexico

POSTER # 179

3:00 PM **478** *Positive Staining for Improved Contrast Of Macromolecules In Transmission Electron Microscopy;* **KA Parker**, Y Li, A Eshein, S Zhu; Northwestern University, CM Hampton, LF Drummy; U.S. Air Force Research Laboratory, VP Dravid; Northwestern University

POSTER # 180

3:00 PM **479** *Fabrication of Multilayer Graphene by an Environment-Friendly Synthesis of Metallic Magnesium and Carbon Dioxide Combined in a Chemical Reaction;* E Cuadros-Lugo, D Lardizabal-Gutiérrez, JM Herrera-Ramirez, C Garay-Reyes; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, C López-Meléndez; Universidad La Salle Chihuahua (ULSA), Mexico, **C Carreño-Gallardo**; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 181

3:00 PM **480** *Solar Cell Power Conversion Efficiency Dependence on Multilayered Si and ZnO QD films;* **AJ Cordova-Rubio**; University of Sonora, Mexico, R Lopez-Delgado; University of Texas-San Antonio, A Zazueta-Raynaud; University of Sonora, Mexico, C Velasquez-Ordoñez; University of Guadalajara, Mexico, ME Alvarez-Ramos; University of Sonora, Mexico, AA Ayon; University of Texas-San Antonio

POSTER # 182

3:00 PM **481** *A Simple Method for Coating Polypropylene with Gold Nanoparticles;* YR Ponce-de-Leon, **JL Pichardo-Molina**, PE Cardoso-Avila, MM Martinez-Garcia; Optics Research Center, Mexico

POSTER # 183
3:00 PM **482** *Biosynthesis of Gold Nanoparticles Using* Loeselia Mexicana *Extract;* R Herrero-Calvillo, SE Borjas-Garcia, GA Rosas; Universidad Michoacana de San Nicolás de Hidalgo, Mexico

POSTER # 184
3:00 PM **483** *Green Synthesis of Gold Nanoparticles Using* Taraxacum Officinale *extract;* AI Del Moral, SE Borjas-Garcia, GA Rosas; Universidad Michoacana de San Nicolás de Hidalgo, Mexico

POSTER # 185
3:00 PM **484** *Fabrication of a SERS Substrate of Gold Nanoparticles by Dewetting;* **IA Estrada-Moreno**, R Dominguez-Cruz, V Osuna-Galindo, J Holguín-Momaca, A Vega-Ríos, A Márquez-Lucero; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 186
3:00 PM **485** *Structural and Elemental Analysis on Bismuth Ferrite-Doped Ceramics: An Energy Dispersive Spectroscopy and Rietveld Analysis;* **G Rojas-George**, G Herrera-Perez, HE Esparza-Ponce, A Reyes-Rojas; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 187
3:00 PM **486** *Structural and Luminescent Properties of Samarium Doped $SrSnO_3$ Nanoparticles;* CG Pérez Hernández, **A Flores Pacheco**, RC Carrillo Torres; Posgrado en Nanotecnología, Mexico, A Acevedo Carrera; Licenciatura en Física, Mexico, R Sánchez Zeferino, ME Álvarez Ramos; Posgrado en Nanotecnología, Mexico

POSTER # 188
3:00 PM **487** *Surface Plasmon Modes in Long Chains of Au Nanoparticles;* **P Potapov**; Leibniz Institute for Solid State and Materials Research, Germany, M Mayer; Leibniz Institute of Polymer Research, Germany, A Lubk, D Pohl, J Schultz; Leibniz Institute for Solid State and Materials Research, Germany, TAF König, A Fery; Leibniz Institute of Polymer Research, Germany

POSTER # 189
3:00 PM **488** *Gold Nanoparticles Phase Transfer for Coating the End Face of Optical Fibers;* MM Martinez-Garcia, **JL Pichardo-Molina**, PE Cardoso-Ávila, MA-MN Meneses-Nava, D Monzón-Hernández; Centro de Investigaciones en Óptica, Mexico

POSTER # 190
3:00 PM **489** *Synthesis of $Fe2O_3$@titanate Nanostructures with Improved Optical Absorption;* **AM Costa**, NN Suguihiro, EA Brocchi, FC Rizzo; Pontifícia Universidade Católica do Rio de Janeiro, Brazil

POSTER # 191
3:00 PM **490** *CdTe Photo-Luminescent Quantum Dots as a Possible New Method to Improve Solar Cell Efficiency;* **A Zazueta Raynaud**, A Flores Pacheco, G Saavedra Rodríguez, ME Álvarez Ramos; University of Sonora, Mexico, JE Pelayo; University of Guadalajara, Mexico, R Lopez Delgado, AA Ayon; University of Texas-San Antonio

POSTER # 192
3:00 PM **491** *EELS Investigations of Carbon-rich Boron Carbide Nanomaterials*; **J Dampare**, M Zondode, B Ozturk, Y Lan; Morgan State University, S-C Liou, H Yu; University of Maryland

POSTER # 193
3:00 PM **492** *Synthesis of Polydopamine Nanoparticles for Drug Delivery Applications*; R Batul, A Yu, M Bhave; Swinburne University of Technology, Australia, **A Khaliq**; RMIT University, Australia

P04.P1 *In Situ* Methods for Probing Properties and Dynamics in Materials

POSTER SESSION
Tuesday: 3:00 PM • Room: Exhibit Hall

POSTER # 194
3:00 PM **493** In Situ *TEM Characterization of Ultra-Robust Memristors Based on Fully-Layered Two-Dimensional Materials;* S Cai, M Wang; Nanjing University, China, X Pan; University of California, JJ Yang; University of Massachusetts, F Miao, **P Wang**; Nanjing University, China

POSTER # 195
3:00 PM **494** *Electron Microscopy Characterization of the Synergistic Effects between Pd, Au NPs, and Their Graphene Support;* **K Meduri**, C Stauffer; Portland State University, G O'Brien Johnson, PG Tratnyek; Oregon Health & Science University, J Jiao; Portland State University

POSTER # 196
3:00 PM **495** *Double-Tilt* In Situ *TEM Holder with Ultra-high Stability;* **M Xu**, S Dai, T Blum, X Pan; University of California-Irvine

POSTER # 197
3:00 PM **496** In Situ *TEM Investigation of Anti-Sintering Au@Pt Core-Shell Nanostructures on MoS_2 at Elevated Temperatures;* **B Song**; University of Illinois-Chicago, Y Yuan; Argonne National Laboratory, S Sharifi-Asl; University of Illinois-Chicago, Y Liu; Argonne National Laboratory, R Shahbazian-Yassar; University of Illinois-Chicago

POSTER # 198
3:00 PM **497** *Use of a MEMS-Based TEM Heating Stage to Characterize Carbide Precipitation in Alloy 690;* **JK Heuer**; Naval Nuclear Laboratory

POSTER # 199
3:00 PM **498** *Effects of Photoinduced Elastic Responses on Debye-Waller Temperature Measurements;* **EJ VandenBussche**, DJ Flannigan; University of Minnesota

POSTER # 200
3:00 PM **499** *Spatially-Resolved Strain-Wave Dynamics in MoS_2;* **Y Zhang**, AJ McKenna, DJ Flannigan; University of Minnesota

Scientific Program

P PHYSICAL SCIENCES POSTER SESSIONS – Tuesday Afternoon *continued*

POSTER # 201
3:00 PM **500** In Situ *Lorentz Differential Phase Contrast STEM Characterization of Rashba Interaction on Skyrmion Thin Films;* **BD Esser,** DW McComb, N Bagués, AS Ahmed, K Meng, J Rowland, B Wang, M Randeria; The Ohio State University *et. al.*

POSTER # 202
3:00 PM **501** In Situ *Heating Experiments Within a Tabletop SEM: Grain Growth and Dewetting of Thin Layers of Au and AuPd With and Without an $Al2O_3$ Coating;* J Jansen; Delft University of Technology, Netherlands, **M Scotuzzi**; Phenom-World B.V., Netherlands, HW Zandbergen; Delft University of Technology, Netherlands

POSTER # 203
3:00 PM **502** *Phase-Change Materials: the Challenges for TEM;* **S Tripathi**, M Janish, F Dirisaglik, A Cywar; University of Connecticut, Y Zhu; IBM Thomas J Watson Research Center, K Jungjohann; Sandia National Laboratories, H Silva, CB Carter; University of Connecticut

POSTER # 204
3:00 PM **503** *Determination of Surface Dynamics on CeO_2 Nanoparticles Using Time-Resolved High-Resolution TEM;* **EL Lawrence**, BD Levin; Arizona State University, BK Miller; Gatan, Inc., PA Crozier; Arizona State University

P09.P1 Microstructure and Mechanics Deformation

POSTER SESSION
Tuesday: 3:00 PM • Room: Exhibit Hall

POSTER # 205
3:00 PM **504** *Nano-Mechanical and Piezoelectric Properties on PZT Thin Films;* DE Olivas-Ortega; Centro de Investigación de Materiales Avanzados (CIMAV), Mexico, J Ramos-Cano; Universidad Autónoma de Coahuila (UADEC), Mexico, RP Talamantes-Soto; Centro de Investigación de Materiales Avanzados (CIMAV), Mexico, **C López-Meléndez**; Universidad La Salle Chihuahua (ULSA), Mexico, A Hurtado-Macias; Centro de Investigación de Materiales Avanzados (CIMAV), Mexico

POSTER # 206
3:00 PM **505** *Synthesis and Characterization of AZO Thin-Films Grown by DC-Sputtering;* JA Duarte Moller; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, **AR Rivera Gomez**; Instituto Tecnologico Nacional, Mexico, JE Morales Mendoza; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 207
3:00 PM **506** *Microstructural Characterization of Nitro-Boriding Coating on ARMCO® Pure Iron;* MÁ Flores-Rentería, **M Ortiz-Domínguez**, I Simón-Marmolejo, LE Martínez-Martínez, J Zuno-Silva; Universidad Autónoma del Estado de Hidalgo-Sahagún, Mexico

POSTER # 208
3:00 PM **507** *A New Powder-Pack Carbo-Boro-Nitriding Process: Microstructural Characterization of Multicomponent Layers on ARMCO® Pure Iron;* M Ortiz-Domínguez, LE Martínez-Martínez, MÁ Flores-Rentería, I Simón-Marmolejo; Universidad Autónoma del Estado de Hidalgo-Sahagún, Mexico, **M Elias-Espinosa**; Tecnológico de Monterrey, Mexico

POSTER # 209
3:00 PM **508** *Deformation and Damage Mechanisms of Novel Austenitic ODS Steel Under* In Situ *ACOM-TEM Straining;* A Chauhan, **D Litvinov**, B Kaiser, J Aktaa; Karlsruhe Institute of Technology (KIT), Germany

POSTER # 210
3:00 PM **509** *Importance of SEM in the Study of Fractography: Camshaft Failure;* **GM Guillermina**, GG Diego Enrique; National Autonomous University of Mexico

POSTER # 211
3:00 PM **510** *Study of the High Temperature Phase of 1,16-Hexadecanediol by Polarized Light Microscopy and Glancing Incidence X-Ray Diffraction;* M Ramírez Cardona; Universidad Autónoma del Estado de Hidalgo, Mexico, MP Falcón León, G Luis Raya; Universidad Politécnica de Pachuca, Mexico, G Mejía Hernández; Universidad Autónoma del Estado de Hidalgo, Mexico, R Arceo; Universidad Autónoma de Chiapas, Mexico, AI Martínez Pérez, G Villagomez García; Universidad Politécnica de Pachuca, Mexico, **EE Vera Cárdenas**; Instituto Tecnológico de Pachuca, Mexico

POSTER # 212
3:00 PM **511** *Study of 1,15-Pentadecanediol by Powder X-Ray Diffraction and Polarized Light Microscopy;* G Luis Raya; Universidad Politécnica de Pachuca, Mexico, M Ramírez Cardona; Universidad Autónoma del Estado de Hidalgo, Mexico, MP Falcón León, AI Martínez Pérez, F González Hernández, EG Pérez Pérez, A Silva Castillo; Universidad Politécnica de Pachuca, Mexico, **EE Vera Cárdenas**; Instituto Tecnológico de Pachuca, Mexico

POSTER # 213
3:00 PM **512** *Process Consolidation of Al-Cu-Mg Alloy Powders Reinforced with WC Particles;* G Rodríguez-Cabriales; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, A Lometo-Sánchez; Universidad Autónoma de Chihuahua (UACH), Mexico, I Estrada-Guel, C Garay-Reyes; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, MC Maldonado-Orozco; Universidad Autónoma de Chihuahua (UACH), Mexico, **R Martínez-Sánchez**; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 214

3:00 PM 513 *An Al-Li Powder Alloy Prepared by Mechanical Milling and Sintered Using High Frequency Induction;* **JM Mendoza-Duarte**; Centro de Ivestigación en Materiales Avanzados (CIMAV), Mexico, FC Robles-Hernandez; Centro de Investigación en Materiales Avanzados (CIMAV), CG Garay-Reyes, I Estrada-Guel, R Martinez-Sanchez; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 215

3:00 PM 514 *Sustainable Imaging Technology for Thermal Printing;* **T Powell**, B Einsla, J Roper; The Dow Chemical Company

O MICROSCOPY OUTREACH POSTER SESSIONS – Tuesday Afternoon

X90.P1 Microscopy in the Classroom

POSTER SESSION

Tuesday: 3:00 PM • Room: Exhibit Hall

POSTER # 160

3:00 PM **515** *Promoting Undergraduate Student Experiential Learning Using Advanced Microscopy and Spectroscopy Instrumentation on Common Materials;* **N Avishai**, K Abbasi, A Avishai; Swagelok Center for Surface Analysis of Materials, Case Western Reserve University

Notes

Scientific Program Information

Wednesday, August 8, 2018

M&M 2018

MICROSCOPY & MICROANALYSIS

August 5-9, 2018 • Baltimore, MD

A ANALYTICAL SCIENCES SYMPOSIA – Wednesday Morning

A02.3 Atomic-Scale Functional Imaging in Aberration-Corrected Electron Microscopy

SESSION CHAIRS:
Marta D. Rossell; Swiss Federal Laboratories for Materials Science and Technology, Switzerland
Jing Tao; Brookhaven National Laboratory

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 339

8:30 AM **516** (Invited) *Decoding the Structural Origin of Piezoelectric and Thermoelectric Materials with Aberration-Corrected STEM;* H Wu, **SJ Pennycook**; National University of Singapore, Singapore

9:00 AM **517** *Roles of Oxygen Vacancy in Improper Ferroelectrics;* **S Deng;** Tsinghua University, China, S Cheng; Canadian Centre for Electron Microscopy, China, C Xu; Tsinghua University, China, B Ge; Beijing National Laboratory for Condensed Matter Physics, China, X Sun; University of Science and Technology of China, China, R Yu, W Duan; Tsinghua University, China, Y Zhu; Brookhaven National Laboratory et. al.

9:15 AM **518** *Direct Visualization and Image Simulations of Oxygen Sublattice Occupancy in Thin Cuprate Films;* **V Srot**, Y Wang, M Minola; Max Planck Institute for Solid State Research, Germany, M Salluzzo; CNR-SPIN Napoli Complesso Monte Sant´ Angelo via Cinthia, Italy, GM De Luca; Complesso Monte Sant´Angelo via Cinthia, Italy, B Keimer, PA van Aken; Max Planck Institute for Solid State Research, Germany

9:30 AM **519** *Probing Jahn–Teller Distortions at Superconducting La_2CuO_4 Interfaces;* YE Suyolcu, **Y Wang**, W Sigle, F Baiutti, G Cristiani, G Logvenov, J Maier, PA van Aken; Max Planck Institute for Solid State Research, Germany

A03.5 Four-Dimensional Scanning Transmission Electron Microscopy (4D-STEM): From Scanning Nanodiffraction to Ptychography and Beyond

SESSION CHAIRS:
Paul Midgley; University of Cambridge, United Kingdom
Jian-Min Zuo; University of Illinois

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 343

8:30 AM **520** (Invited) *Demonstration of STEM Holography Using Diffraction Gratings;* **BJ McMorran**; University of Oregon, T Harvey; University of Göttingen, Germany, C Ophus; Lawrence Berkeley National Laboratory, J Pierce, F Yasin; University of Oregon

9:00 AM **521** *Probing Nanoscale Structural Heterogeneity in Metallic Glasses Using 4-D STEM;* S Im; The Ohio State University, Z Chen; Cornell University, JM Johnson, P Zhao; The Ohio State University, GH Yoo, ES Park; Seoul National University, Republic of Korea, Y Wang; The Ohio State University, DA Muller; Cornell University, **J Hwang**; The Ohio State University *et. al.*

9:15 AM **522** *Characterizing Magnetic Anisotropy in Amorphous Metal Films Using Tilted Fluctuation Electron Microscopy;* E Kennedy, A Ceballos; University of California-Berkeley, F Hellman; University of California-Berkeley and Lawrence Berkeley National Laboratory, C Ophus; Lawrence Berkeley National Laboratory, **M Scott**; University of California-Berkeley

9:30 AM **523** In Situ *Nanobeam Electron Diffraction of Bulk Metallic Glasses;* **TC Pekin**; University of California-Berkeley, C Ophus; Lawrence Berkeley National Laboratory, C Gammer; Erich Schmid Institute of Materials Science, Austria, B Ozdol; Lawrence Berkeley National Laboratory, RO Ritchie, AM Minor; University of California-Berkeley

9:45 AM **524** *Dynamical Diffraction S/TEM Simulations from Molecular Dynamics Data;* **JN Tessmer**, S Singh, M De Graef; Carnegie Mellon University

A04.3 *In Situ* Transmission Electron Microscopy in Liquid and Gas Cells

SESSION CHAIR:
B. Layla Mehdi; University of Liverpool, United Kingdom

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 345-346

8:30 AM **525** (Invited) *Liquid Cell TEM Study of Nucleation and Growth of Dendrites;* M Hauwiller; Lawrence Berkeley National Laboratory, W Zheng; Tianjin University, China, Z Zeng, **H Zheng**; Lawrence Berkeley National Laboratory

9:00 AM **526** *Scanning TEM Electron Beam Induced Current Imaging in Water;* **JJ Lodico**, WA Hubbard, BC Regan; University of California-Los Angeles

9:15 AM **527** In Situ *EC-TEM Studies of Metal Thin Film Corrosion in Liquid Solutions at Elevated Temperatures;* **JH Park**; IBM T.J. Watson Research Center and Princeton University, T Watanabe; Hitachi Metals America, Ltd., A Pinkowitz, DJ Duquette, R Hull; Rensselaer Polytechnic Institute, DA Steingart; Princeton University, FM Ross; IBM T. J. Watson Research Center

Scientific Program

A ANALYTICAL SCIENCES SYMPOSIA – Wednesday Morning *continued*

9:30 AM **528** (Invited) *Developing New Measurement Capabilities with Nanochannel Liquid Phase TEM;* MN Yesibolati, H Sun, S Canepa, S Lagana, T Kasama; Technical University of Denmark (DTU), Denmark, S Kathmann; Pacific Northwest National Laboratory, D Alloyeau; Université Paris Diderot, France, **K Mølhave**; Technical University of Denmark (DTU), Denmark

A05.2 Low-Energy Electron and Particle Microscopies in Liquid, Gaseous, and Frozen Conditions

SESSION CHAIRS:
Xiao-Ying Yu; Pacific Northwest National Laboratory
Andrei Kolmakov; National Institute for Standards and Technology

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 329

8:30 AM **529** (Invited) In Situ *Liquid SEM Studies of Electrochemical and Radiolytic Processes; RM* Nielsen, S Canepa, MN Yesibolati, CP Nielsen, H Bruus, H Sun, **K Mølhave**; Technical University of Denmark (DTU), Denmark

9:00 AM **530** (Invited) *CLEM of Neurons, Tissues and Biofilms Immersed in Liquid Using The Atmospheric Scanning Electron Microscope (ASEM): Dual Gold-Labeling;* C Sato, N Memtily, **M Sato**; National Institute of Industrial Science and Technology (AIST), Japan, T Yamazawa; The Jikei University School of Medicine, Japan, T Kinoshita, S Nishihara; Soka University, Japan, S Sugimoto; The Jikei University School of Medicine, Japan

9:30 AM **531** (Invited) *AirSEM: Electron Microscopy in Air without a Specimen Chamber;* **DA Muller**, KX Nguyen, Y Han, BDA Levin, ME Holtz; Cornell University

A09.4 Data Analytics and Model-Based Imaging for Microstructure and Physical Property Interpretations

SESSION CHAIRS:
Lawrence F. Drummy; U.S. Air Force Research Laboratory
Charles A. Bouman; Purdue University

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 342

8:30 AM **532** (Invited) *Dragonfly as a Flexible Platform for Interpreting and Processing Hyperspectral and Other High-Dimensional Images*; **N Piché**, F Cote, E Yen, M Marsh; Object Research Systems, Canada

9:00 AM **533** *All Mixed Up: Using Machine Learning To Address Heterogeneity In (Natural) Materials;* **JF Einsle**, B Martineau, I Buisman1, Z Vukmanovic, DN Johnstone, PA Midgley, RJ Harrison; University of Cambridge, United Kingdom

9:15 AM **534** *Modernizing Microscopy Data Infrastructure: Data and Metadata Curation;* **RF Devers**; University of Maryland, JW Lau, G Greene; National Institute of Standards and Technology, T Nicholson, P Nguyen, S Konstanty; University of Illinois - Urbana-Champaign

9:30 AM **535** *Automated Prediction of Pseudo-Symmetry Issues in EBSD;* PG Callahan; University of California at Santa Barbara, S Singh; Carnegie Mellon University, M Echlin, JC Stinville, TM Pollock; University of California at Santa Barbara, **M DeGraef**; Carnegie Mellon University

9:45 AM **536** *Image Calculations vs. Experimental Micrographs;* **T Niermann**; Technische Universität Berlin, Germany

A10.5 The Joy of Scanning Electron Microscopy

SESSION CHAIRS:
Raynald Gauvin; McGill University, Canada
Dale Newbury; National Institute of Standards and Technology

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 328

8:30 AM **537** (Invited) *The Joy of Nanoscale Imaging and Spectroscopy in a Low Accelerating Voltage Scanning Transmitted Electron Microscope;* H Demers; Hydro-Québec, Canada, N Brodusch, **R Gauvin**; McGill University, Canada, ML Trudeau, K Zaghib; Hydro-Québec, Canada

9:00 AM **538** *Low Energy Secondary Electron Imaging of Nanosheets Using Inverted Fountain Detector;* **T Sekiguchi**, T Agemura; University of Tsukuba, Japan, Y Yao; National Institute for Materials Science, Japan

9:15 AM **539** *RISE Microscopy: The Benefits of Correlative Microscopy for High Resolution Structural and Chemical Imaging of Biominerals;* **U Schmidt**; WITec GmbH, Germany, M Eder; Carl Zeiss Microscopy GmbH, Germany, W Liu; WITec Instruments, D Steinmetz; WITec GmbH, Germany, G Wille; BRGM, French Geological Survey, France

9:30 AM **540** *Development of Objective Aperture Holder for Mounting Compact Cs Corrector on Conventional SEM;* **T Nomaguchi**, S Motomura, K Nishinaka, T Agemura; Hitachi High-Technologies Corporation, Japan, T Kawasaki, R Yoshida, T Kato; Japan Fine Ceramics Center, Japan

9:45 AM **541** *Creating Ultrafast Electron Pulses Using a Microfabricated Laser-Triggered Beam Blanker;* **GI Weppelman**; Delft Technical University, R van Tol, CC Heerkens, R Moerland, JJ Hoogenboom, P Kruit; Delft Technical University, Netherlands

A11.5 Solid-State X-Ray Spectrometry at 50 Years

SESSION CHAIRS:
Paul Carpenter; Washington University,
Katherine Burgess; U.S. Naval Research Laboratory

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 327

8:30 AM **542** (Invited) *Electron Probe Micro-Analysis at Low Accelerating Voltages: The Impacts of Surface Coatings and Oxide Layers on Quantification;* **MB Matthews**; AWE, University of Bristol, United Kingdom, SL Kearns, B Buse; University of Bristol, United Kingdom

9:00 AM **543** *Monte Carlo Simulation of Surface Semi-Spherical Inclusions Using MC X-Ray;* **S Rudinsky**, N Brodusch, R Gauvin; McGill University, Canada

9:15 AM **544** *ζ-Factor Development and Quantification of a Boron Carbide and Silicon Hexaboride Diffusion Couple;* **CJ Marvel**; Lehigh University, AM Etzold, V Domnich; Rutgers University, KD Behler, JC LaSalvia; Army Research Laboratory, RA Haber; Rutgers University, M Watanabe, MP Harmer; Lehigh University

9:30 AM **545** *Lithium Detection in a Binary Al-20 wt% Li Alloy Powder with a New Windowless SDD EDS Detector and EELS;* **VP Oleshko**; National Institute of Standards and Technology, SM Seddio, R Newton; Thermo Fisher Scientific, CL Soles, JJ McClelland; National Institute of Standards and Technology

9:45 AM **546** *Non-Uniform Distribution of Doped Carrier in a Na-Doped CaB_6 Bulk Material Observed by EPMA-SXES;* **M Terauchi**; Tohoku University, Japan, H Takahashi; JEOL Ltd., Japan, Y Sato; Tohoku University, Japan, M Takeda; Nagaoka University of Technology, Japan, T Hatano; Tohoku University, Japan, M Koike; National Institute for Quantum and Radiological Science, Japan, H Sasai, T Nagano; SHIMADZU Corp., Japan *et. al.*

A17.5 Surface and Subsurface Microscopy and Microanalysis

SESSION CHAIRS:
Vincent S. Smentkowski; General Electric Global Research Center
Chanmin Su; Bruker-Nano Inc.
John A. Chaney; The Aerospace Corporation
Xiao-Ying Yu; Pacific Northwest National Laboratory

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 326

8:30 AM **547** (Invited) *Utilizing Correlative, Multi-Technique Surface Analysis to Complement Microscopy Studies*; **TS Nunney**, C Deeks, P Mack, R Simpson, C Stephens; Thermo Fisher Scientific, United Kingdom

9:00 AM **558** *Continuous Wavelet Transforms for Measuring Roughness of Nanoscale Interfaces;* **DLN Homeniuk**, M Malac, M Hayashida; National Research Council of Canada, Canada

9:15 AM **549** (Invited) *Surface Analysis of Fine Art Paintings: Studying Degradation Mechanisms with a Systematic Approach;* **TP Beebe Jr**, Z Voras; University of Delaware, K de Gheraldi, J Mass; Scientific Analysis of Fine Art LLC, Netherlands

B BIOLOGICAL SCIENCES SYMPOSIA – Wednesday Morning

B02.1 Microscopy in Food Science: Bridging Biology and Materials Science

SESSION CHAIRS:
Almut Vollmer; Utah State University
Nabil Youssef; Utah State University

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 348

8:30 AM **550** (Invited) *The Application of Microscopy in Dairy Science: A Comprehensive Review of Existing and Emerging Techniques;* **MA Auty**; Teagasc, Ireland

9:00 AM **551** (Invited) *Mechanisms of Autocatalytic Multistage Structure Formation Reactions in Dairy-Based Systems in Relation to Processing and Compositional Factors;* **U Kulozik**, S Lenze, S Sedlmeier; Technical University of Munich, Germany

9:30 AM **552** *Non-Thermal Effects of Microwaves Enhancing Fixation of Biological Samples;* **RI Webb**; University of Queensland, Australia

9:45 AM **553** *Optimization of Rapid Microwave Processing of Botanical Samples for Transmission Electron Microscopy;* **J Mowery**, GR Bauchan; U.S. Department of Agriculture

B05.1 Focused on Microbes!

SESSION CHAIRS:
Alice Dohnalkova; Pacific Northwest National Laboratory
Xiao-Ying Yu; Pacific Northwest National Laboratory

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 347

8:30 AM **554** *Bio-Templated Multilayered Organic-Inorganic Composites Investigated by Analytical STEM;* **V Srot**, P Moghimian; Max Planck institute for Solid State Research, Germany, S Facey; Institute of Technical Biochemistry, University of Stuttgart, Germany, PA van Aken; Max Planck institute for Solid State Research, Germany

8:45 AM **555** (Invited) *Multi-Scale Microscopy of Microbially Induced Calcium Carbonate Precipitation;* **N**

Scientific Program

B BIOLOGICAL SCIENCES SYMPOSIA – Wednesday Morning *continued*

Zambare, E Lauchnor, R Gerlach; Montana State University, B Pitts; Center for Biofilm Engineering

9:15 AM **556** (M&M POSTDOCTORAL SCHOLAR) *Investigation of the Magnetosome Biomineralization in Magnetotactic Bacteria Using GLC-TEM;* **E Firlar**, M Ouy, A Bogdanowicz, L Covnot, B Song, Y Nadkarni, R Shahbazian-Yassar, T Tolou Shokuhfar; University of Illinois-Chicago

9:30 AM **557** *Imaging Plant Using Time-of-Flight Secondary Ion Mass Spectrometry;* **X-Y Yu**, R Komorek, Z Zhu, C Jansson; Pacific Northwest National Laboratory

9:45 AM **558** *STEM Observation of eDNA as a Dominant Component of EPS in* Pseudomonas aeruginosa *Biofilm;* **B Deng**, S Ghatak, S Sarkar, P Ghatak, DW McComb, CK Sen; The Ohio State University

B08.1 3D Structure of Complex Soft Materials Derived from Electron Tomography

SESSION CHAIRS:
Deborah Kelly; Virginia Tech University
Steven Ludtke; Baylor College of Medicine

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 349

8:30 AM **559** (Invited) *3-D Electron Tomographic Analysis of Mitochondria and Lipid Droplets Interactions in Heart Muscle;* **R-C Hsia**; University of Maryland-Baltimore, T Chou; Stevens Institute of Technology, C Sztalryd-Woodle; University of Maryland-Baltimore

9:00 AM **560** (M&M STUDENT SCHOLAR) *Workflow for Correlatively Imaging Mouse Pulmonary Valve Extracellular Matrix;* **Y Liu**; The Ohio State University, Y-U Lee, CK Breuer; Nationwide Children's Hospital, DW McComb; The Ohio State University

9:15 AM **561** (Invited) *A Gateway Into Understanding the Unique Vertex of Samba Virus;* **KN Parent**, JR Schrad, EJ Young; Michigan State University, JS Abrahão; Universidade Federal de Minas Gerais, Brazil, JR Cortines; Universidade Federal do Rio de Janeiro, Brazil

9:45 AM **562** *Improved Z-axis Resolution in Serial Block Face SEM with Dual Primary Energies and Monte Carlo Simulation of Electron Scattering;* Q He; National Institute of Biomedical Imaging and Bioengineering, NIH, DC Joy; University of Tennessee-Knoxville, G Zhang, RD Leapman; National Institute of Biomedical Imaging and Bioengineering, NIH

P PHYSICAL SCIENCES SYMPOSIA – Wednesday Morning

P01.5 Advances in Electron, X-Ray and Neutron Spectro-Imaging/Holography of Energy Materials and Devices

SESSION CHAIRS:
Chongmin Wang; Pacific Northwest National Laboratory
Miaofang Chi; Oak Ridge National Laboratory

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 336

8:30 AM **563** (Invited) *Elucidating Ion Transport in Lithium-Ion Conductors by Combining Vibrational Spectroscopy in STEM and Neutron Scattering;* **M Chi**, X Liu, J Hachtel, N Jalarvo, Y Cheng; Oak Ridge National Laboratory

9:00 AM **564** *Panoramic Visualization of Lithiation of Copper Sulfide by* In Situ *STEM;* **K He**, S Kim, S Hwang, D Su; Clemson University

9:15 AM **565** *Tunnel Intergrowth Structures in Manganese Dioxide and Their Influence on Ion Storage;* **Y Yuan**; University of Illinois-Chicago, B Byles; Drexel University, W Yao, K He, M Cheng; University of Illinois-Chicago, J Lu, K Amine; Argonne National Laboratory, E Pomerantseva; Drexel University *et. al.*

9:30 AM **566** *Equivalence of Three Seemingly Different Phases of Ni-rich Li-ion Battery Cathodes—New Insights Using Combined STEM and EELS Study;* **P Mukherjee**; Michigan Technological University, N Faenza, N Pereira, G Amatucci, F Cosandey; Rutgers University

9:45 AM **567** *Structural Degradations in the Bulk of Cathode Particles for Li-Ion Batteries;* **H Zhang**, F Omenya, MS Whittingham; State University of New York, Binghamton, C Wang; Pacific Northwest National Laboratory, G Zhou; State University of New York, Binghamton

P02.5 Atomically Thin 2D Materials: Recent Results and Challenges

SESSION CHAIRS:
Quentin M Ramasse; SuperSTEM Laboratory, United Kingdom
Raul Arenal; University of Zaragoza, Spain

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 338

8:30 AM **568** (Invited) *Electron Irradiation-Induced Defects and Phase Transformations in Two-Dimensional Transition Metal Dichalcogenides;* **AV Krasheninnikov**; Helmholtz-Zentrum Dresden-Rossendorf, Germany

9:00 AM **569** *Automated Atom-by-Atom Assembly of Structures in Graphene: The Rise of STEM for Atomic Scale Control;* **O Dyck**; Oak Ridge National Laboratory, S

Kim; Pusan National University, Republic of Korea, AR Lupini, SV Kalinin, S Jesse; Oak Ridge National Laboratory

9:15 AM **570** *Study of Helium-Ion-Beam-Generated Defects in a Monolayer WS2 Using Aberration-Corrected Scanning Transmission Electron Microscopy;* **TR Kim**, C Cress, J Fonseca Vega, T Brintlinger, J Robinson, R Stroud; U.S. Naval Research Laboratory

9:30 AM **571** *Ultrafast Electron Diffraction for the Dynamical Study of 2D Materials;* AA Petruk, N Rivas, T Dekker, K Pichugin, AW Tsen; University of Waterloo, Canada, **G Sciaini**; University of Buenos Aires, Canada

9:45 AM **572** *Machine Learning for the Dynamic Scanning Transmission Electron Microscopy Experiment on Solid State Transformations;* **M Ziatdinov**; Oak Ridge National Laboratory, A Maksov; University of Tennessee, O Dyck, S Jesse, SV Kalinin; Oak Ridge National Laboratory

P03.3 Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications

SESSION CHAIR:
Jinguo Wang; University of Texas-Dallas

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 337

8:30 AM **573** *Understanding the RuOx–Oxide Support Interactions: A TEM Study;* **J Li**, Z Liu, R Wang; The University of Alabama

8:45 AM **574** *Anchoring Pt Single Atoms on CeOx Clusters for CO Oxidation;* X Li, **J Xu**; Arizona State University, J Zeng; University of Science and Technology of China, China, J Liu; Arizona State University

9:00 AM **575** *Investigation of Laser-Induced Welding Between Gold and Silver Nanostructures by Advanced TEM Techniques;* **X Xu**, S Kundu, T Isik, V Ortalan; Purdue University

