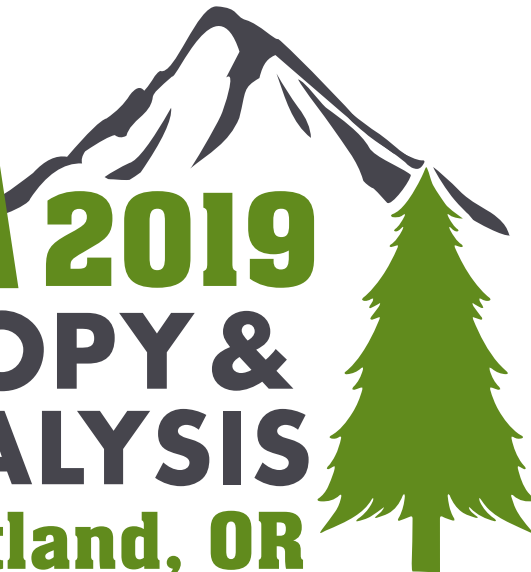




M&M 2019

MICROSCOPY & MICROANALYSIS

August 4-8 • Portland, OR

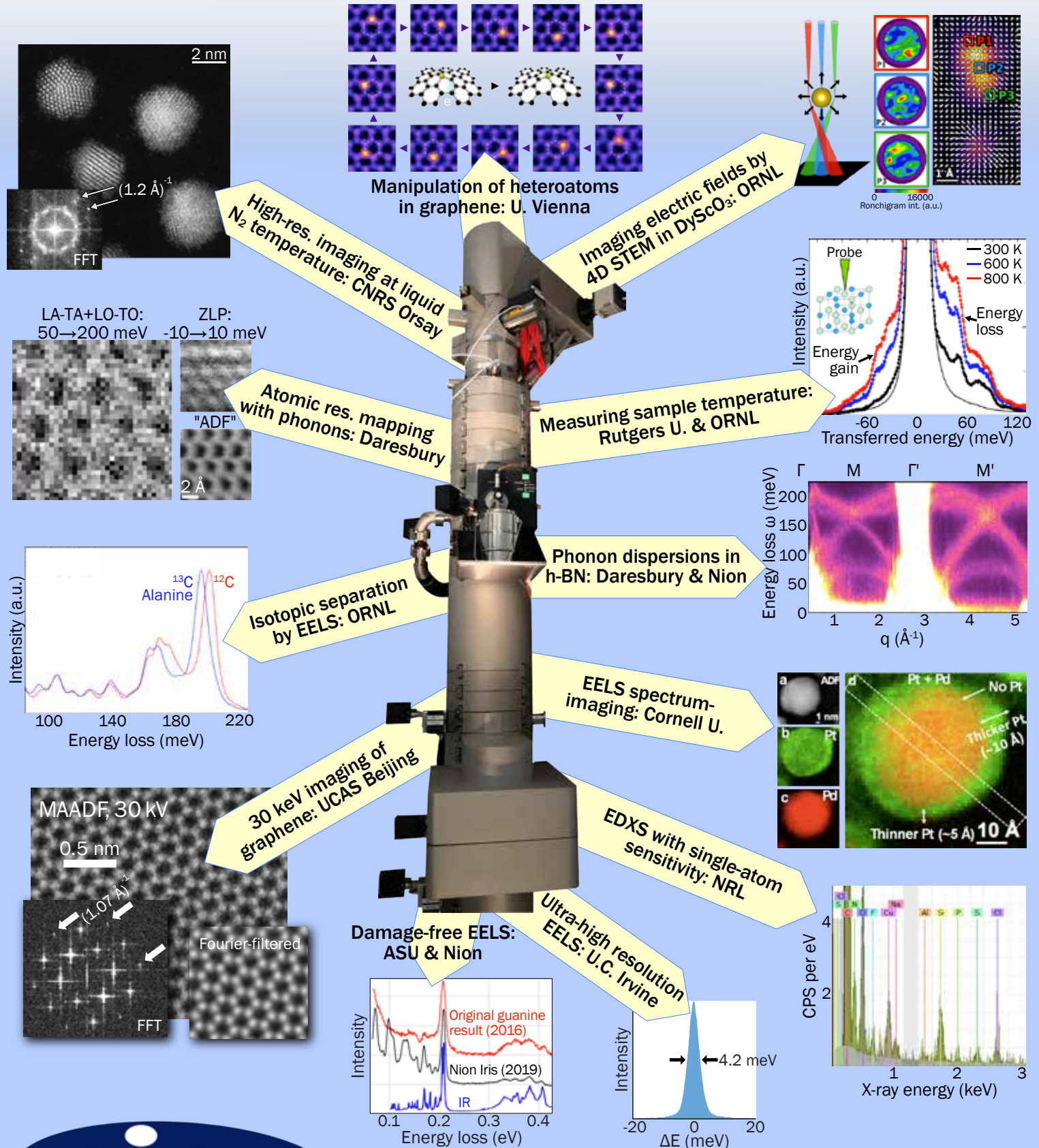


Onsite Program Guide & Exhibitor Information

Exhibitor
Guide
INCLUDED!

www.microscopy.org/MandM/2019

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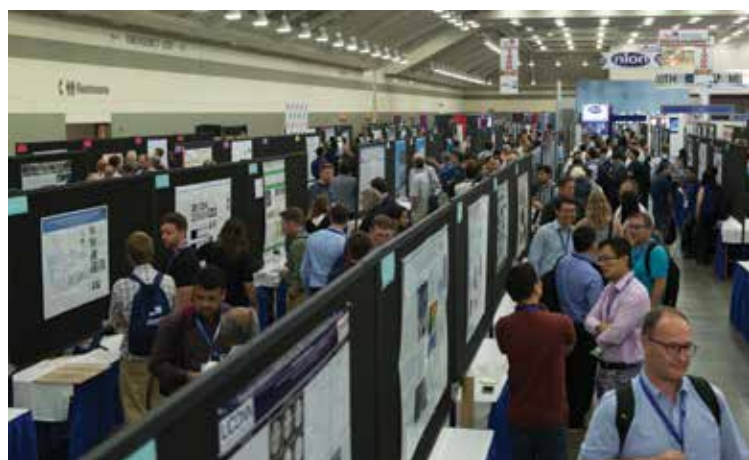
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M&M 2019
MICROSCOPY & MICROANALYSIS
August 4-8 • Portland, OR



Future Meeting Dates

M&M 2020
MICROSCOPY & MICROANALYSIS
August 2-6 • Milwaukee, WI



August 1-5, 2021
PITTSBURGH, PA



July 31-August 4, 2022
PORTLAND, OR



July 23-27, 2023
MINNEAPOLIS, MN



July 28-August 1, 2024
CLEVELAND, OH



Download the 2019 Mobile App!

Navigate the meeting like a pro with the M&M 2019 mobile app, powered by core-apps.com.

With the M&M 2019 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 #MM2019Portland
- And much, much more!



Downloading the App is Easy!

SEARCH:

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



SCAN:



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

http://m.core-apps.com/msa_2019

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 International Field

Emission Society, we welcome you to Microscopy & Microanalysis 2019 at the Oregon Convention Center in Portland, Oregon. It's an excellent venue with wonderful restaurants, lots of activities for the family, and a comfortable climate.

The Program Committee, led by Alice Dohnalkova, Huolin Xin, Assel Aitkaliyeva, and Baptiste Gault, has developed an exciting group of symposia, spanning advances in instrumentation and techniques development, as well as applications in the analytical, biological, and physical sciences. A record number of paper submissions this year is sure to guarantee an exciting and robust program of cutting-edge research!

The main meeting starts with the Opening Welcome Reception on Sunday evening. The Sunday reception is a great place for all attendees to meet new colleagues and reconnect with old friends. On Monday morning, the Plenary Session kicks off the scientific program with two exciting plenary lectures from 2017 Nobel Prize in Chemistry co-winners, Professors Joachim Frank and Richard Henderson, the presentations of the M&M meeting awards, and awards from the sponsoring societies. Please join us in welcoming back these long-time MSA members and frequent M&M attendees as they discuss their groundbreaking work in cryo-electron microscopy.

In addition to the strong scientific program, what sets the M&M meeting apart is the Exhibit Hall, the world's largest annual microscopy exhibition, which showcases the latest in microscopy instrumentation and accessories. Don't miss the highly popular vendor tutorials, held Monday through Wednesday after hours in the Exhibit Hall. Other educational opportunities throughout the week include focused biological and physical science tutorials, educational outreach programs, and our Technologists' Forum special and roundtable sessions.

In short, M&M 2019 is an outstanding opportunity to stay abreast of the latest technologies, hear about new developments in applications across all areas of microscopy and microanalysis, and most importantly network with colleagues.

Welcome to Portland!

Paul Kotula

Sandia National Laboratories

President, Microscopy Society of America



Rhonda Stroud

U.S. Naval Research Laboratory

President, Microanalysis Society



David Larson

AMETEK, Inc.

President, International Field Emission Society





Sponsor List as of 7/1/19

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 will be accommodated as much as possible.

Awards

Major Society Awards for MSA, MAS, and IFES, along with M&M student awards, will be presented at the Plenary Session immediately following the first Plenary Talk (Monday morning). For detailed listings of all awards, criteria, and award winners, please visit <http://microscopy.org/MandM/2019/>.

Cancellation and Refund Policy

Refund requests received prior to July 19, 2019 will be honored less a \$65 administrative fee. No refunds will be issued for cancellations (for any reason) received on or after July 19, 2019, and no refunds will be issued on-site in Portland. E-mail: MMRegistration@conferencemanagers.com or fax (703) 964-1246.

Food for Purchase

Inexpensive, portable breakfast and snack items are available for purchase in the convention center on the exhibit/registration level (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).

Portland & Regional Visitor Information

Stop by the Travel Portland booth located inside the convention center, to pick up local information, including maps, dining guides and tour info, and visitor information on Portland and surrounding areas.

Internet & E-mail

Free wireless internet is available for M&M attendees in the Oregon Convention Center. Check your email and surf the web at the Internet Café inside the M&M exhibit hall during exhibit hours (located next to the MSA MegaBooth). For more information on the MegaBooth, go to page 23.

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 2020 – Meeting & City Information

Stop by for advance information on the 2020 M&M Meeting in Milwaukee, Wisconsin! The 2020 table is located in the main registration area, and has visitors guides, maps, and other important information.

MSA MegaBooth (Booth #502)

(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

- Oregon Convention Center Main: (503) 235-7575
- Exhibitor Service Desk: ask@oregoncc.org
- ZOOM+Care NE Grand Super Clinic (Urgent Care): (503) 684-8252 (7 days: 7:00 am–midnight); www.zoomcare.com
- Emergency Room (24 hours): Oregon Health & Science University (OHSU): (503) 494-7551



Proceedings

Conference Proceedings are distributed at Registration. All Full Meeting registrations include a free copy of the proceedings on digital or online 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 talk with MAS members and stakeholders to learn how to get involved!

Smoking Policy

M&M 2019 is a smoke-free and vape-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 Room G-129 on the exhibit level. Check in here for volunteer assignments and sign-outs.

A close-up photograph of green grass blades, showing their texture and color. The blades are long and narrow, with some showing signs of wear or damage. The lighting is bright, highlighting the green color and the fine details of the grass.[illegible][illegible]

Unless indicated otherwise, all official conference events are being held at the Oregon Convention Center, located on the east side (Convention Center District) of downtown Portland, Oregon.

Onsite Registration Desk

Oregon Convention Center

Pick up your badge and materials at the Registration desk according to the schedule below. The Sunday Welcome Reception starts at 6:30 PM in the Portland Ballroom (upper level of the Oregon Convention Center).