9:15 AM **576** *Measurement of N-V Centers in Nanodiamond Particles Using Advanced (S)TEM;* **SL Chang**, K March, C Dwyer; Arizona State University

9:30 AM **577** *Controlled Synthesis of Metal-Support Interface for High Activity CeO_2-Supported Pt Nanoparticles;* **JL Vincent**, VJ O'Keefe, PA Crozier; Arizona State University

9:45 AM **578** *Metatitanic Acid and Titania Pseudomorphs after Titanyl Sulfates;* **M Klementova;** Institute of Physics of the CAS, Czech Republic, M Motlochova; University of Ostrava, Czech Republic, J Kupcik; Institute of Inorganic Chemistry of the CAS, Czech Republic, L Palatinus; Institute of Physics of the CAS, Czech Republic, E Plizingrova; Institute of Inorganic Chemistry of the CAS, Czech Republic, L Szatmary; UJV Rez, Czech Republic, J Subrt; Institute of Inorganic Chemistry of the CAS, Czech Republic

P04.4 *In Situ* Methods for Probing Properties and Dynamics in Materials

SESSION CHAIR:
Sanjit Bhowmick; Bruker Nano Surfaces

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 340

8:30 AM **579** (Invited) *Development of a Novel Bulk Sample TEM Heater and Its Application;* M Li, D Xie, **Z Shan**; Xi'an Jiaotong University, China

9:00 AM **580** (M&M Student Scholar) In Situ *Single/Cyclic Deformation and Correlated Precession Electron Diffraction Analysis of Nano-Laminate Crystalline/Glassy Metal Composites;* **Q Guo**; The University of Alabama, CM Barr, K Hattar; Sandia National Laboratories, GB Thompson; The University of Alabama

9:15 AM **581** (M&M STUDENT SCHOLAR) In Situ *Transmission Electron Microscopy of Room-Temperature Plastic Deformation and Recovery in Thin 3C-SiC;* **X Liu**, I Szlufarska, PM Voyles; University of Wisconsin-Madison

9:30 AM **582** (Invited) *Defect Characterization Using Transmission Scanning Electron Microscopy;* P Callahan, J-C Stinville, E Yao, MP Echlin, J Shin, F Wang; University of California-Santa Barbara, M de Graef; Carnegie Mellon University, TM Pollack; University of California-Santa Barbara, **D Gianola**; University of California-Santa Barbara *et. al.*

P05.5 Modulating Electron Beams in Space and Time to Probe for Structure and Function of Soft and Hard Matter

SESSION CHAIRS:
Joerg Jinschek; The Ohio State University
Christian Kisielowski; Lawrence Berkeley National Laboratory

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 344

8:30 AM **583** (Invited) Monochromated Electron Energy-Loss Spectroscopy of Interfaces in Beam Sensitive Materials; JA Alexander, **DW McComb**; The Ohio State University

9:00 AM **584** Elucidating Mechanisms for Electron Beam Damage in Conjugated Polymers; **B Kuei**, ED Gomez; Pennsylvania State University

9:15 AM **585** Local Structural Analysis of Graphitic Carbon Nitrides; **DM Haiber**, MM Treacy, PA Crozier; Arizona State University

9:30 AM **586** Electronic and Structural Characterization of Diamondoid Carbon Nanothreads by Transmission Electron Microscopy; **S Juhl**; The Pennsylvania State University, Q Ramasse; STFC Daresbury Laboratory, United Kingdom, X Li, J Badding; N Alem; The Pennsylvania State University

Scientific Program

P PHYSICAL SCIENCES SYMPOSIA – Wednesday Morning *continued*

9:45 AM **587** *Graphene Defect Editing, Deposition, and Growth via E-Beam-Induced Organic Reactions in Aberration Corrected STEM;* **O Dyck**; Oak Ridge National Laboratory, S Kim; Pusan National University, Republic of Korea, SV Kalinin, S Jesse; Oak Ridge National Laboratory

P09.2 Microstructure and Mechanics Deformation

SESSION CHAIRS:
Frank Muecklich; Saarland University, Germany
James Martinez; NASA Johnson Space Center

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 325

8:30 AM **588** (Invited) *Linking Macroscopic Fracture Properties to Single Dislocation Processes;* I Issa; Austrian Academy of Sciences, Austria, M Alfreider; Montanuniversität Leoben, Austria, D Kozic; Material Center Leoben, Austria, O Kolednik; Austrian Academy of Sciences, Austria, S Sandfeld; TU Bergakademie Freiberg, Germany, **D Kiener**; Montanuniversität Leoben, Austria

9:00 AM **589** *3D EBSD Analysis of Hydrogen-Induced Cracking in Pipeline Steel Using Serial Section Broad Ion Beam Tomography;* **MK O'Brien**, KO Findley; Colorado School of Mines, T Hosman; JA Hunt; Gatan, Inc

9:15 AM **590** *Detailed Microstructure Characterizations of BEOL Cu Interconnects;* **B Fu**, M Gribelyuk, S Choi; GLOBALFOUNDRIES

9:30 AM **591** *Electromigration of Copper in Lithographically-Defined Aluminum Nanowires;* **B Zutter**; University of California-Los Angeles, M Mecklenburg; University of Southern California, S Aloni; Lawrence Berkeley National Laboratory, BC Regan; University of California-Los Angeles

9:45 AM **592** *Rapid Mechanical Property Tomograms Generated by Indentation Testing;* **KE Johanns**, B Crawford, KH Parks; Nanomechanics, Inc.

T TUTORIALS – Wednesday Morning

X42.1 Ultra-High Spatial Resolution EBSD: Transmission Kikuchi Diffraction (TKD) in the SEM

SESSION CHAIR:
Donovan N. Leonard; Oak Ridge National Laboratory

PLATFORM SESSION
Wednesday: 8:30 AM • Room: 321

8:30 AM **593** (Invited) *Tutorial: Ultra-High Spatial Resolution EBSD: Transmission Kikuchi Diffraction (TKD) in the SEM;* **S Sitzman**; The Aerospace Corporation

A ANALYTICAL SCIENCES SYMPOSIA – Wednesday Morning *continued*

A02.4 Atomic-Scale Functional Imaging in Aberration-Corrected Electron Microscopy

SESSION CHAIRS
Miaofang Chi; Oak Ridge National Laboratory
Marta D. Rossell; Empa, Switzerland

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 339

10:30 AM **594** (Invited) *Probing the Atomic Lattice Response of Quantum Materials Across Phase Transitions;* **LF Kourkoutis**, I El Baggari, BH Savitzky, DJ Baek, BH Goodge, MJ Zachman; Cornell University

11:00 AM **595** (Invited) *Direct Imaging of Electron Transfer and Its Influence on Superconducting Pairing at FeSe/$SrTiO_3$ Interface;* L Wu; Brookhaven National Lab, M Li; Massachusetts Institute of Technology, W Zhao; Harbin Institute of Technology at Shenzhen, China, C-Z Chang; The Pennsylvania State University, J Moodera; Massachusetts Institute of Technology, M-HW Chan; The Pennsylvania State University, **Y Zhu**; Brookhaven National Laboratory

11:30 AM **596** (M&M STUDENT SCHOLAR) *Atomic-Resolution Study of Oxygen Vacancy Ordering in $La_{0.5}Sr_{0.5}CoO_{3-\delta}$ Thin Films on $SrTiO_3$ During* In Situ *Cooling Experiments;* **X Rui**, R Klie; University of Illinois-Chicago, J Walter, C Leighton; University of Minnesota

11:45 AM **597** *Atomic-Resolution Cryo-STEM Imaging of a Structural Phase Transition in $TaTe_2$;* **I El Baggari**, GM Stiehl, J Waelder, DC Ralph, LF Kourkoutis; Cornell University

A04.4 *In Situ* Transmission Electron Microscopy in Liquid and Gas Cells

SESSION CHAIR:
Larry Allard; Oak Ridge National Laboratory

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 345-346

10:30 AM **598** (Invited) *Using* Operando *Characterization, Data Analytics, and Artificial Intelligence to Understand Mechanistic Links between Processing and Structure;* **EA Stach**; University of Pennsylvania, B Maruyama; U.S. Air Force Research Laboratory, C Chen; Drexel University

11:00 AM **599** In Situ *Open Cell TEM/STEM Environmental Study of Iron Oxides Nanoparticles and Sample-Beam Interaction in O_2 gas;* **L Lari**; University of York, United Kingdom, S Steinhauer, M Sowwan; OIST Graduate University, Japan, VK Lazarov; University of York, United Kingdom

11:15 AM **600** *Probing Dynamic Processes of the Initial Stages of Cu(100) Surface Oxidation by* In Situ *Environmental TEM and Multiscale Simulations;* **M Li**, MT Curnan, H Chi; University of Pittsburgh, X Li, G Henkelman; University of Texas-Austin, WA Saidi, JC Yang; University of Pittsburgh

11:30 AM **601** *Growth Dynamics of Ga Nanodroplets on 2D Substrate;* **Z Baraissov**; National University of Singapore, Singapore, F Panciera, J-C Harmand, G Patriarche; CNRS, University of Paris, Saclay, France, U Mirsaidov; National University of Singapore, Singapore

11:45 AM **602** *Engineering the Energy Flow in Nanoparticles for Plasmonically Enhanced Catalysis;* **C Wang**, W-CD Yang, D Sil, A Agrawal; University of Maryland and National Institute for Standards and Technology, R Sharma; National Institute for Standards and Technology

A05.3 Low-Energy Electron and Particle Microscopies in Liquid, Gaseous, and Frozen Conditions

SESSION CHAIR:
Debbie Stokes; Thermo Fisher Scientific, The Netherlands

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 329

10:30 AM **603** (Invited) *The ESEM as* In Situ *Platform for the Study of Gas-Solid Interaction;* J Cao, Z-J Wang, X Huang; Fritz Haber Institute of the Max Planck Society, Germany, A Rinaldi; King Fahd University of Petroleum & Minerals, Saudi Arabia, M Greiner; Max Planck Institute for Chemical Energy Conversion, Germany, G Moldovan, W Joachimi; point electronic GmbH, Germany, R Schloegl; Fritz Haber Institute of the Max Planck Society, Germany, **M Willinger**; ETH Zuerich et. al.

11:00 AM **604** (Invited) *3D Nanoprinting via Focused Electron Beams;* **H Plank**, R Winkler, J Sattelkow; Graz University of Technology, Austria, JD Fowlkes; Oak Ridge National Labs, PD Rack; University of Tennessee

11:30 AM **605** *3-Dimensional Hydrogel Printing via Electron Crosslinking;* T Gupta, **A Kolmakov**; National Institute of Standards and Technology

11:45 AM **606** *Characterization of Liquid Suspensions in 3D Using Environmental Scanning Electron Microscopy in Transmission;* J Xiao, L Roiban, G Foray; Université Lyon, INSA-Lyon, France, **K Masenelli-Varlot**; Université de Lyon, INSA-Lyon, France

A07.1 New Advances in Electron Energy Loss Spectroscopy and Allied Techniques

SESSION CHAIRS:
Juan-Carlos Idrobo; Oak Ridge National Laboratory
Robert Klie; University of Illinois-Chicago

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 341

10:30 AM **607** (Invited) *Addressing Vibrational Excitations in Van der Waals Materials and Molecular Layers Within Electron Energy Loss Spectroscopy*; A Konecna; Materials Physics Center (CSIC-UPV/EHU), Spain, LE Hueso, R Hillenbrand; CIC nanoGUNE, Spain, J Aizpurua; Materials Physics Center (CSIC-UPV/EHU), Spain, AA Govyadinov; CIC nanoGUNE, Spain, T Neuman; Materials Physics Center (CSIC-UPV/EHU), Spain, A Chuvilin, S Velez; CIC nanoGUNE, Spain, F Casanova; CIC nanoGUNE, Spain et. al.

11:00 AM **608** *Dipole Scattering and Its Implications for Vibrational Mapping at Lattice Resolution;* **C Dwyer**; Arizona State University

11:15 AM **609** *Interpretation of meV Resolution Phonon EELS Data;* **P Batson**; Rutgers University, M Lagos; McMaster University, Canada

11:30 AM **610** (M&M STUDENT SCHOLAR) *Spatially Resolved Vibrational Electron Energy-loss Spectroscopy Across an Abrupt SiO_2/Si Interface*; **K Venkatraman**, K March, P Rez, PA Crozier; Arizona State University

11:45 AM **611** *Investigating Thermal Behavior of Surface Phonon in SiC by* In Situ *Vibrational Spectroscopy*; **X Yan**, CA Gadre, S Dai, K Yu, X Pan; University of California-Irvine

Scientific Program

A ANALYTICAL SCIENCES SYMPOSIA – Wednesday Morning *continued*

A09.5 Data Analytics and Model-Based Imaging for Microstructure and Physical Property Interpretations

SESSION CHAIRS:
Lawrence F. Drummy; U.S. Air Force Research Laboratory
Charles A. Bouman; Purdue University

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 342

10:30 AM **612** (Invited) *Simultaneous Tracking and Registration in SiC/SiC Serial Section Images;* **H Yu**, Y Sun, Y Zhou; University of South Carolina, J Simmons, CP Przybyla; Air Force Research Lab, S Wang; University of South Carolina

11:00 AM **613** *A Novel Method for Automatic Determination of the Number of Meaningful Components in the PCA Analysis of Spectrum-Images;* P Potapov; Leibniz Institute for Solid State and Materials Research (IFW) Dresden, Germany, P Longo; Gatan Inc., A Lubk; Leibniz Institute for Solid State and Materials Research (IFW) Dresden, Germany

11:15 AM **614** *Bayesian Analysis of Electron Spectroscopic SEM Images;* J Eisele; Heidelberg University, Germany, B Schindler, D Preikszas; Carl Zeiss Microscopy, Germany, RR Schröder; Heidelberg University Hospital, Germany

11:30 AM **615** *Improvement of Principal Component Analysis for Quantification of Spectrum-Imaging Datasets;* **M Watanabe**; Lehigh University, A Ishizuka, K Ishizuka; HREM Research Inc., Japan

11:45 AM **616** *Image and Spectrum Image Denoising under the Local Low Rank Assumption;* **J Spiegelberg**; Uppsala University, Sweden, JC Idrobo; Oak Ridge National Laboratory, J Rusz; Uppsala University, Sweden

A10.6 The Joy of Scanning Electron Microscopy

SESSION CHAIRS:
Dale Newbury; National Institute of Standards and Technology
Raynald Gauvin; McGill University, Canada

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 328

10:30 AM **617** *New Possibilities for State-of-the-Art Electron Microscopy with Fast Backscattered Electron Detectors;* **M Schmid**, A Liebel; PNDetector GmbH, Germany, G Moldovan; point electronic GmbH, Germany, R Lackner, D Steigenhoefer, A Niculae, H Soltau; PNDetector GmbH, Germany

10:45 AM **618** *SEM Technique-Based Automatic Analysis for Metal Powders and Defects in Additive Manufactured Components;* Y Sun, **M Aindow**, R Hebert; University of Connecticut

11:00 AM **619** *Live Quantitative BSE Acquisition with Standard-less Calibration;* M Hemmleb; point electronic GmbH, Germany, M Schmid; PNDetector GmbH, Germany, U Grauel, W Joachimi, **G Moldovan**; point electronic GmbH, Germany

11:15 AM **620** *X-Ray Spectrum Imaging at High Resolution in the STEM and STEM/SEM and SEM;* **JT Sagar**; Oxford Instruments Nanoanalysis, United Kingdom, D Wood; Oxford Instruments Inc., P Pinard; Oxford Instruments Nanoanalysis, United Kingdom, JY Howe; Hitachi High-Technologies America Inc., J Holland, SR Burgess, PJ Stathem; Oxford Instruments Nanoanalysis, United Kingdom

11:30 AM **621** (ERIC SAMUEL AWARD) *Developing a Programmable STEM Detector for the Scanning Electron Microscope;* **BW Caplins**, JD Holm, RR Keller; National Institute of Standards and Technology

11:45 AM **622** *Environmental SEM as a Surface-Sensitive Tool to Study Reaction Dynamics;* **C Barroo**; Unviersité Libre de Bruxelles, Belgium, Z-J Wang, MG Willinger; Fritz-Haber-Institut der Max-Planck-Gesellschaft, Germany

A11.6 Solid-State X-Ray Spectrometry at 50 Years

SESSION CHAIRS:
Katherine Burgess; U.S. Naval Research Laboratory
Nicholas Ritchie; National Institute of Standards and Technology

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 327

10:30 AM **623** (Invited) *Comparison and Combination of Energy and Wavelength Dispersive X-Ray Spectrometry in Electron Probe Microanalysis of Minerals and Glasses;* **K Goemann**; University of Tasmania, Australia

11:00 AM **624** *Exploring the Limits of EDS Microanalysis for Rare Earth Element Analyses;* N Ritchie; National Institute of Standards and Technology, **H Lowers**; U.S. Geological Survey

11:15 AM **625** *An Open Evaluation of Hyperspectral Unmixing Strategies for EDS Analysis;* **JA Taillon**; National Institute of Standards and Technology

11:30 AM **626** *Advances in SDD-Based EDS and Comparisons to WDS for Light Element Sensitivity;* **K Thompson**; Thermo Fisher Scientific

11:45 AM **627** *SD-WDS Second Order Bremsstrahlung and Peak to Background Ratios;* K Moran; Moran Scientific Pty. Ltd, Australia, **R Wuhrer**; Western Sydney University, Australia

A17.6 Surface and Subsurface Microscopy and Microanalysis

SESSION CHAIRS:
Vincent S. Smentkowski; General Electric Global Research Center
John A. Chaney; The Aerospace Corporation
Xiao-Ying Yu; Pacific Northwest National Laboratory

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 326

10:30 AM **628** *Microstructural and Material Properties of Individual Zirconium Hydride Domains Formed Under Simulated Conditions;* **S Riechers**, B Johnson; Pacific Northwest National Laboratory

10:45 AM **629** *Correlative Defect Characterization in Semiconductors via Electron Channeling Contrast Imaging and Scanning Deep Level Transient Spectroscopy;* **TJ Grassman**, JP Pelz, K Galiano, JI Deitz, SD Carnevale, DA Gleason, PK Paul, Z Zhang; The Ohio State University *et. al.*

11:00 AM **630** *Mapping Subsurface Composition with Attogram Sensitivity Using Micro-XRF;* **J Gelb**, B Stripe, X Yang, S Lewis, S Lau, W Yun; Sigray, Inc.

11:15 AM **631** In Situ *Low Energy Argon Ion Source for the Improvement of EBSD Pattern Acquisition;* **R Isaacs**; Thermo Fisher Scientific, Czech Republic, A Prokhodtseva; Thermo Fisher Scientific, Netherlands, T Vystavel; Thermo Fisher Scientific, Czech Republic

B BIOLOGICAL SCIENCES SYMPOSIA – Wednesday Morning *continued*

B02.2 Microscopy in Food Science: Bridging Biology and Materials Science

SESSION CHAIRS:
Almut Vollmer; Utah State University
Nabil Youssef; Utah State University

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 348

10:30 AM **632** (Invited) *Resolving the Calcium and Phosphorus Distribution in Casein Micelles in Bovine Milk: an* In Situ *STEM/EDX Study as Applied to Hydrated Materials in Food Science;* **BR Van Devener**; University of Utah, AH Vollmer, NN Youssef; Utah State University

11:00 AM **633** (Invited) *Confocal Raman Microscopy Study of Food Microstructures;* **J Dong**; Cargill, Inc.

11:30 AM **634** (Invited) *Survey of Image Analysis Methods Applied to Consumer Foods;* **N Piché**, E Jabason; Object Research Systems, Canada, M Marsh; Object Research Systems, AH Vollmer; Utah State University

B05.2 Focused on Microbes!

SESSION CHAIRS:
Xiao-Ying Yu; Pacific Northwest National Laboratory
Alice Dohnalkova; Pacific Northwest National Laboratory

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 347

10:30 AM **635** (Invited) *New Insights Into Bacterial Chemoreceptor Array From Electron Cryotomography;* **W Yang**; Leiden University, Netherlands, CK Cassidy; University of Illinois - Urbana-Champaign, S Ringgaard; Max Planck Institute for Terrestrial Microbiology, Germany, S Parkinson; University of Utah, A Briegel; Leiden University, Netherlands

11:00 AM **636** (Invited) *Correlative Microscopy of the* Caulobacter crescentus *Flagellum Reveals How Changes to the Flagellin Protein Sequence Regulate Structure and Function;* **ER Wright**, RS Dillard; Emory University, CW Shebelut; University of Virginia

11:30 AM **637** (Invited) *Microscopy Tools and Techniques Used in the Study of Infectious Disease Agents;* **ER Fischer**, BT Hansen, CL Schwartz, V Nair; National Institutes of Health

B08.2 3D Structure of Complex Soft Materials Derived from Electron Tomography

SESSION CHAIRS:
Deborah Kelly; Virginia Tech University
Elizabeth Wright; Emory University School of Medicine

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 349

10:30 AM **638** (Invited) *Quantitative ET in Materials Chemistry;* **H Friedrich**; Eindhoven University of Technology, Netherlands

11:00 AM **639** *Serial Thick Section Gas Cluster Ion Beam Scanning Electron Microscopy;* **KJ Hayworth**, D Peale; Howard Hughes Medical Institute-Janelia Research Campus, Z Lu; Dalhousie University, Canada, CS Xu, HF Hess; Howard Hughes Medical Institute-Janelia Research Campus

11:15 AM **640** (Invited) *GENFIRE: From Precisely Localizing Single Atoms in Materials to High-Resolution 3D Imaging of Cellular Structures;* **J Miao**, A Pryor, Y Yang, A Rana, M Gallagher-Jones, J Zhou, M Lo, J Rodriguez; University of California-Los Angeles *et. al.*

11:45 AM **641** *3D Elemental Mapping by Array Tomography Particle Analysis;* **Y Yamaguchi**; JEOL Ltd., Japan, H Morita; Oxford instruments KK, Japan, Y Moriya, C Nakayama, T Haruta, M Suga; JEOL Ltd., Japan, N Erdman; JEOL USA, INC., S Asahina; JEOL Ltd., Japan

Scientific Program

P PHYSICAL SCIENCES SYMPOSIA – Wednesday Morning *continued*

P01.6 Advances in Electron, X-Ray and Neutron Spectro-Imaging/Holography of Energy Materials and Devices

SESSION CHAIRS:
Katherine Jungjohann; Sandia National Laboratories
Pratibha Gai; University of York, United Kingdom

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 336

10:30 AM **642** (Invited) In Situ *Visualization and Analysis of Single Atom Dynamics in Chemical Reactions Using Novel Environmental Scanning Transmission Electron Microscopy (ESTEM);* ED Boyes, T Martin, D Lloyd, AP La Grow, RW Mitchell, L Lari, M Ward, **PL Gai**; University of York, United Kingdom

11:00 AM **643** *TEM Studies of Hole-Selective Molybdenum Oxide Contacts in Silicon Heterojunction Solar Cells;* **H Ali**, G Gregory; University of Central Florida, M Bivour; Fraunhofer Institute for Solar Energy Systems, Germany, M Schneider; Los Alamos National Laboratory, M Hermle; Fraunhofer Institute for Solar Energy Systems, Germany, KO Davis; University of Central Florida

11:15 AM **644** *Exploring the Activity and Stability of Pt-based Catalysts through Analytical Electron Microscopy;* **DA Cullen**; Oak Ridge National Laboratory, D Myers; Argonne National Laboratory, J Greeley; Purdue University, J Erlebacher; Johns Hopkins University, G Thoma, A Steinbach; 3M Company

11:30 AM **645** *Visualization of Crystal Orientation and the Granulate Sub-Grain Size in Lithium Ion Batteries by Means of EBSD and Correlative Microscopy;* D Zeibig, T Bernthaler, G Schneider; Aalen University, Germany, **S Freitag**; Carl Zeiss Microscopy GmbH, Germany

11:45 AM **646** *Energy Selected Secondary Electron Image Revealing Surface Potential by High Accelerating Voltage Scanning Electron Microscope;* **K-I Fukunaga**, N Endo, S Kawai, T Suzuki, E Okunishi; JEOL Ltd., Japan, Y Kondo; JEOL Ltd., Japan

P02.6 Atomically Thin 2D Materials: Recent Results and Challenges

SESSION CHAIRS:
Raul Arenal; University of Zaragoza, Spain
Quentin M Ramasse; SuperSTEM Laboratory, United Kingdom

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 338

10:30 AM **647** *Surface Potential Imaging of Germanium / Monolayer MoS_2 Heterostructures;* Y Yoon; University of Utah, J Yoo; Los Alamos National Laboratory, D Magginetti, X Cheng, **H Yoon**; University of Utah

10:45 AM **648** *Two-Dimensional Polycrystalline ZnO Hierarchical Structures as Single-Atom Catalyst Supports;* Y Cai, **J Xu**; Arizona State University, Y Guo; East China University of Science and Technology, China, J Liu; Arizona State University

11:00 AM **649** (M&M STUDENT SCHOLAR) *Direct Correlation of MXene Surface Chemistry and Electronic Properties;* **JL Hart**, K Hantanasirisakul, AC Lang, B Anasori, Y Gogotsi, ML Taheri; Drexel University

11:15 AM **650** *Transmission Electron Microscopy of Two-Dimensional MXene Sheets;* **DH Anjum**, B Ahmed, HN Alshareef; King Abdullah University of Science and Technology (KAUST), Saudi Arabia

11:30 AM **651** *Highly Depth-Sensitive TEM Imaging of Graphene by Using Monochromatic Electron Source at Low Accelerating Voltage;* **S Morishita**; JEOL Ltd., Japan, R Senga, Y-C Lin; National Institute of Advanced Industrial Science and Technology (AIST), Japan, H Sawada; JEOL Ltd., Japan, K Suenaga; National Institute of Advanced Industrial Science and Technology (AIST), Japan

11:45 AM **652** *Toward Quantitative Bright Field TEM Imaging of Ultra Thin Samples;* **T Fujii**; Hitachi High-Technologies Corporation, Japan, M Malac, E Kano, M Hayashida; NRC-NANO, Canada, T Yaguchi; Hitachi High-Technologies Corporation, Japan, R Egerton; University of Alberta, Canada

P03.4 Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications

SESSION CHAIR:
Moon Kim; University of Texas-Dallas

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 337

10:30 AM **653** *Hierarchical InGaN Nanowires for High-Efficiency Solar Water Splitting;* **J Gim**; University of Michigan, I Shih; McGill University, Canada, Z Mi, R Hovden, R Yalisove; University of Michigan, S Chu; McGill University, Canada, Y Park, S Vanka; University of Michigan *et. al.*

10:45 AM **654** (Invited) *Growth and Exfoliation of Selenium and Tellurium for Quantum Chains of Atoms;* **HOH Churchill**; University of Arkansas

11:15 AM **655** (M&M STUDENT SCHOLAR) *Quantitative Chemical Mapping of Soft-Hard Interfaces on Gold Nanorods;* **BE Janicek**, JG Hinman, JJ Hinman, H-H Chang, KS Suslick, CJ Murphy, PY Huang; University of Illinois - Urbana-Champaign

11:30 AM **656** *Non-Covalent Functionalization of Carbon Nanotubes by Phthalocyanines Analyzed by Spatial-Resolved EELS;* **R Arenal**; University of Zaragoza, Spain, L Alvarez, JL Bantignies; University of Montpellier, France

11:45 AM **657** *Light-Assisted Growth of Hexagonal Au Nanostructures on Sapphire Substrates;* SD Golze, RD Neal, RA Hughes, S Neretina, **S Rouvimov**; University of Notre Dame

P04.5 *In Situ* Methods for Probing Properties and Dynamics in Materials

SESSION CHAIR:
Daniele Filippetto; Lawrence Berkeley National Laboratory

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 340

10:30 AM **658** (Invited) *Imaging Coherent Structural Dynamics with Ultrafast Electron Microscopy;* **DJ Flannigan**, DR Cremons, DX Du, AJ McKenna, DA Plemmons; University of Minnesota

11:00 AM **659** In Situ *TEM Study of Diffusion Kinetics in Al/Ni Nanomaterials;* CE Shuck, JM Pauls, AS Mukasyan; University of Notre Dame, A Genc; Thermo Fisher Scientific, **S Rouvimov**; University of Notre Dame

11:15 AM **660** (M&M STUDENT SCHOLAR) *Measuring the Minority Carrier Diffusion Length in n-GaN Using Bulk STEM EBIC;* **Z Warecki**, J Cumings; University of Maryland, V Oleshko; National Institute of Standards and Technology, K Celio, A Armstrong, A Allerman; Sandia National Laboratories

11:30 AM **661** *Direct Electron Detection for Atomic Resolution* In Situ *EELS;* **BH Goodge**, DJ Baek, LF Kourkoutis; Cornell University

11:45 AM **662** *Secondary Electron Contrast in STEM Electron Beam-Induced Current (EBIC): A Path Towards Mapping Electronic Structure;* **WA Hubbard**; University of California-Los Angeles, M Mecklenburg; University of Southern California, HL Chan, BC Regan; University of California-Los Angeles

P07.1 Planetary Building Blocks and the Techniques Needed to Analyze Them

SESSION CHAIRS:
Emma Bullock; Carnegie Institution of Washington
Tom Zega; University of Arizona

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 324

10:30 AM **663** (Invited) *Amorphous Silicate Building Block Origins by Transmission Electron Microscopy;* **HA Ishii**; University of Hawai'i-Mānoa, J Ciston; Lawrence Berkeley National Laboratory, JP Bradley; University of Hawai'i-Mānoa, K Bustillo, P Ercius; Lawrence Berkeley National Laboratory

11:00 AM **664** *Water-Rock Interactions in Outer Solar System Bodies: Evidence from the Coordinated Analysis of Interplanetary Dust;* **L Keller**; NASA Johnson Space Center, C Snead; Jacobs, S Messenger; NASA Johnson Space Center, G Flynn; SUNY-Plattsburgh, S Wirick; Focused Beam Enterprises

11:15 AM **665** *Low Energy STEM-EELS Characterization of Primitive Organic Matter and Silicates in the Meteorite LAP 02342;* **BT De Gregorio**, RM Stroud; U.S. Naval Research Laboratory, LR Nittler, CMO Alexander, J Davidson; Carnegie Institution of Washington, CE Moyano-Cambero, JM Trigo-Rodriguez; Institute d'Estudis Espacials de Catalunya, Spain

11:30 AM **666** (Invited) *Low-Voltage Transmission Electron Microscopy Analysis of 15N-Rich Organic Matter: Insight into the Origins of Fine-Grained Antarctic Micrometeorites;* **P Haenecour**; The University of Arizona

P09.3 Microstructure and Mechanics Deformation

SESSION CHAIRS:
Frank Muecklich; Saarland University, Germany
James Martinez; NASA Johnson Space Center

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 325

10:30 AM **667** (Invited) *Significance of Established TEM Analysis for Industry-Related Research on Inhomogeneous and/or Inside Boundaries and Interfaces;* **M Zimmermann**, J Bretschneider, B Brenner, J Kaspar; Fraunhofer Institute for Material and Beam Technology, Germany

11:00 AM **668** *Interface Characteristics of Reaction Bonded Silicon Carbide Composites;* **Y Zhang**; University of Delaware, C-Y Hsu; University of Delware, P Karandikar; Univerisity of Delaware, J Li; XAE, China, C Ni; University of Delaware

11:15 AM **669** *Uncovering the Microstructure of BaSnO3 Thin Films Deposited on Different Substrates Using TEM;* **H Yun**, K Ganguly, W Postiglione, B Jalan, C Leighton, KA Mkhoyan, JS Jeong; University of Minnesota

11:30 AM **670** *TEM Study of Precipitation Sequences in Haynes 282 Ni Superalloy;* **A Alexandratou**, S Deligiannis, D Liolios, PE Tsakiridis; National Technical University of Athens, Greece

11:45 AM **671** (M&M POSTDOCTORAL SCHOLAR) *Dislocation Characterization Using Weak Beam Dark Field STEM Imaging;* **J Miao**; The Ohio State University, S Singh, JN Tessmer; Carnegie Mellon University, M Shih, M Ghazisaeidi; The Ohio State University, M DeGraef; Carnegie Mellon University, MJ Mills; The Ohio State University

Scientific Program

TF TECHNOLOGISTS' FORUM SESSIONS – Wednesday Morning

X32.1 Technologists' Forum Roundtable Session: Sample Preparation Strategies for Super-Resolution Correlative Electron Microscopy

SESSION CHAIR:
Janice G. Pennington; University of Wisconsin-Madison

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 350

10:30 AM **672** (Invited) *Protein Localization in Electron Micrographs;* S Raychaudhuri; Johns Hopkins Univeristy, S Li, **S Watanabe**; Johns Hopkins University

11:00 AM **673** (Invited) *Development and Applications of Fluorescent Proteins for Correlative Light and Electron Microscopy;* **MG Paez-Segala**; Howard Hughes Medical Institute-Janelia Research Campus, Y Wang; Tsinghua University, China, N Iyer, W-P Li, PK Rivlin, LL Looger; Howard Hughes Medical Institute-Janelia Research Campus

11:30 AM **674** *Roundtable Discussion;* **S Watanabe**; Johns Hopkins University, MG Paez-Segala; Howard Hughes Medical Institute-Janelia Research Campus

T TUTORIALS – Wednesday Morning *continued*

X44.1 Single-Particle CryoEM: Data Processing Techniques for Obtaining Optimal Results

SESSION CHAIR:
Tommi A. White; University of Missouri

PLATFORM SESSION
Wednesday: 10:30 AM • Room: 321

10:30 AM **675** (Invited) *Single-Particle Cryo-EM: Data Processing Techniques for Obtaining Optimal Results*; **A Punjani**; University of Toronto, Canada

A ANALYTICAL SCIENCES SYMPOSIA – Wednesday Afternoon

A02.5 Atomic-Scale Functional Imaging in Aberration-Corrected Electron Microscopy

SESSION CHAIRS:
Jing Tao; Brookhaven National Laboratory
Miaofang Chi; Oak Ridge National Laboratory

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 339

1:30 PM **676** (Invited) *Dislocation-Driven Growth of Two-Dimensional Lateral Quantum Well Superlattices;* **W Zhou**; University of Chinese Academy of Sciences, China, K Loh; National University of Singapore, Singapore, Y Zhang; University of Chinese Academy of Sciences, China, J Chen; National University of Singapore, Singapore, D Li; University of Chinese Academy of Sciences, China, J Zhou, Z Liu; Nanyang Technological University, Singapore, M Chisholm; Oak Ridge National Laboratory et. al.