Registration Hours:

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

*Exhibitors Only

Commercial Exhibition Hours:

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

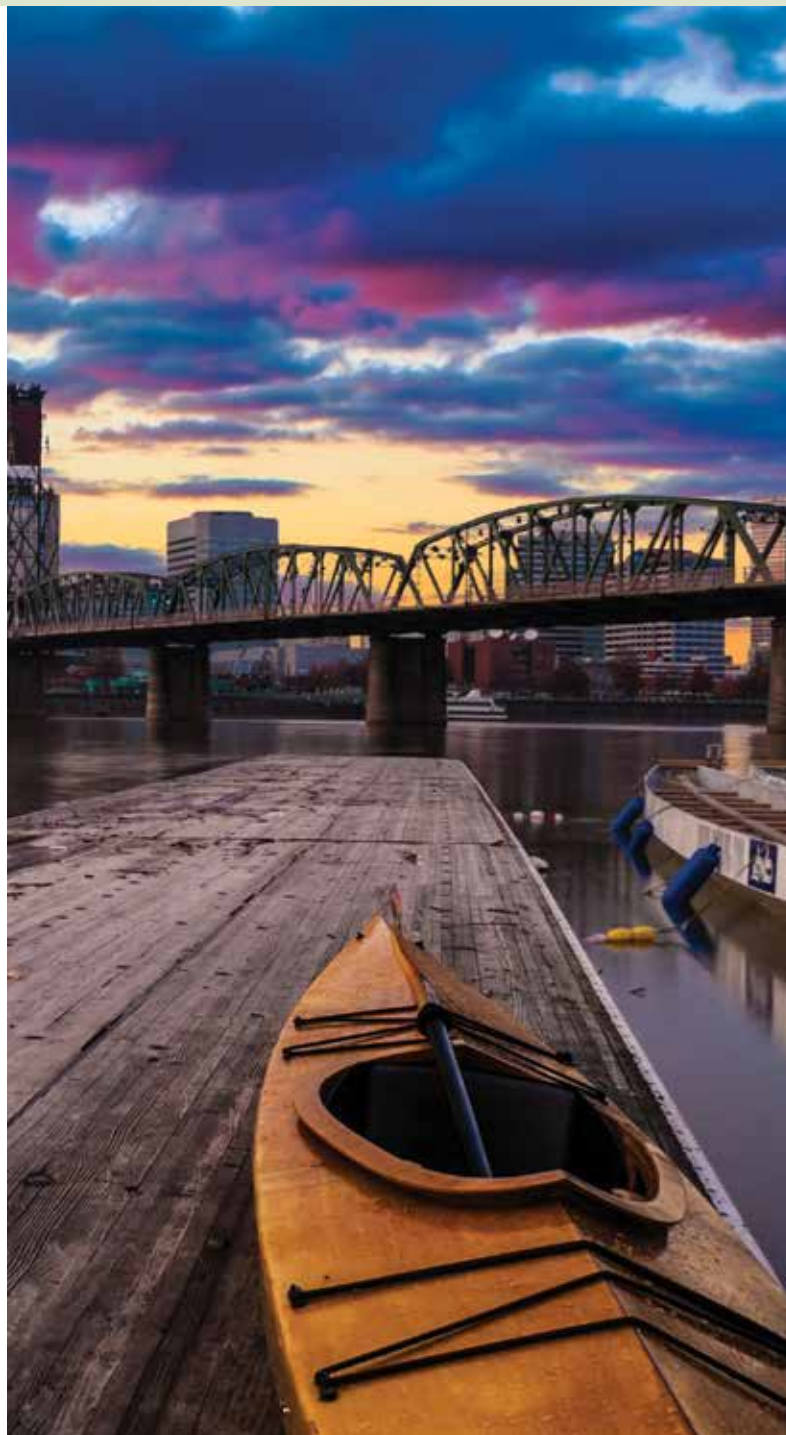
Exhibitor Move-In:

Thursday, August 1*	8:00 am – 4:00 pm
Friday, August 2	8:00 am – 4:30 pm
Saturday, August 3	8:00 am – 4:30 pm
Sunday, August 4	8:00 am – 4:30 pm

*Targeted Island Booths Only

Exhibitor Move-Out:

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





Ground Transportation

RENTAL CAR/VAN/SHUTTLE:

<https://www.flypdx.com>

Ground Transportation for detailed information on taxi service, limousine service, and scheduled shuttle service fees and schedules.

MAX LIGHT RAIL:

Portland features one of the best light-rail systems in the country. One-way fare from the airport to downtown Portland is \$2.50. Visit www.trimet.org for fares, schedules, and system maps.

MORE PORTLAND TRAVEL INFO:

For detailed attraction, tour, dining and travel information for visitors, please go to the Travel Portland website at www.travelportland.com.

M&M 2019
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HOTELS

- 1 DoubleTree by Hilton
- 2 Crowne Plaza Portland
- 3 Courtyard Portland Convention Center
- 4 Residence Inn Convention Center
- 5 Hotel Eastlund
- 6 Hilton Portland Downtown
- 7 Embassy Suites by Hilton Portland
- 8 The Benson Hotel
- 9 Portland Marriott Downtown Waterfront

Getting To & Around Portland

The Portland International Airport (PDX) is located only 12 miles (roughly 20 minutes by car) from downtown Portland. The airport features free Wi-Fi, guest services information and assistance center, and several restaurants, stores, and personal-services outlets. Visit <https://flypdx.com/> for detailed information about the airport.



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- Streamlined, workflow-based user interface



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Events and Activities Sponsored and Organized by the Pacific Northwest Microscopy Society (Local Host Committee)



For reservations and directions: <https://squareup.com/market/pacific-northwest-microscopy-society>



Pub Crawl

TUESDAY, AUGUST 6, 2019
8:00 - 10:30 PM

Meet at the Convention Center
(specific location TBA)

\$6/person

Advance registration required!

Join your PNMS host committee for an evening of local beer and socializing. We will visit 3 Portland breweries, all within walking distance of the convention center, that serve a variety of beers from sours to stouts. Your first round is free!



Willamette River Dinner Cruise

WEDNESDAY, AUGUST 7, 2019
6:30 - 9:00 PM

(6:00 PM boarding from the Salmon St./ Naito Parkway embarkation in downtown Portland)

\$45 per person

\$25 per person (students only—will be verified)

Space is limited!

Advance reservations required!

Enjoy dinner and a Portland river tour aboard the Portland Spirit!

Fresh Northwest cuisine, grand scenery and a warm summer evening are the main ingredients you need for a memorable dinner cruise. Join fellow M&M attendees for a chartered 2.5-hour sail aboard the Portland Spirit (<http://www.portlandspirit.com>), a 150' yacht with panoramic views from 3 decks, two of which are enclosed and climate controlled. The cruise will take you on a unique tour through downtown Portland on the Willamette River while you enjoy your dinner. Several full service no-host (cash) bars provide wine and other beverage service.

This event is made possible by the generous support of **Stacie Kirsch at EMS** and **Paul DeGeorge at Marine Reef International**.



Portland Segway Tour

Discover Portland on a Segway!

TUESDAY AUGUST 6, 2019
4:00 - 6:00 PM

Meet at Lovejoy Fountain Park
(find it on Google Maps)

\$30/person

Advance registration required
(limited to 15 people).

M&M 2019 Sunday Evening Welcome Reception

Oregon Convention Center – Portland Ballroom (Upper Level)

SUNDAY, AUGUST 4, 2019

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.

This year's welcome event at the Oregon Convention Center will be a fun and informal get-together. Enjoy a delicious Northwest-inspired supper buffet and local brews; and catch up with friends and colleagues. After the reception, grab some old and new friends and head out to one of Portland's numerous pubs, microbreweries, or wine bars to continue the fun!



MAS Business Meeting and Social Event –

for MAS Members Only!

WEDNESDAY, AUGUST 7, 2019

5:30 PM - 7:30 PM

Stop by the MAS booth in the lobby to check your membership status and pick up your ticket to the MAS Business Meeting and Social Event, starting on Wednesday, August 7, at 5:30 PM. Meeting and social event will be held in an offsite venue, away from the convention center.



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.



Microscopy Today Innovation Awards

WEDNESDAY, AUGUST 7, 2019

4:00 PM - Poster Awards Stage, Exhibit Hall



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

All events to be held at the Oregon Convention Center unless otherwise noted.

Friday, August 2, 2019

	TIME	LOCATION
MSA Council	8:30 AM	C124

Saturday, August 3, 2019

	TIME	LOCATION
MSA Council	8:30 AM	C124

Sunday, August 4, 2019

	TIME	LOCATION
MAS Council	8:30 AM	C124
IFES Steering Committee	9:00 AM	G131
<i>Microscopy Today</i> Editors	3:00 PM	G132
M&M 2019 Welcome Reception	6:30 PM	Portland Ballroom at Oregon Convention Center

Monday, August 5, 2019

	TIME	LOCATION
Technologists' Forum Board	7:15 AM	G130
MSA Awards + Fellowship Committees	7:15 AM	G131
FIG Pharmaceuticals "Lunch & Learn"	12:00 PM	D140
MAS Meal with a Mentor	12:15 PM	C124
FOM FIG Roundtable	12:15 PM	C121
FIG: Diagnostic & Biomedical Microscopy	12:15 PM	G132
FIG: Focused Ion Beam	12:15 PM	G131
FIG: Atom Probe Field Ion Microscopy	12:15 PM	C120
International Committee	12:15 PM	G130
Technologists' Forum Business Meeting	3:30 PM	G132
FIG: 3D EM in Biological Sciences	3:30 PM	D136
MSA-CUP <i>Elements</i> Committee	4:15 PM	G131
Student Mixer	5:30 – 7:00 PM	C124
Diversity & Inclusion Meet-Up	5:30 PM	C121
Vendor Tutorials at the Exhibit Hall (Sign Up at MSA MegaBooth)	5:45 – 6:45 PM	Exhibit Hall

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

All events to be held at the Oregon Convention Center unless otherwise noted.

Tuesday, August 6, 2019

	TIME	LOCATION
MSA Local Affiliate Societies & MAS Affiliated Regional Societies	7:15 AM	G131
<i>Microscopy Today</i> Editorial Board Meeting	7:15 AM	G132
M&M 2020 – Program Planning for Symposium Organizers	10:00 AM	D140
MSA Standards Committee	12:15 PM	C128
FOM FIG Lunch Meeting	12:15 PM	G131
MSA Distinguished Scientists Awardee Lectures	12:15 PM	C124
FIG: Cryo-Preparation	12:15 PM	G132
FIG: Electron Microscopy in Liquids and Gases	12:15 PM	F149
FIG: Electron Crystallography	12:15 PM	G130
FIG: MicroAnalytical Standards	12:15 PM	F150
MSA Education Committee Meeting	3:30 PM	G132
FIG Business Meeting	3:30 PM	G130
FIG: Aberration-Corrected EM	5:15 PM	G130
Post-Doc Reception	5:30 PM	G131
MSA Student Council	5:30 PM	C123
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 7, 2019

	TIME	LOCATION
MSA Certification Board	7:15 AM	G132
MSA Membership Committee	7:15 AM	G130
<i>MaM</i> Editorial Board	7:15 AM	G131
MSA Members' Meeting	12:15 PM	C124
MAS Members' Meeting & Social (See MAS Booth for Details)	5:30 PM – 7:30 PM	Offsite
Vendor Tutorials in Exhibit Hall (Sign up at MSA MegaBooth)	5:45 PM – 6:45 PM	Exhibit Hall

Thursday, August 8, 2019

	TIME	LOCATION
M&M Sustaining Members	8:30 AM	C123

Thank you

to our sustaining members

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Angstrom Scientific, Inc.

Applied Physics Technologies, Inc.

Birla Carbon Company

Bruker Nano Analytics

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Carnegie Mellon University

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High-Field Consultants, Inc.

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Tescan USA, Inc.

Thermo Fisher Scientific

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TSS Microscopy, LLC

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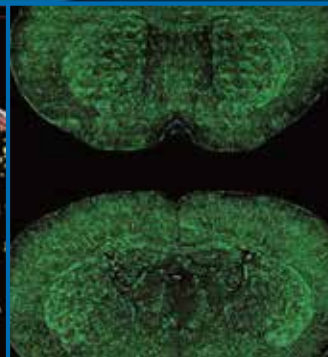
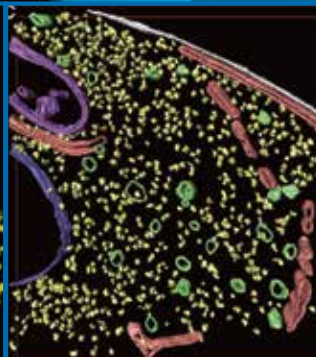
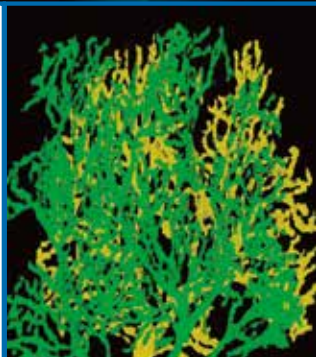
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Societies & Awards



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NEW! Ultra ATS The Ultra ATS Diamond knife is perfect for placing sections on Si wafers to view under the SEM. The knife comes in 3.0mm size with 35° angle.