2:00 PM **677** *Direct Imaging of Low-Dimensional Nanostructures;* **AR Lupini**, BM Hudak; Oak Ridge National Laboratory, J Song; Oak Ridge National Laboratory, China, H Sims; Vanderbilt University, Y Sharma, TZ Ward; Oak Ridge National Laboratory, ST Pantelides; Vanderbilt University, PC Snijders; Oak Ridge National Laboratory

2:15 PM **678** *Towards the Mechanism of Oxygen Vacancy Formation & Ordering via Tracking of Beam-Induced Dynamics and Density Functional Theory;* **AY Birenbaum**; Oak Ridge National Laboratory, L Qiao; University of Manchester, United Kingdom, VR Cooper, A Borisevich; Oak Ridge National Laboratory

2:30 PM **679** *Reversible Structure Manipulation by Tuning Electron Dose Rate on Metastable Cu_2S;* **J Tao**; Brookhaven National Laboratory, RJ Cava; Princeton University, Y Zhu; Brookhaven National Laboratory, J Chen; University of Arkansas, J Li; Brookhaven National Laboratory, L Mathurin; University of Arkansas, J-C Zheng; Xiamen University, China, Y Li; American Physical Society et. al.

2:45 PM **680** *Leveraging Single Atom Dynamics to Measure the Electron-Beam-Induced Force and Atomic Potentials;* **O Dyck**, S Jesse, SV Kalinin; Oak Ridge National Laboratory, F Bao; University of Tennessee-Chatanooga, M Ziatdinov; Oak Ridge National Laboratory, A Nobakht, S Shin; University of Tennessee-Knoxville, K Law; Oak Ridge National Laboratory *et. al.*

A04.5 *In Situ* Transmission Electron Microscopy in Liquid and Gas Cells

SESSION CHAIR:
Niels de Jonge; Leibniz Institute for New Materials, Germany

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 345-346

1:30 PM **681** (Invited) *Liquid Cell Electron Tomography for Biomedical Applications;* WJ Dearnaley, B Schleupner, NA Alden, F Gonzalez, B Scharf; Virginia Tech, MJ Dukes; Protochips, Inc, **DF Kelly**; Virginia Tech

2:00 PM **682** *Characterization of G-FET Biosensors in Action with Liquid-Cell TEM;* **C Hampton**, L Xing, V Hsiao, A Islam, N Bedford, R Martineau, Y Ngo, S Kim; U.S. Air Force Research Laboratory *et. al.*

2:15 PM **683** *Imaging Graphene-Enclosed Microtubules in their Polymerization Medium with Electron Microscopy;* **S Keskin**, N de Jonge; INM – Leibniz Institute for New Materials, Germany

2:30 PM **684** (Invited) *Application of Liquid Phase Scanning Transmission Electron Microscopy Methods for the Quantitative Study of Membrane Proteins in Whole Cells;* **DB Peckys**; Saarland University, Germany, IN Dahmke; Leibniz Institute for New Materials, Germany, D Alansary, B Niemeyer; Saarland University, Germany, N de Jonge; Leibniz Institute for New Materials, Germany

A07.2 New Advances in Electron Energy Loss Spectroscopy and Allied Techniques

SESSION CHAIRS:
Phil Batson; Rutgers University
Javier Aizpurua; CIC NanoGUNE, Spain

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 341

1:30 PM **685** (Invited) *Novel EELS Experiments in the Newly Opened Monochromated Regime;* **JA Hachtel**; Oak Ridge National Laboratory, J Jokisaari, R Klie; University of Illinois-Chicago, JC Idrobo; Oak Ridge National Laboratory

2:00 PM **686** (M&M POSTDOCTORAL SCHOLAR) *Nanoscale Temperature Measurements Using Phonon Scattering;* **MJ Lagos**; McMaster University, Canada, PE Batson; Rutgers University

2:15 PM **687** *Vibrational Spectroscopy of Liquid Water by Monochromated Aloof EELS;* **JR Jokisaari**, RF Klie; University of Illinois-Chicago, JA Hachtel; Oak Ridge National Laboratory, X Hu, A Mukherjee, C Wang; University of Illinois-Chicago, A Konecna, J Aizpurua; Center for Material Physics, Donostia - San Sebastian, Spain *et. al.*

Scientific Program

A ANALYTICAL SCIENCES SYMPOSIA – Wednesday Afternoon *continued*

2:30 PM **688** *Vibrational Electron Energy Loss Spectroscopy of Astrosilicates;* **RM Stroud**; U.S. Naval Research Laboratory, MJ Lagos, PE Batson; Rutgers University

2:45 PM **689** *Utilizing Aloof-beam Vibrational EELS for the Detection of Hydrogen and Defect Heterogeneity in Carbon Nitrides;* **DM Haiber**, K Venkatraman, PA Crozier; Arizona State University

A08.1 Machine Learning and Compressive Sensing for Signal Processing and Image Reconstruction in Microscopy and Microanalysis

SESSION CHAIR:
Andrew Stevens; OptimalSensing LLC

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 342

1:30 PM **690** (Invited) *The MTF & DQE of Annular Dark Field STEM: Implications for Low-dose Imaging and Compressed Sensing;* **L Jones**, C Downing; Advanced Microscopy Laboratory, Ireland

2:00 PM **691** *Fact or Fiction: Maximal Image Quality with Minimal Dwell Time;* **P Trampert**, T Dahmen, P Slusallek; German Research Center for Artificial Intelligence

2:15 PM **692** *Inpainting Versus Denoising for Dose Reduction in STEM;* **T Sanders**, C Dwyer; Arizona State University

2:30 PM **693** *Increasing the Speed of EELS/EDS Mapping through Dynamic/Adaptive Sampling Methodologies;* **KA Hujsak**; Northwestern University, A Stevens; Duke University, L Kovarik, A Liu; Pacific Northwest National Laboratory, ND Browning; University of Liverpool, United Kingdom, VP Dravid; Northwestern University

2:45 PM **694** *Compressive Sensing Reconstruction for EDS Analysis;* **JA Taillon**; National Institute of Standards and Technology

A12.1 The FIB-SEM Laboratory: Sample Preparation and Beyond

SESSION CHAIRS:
Joshua F. Einsle, Emilie Ringe; University of Cambridge, United Kingdom
Marco Cantoni; École Polytechnique Fédérale de Lausanne, Switzerland

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 328

1:30 PM **695** (Invited) *Time of Flight Backscatter and Secondary Ion Spectrometry in a Helium Ion Microscope;* N Klingner, **G Hlawacek**, R Heller, J von Borany, S Facsko; Helmholtz Zentrum Dresden Rossendorf, Germany

2:00 PM **696** *COLDFIB – The New FIB Source from Laser Cooled Atoms;* **A Delobbe**, M Reveillard, M Viteau, A Houel; Orsay Physics, France, D Comparat; Laboratoire Aimé Cotton, France

2:15 PM **697** (Invited) *Using FIB-SEM as a Platform for the Positioning and Correlated Characterization of III-V Nanowires;* **AB Mosberg**, D Ren; Norwegian University of Science and Technology, Norway, VT Fauske, BO Fimland, ATJ van Helvoort; Norwegian University of Science and Technology (NTNU), Norway

2:45 PM **698** *Control and* In Situ *imaging of Heat & Gas Mediated Processes in FIB/SEM System;* L Novák; Thermo Fisher Scientific, Czech Republic, M Kolíbal; Central European Institute of Technology – CEITEC, Czech Republic, M Wu, P Wandrol, **T Vystavěl**; Thermo Fisher Scientific, Czech Republic

A13.1 Pushing the Limits of Cryo-EM

SESSION CHAIRS:
Anchi Cheng; New York Structural Biology Center
Mike Marko; Wadsworth Center

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 349

1:30 PM **699** (Invited) *Advanced Data Acquisition from Electron Microscopes with SerialEM;* **DN Mastronarde**; University of Colorado, Boulder

2:00 PM **700** *A Complete Workflow for Cellular Tomography and Subtomogram Averaging in EMAN2*; **JM Bell**, M Chen, AC Fluty, SJ Ludtke; Baylor College of Medicine

2:15 PM **701** (Invited) *Algorithmic Advances in Single Particle Cryo-EM Data Processing*; **A Punjani**; University of Toronto, Canada, H Zhang; Structura Biotechnology Inc., Canada, J Rubinstein; The Hospital for Sick Children Research Institute, Canada, M Brubaker; York University, Canada, D Fleet; University of Toronto, Canada

2:45 PM **702** *To Cryo-Cycle or Not to Cryo-Cycle: That is the Question!*; A Cheng, W Rice, E Eng; New York Structural Biology Center, **LM Alink**; Thermo Fisher Scientific

A14.1 Quantitative Magnetic Characterization in the TEM

SESSION CHAIRS:
Ben McMorran; University of Oregon
Martha McCartney; Arizona State University

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 338

1:30 PM **703** (Invited) *Imaging Magnetic Domains in Functional Nanoscale Heterostructures Using Lorentz Microscopy;* **C Phatak**, A Petford-Long, F Barrows, V Brajuskovic, S Bakaul, O Heinonen; Argonne National Laboratory, M De Graef; Carnegie Mellon University, W Jiang; Tsinghua University, China *et. al.*

2:00 PM **704** *Optical Quenching of Magnetic Vortex Visualized* In Situ *by Lorentz Electron Microscopy;* **X Fu**; Brookhaven National Laboratory, SD Pollard; National University of Singapore, Singapore, B Chen; Shanghai Jiao Tong University, China, B-K Yoo; California Institute of Technology, H Yang; National University of Singapore, Singapore, Y Zhu; Brookhaven National Laboratory

2:15 PM **705** (Invited) *Magnetic Configurations in Three-Dimensional Nanomagnets Explored by Electron Holographic Tomography;* **D Wolf**; IFW Dresden, Germany, C Gatel; Centre d'Elaboration de Matériaux et d'Etudes Structurales-CNRS, France, S Sturm, J Krehl; IFW Dresden, Germany, E Snoeck; Centre d'Elaboration de Matériaux et d'Etudes Structurales-CNRS, France, A Lubk; IFW Dresden, Germany

2:45 PM **706** *Probe Shaping for Quantitative DPC-STEM Using Segmented Detectors;* **L Clark**, HG Brown, DM Paganin, MJ Morgan; Monash University, Australia, T Matsumoto, N Shibata; University of Tokyo, Japan, TC Petersen, SD Findlay; Monash University, Australia

A15.1 Strain Analysis from Nano- to Micro-Length Scales

SESSION CHAIRS:
Brendan J. Foran; The Aerospace Corporation
Jinguo Wang; University of Texas-Dallas

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 327

1:30 PM **707** (Invited) *Strain Mapping Using EBSD Cross Correlation and Raman Methods;* **MD Vaudin**, AJ Gayle, LH Friedman, RF Cook; National Institute of Standards and Technology (NIST)

2:00 PM **708** *High Angular Resolution Electron Backscatter Diffraction Studies of Tetragonality in Fe-C Martensitic Steels;* T Tanaka, **AJ Wilkinson**; University of Oxford, United Kingdom

2:15 PM **709** (Invited) *Local Strain Analysis Using Scanning Nanobeam Electron Diffraction during* In Situ *TEM Nanomechanical Testing;* **AM Minor**; University of California-Berkeley, and Lawrence Berkeley National Laboratory

B BIOLOGICAL SCIENCES SYMPOSIA – Wednesday Afternoon

B06.1 Imaging Life at New Frontiers of Spatiotemporal Resolution and Adaptive Microscopy

SESSION CHAIRS:
Jay Potts; University of South Carolina Medical School
Teng-Leong Chew; Advanced Imaging Center-Janelia Research Campus

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 350

1:30 PM **710** (Invited) *Biological Imaging at High Spatiotemporal Resolution;* **H Shroff**; National Institutes of Health

2:00 PM **711** (MSA PROFESSIONAL TECHNICAL STAFF MEMBER AWARD - BIOLOGICAL SCIENCES) *Light and Dark: Fluorescent and Electron Dense Labeling for Neuronal Cells Using a Novel Viral Vector*; **CI Thomas**, S Okayama; Max Planck Florida Institute for Neuroscience, C Keine; University of Iowa, R Satterfield, D Guerrero-Given; Max Planck Florida Institute for Neuroscience, SM Young; University of Iowa, N Kamasawa; Max Planck Florida Institute for Neuroscience

2:15 PM **712** (Invited) *Cutting Edge of Atomic Force Microscopy (AFM) of the Cell: From Live Cell Imaging to High-Resolution Structural Analysis of Cytoskeletal Actin Filaments*; **J Usukura**, E Usukura, A Narita; Nagoya University, Japan, A Yagi, N Sakai, Y Uekusa, Y Imaoka, S Ito; Olympus Corporation, Japan

2:45 PM **713** *Measuring Lateral Diffusion of Receptors on Plasma Membrane of Macrophages Using Raster Image Correlation Spectroscopy;* **S Makaremi**; McMaster University, Canada, S Ranjit, MA Digman, E Gratton; University of California-Irvine, D Bowdish, J Moran-Mirabal; McMaster University, Canada

Scientific Program

P PHYSICAL SCIENCES SYMPOSIA – Wednesday Afternoon

P01.7 Advances in Electron, X-Ray and Neutron Spectro-Imaging/ Holography of Energy Materials and Devices

SESSION CHAIRS:
Kazuo Yamamoto; Japan Fine Ceramics Center, Japan
Lijun Wu; Brookhaven National Laboratory

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 336

1:30 PM **714** (Invited) In Situ *Probe of Lithium-Ion Transport and Phase Evolution Within and Between Silver Hollandite Nanorods;* **L Wu**; Brookhaven National Laboratory, F Xu; Southeast University, China, Q Meng; Brookhaven National Laboratory, AC Marschilok, ES Takeuchi, KJ Takeuchi; Stony Brook University, MS Hybertsen, Y Zhu; Brookhaven National Laboratory

2:00 PM **715** *Probing the Native Structure and Chemistry of Dendrites and SEI Layers in Li-Metal Batteries by Cryo-FIB Lift-Out and Cryo-STEM;* **MJ Zachman**, Z Tu, LA Archer, LF Kourkoutis; Cornell University

2:15 PM **716** *Understanding the Chemical and Relevant Phase Evolutions of Lithium-Based Electrode Materials Using Atomic-Resolution Electron Energy Loss Spectroscopy;* **H Liu**, GA Botton; McMaster University, Canada

2:30 PM **717** *Observation of Solid-Liquid Interfacial Reactions Controlled Bulk Phase Transition of Ni-rich Layered Cathode;* **L Zou**; Pacific Northwest National Laboratory, Z Liu; University of Pittsburgh, W Zhao, J Zheng; Pacific Northwest National Laboratory, Y Yang; Xiamen University, China, G Wang; University of Pittsburgh, J Zhang; Environmental Molecular Sciences Laboratory, C Wang; Pacific Northwest National Laboratory

2:45 PM **718** *Correlative SPM/TEM Investigation of the Electrochemical Deposition of Lithium Metal;* C Campbell; Northwestern University, **C Phatak**, B Lee; Argonne National Laboratory, YM Lee; Daegu Gyeongbuk Institute of Science and Technology, Republic of Korea, KY Cho; Hanyang University, Republic of Korea, Y-G Lee; Electronics and Telecommunication Research Institute, Republic of Korea, S Hong; Korea Advanced Institute of Science and Technology, Republic of Korea

P03.5 Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications

SESSION CHAIR:
Zonghoon Lee; Ulsan National Institute of Science and Technology (UNIST), Republic of Korea

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 337

1:30 PM **719** (Invited) *Liquid Cell TEM and Automated Image Analysis for Nanoparticle Growth Study;* BH Kim, J Kim, **J Park**; Seoul National University, Republic of Korea

2:00 PM **720** *A Combined Experimental and Theoretical Approach to Measure Spatially Resolved Local Surface Plasmon Resonances in Aluminum Nanocrystals;* **A Bruma**, C Wang, W-CD Yang; University of Maryland-College Park, D Swearer, N Halas; Rice University, R Sharma; National Institute of Standards and Technology

2:15 PM **721** *Impact of Non-Uniform Doping on the Plasmonic Properties of In_2O_3 Nanoparticles: A Study by Electron Energy Loss Spectroscopy;* **S Yazdi**; Rice University, A Agrawal; University of Texas-Austin, A Singh; Los Alamos National Laboratory, MJ Delia; University of Texas-Austin, E Ringe; Rice University

2:30 PM **722** *Sonosynthesis of Iron Carbide@Iron Oxide Nanoparticles;* **A Arguelles-Pesqueira**, P Zavala-Rivera, A Lucero-Acuna, P Guerrero-German; Universidad de Sonora, Mexico, A Rosas-Durazo; Rubio Pharma, Mexico

2:45 PM **723** *Evaluating the 3D Structures of PtNi Nanoparticles from Single Projection ADF STEM Images and EDX Maps;* **KE MacArthur**, M Heggen, RE Dunin-Borkowski; Forschungszentrum Jülich, Germany

P04.6 *In Situ* Methods for Probing Properties and Dynamics in Materials

SESSION CHAIR:
Jennifer A. Dionne; Stanford University

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 340

1:30 PM **724** (Invited) *Ultrafast Electric Field-Driven Control of the Structure of WTe_2 via Terahertz Frequency Light Pulses;* E Sie; Stanford University / SLAC, C Nyby, **A Lindenberg**; Stanford University/SLAC National Accelerator Laboratory

2:00 PM **725** *Imaging Coherent Acoustic Phonons in LaFeAsO with Ultrafast Electron Microscopy;* **RA Gnabasik**; University of Minnesota, PK Suri; Drexel University, DJ Flannigan; University of Minnesota

2:15 PM **726** *A RF Broadband Biasing Holder for Ultrafast*

Stroboscopic Electron Microscopy; **KB Schliep**, MB Katz, JW Lau; The National Institute of Standards and Technology

2:30 PM **727** (Invited) *Electron Probes for Ultrafast Dynamics at the Nanoscale;* **D Filippetto**, F-H Ji, A Minor, D Durham; Lawrence Berkeley National Laboratory, X Wang, M Centurion; University of Nebraska-Lincoln, F Riminucci; University of Rome-La Sapienza, Italy, D Slaughter; Lawrence Berkeley National Laboratory

P06.1 Applications of Integrated Electron Probe Microscopy and Microanalysis in Characterizing Natural and Synthetic Materials

SESSION CHAIRS:
Kat Crispin; Pennsylvania State University
Colin MacRae; CSIRO, Australia
Owen Neill; University of Michigan

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 329

1:30 PM **728** (Invited) *A Combined Cathodoluminescence and Wavelength Dispersive Spectrometry Study of Ti Zoning in Quartz from the Tuolumne Intrusive Suite in Yosemite, CA;* **ES Bullock**; Carnegie Institution of Washington, MR Ackerson; Rensselaer Polytechnic Institute

2:00 PM **729** *Confocal Raman-in-SEM Imaging: a New Method for 3D Morphology of Asbestos-like Fibers in a Mineral Matrix - Complementarity with SEM-FIB;* **G Wille**, D Lahondere; Bureau de Recherches Géologiques et Minières, France, U Schmidt; WITec Gmbh, Germany, J Duron; Bureau de Recherches Géologiques et Minières, France, R Vana; TESCAN, Czech Republic, J Silvent; TESCAN Orsay Holding, France, X Bourrat; Bureau de Recherches Géologiques et Minières, France

2:15 PM **730** (Invited) *Stone-Cold Low Temperature Cathodoluminescence Spectrometry of Quartz (SiO_2)*; **EP Vicenzi**; Smithsonian Institution, SA Wight; National Institute of Standards and Technology

2:45 PM **731** *Iron Lα and Lβ X-Ray Lines: A Comparison of EPMA Measurements and Theoretical Calculations with Possible Implications for Oxidation Determination;* **AG Moy**; University of Wisconsin-Madison, J Vinson; National Institute of Standards and Technology, JH Fournelle; University of Wisconsin-Madison

P07.2 Planetary Building Blocks and the Techniques Needed to Analyze Them

SESSION CHAIRS:
Tom Zega; University of Arizona
Michelle Thompson; NASA Johnson Space Center

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 324

1:30 PM **732** (Invited) *Coordinated Microanalysis of Phosphates in High-Titanium Lunar Basalts;* **JJ Barnes**, MS Thompson, FM McCubbin; NASA Johnson Space Center, JY Howe; Hitachi High-Technologies America, Z Rahman; JETS Jacobs Technology, S Messenger; NASA Johnson Space Center, T Zega; University of Arizona

2:00 PM **733** *Investigating Variations in Water Abundances in Lunar Felsite Clasts Using Coordinated Field-Emission STEM and NanoSIMS Analyses*; **R Christoffersen**; Jacobs - NASA Johnson Space Center, JI Simon; NASA Johnson Space Center, MD Mouser; University of Tennessee, Z Rahman; Jacobs - NASA Johnson Space Center

2:15 PM **734** *The Use of High Speed, High Resolution EBSD to Unlock Hidden Secrets of the Allende Meteorite;* **P Trimby**; Oxford Instruments Nanoanalysis, United Kingdom, L Daly; The University of Glasgow, United Kingdom, S Piazolo; The University of Leeds, United Kingdom

2:30 PM **735** *Mass-Thickness Measurements in the TEM via EDS: A New Approach to Quantitative Chemical Analysis of Planetary Materials?*; **TJ Zega**; University of Arizona, JY Howe; Hitachi High-Technologies America, J Sagar, P Pinard; Oxford Instruments NanoAnalysis, United Kingdom, R Koch; University of Arizona

2:45 PM **736** *Toward Quantification of Ti-Oxidation States in Planetary Materials via Application of the EELS White-Line Ratio Technique;* **LR Slick**, P Mane; The University of Arizona, J Howe; Hitachi High Technologies America, TJ Zega; The University of Arizona

P08.1 Spectroscopic and Imaging Studies in Heritage Science

SESSION CHAIRS:
Edward Vicenzi; Smithsonian Institution
Thomas Lam; Smithsonian Institution

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 326

1:30 PM **737** (Invited) *Understanding and Predicting Cadmium Yellow Pigment Failure Mechanisms in the Works of the Early Modernists Using STEM Methodologies;* **JL Mass**; Bard Graduate Center, M Wiggins; University of Delaware, DA Muller; Cornell University, BDA Levin; Arizona State University, KX Nguyen, ME Holtz, MG Thomas; Cornell University, ES Tveit; MunchMuseet, Norway *et. al.*

Scientific Program

P PHYSICAL SCIENCES SYMPOSIA – Wednesday Afternoon *continued*

2:00 PM **738** *Reconstructing Rock Art Fe-Oxide Pigment Pyrotechnology Using In Situ SEM Heating Experiments;* **BL MacDonald**, D Stalla, X He, M Maschmann; University of Missouri, D Emerson; Bigelow Laboratory for Ocean Sciences, TA White; University of Missouri

2:15 PM **739** (M&M STUDENT SCHOLAR) *Contribution from SEM Studies in the Understanding of Degradation Mechanisms of Copper Green Pigments from the Louvre Museum's 21st Dynasty Egyptian Coffins;* **L Brunel-Duverger**, S Pagès-Camagna; Research and Restoration Center of the Museums of France, N Brodie-Linder; Université Cergy-Pontoise, France, C Doublet, E Laval; Research and Restoration Center of the Museums of France

2:30 PM **740** (Invited) *The Internal Morphology and Composition of a Purple Pigment Particle Extracted from an Ancient Faiyum Mummy Portrait;* **GA Gates**; Walters Art Museum, D Butt; University of Utah, Y Wu, J Burns, G Alanko, J Watkins; Boise State University

P09.4 Microstructure and Mechanics Deformation

Session Chairs:
Frank Muecklich; Saarland University, Germany
James Martinez; NASA Johnson Space Center

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 325

1:30 PM **741** *Core/Triple Shell Precipitates in Al-Er-Sc-Zr-(V,Nb,Ta) Alloys;* **KE Knipling**; U.S. Naval Research Laboratory

1:45 PM **742** *Challenges and Opportunities on Elucidating Irradiated Fuels with Atom Probe Tomography;* **M Bachhav**, J Gan, L He, B Miller, D Keiser; Idaho National Laboratory

2:00 PM **743** *Understanding of a Novel Irradiation-Induced Nanostructuring Process in SiC Layer of TRISO Fuel Particles via Transmission Electron Microscopy;* **S Meher**, IJ van Rooyen; Idaho National Laboratory

2:15 PM **744** *Hardening Contribution of G-Phase Nanoparticle Precipitation and Spinodal Decomposition in Aged Duplex Stainless Steel Studied by APT Analysis and Micro-Hardness of Ferrite;* R Badyka; Groupe de Physique des Matériaux, France, S Saillet, C Domain, G Monnet; Électricité de France, France, C Pareige; Groupe de Physique des Matériaux, France

2:30 PM **745** *Grain Boundary Analysis of Inconel 718 Using a Novel Atom Probe Design;* **KP Rice**, RM Ulfig, Y Chen, TJ Prosa, DJ Larson; CAMECA Instruments Inc.

2:45 PM **746** *Investigation of Clusters and Their Effect on Grain Growth in Single Phase AlxCoCrFeNi High Entropy Alloys;* **B Gwalani**, R Salloom, T Alam, SB Grace, S Srinivasan, R Banerjee; University of North Texas

T PHYSICAL SCIENCES SYMPOSIA – Wednesday Afternoon

X40.1 Scanning Nanobeam Diffraction

SESSION CHAIR:
Donovan N. Leonard; Oak Ridge National Laboratory

PLATFORM SESSION
Wednesday: 1:30 PM • Room: 321

1:30 PM **747** (Invited) *Experimental and Simulation Methods in Scanning Electron Nanobeam Diffraction;* **C Ophus**, A Minor, K Bustillo, T Pekin; Lawrence Berkeley National Laboratory, A Pryor, J Miao; University of California-Los Angeles, B Shevitski, S Aloni; Lawrence Berkeley National Laboratory *et. al.*

A ANALYTICAL SCIENCES POSTER SESSIONS – Wednesday

A02.P1 Atomic-Scale Functional Imaging in Aberration-Corrected Electron Microscopy

POSTER SESSION
Wednesday: 3:00 PM • Room: Exhibit Hall

POSTER # 216
3:00 PM **748** *Atomic Resolution Imaging and Analysis of Graphene at Low Acceleration Voltages Using Aberration Corrected Microscope with Cold Field Emission Gun;* **H Hashiguchi**, R Sagawa, E Okunishi, N Endo, Y Kondo; JEOL Ltd., Japan

POSTER # 217
3:00 PM **749** *Atomic Scale Analyses of Planar Defects in Cross-Section Nanorods of K+ Stabilized α-MnO_2;* **X Hu**, L Wu; Brookhaven National Laboratory, J Huang, AC Marschilok, ES Takeuchi, KJ Takeuchi; Stony Brook University, Y Zhu; Brookhaven National Laboratory

POSTER # 218
3:00 PM **750** *STEM SI Warp: A Tool for Correcting the Linear and Nonlinear Distortions for Atomically Resolved STEM Spectrum and Diffraction Imaging;* **Y Wang**, YE Suyolcu, U Salzberger, K Hahn, V Srot, W Sigle, PA van Aken; Max Planck Institute for Solid State Research, Germany

POSTER # 219
3:00 PM **751** *Carbon Based Nanohybrid Materials (sp^2-sp^3) for Energy Applications;* **HA Calderon**; Instituto Politecnico Nacional, ESFM, Mexico, A Sierra-Castillo, I Saucedo-Orozco; Universidad Autonoma de San Luis Potosi, Mexico, C Bittencourt; University of Mons, Belgium, D Arcon; Jozef Stefan Institute, Slovenia, AK Cuentas-Gallegos; Universidad Nacional Autónoma de México, Mexico, M Quintana; Universidad Autónoma de San Luis Potosí, Mexico

POSTER # 220
3:00 PM **752** *Correlative Characterization of Defect Clusters in GaAs Solar Cells by High-Resolution TEM and Spatially Resolved Optical Techniques;* **BS McKeon**; Arizona State University, Q Chen, S Zhang; University of North Carolina-Charlotte, C-K Hu; Wuhan University of Technology, China, TH Gfroerer; Davidson College, MW Wanlass; National Renewable Energy Laboratory, Y Zhang; University of North Carolina-Charlotte, DJ Smith; Arizona State University

POSTER # 221
3:00 PM **753** *Effective Reinforcement of Carbon-Carbon Composites Using Morped Graphene;* HA Calderon; Instituto Politecnico Nacional, Mexico, DA Barber; University of Houston, F Alvarez Ramirez; Instituto Mexicano del Petroleo, Mexico, R Ordonez Olivares; University of Pittsburgh, VG Hadjiev, **FC Robles Hernandez**; University of Houston

POSTER # 222
3:00 PM 754 *HAADF-STEM Investigation of III-V Semiconductors Grown on Nanopatterned Si(001) Substrates;* **R Kozak**; Empa - Swiss Federal Laboratories for Materials Science & Technology, Switzerland, I Prieto; Eidgenössische Technische Hochschule Zürich, Switzerland, Y Arroyo, R Erni; Swiss Federal Laboratories for Materials Science & Technology, Switzerland, H von Känel; Eidgenössische Technische Hochschule Zürich, Switzerland, G-L Bona, MD Rossell; Swiss Federal Laboratories for Materials Science & Technology, Switzerland

POSTER # 224
3:00 PM 756 *Interpreting Cation Displacements and Image Motifs Associated with the Oxygen Exchange Reaction on CeO_2 Nanoparticles*; **T Boland**, E Lawrence, B Levin, P Rez, PA Crozier; Arizona State University

POSTER # 225
3:00 PM 757 *B-Site Cation Ordering in Ba3MnNb2O9 by Atomic Resolution HAADF-STEM and Their Valence State by EELS;* **Y Xin**; Florida State University, Q Huang; University of Tennessee, Z Shafieizadeh; Florida State University, H Zhou; University of Tennessee

A04.P1 *In Situ* Transmission Electron Microscopy in Liquid and Gas Cells

POSTER SESSION
Wednesday: 3:00 PM • Room: Exhibit Hall

POSTER # 226
3:00 PM **758** (M&M STUDENT SCHOLAR) *Application of Liquid Cell-TEM in Hydration Reactions of Nano Portland Cement*; **P Dong**; McMaster University, Canada, A Allahverdi; Iran University of Science and Technology, Islamic Republic of Iran, CM Andrei; McMaster University, Canada, ND Bassim; McMaster University

POSTER # 227
3:00 PM **759** *Observation of PbTe Nanorod Formation Using* In Situ *Liquid Cell TEM;* **N Bhattarai**, DL Woodall, JE Boercker, TH Brintlinger; U.S. Naval Research Laboratory

POSTER # 228
3:00 PM **760** Facile Fabrication of Graphene-Sealed Microwell Liquid Cell for Liquid Electron Microscopy; **N Noh**, J Park, J Park, K Koo; Korea Advanced Institute of Science and Technology, Republic of Korea, YH Kim; Korea Research Institute of Standards and Science, Republic of Korea, JM Yuk; Korea Advanced Institute of Science and Technology, Republic of Korea

POSTER # 229
3:00 PM **761** In Situ *TEM Observation on the Growth of Solid Electrolyte Interphase (SEI) Layer on Co_3O_4 upon Sodiation and Magnesiation Using Graphene*

Scientific Program

A ANALYTICAL SCIENCES POSTER SESSIONS – Wednesday *continued*

Liquid Cell; **JY Cheong**, JH Chang, JY Lee, I-D Kim; Korea Advanced Institute of Science and Technology, Republic of Korea

POSTER # 230
3:00 PM **762** *In Situ* Observation of Cu_2O Island Shrinking on Cu(100) Facet under Methanol Using Environmental Transmission Electron Microscopy; **H Chi**, C Andolina, M Curnan, M Li, G Veser, J Yang; University of Pittsburgh

POSTER # 231
3:00 PM **763** *Optimization of Liquid Cell Transmission Electron Microscopy for Energy Dispersive X-Ray Spectroscopy;* MJ Dukes, **J Moering**, J Damiano; Protochips, Inc.

POSTER # 232
3:00 PM **764** *Assessment of High Sn Incorporation in Ge NanoWires Synthesized via In Plane Solid-Liquid-Solid Mechanism by* In Situ *TEM;* **S Moldovan**, E Azrak; Groupe de Physique des Materiaux, CNRS-INSA, France, W Chen, S Gao; CNRS, Université Paris-Saclay, France, S Duguay, P Pareige; Groupe de Physique des Materiaux, CNRS-INSA, France, PRI Cabarrocas; CNRS, Université Paris-Saclay, France

POSTER # 233
3:00 PM **765** (M&M POSTDOCTORAL SCHOLAR) In Situ *Insights into the Uncorking and Oxidative Decomposition Dynamics of Gold Nanoparticle Corked Carbon Nanotube Cups for Drug Delivery;* **SD House**, CM Andolina, SC Burkert, A Star, JC Yang; University of Pittsburgh

POSTER # 234
3:00 PM **766** In Situ *Observation of the Reversible Electrochemical Deposition of Fe in a Transmission Electron Microscope;* **U Wolff**; IFW Dresden, Germany, B Ambrožič, K Žužek Rožman; Jožef Stefan Institute, Slovenia, K Leistner, K Nielsch; IFW Dresden, Germany, S Šturm; Jožef Stefan Institute, Slovenia

POSTER # 235
3:00 PM **767** In Situ *Encapsulation of* E. coli *in GLC and Prediction of Beam Induced Death;* **DJ Banner**, J Jakubonis, E Firlar, JK Finlay, A Bogdanowicz, R Shahbazian Yassar, C Megaridis, T Shokuhfar; University of Illinois-Chicago

A05.P1 Low-Energy Electron and Particle Microscopies in Liquid, Gaseous, and Frozen Conditions

POSTER SESSION
Wednesday: 3:00 PM • Room: Exhibit Hall

POSTER # 236
3:00 PM **768** *Cryo-SEM: Direct Evidence of Water and Counterion Release upon Complexation;* **J Liang**, X Xiao, T Chou, M Libera; Stevens Institute of Technology

POSTER # 237
3:00 PM **769** *Polarization of the Graphene-Liquid Electrolyte Interface Probed by SEM;* **H Guo**, A Yulaev, E Strelcov; National Institute of Standards and Technology, A Tselev; University of Aveiro, Portugal, A Kolmakov; National Institute of Standards and Technology

B BIOLOGICAL SCIENCES POSTER SESSIONS – Wednesday

B05.P1 Focused on Microbes!