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Council & Appointed Officers

2019 COUNCIL – OFFICERS & DIRECTORS

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Past President	Robert L. Price
President-Elect	Esther Bullitt
Secretary	Pamela F. Lloyd
Treasurer	Peter A. Crozier
Director	Elizabeth A. Dickey
Director (Local Affiliated Societies)	Patricia Jansma
Director	Deborah F. Kelly
Director	Lena Kourkoutis
Director	Melanie Ohi
Director	Jay Potts
Director	Yimei Zhu

APPOINTED OFFICERS

Archives	Michael Marko
Awards Committee Chair	Miaofang Chi
Certification Board Chair	Lee Cohen-Gould
Educational Outreach Committee Chair	Rengasayee (Sai) Veeraraghavan
Educational Outreach Committee Vice Chairs	Isabel Boona
Educational Resources Chair	Donovan Leonard
Fellows Chair	Esther Bullitt
Finance	Peter A. Crozier
International Committee	David C. Bell
Membership Committee Chair	James Kilcrease
Nominating Committee Chair	Robert L. Price
Placement Office	Katie Jungjohann
Sustaining Members Chair	Stephen E. Mick
Standards Committee	Nestor J. Zaluzec
Student Council President	A. Cameron Varano
Technologists' Forum	Janice Pennington

FOCUSED INTEREST GROUPS

Focused Interest Group Chair	Andrew D. Vogt
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	Suzy Vitale
Pharmaceuticals	Jason Mantei
MicroAnalytic Standards	Anette von der Handt

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Past President	Janet Gbur
President-Elect	Erica Stevens
Secretary	Jackson Spurling
Treasurer	Kartik Venkatraman
Program Chair	Ethan L. Lawrence

PUBLICATIONS

Microscopy and Microanalysis Editor in Chief	John F. Mansfield
Scientific Program Editor	Richard L. Martens
M&M 2019 Proceedings Editor	Gail J. Celio
Microscopy Today Editor-in-Chief	Charles E. Lyman

M&M 2019 ANNUAL MEETING PROGRAM CHAIR

Alice Dohnalkova

SOCIETY & MEETING MANAGEMENT

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Managing Director	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

MSA PAST PRESIDENTS

1942	G.L. Clark	1968	John H. Luft	1994	Robert R. Cardell
1943	R. Bowling Barnes	1969	Wilbur C. Bigelow	1995	Terence E. Mitchell
1944	R. Bowling Barnes	1970	Russell Steere	1996	Margaret Ann Goldstein
1945	James Hillier	1971	Robert M. Fisher	1997	C. Barry Carter
1946	David Harker	1972	Daniel C. Pease	1998	Ralph M. Albrecht
1947	William G. Kinsinger	1973	Benjamin Siegel	1999	David C. Joy
1948	Perry C. Smith	1974	Russell J. Barnett	2000	Kenneth H. Downing
1949	F.O. Schmitt	1975	Gareth Thomas	2001	Ronald M. Anderson
1950	Ralph W.G. Wyckoff	1976	Etienne de Harven	2002	Stanley L. Erlandsen
1951	Robley C. Williams	1977	Thomas E. Everhart	2003	J. Alwyn Eades
1952	R.D. Heidenreich	1978	Myron C. Ledbetter	2004	Sara E. Miller
1953	Cecil E. Hall	1979	John Silcox	2005	M. Grace Burke
1954	Robert G. Picard	1980	Michael Beer	2006	W. Gray (Jay) Jerome
1955	Thomas F. Anderson	1981	John J. Hren	2007	Michael A. O'Keefe
1956	William L. Grube	1982	Lee Peachey	2008	William T. Gunning
1957	John H.L. Watson	1983	David B. Wittry	2009	David J. Smith
1958	Max Swerdlow	1984	J. David Robertson	2010	David W. Piston
1959	John H. Reisner	1985	Dale E. Johnson	2011	Nestor J. Zaluzec
1960	D. Gordon Sharp	1986	Robert M. Glaeser	2012	Janet H. Woodward
1961	D. Maxwell Teague	1987	Linn W. Hobbs	2013	Ernest L. Hall
1962	Keith R. Porter	1988	Jean Paul Revel	2014	Jeanette Killius
1963	Charles Schwartz	1989	Ray W. Carpenter	2015	John F. Mansfield
1964	Sidney S. Breese	1990	Keith R. Porter	2016	Michael Marko
1965	Virgil G. Peck	1991	Charles E. Lyman	2017	Ian M. Anderson
1966	Walter Frajola	1992	Patricia Calarco	2018	Robert L. Price
1967	Joseph J. Comer	1993	Michael S. Isaacson		

2019

Wilbur C. Bigelow
Edward D. Boyes
Pratibha L. Gai
Ronald Gronsky
Maximilian Haider
Michael Marko
David W. McComb
Karren L. More

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

2009 (Inaugural Class)

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

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

Distinguished Scientist Awards

PHYSICAL SCIENCES (2019)

Philip E. Batson

Rutgers University, Department of Physics and Astronomy

Philip E. Batson is a Distinguished Research Professor at Rutgers University, with appointments in Physics, and Materials Science, since his retirement from the IBM Thomas J. Watson Research Center in 2009. After receiving a Ph.D. in Applied Physics in 1976 at Cornell University, he did post-doctoral work at the Cavendish Laboratory in Cambridge England, and then moved to IBM in 1978. During the 1980's he built high resolution EELS equipment there and used it to explore spatially resolved EELS in the STEM, with studies of surface plasmon scattering in metal nanoparticle systems. In 2002, he was the first to demonstrate sub-Angstrom imaging using aberration correction, for which he was recognized with a 2002-2003 Scientific American 50 Award for Leadership in Imaging Sciences. Currently, he is exploring phonon behavior in nanometer sized structures Using EELS with a 10 meV energy resolution. The NSF sponsored project in collaboration with Nion to improve EELS resolution was cited by the White House in 2010 as one of "100 Recovery Act Projects that are Changing America." He has authored about 210 publications and is a Fellow of the American Physical Society and the Microscopy Society of America.



BIOLOGICAL SCIENCES (2019)

Bridget Carragher

Simons Electron Microscopy Center, New York Structural Biology Center

Bridget Carragher received her Ph.D. in Biophysics from the University of Chicago in 1987. She then worked in a variety of positions, both in industry and academia until moving to the Scripps Research Institute in 2001. Since 2002 she has served, together with Clint Potter, as the Director of the National Resource for Automated Molecular Microscopy (NRAMM), an NIH funded national biotechnology research resource. The focus of NRAMM is the development of automated imaging techniques for solving three-Dimensional structures of macromolecular complexes using cryo-transmission electron microscopy (cryoEM). The overall goal is to develop new methods to improve the entire process, from specimen preparation to the generation of the final three-Dimensional map. In 2007 Bridget co-founded a new company, Nanolmaging Services, Inc., whose goal is to provide cryoEM and other microscopy services to the biopharmaceutical and biotechnology industry. She serves as Chief Technical Officer of Nanolmaging Services. In 2015 Bridget and Clint moved their academic lab from The Scripps Research Institute to the New York Structural Biology Center where they serve as Co-Directors of the Simons Electron Microscopy Center. In May 2018 they were awarded a U24 grant to build the National Center for CryoEM Access and Training (NCCAT).



	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. Glauret	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 Aepli	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
2018	Richard Leapman	Yimei Zhu

BURTON MEDAL AWARD (2019)

Hari Shroff

National Institute of Health

Dr. Hari Shroff received a B.S.E. in bioengineering from the University of Washington in 2001, and under the supervision of Dr. Jan Liphardt, completed his Ph.D. in biophysics at the University of California at Berkeley in 2006. He spent the next three years performing postdoctoral research under the mentorship of Eric Betzig at the Howard Hughes Medical Institute's Janelia Farm Research Campus where his research focused on development of photactivated localization microscopy (PALM), an optical super-resolution technique. Dr. Shroff is now chief of NIBIB's Section on High Resolution Optical Imaging laboratory, where he and his staff are developing new imaging tools for application in biological research. Current research areas include further development of super-resolution microscopy, light-sheet microscopy, inverse imaging problems, deep learning for microscopy, and the study of neurodevelopment in *C. elegans*.



MORTON D. MASER DISTINGUISHED SERVICE AWARD (2019)

No 2019 awardee.

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 Gronskey
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
2018	Lena F. Kourkoutis

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
2018	Donovan N. Leonard

Major Society Awards

ALBERT CREWE AWARD (2019)

B. Layla Mehdi

University of Liverpool

Dr B. Layla Mehdi is currently an Assistant Professor and Associate Director of the Imaging Centre at the University of Liverpool (ICaL), UK. She received her Master's in Analytical Chemistry from the University of Warsaw, Poland and her Ph. D. in Chemistry from Miami University, USA working in the area of electrochemical detectors coupled with gas chromatography for cancer therapy. Following her Ph.D., in 2013 she joined the Physical Sciences Directorate at the Pacific Northwest National Laboratory (PNNL) as a postdoctoral research associate and in 2016 was promoted to Staff Scientist. Her work at PNNL involved the development of an In Situ stage to study dynamic processes in next generation batteries with applications to Li-Ion and beyond Li chemistries being supported as part of the Joint Centre for Energy Storage Research (JCESR) funded by the US Department of Energy. She has received numerous international awards for this work, including the 2015 MRS postdoctoral award, the 2015 Microscopy Society of America postdoctoral award and the 2014 Microscopy & Microanalysis Presidential award. In 2016 she also received JSPS Postdoctoral Fellowship to perform Research at Nagoya University, Japan in collaboration with TOYOTA Japan. She has over 20 publications in the development and application of low-dose methods to the operando and high resolution study of beam sensitive materials and processes. She has organized 4 international In Situ liquid TEM workshops, an international In Situ TEM symposium, has given over 25 invited talks at international meetings and institutions, and is the Associate Editor covering In Situ TEM for the SpringerNature journal, Advanced Structural and Chemical Imaging. Currently, her research group focuses on developing advanced new microscopy methods to generate an in depth understanding of reaction kinetics at solid/liquid and solid/gas interfaces in batteries, electrocatalysts and pharmaceuticals.



GEORGE PALADE AWARD (2019)

Alex Noble

New York Structural Biology Center

Alex Noble earned his BS in Physics and BA in Applied Mathematics from UC San Diego and his MS and PhD in Physics at Florida State University. He is currently an NIH Kirschstein Postdoctoral fellow in the laboratory of Bridget Carragher and Clint Potter at the Simons Electron Microscopy Center (SEMC) in the New York Structural Biology Center. He is broadly focused on developing, distributing, and applying methods that further the progress of the cryo-electron microscopy (cryoEM) field and individual cryoEM projects, along with applying those methods himself to specific biological systems. Each focus is driven by a motivation to make positive biomedical and thus humanitarian impacts. As a graduate student, he investigated a model of a coat protein complex II cage by combining cryoEM, hydrogen-deuterium exchange mass spectrometry, and molecular modelling. Beginning as a graduate student and continuing into his postdoctoral training, he develops and maintains software, Appion-Protomo, that enables researchers of all experience levels to process cryo-electron tomography (cryoET) images without the need for additional sample or imaging optimization. As a postdoctoral fellow in a highly-collaborative environment, he has illuminated and investigated a long-standing and widespread problem with single particle cryoEM sample preparation that has numerous broad implications – protein adsorption to the air-water interface. Through collaborative efforts internal and external to SEMC, he investigated solutions to this problem in the form of cryoEM grid freezing techniques (the Spotiton grid preparation robot) and sample detergent optimization. His postdoctoral fellowship, spurred by a fruitful cryoET collaboration, seeks to understand the structural behavior of type II cadherins on membranes, which are a set of cell adhesion molecules with several pathological implications if malformed. His current investigations and efforts also include several projects designed to obtain three-Dimensional cryoET structures of cellular interiors Using cryo-focused ion beam preparation, developing and overseeing deep learning applications in cryoEM/ET, assisting cryoET users at SEMC, and leading cryoET training workshops.



YEAR RECIPIENT

2012	Wu Zhou
2013	Lena Fitting-Kourkoutis
2014	Jinwoo Hwang
2015	Meng Gu
2016	Ryo Ishikawa
2017	Pinshane Y. Huang
2018	Timothy Pennycook

YEAR RECIPIENT

2012	Gabriel C. Lander
2013	Peng Ge
2014	Ricardo C. Guerrero-Ferreira
2015	Alexey Amunts
2016	Dmitry Lyumkis
2017	Rengasayee Veeraraghavan
2018	Not awarded

HILDEGARD H. CROWLEY OUTSTANDING TECHNOLOGIST AWARD FOR BIOLOGICAL SCIENCES (2019)



Matthew S. Joens

Washington University School of Medicine

Matthew is an analytical chemist by undergraduate training and has over 10 years of electron microscopy experience. His introduction into microscopy included internships at the University of California – San Diego (UCSD) with Dr. Timothy Baker, one of the founding fathers of cryo-electron microscopy, and with the National Center for Microscopy Imaging Research (NCMIR), a NIH funded lab headed by Dr. Mark Ellisman. Following these internships, he moved to the Salk Institute for Biological Studies where he worked with Dr. James Fitzpatrick to establish and grow the electron microscopy division of the Waitt Advanced Biophotonics Center. Matthew was later recruited by Dr. Fitzpatrick to help build the Center for Cellular Imaging at the Washington University School of Medicine in St. Louis. His background includes extensive experience with cryo sample preparation, immunolabeling, 3D electron microscopy, and selective staining chemistries. His main interests are in correlative sample preparation and imaging techniques, spanning light, X-Ray, ion, and electron microscopies.

CHUCK FIORI OUTSTANDING TECHNOLOGIST AWARD FOR PHYSICAL SCIENCES (2019)



Dmitri Zakharov

Brookhaven National Laboratory

Dmitri N. Zakharov received his M.S. degree in Solid State Physics from Moscow State Engineering Physical Institute, Department of Theoretical and Experimental Physics in 1995, his Ph.D. in Solid State Physics from the Institute of Crystallography of the Russian Academy of Sciences in 2001, and postdoctoral trainings at Max Planck Institute of Microstructure Physics and Lawrence Berkeley National Laboratory. After spending 6 years as a Staff Scientist at Birck Nanotechnology Center at Purdue University, Dr. Zakharov joined the Center for Functional Nanomaterials at Brookhaven National Laboratory in 2012 in a Staff Scientist role. Dr. Zakharov's research interests include environmental scanning/transmission electron microscopy (ETEM) technique; automated low dose image acquisition of electron beam sensitive materials; Machine Learning algorithms and Big Data analysis for Real-Time image streams processing to extract quantitative information; operando experimental setup utilizing ETEM and the National Synchrotron Light Source II as two complimentary techniques; carbon nanotube nucleation, growth, termination and chirality control; 2D and III-Nitride materials and devices. Dr. Zakharov has over 150 journal and conference publications, which have been cited more than 3,200 times (h-index 33), and he has presented over 30 invited talks in the US and abroad. Dmitri was recipient of 2014 Spotlight Award by Brookhaven National Laboratory and Mikhail Teplov Scholarship in 2000. He also served as Graduate Faculty at the School of Materials Engineering at Purdue University.

YEAR RECIPIENT

1993	Ben O. Spurlock
1994	<i>not awarded</i>
1995	Kai Chien
1996	<i>not awarded</i>
1997	John P. Benedict
1998	Hilton H. Mollenhauer
1999	John M. Basgen
2000	Nancy Crise Smith
2001	<i>not awarded</i>
2002	José A. Mascorro
2003	<i>not awarded</i>
2004	<i>not awarded</i>
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
2018	Anchi Cheng

YEAR RECIPIENT

1993	<i>not awarded</i>	2009	Lynne Gignac
1994	Bernard J. Kestel	2010	<i>not awarded</i>
1995	<i>not awarded</i>	2011	<i>not awarded</i>
1996	David W. Ackland	2012	<i>not awarded</i>
1997	Stanley J. Klepeis	2013	K. Shawn Reeves
1998	Charles J. Echer	2014	Eddy Garcia-Meitin
1999	John C. Wheatley	2015	Masahiro Kawasaki
2000	<i>not awarded</i>	2016	<i>not awarded</i>
2001	Conrad G. Bremer	2017	Richard L. Martens
2002	<i>not awarded</i>	2018	Chengyu Song
2003	Edward A. Ryan		
2004	Mark C. Reuter		
2005	Chris Nelson		
2008	<i>not awarded</i>		



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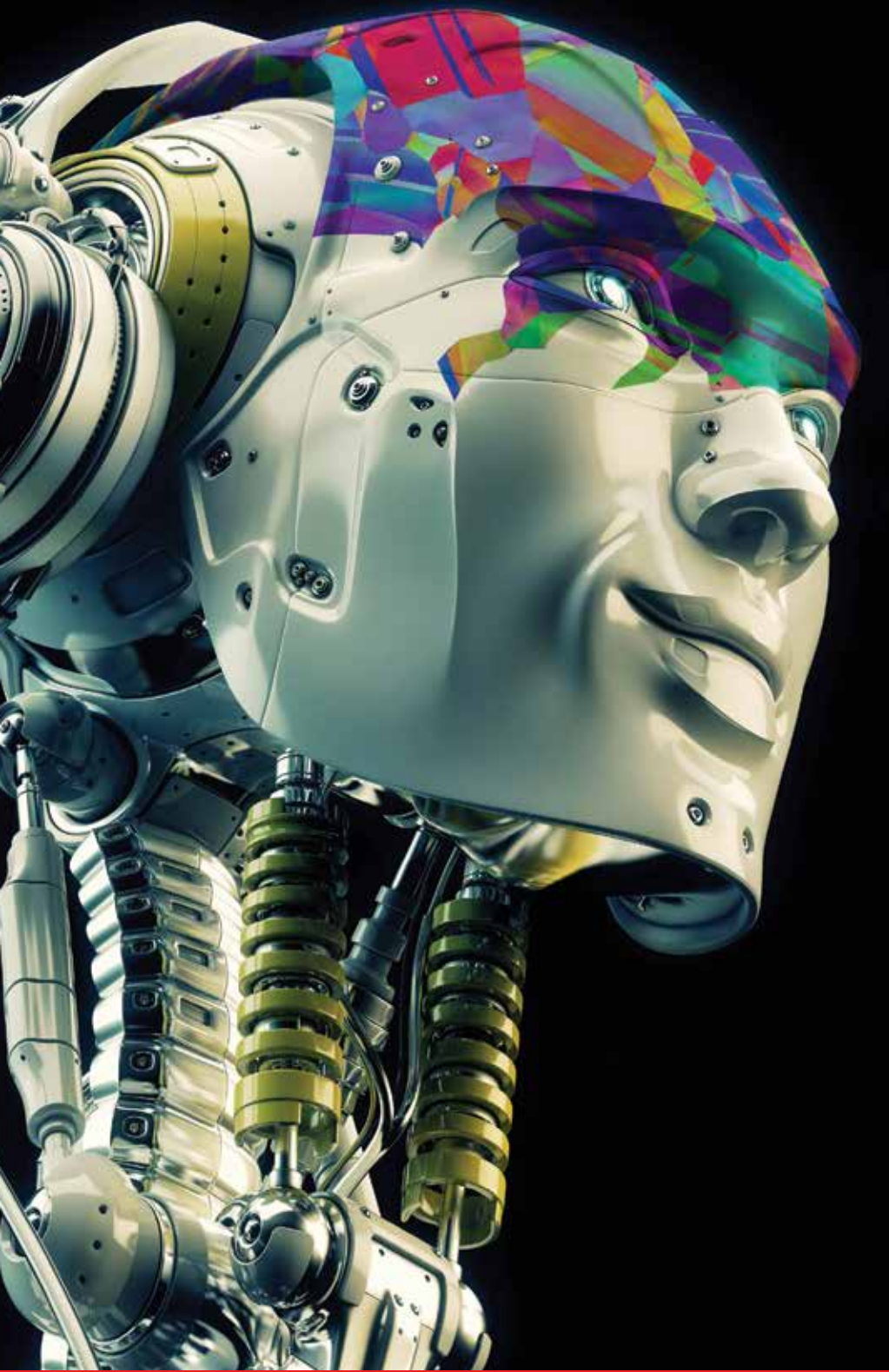
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 - ★ **Velocity™ Super** up to **4,500** indexed points per second
- **Dictionary indexing/Dynamic pattern simulation module** for OIM Analysis™
- Preview **APEX™ 2.0** software for integrated EDS-EBSD analysis
- **Elite T EDS System for TEM** now with 70 mm² and 160 mm² sensors
- **Coming soon....patented CdTe module** for high-energy X-ray analysis for TEM

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or contact us at info.edax@ametek.com

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Roseann Csencsits
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Topical Conferences	Paul K. Carpenter

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
2017-18	M. Watanabe

PETER DUNCUMB AWARD FOR EXCELLENCE IN MICROANALYSIS (2019)

David N. Seidman

Department of Materials Science & Engineering, Northwestern University



David Seidman is a Walter P. Murphy professor of materials science and engineering at Northwestern University, since 1996. He is a pioneer in the development and application of field-ion microscopy (FIM), atom-probe FIM and atom-probe tomography to a wide range of scientific and technological problems, which require spatial resolution at the subnanometer scale and chemical information at the same length scale. He received his Ph.D. degree from the University of Illinois at Urbana-Champaign, where he studied the kinetics of formation of vacancies in up-quenched gold: his advisor was Robert W. Balluffi. His current research interests are in atomistic mechanisms of phase-separation in multicomponent Ni-Based superalloys, development of high-temperature (greater than 723 K) Al-Based alloys, development of high-temperature Co-Based alloys, high-strength tough-steels with good blast and projectile resistance, and the use of silicon nanowires for sensors. Seidman is a member of the National Academy of Engineering, a fellow of the American Academy of Arts & Sciences, American Association for the Advancement of Science, American Physical Society, ASM International, John Simon Guggenheim Memorial Foundation, Materials Research Society, TMS (Minerals•Metals•Materials). Gold Medal Award and Albert Sauveur Achievement Award of ASM International, David Turnbull Lecturer Award of the Materials Research Society, Alexander von Humboldt Stiftung Prize, Max Planck Research Prize.

KURT F.J. HEINRICH AWARD (2019)

Miaofang Chi

Oak Ridge National Laboratory



Miaofang Chi is a senior staff scientist at the Center for Nanophase Materials Sciences (CNMS) at Oak Ridge National Laboratory (ORNL). She received her Ph.D. in Materials Science and Engineering from University of California, Davis in 2008. Her primary research interest lies in the advancements and applications of novel electron microscopy techniques in energy and nanotechnology research, especially in the understanding of interfacial charge transfer behavior in energy storage and nanoelectronics systems. She was awarded the Burton Metal by the Microscopy Society of America (2016). She received the ORNL Director's Award for Outstanding Individual Accomplishment in Science and Technology (2015) and the ORNL's Early Career Research Award (2015). Miaofang is the author and co-author of more than 150 peer-reviewed journal articles. She was named to the Clarivate's 2018 list of Highly Cited Researchers.