POSTER SESSION
Wednesday: 3:00 PM • Room: Exhibit Hall

POSTER # 238
3:00 PM **770** *Automated SEM Diatom Surveys and Correlative Light Microscopy*; **S Sepsenwol**, K Slemmons; University of Wisconsin-Stevens Point

POSTER # 239
3:00 PM **771** *Analytical STEM of Amorphous and Crystalline Mineral Phases in Calcium Bodies of Terrestrial Crustaceans;* M Vittori; Biotechnical Faculty, University of Ljubljana, Slovenia, **V Srot**, B Bussmann, PA van Aken; Max Planck Institute for Solid State Research, Germany, J Štrus; Biotechnical Faculty, University of Ljubljana, Slovenia

POSTER # 240
3:00 PM **772** *Addressing Challenges in Ultrastructural TEM Imaging of Chlorophyceae (Green Algae);* **AC Dohnalkova**; Pacific Northwest National Laboratory, Z Cardon; Marine Biological Laboratory-Woods Hole

POSTER # 241
3:00 PM **773** *Characterization of Septin Protein Interactions at the Yeast Bud Neck Using a Tripartite Split GFP Detection System;* E Turnquist, MN Schrock, M Halloran, **GC Finnigan**; Kansas State University

B06.P1 Imaging Life at New Frontiers of Spatiotemporal Resolution and Adaptive Microscopy

POSTER SESSION
Wednesday: 3:00 PM • Room: Exhibit Hall

POSTER # 242
3:00 PM **774** *Markers of Apoptosis and Phagocytosis Suggest a Function for Maternal Macrophages in Uterine Remodeling During Mid-Pregnancy and Postpartum;* **G Mishra**, B Ortiz, L Gebremedhin, K Ramsden, A Nguyen, SJ Bacon; Mount Holyoke College

POSTER # 243
3:00 PM **775** *Precise Protein Localization in Dissected* Drosophila *Larvae by Correlative Light and Transmission Electron Microscopy;* **H Zhan**, E Kielar-Grevstad, K O'Connor-Giles; University of Wisconsin-Madison

POSTER # 244
3:00 PM **776** *Developing Tools for STEM Education: The Foldscope, a very Inexpensive Monocular Microscope for Biological Research;* **F Denaro**, M Gabriel, A Noe, S Nyaga; Morgan State University

POSTER # 245
3:00 PM **777** *FRAP Experiments Show Pectate Lyases Promote Pollen Germination and Lubricate the Path of the Pollen Tube in* Arabidopsis thaliana*;* **Y Chebli**, A Geitmann; McGill University, Canada

POSTER # 246
3:00 PM **778** *Progression of Cell Wall Matrix Alterations during Aerenchyma Formation in* Pisum sativum *Root Cortical Cells;* **TJ Pegg**, RE Edelmann, GK Gladish; Miami University

POSTER # 247
3:00 PM **779** *Plasma Membrane Protein Fluorescence Recovery after Photobleaching Measured by Confocal Microscope with High Numerical Aperture at Periphery of Live Cell;* **J Janáček**, J Brejchová, P Svoboda; Institute of Physiology of the CAS, Czech Republic

POSTER # 248
3:00 PM **780** *Use of Butyl-Methyl Methacrylate Thin-Sections for Quantification of mRNA Using Branched-DNA ISH;* AJ Bowling, **HE Pence**; Dow AgroSciences

POSTER # 249
3:00 PM **781** *The Role of Humic Substances in Abiotic Clay Mineral Transformation;* **H Zuo**, H Dong; Miami University

POSTER # 250
3:00 PM **782** *Post-Embedding Immunogold Detection of GABA-Labeling Using Large Area, High Resolution SEM Backscatter Imaging;* **C Clarkson**, CA Brantner; George Washington University, NW Rizzo; Leica Microsystems, CT Zugates; Arivis AG, A Popratiloff; George Washington University

POSTER # 251
3:00 PM **783** *Light/Electron Microscopy Correlative Workflow Involving Leica Stage Overview and Thermo Fisher/FEI MAPS Platforms Facilitate Neuronal Identification*; **CA Brantner**, Y Lilach, C Clarkson, P Mistry, L Matsiyevskiy, B Karpinski, A Popratiloff; George Washington University

POSTER # 252
3:00 PM **784** *3D Imaging of BABB Cleared Whole-Mount Organs Using Light Sheet Microscopy*; **KA Boateng**, A Cyphersmith, G Fried, BS Sivaguru, X Lu, C Seward, E Ko; University of Illinois - Urbana-Champaign *et. al.*

POSTER # 253
3:00 PM **785** *Improved Method for Handling and Collection of Semi-Thin Sections of Resin-Embedded Biological Specimens for Light Microscopy*; **K Ghoshroy**; University of South Carolina-Sumter, E Balogh; South Carolina Dept. of Health and Environmental Control, H Alsudani, S Ghoshroy; University of South Carolina-Sumter

POSTER # 254
3:00 PM **786** *spFRET Microscopy Analysis of Distances Between DNA Linkers in Mononucleosomes*; **GA Armeev**, AV Lubitelev, VM Studitsky, AV Feofanov, MP Kirpichnikov; Lomonosov Moscow State University, Russian Federation

POSTER # 255
3:00 PM **787** *Differentiating Spatial Resolution and Detection Limits in Molecular (Infrared) Microspectroscopy*; **SH Elagamy**; Tanta University, Egypt, J Gravelle, AJ Sommer; Miami University

B08.P1 3D Structure of Complex Soft Materials Derived from Electron Tomography

POSTER SESSION
Wednesday: 3:00 PM • Room: Exhibit Hall

POSTER # 256
3:00 PM **788** *3D Modeling of the Stink Bug Alimentary System from Serial Resin Sections;* **AJ Bowling**, HE Pence; Dow AgroSciences

POSTER # 257
3:00 PM **789** (MSA PROFESSIONAL TECHNICAL STAFF MEMBER AWARD - BIOLOGICAL SCIENCES) *Optimal Preparation of* Drosophila *Brain Samples for FIB-SEM;* **Z Lu**, KJ Hayworth, S Xu, P Rivilin; Janelia Research Campus, I Meinerzhagen; Dalhousie University, Canada

POSTER # 258
3:00 PM **790** *Fabrication and Morphology Evaluation of Poly-Vinyl Alcohol-Chitosan Nanofibers Prepared by Electrospinning Direct Deposition;* P Hernández, **RJ Rodriguez-Cordova**; Universidad de Sonora, Mexico, FJ Martínez-Vazquez, IE Moreno-Cortéz; Universidad Autónoma de Nuevo León, Mexico,

Scientific Program

B BIOLOGICAL SCIENCES POSTER SESSIONS – Wednesday *continued*

A Martínez-Higuera, A Lucero-Acuña, E Alvarez-Ramos, R Esquivel; Universidad de Sonora, Mexico

POSTER # 259
3:00 PM **791** *The Effect of Sample Preparation on Observed Microstructure in Polymeric and Polymer Composite Gas Separation Membranes;* **CJ Holt**, KJ Balkus, JP Ferraris, IH Musselman; University of Texas-Dallas

P PHYSICAL SCIENCES POSTER SESSIONS– Wednesday

P01.P2 Advances in Electron, X-Ray and Neutron Spectro-Imaging/ Holography of Energy Materials and Devices

POSTER SESSION
Wednesday: 3:00 PM • Room: Exhibit Hall

POSTER # 260
3:00 PM **792** *Atomic Observation on Alternating Heteroepitaxial Nanostructures in Na-Ion Layered Oxide Cathodes;* S Xu; Nanjing University, China, H Qun; Central South University, China, J Liu; Nanjing University, China, W Wei; Central South University, China, **P Wang**; Nanjing University, China

POSTER # 261
3:00 PM **793** *Structural Modifications of Nanostructured Cubic CdS Thin-Films due Cu_2+ Doping;* A Flores-Pacheco, J-I Contreras-Rascón, R-C Carrillo-Torres; Universidad de Sonora, Mexico, P Del Angel-Vicente; Instituto Mexicano del Petróleo, Mexico, R-A Rosas-Burgos, R Sánchez-Zeferino, M-E Álvarez-Ramos; Universidad de Sonora, Mexico

POSTER # 262
3:00 PM **794** *Effect of Oxygen on Sputtered Tantalum Nitride Films for Photoelectrochemical Water Splitting;* S Macartney, **R Wuhrer**, L Sheppard; Western Sydney University, Australia

POSTER # 263
3:00 PM **795** *Comparative Study of CdS and CdS/ZnS Thin Films Deposited by CBD as a Buffer Layer Solar Cell;* **A Garcia-Barrientos**; Universidad Autónoma de San Luis Potosi, Mexico, H Gomez-Pozos; Universidad Autónoma del Estado de Hidalgo, Mexico, E Villicaña-Ortiza; Universidad de Ingeniería y Tecnología, Peru, L Cruz-Netro; Universidad Politécnica de Altamira, Mexico

POSTER # 264
3:00 PM **796** *Failure Analysis of CIGS Solar Cells by SEM/EDS;* **JF Konopka**; Thermo Fisher Scientific

POSTER # 265
3:00 PM **797** *Color Tuning of YAG:Ce^{3+} Phosphor-in-Glass Nanocomposites Using a Sm^{3+} Doped Tellurite Glass;* EA Salazar-Valenzuela, J Alvarado-Rivera, **A Flores-Pacheco**, ME Alvarez-Ramos; Universidad de Sonora, Mexico

POSTER # 266
3:00 PM **798** *High Precision Phase-Shifting Electron Holography with Multiple Biprisms for GaN Semiconductor Devices;* **K Yamamoto**; Japan Fine Ceramics Center, Japan

P02.P1 Atomically Thin 2D Materials: Recent Results and Challenges

POSTER SESSION
Wednesday: 3:00 PM • Room: Exhibit Hall

POSTER # 267
3:00 PM **799** *Atomic-Resolution Imaging and Spectroscopy of Iron Oxide Epitaxial Thin Films*; **A Carranco-Rodriguez**, A Pofelski, S Cheng; McMaster University, Canada, L Corbellini, A Pignolet; INRS, Canada, GA Botton; McMaster University, Canada

POSTER # 268
3:00 PM **800** *Local Lattice Match for Commensurate State of Graphene/h-BN van der Waals Heterostructure with TEM Analysis*; **NY Kim**, JH Kim, Z Lee; Ulsan National Institute of Science and Technology (UNIST), Republic of Korea

POSTER # 269
3:00 PM **801** *TiSn and Ti_2SnC Nanolaminates Prepared by Ion Beam Sputtering of Individual Phase Elements: Materials for Future Nuclear Application;* **S Bakardjieva**; Institute of Inorganic Chemistry of the CAS, Czech Republic, J Vacik, P Horak; Nuclear Physics Institute of the CAS, Czech Republic, I Jakubec; Institute of Inorganic Chemistry of the CAS, Czech Republic, J Nemecek; Czech Technical University in Prague, Czech Republic, R Klie; University of Illinois-Chicago

POSTER # 270
3:00 PM **802** *Low Temperature Surface-Mediated Growth of Graphene on Ultra-Thin Metal Catalysts;* **ST Olson**, O Zietz, B Coyne, J Jiao; Portland State University

POSTER # 271
3:00 PM **803** *Surface-Interface Quality of Mn_3Ge_3 Thin Films on Ge(001): Reactive Deposition Epitaxy vs. Solid Phase Epitaxy*; **A Alvídrez-Lechuga**, JT Holguín-Momaca, ÓO Solís-Canto, CR Santillán-Rodríguez, JA Matutes-Aquino, SF Olive-Méndez; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 272
3:00 PM **804** *Graphene Layer Control Enabled by Nickel-Copper Alloy Thin Film Catalyst;* **B Coyne**, O Zietz, S Olson, J Jiao; Portland State University

POSTER # 273
3:00 PM **805** *Investigation of the Effect of Graphene-Encapsulation on the O_2 Release Phenomenon from LixCoO2, Studied by* In Situ *Heating STEM/EELS;* **S Sharifi-Asl**; University of Illinois-Chicago, FA Soto; Texas A&M University, T Foroozan; University of Illinois-Chicago, Y Yuan, K Amine, J Lu; Argonne National Laboratory, PB Balbuena; Texas A&M University, R Shahbazian-Yassar; University of Illinois-Chicago

POSTER # 274
3:00 PM **806** *Atomic Structure of $W_{1-x}M_{ox}S_2$ Alloys and Heterostructures;* **D Reifsnyder Hickey**, S Bachu, M Chubarov, JM Redwing, N Alem; The Pennsylvania State University

POSTER # 275
3:00 PM **807** *Increased Sample Yield and Achievable Imaging Resolutions Through Thin Film Transfer Technique;* **O Zietz**, S Olson, B Coyne, J Jiao; Portland State University

POSTER # 276
3:00 PM **808** *A High Resolution Electron Microscopy Study of Dislocations in Graphene Nano-Flakes Produced by Chemical Ultrasonic Exfoliation;* C Magaña, F Hernandez, N Kramsky, **D Acosta**; Universidad Nacional Autónoma de México, Mexico

POSTER # 277
3:00 PM **809** *An Eco Friendly Mechanochemical Alternative Route for Exfoliated Graphite Preparation;* J Mendoza-Duarte; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, F Robles-Hernandez; University of Houston, C Garay-Reyes, **I Estrada-Guel**, M-S Martínez-Sánchez; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 278
3:00 PM **810** *High Resolution S/TEM Study of Defects in MOCVD Grown Mono to Few Layer WS_2;* S Bachu, **DR Hickey**, TH Choudhury, M Chubarov, JM Redwing, N Alem; The Pennsylvania State University

POSTER # 279
3:00 PM **811** *Phase Coexistence of Ferroelectric Vortices and Classical a_1/a_2 Domains in $PbTiO_3/SrTiO_3$ Superlattices;* **CT Nelson**; Oak Ridge National Laboratory, Z Hong; Pennsylvania State University, AK Yadav, AR Damodaran, S-L Hsu, JD Clarkson; University of California-Berkeley, L-Q Chen; Pennsylvania State University, LW Martin; University of California-Berkeley *et. al.*

P03.P2 Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications

POSTER SESSION
Wednesday: 3:00 PM • Room: Exhibit Hall

POSTER # 280
3:00 PM **812** *Utilization of ZnS Quantum Dots for Photovoltaic Applications;* **JC Melendres**, G Saavedra; Universidad de Sonora, Mexico, R Lopez; University of Texas-San Antonio, R Carrillo, R Sanchez, E Alvarez; Universidad de Sonora, Mexico, A Ayon; University of Texas-San Antonio

POSTER # 281
3:00 PM **813** *Microstructure and Chemical Characterization of Copper Nanoparticles in Wood Dust by TEM/STEM;* **C Wang**, C Qi, AK Dozier, JE Fernback, P Kulkarni; National Institute for Occupational Safety and Health

POSTER # 282
3:00 PM **814** In Situ *XRD Study of MoO3 Particles During Heat Treatment and Their Capacity of Removing the MB;* F Paraguay-Delgado, **M Santos-Beltràn**; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, R García-Alamilla; Center for Research in Secondary Petrochemistry, Mexico, A Santos-Beltrán, G Gallegos-Orozco; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 283
3:00 PM **815** *Defect Analysis of Single Crystal Synthetic Diamond;* **JF Al-Sharab**; Northwestern State University, SD Tse, BH Kear; Rutgers University

POSTER # 284
3:00 PM **816** *Potassium Titanate Nanoparticles: Effect of Thermal Annealing on the Band Gap Energy;* C Leyva-Porras, **I Estrada-Moreno**, M Miki-Yoshida, FE Longoria-Rodríguez, AM Garáy-Tápia; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, ML García-Guaderrama; Universidad de Guadalajara, Mexico

POSTER # 285
3:00 PM **817** *Gold Nanoshells and Nanorings for Photo-Thermal Therapeutic Medicine*; **JA Duarte-Moller**; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 286
3:00 PM **818** *SnO_2 Nanoparticles Deposited on Optical Fibers and Glass Substrate for Gas Sensors Applications;* J Necochea-Chamorro, M Álvarez-Ramos, **A Flores-Pacheco**, RC Carrillo-Torres, GJ Lanpar-Sinotez, R Sánchez-Zeferino; Universidad de Sonora, Mexico

POSTER # 287
3:00 PM **819** *Facile Synthesis of High Luminescent Blue Emitting ZnS Quantum Dots for UV to Visible Light Conversion, Solar Cell and LED Applications;* G

Scientific Program

P PHYSICAL SCIENCES POSTER SESSIONS– Wednesday

Saavedra-Rodriguez, **FJ Carrillo-Pesqueira**, R Sánchez-Zeferino, R Carrillo-Torres, A Flores-Pacheco; Universidad de Sonora, Mexico, C Velasquez-Ordoñez; Universidad de Guadalajara, Mexico, RP Duarte-Zamorano, ME Alvarez-Ramos; Universidad de Sonora, Mexico

POSTER # 288
3:00 PM **820** *Effect of Clay Loading in The Morphology and Electrical Conductivity of Polyaniline-Clay/ Elastomer Semiconductors;* CM De León-Almazán; Centro de Investigación en Petroquímica Secundaria-Instituto Tecnológico de Ciudad Madero, Mexico, **IA Estrada-Moreno**; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, JL Rivera-Armenta, U Páramo-García; Centro de Investigación en Petroquímica Secundaria-Instituto Tecnológico de Ciudad Madero, Mexico

POSTER # 289
3:00 PM **821** *Encapsulation of Iron Oxide Nanoparticles Type Core-Shell in Chitosan as Possible Theranostic Agent;* **PY Sauceda-Oloño**, JA Lucero-Acuña, P Zavala-Rivera; Universidad de Sonora, Mexico

POSTER # 290
3:00 PM **822** *ZnO and MgO Decorated with Spherical Gold Nanoparticles;* FD Cortes-Vega, NM Gomez-Ortiz, SE Borjas-Garcia, **P Martínez-Torres**; Universidad Michoacana de San Nicolás de Hidalgo, Mexico

POSTER # 291
3:00 PM **823** *Controlled Synthesis and Surface Functionalization of ZnO Quantum Dots;* LM Montes-de-Oca, A Hernandez-Prudencio, SE Borjas-García, G Espinosa, NM Gomez-Ortiz, **P Martínez-Torres**; Universidad Michoacana de San Nicolás de Hidalgo, Mexico

POSTER # 292
3:00 PM **824** *Unveiling the Mechanism of Liposome Formation Using the Graphene Liquid Cells;* **S Narayanan**, E Firlar, T Foroozan, R Rojaee, D Bidny, RS Yassar, T Shokuhfar; University of Illinois-Chicago

POSTER # 293
3:00 PM **825** *Synthesis of Silver/SiO_2:Eu^{3+} Nanocomposites Using Sunlight-Produced AgNPs to Enhance its Photoluminescence*; F Félix-Domínguez, R Carrillo-Torres, Á Flores-Pacheco, R Duarte-Zamorano; Universidad de Sonora, Mexico, C Velásquez-Ordoñez; Universidad de Guadalajara, Mexico, M Álvarez-Ramos; Universidad de Sonora, Mexico

POSTER # 294
3:00 PM **826** *Numerical Analysis Receiving/Transmitting Mechanisms of ZnO/Ag Nanoantennas;* **A Garcia-Barrientos**, F Castillo-Soria, MA Cardenas-Juarez; Universidad Autónoma de San Luis Potosí, Mexico, VI Rodríguez-Abdala; Universidad Autónoma de Zacatecas, Mexico, FJ Gonzalez-Contreras; Universidad Autónoma de San Luis Potosí, Mexico

POSTER # 295
3:00 PM **827** *Magnetic Nanoparticles Stability Analysis Coated with Plant Extract by Using UV-Visible Spectrophotometer*; EE Rizo Tafolla; Instituto Tecnológico de La Piedad, Mexico, DK Tiwari; CONACYT-El Colegio de Michoacán, Mexico, AV Coria-Tellez; El Colegio de Michoacán, Mexico, **SE Borjas Garcia**; Universidad Michoacana de San Nicolás de Hidalgo, Mexico

POSTER # 296
3:00 PM **828** *Neuromorphic Systems Based on Nanoantennas for Renewable Energy Applications;* **JE Sanchez**, FJ Gonzalez Contreras; Universidad Autonoma de San Luis Potosi, Mexico, M Jose Yacaman; University of Texas-San Antonio

POSTER # 297
3:00 PM **829** *Hollow Gold Nanoshells Encapsulated in PNIPAM Nanoparticles*; **SA Tovar-Cabrera**, R Esquivel, CA Gutiérrez-Valenzuela, P Hernández, P Zavala-Rivera; University of Sonora, Mexico, IE Moreno-Cortez; Autonomous University of Nuevo Leon, Mexico, R Guzman-Z; University of Arizona, A Lucero-Acuña; University of Sonora, Mexico

POSTER # 298
3:00 PM **830** *Precipitative Synthesis of Gd_2O_3: Eu^{3+} Using Sucrose Precursor: Surface Modification and Its Water Dispersibility*; DB Rodriguez Soto, AK Rosas Hernández; Universidad Politécnica de Pénjamo, Mexico, DK Tiwari; CONACYT- El colegio de Michoacán, Mexico, **SE Borjas Garcia**; Universidad Michoacana de San Nicolás de Hidalgo, Mexico

POSTER # 299
3:00 PM **831** *Nanofibers Pure and Doped With a Transition Metal: $BaTiO_3$ and $LiNbO_3$;* **MC Maldonado-Orozco**, R Narro-Garcia, C Nava-Dino, JP Flores-De los Rios; Universidad Autónoma de Chihuahua (UACH), Mexico, MT Ochoa-Lara, F Espinosa-Magana; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 300
3:00 PM **832** *Sulfidation-Oxidation Cycling of a H_2S Adsorbing Hollow Sphere Array;* **P Kumar**, Z Liu, M Tsapatsis, A Mkhoyan; University of Minnesota

POSTER # 301
3:00 PM **833** *Effect of Synthesis Time of Carbon Supported Pd/Au NPs on TCE Degradation;* **C Stauffer**, K Meduri; Portland State University, G O'Brien Johnson, PG Tratnyek; Oregon Health & Science University, J Jiao; Portland State University

POSTER # 302
3:00 PM **834** *Synthesis and Morphologic Characterization of Hollow Gold Nanoparticles with Different Amount of Gold and its Possible use as Radio Sensitizer*; **J Medina-Monares**; Universidad de Sonora, Mexico, E Ortiz-Rascón; CONACYT - Universidad de Sonora, Mexico, L Baez-Castillo, RC Carrillo-Torres, ME Álvarez-Ramos; Universidad de Sonora, Mexico

P04.P2 *In Situ* Methods for Probing Properties and Dynamics in Materials

POSTER SESSION
Wednesday: 3:00 PM • Room: Exhibit Hall

POSTER # 303
3:00 PM **835** *Anelastic Behavior in Crystalline Nanowires*; **G Cheng**, Y Zhu; North Carolina State University

POSTER # 304
3:00 PM **836** *Correlative* In Operando *Studies of Abusive Cycling Conditions for Li-Ion Batteries;* **JH Park**, A Raj, A Kim, G Davies, D Steingart; Princeton University

POSTER # 305
3:00 PM **837** (M&M STUDENT SCHOLAR) *Directed Hypersonic Strain Waves Imaged with Ultrafast Electron Microscopy;* **DX Du**, DR Cremons, DJ Flannigan; University of Minnesota

POSTER # 306
3:00 PM **838** (M&M STUDENT SCHOLAR) *Charge-Density Wave Localization and Co-Existence in 1T-TaS_2;* **SA Reisbick**, DJ Flannigan; University of Minnesota

POSTER # 307
3:00 PM **839** *High-Resolution S/TEM Imaging of High Density Domain Stacking and Coexisting Polar-Nonpolar Phases in Layered Perovskite $Ca_3Mn_2O_7$*; **L Miao**, D Mukherjee; The Pennsylvania State University, R Hu, S-W Cheong; Rutgers University, N Alem; The Pennsylvania State University

POSTER # 308
3:00 PM **840** *Good Contacts for Quantitative In Situ TEM Biasing Experiments with Movable Probes;* **JA Rodriguez Manzo**, DH Alsem, NJ Salmon; Hummingbird Scientific, D Cooper; CEA, LETI, Minatec Campus, France

POSTER # 309
3:00 PM **841** *Imaging Surface Plasma of Metals by Ultrafast Transmission Electron Microscopy;* **Z Wang**; Chinese Academy of Sciences, China

POSTER # 310
3:00 PM **842** *Correlative* In Situ *Analysis on the Nanoscale by Combination of AFM and SEM*; M Winhold, M Leitner, P Frank; GETec Microscopy GmbH, Austria, N Hosseini; École Polytechnique Fédérale de Lausanne, Switzerland, J Sattelkov; Graz University of Technology, Austria, GE Fantner; École Polytechnique Fédérale de Lausanne, Switzerland, H Plank; Graz University of Technology, Austria, **CH Schwalb**; GETec Microscopy GmbH, Austria

POSTER # 311
3:00 PM **843** *Local* In Situ *Temperature Measurements from Aluminum Nanoparticles;* **B Miller**; Gatan, Inc., H Perez Garza; DENSsolutions, Netherlands, M Mecklenburg; University of Southern California

POSTER # 312
3:00 PM **844** *Unravelling Irradiation-Induced Detwinning Mechanisms via* In Situ *and Aberration-Corrected TEM Combined with Atomistic Simulations*; **PK Suri**, JE Nathaniel, EA Anber; Drexel University, M Li, MA Kirk, J Wen; Argonne National Laboratory, ML Taheri; Drexel University

POSTER # 313
3:00 PM **845** *Thermal Stability of High Entropy Alloys during* In Situ *TEM Heating*; **EA Anber**, AC Lang; Drexel University, E Lass; National Institute of Standards and Technology, PK Suri, D Scotto D'Antuono; Drexel University, H Diao, PK Liaw; University of Tennessee-Knoxville, ML Taheri; Drexel University

P05.P1 Modulating Electron Beams in Space and Time to Probe for Structure and Function of Soft and Hard Matter

POSTER SESSION
Wednesday: 3:00 PM • Room: Exhibit Hall

POSTER # 314
3:00 PM **846** *Study of the Crystalline and Mesoporous Structure of a Heterogeneous Catalyst (ZSM-5) in Relation to Al, Si and Other Heteroatom, Distribution by Transmission Electron Microscopy*; **Y Wang**, M Kulzick; BP Amoco Chemical Company, A Carlsson; Thermo Fisher Scientific, Netherlands

POSTER # 315
3:00 PM **847** *Validation of Minimum Electron Beam Dosage on Characterization of Carbon-Depletion in ULK Dielectric Materials by EELS Quantifications;* **WW Zhao**, M Gribelyuk; GLOBALFOUNDRIES U.S. Inc.

POSTER # 316
3:00 PM **848** *Observing the Chemical Transformation of $MnBr_2$ Catalyzed by Cu under Electron Beam Irradiation;* **W Wang**; Chinese Academy of Sciences, China, X Bai; Beijing Institute of Technology, China, X Guan, X Shen, Y Yao, Y Wang; Chinese Academy of Sciences, China, B Zou; Beijing Institute of Technology, China, R Yu; Chinese Academy of Sciences, China

POSTER # 317
3:00 PM **849** (M&M STUDENT SCHOLAR) *The Effect of a Pulsed Electron Beam on Damage Threshold;* **EJ VandenBussche**, DJ Flannigan; University of Minnesota

POSTER # 318
3:00 PM **850** *Morphological Characterization of Tri-Continuous Conductive PP/PMMA/EAA Carbon Black Composites;* **JR Reffner**, CA Wolf, P Brigandi, JM Cogen; DowDuPont, Inc.

POSTER # 319
3:00 PM **851** *Ultrafast Transmission Electron Microscopy with High-Coherence Electron Pulses;* **TR Harvey**, K Priebe; University of Göttingen, Germany, S Schäfer; University of Oldenburg, Germany, C Ropers, A Feist, M Möller, N Rubiano da Silva, N Bach; University of Göttingen, Germany *et. al.*

Scientific Program

P PHYSICAL SCIENCES POSTER SESSIONS– Wednesday

POSTER # 320
3:00 PM **852** *TEM Characterization of Ball Milled Synthesized CIGS, CIS and CGS Nanoparticles for Energy Applications;* **HA Calderon**, II Santana-Garcia; Instituto Politecnico Nacional, ESFM, Mexico

P07.P1 Planetary Building Blocks and the Techniques Needed to Analyze Them

POSTER SESSION
Wednesday: 3:00 PM • Room: Exhibit Hall

POSTER # 321
3:00 PM **853** *Midwest Micrometeorites;* **S Peterson**; Project Stardust, AVD Handt; University of Minnesota

POSTER # 322
3:00 PM **854** *Automated Search for SiC Grains in Meteorite Cross Sections by SEM/EDS;* **JF Konopka**; Thermo Fisher Scientific

POSTER # 323
3:00 PM **855** *Low-Voltage Energy-Dispersive X-Ray Spectroscopy and Electron Energy-Loss Spectroscopy Analysis of Presolar Graphite Spherules;* **P Haenecour**; The University of Arizona, A Muto, JY Howe; Hitachi High-Technologies America Inc., TJ Zega; The University of Arizona, S Amari, C Floss; Washington University in St. Louis, P Wallace; The University of Arizona, K Lodders; Washington University in St. Louis *et. al.*

POSTER # 324
3:00 PM **856** *Micro-CT Imaging for Understanding the Formation of Impact Spherules and Their Compositional Heterogeneity: A Case Study from Lonar Impact Crater, India*; **R Das Gupta**, R Chakrabarti; Indian Institute of Science, India

POSTER # 325
3:00 PM **857** *Understanding the Possible Links Between Grain Boundary Morphology and Mineralogy in the Sericho Pallasite*; **SW Wallace**, J Rafaelsen; EDAX

POSTER # 326
3:00 PM **858** *Exploring Angrite Meteorites with Microanalysis: A Broad-Spectrum Approach to Constraining Petrogenesis*; **S Singletary**; Robeson Community College, A Love; Appalachian State University, S Mu; Fayetteville State University, S Huang; University of Nevada-Las Vegas, J Sinclair, D Cline; Pisgah Astronomical Research Institute

P08.P1 Spectroscopic and Imaging Studies in Heritage Science

POSTER SESSION
Wednesday: 3:00 PM • Room: Exhibit Hall

POSTER # 329
3:00 PM **861** *Characterization of Zinc Soap from an Accelerated Aged Oil Painting Test Panel;* T Lam, **C Romano**, GA Newsome, N Little, J-S Tsang; Smithsonian Institution

POSTER # 330
3:00 PM **862** *Laser Cleaning Iron Meteorite Corrosion, A Microstructural and Compositional Examination;* **EP Vicenzi**, RA Kaczkowski; Smithsonian Institution, BA Dajnowski; Conservation of Sculpture and Objects Studio

POSTER # 331
3:00 PM **863** *Gutta Percha, Rubber or Balata? Establishing Analytical Markers for Identification of Cultural Heritage Materials;* **HM Szczepanowska**; Heritage Conservation Centre, National Heritage Board, Singapore, VC Horie; Collection Care and Conservation Consultant, United Kingdom

POSTER # 332
3:00 PM **864** *Analysis of Ancient Painting by Shortwave Infrared Imaging Spectroscopy*; **T Wu**; Hohai University, China, G Li, Z Yang, Y Lei; The Palace Museum, China

POSTER # 333
3:00 PM **865** *Fresco Paintings Deterioration: Case Study of Bodjani Monastery, Serbia*; **S Vučetić**, J Ranogajec; University of Novi Sad - Faculty of Technology, Serbia, S Vujović; Institute for Protection of Cultural Monuments of the Autonomous Province of Vojvodina, Serbia, S Pašalić; University of Belgrade, Serbia, JM van-der-Bergh; University of Novi Sad - Faculty of Technology, Serbia, B Miljević; University of Novi Sad – Faculty of Technology, Serbia

POSTER # 334
3:00 PM **866** *Unravelling History Using Scanning Electron Microscopy*; **EC Humphrey**; University of Victoria, Canada, T Loychuk; Private Researcher, Canada

POSTER # 335
3:00 PM **867** *Microfadeometry of Miss Breme Jones Watercolor with Iron-Gall Ink Inscriptions*; **P Young**, P Silence; Colonial Williamsburg Foundation, T Lam; Smithsonian Institution

POSTER # 336
3:00 PM **868** *Understanding Effects Responsible for Pinhole Development and Coating Adhesion for Atomic Layer Deposited Coatings on Glass*; **ME Hiebert**, RJ Phaneuf; University of Maryland, EP Vicenzi; Smithsonian Institution

P09.P2 Microstructure and Mechanics Deformation

POSTER SESSION
Wednesday: 3:00 PM • Room: Exhibit Hall

POSTER # 337
3:00 PM **867** *Microstructural Study of a Bond Coat Type Al-Rich Intermetallic Alloy for Nb-Silicide Based Alloys for High Temperature Structural Applications;* **O Hernandez-Negrete**; Universidad de Sonora, Mexico, P Tsakiropoulos; University of Sheffield, United Kingdom

POSTER # 338
3:00 PM **870** *DIGM Phenomenon as Precursor of DP Reaction in a High Cr-Ni Corrosion-Resistant Alloy*; JC Spadotto, **G Solórzano**; Pontifical Catholic University of Rio de Janeiro, Brazil

POSTER # 339
3:00 PM **871** *Microscopic Analysis of TiB_2 Formation Mechanism in Al-Ti-B Alloy;* **A Khaliq**; RMIT University, Australia, S Mehmood; Mughal Materials Engineering, United Kingdom, SA Ranjha; University of Nebraska–Lincoln, MA Javed; Swinburne University of Technology, Australia, KS Munir; RMIT University, Australia

POSTER # 340
3:00 PM **872** *Nanostructure Findings by Use of a Modified Preparation Method of TEM Samples Collected from the Topmost Surface Layer of Carburized Inconel-718 Superalloy;* **C Sârbu**; Independent researcher, Romania

POSTER # 341
3:00 PM **873** *Microstructure of Thermoelectric Material - Pb1-xSnxSe and PbSe;* **S-C Liou**, W-A Chiou, Y Zhou; University of Maryland, G-J Shu; National Taipei University of Technology, Taiwan, F-C Chou; National Taiwan University, Taiwan

POSTER # 342
3:00 PM **874** *The Effect of Process Control Agent on the Oxidation of Nanocrystalline Mechanically Alloyed AlCoCrFeMnNi Powders;* M Ruiz-Esparza-Rodriguez, C Garay-Reyes, I Estrada-Guel, J Mendoza-Duarte; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, M Maldonado-Orozco; Universidad Autónoma de Chihuahua, Mexico, **R Martinez-Sanchez**; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 343
3:00 PM **875** *Hardness Behavior in Al7075 Aged Alloys Modified with Ce/La Rare Earths;* R Pérez-Bustamante; CONACYT-Corporación Mexicana de Investigación en Materiales S.A. de C.V. (COMIMSA), Mexico, F Pérez-Bustamante; Universidad Autónoma de Coahuila (UADEC), Mexico, **C Carreño-Gallardo**, I Estrada-Guel; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 344
3:00 PM **876** *Exploring Possibility of the Chromium (Cr) Removal from Molten Aluminum by Adding Boron Bearing Additive (Aluminum-Boron Master Alloy);* **A Khaliq**; RMIT University, Australia, MA Rhamdhani, R Batul; Swinburne University of Technology, Australia