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	D. Muller
2017	T. F. Kelly
2018	R.D. Leapman

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	J. Allaz
2017	A. Herzing
2018	Y.N. Picard

PRESIDENTIAL SCIENCE AWARD (2019)

Lawrence Allard

Oak Ridge National Laboratory



Dr. Larry Allard obtained all three of his degrees at the University of Michigan in (what is now the) Materials Science and Engineering Dept. He started his electron microscopy career in 1963 as a sophomore, learning theory and practice under Prof. Wilbur Bigelow. He is currently a Distinguished Research Staff Member in the Materials Science & Technology Division at Oak Ridge National Laboratory. His research involves ultra-high-resolution imaging and microanalysis in studies of precipitation processes in aluminum alloys and superalloys, catalytic materials (e.g. single-atom catalysts) for automotive exhaust after-treatment and other chemical processes, and instrumental developments involving in situ heating and operando gas-reactions electron microscopy used in those studies. He is the chief scientist in charge of the Aberration-Corrected Electron Microscope (ACEM) project at the High Temperature Materials Lab at ORNL; his JEOL 2200FS instrument is one of the first of the new generation of STEM/TEM instruments with sub-Ångström resolution to be installed in the US (2004). He is also the principal technical designer of ORNL's new Advanced Microscopy Laboratory, a facility currently housing 7 Aberration-Corrected microscopes. Dr. Allard has more than 300 cited scientific publications; he has been a co-organizer of more than a dozen workshops and symposia on advanced microscopy topics, and has co-edited several conference proceedings and books, including "Introduction to Electron Holography," the first definitive textbook on electron holography, published by Kluwer/Plenum in 1999. Dr. Allard was elected Fellow of the Microscopy Society of America in 2010. He is still collaborating closely with Prof. Bigelow, who at age 96 continues to contribute to the scientific capabilities provided by the microscopy group at ORNL and other institutions.

PRESIDENTIAL SERVICE AWARD (2019)

Lucille Giannuzzi

EXpressLO LLC



Dr. Lucille Giannuzzi holds a B.E. in Engineering Science and M.S. in Materials Science and Engineering from Stony Brook University. She received her Ph.D. from Penn State in Metals Science and Engineering and was a Post-Doc at the PSU Center for Advanced Materials. Prof. Giannuzzi was at the University of Central Florida for 10 years where she was a recipient of an NSF CAREER award. She joined FEI Company as a product marketing engineer for 7 years before founding her own consulting and product companies. She recently joined TESCAN USA. Dr. Giannuzzi has applied focused ion beam and electron microscopy techniques to study the structure/property relationships in metals, alloys, ceramics, composites, polymers, minerals, bone/dental implants, irradiated, inorganic, and biological materials. She maintains professional affiliations in several societies and is a Fellow of AVS, MSA, and MAS. Dr. Giannuzzi has over 125 (co)authored publications; several FIB-related patents, contributed to several invited book chapters, and is co-editor of a book entitled "Introduction to Focused Ion Beams."

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 M.K. Miller
2018 M.G. Burke

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 D. Kremser
2018 V. Robertson

MAS OUTSTANDING PAPER AWARDS (2019)

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:

Analysis of Redox Changes in Silicate Glasses Using EPMA and Raman Spectroscopy

Ery Hughes, University of Bristol, United Kingdom

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

The MTF and DQE of Annular Dark Field STEM: Implications for Low-dose Imaging and Compressed Sensing

Lewys Jones, Trinity College Dublin, Ireland

L.S. BIRKS – BEST CONTRIBUTED PAPER AWARD:

Low Energy STEM-EELS Characterization of Primitive Organic Matter and Silicates in the Meteorite LAP 02342

Bradley De Gregorio, U.S. Naval Research Laboratory

V.E. COSSLETT – BEST INVITED PAPER AWARD:

Novel EELS Experiments in the Newly Opened Monochromatic Regime

Jordan Hachtel, Oak Ridge National Laboratory

2019 MAS FELLOWS (INAUGURAL CLASS):

Ian Anderson	Cathy Johnson
Phil Batson	Thomas Kelly
Paul Carpenter	Paul Kotula
Bill Chambers	Charles Lyman
John Donovan	John Mansfield
Vinayak Dravid	Joseph Michael
Ray Egerton	Inga Musselman
John Fournelle	Nicholas Ritchie
Hamish Fraser	John Henry Scott
Raynald Gauvin	John Small
Paul Hlava	Ed Vicenzi
Thomas Huber	Masashi Watanabe
Michael Jercinovic	Valerie Woodward



M&M STUDENT SCHOLAR AWARDS— SPONSORED BY MSA

Fatemeh Abbasi Yeganeh, Florida State University
 Yanyan Zhao, Stanford University (Miller Award)
 Paul Cueva, Cornell University
 Ha Dang, University of Washington
 Julia Doh, Oregon Health & Science University
 Amanda Erwin, University of Michigan
 Alice Greenberg, University of Oregon
 Catherine Groschner, University of California-Berkeley
 Shen Han, Max Planck Institute for Polymer Research,
 Germany Daniel Kelly, Manchester University, United Kingdom
 Abinash Kumar, North Carolina State University
 Ethan Lawrence, Arizona State University
 Brandon McKeon, Arizona State University
 Arthur Moya, University of Oxford, United Kingdom
 Akshay Murthy, Northwestern University
 Colum O'Leary, University of Oxford, United Kingdom
 Will Parker, University of Oregon
 Timothy Pegg, Miami University
 Graham Rykiel, Oregon Health & Science University
 Jonathan Schwartz, University of Michigan
 Alexandra Sheader, University of Oxford, United Kingdom
 Michelle Smeaton, Cornell University
 Louisa Mezache, The Ohio State University
 Janis Wirth, Friedrich-Alexander University, Germany
 Yao Long Xing, Sung Kyun Kwan University, Korea
 Reed Yalisove, University of Michigan
 Hwanhui Yun, University of Minnesota
 Ruopeng Zhang, University of California-Berkeley
 Anika Burrell, University of Washington



M&M STUDENT SCHOLAR AWARDS - SPONSORED BY MAS

Kousuke Ooe, University of Tokyo, Japan
 Kevin Schweinar, Max Planck Institute for Iron
 Research, Germany
 Berit Goodge, Cornell University
 Brian Zutter, University of California-Los Angeles
 Charles Fletcher, The University of Oxford, United Kingdom
 Meredith Sharps, University of Oregon
 Heena Inani, University of Vienna, Austria
 Yichao Zhang, University of Minnesota
 Parivash Moradifar, Pennsylvania State University
 Yitian Zeng, Stanford University
 Komal Syed, University of California-Irvine

M&M POSTDOCTORAL SCHOLAR AWARDS

Benjamin Apeleo Zubiri, Friedrich-Alexander University,
 Germany (APKARIAN AWARD—BIOLOGICAL SCIENCES)
 Axel Brilot, University of California-San Francisco
 (APKARIAN AWARD—PHYSICAL SCIENCES)
 Hamish Brown, Lawrence Berkeley Laboratory
 Michael Buch, National Institutes of Health
 Johannes Elferich, Oregon Health & Science University
 Wenpei Gao, University of California-Irvine
 Vivian Merk, Northwestern University
 Aubrey Penn, North Carolina State University
 (ERIC SAMUELS SCHOLARSHIP)
 Paul Smeets, Northwestern University
 Wei-Chang Yang, National Institute of Standards
 and Technology
 Andrew Yankovich, Chalmers University
 of Technology, Sweden

M&M PROFESSIONAL TECHNICAL STAFF AWARDS

Leslie Cummins, Albert Einstein College of Medicine
 Pauline Mochama, University of Minnesota
 Sara Dickens, Sandia National Laboratories
 Ann Johnson, The Dow Chemical Company

Current IFES Steering Committee

David J. Larson	President
Julie Cairney	Vice-President
Ross Marceau	Secretary
Paul Bagot	Treasurer
Mattias Thuvander	
Arun Deveraj	
Gang Sha	
David Saxey	
Baptiste Gault	

IFES Past Presidents

2014 -present	D.J. Larson
2008 - 2014	N. Kruse
2006 – 2008	T.F. Kelly
2002 – 2006	R.G. Forbes
2000 – 2001	D.N Seidman
1996 – 2000	R.G. Forbes
1993 – 1996	M.K. Miller
1990 – 1993	G.D.W. Smith
1987 – 1990	J.H. Block

IFES Fellows

Hans-Olof Andrén	Michael Miller
Didier Blavette	Marwan Mousa
Alfred Cerezo	Osamu Nishikawa
Paul Cutler	John Panitz
Frédéric Danoix	Simon Ringer
Richard Forbes	Guido Schmitz
Georgiy Fursey	David Seidman
Robert Gomer	George Smith
Kazuhiro Hono	Krystyna Stiller
Gary Kellogg	Lyn Swanson
Thomas Kelly	Tien Tzou Tsong
Hans Juergen Kreuzer	Nelia Wanderka
Norbert Kruse	
Allan Melmed	

E.W. Müller Young Scientist Award

(1978)	A.R. Waugh
(1979)	H.-W. Fink
(1980)	Y. Kuk
(1981)	S.J. Banard
(1982)	J.M. Derochette
(1983)	D.R. Kingham
(1984)	M.G. Hetherington
(1985)	M. Ahmad
(1986)	L. Karlsson
(1987)	P.P. Camus
(1988)	A. Cerezo
(1989)	J. Dirks
(1990)	J.E. Brown
(1991)	F. Danoix
(1992)	H. Schmid
(1993)	M.C. Reckzügel
(1994)	R.C. Thomson
(1995)	C. Voss
(1996)	L. Li
(1997)	C. Schmuck-Pareige
(1998)	K. Nagaoka
(2001)	Ch. Lang
(2002)	E. A. Marquis
(2004)	B. Cho
(2006)	W.M. Tsang
(2008)	M. Moors
(2010)	P. Stender
(2012)	M. Roussel
(2014)	C. Oberdorfer
(2016)	M. Dagan
(2018)	S. Lambeets

2019 IFES Travel Scholarship Awards

Olivia G. Licata

University at Buffalo

Multiplicity vs. Composition Study to Understand the Field Evaporation of Polar AlxGa1-xN Heterostructures: A New Approach

Yi-Sheng (Eason) Chen

The University of Sydney, Australia

Atomic-Scale Observation of Hydroxyapatite Nanoparticle

BE PREPARED at the Oregon Convention Center!

In case of fire, medical emergency, or another emergency situation,
Do Not Call 911. Call Building Security at (503) 731-7849.

- Tell them the type of emergency (fire, medical) and the location and level.
- Remain calm and follow directions.
- Use (503) 731-7849 to report any other Security concerns.

Earthquakes

- Portland is in an earthquake-prone area. If you experience an earthquake, remain calm.
 - * DUCK under a sturdy table or other protection.
 - * COVER your head by using your arms.
 - * HOLD on to the table or brace against a wall until the shaking stops.
- Move away from windows and skylights as quickly as possible. Stay away from items that can tip, drop, or fall (windows, overhead lights, exhibit-booth walls, etc.).

DO NOT CALL 911 unless immediate lifesaving or fire suppression help is needed.

Should you encounter a **suspicious package:**

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

In Case of Fire

Call Security at (503) 731-7849. Tell them the **type of fire** (rubbish, oil, etc.), the **location of the fire**, and the **status** (uncontrolled, etc.).

Other Information:

The Oregon Convention Center's **Lost and Found** Department may be contacted at (503) 731-7849. Check M&M 2019 registration first for any lost & found items.

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

Notes

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Electron Microscopy Sciences

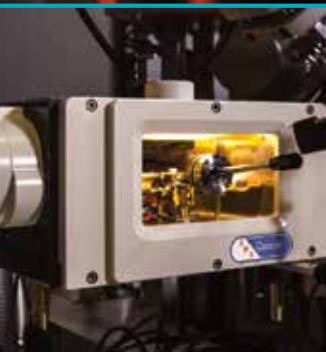
Visit us at Booth 938

Pictured: Neurons from rat
embryonic dorsal root
ganglion.