POSTER # 345
3:00 PM **877** *Microstructure and Hardness of 2024 Alloy Subject to Hot-Extrusion, Cold-Rolling and Heat-Treatments;* **C Garay-Reyes**; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, JC Aranda-Casas; Universidad Autónoma de Chihuahua (UACH), Mexico, I Estrada-Guel, HM Medrano-Prieto, JM Mendoza-Duarte; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, MC Maldonado-Orozco; Universidad Autónoma de Chihuahua (UACH), Mexico, R Martínez-Sánchez; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 346
3:00 PM **878** *Effect of CeO_2 Nanoparticles on Microstructure and Hardness of A6063 Aluminum Alloy;* ML Camacho-Rios, A Saenz-Trevizo, D Lardizabal-Gutierrez, HM Medrano-Prieto, I Estrada-Guel, C Garay-Reyes, **R Martínez-Sánchez**; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 347
3:00 PM **879** *Effect of Transition Element Addition on the Microstructure and Microhardness of (Al-Si-Cu) Aged Alloys*; HM Medrano-Prieto, **C Garay-Reyes**, M Ruiz-Esparza-Rodriguez, I Estrada-Guel; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, MC Maldonado-Orozco; Universidad Autónoma de Chihuahua (UACH), Mexico, R Martínez-Sánchez; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 348
3:00 PM **880** *Crystallographic and Nanomechanical Analysis by Correlative* In Situ *AFM & SEM;* **P Frank**, CH Schwalb, M Leitner, S Hummel; GETec Microscopy GmbH, Austria, N Hosseini; Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, Y Wang; Shanghai Institute of Ceramics, Chinese Academy of Sciences, China, R Winkler; Graz University of Technology, Austria, GE Fantner; Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland *et. al.*

Notes

Scientific Program Information

Thursday, August 9, 2018

M&M 2018

MICROSCOPY & MICROANALYSIS

August 5-9, 2018 • Baltimore, MD

M&M 2018
MICROSCOPY & MICROANALYSIS

August 5-9, 2018 • Baltimore, MD

A ANALYTICAL SCIENCES SYMPOSIA – Thursday Morning

A02.6 Atomic-Scale Functional Imaging in Aberration-Corrected Electron Microscopy

SESSION CHAIRS:
Marta D. Rossell; Swiss Federal Laboratories for Materials Science and Technology (EMPA), Switzerland
Jing Tao; Brookhaven National Laboratory

PLATFORM SESSION
Thursday: 8:30 AM • Room: 339

8:30 AM **881** (Invited) *Temperature Measurement by a Nanoscale Electron Probe Using Energy Gain and Loss Spectroscopy;* **JC Idrobo**; Oak Ridge National Laboratory, O Krivanek; Nion Company, A Lupini; Oak Ridge National Laboratory, T Feng; Vanderbilt University, R Unocic; Oak Ridge National Laboratory, F Walden, D Gardiner; Protochips Company, T Lovejoy; Nion Company *et. al.*

9:00 AM **882** *Atomic-Scale Identification of Planar Defects in Cesium Lead Bromide Perovskite Nanocrystals;* **AS Thind**, G Luo; Washington University in St. Louis, JA Hachtel; Oak Ridge National Laboratory, M Goriacheva; University of Missouri-Columbia, SB Cho; Washington University in St. Louis, A Borisevich, JC Idrobo; Oak Ridge National Laboratory, Y Xing; University of Missouri *et. al.*

9:15 AM **883** *Atomic-Resolution Study of Grain Boundaries in CdTe Using Scanning Transmission Electron Microscopy;* **J Guo**; University of Illinois-Chicago, FG Sen; Argonne National Laboratory, L Wang, S Nam, M Kim; University of Texas-Dallas, MKY Chan; Argonne National Laboratory, RF Klie; University of Illinois-Chicago

9:30 AM **884** *Defect-Assisted Reorganization of Ferroelectric Domain Walls Revealed by Aberration-Corrected Electron Microscopy;* **L-Z Li**; University of California - Irvine, J Jokisaari; University of Michigan, Y Zhang; University of California - Irvine, X-X Cheng; Pennsylvania State University, C Heikes, D Schlom; Cornell University, L-Q Chen; Pennsylvania State University, X-Q Pan; University of California-Irvine

9:45 AM **885** *Real-Space Study of Charge and Orbital Ordering in $La_{0.6}Sr_{2.4}Mn_2O7$ Manganite Single Crystal*; **Q Zheng**; Oak Ridge National Laboratory, N Schreiber, H Zheng; Argonne National Laboratory, J Yan, MA McGuire; Oak Ridge National Laboratory, JF Mitchell; Argonne National Laboratory, M Chi, BC Sales; Oak Ridge National Laboratory

A04.6 *In Situ* Transmission Electron Microscopy in Liquid and Gas Cells

SESSION CHAIR:
Damien Alloyeau; CNRS - Paris Diderot University, France

PLATFORM SESSION
Thursday: 8:30 AM • Room: 345-346

8:30 AM **886** (Invited) *Direct Visualization of Solution-Based Nanofabrication Processes with In Situ TEM: Chemical Wet-Etching and Solution-Based Cleaning/Drying of High-Aspect-Ratio Nanostructures*; **U Mirsaidov**; National University of Singapore, Singapore, Z Aabdin; A*STAR (Agency for Science, Technology and Research), Singapore, T Ghosh, U Anand; National University of Singapore, Singapore, N Vrancken, XM Xu; imec, Belgium, SW Chee, Z Baraissov; National University of Singapore, Singapore *et. al.*

9:00 AM **887** *Investigation of Electron Beam Deposition Parameters Within a Scanning Electron Microscope*; **W Kellogg**, BD Myers, KA Hujsak, VP Dravid; Northwestern University

9:15 AM **888** *Quantitative Modeling of Kinetically Controlled Nanocrystal Synthesis with Liquid Cell Electron Microscopy*; **M Wang**; University of Maryland, C Park; Florida State University, TJ Woehl; University of Maryland

9:30 AM **889** (M&M POSTDOCTORAL SCHOLAR) In Situ *Nucleation, Growth and Evolution of Au Nanoparticles during Metallization of DNA Origami Visualized with HAADF-STEM*; **A Londono-Calderon**; Ames Laboratory, L Bendickson, P Palo, M Nilsen-Hamilton, S Mallapragada; Iowa State University, T Prozorov; Ames Laboratory

9:45 AM **890** *Study of Long Range van der Waals Interactions with Liquid-Phase STEM*; **E Cepeda-Perez**, A Verch, N de Jonge; INM-Leibniz Institute for New Materials, Germany

A06.1 Mesoscale Correlative Microscopy and Imaging of Physical, Environmental, and Biological Sciences

SESSION CHAIR:
Xiao-Ying Yu; Pacific Northwest National Laboratory

PLATFORM SESSION
Thursday: 8:30 AM • Room: 322

8:30 AM **891** (Invited) *Meso/Nano Correlative Imaging by Multiplex Protein Meso-Imaging with SIMS and Single Protein Nano-Imaging with HIM*; HJ Lim, Y Park, S Lee, S In, **D Moon**; Daegu Gyeongbuk Institute of Science and Technology (DGIST), Republic of Korea

9:00 AM **892** *Advancements in X-Ray Analysis for Correlative Microscopy*; **J Gelb**, S Lewis, S Lau; Sigray, Inc., J Kirz; Lawrence Berkeley National Laboratory, W Yun; Sigray, Inc.

Scientific Program

A ANALYTICAL SCIENCES SYMPOSIA – Thursday Morning *continued*

9:15 AM **893** (Invited) *Correlative Electron Microscopy and NanoSIMS Analysis for Lipid Studies;* **H Jiang**; University of Western Australia, Australia, C He, L Fong, S Young; University of California-Los Angeles

9:45 AM **894** (M&M STUDENT SCHOLAR) *Correlative Workflow in the Characterization of TiN Coatings in Cardiac Rhythm Management Devices;* **J Favata**, B Ahmadi; University of Connecticut, S Amini; Johnson Matthey, S Shahbazmohamadi; University of Connecticut

A07.3 New Advances in Electron Energy Loss Spectroscopy and Allied Techniques

SESSION CHAIRS:
Ian MacLaren; University of Glasgow, United Kingdom
Maria Varela; Universidad Complutense de Madrid, Spain

PLATFORM SESSION
Thursday: 8:30 AM • Room: 341

8:30 AM **895** (Invited) In Situ *Materials Characterization of 2-Dim Materials at High Energy and Spatial Resolution;* X Hu, JR Jokisaari, L Hong, **RF Klie**; University of Illinois-Chicago

9:00 AM **896** *High Resolution EELS of Point Defects in a Nitride Semiconductor Material;* **K March**, S Wang, FA Ponce, P Rez; Arizona State University

9:15 AM **897** *Investigation of Surface Plasmon Resonances in Silver Infiltrated Metalattices by Monochromated Electron Energy Loss Spectroscopy;* **P Moradifar**, Y Liu, J Russell, T Mallouk, J Badding, N Alem; Pennsylvania State University

9:30 AM **898** (Invited) *New Directions Toward Nanophysics Experiments in STEM;* M Kociak, LHG Tizei, M Walls, A Zobelli, **O Stéphan**, J-D Blazit, L Bocher, N Brun; Université Paris Sud, France *et. al.*

A08.2 Machine Learning and Compressive Sensing for Signal Processing and Image Reconstruction in Microscopy and Microanalysis

SESSION CHAIR:
Volkan Ortalan; Purdue University

PLATFORM SESSION
Thursday: 8:30 AM • Room: 342

8:30 AM **899** (Invited) *Focused-Probe STEM Ptychography: Reconstruction Methods, Transfer Functions and Signal-to-Noise;* **PD Nellist**, GT Martinez, C O'Leary; University of Oxford, United Kingdom, H Yang; Lawrence Berkeley National Laboratory, A Stevens; Duke University, ND Browning; University of Liverpool, United Kingdom

9:00 AM **901** *A Natural Basis for Unsupervised Machine Learning on Scanning Diffraction Data*; **P Cueva**, E Padgett, DA Muller; Cornell University

9:15 AM **901** *Exit-Wave Reconstruction and Phase Analysis Using a Hitachi SU9000 FE-SEM*; **S Rudinsky**, R Gauvin; McGill University, Canada

9:30 AM **902** *Next Steps for Compressively Sensed Video in Transmission Electron Microscopy*; **BW Reed**, N Moghadam, RS Bloom, ST Park, DJ Masiel; Integrated Dynamic Electron Solutions, Inc.

9:45 AM **903** *Gesture-Based Control of the Scanning Electron Microscope Using a Low-Cost Webcam Sensor*; B Wong, **DM Holburn**, BC Breton; University of Cambridge, United Kingdom, NHM Caldwell; University of Suffolk, United Kingdom

A12.2 The FIB-SEM Laboratory: Sample Preparation and Beyond

SESSION CHAIRS:
Marco Cantoni; École Polytechnique Fédérale de Lausanne, Switzerland
Timothy Burnett; University of Manchester, United Kingdom

PLATFORM SESSION
Thursday: 8:30 AM • Room: 328

8:30 AM **904** (Invited) *Using Three-Dimensional Electron Backscatter Diffraction Data to Measure Grain Boundary Properties in Metals and Ceramics;* **GS Rohrer**; Carnegie Mellon University

9:00 AM **905** *The Challenges of High-Resolution Analytic FIB-SEM Tomography and Their Solution;* **T Volkenandt**, F Pérez-Willard, M Rauscher; Carl Zeiss Microscopy GmbH, Germany

9:15 AM **906** *3D Microstructure Reconstruction and Characterization of Solid-State Electrolyte with Varying Porosity;* **TR Hamann**, ED Wachsman, L Zhang, Y Gong, GL Godbey, JE Gritton, Z Ma, DW McOwen; University of Maryland-College Park *et. al.*

9:30 AM **907** *Crystallography at the Nanoscale: t-EBSD Study of npAu Catalysts*; **C Barroo**; Université Libre de Bruxelles, Belgium, AJ Akey, DC Bell; Harvard University

9:45 AM **908** *Direct Real-time Microstructure Evolution Observation of Ti-6Al-4V Alloy by* In Situ *EBSD During Cycling Heating and Cooling at Elevated Temperatures Using μHeater in SEM/FIB Systems*; **M Wu**, L Novak; Thermo Fisher Scientific, Czech Republic

WITHDRAWN

A13.2 Pushing the Limits of Cryo-EM

SESSION CHAIRS:
Mike Marko; Wadsworth Center
Anchi Cheng; NY Structural Biology Center

PLATFORM SESSION
Thursday: 8:30 AM • Room: 349

8:30 AM **909** (Invited) *CryoET of Single Particle CryoEM Grids Reveals Widespread Particle Adsorption to the Air-Water Interface, Which May be Reduced with New Plunging Techniques*; **AJ Noble**; New York Structural Biology Center, G Scapin; Merck & Co., Inc., M Rapp; Columbia University, ET Eng, WJ Rice, A Cheng, CJ Negro; New York Structural Biology Center, L Shapiro; Columbia University *et. al.*

9:00 AM **910** (Invited) *Zooming in on Cell Architecture and Molecular Structures with Correlative Light and Electron Microscopy;* MW Tuijtel, CE Melia, G Wolff, FG Faas, RI Koning, TH Sharp, M Bárcena, **AJ Koster**; Leiden University Medical Center, Netherlands

9:30 AM **911** *Cryo-STEM Imaging of Ribosomes Using the Electron Microscope Pixel Array Detecto;* **KA Spoth**, DA Muller, LF Kourkoutis; Cornell University

9:45 AM **912** *The Potential for Greater Clarity Cryo-Electron Microscopy via Ptychography;* **TJ Pennycook**; Max Planck Institute for Solid State Research, Germany, GT Martinez, PD Nellist; University of Oxford, United Kingdom, JC Meyer; University of Vienna, Austria

A14.2 Quantitative Magnetic Characterization in the TEM

SESSION CHAIRS:
Sebastian Schneider; IFW Dresden, Germany
Ben McMorran; University of Oregon

PLATFORM SESSION
Thursday: 8:30 AM • Room: 338

8:30 AM **913** *Towards Nanometer-Scale Three-Dimensional Magnetic Studies with Atomic Size Electron Vortex Beams;* **J Rusz**, D Negi; Uppsala University, Sweden, L Jones; Trinity College Dublin, Ireland, J-C Idrobo; Oak Ridge National Laboratory

8:45 AM **914** (M&M POSTDOCTORAL SCHOLAR) *The Role of Spatial Coherence for the Creation of Atom-Size Electron Vortex Beams;* **D Pohl**; Technical University Dresden, Germany, S Löffler; Technical University Wien, Austria, S Schneider; Leibniz Institute for Solid State and Materials Research, Dresden, Germany, P Tiemeijer, S Lazar; Thermo Fisher Scientific, Netherlands, K Nielsch; IFW Dresden, Germany, B Rellinghaus; Technical University Dresden, Germany

9:00 AM **915** *Probing the Proximity of Magnetic Dichroic Signal in Electron Magnetic Circular Dichroism by Atomic Sized Electron Vortex Beams and Four-Fold Astigmatic Beams;* **DS Negi**; Uppsala University, Sweden, JC Idrobo; Oak Ridge National Laboratory, J Rusz; Uppsala University, Sweden

9:15 AM **916** *Boundary-Artifact-Free Observation of Magnetic Materials Using the Transport of Intensity Equation;* **A Ishizuka**; HREM Research Inc., Japan, K Mitsuishi; National Institute for Materials Science, Japan, K Ishizuka; HREM Research Inc., Japan

9:30 AM **917** (Invited) *Towards Topological Spectroscopy in the Electron Microscope with Atomic Resolution;* **JC Idrobo**, A Lupini; Oak Ridge National Laboratory, T Lovejoy; Nion Company, N Lavrik, JA Hachtel; Oak Ridge National Laboratory, J Rusz; Uppsala University, Sweden, N Dellby, O Krivanek; Nion Company

A15.2 Strain Analysis from Nano- to Micro-Length Scales

SESSION CHAIRS:
Ling Pan; Intel
Andrew Minor; University of California-Berkeley

PLATFORM SESSION
Thursday: 8:30 AM • Room: 327

8:30 AM **918** (Invited) *Developing High Resolution and High Precision Strain Mapping Methodologies for Materials Research and Semiconductor Technology*; **J-M Zuo**, R Yuan; University of Illinois, Urbana-Champaign

9:00 AM **919** *Residual Stress Characterization on the Mesoscale in Additive Manufacturing*; **KA Small**; Drexel University, Z Clayburn; Brigham Young University, J Almer, J Tischler; Argonne National Laboratory, D Fullwood; Brigham Young University, M Taheri; Drexel University

9:15 AM **920** *Nano-Scale Elastic Strain Maps of Twins in Magnesium Alloys*; **L Ma**; Johns Hopkins University, PF Rottmann; University of California-Santa Barbara, K Xie; Texas A&M University, KJ Hemker; Johns Hopkins University

9:30 AM **921** (Invited) *Probing Nanoscale Local Lattice Strains in Semiconductor Nanostructures and Devices by Transmission Electron Microscopy*; **J Wang**; University of Texas-Dallas, G Lian; IBM, MJ Kim; University of Texas-Dallas

Scientific Program

B BIOLOGICAL SCIENCES SYMPOSIA – Thursday Morning

B06.2 Imaging Life at New Frontiers of Spatiotemporal Resolution and Adaptive Microscopy

SESSION CHAIRS:
Teng-Leong Chew; Advanced Imaging Center-Janelia Research Campus
Jay Potts; University of South Carolina Medical School

PLATFORM SESSION
Thursday: 8:30 AM • Room: 350

8:30 AM **922** (Invited) *Three-Dimensional Reconstruction and Quantification of PGP9.5-Immunoreactive, Sensory Intra-Epidermal Nerve Fibers;* **MB Anderson**; Oklahoma State University Center for Health Sciences, K Miller; Oklahoma State University

9:00 AM **923** (Invited) *Three-Dimensional Printing of Agriculturally Important Mites Generated from Confocal Microscopy*; **CJ Gulbronson**; Oak Ridge Institute for Science and Education, J Mowery, C Pooley, R Ochoa; U.S. Department of Agriculture, S Bolton; Florida Department of Agriculture and Consumer Services, GR Bauchan; U.S. Department of Agriculture

9:30 AM **924** *Modeling and Imaging Interactive Biomaterial Effects on Self-Organizing Tissues;* **J Potts**, L Junor, A Worden, M Uline; University of South Carolina

P PHYSICAL SCIENCES SYMPOSIA – Thursday Morning

P03.6 Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications

SESSION CHAIR:
Jinguo Wang; University of Texas-Dallas

PLATFORM SESSION
Thursday: 8:30 AM • Room: 337

8:30 AM **925** *Iodine and NIR Dye Labeled Biodegradable Polymer Nanoparticles for Dual CT/NIR Imaging;* **VN Joshi**; Anvesha Labs

8:45 AM **926** *Statistical Measurement of Peptide Nucleic Acid-Assisted Self-Assembly of Gold Nanocluster Dimers;* **SD House**; University of Pittsburgh, DR Jayarathna; Carnegie Mellon University, C Achim; Carnegie Mellon Univeristy, JC Yang; University of Pittsburgh

9:00 AM **927** *Challenges and Opportunities in Transmission Electron Microscopy for Revealing the Fate of Inorganic Nanomaterials in Living Beings;* **A Damien**, J Volatron, Y Javed, M Piffoux, W Dachraoui, D Elgrabli, L Lartigue, F Gazeau; CNRS – Université Paris-Diderot, France *et. al.*

9:15 AM **928** *HRTEM and XPS Characterization of Photocatalytic Fe Doped TIO_2 Nanocrystals Enabling Significant Improvement in the Cleaning of Wastewater;* V Moradi, A Blackburn, **R Herring**; University of Victoria, Canada

9:30 AM **929** *Photocatalytic Protection of Building Materials in Real Environmental Conditions;* **J Ranogajec**, S Vučetić, JM van-der-Bergh, B Miljević;, H Hiršenberger; University of Novi Sad - Faculty of Technology, Serbia

P04.7 *In Situ* Methods for Probing Properties and Dynamics in Materials

SESSION CHAIR:
Nathan Mara; University of Minnesota

PLATFORM SESSION
Thursday: 8:30 AM • Room: 340

8:30 AM **930** (Invited) *Phase-Locked Transmission Electron Microscopy for Detecting Dynamic Responses of Heterogeneous Materials and Electrochemical Devices under an Alternating Electric Potential*; **S Takeda**, K Soma, R Aso, N Kamiuchi, H Yoshida; Osaka University, Japan

9:00 AM **931** *Observing the Lithiation of MoS_2*; **S Tripathi**, MT Janish; University of Connecticut, WM Mook, KL Jungjohann; Sandia National Laboratories, A Dongare, CB Carter; University of Connecticut

9:15 AM **932** *Lithium Electrochemistry of WS_2 Nanoflakes Studied by* In Situ *TEM*; **Y Xu**, J Kang, MC Hersam, J Wu, VP Dravid; Northwestern University

9:30 AM **933** In Situ *Atomic-Scale TEM Observation of Phase Transformation in Two-Dimensional $SnSe_2$ Single Crystals*; K He; Northwestern Universtiy, VP Dravid, **S Kim**; Northwestern University

9:45 AM **934** In Situ *Investigation of Multi-Step Lithiation of Tin Sulfide;* **S Hwang**; Brookhaven National Laboratory, Z Yao; Northwestern University, L Zhang; Wuhan University of Technology, China, M Fu; Brookhaven National Laboratory, K He; Northwestern University, L Mai; Wuhan University of Technology, China, C Wolverton; Northwestern University, D Su; Brookhaven National Laboratory

P06.2 Applications of Integrated Electron Probe Microscopy and Microanalysis in Characterizing Natural and Synthetic Materials

SESSION CHAIRS:
Owen Neill; University of Michigan
Kat Crispin; Pennsylvania State University
Colin MacRae; CSIRO, Australia

PLATFORM SESSION
Thursday: 8:30 AM • Room: 329

8:30 AM **935** (Invited) *Material Discrimination at High Spatial Resolution Using Sub-300 eV X-Rays;* **PJ Statham**,

J Sagar, S Burgess, J Holland; Oxford Instruments NanoAnalysis, United Kingdom

9:00 AM **936** *Crystallographic Orientation Information by Soft X-Ray Spectroscopy;* **CM MacRae**, M Pearce, NC Wilsonj, A Torpy; CSIRO, Australia

9:15 AM **937** (Invited) *Analysis of Redox Changes in Silicate Glasses Using EPMA and Raman Spectroscopy;* **EC Hughes**, B Buse, SL Kearns, D Di Genova, JD Blundy; University of Bristol, United Kingdom

9:45 AM **938** *Investigation of Nitrogen in Silicate Glasses and Iron Alloys by SXES;* **A vonderHandt**; University of Minnesota, H Takahashi; JEOL Ltd., Japan, M Takakura; JEOL Ltd., Japan, C Dalou, J Mosenfelder, MM Hirschmann; University of Minnesota

P07.3 Planetary Building Blocks and the Techniques Needed to Analyze Them

SESSION CHAIRS:
Emma Bullock; Carnegie Institution of Washington
Prajikta Mane; University of Arizona

PLATFORM SESSION
Thursday: 8:30 AM • Room: 324

8:30 AM **939** *Coordinated Analyses of the Chemical and Microstructural Effects of Progressive Space Weathering of a Carbonaceous Chondrite*; **MS Thompson**; NASA Johnson Space Center, MJ Loeffler; Northern Arizona University, RV Morris; NASA Johnson Space Center, SJ Clemett, R Christoffersen, Z Rahman; Jacobs, NASA Johnson Space Center, DG Agresti; University of Alabama-Birmingham, LP Keller; NASA Johnson Space Center

8:45 AM **940** *Novel Applications of Focused Ion Beam Technique for Planetary Sample Analyses*; **ZU Rahman**; Jacobs - NASA Johnson Space Center, LP Keller; NASA Johnson Space Center, AL Nguyen; Jacobs - NASA Johnson Space Center, MS Thompson, SR Messenger; NASA Johnson Space Center

9:00 AM **941** *Understanding the Formation of Defect-Structured Hibonite in Chondritic Meteorites: A FIB/TEM Study*; **J Han**; USRA Lunar and Planetary Institute, LP Keller; NASA Johnson Space Center

9:15 AM **942** *Aberration-Corrected STEM/TEM Chemical Analysis and Imaging of Meteoritic Refractory Oxide Assemblages*; **T Ramprasad**, P Mane, TJ Zega; University of Arizona

9:30 AM **943** *Coordinated EBSD and TEM Analysis to Decipher Shock Deformation Effects in the Oldest Solids in the Solar System*; **P Mane**; University of Arizona, S Wallace; EDAX, Ametek, P Wallace, Y-J Chang, K Domanik, TJ Zega; University of Arizona

9:45 AM **944** *Quantitative Characterization of Crystal Defects in Planetary Materials in a Scanning Electron Microscope (SEM)*; **S Kaboli,** PC Burnley; University of Nevada-Las Vegas

P08.2 Spectroscopic and Imaging Studies in Heritage Science

SESSION CHAIRS:
Thomas Lam; Smithsonian Institution
Edward Vicenzi; Smithsonian Institution

PLATFORM SESSION
Thursday: 8:30 AM • Room: 326

8:30 AM **945** (Invited) *Large-Scale Micron-Order 3D Surface Correlative Imaging of Ancient Roman Concrete*; J Maragh; Massachusetts Institute of Technology, JC Weaver; Harvard University, **A Masic**; Massachusetts Institute of Technology

9:00 AM **946** *Microstructural Characterization of Hidalgo/Pachuca Obsidian Using Analytical Electron Microscopy*; **NJ Zaluzec**; Argonne National Laboratory, S Nicolopoulos; NanoMEGAS SPRL, Belgium, J Arenas-Alatorre; Universidad Nacional Autónoma de Mexico, Mexico

9:15 AM **947** *Compositional Imaging and Analysis of Late Iron Age Glass from the Broborg Vitrified Hillfort, Sweden*; **EP Vicenzi**; Smithsonian Institution, MJ Schweiger; Pacific Northwest National Laboratory, AA Kruger; Department of Energy, CI Pearce; Pacific Northwest National Laboratory, JL Weaver; National Institute of Standards and Technology, JS McCloy; Washington State University, S Wight; National Institute of Standards and Technology, T Am; Smithsonian Institution *et. al.*

9:30 AM **948** *Microscopic Identification of Micro-Organisms on Pre-Viking Swedish Hillfort Glass;* **JL Weaver**; National Institute of Standards and Technology, DK Peeler; Pacific Northwest National Laboratory, JS McCloy; Washington State University, AA Kruger; Department of Energy, CI Pearce, B Arey; Pacific Northwest National Laboratory, M Conroy; Pacific Northwest National Laboratory, United Kingdom, EP Vicenzi; Smithsonian Institution *et. al.*

9:45 AM **949** *Use of Microscopy and Microanalysis in Assessing Kinetics of Degradation in 19th-Century Heritage Glasses*; **AC Buechele**, X Xie; The Catholic University of America, L Brostoff; U.S. Library of Congress, S Zaleski; The George Washington University, N Deems, E Montagnino, I Muller, I Pegg; The Catholic University of America *et. al.*

P09.5 Microstructure and Mechanics Deformation

SESSION CHAIRS
Frank Muecklich; Saarland University, Germany
James Martinez; NASA Johnson Space Center

PLATFORM SESSION
Thursday: 8:30 AM • Room: 325

8:30 AM **950** *Electron Backscatter Diffraction Analysis of Single Pass Builds of Additively Manufactured Inconel 625;* MJ Matthews; Lawrence Livermore National

Scientific Program

P PHYSICAL SCIENCES SYMPOSIA – Thursday Morning *continued*

Laboratory, TT Roehling; University of the Pacific, **BW Baker**, ND Hart; United States Naval Academy

9:00 AM **951** *Characterization of Layered Structures of Ti-6Al-4V Alloy and Metal Matrix Composites on Its Base*; **SV Prikhodko**; University of California-Los Angeles, P Markovsky, D Savvakin, O Stasiuk; Kurdyumov Institute for Metal Physics, Ukraine, M Norouzi Rad; Carl Zeiss Microscopy LLC, C Choi; University of California-Los Angeles, O Ivasishin; Kurdyumov Institute for Metal Physics, Ukraine

9:15 AM **952** (M&M STUDENT SCHOLAR) *Characterizing the Effect of ECAP on Particle Dispersion and Thermal Stability of Internally Oxidized Fe-Y Alloys*; **AC Weiss**, SJ Kachur, YN Picard, BA Webler; Carnegie Mellon University

9:30 AM **953** *Dynamic Precipitation in a Binary Mg-Al Alloy During Equal Channel Angular Extrusion (ECAE)*; X Ma, S Eswarappa-Prameela, **NM Krywopusk**; Johns Hopkins University, LJ Kecskes; MATSYS Inc., T Sano; U.S. Army Research Laboratory, TP Weihs; Johns Hopkins University

9:45 AM **954** *Hole-Free Phase Plate Electron Tomography in Material Sciences;* **M Hayashida**; NRC Nanotechnology, Canada, AM Najarian, R McCreery; University of Alberta, Canada, M Malac; NRC Nanotechnology, Canada

A ANALYTICAL SCIENCES POSTER SESSIONS – Thursday

A02.P2 Atomic-Scale Functional Imaging in Aberration-Corrected Electron Microscopy

POSTER SESSION
Thursday: 10:00 AM • Room: Exhibit Hall

POSTER # 349
10:00 AM **955** *Microstructure Study of Carbon Nanocages Consisting of Graphene Oxide Grafted with Single Gold Nanoparticles by Application of HAADF Contrast Imaging*; **S Bakardjieva**, M Bakardjiev; Institute of Inorganic Chemistry of the CAS, Czech Republic, R Klie, C Wang; University of Illinois-Chicago

POSTER # 350
10:00 AM **956** *Sample Preparation for Aberration-Corrected Microscopy of High-Quality TEM Specimens of Advanced Integrated Circuits;* **CS Bonifacio**, M Campin; E.A. Fischione Instruments, Inc., K McIlwrath; JEOL USA, ML Ray, PE Fischione; E.A. Fischione Instruments, Inc.

POSTER # 351
10:00 AM **957** *Spherical Aberration Correction for SEMs with Electrostatic-Type Compact Cs-Corrector*; **T Kawasaki**, R Yoshida, T Kato; Japan Fine Ceramics Center, Japan, T Nomaguchi, S Motomura, K Nishinaka, T Agemura; Hitachi High-Technologies, Japan, M Tomita; Vacuum Device. Ltd., Japan *et. al.*

POSTER # 352
10:00 AM **958** *Sunlight Active Perovskites (TiO_2-$CoTiO_3$) with Effective Dye Degradation and Water Splitting*; M Sighn, W Yang, J Bao, F Qin; University of Houston, A Genc; Thermo Fisher Scientific, **FC Robles Hernandez**; University of Houston

POSTER # 353
10:00 AM **959** *The Morphology of Ti_2AlC (M_2AX) and Ti_2C (MXene) Sheets Revealed by HAADF STEM Analysis;* **S Bakardjieva**; Institute of Inorganic Chemistry of the CAS, Czech Republic, R Klie; University of Illinois-Chicago

POSTER # 354
10:00 AM **960** *Towards Atomic-Scale Fabrication in Silicon*; **BM Hudak**, S Jesse, J Song, A Borisevich, PC Snijders, SV Kalinin, AR Lupini; Oak Ridge National Laboratory

POSTER # 355
10:00 AM **961** *The Effect of Epitaxial Strain on Phase Stability in Double-Perovskite La_2NiMnO_6 films*; S-Q Wu, S Cheng, X-W Jin, L Lu, M Liu, S-D Cheng, **S-B Mi**; Xi'an Jiaotong University, China

POSTER # 356
10:00 AM **962** *Substrate Surface Roughness-Induced Antiphase Boundaries and Strain Relaxation in $CuFe_2O_4$ Films on $MgAl_2O_4$ (001) Substrates*; K Liu, R Zhang, **S-B Mi**, L Lu, M Liu, H Wang; Xi'an Jiaotong University, China, C-L Jia; Forschungszentrum Jülich, Germany

POSTER # 357
10:00 AM **963** *Structural and Magnetic Properties of Nanosized $LiCoO_2$ Surfaces*; **L Hong**, L Hu, JJ Cabana, S **Öğüt**, RF Klie, RF Klie; University of Illinois-Chicago

A04.P2 *In Situ* Transmission Electron Microscopy in Liquid and Gas Cells

POSTER SESSION
Thursday: 10:00 AM • Room: Exhibit Hall

POSTER # 359
10:00 AM **965** *Frozen Phase* In Situ *Multi-Modal Microscopy of Liquid Metal Eutectics*; **AJ Akey**, DC Bell; Harvard University

POSTER # 360
10:00 AM **966** *Environmental Real Time Imaging with 200kV FE Aberration-Corrected Analytical Scanning Transmission Electron Microscope (ESTEM) System with an Open Window Gas Injection*; **H Inada**,

M Shirai, A Hanawa, Y Suzuki, H Kikuchi, K Nakamura; Hitachi High-Technologies Corp., Japan

POSTER # 361
10:00 AM **967** In Situ *TEM Study of Formation of an Ordered Hollow Structure Metalattice from Silica Nano-Opals through High-Temperature Annealing*; **P Moradifar**, JL Russell, TE Mallouk, N Alem; Pennsylvania State University

POSTER # 362
10:00 AM **968** In Situ *S/TEM Reduction Reaction of Ni-Mo_2C Catalyst for Biomass Conversion*; **KA Unocic**, J-S Cho; Oak Ridge National Laboratorory, DA Ruddy; National Renewable Energy Laboratory, C Yan, J Kropf; Argonne National Laboratory, J Miller; Purdue University, TR Krause; Argonne National Laboratory, S Habas; National Renewable Energy Laboratory

POSTER # 363
10:00 AM **969** *Replicating Bulk Electrochemistry in Liquid Cell Microscopy*; **K Karki**; Hummingbird Scientific, T Mefford; Stanford University, DH Alsem, N Salmon; Hummingbird Scientific, WC Chueh; Stanford University

POSTER # 364
10:00 AM **970** *Atom-by-Atom Assembly in Aberration Corrected STEM and the Role of Chemistry at the Surface of Graphene*; **O Dyck**; Oak Ridge National Laboratory, S Kim; Pusan National University, Republic of Korea, E Jimenez-Izal; University of California-Los Angeles, AN Alexandrova; Euskal Herriko Unibertsitatea and Donostia International Physics Center, Spain, SV Kalinin, S Jesse; Oak Ridge National Laboratory

POSTER # 365
10:00 AM **971** *Study of the Li-Oxygen Battery Discharging and Charging Process Using* In Situ *TEM*; **K He**, Y Yuan; University of Illinois-Chicago, X Bi; Argonne National Laboratory, T Foroozan; University of Illinois-Chicago, J Lu; Argonne National Laboratory, R Shahbazian-Yassar; University of Illinois-Chicago

A06.P1 Mesoscale Correlative Microscopy and Imaging of Physical, Environmental, and Biological Sciences

POSTER SESSION
Thursday: 10:00 AM • Room: Exhibit Hall

POSTER # 366
10:00 AM 972 *Multiscale Microstructural Features in Thermoelectric Materials;* **JA Grovogui**, T Slade; Northwestern University, Y Pan; Tsinghua University, China, I Witting, GJ Snyder, MG Kanatzidis, VP Dravid; Northwestern University

POSTER # 367
10:00 AM 973 *Aberration-Corrected Scanning Transmission Electron Microscopy and Energy-Dispersive Spectral Maps of DNA Origami Triangles Using Graphene Supports*; **TH Brintlinger**; U.S. Naval Research Laboratory, ND Bassim; McMaster University, Canada, RM Stroud, JT Robinson, S Buckhout-White, MG Ancona, ER Goldman; U.S. Naval Research Laboratory

POSTER # 368
10:00 AM 974 *Correlative HAADF-STEM and EDX-STEM Tomography for the 3D Morphological and Elemental Analysis of FinFET Semiconductor Devices*; **J Sorel**; Université de Lyon, INSA-Lyon; University Grenoble Alpes, France, M Jacob; University Grenoble Alpes, France, T Sanders; Arizona State University, A Grenier, R Bortolin Pinheiro, F Mazen; University Grenoble Alpes, France, T Epicier; Université de Lyon, INSA-Lyon, France, Z Saghi; University Grenoble Alpes, France

POSTER # 369
10:00 AM 975 *Effectively Characterize Planar-View FinFET Semiconductor Device Etch Uniformity by Introducing Diffraction Contrast in STEM Imaging*; **W Zhao**; GLOBALFOUNDRIES, U.S. Inc.

POSTER # 370
10:00 AM **976** *Structural, Micro-Structural and Electronic Structure Evolution in Polycrystalline Perovskite Electro-Ceramics Based on $Ba_{1-x}CaxTi_{0.9}Zr_{0.1}O_3$*; **GM Herrera-Pérez**; CONACyT, Mexico, LE Fuentes-Cobas; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, A Reyes-Montero; Universidad Nacional Autónoma de México (UNAM), Mexico, K Campos-Venegas, R Gomez-Bartres, J Canche-Tello, ME Montero-Cabrera; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, JR Plaisier; Elettra-Sincrotrone, Italy *et. al.*

POSTER # 371
10:00 AM **977** *Synthesis of Mesoporous Titania by Using Alkoxide Precursor and CTAB as Template*; **SE Borjas García**, P Sahare, N Dasgupta-Schubert, PG Martínez-Torres; Universidad Michoacana de San Nicolás de Hidalgo, Mexico, DK Tiwari; CONACyT-Colegio de Michoacan, Mexico, A Medina Flores, GA Rosas Trejo; Universidad Michoacana de San Nicolás de Hidalgo, Mexico

POSTER # 372
10:00 AM **978** *Environmental Transmission Electron Microscopy of Individual Atmospheric Particles from the North Atlantic;* **D Veghte**, S China, L Kovarik; Pacific Northwest National Laboratory, J Weis, M Gilles; Lawrence Berkeley National Laboratory, J Wang; Brookhaven National Laboratory, A Laskin; Purdue University

A ANALYTICAL SCIENCES POSTER SESSIONS – Thursday *continued*

POSTER # 373
10:00 AM **979** *Evaluating Compositional Variation in InGaAs Random Alloys Using Atom Probe Tomography;* **NA Kotulak**, ME Twigg, NA Mahadik, S Tomasulo, PL Bonanno; U.S. Naval Research Laboratory, NR Pereira; Ecopulse, Inc., K Knipling, MK Yakes; U.S. Naval Research Laboratory

POSTER # 374
10:00 AM **980** *An Assessment of Polarized Light Microscopy for the Quantification of Grain Size and Orientation in Titanium Alloys via Microanalytical Correlative Light to Electron Microscopy (CLEM)*; **H Safaie**, RL Mitchell, R Johnston, J Russell, C Pleydell-Pearce; Swansea University, United Kingdom

POSTER # 375
10:00 AM **981** *Combining High-Speed Video Imaging and Cryo-SEM to Study Droplet Impact Freezing on an Extremely Cold Surface*; **D Song**, C-H Choi, T Chou; Stevens Institute of Technology

POSTER # 376
10:00 AM **982** *Image Fusion in SIMS-Based Correlative Microscopy: Methodology and Applications*; **J-N Audinot**, F Vollnhals, S Eswara, T Wirtz; Luxembourg Institute of Science and Technology, Luxembourg

POSTER # 377
10:00 AM **983** *A Versatile Method for Correlated Imaging and Stitching of the Outer Surface of Cylindrically-Shaped Samples***; X Wang**; Nalco Water, An Ecolab Company

A07.P1 New Advances in Electron Energy Loss Spectroscopy and Allied Techniques

POSTER SESSION
Thursday: 10:00 AM • Room: Exhibit Hall

POSTER # 378
10:00 AM **984** *Characterization of Sub-Bandgap Energy States in $CuIn_xGa_{(1-x)}Se_2$ and Transparent Conducting Oxides with Electron Energy-Loss Spectroscopy*; **J Deitz**, PK Paul; The Ohio State University, S Karki, S Marsillac; Old Dominion University, A Arehart; The Ohio State University, J Walls, J Bowers; Loughborough University, United Kingdom, T Grassman; The Ohio State University *et. al.*

POSTER # 379
10:00 AM **985** *Characterization of Mixed Metal Oxide Interfaces Based on TiO_2-Supported CeO_{2-x} Nanoparticles*; **DM Haiber**, T-U Phan, K Venkatraman, PA Crozier; Arizona State University

POSTER # 380
10:00 AM **986** *Aloof-Beam Vibrational Electron Energy-Loss Spectroscopy of Adsorbate/Metal Particle Systems*; **K Venkatraman**, K March, P Rez, PA Crozier; Arizona State University

POSTER # 381
10:00 AM **987** *Investigation of Surface and Bulk Vibrational Modes in SiC Polytypes Using Spatially Resolved Monochromated HREELS*; **CA Gadre**, X Yan, X Pan; University of California-Irvine

POSTER # 382
10:00 AM **988** (M&M STUDENT SCHOLAR) *EELS Analysis of Bulk Plasmon Harmonics of Aluminium at 30 keV*; **F Voisard**; Université Mcgill, Canada, N Brodusch; McGill University, Canada, ML Trudeau; Hydro-Québec Research Institute, Canada, H Demers, K Zaghib; Hydro-Quebec, Canada, R Gauvin; McGill University, Canada

POSTER # 383
10:00 AM **989** (M&M STUDENT SCHOLAR) *Momentum Resolved EELS of Plasmons at Al Grain Boundaries without a q-Slit Aperture*; **ER Hoglund**, JM Howe; University of Virginia

POSTER # 384
10:00 AM **990** *EELS of the Interface between Al and Glass Formed with a High Speed Collision Process of Cold Spray*; **M Song**, H Araki, S Kuroda; National Institute for Materials Science, Japan, K Sakaki; Shinshu University, Japan

POSTER # 385
10:00 AM **991** *Electron Microscopy and Electron Energy-Loss Spectroscopy (EELS) of Few-Layer Chemically-Exfoliated Phosphorene Flakes*; **HM ElSherif**, ND Bassim; McMaster University, Canada

POSTER # 386
10:00 AM **992** *Quantification of Composition of Epitaxial Si/SiGe by EELS*; **MA Gribelyuk**; GLOBALFOUNDRIES, B Fu; Entegris, W Zhao; GLOBALFOUNDRIES

POSTER # 387
10:00 AM **993** *Advantages of Direct Detection and Electron Counting for High-Energy Resolution and Monochromated Electron Energy Loss Spectroscopy Data Acquisition*; **P Longo**, RD Twesten; Gatan Inc., A Carranco Rodriguez, G Botton; McMaster University, Canada

POSTER # 388
10:00 AM **994** *Molecular Excitation Spectroscopy near Metallic Surfaces Using Electron Energy Loss Spectroscopy*; **P Abellan**; SuperSTEM Laboratory, United Kingdom, PZ El-Khoury; Pacific Northwest National Laboratory, FS Hage; SuperSTEM Laboratory, United Kingdom, WP Hess; Pacific Northwest National Laboratory, R Brydson; University of Leeds, United Kingdom, Q Ramasse; SuperSTEM Laboratory, United Kingdom

A08.P1 Machine Learning and Compressive Sensing for Signal Processing and Image Reconstruction in Microscopy and Microanalysis

POSTER SESSION
Thursday: 10:00 AM • Room: Exhibit Hall

POSTER # 389
10:00 AM **995** *Real-time Image Processing and Restoration Prototype for the SEM: Initial Steps*; G Chilton; BT plc, United Kingdom, BC Breton, DM Holburn; University of Cambridge, United Kingdom, **NH Caldwell**; University of Suffolk, United Kingdom

POSTER # 390
10:00 AM **996** *Tricky Registration for Unruly Data: Image Registration of Low-Signal-to-Noise Cryo-STEM Data*; **BH Savitzky**; Cornell University, TM McQueen; Johns Hopkins University, R Hovden; University of Michigan, LF Kourkoutis, I El Baggari, C Clement, E Waite; Cornell University, JP Sheckelton; Johns Hopkins University *et. al.*

POSTER # 391
10:00 AM **997** *Machine Learning Powered Image Segmentation*; **T Volkenandt**, S Freitag, M Rauscher; Carl Zeiss Microscopy GmbH, Germany

POSTER # 392
10:00 AM **998** *Reducing the Learning Population Size for Morphological Classification of Natural Materials: Example of Gold Grains from Electron Backscattered Images*; **A Néron**, R Girard, J Tremblay; IOS Services Geoscientifiques Inc., Canada, PL Bédard, K Bouchard; Université du Québec à Chicoutimi, Canada

POSTER # 393
10:00 AM **999** *Coupling of First Principles and Machine Learning for High Throughput Calculation of Evaporation Fields*; **J Peralta**; Universidad Andres Bello, Chile, S Broderick; University of Buffalo, C Loyola; Universidad Andres Bello, Chile, K Rajan; University of Buffalo

POSTER # 394
10:00 AM **1000** *Machine Learning for Atomic Scale Chemical and Morphological Assessment;* **S Broderick**, T Zhang, BU Kota, R Subramanian, S Setlur, V Govindaraju, K Rajan; University at Buffalo

POSTER # 395
10:00 AM **1001** *Extended High Efficiency Computed Tomography with Optimized Recursions;* **WR Jarisch**; Cyber Technology, Inc., MJ Curry; University of Maryland, PJ Basser; National Institutes of Health

POSTER # 396
10:00 AM **1002** *Deep Convolutional Neural Network Approach as a Universal Tool for Determination of Local 3D Structure from ABF STEM Images of Perovskites*; N Laanait, **A Borisevich**; Oak Ridge National Laboratory

POSTER # 397
10:00 AM **1003** *Dragonfly as a Platform for Easy Image-Based Deep Learning Applications*; R Makovetsky, N Piché, **M Marsh**; Object Research Systems, Canada

A12.P1 The FIB-SEM Laboratory: Sample Preparation and Beyond

POSTER SESSION
Thursday: 10:00 AM • Room: Exhibit Hall

POSTER # 398
10:00 AM **1004** *The Path to Quantitative 3D Metrology: FIB-SEM 3D Tomography in Data Storage Industry*; **Z Li**, J Fang, H Wang; Western Digital Corporation

POSTER # 399
10:00 AM **1005** *High-Accuracy Sample Preparation for Three-Dimensional Atom Probe Tomography Using Orthogonal Column Layout FIB-SEM and its STEM function;* **M Tsuchiya**, Y Orai, TS Sato; Hitachi High-Technologies Corporation, Japan, X Man; Hitachi High-Tech Science Corporation, Japan, J Katane, T Onishi; Hitachi High-Technologies Corporation, Japan

POSTER # 400
10:00 AM **1006** (MSA PROFESSIONAL TECHNICAL STAFF MEMBER AWARD - PHYSICAL SCIENCES) *Vacuum-Assisted* Ex Situ *Lift Out for Plan View FIB Specimen Preparation;* **LM Lowery**; Sandia National Laboratories, LA Giannuzzi; EXpressLO LLC, P Lu, PG Kotula, JR Michael; Sandia National Laboratories

POSTER # 401
10:00 AM **1007** *Development of Automated Micro-Sampling System and Application to Semiconductor Devices*; **T Sato**, Y Aizawa, M Suzuki, S Tomimatsu, J Katane; Hitachi High-Technologies Corporation, Japan

POSTER # 402
10:00 AM **1008** *Development of Electron Optics System for "ETHOS" High-Performance FIB-SEM*; **S Sato**, C Kamiya, R Hirano, T Nomaguchi, A Morikawa; Hitachi High-Technologies Corporation, Japan, H Suzuki, H Suzuki, Y Yamamoto; Hitachi High-Tech Science Corporation, Japan

POSTER # 403
10:00 AM **1009** *A Method to Prepare TEM Specimens by Focused Ion Beam Milling for Cu/Diamond Composites*; **L Wang**; The University of Texas-Dallas, H Zhang, X Wang; University of Science and Technology Beijing, China, J Wang, MJ Kim; The University of Texas-Dallas

POSTER # 404
10:00 AM **1010** *A Universal Method of* In Situ *FIB Lift-Out for Cryogenic Samples*; J Lindsay; Oxford Instruments, United Kingdom, C Parmenter; University of Nottingham, United Kingdom**, J Goulden**; Oxford Instruments, United Kingdom

Scientific Program

A ANALYTICAL SCIENCES POSTER SESSIONS – Thursday *continued*

POSTER # 405
10:00 AM **1011** *A Method for Plan-View FIB Liftout of Near Surface Defects with Minimal Beam-Induced Damage*; **WL York**, D Medlin, J Sugar, P Noell; Sandia National Laboratories

POSTER # 406
10:00 AM **1012** *A Unique Approach for Preparing Cross-Sectional EM Study of Textile Fibers*; **W-A Chiou**, S-C Liou, J Rao, TK Maugel; University of Maryland-College Park

POSTER # 407
10:00 AM **1013** *The NanoWorkstation: Complementing FIB-SEM Tools with Micromanipulators*; **AJ Smith**, A Rummel, M Kemmler, K Schock, S Kleindiek; Kleindiek Nanotechnik, Germany

POSTER # 408
10:00 AM **1014** *Characterization of the CIGS Solar Cell System in the FIB-SEM Laboratory*; **F Pérez-Willard**; Carl Zeiss Microscopy GmbH, Germany, T Magorian Friedlmeier; Center for Solar Energy and Hydrogen Research Baden-Württemberg, Germany, J Braggin; Carl Zeiss Microscopy, LLC

POSTER # 409
10:00 AM **1015** *NanoFab with SIMS – Recent Results from the BAM-L200 Analytical Standard and Semiconductor Samples;* B Lewis, F Khanom, **J Notte**; Carl Zeiss Microscopy, LLC

POSTER # 410
10:00 AM **1016** *Technical Refinement of the Orage Ga-FIB Column and Optimizing its Control for Routine Analytical Tasks*; **T Hrnčíř**, M Rudolf, M Kocman; TESCAN Brno, Czech Republic, J-B Mellier, L Alcaraz, A Delobbe; Orsay Physics S.A., France

POSTER # 411
10:00 AM **1017** *Automatic End-Point Detection for Ar+ Milling of FIB* In Situ *and* Ex Situ *Lift-Out Specimens from Semiconductor Devices*; **CS Bonifacio**; E.A. Fischione Instruments Inc., LA Giannuzzi; EXpressLO LLC, P Nowakowski, JT Harbaugh, MJ Campin; E.A. Fischione Instruments Inc., M Boccabella; E.A. Fischione Instruments Inc., ML Ray; E.A. Fischione Instruments Inc., PE Fischione; E.A. Fischione Instruments Inc.,

POSTER # 412
10:00 AM **1018** (M&M STUDENT SCHOLAR) *Coloring with Focused Ion Beam Fabricated Nanostructures;* **V Garg**; IITB Monash Research Academy, India, RG Mote; Indian Institute of Technology Bombay, India, J Fu; Monash University, Australia

POSTER # 413
10:00 AM **1019** *Investigation of Slice Thickness for FIB Tomography in a Plasma-Focused Ion Beam System*; **B Van Leer**, R Kelley; Thermo Fisher Scientific, B Winiarski; Thermo Fisher Scientific, Czech Republic

POSTER # 414
10:00 AM **1020** *Preparation of Sharp Tip Samples Using a Tescan GAIA$_3$ FIB-SEM System*; **J-G Zheng**; University of California-Irvine

POSTER # 415
10:00 AM **1021** *Low-Energy Argon Broad Ion Beam and Narrow Ion Beam Milling of* In Situ *Lift-Out FIB Specimens*; **MJ Campin**, CS Bonifacio, PE Fischione; E.A. Fischione Instruments, Inc.

A13.P1 Pushing the Limits of Cryo-EM

POSTER SESSION
Thursday: 10:00 AM • Room: Exhibit Hall

POSTER # 416
10:00 AM **1022** *Performance of a Novel Detector for TEM Employing a 4T Pixel Design for On-Chip Correlated Double Sampling and a Selectable Full-Well Capacity*; M Oster, R Ghadimi, **H Tietz**; Tietz Video and Imaging Processing Systems GmbH, Germany

POSTER # 417
10:00 AM **1023** *Routine Determination of Ice Thickness by Energy Filtration*; **WJ Rice**, A Cheng, AJ Noble, ET Eng, LY Kim, B Carragher, CS Potter; New York Structural Biology Center

POSTER # 418
10:00 AM **1024** (ROBERT P. APKARIAN AWARD - BIOLOGICAL SCIENCES) *2.5 Å Resolution Cryo-EM Structure of Human Apo-Ferritin Using an Optimized Workflow for Volta Phase Plate*; **K Li**, T Klose, C Sun, Y Liu, W Jiang; Purdue University

POSTER # 419
10:00 AM **1025** *High Resolution Cryo-TEM Single-Particle Averaging Reconstruction with Beam-Image Shift*; **A Cheng**, E Eng; New York Structural Biology Center, M Alink; Thermo Fisher Scientific, W Rice, K Jordan, L Kim, CS Potter, B Carragher; New York Structural Biology Center

POSTER # 420
10:00 AM **1026** *Characterizing Dense Nanosuspensions Using Cryo-SEM*; **NN Khawaja**, D Goldfarb, S Mittal, I Kazakevich, M Lamm; Merck & Co.

POSTER # 421
10:00 AM **1027** *Self-Wicking Nanowire Grids*; **H Wei**, V Dandey, Z Zhang, A Raczkowski, W Rice, B Carragher, C Potter; New York Structural Biology Center

POSTER # 422
10:00 AM **1028** *Microscopy Observation of Lithium Deposition Behavior on Graphene Matrix*; **T Foroozan**, S Sharifi-Asl, R Shahbazian-Yassar; University of Illinois-Chicago

A14.P1 Quantitative Magnetic Characterization in the TEM

POSTER SESSION
Thursday: 10:00 AM • Room: Exhibit Hall

POSTER # 423
10:00 AM **1029** (M&M STUDENT SCHOLAR) *Cryogenic TEM Studies of Bloch and Néel Skyrmion Textures in Lacunar Spinels and Cubic Helimagnets*; F Seifert, FL Kern; Leibniz Institute for Solid State and Materials Research Dresden, Germany, I Kézsmárki; University of Augsburg, Germany, U Rößler, **D Wolf**, S Schneider; Leibniz Institute for Solid State and Materials Research Dresden, Germany, D Pohl; Dresden University of Technology, Germany, B Büchner; Leibniz Institute for Solid State and Materials Research Dresden, Germany *et. al.*

POSTER # 424
10:00 AM **1030** *Characterizing Dzyaloshinskii Domain Walls in Asymmetric [Pt/Co/Ni/Ir]N Multi-Layers Using Lorentz TEM*; **MP Li**; Carnegie Mellon University, M De Graef; Carnegie Mellon Univesity, V Sokalski; Carnegie Mellon University

POSTER # 425
10:00 AM **1031** *Visualized Effects of Oxidation and Temperature on Vortex-State Fe_3O_4 Particles Examined by Environmental TEM and Off-Axis Electron Holography*; **TP Almeida**; University of Glasgow, United Kingdom, AR Muxworthy; Imperial College London, United Kingdom, W Williams; University of Edinburgh, United Kingdom, T Kasama, T Hansen; Technical University of Denmark, Denmark, P Brown; University of Nottingham, United Kingdom, A Kovács, R Dunin-Borkowski; Forschungszentrum Jülich, Germany

POSTER # 426
10:00 AM **1032** *Study of Vortex State in Permalloy Plates Using Optimized Electron Holography*; E Ortega; University of Texas-San Antonio, B Mora; University of the Basque Country, Spain, C Monton; University of Texas-San Antonio, C Redondo; University of the Basque Country, Spain, J Arellano; University of Texas-San Antonio, R Morales; University of the Basque Country, Spain, E Voelkl; HoloWerk LLC, **A Ponce**; University of Texas-San Antonio

POSTER # 427
10:00 AM **1033** *Revealing the Magnetic Interactions of DP in Cu-Co Alloys by Electron Holography*; **NM Suguihiro**; Pontifícia Universidade Católica do Rio de Janeiro, Brazil, MR Mc Martney, DJ Smith; ASU, AM Costa, IG Solórzano; Pontifícia Universidade Católica do Rio de Janeiro, Brazil

POSTER # 428
10:00 AM **1034** *Direct Laser Deposition and Homogenization of Ni-Co-Mn-Sn Magnetocaloric Material*; **E Stevens**, K Kimes; University of Pittsburgh, V Chernenko, P Lazpita; BCMaterials & University of Basque Country, Spain, A Wojcik, W Maziarz; Polish Academy of Science, Poland, M Chmielus; University of Pittsburgh

POSTER # 429
10:00 AM 1035 *Microstructural Development in Melt-Spun $Nd_2Fe_{14}B$ Under High Magnetic Field Annealing;* **L Zhou**; Ames Lab, W Carter, M Kesler; Oak Ridge National Laboratory, M Kramer, T Kim, B Brandt Jensen, K Sun, O Palasyuk; Ames Laboratory *et. al.*

P PHYSICAL SCIENCES POSTER SESSIONS – Thursday

P04.P3 In Situ Methods for Probing Properties and Dynamics in Materials

POSTER SESSION
Thursday: 10:00 AM • Room: Exhibit Hall

POSTER # 430
10:00 AM **1036** In Situ *TEM Observation of Crystallization in Phase-Change Material*; **K Karki**; Hummingbird Scientific, VL Bird; Oregon State University, DH Alsem; Hummingbird Scientific, MK Santala; Oregon State University

POSTER # 431
10:00 AM **1037** In Situ *TEM Heating Experiment to Study Effects of Cyclic Thermal Gradients on Ti-6Al-4V Under Additive Manufacturing Growth Conditions*; **M Shao**, C-H Li; The Ohio State University, CL Frederick, SSS Babu; University of Tennessee, JR Jinschek; The Ohio State University

POSTER # 432
10:00 AM **1038** In Situ *SEM and TEM Nanomechanical Study of Wear and Failure Mechanisms*; **S Bhowmick**, E Hintsala, D Stauffer, S Asif; Bruker Nano Surfaces

POSTER # 433
10:00 AM **1039** In Situ *TEM Evidence of Temperature Dependent Defect Morphology in Heavy Ion Irradiated Nanocrystalline Molybdenum*; **J Nathaniel**, PK Suri, M Taheri; Drexel University, JK Baldwin; Center for Integrated Nanotechnologies, M Kirk, M Li; Argonne National Laboratory

POSTER # 434
10:00 AM **1040** *Approaches to Quantifying the Dynamics of Nanostructures Using* In Situ *Electron Microscopy*; **TW Hansen**, P Liu, J Madsen, MR Nielsen, J Schiøtz, JB Wagner; Technical University of Denmark, Denmark

POSTER # 435
10:00 AM **1041** *Visualizing and Quantifying the Cationic Mobility at {100} Surfaces of Ceria: Application to CO_2 Adsorption/Desorption Phenomena in the Environmental Transmission Electron Microscope*; **M Bugnet**; CNRS – Université de Lyon, France, SH Overbury, Z Wu; Oak Ridge National

P PHYSICAL SCIENCES POSTER SESSIONS – Thursday *continued*

Laboratory, FJCS Aires, F Meunier; CNRS – University of Lyon, France, T Epicier; CNRS – Université de Lyon, France

POSTER # 436
10:00 AM **1042** (M&M STUDENT SCHOLAR) *Microstructure and Mechanical Behavior of the 3D-Printed Inconel 718:* In Situ *TEM Study*; **S Koul**, L Zhou, Y Sohn, A Kushima; University of Central Florida

POSTER # 437
10:00 AM **1043** In Situ *Transmission Electron Microscopy of Lithiation Dynamics in a SnO_2 Hollow Nanosphere*; **JH Chang**, JY Cheong, I-D Kim, JM Yuk; Korea Advanced Institute of Science and Technology, Republic of Korea

POSTER # 438
10:00 AM **1044** In Situ *STEM/SEM study of Thermal Coarsening of Pt-Modified Nanoporous Gold in Oxygen and Hydrogen*; **A El-Zoka**; University of Toronto, Canada, J Howe; Hitachi High-Technologies America Inc., P Brodersen; Ontario Centre for the Characterisation of Advanced Materials, Canada, D Perovic, R Newman; University of Toronto, Canada

POSTER # 439
10:00 AM **1045** *Subsurface Oxygen Formation During H_2 Oxidation Over Rh, Pt and Pt-Rh Model Nanoparticles;* **SVM Lambeets**, C Barroo; Université Libre de Bruxelles, Belgium, S Owczarek; University of Wrocław, Poland, N Kruse; Washington State University, T VisartdeBocarmé; Université Libre de Bruxelles, Belgium

P06.P1 Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing Earth Materials

POSTER SESSION
Thursday: 10:00 AM • Room: Exhibit Hall

POSTER # 441
10:00 AM **1047** *Structural Characterization of Natural Quartz by Scanning TEM;* J Busam; Norwegian University of Science and Technology (NTNU), Norway, S Wenner; SINTEF, Norway, A-M Muggerud; The Quartz Corp, Norway, **ATJ van Helvoort**; Norwegian University of Science and Technology (NTNU), Norway

POSTER # 442
10:00 AM **1048** *Electron Probe Microanalysis of Irradiated U-Pu-Zr Fuel with Added Minor Actinides;* **KE Wright**, J Harp, L Capriotti; Idaho National Laboratory

POSTER # 443
10:00 AM **1049** *Development and Application of an Automatic Cluster Analysis System for EPMA Using Neural Network*; **N Mori**, N Kato, M Morita; JEOL Ltd., Japan

POSTER # 444
10:00 AM **1050** *Study of the Development of Calcite Crystals and Carbonation by ESEM and DTA*; E Soukupova, **V Nedela**; Institute of Scientific Instruments of the CAS, Czech Republic

POSTER # 445
10:00 AM **1051** *Chemical Microanalysis of SnO_2-MnO_2 Nanofibers in an Electron Probe Microanalyzer*; Z Luo, G Geroge, **ZR Mobley**, SL Jackson; Fayetteville State University

POSTER # 446
10:00 AM **1052** *Cathodoluminescence from Nanoscale Scintillators Using an Electron Probe Microanalyzer*; **CD Ashford**; Fayetteville State University, TC Trapier; Cumberland International Early College High School, G George; Fayetteville State University, J Davis; Oak Ridge Associated Universities, D Ila, Z Luo; Fayetteville State University

POSTER # 447
10:00 AM **1053** *Characterizing Unlayered-Graphene in Homemade Core\Rim Carbon Raindrops*; **T Hundley**, P Fraundorf; University of Missouri-Saint Louis

POSTER # 448
10:00 AM **1054** *Analysis of Anorthite Dissolution on the Submicrometer Scale*; **MG Malenda**, H Jung, J Squier, B Gorman, A Navarre-Sitchler; Colorado School of Mines

POSTER # 449
10:00 AM **1055** *Electron Probe Microanalysis of Minor Actinide Bearing Fuels Studied within the FUTURIX-FTA International Collaboration: $(Pu_{0.8}Am_{0.2})O_2$ + 86 vol. % Mo and $(Pu_{0.23}Am_{0.25}Zr_{0.52})O_2$ + 60 vol. % Mo*; **P Pöml**; European Commission - Joint Research Centre, Germany

POSTER # 450
10:00 AM **1056** *Phase Stability of Ni-Base Alloy 625 Produced by Direct Metal Deposition*; C Labre, AL Pinto; Brazilian Center of Research in Physics (CBPF), Brazil, **IG Solórzano**; Pontifical Catholic University of Rio de Janeiro, Brazil

POSTER # 451
10:00 AM **1057** *Morphological Analysis of Particles Formed by Aeolian Abrasion in Dune Sands*; **R Morales-Ochoa**, FA Paz-Moreno; Universidad de Sonora, Mexico, E Ortiz-Rascón; CONACYT-Universidad de Sonora, Mexico, RC Carrillo-Torres, ME Álvarez-Ramos; Universidad de Sonora, Mexico

POSTER # 452
10:00 AM **1058** *Resolving Problems of EPMA-Derived Water Contents of Melt Inclusions*; **EC Hughes**, B Buse, SL Kearns, JD Blundy; University of Bristol, United Kingdom

POSTER # 453

10:00 AM **1059** *Electron Probe Technique for Measuring the Iron Oxidation State of Silicate Glasses;* **EC Hughes**, B Buse, SL Kearns, JD Blundy; University of Bristol, United Kingdom

P09.P3 Microstructure and Mechanics Deformation

POSTER SESSION
Thursday: 10:00 AM • Room: Exhibit Hall

POSTER # 454

10:00 AM **1060** *Sintering and Nanoindentation of Ti_2SnC (M_2AX) Ceramics – Attractive Materials in the Topic of Nuclear Engineering*; **S Bakardjieva**; Institute of Inorganic Chemistry of the CAS, Czech Republic, J Vacik; Nuclear Physics Institute of the CAS, Czech Republic, J Plocek; Institute of Inorganic Chemistry of the CAS, Czech Republic, P Horak; Nuclear Physics Institute of the CAS, Czech Republic, J Nemecek; Czech Technical University-Prague, Czech Republic, R Klie; University of Illinois-Chicago

POSTER # 455

10:00 AM **1061** *Influence of Sintering Temperature on AlCoCrFeNiMo(Ti_x, x=0,1) High Entropy Alloys;* **FJ Baldenebro-Lopez**; Universidad Autónoma de Sinaloa, Mexico, K Campos-Venegas, R Martínez-Sánchez; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, H Camacho-Montes; Universidad Autónoma de Sinaloa, Mexico, A Duarte-Moller, CD Gómez-Esparza; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 456

10:00 AM **1062** *Al-Graphite Composites Prepared by Powder Metallurgy Applying an Innovative Sintering Route, Which Avoids Carbides Formation*; **JM Mendoza-Duarte**; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, FC Robles-Herandez; University of Houston, C Carreño-Gallardo, I Estrada-Guel, R Martinez-Sanchez; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 457

10:00 AM **1063** *Microstructural Characterization Al-Cu-Mg-WC Composite Powders Prepared by Mechanical Alloying*; G Rodríguez-Cabriales; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, A Lometo-Sánchez; Universidad Autónoma de Chihuahua (UACH), Mexico, I Estrada-Guel, C Garay-Reyes; Centro de Investigación en Materiales Avanzados(CIMAV), Mexico, MC Maldonado-Orozco; Universidad Autónoma de Chihuahua (UACH), Mexico, **R Martínez-Sánchez**; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 458

10:00 AM **1064** *Fast Low-Temperature Consolidation of AlCoCrFeMnNi High Entropy Alloy*; M Ruiz-Esparza-Rodriguez, C Garay-Reyes, I Estrada-Guel, J Mendoza-Duarte; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, M Maldonado-Orozco; Universidad Autónoma de Chihuahua (UACH), Mexico, **R Martinez-Sanchez**; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 459

10:00 AM **1065** *Nanocrystalline Particles of CoCrFeMnMoNi High Entropy Alloy as Reinforcement Material in an Al Matrix*; **MF Bujanda-Sánchez**; Universidad Tecnológica de Ciudad Juárez, Mexico, I Estrada-Guel, R Martínez-Sánchez; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, A Torres-García; Universidad Tecnológica de Ciudad Juárez, Mexico,CA Rodríguez-González; Univesidad Autónoma de CIudad Juárez, Mexico, A Duarte-Moller, CD Gómez-Esparza; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 460

10:00 AM **1066** *Effect of Mg additions, Hot-Extrusion and Cold-Rolling on Microstructure and Mechanical Properties of 2024 Alloy during Aging*; C Garay-Reyes; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, A Hernández-Arrollo; Universidad Autónoma de Chihuahua (UACH), Mexico, I Estrada-Guel, HM Medrano-Prieto, JM Mendoza-Duarte; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, MC Maldonado-Orozco; Universidad Autónoma de Chihuahua (UACH), Mexico, **R Martínez-Sánchez**; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 461

10:00 AM **1067** *Microstructural Evolution of CuNi/Al_2O_3 Nanocomposites: From Nanoparticles to Cold Rolled and Annealed Ribbons*; MI Ramos, EA Brocchi, **G Solorzano**; Pontifical Catholic University of Rio de Janeiro, Brazil

POSTER # 462

10:00 AM **1068** *Microstructural Study of a Zn-Ni Alloy Prepared by Ball Milling Using Two Different Devices*; **I Estrada-Guel**; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, J Miranda-Hernández; Universidad Autónoma del Estado de Mexico, Mexico, C Gómez-Esparza; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, H Herrera-Hernández; Universidad Autónoma del Estado de Mexico. Laboratorio de Investigación y Desarrollo de Materiales Industriales, Mexico, R Martínez-Sánchez; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

P PHYSICAL SCIENCES POSTER SESSIONS – Thursday *continued*

POSTER # 463

10:00 AM **1069** *Chromium Effect as Grain Growth Inhibitor of Nanostructured WC-10Co after Sintering by Hot Isostatic Pressing*; **CG Garay-Reyes**, MA Ruiz-Esparza-Rodríguez, I Estrada Guel; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico, SE Hernández-Martínez, J Hernández-Rivera, J Cruz-Rivera; Universidad Autónoma de San Luis Potosí, Mexico, JS Castro Carmona; Universidad Autónoma De Ciudad Juárez (UACJ), Mexico, R Martínez-Sánchez; Centro de Investigación en Materiales Avanzados (CIMAV), Mexico

POSTER # 464

10:00 AM **1070** *Effect of Process Control Agent on a Mechanically Milled Pure Aluminum Sample*; A Limas-Piña; Tecnológico Nacional de Mexico Instituto Tecnológico de Chihuahua, Mexico, **I Estrada-Guel**, R Martinez-Sanchez; Centro de Investigacion en Materiales Avanzados (CIMAV), Mexico

A ANALYTICAL SCIENCES SYMPOSIA – Thursday Afternoon

A02.7 Atomic-Scale Functional Imaging in Aberration-Corrected Electron Microscopy

SESSION CHAIRS:
Miaofang Chi; Oak Ridge National Laboratory
Marta D. Rossell; Swiss Federal Laboratories for Materials Science and Technology, Switzerland

PLATFORM SESSION
Thursday: 1:30 PM • Room: 339

1:30 PM **1071** (Invited) *Towards Quantitative Atomic-Scale Imaging of Magnetization Distributions in Materials Using Aberration-Corrected Off-Axis Electron Holography*; **RE Dunin-Borkowski**, J Caron, P Diehle, AH Tavabi, A Kovács; Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons and Peter Grünberg Institute, Germany