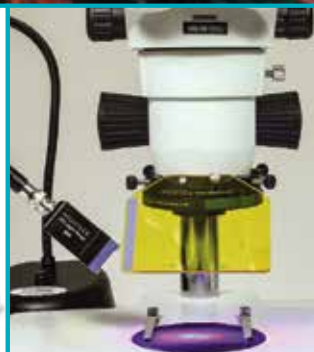
Program Information

FlowVIEW Aquarius
"Liquid" Scanning EM Kit

K-Kit Wet "Liquid" TEM Kit



Quorum PP3010
Cryo-SEM/Cryo-FIB/SEM
Preparation System



NIGHTSEA
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Friday, August 2

8:30 am	MSA Council	C124
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Saturday, August 3

8:30 am	MSA Council	C124
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8:30 am – 5:00 pm	Pre-Meeting Congress	
	X60 - 3rd Annual Pre-Meeting Congress for Students, Post-docs, and Early-Career Professionals in Microscopy & Microanalysis	F150-151

Sunday, August 4

8:30 am – 5:00 pm	Sunday Short Courses	
	X10 - High-Resolution Structure Determination by Cryo-EM: What Could Possibly Go Wrong?	B110-111
	X11 - Super-Resolution Microscopy: Potential, Mechanics, Implementation, and Practicalities	B113
	X12 - Selecting and Optimizing Image Information in the SEM and VPSEM	B114
	X13 - Modern Electron Crystallography for Materials Sciences and Biology	B115
	X14 - <i>In Situ</i> and <i>Operando</i> Approaches to TEM	B116
	X15 - Data Analysis in Materials Science	B118-119

8:30 am – 5:00 pm	Pre-Meeting Congress	
	X61 - NexTEM: Next-Generation Transmission Electron Microscopy	F150-151

8:30 am	MAS Council	C124
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9:00 am	IFES Steering Committee	G131
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3:00 pm	Microscopy Today Editors	G132
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6:30 pm	M&M 2019 Welcome Reception	Portland Ballroom at the OCC
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Monday, August 5

7:15 am	MSA Awards + Fellowship Committees	G131
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7:15 am	Technologists' Forum Board	G130
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8:30 am – 12:00 pm	M&M 2019 Plenary Session	Portland Ballroom at the OCC
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Opening Welcome

The M&M 2019 Executive Program Committee is very pleased to present two of the three 2017 Laureates of the Nobel Prize in Chemistry "for developing cryo-electron microscopy for the high-resolution structure determination of biomolecules in solution", shared with Jacques Dubochet.

Plenary Talk #1:

Joachim Frank, Ph.D.

Professor of Biochemistry, Molecular Biophysics, and Biological Sciences, Columbia University

Studying Kinetics by Counting Particles in Time-Resolved Cryo-EM

MAS Awards Presentation

IFES Awards Presentation

Coffee & Donuts Break

MSA Awards Presentation

M&M Meeting Awards Presentation

Plenary Talk #2:

Richard Henderson, Ph.D.

Professor of Biochemistry, Medical Research Council Laboratory of Molecular Biology (MRC LMB) - Cambridge, United Kingdom

Single-Particle CryoEM: Potential for Further Improvement

12:00 pm – 5:30 pm	Exhibit Hall Open	Exhibit Hall BCD
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12:15 pm	MAS Meal with a Mentor	C124
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Monday, August 5 (cont'd.)

12:15 pm	FIG: Pharmaceuticals “Lunch & Learn”	D140
12:15 pm	FIG: Diagnostic & Biomedical Microscopy	G132
12:15 pm	FIG: Focused Ion Beam	G131
12:15 pm	FIG: Atom Probe Field Ion Microscopy	C120
12:15 pm	FIG: FOM Roundtable	C121
12:15 pm	International Committee	G130
1:30 pm – 3:00 pm	P.M. Symposia & Sessions	
	X44 - Biological Tutorial: High-End Data Collection for Single-Particle Cryo-EM	B110
	A01.1 - Advances in Phase Retrieval Microscopy	B114
	A02.1 - Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy	C123
	A03.1 - Low-Energy X-Ray Spectroscopy: Novel Applications Using Soft X-Ray Emission Spectroscopy (SXES)	D139
	A04.1 - Recent Developments in Atom Probe Tomography	F151
	A05.1 - Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science	C122
	A08.1 - Current Trends and Challenges in Electron Energy-Loss Spectroscopy	B111
	A11.1 - Current and Emerging Microscopy for Quantum Information Sciences	B117
	B03.1 - Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals	D136
	B04.1 - Cutting Edge Microscopy in the Pacific Northwest	D133-134
	P06.1 - <i>In situ</i> TEM of Nanoscale Materials and Electronic Devices for Phase Transformation Studies	B118- 119
	P07.1 - Electron Crystallography of Nanostructures in Nanotechnology, Materials and Bio-Sciences	D138
	P08.1 - Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications	B115
	P09.1 - The Success of TMBA: TEM and STEM Developments in Techniques, Applications and Education	D137
	P11.1 - Advances in Characterization of Geological and Extraterrestrial Samples	B112
	P14.1 - Microstructural and Mechanical Characterization of Metallic Alloys	B116
3:00 pm – 5:00 pm	Monday Poster Presentations	Exhibit Hall
	A01.P1 - Advances in Phase Retrieval Microscopy	
	A05.P1 - Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science	
	A08.P1 - Current Trends and Challenges in Electron Energy-Loss Spectroscopy	
	B03.P1 - Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals	
	B04.P1 - Cutting Edge Microscopy in the Pacific Northwest	
	P07.P1 - Electron Crystallography of Nanostructures in Nanotechnology, Materials and Bio-Sciences	
	P09.P1 - The Success of TMBA: TEM and STEM Developments in Techniques, Applications and Education	
	P14.P1 - Microstructural and Mechanical Characterization of Metallic Alloys	
	X93 - Microscopy Outreach STEM Workshop - High School Poster Presentations	
	All Post-Deadline Posters will be presented on this day.	
3:30 pm	FIG: 3D EM in the Biological Sciences	D136
3:30 pm	Technologists' Forum Business Meeting	G132
4:15 pm	MSA-CUP Elements Committee	G131
5:00 pm	Student Poster Awards	Exhibit Hall
5:30 pm	Student Mixer	C124
5:30 pm	Diversity & Inclusion Meet-Up	C121
5:45 – 6:45 pm	Vendor Tutorials (Sign Up at MSA MegaBooth)	Exhibit Hall

Tuesday, August 6

7:15 am	MSA Local Affiliate Societies & MAS Affiliated Regional Societies	G131
7:15 am	Microscopy Today Editorial Board	G132
8:30 am – 10:00 am	A.M. Symposia & Sessions	
	X43 - Physical Tutorial: Expanding the Computational Toolbox for CryoEM	B110
	X94 - Microscopy Outreach—STEM Roundtable: Building Skills for the Future (OPEN TO ALL)	C124
	A01.2 - Advances in Phase Retrieval Microscopy	B114
	A02.2 - Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy	C123
	A03.2 - Low-Energy X-Ray Spectroscopy: Novel Applications Using Soft X-Ray Emission Spectroscopy (SXES), Cathodoluminescence (CL) and Synchrotron Techniques	D139
	A04.2 - Recent Developments in Atom Probe Tomography	F151
	A05.2 - Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science	C122
	A07.1 - Vendor Symposium	C120-121
	A08.2 - Current Trends and Challenges in Electron Energy-Loss Spectroscopy	B111
	A09.1 - Microscopy and Microanalysis for Real-World Problem Solving	B113
	A11.2 - Current and Emerging Microscopy for Quantum Information Sciences	B117
	B03.2 - Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals	D136
	B04.2 - Cutting Edge Microscopy in the Pacific Northwest	D133-134
	P01.1 - <i>In situ</i> TEM Characterization of Dynamic Processes During Materials Synthesis and Processing	B116
	P05.1 - Theory and Applications of Electron Tomography in the Materials Sciences	D135
	P06.2 - <i>In situ</i> TEM of Nanoscale Materials and Electronic Devices for Phase Transformation Studies	B118-119
	P07.2 - Electron Crystallography of Nanostructures in Nanotechnology, Materials and Bio-Sciences	D138
	P08.2 - Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications	B115
	P09.2 - The Success of TMBA: TEM and STEM Developments in Techniques, Applications and Education	D137
	P11.2 - Advances in Characterization of Geological and Extraterrestrial Samples	B112
10:00 am – 5:30 pm	Exhibit Hall Open	Exhibit Hall
10:00 am – 10:30 am	Coffee Break	Exhibit Hall
10:00 am	M&M 2020 - Program Planning for Symposium Organizers	D140
10:30 am – 12:00 pm	A.M. Symposia & Sessions (Cont'd.)	
	X40 - Physical Tutorial: Following the Electrons: Simulation for High-Resolution STEM and CBEDs	B110
	A01.3 - Advances in Phase Retrieval Microscopy	B114
	A02.3 - Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy	C123
	A04.3 - Recent Developments in Atom Probe Tomography	F151
	A05.3 - Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science	C122
	A07.2 - Vendor Symposium	C120-121
	A08.3 - Current Trends and Challenges in Electron Energy-Loss Spectroscopy	B111
	A09.2 - Microscopy and Microanalysis for Real-World Problem Solving	B113
	A11.3 - Current and Emerging Microscopy for Quantum Information Sciences	B117
	B03.3 - Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals	D136
	B04.3 - Cutting Edge Microscopy in the Pacific Northwest	D133-134
	B08.1 - Cryo-EM—from Physics to Cell Biology: Honoring the Remarkable Legacy of Ken Downing	D139
	P01.2 - <i>In situ</i> TEM Characterization of Dynamic Processes During Materials Synthesis and Processing	B116
	P05.2 - Theory and Applications of Electron Tomography in the Materials Sciences	D135
	P06.3 - <i>In situ</i> TEM of Nanoscale Materials and Electronic Devices for Phase Transformation Studies	B118-119
	P07.3 - Electron Crystallography of Nanostructures in Nanotechnology, Materials and Bio-Sciences	D138
	P08.3 - Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications	B115
	P09.3 - The Success of TMBA: TEM and STEM Developments in Techniques, Applications and Education	D137
	P11.3 - Advances in Characterization of Geological and Extraterrestrial Samples	B112

Tuesday, August 6 (cont'd.)

10:00 am – 10:30 am	Lunch Break	
12:15 pm	MSA Distinguished Scientist Awardee Lectures (Lunch served to first 100 attendees)	C124
12:15 pm	FIG: FOM Lunch Meeting	G131
12:15 pm	FIG: Cryo-Preparation	G132
12:15 pm	FIG: Electron Microscopy in Liquids and Gases	F149
12:15 pm	FIG: Electron Crystallography	G130
12:15 pm	FIG: MicroAnalytical Standards	F150
12:15 pm	MSA Standards Committee	C128
1:30 pm – 3:00 pm	P.M. Symposia & Sessions	
	X45 - Biological Tutorial: Tips and Tricks for High-Pressure Freezing / Freeze Substitution	B110
	A01.4 - Advances in Phase Retrieval Microscopy	B114
	A02.4 - Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy	C123
	A04.4 - Recent Developments in Atom Probe Tomography	F151
	A05.4 - Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science	C122
	A07.3 - Vendor Symposium	C120-121
	A08.4 - Current Trends and Challenges in Electron Energy-Loss Spectroscopy	B111
	A09.3 - Microscopy and Microanalysis for Real-World Problem Solving	B113
	A11.4 - Current and Emerging Microscopy for Quantum Information Sciences	B117
	B03.4 - Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals	D136
	B08.2 - Cryo-EM - from Physics to Cell Biology: Honoring the Remarkable Legacy of Ken Downing	D139
	P01.3 - <i>In situ</i> TEM Characterization of Dynamic Processes During Materials Synthesis and Processing	B116
	P02.1 - Microscopy and Microanalysis of Nuclear and Irradiated Materials	D133-134
	P03.1 - Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions	D135
	P06.4 - <i>In situ</i> TEM of Nanoscale Materials and Electronic Devices for Phase Transformation Studies	B118-119
	P07.4 - Electron Crystallography of Nanostructures in Nanotechnology, Materials and Bio-Sciences	D138
	P08.4 - Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications	B115
	P09.4 - The Success of TMBA: TEM and STEM Developments in Techniques, Applications and Education	D137
	P11.4 - Advances in Characterization of Geological and Extraterrestrial Samples	B112
3:00 pm – 5:00 pm	Tuesday Poster Presentations	Exhibit Hall
	A01.P2 - Advances in Phase Retrieval Microscopy	
	A02.P1 - Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy	
	A03.P1 - Low-Energy X-Ray Spectroscopy: Novel Applications Using Soft X-Ray Emission Spectroscopy (SXES), Cathodoluminescence (CL) and Synchrotron Techniques	
	A04.P1 - Recent Developments in Atom Probe Tomography	
	A05.P2 - Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science	
	A07.P1 - Vendor Symposium	
	A08.P2 - Current Trends and Challenges in Electron Energy-Loss Spectroscopy	
	A09.P1 - Microscopy and Microanalysis for Real-World Problem Solving	
	A11.P1 - Current and Emerging Microscopy for Quantum Information Sciences	
	B01.P1 - Multi-Modal, Large-Scale, and 3D Correlative Microscopy	
	B03.P2 - Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals	
	P01.P1 - <i>In situ</i> TEM Characterization of Dynamic Processes During Materials Synthesis and Processing	
	P02.P1 - Element Analysis of Biological Materials	
	P05.P1 - Theory and Applications of Electron Tomography in the Materials Sciences	
	P06.P1 - <i>In situ</i> TEM of Nanoscale Materials and Electronic Devices for Phase Transformation Studies	