2:00 PM **1072** *Linear and Nonlinear Reconstruction Algorithms for Atomic-Resolution Tomography Using Phase Contrast Electron Microscopy*; **C Ophus**; Lawrence Berkeley National Laboratory, D Ren, M Chen, C Groschner, M Scott, L Waller; University of California-Berkeley

2:15 PM **1073** *Deep Convolutional Neural Networks for Symmetry Detection*; **RK Vasudevan**, O Dyck, M Ziatdinov, S Jesse, N Laanait, SV Kalinin; Oak Ridge National Laboratory

2:30 PM **1074** (M&M POSTDOCTORAL SCHOLAR) *Atomic-Resolution Electric Field Measurements with a Universal Detector;* **JA Hachtel**; Oak Ridge National Laboratory, A Thind, R Mishra; Washington University in St. Louis, JC Idrobo, M Chi; Oak Ridge National Laboratory

2:45 PM **1075** *Accurate Calculation of CBED Patterns for 4D STEM Using Electron Densities Calculated by Density Functional Theory;* **MP Oxley**, AY Birenbaum, T Pandey, VR Cooper, M Chi; Oak Ridge National Laboratory

A04.7 *In Situ* Transmission Electron Microscopy in Liquid and Gas Cells

SESSION CHAIR:
Layla Mehdi; University of Liverpool, United Kingdom

PLATFORM SESSION
Thursday: 1:30 PM • Room: 345-346

1:30 PM **1076** (Invited) *Controlling Water Vapor in Gas-Cell Microscopy Experiments;* **KA Unocic**, HM Meyer III; Oak Ridge National Laboratory, W Walden, N Marthe; Protochips, WC Bigelow; University of Michigan, LF Allard; Oak Ridge National Laboratory

2:00 PM **1077** *Combined* In Situ *and* Ex Situ *Study on Synthesis of Nanostructured Catalyst in Solid State*; **W Gao**, C Addiego; University of California-Irvine, Y Ma, J Wu; Shanghai Jiao Tong University, China, X Pan; University of California-Irvine

2:15 PM **1078** *Photocorrosion of Particles in Aqueous Solutions in an Open Cell in the Environmental Transmission Electron Microscope*; **B Levin**, D Haiber, Q Liu, PA Crozier; Arizona State University

2:30 PM **1079** (Invited) *Exploring Environmental Reactions in "Real World" Materials Using* In Situ *Analytical TEM*; **MG Burke**; University of Manchester, United Kingdom, A Janssen; AkzoNobel, Netherlands, ML Martin; National Institute of Standards and Technology, G Bertali, E Prestat, T Woodward; University of Manchester, United Kingdom, P Sofronis; University of Illinois - Urbana-Champaign, B Connolly; University of Manchester, United Kingdom

A06.2 Mesoscale Correlative Microscopy and Imaging of Physical, Environmental, and Biological Sciences

SESSION CHAIR:
Nestor Zaluzec; Argonne National Laboratory

PLATFORM SESSION
Thursday: 1:30 PM • Room: 322

1:30 PM **1080** (Invited) *Correlative Spectromicroscopy and Tomography Involving Soft X-Ray Methods*; **AP Hitchcock**, X Wang, K Grandfield; McMaster University, Canada

2:00 PM **1081** *Investigation of Cracking in Additively Manufactured IN718 by Correlative Tomography*; **B Winiarski**, G Pyka; Thermo Fisher Scientific, Czech Republic, AC Wade; University of Manchester, United Kingdom, A Chirazi, D Lichau; Thermo Fisher Scientific, France, GM Burke, PJ Withers; The University of Manchester, United Kingdom

2:15 PM **1082** In Situ *Correlative Imaging and Spectroscopy of Boehmite Particles in Liquid*; **X-Y Yu**, J Yao, B Arey, Z Zhu, J Chun; Pacific Northwest National Laboratory

2:30 PM **1083** *Exploring Li Distribution in Li-Ion Batteries with FIB-SEM and TOF-SIMS;* **DJ Miller**, D Zapotok, P Anzalone; TESCAN USA, T **Šamořil**, L Hladík, H Tesařová; TESCAN Orsay Holding, Czech Republic, K Yao, VA Maroni; Argonne National Laboratory *et. al.*

2:45 PM **1084** *Integrated Correlative Light Electron Microscopy for Automated Array Tomography*; **R Lane**; Delft University of Technology, Netherlands, P de Boer, B Giepmans; University Medical Centre Groningen, Netherlands, J Hoogenboom; Delft University of Technology, Netherlands

A07.4 New Advances in Electron Energy Loss Spectroscopy and Allied Techniques

SESSION CHAIRS:
Maria Varela; Universidad Complutense de Madrid, Spain
Ian MacLaren; University of Glasgow, United Kingdom

PLATFORM SESSION
Thursday: 1:30 PM • Room: 341

1:30 PM **1085** (Invited) *EELS Analysis of Nano-Sized Particles in a Matrix;* **AJ Craven**, B Sala, I MacLaren; Glasgow University, United Kingdom

2:00 PM **1086** *Using EELS to Determine He Pressure Inside Nanometer-Scale Bubbles;* **JD Sugar**; Sandia National Laboratories, RD Twesten; Gatan, Inc., NC Bartelt, CA Taylor, NR Catarineu, DB Robinson; Sandia National Laboratories

2:15 PM **1087** (M&M STUDENT SCHOLAR) *Methods for Simulation of Electron Energy Loss Spectra for Low Energy Edges in Battery Materials*; **Q Stoyel**, F Voisard, N Brodusch, GP Demopoulos, R Gauvin; McGill University, Canada

2:30 PM **1088** *DualEELS at High Energy Losses: Exploring Lower Accelerating Voltages and Absolute Cross Sections*; **I MacLaren**; University of Glasgow, United Kingdom, H Sawada; JEOL UK Ltd., Japan, S McFadzean, L Gardiner; University of Glasgow, United Kingdom, KE MacArthur; Forschungszentrum Jülich, Germany, AJ Craven; University of Glasgow, United Kingdom

2:45 PM **1089** *Electron Energy Loss Spectroscopy of Actinides at the Nanogram Scale;* **A Mueller**, GJ-P Deblonde, P Ercius, RJ Abergel, AM Minor; Lawrence Berkeley National Laboratory

A08.3 Machine Learning and Compressive Sensing for Signal Processing and Image Reconstruction in Microscopy and Microanalysis

SESSION CHAIR:
Rowan Leary; University of Cambridge, United Kingdom

PLATFORM SESSION
Thursday: 1:30 PM • Room: 342

1:30 PM **1090** (Invited) *High-speed Fly-Scan Volumetric Imaging;* **D Gursoy**; Argonne National Laboratory

2:00 PM **1091** *Multivariate Analysis and Compressed Sensing Methods for Spectroscopic Electron Tomography of Semiconductor Devices;* M Jacob; Institut Nanosciences et Cryogénie-CEA, France, T Sanders; Arizona State University, N Bernier, A Grenier, R Bortolin Pinheiro, F Mazen, P Bayle-Guillemaud, **Z Saghi**; Institut Nanosciences et Cryogénie-CEA, France

2:15 PM **1092** *Inpainting Assisted Controlled Rotation Tomography (CORT)*; **Y Li**; Northwest University, China, KA Hujsak, V Backman, VP Dravid; Northwestern University

Scientific Program

A ANALYTICAL SCIENCES SYMPOSIA – Thursday Afternoon *continued*

2:30 PM **1093** (Invited) *Deep Learning Based Atom Segmentation and Noise and Missing-Wedge Reduction for Electron Tomography*; M Ge, **H Xin**; Brookhaven National Laboratory

A12.3 The FIB-SEM Laboratory: Sample Preparation and Beyond

SESSION CHAIRS:
Joshua F. Einsle, Emilie Ringe; University of Cambridge, United Kingdom
Timothy Burnett; University of Manchester, United Kingdom

PLATFORM SESSION
Thursday: 1:30 PM • Room: 328

1:30 PM **1094** (Invited) *Cryo-FIB Lamella Milling: A Comprehensive Technique to Prepare Samples of Both Plunge- and High-Pressure Frozen-Hydrated Specimens for* In Situ *Studies;* **M Schaffer**, W Baumeister, JM Plitzko, S Pfeffer; Max Planck Institute of Biochemistry, Germany, S Kleindiek; Kleindiek Nanotechnik GmbH, Germany, J Mahamid, M Heymann; Max Planck Institute of Biochemistry, Germany, AJ Smith; Kleindiek Nanotechnik GmbH, Germany *et. al.*

2:00 PM **1095** (Invited) *FIB/SEM Processing of Biological Samples;* **A Wolff**, Y Zhou; Queensland University of Technology, Australia, J Lin; Xiamen Stomatological Research Institute, China, Y Peng, J Ramshaw; CSIRO, Australia, Y Xiao; Queensland University of Technology, Australia

2:30 PM **1096** *An Improved FIB Sample Preparation Technique for Site-Specific Plan-View Specimens: A New Cutting Geometry;* **C Li;** Max Planck Institute for Solid State Research, Germany, G Habler, LC Baldwin, R Abart; University of Vienna, Austria

2:45 PM **1097** *FIB Milling Strategies for TEM Sample Preparation of Spheroidal Powder Particles;* **AT Ernst**, M Wei, M Aindow; University of Connecticut

A13.3 Pushing the Limits of Cryo-EM

SESSION CHAIRS:
Anchi Cheng; NY Structural Biology Center
Mike Marko; Wadsworth Center

PLATFORM SESSION
Thursday: 1:30 PM • Room: 349

1:30 PM **1098** (Invited) *Determining and Controlling the Surface Properties of Cryo-EM Specimen Supports;* **K Naydenova**, CJ Russo; MRC Laboratory of Molecular Biology, United Kingdom

2:00 PM **1099** (M&M STUDENT SCHOLAR) *Functionalized Graphene as Cryo-EM Supporting Film*; **J Park**; Korea Advanced Institute of Science and Technology, Republic of Korea, H Jeong, E Choi, J Hyun; Korea Basic Science Institute, Republic of Korea, JM Yuk; Korea Advanced Institute of Science and Technology, Republic of Korea

2:15 PM **1100** *Use of Focused Ion Beam as a Sample Preparation Tool for Cryo-Electron Tomography*; S Záchej; TESCAN Brno, Slovakia, J Havránková, K Rosíková; TESCAN Orsay Holding, Czech Republic, **R Váňa**, M Havelka; TESCAN Brno, Czech Republic

2:30 PM **1101** (Invited) *Innovation in CryoEM Sample Preparation: Towards Commercialization of Spotiton;* **RS King**, JP Moore, K Doering, RJ Walker, MC Darrow, MA Adams-Cioaba; TTP Labtech, Ltd., United Kingdom

A14.3 Quantitative Magnetic Characterization in the TEM

SESSION CHAIRS:
Darius Pohl; Technical University of Dresden, Germany
Ben McMorran; University of Oregon

PLATFORM SESSION
Thursday: 1:30 PM • Room: 338

1:30 PM **1102** (Invited) *Quantitative Magnetic Imaging of Skyrmions and Magnetic Thin Layers by Lorentz Transmission Electron Microscopy and Electron Holography;* **T Tanigaki**, T Akashi; Hitachi, Ltd., Japan

2:00 PM **1103** *Towards Induction Mapping of the 3D-Spin Texture of Skyrmions;* **S Schneider**, K Nielsch, A Lubk, D Wolf; IFW Dresden, Germany, MJ Stolt, S Jin; University of Wisconsin-Madison, D Pohl, B Rellinghaus; IFW Dresden, Germany *et. al.*

2:15 PM **1104** *Investigating Skyrmions Using Lorentz Transmission Electron Microscopy;* P Huang; École Polytechnique Fédérale de Lausanne, Switzerland, JS White; Paul Scherrer Institut, Switzerland, A Magrez; École Polytechnique Fédérale de Lausanne, Switzerland, T Giamarchi; University of Geneva, Switzerland, F Carbone, HM Ronnow, R Jayaraman, GF Mancini; École Polytechnique Fédérale de Lausanne, Switzerland *et. al.*

2:30 PM **1105** In Situ *Lorentz Transmission Electron Microscopy of FeRh Thin Films*; **MS Gorji**, D Wang, R Witte, X Mu, R Kruk, C Kübel, H Hahn; Karlsruhe Institute of Technology, Germany

2:45 PM **1106** *Quantitative Differential Phase Contrast Imaging of the Magnetostructural Transition and Current-Driven Motion of Domain Walls in FeRh Thin Films;* **TP Almeida**; University of Glasgow, United Kingdom, R Temple, J Massey; University of Leeds, United Kingdom, K Fallon, G Paterson; University of Glasgow, United Kingdom, T Moore; University of Leeds, United Kingdom, D McGrouther; University of Glasgow, United Kingdom, C Marrows; University of Leeds, United Kingdom *et. al.*

A15.3 Strain Analysis from Nano- to Micro-length Scales

SESSION CHAIRS:
Guoda Lian; IBM
Jiong Zhang; Intel

PLATFORM SESSION
Thursday: 1:30 PM • Room: 327

1:30 PM **1107** (Invited) *Strain Characterization of Advanced CMOS Transistors: An Industry Perspective;* **J Zhang**, X Weng; Intel Corporation, R Yuan; University of Illinois, Urbana-Champaign, L Pan, H Li, M Kuhn, K Johnson; Intel Corporation, J-M Zuo; University of Illinois, Urbana-Champaign *et. al.*

2:00 PM **1108** *Dynamical Effects on the Geometric Phase;* **L Meißner**, T Niermann, D Berger, M Lehmann; Technische Universität Berlin, Germany

2:15 PM **1109** *Strain Analysis of FinFET Device Utilizing Moiré Fringes in Scanning Transmission Electron Microscopy*; **Y Kondo**, N Endo, Y Aoyama, K Asayama, K-I Fukunaga; JEOL Ltd., Japan, CC Lin, H Kim; Integrated Service Technology, Taiwan

2:30 PM **1110** *Strain Analysis in Polycrystalline Diamond under Extreme Conditions;* **S Kaboli**, P Burnley; University of Nevada-Las Vegas

2:45 PM **1111** *Coherency and Thermal Evolution of Metastable and Stable β Phase Precipitates in Aluminum Alloy AA5456;* **D Foley**, A Lang; Drexel University, A Leff; U.S. Army Research Laboratory

B BIOLOGICAL SCIENCES SYMPOSIA – Thursday Afternoon

B06.3 Imaging Life at New Frontiers of Spatiotemporal Resolution and Adaptive Microscopy

SESSION CHAIRS:
Jay Potts; University of South Carolina Medical School
Teng-Leong Chew; Advanced Imaging Center-Janelia Research Campus

PLATFORM SESSION
Thursday: 1:30 PM • Room: 350

1:30 PM **1112** (Invited) (M&M STUDENT SCHOLAR) *Precisely Localizing Wavelength Sensitive Point-Spread Functions Engineered with a Silicon Oxide Phase Plate;* **JT Martineau**, EM Jorgensen, R Menon, J Gerton; University of Utah

2:00 PM **1113** (Invited) *Lensless Single Pixel Imaging with Laser Interference Patterns;* **JS Jackson**, DS Durfee; Brigham Young University

2:30 PM **1114** *LIQUITOPY ®: A Liquid Tunable Microscope to Study Chromatin Organization in the Cell Nucleus;* **A Diaspro**, S Pelicci, L Pesce, N Anthony, P Bianchini, I Cainero, M Di Bona, L Lanzanò; Istituto Italiano di Tecnologia, Italy *et. al.*

P PHYSICAL SCIENCES SYMPOSIA – Thursday Afternoon

P03.7 Nanoparticles and 1D Materials: Synthesis, Characteristics and Applications

SESSION CHAIR:
Moon Kim; University of Texas-Dallas

PLATFORM SESSION
Thursday: 1:30 PM • Room: 337

1:30 PM **1115** *Using a Combination of HAADF and SE Imaging to Locate Pt Nanoparticles within a Mesoporous Silica Diesel Oxidation Catalyst;* HN Pham; University of New Mexico, **JY Howe**; Hitachi High-Technologies America Inc., A Ghosh, M Melton, D Kunwar, EJ Peterson, AK Datye; University of New Mexico

1:45 PM **1116** *Direct Atomic-Scale Observation of Droplets Coalescence Driven Nucleation and Growth of Supported Bismuth Nanocrystal in the TEM;* J Li, **FL Deepak**; International Iberian Nanotechnology Laboratory (INL), Portugal

2:00 PM **1117** *Role of Anomalous Channeling on HAADF in a Quasi-1D KMn_6Bi_5 Structure;* **HJ Jung**; Northwestern University, J-K Bao, D-Y Chung; Argonne National Laboratory, MG Kanatzidis, VP Dravid; Northwestern University

2:15 PM **1118** *Size and Shape Distribution of Bipyramidal TiO_2 Nanoparticles by Transmission Electron Microscopy – an Inter-Laboratory Comparison*; **V-D Hodoroaba**; Federal Institute for Materials Research and Testing (BAM), Germany, K Yamamoto; National Institute of Advanced Industrial Science and Technology (AIST), Japan, EA Grulke; University of Kentucky

2:30 PM **1119** *Using HR-TEM for Geological Environment Investigation: A Case Study of Silver Nanoparticles Associated with Mine Waste in a World Heritage Site*; **BA Cymes**; Miami University, MP Krekeler; Miami University-Hamilton

P04.8 *In Situ* Methods for Probing Properties and Dynamics in Materials

SESSION CHAIR:
Chongmin Wang; Pacific Northwest National Laboratory

PLATFORM SESSION
Thursday: 1:30 PM • Room: 340

1:30 PM **1120** (Invited) In Situ *Visualization of Plasmon-Mediated Chemical Transformations at the Single and Sub-Particle Level*; **J Dionne**, M Vadai, D Angell, F Hayee, K Sytwu; Stanford University

2:00 PM **1121** *Mapping Crystallization Kinetics of Phase-Change Materials Over Large Temperature Ranges Using Complementary* In Situ *Microscopy Techniques*; VL Bird, AJ Rise; Oregon State University, K Karki, DH

Alsem; Hummingbird Scientific, GH Campbell; Lawrence Livermore National Laboratory, **MK Santala**; Oregon State Unversity

2:15 PM **1122** *Mapping Nanoscale Thermal Gradients in MoS2 Using Plasmon Energy Shifts*; **M Mecklenburg**, L Shen; University of Southern California, S Aloni; Lawrence Berkeley National Laboratory, S Cronin; University of Southern California

2:30 PM **1123** *3D Nano-Probes for Thermal Microscopy*; J Sattelkow, JE Froech, R Winkler; Graz University of Technology, Austria, C Schwalb, M Winhold, EG Fantner; GETec Microscopy Inc., Austria, **H Plank**; Graz University of Technology, Austria

2:45 PM **1124** *Time-Resolved Electron Holography by Interference Gating*; **T Niermann**, T Wagner, M Lehmann; Technische Universität Berlin, Germany

P06.3 Applications of Integrated Electron Probe Microscopy and Microanalysis in Characterizing Natural and Synthetic Materials

SESSION CHAIRS:
Colin MacRae; CSIRO, Australia
Owen Neill; University of Michigan
Kat Crispin; Pennsylvania State University

PLATFORM SESSION
Thursday: 1:30 PM • Room: 329

1:30 PM **1177** (Invited) *Low Voltage Analytical Possibilities in a Scanning Electron Microscope in Transmission Mode at 30 kV: EDS, EELS and CBED at the Nanoscale;* **R Gauvin**, N Brodusch; McGill University, Canada, H Demers; Hydro-Quebec Research Center, Canada

2:00 PM **1126** *TEM Study of Epitaxial LSMO-BTO-STO Thin Film Heterostructure*; J-G Zheng, **T Aoki**; University of California-Irvine, A Paul; Technische Universität at München, Germany

2:15 PM **1127** *Low-Dose Transmission Electron Microscopy of Highly Oriented Polyacetylene*; **H-T Huang**; Pennsylvania State University, MD Ward; Carnegie Institution of Washington, SJ Juhl, A Biswas, N Alem, JV Badding; Pennsylvania State University, TA Strobel; Carnegie Institution of Washington

2:30 PM **1128** *Characterization of Collected Wood Combustion Nanoparticulates from the Gas Stream of Pellet and Wood Chip Stoves*; **BJ Panessa-Warren**, T Butcher, J Warren, R Trojanowski, K Kisslinger, G Wei, Y Celebi; Brookhaven National Laboratory

2:45 PM **1129** *Quantitative STEM-EELS Imaging of Ferritin Distributions in Cultured Erythroblasts Undergoing Erythropoiesis*; **MA Aronova**, C Byrnes, TY Lee, G Zhang; National Institutes of Health, Y Kim; NRL, ER Meier; Children's National Health System, R Leapman; National Institutes of Health

P07.4 Planetary Building Blocks and the Techniques Needed to Analyze Them

SESSION CHAIRS:
Michelle Thompson; NASA Johnson Space Center
Emma Bullock; Carnegie Institution of Washington

PLATFORM SESSION
Thursday: 1:30 PM • Room: 324

1:30 PM **1130** *Origins of Secondary Minerals in Micrometeorites*; **E Dobrica**; University of New Mexico, RC Ogliore; Washington University in St. Louis, C Engrand; University Paris Sud, France, K Nagashima; University of Hawai'i-Mānoa, AJ Brearley; University of New Mexico

1:45 PM **1131** (M&M STUDENT SCHOLAR) *Multi-keV Analyses of a Presolar Mg-Silicate Grain via SEM/STEM*; **L Seifert**, P Haenecour, T Zega; University of Arizona, C Floss; Washington University in St. Louis, J Howe; Hitachi High-Technologies America Inc.

2:00 PM **1132** *FTIR Micro-Tomography of Five Itokawa Particles and One Primitive Carbonaceous Chondrite;* **Z Dionnet**, A Aléon-Toppani; Institut d'Astrophysique Spatial, CNRS, Université Paris-Saclay, France, F Borondics; SMIS beamline, Synchrotron SOLEIL, France, R Brunetto, A-C Buellet, Z Djouadi; Institut d'Astrophysique Spatiale, CNRS, Université Paris-Saclay, France, A King; PSICHE beamline, Synchrotron SOLEIL, France, S Rubino; Institut d'Astrophysique Spatiale, CNRS, Université Paris-Saclay, France *et. al.*

2:15 PM **1133** *Nanoscale Investigation of Thermal Alteration of Chondritic Meteorites via Simultaneous Secondary and Transmitted Electron Imaging during* In Situ *Heating up to 1000 oC;* **J Howe**; Hitachi High Technologies America, Inc., P Haenecour; University of Arizona, M Thompson; NASA Johnson Space Center, S Dogel; Hitachi High-Technologies Canada Inc., Canada, T Sunaoshi; Hitachi High-Technologies Co., Japan, J Sagar; Oxford Instruments NanoAnalysis, United Kingdom, H Hosseinkhannazer; Norcada Inc., Canada, T Zega; University of Arizona

2:30 PM **1134** (Invited) *The CAESAR New Frontiers Comet Sample Return Mission;* **K Nakamura-Messenger**; NASA Johnson Space Center, T Nakamura; Tohoku University, Japan, JP Dworkin; NASA Goddard Space Flight Center, A Nguyen, SJ Clemett; NASA Johnson Space Center, Y Furukawa; Tohoku University, Japan, Y Kimura; Hokkaido University, Japan, A Takigawa; Kyoto University, Japan *et. al.*

P08.3 Spectroscopic and Imaging Studies in Heritage Science

SESSION CHAIRS:
Edward Vicenzi; Smithsonian Institution
John Mansfield; University of Michigan

PLATFORM SESSION
Thursday: 1:30 PM • Room: 326

1:30 PM **1135** (Invited) *The Design of a Dark Field Backscatter Hyperspectral Microscope for Materials Characterization*; **M Walton**, L Oakley, V Cooley, D Duggins; Northwestern University

2:00 PM **1136** (Invited) *A Novel OCT Design for Cultural Heritage Applications*; **D Duggins**, F Li; Northwestern University, M Aalders; University of Amsterdam, Netherlands, O Cossairt, A Katsaggelos, M Walton; Northwestern University

2:30 PM **1137** *Microfadeometry of Face-Mounted and Unmounted Chromogenic Photographs*; **S Brodgon-Grantham**, S Lussier; Smithsonian Institution, CA Maines; National Gallery of Art, M McGath; Johns Hopkins University, T Lam; Smithsonian Institution

2:45 PM **1138** *Investigation of a Simulated Chinese Jade Dagger by Multiple Imaging Techniques*; **RA Livingston**; University of Maryland, A O'Connor; Smithsonian American Art Musuem, JM LaManna, H Chen-Mayer, L King; National Institute of Standards and Technology

P09.6 Microstructure and Mechanics Deformation

SESSION CHAIRS:
Frank Muecklich; Saarland University, Germany
James Martinez; NASA Johnson Space Center

PLATFORM SESSION
Thursday: 1:30 PM • Room: 325

1:30 PM **1139** (Invited) *Practical Metallography of Low Carbon Steels – New Approaches in Preparation, Imaging and Analysis of Microstructures;* **D Britz**, J Webel, J Gola, Y Steimer, F Mücklich; Saarland University, Germany

2:00 PM **1140** *Reversion to Ultrafine-Grained Austenite in a Medium-Mn AHSS;* JT Benzing, **J Wittig**; Vanderbilt University, J Bentley; Microscopy and Microanalytical Sciences, A Kwiatkowski daSilva, L Morsdorf; Max Planck Institute for Iron Research, Germany, J McBride; Vanderbilt University, D Ponge; Max Planck Institute for Iron Research, Germany, B Gault; Max Planck Institute for Iron Research *et. al.*

2:15 PM **1141** (M&M STUDENT SCHOLAR) *TEM Study of Nanoprecipitate Formation in Novel HSLA Steels;* **S Deligiannis**, A Alexandratou, E Flampouris, PE Tsakiridis, G Fourlaris; National Technical University of Athens, Greece

2:30 PM **1142** *Structure-Properties Relationship of Ultra-Fine-Grained V-Microalloyed Dual Phase Steels;* **B Shalchi Amirkhiz**, C Scott, F Fazeli; Natural Resources Canada, Canada

2:45 PM **1143** *Characterizing Graphite Nodule in Ductile Iron Using TKD, EDX and TEM;* **J Qing**, M Xu; Missouri University of Science & Technology

A ANALYTICAL SCIENCES SYMPOSIA – Thursday Afternoon *continued*

A02.8 Atomic-Scale Functional Imaging in Aberration-Corrected Electron Microscopy

SESSION CHAIRS:
Jing Tao; Brookhaven National Laboratory
Miaofang Chi; Oak Ridge National Laboratory

PLATFORM SESSION
Thursday: 1:30 PM • Room: 339

3:30 PM **1144** (Invited) *Surface and Electric Field Imaging by Newly Designed Atomic-Resolution STEM;* **R Ishikawa**, N Shibata, Y Ikuhara; University of Tokyo, Japan

4:00 PM **1145** *Resolution Achievement of 40.5 pm in Scanning Transmission Electron Microscopy Using 300 kV Microscope with Delta Corrector;* **S Morishita**; JEOL Ltd., Japan, R Ishikawa; The University of Tokyo, Japan, Y Kohno, H Sawada; JEOL Ltd., Japan, N Shibata, Y Ikuhara; The University of Tokyo, Japan

4:15 PM **1146** *Low Dose Imaging Using Simultaneous iDPC- and ADF-STEM for Beam Sensitive Crystalline Structures*; **A Carlsson**, I Alexandrou, E Yücelen, EG Bosch; Thermo Fisher Scientific, Netherlands, I Lazić; Thermo Fischer Scientific, Netherlands

4:30 PM **1147** *Enhanced Environmental Design for a New Integrated Hyper-Modal Microscope*; **DC Bell**, A Graham; Harvard University, J Rooney, L Cessna; Hitachi High-Technologies America, JD Gibbons; Wilson Architects, H Muller, M Haider; CEOS Gmbh, Germany

4:45 PM **1148** *Real Time Acquisition and Calibration of S/TEM Probe Current Measurement Simultaneously with Any Imaging or Spectroscopic Signal*; **SD House**; University of Pittsburgh, CT Schamp; MAS, LLC, JC Yang; University of Pittsburgh

Scientific Program

A ANALYTICAL SCIENCES SYMPOSIA – Thursday Afternoon *continued*

A06.3 Mesoscale Correlative Microscopy and Imaging of Physical, Environmental, and Biological Sciences

SESSION CHAIR:
Si Chen; Argonne National Laboratory

PLATFORM SESSION
Thursday: 1:30 PM • Room: 322

3:30 PM **1149** (Invited) *Correlative Bioimaging with Electron, X-Ray, and Light Microscopies;* MA Aronova; National Institutes of Health, S Chen, B Lai; Argonne National Laboratory, NB Pivovarova, A Daoust, SB Andrews, AP Koretsky, **RD Leapman**; National Institutes of Health

4:00 PM **1150** *Correlative Imaging and Bio-Inspiration: Multi-Scale and Multi-Modal Investigations of the Acorn Barnacle* (Semibalanus balanoides)*;* **RL Mitchell**, C Pleydell-Pearce, MP Coleman, P Davies, L North; Swansea University, United Kingdom, W Harris; Zeiss Microscopy, RE Johnston; Swansea University, United Kingdom

4:15 PM **1151** *Towards Correlative Cryo Fluorescence-SEM Imaging of Cryo-Planed Frozen-Hydrated Sea Urchin Embryos*; **A DiCorato**, B Moreno, D Joester; Northwestern University

4:30 PM **1152** In Situ *Correlative Microscopy Combining Transmission Electron Microscopy and Secondary Ion Mass Spectrometry*; S Eswara; Luxembourg Institute of Science and Technology, Luxembourg, L Yedra; Centrale Supelec, France, V Sarbada; Rensselaer Polytechnic Institute, A Pshenova, **J-N Audinot**; Luxembourg Institute of Science and Technology, Luxembourg, R Hull; Rensselaer Polytechnic Institute, T Wirtz; Luxembourg Institute of Science and Technology, Luxembourg

4:45 PM **1153** *Correlative Microbially-Assisted Imaging of Cellulose Deconstruction with Electron Microscopy*; A Londono-Calderon; Ames Laboratory, W Sun, Z Shao; Iowa State University, D Hein Alsem; Hummingbird Scientific, **T Prozorov**; Ames Laboratory

A07.5 New Advances in Electron Energy Loss Spectroscopy and Allied Techniques

SESSION CHAIRS:
Alan Craven; University of Glasgow, United Kingdom
Juan-Carlos Idrobo; Oak Ridge National Laboratory

PLATFORM SESSION
Thursday: 1:30 PM • Room: 341

3:30 PM **1154** (Invited) *Advances in Ultra-High Energy Resolution STEM-EELS;* **TC Lovejoy**, GC Corbin, N Dellby, MV Hoffman, OL Krivanek; Nion Company

4:00 PM **1155** *Atomically Resolved EELS Elemental and Fine Structure Mapping via Multi-Frame and Energy-Offset Correction Acquisition;* **Y Wang**, M Huang, U Salzberger, K Hahn, W Sigle, PA van Aken; Max Planck Institute for Solid State Research, Germany

4:15 PM **1156** *Direct Detection Carbon Electron Energy-Loss Spectroscopy on Zeolites;* **MC Akatay**, SA Bradley; Honeywell UOP

4:30 PM **1157** *Direct Detection Electron Energy-Loss Spectroscopy: Applications in Low-Dose Chemical Mapping and* In Situ *Heating+Biasing;* **ML Taheri**, JL Hart, AC Lang; Drexel University

4:45 PM **1158** (M&M STUDENT SCHOLAR) *Direct Electron Detection for Atomic-Resolution EELS Mapping at Cryogenic Temperature;* **DJ Baek**, MJ Zachman, BH Goodge; Cornell University, D Lu; Stanford University, Y Hikita; Stanford Institute for Materials and Energy Sciences, SLAC National Accelerator Laboratory, HY Hwang; Stanford University, LF Kourkoutis; Cornell University

A08.4 Machine Learning and Compressive Sensing for Signal Processing and Image Reconstruction in Microscopy and Microanalysis

SESSION CHAIR:
Andrew Stevens; OptimalSensing LLC

PLATFORM SESSION
Thursday: 1:30 PM • Room: 342

3:30 PM **1159** (Invited) *Deep Learning for Lensless Compressive Imaging*; **X Yuan**; Nokia Bell Labs, Y Pu; Duke University

4:00 PM **1160** *Problems and Progress in Automating Electron Microscopy Segmentation;* **M Guay**; National Institute of Biomedical Imaging and Bioengineering, National Institutes of Health, Z Emam; University of Maryland-College Park, R Leapman; National Institute of Biomedical Imaging and Bioengineering, National Institutes of Health

4:15 PM **1161** *An Autonomous Microscopy Workflow for Structure Determination from Atomic-Resolution Images;* **E Schwenker**, F Sen; Argonne National Laboratory, C Ophus; Lawrence Berkeley National Laboratory, T Paulauskas, J Guo; University of Illinois-Chicago, S Hills; Argonne National Laboratory, R Klie; University of Illinois-Chicago, MK Chan; Argonne National Laboratory

4:30 PM **1162** *Identifying Atoms in High Resolution Transmission Electron Micrographs Using a Deep Convolutional Neural Net;* **J Schiøtz**, J Madsen, P Liu, O Winther, J Kling, JB Wagner, TW Hansen; Technical University of Denmark, Denmark

4:45 PM **1163** *Pioneering the Use of Neural Network Architectures and Feature Engineering for Real-Time Augmented*

Microscopy and Analysis; **ML Gong**; University of Utah, JA Aguiar, SJ Yoon; Idaho National Laboratory, RR Unocic; Oak Ridge National Laboratory, H Ishii, JP Bradley; University of Hawai'i-Mānoa, BD Miller; Idaho National Laboratory, D Masiel; Integrated Dynamic Electron Solutions *et. al.*

A13.4 Pushing the Limits of Cryo-EM

SESSION CHAIRS:
Mike Marko; Wadsworth Center
Anchi Cheng; NY Structural Biology Center

PLATFORM SESSION
Thursday: 1:30 PM • Room: 349

3:30 PM **1164** (Invited) *Pros and Cons of Integrating Versus Counting with a Direct Electron Detecting Camera;* J Mendez, **SM Stagg**; Florida State University

4:00 PM **1165** (Invited) *K3 – A First Look at the New Direct Electron Detection Camera from Gatan Company;* **A Myasnikov**, S Zheng, D Bulkley; University of California-San Francisco, Y Cheng, D Agard; University of California-San Francisco and Howard Hughes Medical Institute

4:30 PM **1166** *Physical Phase Plates for Cryo-Electron Microscopy of Biological Specimens: Comparison of Hole-Free Phase Plates and Zach Electrostatic Phase Plates;* M Obermair; Laboratory for Electron Microscopy, Germany, **M Marko**; Wadsworth Center, S Hettler; Laboratory for Electron Microscopy, Germany, C Hsieh; Wadsworth Center, D Gerthsen; Laboratory for Electron Microscopy, Germany

4:45 PM **1167** *Hole-Free Phase Plate Imaging of a Phase Grating;* **M Malac**, M Hayashida; University of Alberta, Canada, K Harada, K Shimada; RIKEN, Japan, K Niitsu; Kyoto University, Japan, T Rowan; University of Alberta, Canada, M Beleggia; Denmark Technical University, Denmark

A14.4 Quantitative Magnetic Characterization in the TEM

SESSION CHAIRS:
Martha McCartney; Arizona State University
Darius Pohl; Technical University of Dresden, Germany

PLATFORM SESSION
Thursday: 1:30 PM • Room: 338

3:30 PM **1168** (Invited) *Holographically Probing Longitudinal Magnetic Fields with Electron Vortex Beams;* **TR Harvey**; University of Göttingen, Germany, V Grillo; CNR-Istituto Nanoscienze, Italy, F Venturi; Universitá di Modena e Reggio Emilia, Italy, JS Pierce, FS Yasin, JJ Chess; University of Oregon, S Frabboni; Università di Modena e Reggio Emilia, Italy, E Karimi; University of Ottowa, Canada *et. al.*

4:00 PM **1169** *Topological Defects and Interaction of Electron Waves and Localized Magnetic Charge;* **F Barrows**, A Petford-Long, C Phatak; Argonne National Laboratory

4:15 PM **1170** (Invited) *Topological Magnetic States and their Properties;* **SA Montoya**; Space and Naval Warfare Systems Center Pacific

4:45 PM **1171** *TEM Study of Current-Induced Domain Wall Motion in Cylindrical Nanowires: Towards 3D Magnetic Memory Devices;* **S Lopatin**; King Abdullah University of Science and Technology, Saudi Arabia, YP Ivanov; Erich Schmid Institute of Materials Science, Australia, J Kosel; King Abdullah University of Science and Technology, Saudi Arabia, A Chuvilin; CIC nanoGUNE, Spain

P PHYSICAL SCIENCES SYMPOSIA – Thursday Afternoon *continued*

P04.9 *In Situ* Methods for Probing Properties and Dynamics in Materials

SESSION CHAIR:
Meng Li; University of Pittsburgh

PLATFORM SESSION
Thursday: 1:30 PM • Room: 340

3:30 PM **1172** (Invited) In Situ *S/TEM Probing of the Behavior of Nanoparticles under Chemical and Electrochemical Reactions in the System Involving Solid, Liquid and Gas*; **C Wang**, L Luo, Y Shao; Pacific Northwest National Laboratory

4:00 PM **1173** (M&M STUDENT SCHOLAR) *Characterizing the Calcination Behaviors of Ni-Fe Layered Double Hydroxide Materials Via* In Situ *Transmission Electron Microscopy;* **C Hobbs**, S Jaskaniec, V Nicolosi; Trinity College Dublin, Ireland

4:15 PM **1174** *Gas Absorption and Pore Breathing of Metal-Organic Frameworks Studied Using In Situ Environmental Transmission Electron Microscopy (ETEM);* **LR Parent**; Northwestern University, CH Pham; University of California-San Diego, JP Patterson; Eindhoven University of Technology, Netherlands, MS Denny, SM Cohen, F Paesani; University of California-San Diego, NC Gianneschi; Northwestern University

4:30 PM **1175** *Real-Time Data Processing and Feedback During* In Situ *Heating;* **B Miller**, C Czarnik; Gatan, Inc., G Vacek; DataDirect Networks, S Mick; Gatan, Inc.