3:00 pm – 5:00 pm	Tuesday Poster Presentations (Cont'd.)	Exhibit Hall
	P07.P2 - Electron Crystallography of Nanostructures in Nanotechnology, Materials and Bio-Sciences	
	P08.P1 - Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications	
3:30 pm	FIG Business Meeting	G130
3:30 pm	MSA Education Committee	G132
5:15 pm	FIG: Aberration-Corrected EM	G130
5:00 pm	Student Poster Awards	Exhibit Hall
5:30 pm	MSA Student Council	C123
5:30 pm	Post-Doctoral Researchers' Reception	G131
5:45 pm	Vendor Tutorials (Sign Up at MSA MegaBooth)	Exhibit Hall
6:30 pm	Presidents' Reception (Invitation Only)	Offsite

Wednesday, August 7

7:15 am	MSA Certification Board	G132
7:15 am	MSA Membership Committee	G130
7:15 am	MaM Editorial Board	G131
8:30 am – 10:00 am	A.M. Symposia & Sessions	
	X31 - Tech Forum Roundtable: Technical Careers in Microscopy—For the Love of Microscopy	B110
	A01.5 - Advances in Phase Retrieval Microscopy	B114
	A02.5 - Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy	C123
	A04.5 - Recent Developments in Atom Probe Tomography	F151
	A05.5 - Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science	C122
	A06.1 - Low Voltage, Low Energy Electron Microscopy Imaging and Analysis	B112
	A08.5 - Current Trends and Challenges in Electron Energy-Loss Spectroscopy	B111
	A09.4 - Microscopy and Microanalysis for Real-World Problem Solving	B113
	A11.5 - Current and Emerging Microscopy for Quantum Information Sciences	B117
	B01.1 - Multi-Modal, Large-Scale, and 3D Correlative Microscopy	D137
	B02.1 - Element Analysis of Biological Materials	D138
	B07.1 - 3D Structures: from Macromolecular Assemblies to Whole Cells (3DEM FIG)	D139
	B09.1 - From Images to Insights: Working with Large Data in Cell Biological Imaging	C120-121
	P01.4 - <i>In situ</i> TEM Characterization of Dynamic Processes During Materials Synthesis and Processing	B116
	P02.2 - Microscopy and Microanalysis of Nuclear and Irradiated Materials	D133-134
	P03.2 - Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions	D135
	P04.1 - Spectroscopy and Imaging of Nanostructured Low-Z Materials in the Electron Microscope	F149
	P06.5 - <i>In situ</i> TEM of Nanoscale Materials and Electronic Devices for Phase Transformation Studies	B118-119
	P08.5 - Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications	B115
	P10.1 - Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing Natural and Synthetic Materials	F150
	P12.1 - New Frontiers in Atom Probe Tomography Applications	D136
	P13.1 - Advanced Characterization of Components Fabricated by Additive Manufacturing	D140
10:00 am – 5:30 pm	Exhibit Hall Open	Exhibit Hall
10:00 am – 10:30 am	Coffee Break	Exhibit Hall
10:30 am – 12:00 pm	A.M. Symposia & Sessions (Cont'd.)	
	X30 - Tech Forum: Utilization of the National NIH funded Cryo-EM Centers: Transformative High Resolution Cryo-Electron Microscopy	B117
	X42 - Physical Tutorial - Efficient Phase Contrast Imaging via Electron Ptychography	B110

Wednesday, August 7 (cont'd.)

10:30 am – 12:00 pm

A.M. Symposia & Sessions (Cont'd.)

A01.6 - Advances in Phase Retrieval Microscopy	B114
A02.6 - Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy	C123
A05.6 - Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science	C122
A06.2 - Low Voltage, Low Energy Electron Microscopy Imaging and Analysis	B112
A08.6 - Current Trends and Challenges in Electron Energy-Loss Spectroscopy	B111
A09.5 - Microscopy and Microanalysis for Real-World Problem Solving	B113
A10.1 - Advances in Focused Ion Beam Instrumentation, Applications and Techniques	F151
B01.2 - Multi-Modal, Large-Scale, and 3D Correlative Microscopy	D137
B02.2 - Element Analysis of Biological Materials	D138
B07.2 - 3D Structures: from Macromolecular Assemblies to Whole Cells (3DEM FIG)	D139
B09.2 - From Images to Insights: Working with Large Data in Cell Biological Imaging	C120-121
P01.5 - <i>In situ</i> TEM Characterization of Dynamic Processes During Materials Synthesis and Processing	B116
P02.3 - Microscopy and Microanalysis of Nuclear and Irradiated Materials	D133-134
P03.3 - Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions	D135
P04.2 - Spectroscopy and Imaging of Nanostructured Low-Z Materials in the Electron Microscope	F149
P08.6 - Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications	B115
P10.2 - Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing Natural and Synthetic Materials	F150
P12.2 - New Frontiers in Atom Probe Tomography Applications	D136
P13.2 - Advanced Characterization of Components Fabricated by Additive Manufacturing	D140

12:00 pm – 1:30 pm

Lunch Break

12:15 pm

MSA Members' Meeting (Lunch served to first 100 participants)

C124

1:30 pm – 3:00 pm

P.M. Symposia & Sessions

X32 - Tech Forum: Imaging Resin Embedded Samples for Serial Block Face Imaging or Array Tomography	B117
X41 - Physical Tutorial: Entrepreneurship in the Microscopy Community	B110
X91 - Microscopy Explorations (Outreach)	B118-119
A01.7 - Advances in Phase Retrieval Microscopy	B114
A05.7 - Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science	C122
A06.3 - Low Voltage, Low Energy Electron Microscopy Imaging and Analysis	B112
A08.7 - Current Trends and Challenges in Electron Energy-Loss Spectroscopy	B111
A09.6 - Microscopy and Microanalysis for Real-World Problem Solving	B113
A10.2 - Advances in Focused Ion Beam Instrumentation, Applications and Techniques	F151
B01.3 - Multi-Modal, Large-Scale, and 3D Correlative Microscopy	D137
B02.3 - Element Analysis of Biological Materials	D138
B07.3 - 3D Structures: from Macromolecular Assemblies to Whole Cells (3DEM FIG)	D139
B09.3 - From Images to Insights: Working with Large Data in Cell Biological Imaging	C120-121
P01.6 - <i>In situ</i> TEM Characterization of Dynamic Processes During Materials Synthesis and Processing	B116
P02.4 - Microscopy and Microanalysis of Nuclear and Irradiated Materials	D133-134
P03.4 - Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions	D135
P04.3 - Spectroscopy and Imaging of Nanostructured Low-Z Materials in the Electron Microscope	F149
P08.7 - Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications	B115
P10.3 - Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing Natural and Synthetic Materials	F150
P12.3 - New Frontiers in Atom Probe Tomography Applications	D136

Wednesday, August 7 (cont'd.)

1:30 pm – 3:00 pm	P.M. Symposia & Sessions (Cont'd.)	
	P13.3 - Advanced Characterization of Components Fabricated by Additive Manufacturing	D140
	SEM Photography Workshop: Photography as Art (FREE; open to all. See M&M website for details.)	C123
3:00 pm – 5:00 pm	Wednesday Poster Presentations	Exhibit Hall
	X91.P1 - Microscopy Explorations	
	A01.P3 - Advances in Phase Retrieval Microscopy	
	A02.P2 - Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy	
	A04.P2 - Recent Developments in Atom Probe Tomography	
	A06.P1 - Low Voltage, Low Energy Electron Microscopy Imaging and Analysis	
	A09.P2 - Microscopy and Microanalysis for Real-World Problem Solving	
	A10.P1 - Advances in Focused Ion Beam Instrumentation, Applications and Techniques	
	B02.P1 - Element Analysis of Biological Materials	
	B04.P1 - Cutting Edge Microscopy in the Pacific Northwest	
	B06.P1 - Pharmaceuticals FIG - Imaging, Analysis, and Regulation of Medical Products, Devices and Data Integrity	
	B07.P1 - 3D Structures: from Macromolecular Assemblies to Whole Cells (3DEM FIG)	
	B09.P1 - From Images to Insights: Working with Large Data in Cell Biological Imaging	
	P01.P2 - <i>In situ</i> TEM Characterization of Dynamic Processes During Materials Synthesis and Processing	
	P02.P2 - Microscopy and Microanalysis of Nuclear and Irradiated Materials	
	P03.P1 - Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions	
	P04.P1 - Spectroscopy and Imaging of Nanostructured Low-Z Materials in the Electron Microscope	
	P06.P2 - <i>In situ</i> TEM of Nanoscale Materials and Electronic Devices for Phase Transformation Studies	
	P08.P2 - Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications	
	P10.P1 - Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing Natural and Synthetic Materials	
	P11.P1 - Advances in Characterization of Geological and Extraterrestrial Samples	
	P12.P1 - New Frontiers in Atom Probe Tomography Applications	
	P13.P1 - Advanced Characterization of Components Fabricated by Additive Manufacturing	
5:00 pm	Student Poster Awards	Exhibit Hall
5:30 pm	MAS Business Meeting and MAS Members' Social (See MAS Booth for details and location.)	
5:45 pm	Vendor Tutorials (Sign Up at MSA MegaBooth)	Exhibit Hall

Thursday, August 8

8:30 am	M&M Sustaining Members	C123
8:30 am – 10:00 am	A.M. Symposia & Sessions	
	A06.4 - Low Voltage, Low Energy Electron Microscopy Imaging and Analysis	B112
	A09.7 - Microscopy and Microanalysis for Real-World Problem Solving	B113
	A10.3 - Advances in Focused Ion Beam Instrumentation, Applications and Techniques	F151
	A12.1 - Advances in Cryo-EM Technology	D137
	B05.1 - Light and Fluorescence Microscopy for Imaging Cell Surface and Structure	B114
	B06.1 - Pharmaceuticals FIG-Imaging, Analysis, and Regulation of Medical Products, Devices and Data Integrity	B111
	P01.7 - <i>In situ</i> TEM Characterization of Dynamic Processes During Materials Synthesis and Processing	B116
	P02.5 - Microscopy and Microanalysis of Nuclear and Irradiated Materials	D133-134
	P03.5 - Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions	D135
	P04.4 - Spectroscopy and Imaging of Nanostructured Low-Z Materials in the Electron Microscope	F149

Thursday, August 8 (Cont'd.)