4:45 PM **1176** *Preferential Growth of Carbon Nanotubes via the Carbon Volume Diffusion Channels in Fe_3C Nanoparticles;* **KS Dae**, JH Chang, JW Shin; Institute for Basic Science (IBS), Republic of Korea, JM Yuk; Korea Advanced Institute of Science and Technology (KAIST), Republic of Korea

P PHYSICAL SCIENCES SYMPOSIA – Thursday Afternoon *continued*

P06.4 Applications of Integrated Electron Probe Microscopy and Microanalysis in Characterizing Natural and Synthetic Materials

SESSION CHAIRS:
Kat Crispin; Pennsylvania State University
Colin MacRae; CSIRO, Australia
Owen Neill; University of Michigan

PLATFORM SESSION
Thursday: 1:30 PM • Room: 329

3:30 PM **1125** (Invited) *You Do* What *in Your Microprobe?! The EPMA as a Multimode Platform for Nitride Semiconductor Characterization;* **PR Edwards**, G Naresh-Kumar, G Kusch, J Bruckbauer, L Spasevski, CG Brasser, MJ Wallace, C Trager-Cowan; University of Strathclyde, United Kingdom *et. al.*

4:00 PM **1178** *A Study on the Change of the Fe Lα Mass Absorption Coefficients and Fluorescence Yields in Iron Silicide Samples by EPMA;* **AG Moy**, JH Fournelle; University of Wisconsin-Madison

4:15 PM **1179** *Complementary Microscopy Techniques Applied for Characterizing the Localized Nanoscale Structure of Poly (Vinylidene Fluoride);* **W Qian**, S Sun, C Nguyen, W Li, S Ducharme, JA Turner; University of Nebraska-Lincoln

4:30 PM **1180** *Electron Microscopy Studies Superconducting $BaMX_3$ Family Materials;* C Ozsoy Keskinbora; Harvard University, A Devarakonda; Massachusetts Institute of Technology, A Akey, S Kraemer2; Harvard University, J Checkelsky; Massachusetts Institute of Technology, **DC Bell**; Harvard University

P08.4 Spectroscopic and Imaging Studies in Heritage Science

SESSION CHAIRS:
John Mansfield; University of Michigan
Thomas Lam; Smithsonian Institution

PLATFORM SESSION
Thursday: 1:30 PM • Room: 326

3:30 PM **1181** (Invited) *Investigating Natural Red Lakes with Two-Photon Excited Fluorescence Lifetime Imaging Microscopy;* **TE Villafana;** U.S. Library of Congress, R Beams; National Institute of Standards and Technology, JK Delaney; National Gallery of Art, F France; U.S. Library of Congress, S Stranick; National Institute of Standards and Technology

4:00 PM **1182** *Photoluminescence Spectroscopy of ZnO and TiO_2 Pigments;* R Beams; National Institute of Standards and Technology, EP Vicenzi; Smithsonian Institution, S Wight; National Institute of Standards and Technology, T Lam; Smithsonian Institution**, S Barnes**; Library and Archives Canada, Canada, J-S Tsang; Smithsonian Institution, SJ Stranick; National Institute of Standards and Technology

4:15 PM **1183** *Microspectroscopic Investigation of Metal Soaps in Oil Paintings—A Case Study on Late 19*th Century Cobalt Green ($Co_xZn_{1-x}O$) Paint; M Réfrégiers; Synchrotron SOLEIL, France, **X Ma,** B Berrie; National Gallery of Art, V Beltran; IPANEMA, CNRS, France, K Kuene, S Hageraats; Rijksmuseum, University of Amsterdam, Netherlands, M Thoury; IPANEMA, CNRS, France

4:30 PM **1184** *Using Trace Element Ratios to Establish Correlations in Brick and Terra Cotta;* E Steiner; New York State College of Ceramics at Alfred University, P Merrick; Historical Hillsborough Research Group, S Tunick; Friends of Terra Cotta, K Tierney; Boston Valley Terra Cotta, H Lee, **WM Carty**; New York State College of Ceramics at Alfred University

4:45 PM **1185** *Using WDS to Estimate the Firing Time of Koryŏ Celadons*; **H Lee**, G Wynick, WM Carty; New York State College of Ceramics at Alfred University

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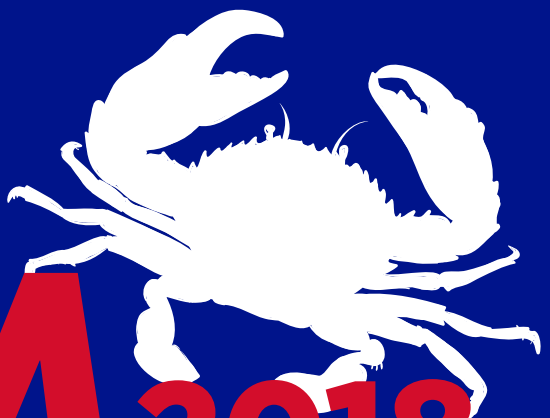

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Direct Electron, LP	738
HREM Research Inc.	906
PNDetector GmbH	905
Point Electronic GmbH	908
Raith America, Inc.	637
Semtech Solutions	531
TVIPS GmbH	809
Voxa	541

SEM Accessories

Advanced Microscopy Techniques Corp.	1111
Applied Beams LLC	1306
Bruker Corporation	514
Edax	530
El-Mul Technologies	714
EMCrafts Co., Ltd.	741
Gatan, Inc.	824
Herzan LLC	1206
Integrated Dynamics Engineering	803
IXRF Systems, Inc.	1117
Kammrath and Weiss	610
Kleindiek Nanotechnik	1140
MEO Engineering Co., DBA PBS&T Particle Beam Systems & Technology	330
MTI Instruments, Inc.	805
Nanoscience Instruments	1406
PIE Scientific LLC	641
PNDetector GmbH	905
Point Electronic GmbH	908
Quantum Design International	608
Semtech Solutions	531
SmarAct Inc	712
SPI Supplies	1106, 1105
Ted Pella Inc.	1012
Tescan USA	413
Tousimis	1007
TSS Microscopy	1115
XEI Scientific, Inc.	1006

SEM Stages, Mounts and Holders

EMCrafts Co., Ltd.	741
Ephemeron Labs	508
EXpressLO LLC	538

SEM Stages, Mounts and Holders cont.

Hitachi High Technologies America, Inc.	1125
Hummingbird Scientific	605
Kammrath and Weiss	610
Mel-Build Corporation	1410
MTI Instruments, Inc.	805
Semtech Solutions	531
SmarAct Inc	712
Tousimis	1007

Service & Repair

Applied Beams LLC	1306
Gamma Vacuum	807
J. Kraft Microscopy Services, Inc.	606
LSM Tech LLC	T -1430
MEO Engineering Co., DBA PBS&T Particle Beam Systems & Technology	330
Physical Electronics	716
Semtech Solutions	531
TSS Microscopy	1115
ZEISS	624

Service Laboratories

Applied Beams LLC	1306
Attolight/Barnett Technical Services	510
MEO Engineering Co., DBA PBS&T Particle Beam Systems & Technology	330
Nanoscience Instruments	1406

Society and Event Organizer

ASM International	438

Software

Analitex	1412
BlueQuartz Software	506
CAMECA	524
DigiM Solution LLC	T-1432
Direct Electron, LP	738
FOM Networks, Inc.	542
Gatan, Inc.	824
HREM Research Inc.	906
International Centre for Diffraction Data (ICDD)	609
Linkam Scientific Instruments	423
NanoMEGAS USA	507
Objects Research Systems	707
Olympus America	612
TVIPS GmbH	809

Specimen Preparation & Handling

Coxem Co., Ltd	614
E. A. Fischione Instruments, Inc.	424
Ephemeron Labs	508
EXpressLO LLC	538
Gatan, Inc.	824
Microscopy Innovations, LLC	718
Nanoscience Instruments	1406
RMC Boeckeler	1031
Ted Pella Inc.	1012
Voxa	541
XEI Scientific, Inc.	1006

Specimen Storage

Microscopy Innovations, LLC	718
PIE Scientific LLC	641

Spectrometers

CAMECA	524
Clark-MXR. Inc.	539
Hinds Instruments, Inc.	540
IXRF Systems, Inc.	1117
Linkam Scientific Instruments	423
PNDetector GmbH	905
TVIPS GmbH	809

SQUID / Superconducting Quantum Interference Devices

Quantum Design International	608

Stage Automation

Point Electronic GmbH	908
SmarAct Inc	712
Voxa	541

Supplies

Duniway Stockroom Corp.	720
Microscopy Innovations, LLC	718
Norcada, Inc.	1142
SPI Supplies	1106, 1105

Surface Analysis

Anton Paar USA	1405
CAMECA	524
Nanoscience Instruments	1406
Physical Electronics	716
Zygo Corporation	524

Surface Profiling

Anton Paar USA	1405
CAMECA	524
Nanoscience Instruments	1406
Zygo Corporation	524

Tabletop SEM/TEM

Angstrom Scientific Inc.	1138
Coxem Co., Ltd	614
EMCrafts Co., Ltd.	741
Hitachi High Technologies America, Inc.	1125
Nanoscience Instruments	1406
Voxa	541

TEM Accessories

Advanced Microscopy Techniques Corp.	1111
Attolight/Barnett Technical Services	510
Bruker Corporation	514
DECTRIS Ltd	1438
Direct Electron, LP	738
Edax	530
Electron Microscopy Sciences	616
EXpressLO LLC	538
Gatan, Inc.	824
Herzan LLC	1206
Hummingbird Scientific	605
IDES, Inc	437
Integrated Dynamics Engineering	803
IXRF Systems, Inc.	1117
Mel-Build Corporation	1410
NanoMEGAS USA	507
Norcada, Inc.	1142
PNDetector GmbH	905
Scientific Instruments & Applications, Inc.	1005
SPI Supplies	1106, 1105
Ted Pella Inc.	1012
Tousimis	1007
TSS Microscopy	1115
TVIPS GmbH	809
XEI Scientific, Inc.	1006

TEM Specimen Holders

Angstrom Scientific Inc.	1138
Clark-MXR. Inc.	539
E. A. Fischione Instruments, Inc.	424
EXpressLO LLC	538
Gatan, Inc.	824
Hummingbird Scientific	605

TEM Specimen Holders cont.

Mel-Build Corporation	1410
Norcada, Inc.	1142
Tousimis	1007
Voxa	541

Testing Equipment

Anton Paar USA	1405
Hinds Instruments, Inc.	540
Kammrath and Weiss	610
MTI Instruments, Inc.	805
Olympus America	612
Pace Technologies	1404
Seiwa Optical America, Inc	1407
SmarAct Inc	712

Transmission Electron Microscopes (TEM)

Clark-MXR. Inc.	539
Hitachi High Technologies America, Inc.	1125
HREM Research Inc.	906
IDES, Inc	437
Integrated Dynamics Engineering	803
JEOL USA, Inc.	812
NanoMEGAS USA	507
Physical Electronics	716
Point Electronic GmbH	908
TSS Microscopy	1115
TVIPS GmbH	809

Vacuum Equipment

Denton Vacuum, LLC	1119
Duniway Stockroom Corp.	720
Electron Microscopy Sciences	616
Gamma Vacuum	807
Mel-Build Corporation	1410
Pace Technologies	1404
Quorum Technologies	616
SmarAct Inc	712

Vacuum Evaporators

Denton Vacuum, LLC	1119
SPI Supplies	1106, 1105

Vibration Isolation Systems

Herzan LLC	1206
Integrated Dynamics Engineering	803
TMC	524

WDS Detectors & Systems

Bruker Corporation	514
Edax	530
Oxford Instruments	838
PNDetector GmbH	905

X-ray Analysis Equipment

Anton Paar USA	1405
Bruker Corporation	514
DECTRIS Ltd	1438
Edax	530
El-Mul Technologies	714
IXRF Systems, Inc.	1117
JEOL USA, Inc.	812
Linkam Scientific Instruments	423
Norcada, Inc.	1142
Olympus America	612
Oxford Instruments	838
Physical Electronics	716
PNDetector GmbH	905
Semtech Solutions	531
Tescan USA	413
ZEISS	624

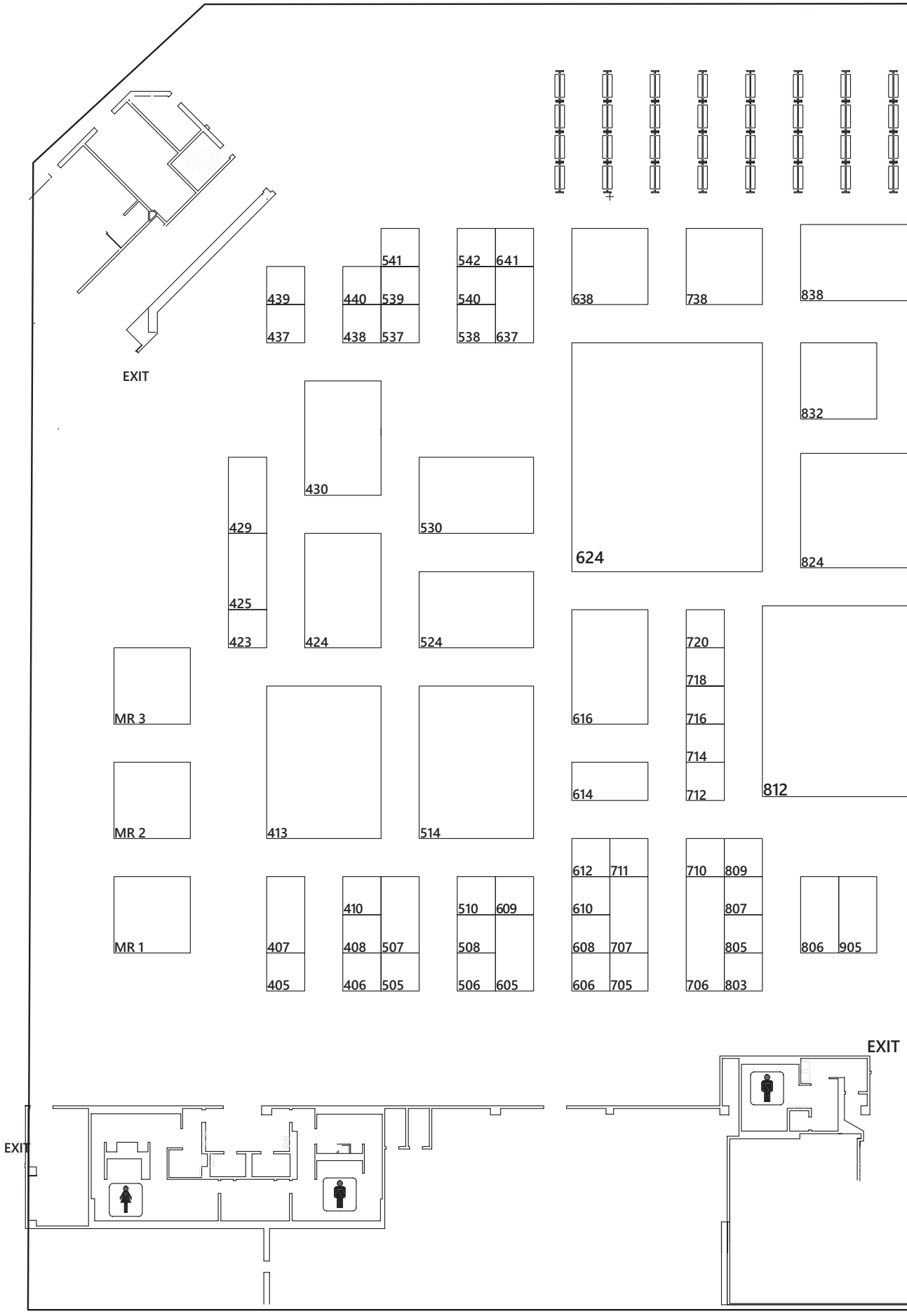
M&M 2018 EXHIBITOR LIST by company name *(as of July 1, 2018)*

Company	Booth#
Advanced Microscopy Techniques Corp	1111
Analitex	1412
Angstrom Science	535
Angstrom Scientific Inc.	1138
Anton Paar USA	1405
Applied Beams LLC	1306
ASM International	438
Attolight/Barnett Technical Services	510
BlueQuartz Software	506
Bruker Corporation	514
Cambridge University Press	706
CAMECA	524
Clark-MXR. Inc.	539
Coxem Co., Ltd.	614
Crytur	1414
DECTRIS Ltd.	1438
Denton Vacuum, LLC	1119
DigiM Solution LLC	T-1432
Digital Surf	425
Direct Electron, LP	738
DRVision Technologies	432
Duniway Stockroom Corp.	720
E. A. Fischione Instruments, Inc.	424
E. Fjeld Co, Inc.	1208
Edax	530
Electron Microscopy Sciences	616
El-Mul Technologies	714
EmCrafts Co., Ltd.	741
Ephemeron Labs	508
EXpressLO LLC	538
Fluid Imaging Technologies, Inc.	1444
FOM Networks, Inc.	542
Gamma Vacuum	807
Gatan, Inc.	824
Herzan LLC	1206
Hinds Instruments, Inc.	540
HIROX-USA, Inc.	1207
Hitachi High Technologies America, Inc.	1125
HREM Research Inc.	906
Hummingbird Scientific	605
ibss Group, Inc.	1237
IDES, Inc.	437
iLab Solutions, part of Agilent Technologies	537
Integrated Dynamics Engineering	803
International Centre for Diffraction Data (ICDD)	609
IXRF Systems, Inc.	1117
J. Kraft Microscopy Services, Inc.	606
JEOL USA, Inc.	812
Kammrath and Weiss	610
Keyence Corporation of America	1305
Kleindiek Nanotechnik	1140
Kratos Analytical	710
Ladd Research	705
Leica Microsystems	1038
Linkam Scientific Instruments	423
LSM Tech LLC	T-1430
Mel-Build Corporation	1410
MEO Engineering Co., dba PBS&T Particle Beam Systems Technology	330
Microscopy Innovations, LLC	718
MSA MegaBooth	1329
MTI Instruments, Inc.	805
NanoMEGAS USA	507
Nanoscience Instruments	1406
Nion Company	1338
Norcada, Inc.	1142
Objects Research Systems	707
Olympus America	612
Oxford Instruments	838, MR-3
Pace Technologies	1404
Park Systems Inc.	410
PerkinElmer	439
Photonics Media	405
Physical Electronics	716
PIE Scientific LLC	641
PNDetector GmbH	905
PNSensor GmbH	806
Point Electronic GmbH	908
Protochips, Inc.	1238
Quantum Design International	608
Quantum Detectors	1416
Quorum Technologies	616
Raith America, Inc.	637
Renishaw Inc.	408
Rigaku Americas Corp.	1428
RMC Boeckeler	1031
Royal Microscopical Society	1308
Scientific Instruments & Applications, Inc.	1005
Seiwa Optical America, Inc.	1407
Semtech Solutions	531
SmarAct Inc.	712
SPI Supplies	1105, 1106
Springer Nature	1023
Syntek Co., Ltd.	T-1434
Technotrade International Inc.	1205
Ted Pella Inc.	1012
Tescan USA	413
Thermo Fisher Scientific	1112
TMC	524
Tousimis	1007
TSS Microscopy	1115
TVIPS GmbH	809
UES, Inc.	505
Vibration Engineering Consultants	1424
Vitatech Electromagnetics LLC	1418
Voxa	541
Wiley	832
WITec Instruments Corp	711
XEI Scientific, Inc.	1006
ZEISS	624
zeroK NanoTech Corporation	1241
Zygo Corporation	524

M&M 2018 EXHIBITOR LIST by booth number *(as of July 1, 2018)*

Booth#	Company
330	MEO Engineering Co., dba PBS&T Particle Beam Systems Technology
405	Photonics Media
408	Renishaw Inc.
410	Park Systems Inc.
413	Tescan USA
423	Linkam Scientific Instruments
424	E. A. Fischione Instruments, Inc.
425	Digital Surf
432	DRVision Technologies
437	IDES, Inc.
438	ASM International
439	PerkinElmer
505	UES, Inc.
506	BlueQuartz Software
507	NanoMEGAS USA
508	Ephemeron Labs
510	Attolight/Barnett Technical Services
514	Bruker Corporation
524	CAMECA
524	TMC
524	Zygo Corporation
530	Edax
531	Semtech Solutions
535	Angstrom Science
537	iLab Solutions, part of Agilent Technologies
538	EXpressLO LLC
539	Clark-MXR. Inc.
540	Hinds Instruments, Inc.
541	Voxa
542	FOM Networks, Inc.
605	Hummingbird Scientific
606	J. Kraft Microscopy Services, Inc.
608	Quantum Design International
609	International Centre for Diffraction Data (ICDD)
610	Kammrath and Weiss
612	Olympus America
614	Coxem Co., Ltd.
616	Electron Microscopy Sciences, Quorum Technologies
624	ZEISS
637	Raith America, Inc.
641	PIE Scientific LLC
705	Ladd Research
706	Cambridge University Press
707	Objects Research Systems
710	Kratos Analytical
711	WITec Instruments Corp
712	SmarAct Inc.
714	El-Mul Technologies
716	Physical Electronics
717	EmCrafts Co., Ltd.
718	Microscopy Innovations, LLC
720	Duniway Stockroom Corp.
738	Direct Electron, LP
803	Integrated Dynamics Engineering
805	MTI Instruments, Inc.
806	PNSensor GmbH
807	Gamma Vacuum
809	TVIPS GmbH
812	JEOL USA, Inc.
824	Gatan, Inc.
832	Wiley
905	PNDetector GmbH
906	HREM Research Inc.
908	Point Electronic GmbH
1005	Scientific Instruments & Applications, Inc.
1006	XEI Scientific, Inc.
1007	Tousimis
1012	Ted Pella Inc.
1023	Springer Nature
1031	RMC Boeckeler
1038	Leica Microsystems
1111	Advanced Microscopy Techniques Corp
1112	Thermo Fisher Scientific
1115	TSS Microscopy
1117	IXRF Systems, Inc.
1119	Denton Vacuum, LLC
1125	Hitachi High Technologies America, Inc.
1138	Angstrom Scientific Inc.
1140	Kleindiek Nanotechnik
1142	Norcada, Inc.
1205	Technotrade International Inc.
1206	Herzan LLC
1207	HIROX-USA, Inc.
1208	E. Fjeld Co, Inc.
1237	ibss Group, Inc.
1238	Protochips, Inc.
1241	zeroK NanoTech Corporation
1305	Keyence Corporation of America
1306	Applied Beams LLC
1308	Royal Microscopical Society
1329	MSA MegaBooth
1338	Nion Company
1404	Pace Technologies
1405	Anton Paar USA
1406	Nanoscience Instruments
1407	Seiwa Optical America, Inc.
1410	Mel-Build Corporation
1412	Analitex
1414	Crytur
1416	Quantum Detectors
1418	Vitatech Electromagnetics LLC
1424	Vibration Engineering Consultants
1428	Rigaku Americas Corp.
1438	DECTRIS Ltd.
1444	Fluid Imaging Technologies, Inc.
1105, 1106	SPI Supplies
838, MR-3	Oxford Instruments
T-1430	LSM Tech LLC
T-1432	DigiM Solution LLC
T-1434	Syntek Co., Ltd.

M&M 2018 EXHIBIT HALL



BALTIMORE CONVENTION CENTER as of July 1, 2018

M&M 2019

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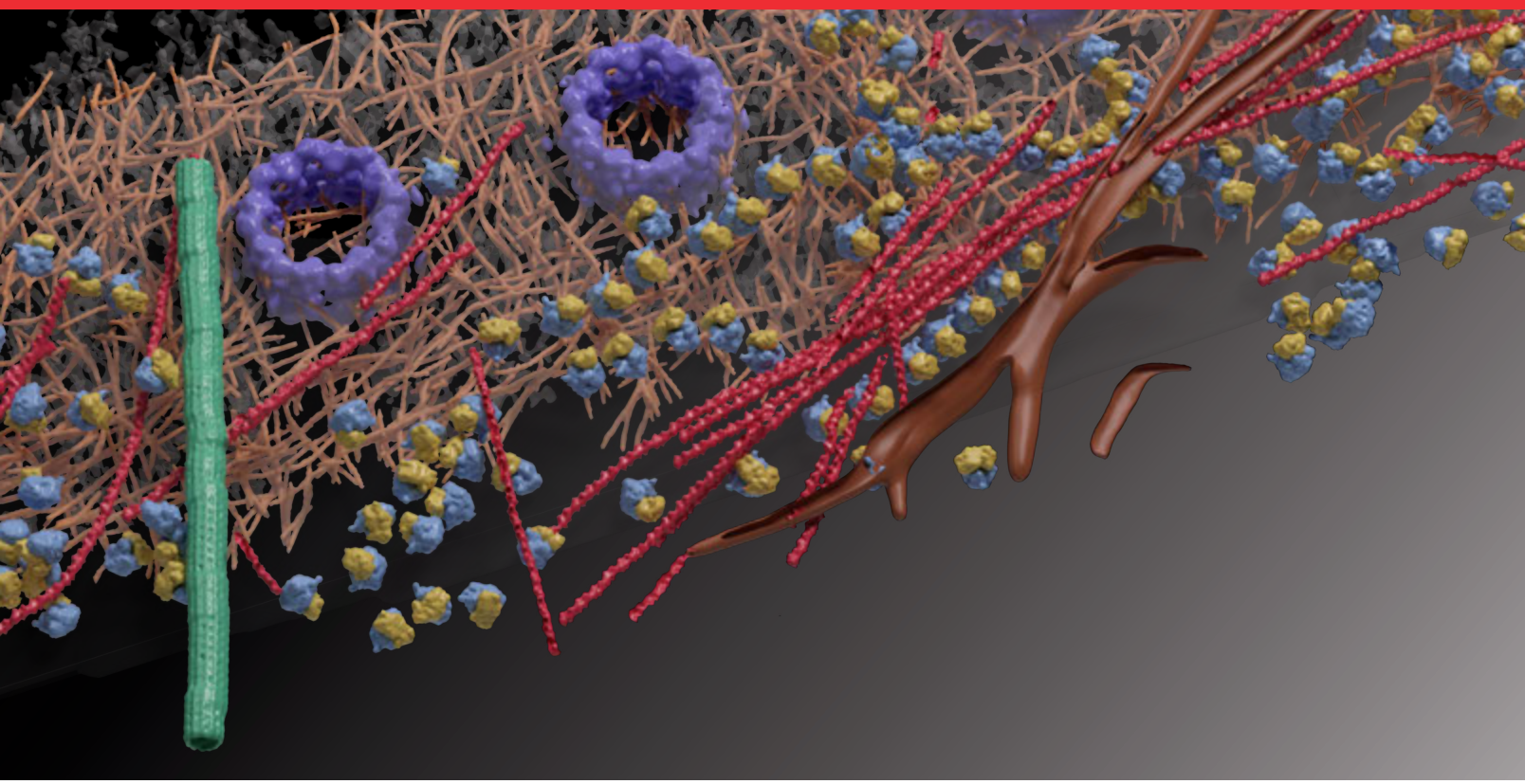

Cryo-electron tomography reveals the molecular organization of various components of the HeLa cell their natural environment. Data courtesy of Dr. J. Mahamid, Department of Molecular Structural Biology, Max Planck Institute for Biochemistry, Martinsried, Germany.

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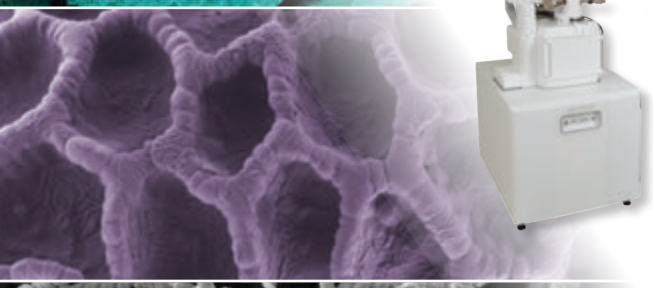

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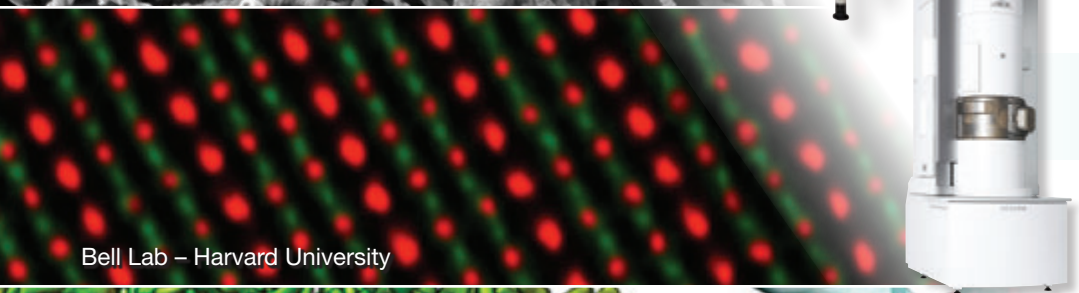
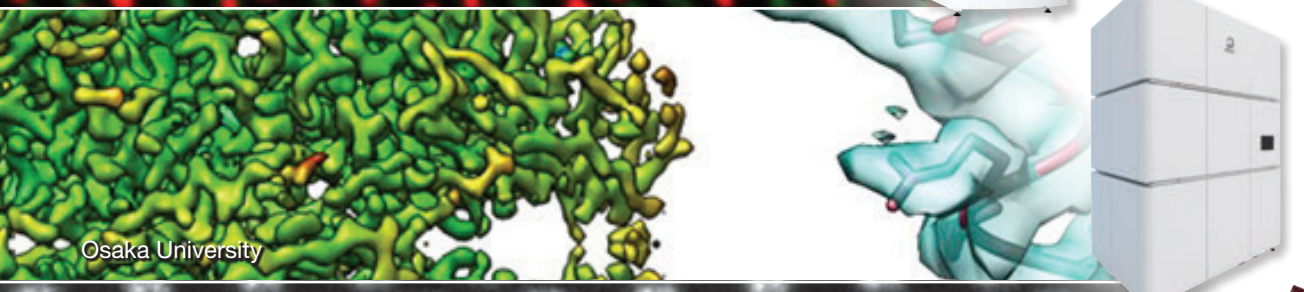
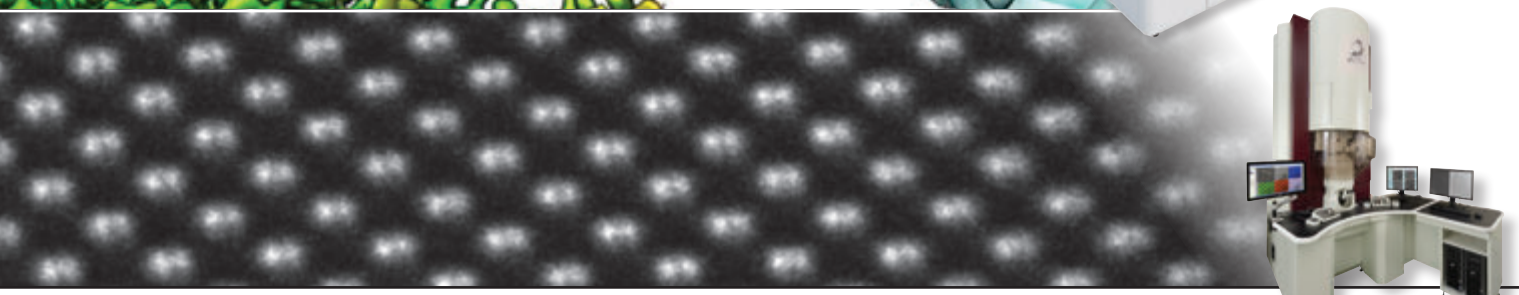


Bell Lab – Harvard University



Osaka University



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