8:30 am – 10:00 am	A.M. Symposia & Sessions (Cont'd.)	
	P08.8 - Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications	B115
	P10.4 - Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing Natural and Synthetic Materials	F150
	P12.4 - New Frontiers in Atom Probe Tomography Applications	D136
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	
	A06.P2 - Low Voltage, Low Energy Electron Microscopy Imaging and Analysis	
	A09.P3 - Microscopy and Microanalysis for Real-World Problem Solving	
	A10.P2 - Advances in Focused Ion Beam Instrumentation, Applications and Techniques	
	A12.P1 - Advances in Cryo-EM Technology	
	B05.P1 - Light and Fluorescence Microscopy for Imaging Cell Surface and Structure	
	B07.P2 - 3D Structures: from Macromolecular Assemblies to Whole Cells (3DEM FIG)	
	P01.P3 - <i>In situ</i> TEM Characterization of Dynamic Processes During Materials Synthesis and Processing	
	P03.P2 - Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions	
	P08.P3 - Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications	
	P10.P2 - Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing Natural and Synthetic Materials	
	P11.P2 - Advances in Characterization of Geological and Extraterrestrial Samples	
12:00 pm	Student Poster Awards	Exhibit Hall
12:00 pm - 1:30 pm	Lunch Break	
1:30 pm – 3:00 pm	P.M. Symposia & Sessions	
	A06.5 - Low Voltage, Low Energy Electron Microscopy Imaging and Analysis	B112
	A09.8 - Microscopy and Microanalysis for Real-World Problem Solving	B113
	A10.4 - Advances in Focused Ion Beam Instrumentation, Applications and Techniques	F151
	A12.2 - Advances in Cryo-EM Technology	D137
	B05.2 - Light and Fluorescence Microscopy for Imaging Cell Surface and Structure	B114
	P01.8 - <i>In situ</i> TEM Characterization of Dynamic Processes During Materials Synthesis and Processing	B116
	P03.6 - Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions	D135
	P04.5 - Spectroscopy and Imaging of Nanostructured Low-Z Materials in the Electron Microscope	F149
	P08.9 - Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications	B115
3:00 pm - 3:30 pm	Coffee Break	
	D Foyer; B Foyer	
	Late P.M. Symposia	
	A12.3 - Advances in Cryo-EM Technology	D137
3:30 pm - 5:00 pm	B05.3 - Light and Fluorescence Microscopy for Imaging Cell Surface and Structure	B114
	P03.7 - Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions	D135
	P04.6 - Spectroscopy and Imaging of Nanostructured Low-Z Materials in the Electron Microscope	F149
	P08.10 - Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications	B115
	P10.6 - Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing Natural and Synthetic Materials	F150

WELCOME FROM THE PROGRAM CHAIRS

On behalf of the Microscopy Society of America (MSA), the Microanalysis Society (MAS), and the International Field Emission Society (IFES), we are excited to welcome you to Microscopy & Microanalysis 2019 in Portland, Oregon.



As many of you who have previously visited Portland know, this city is a terrific location for our meeting: set between Mt. Hood and the Pacific coast, Portland (PDX to locals) presents a variety of attractions for everybody. Infused with the awesome Pacific Northwest culture of environmental conservation and organic local food sourcing, you will find a lot of wonderful restaurants here, plus a myriad of microbreweries, distilleries and wineries! Don't forget to visit famous PDX staples like Powell's Books and the charismatic Voodoo Donuts. Don't forget your hiking shoes or beachwear if you're planning to explore the great outdoors like the Columbia Gorge area or the Oregon Coast beaches.

The meeting itself will be preceded by our usual array of Sunday Short Courses, two Pre-Meeting Congresses, and our Sunday evening Opening Welcome Reception. We will once again hold a Pre-Meeting Congress featuring outstanding work by students and early-career researchers.

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 of the 2017 Nobel Prize laureates Joachim Frank and Richard Henderson.

Immediately following the plenary session, the largest microscopy/ microanalysis instrument exhibition in the world opens to participants. Plan to visit the more than 100 companies displaying their latest technology and services. The social activities of the opening reception, and daily "happy hours" accompanying each day's poster and awards sessions, have become "can't-miss" events of learning and fellowship.

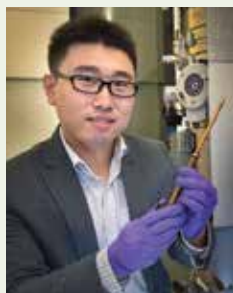
For a complete description of all the symposia, contributed sessions, educational opportunities and the multiple award possibilities from the three organizing societies, please visit:

<http://www.microscopy.org/MandM/2019/>.

Be sure to download the M&M 2019 mobile app! ("M&M Annual Meeting" in App Store or Google Play.)



Alice Dohnalkova
PROGRAM CHAIR



Huolin Xin
PROGRAM CO-CHAIR



Assel Aitkaliyeva
MAS CO-CHAIR



Baptiste Gault
IFES CO-CHAIR

The M&M 2019 Executive Program Committee is very pleased to present two of the three 2017 Laureates of the Nobel Prize in Chemistry "for developing cryo-electron microscopy for the high-resolution structure determination of biomolecules in solution" and shared with Jacques Dubochet.

PLENARY SPEAKER

Joachim Frank, Ph.D.

**Professor of Biochemistry, Molecular Biophysics, and Biological Sciences,
Columbia University**

Dr. Joachim Frank's major contribution to the field has been in developing mathematical and computational methods for processing and analyzing cryo-EM images of multiple randomly-oriented molecules within a sample and compiling them into a representative 3D structure.

Dr. Frank used his algorithms to generate the first 3D images of the ribosome - a large structure made of several proteins and RNA strands, which is responsible for translating RNA into proteins inside cells in all organisms. With this distinctive technique, when combined with Dubochet's method of ice-embedding, information on conformational changes of macromolecules in their native states can be obtained, which enables a deeper understanding of the way 'molecular machines' function in cells. Structures of many molecules that resist crystallization and hence cannot be studied by X-Ray crystallography can now be elucidated. Initially, the resolution that could be obtained was limited by the poor performance of recording media. This technical problem was solved 7 years ago with the introduction of cameras capable of detecting single electrons. The development of cryo-electron microscopy has revolutionized the imaging of biomolecules and propelled biochemistry into a new era. By now, about 1500 structures of proteins and RNA-protein complexes have been solved and entered in a public database, making this knowledge a fast growing and increasingly important contribution to molecular medicine and the development of drug therapies.

Dr. Frank's achievements were recognized with MSA's Distinguished Biological Scientist award in 2003, and he was named an MSA Fellow in 2009.



Studying Kinetics by Counting Particles in Time-Resolved Cryo-EM

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²Department of Biological Sciences, Columbia University, New York, USA

In time-resolved cryo-EM, the progress of a reaction, started by mixing of two components, can be followed over a period of time by stopping the reaction and imaging the samples at defined intervals [1, 2]. At each time point there will be a mixture of the two starting components, transient intermediate products, and end product. Most reactions of biological molecular machines of interest are completed within a few hundred milliseconds, necessitating special technology for fast mixing, reacting over a defined period of time, and depositing the reaction product on the EM grid. We have demonstrated that with a mixing/spraying microfluidic device previously developed in a collaboration between researchers at the Wadsworth Center and RPI [3], high-resolution reconstructions (in the 3-Å range) of short-lived intermediates can now be routinely obtained [4,5]. Thus, we can now achieve both spatial and temporal resolution in following the progress of a reaction. Importantly, kinetic data are obtained implicitly as a byproduct of classification: by simply counting the number of particles in each class (or subpopulation) for each time point captured. In principle, therefore, time-resolved cryo-EM is able to measure the kinetics of a macromolecular reaction by a sequence of experiments with microfluidic chips designed for a series of time points.

Here I would like to raise the question to what extent this method of kinetic measurement can be used in practice. This is an important question since a reliable method of measuring reaction kinetics of macromolecules by counting particles in micrographs collected by cryo-EM would be a significant addition to the tool chest of Biophysics.

However, the precise quantification of the numbers of particles in such experiments faces several obstacles: there is evidence that a fraction of molecules suffer damage as they are prepared for cryo-EM. This damage is attributed to denaturing interactions with the air-water interface [6], where the majority of the molecules reside according to recent electron tomographic evidence [7]. Even if there were a reliable way of sorting out damaged from undamaged molecules, then a bias in counting could still be created if the propensity to damage is different for different reaction products. Clearly a remedy to this problem would require a different preparation method that ensures all molecules are fully encased in ice. Next is the difficulty of unbiased particle selection. At the particle-picking step, it is possible that different molecule species are picked with different error rates. This problem requires a systematic study of particle-picking algorithms Using mixtures of different species with defined ratios. Third on the list is the question if the classification algorithm is able to make the right decision in sorting the images into a pre-given number of classes, especially in the presence of “noise images”, or false positives in the particle picking. Here it is useful to do tests on a given dataset with different fractions of fake particles (i.e., simulated false positives of particle picking) admixed, taking for as fake particles, for example, data excised from the background [4]. Fourth is the reproducibility of classification results from the same dataset with different seeds, which for a dataset of ribosome particles turned out extremely good, within a very small margin of error.

In all, these questions define an entire program of validation tests for different kinds of molecules. These tests do not necessarily all require time-resolved experiments, but can be parceled into separate studies all involving conventional cryo-EM [8].

References

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PLENARY SPEAKER

Richard Henderson, Ph.D.**Professor of Biochemistry, Medical Research Council Laboratory of Molecular Biology (MRC LMB) - Cambridge, United Kingdom**

Dr. Richard Henderson developed TEM into a tool for the direct determination of the structure of proteins, and applied it most notably to two-Dimensional (2D) crystals of the purple light-harvesting protein, bacteriorhodopsin. Images and electron diffraction patterns of many 2D crystals of bacteriorhodopsin from multiple angles were acquired Using low-dose electron exposures, and combined to generate a 3D image of the protein. He continued to refine this technique over many years until he produced images at similar resolutions as those from X-Ray diffraction. Later, Dr. Henderson turned his attention to the development and improvement of methods of high-resolution electron cryo-microscopy and single particle structure determination. With colleagues, he advanced these techniques for exploring high resolution ultrastructure of membrane proteins, protein complexes and other non-crystalline biomolecules in solution. During this journey, Dr. Henderson made critical contributions to many of the single particle electron microscopy approaches, including pioneering the development of direct electron detectors.

Dr. Richard Henderson was presented with MSA's Distinguished Biological Scientist award in 2005, and was named as an MSA Fellow in 2009.

**Single Particle CryoEM: Potential for Further Improvement****Richard Henderson^{1*} and Christopher J. Russo¹**¹ MRC Laboratory of Molecular Biology, Cambridge CB2 0QH, UK

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Recent progress in single particle electron cryo-microscopy (cryoEM) has allowed determination of the structures of a range of novel macromolecules or macromolecular assemblies, many of which have proved intractable to other approaches. The method requires only a few tens of micrograms of material; the sample does not have to be completely pure; nor completely stable. The success of the approach has been built on the early development of a plunge-freezing method for producing a thin film of amorphous ice [1] in which biological structures could be embedded [2], and by three-Dimensional (3D) structure determination algorithms that have evolved out of early random conical tilt [3] and angular reconstitution [4] approaches. The final quantum leap in capability came from technical improvements in the electron microscopes together with better detectors and improvements in computing [5]. The most popular microscope platforms at present, such as the Thermo Fisher Titan Krios or the JEOL CryoARM300, are still very expensive, and there is not yet enough capacity to cope with the demand. This means it is difficult for smaller groups not located in major research universities to obtain access to modern cryoEM equipment, so there is an urgent need for more affordable cryoEM.

We have also been analysing the technical limitations that prevent cryoEM from reaching its ultimate potential. We have made quantitative evaluations of the candidate problems: we have shown that charge build up on non-conducting thin films of amorphous ice [6], the “Berriman effect”, occurs on a shorter timescale than image acquisition, that microscopic charge fluctuations that can be observed as the “beeswarm effect” do not significantly degrade the image quality [7], and confirmed [8] that corrections for Ewald sphere curvature proposed earlier [9] remove one of the arguments for Using higher energy electrons. Alongside measurements of the effects of radiation damage, this has allowed us to propose a rough physical theory of information loss in cryoEM [10]. It is summarized in a model (Fig. 1) of how the B-factor decays with electron fluence during imaging. The B-factor is the Debye-Waller factor, which can be used to assess information content [11]. The key outstanding problem is the elimination of mechanical beam-induced specimen motion in the early part of a typical cryoEM image acquisition (shaded area in Fig. 1). Although gold grids with thick holey gold supporting foils [12] offer a significant reduction in motion, there is still a critical and uncontrolled electron beam-induced motion in the very earliest part of the exposure, where the specimen structure is least damaged by electron irradiation.

Lastly, we have analysed which aspects of current electron microscope technology are really essential for cryoEM, with the goal of making it less expensive and widely accessible. From an analysis of elastic and inelastic cross-sections and radiation damage [13], we have concluded that a 100 keV cryoEM equipped with a bright (coherent) electron source and a good detector could be as good (or even better for many purposes) as the best current technology, yet could be much less expensive. New ideas are therefore needed to address the remaining problem of specimen motion in the earliest part of low-dose exposures, and to develop instruments that are more affordable yet still allow the great majority of cryoEM experiments to be performed [14].

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- [14] The authors acknowledge funding from the UK Medical Research Council grant numbers MC_U105184322 and MC_UP_1201/17. We thank our colleagues Mathew Peet, Greg McMullan, Wasi Faruqi and Shaoxia Chen for discussions and collaborations, and the Medical Research Council for support.

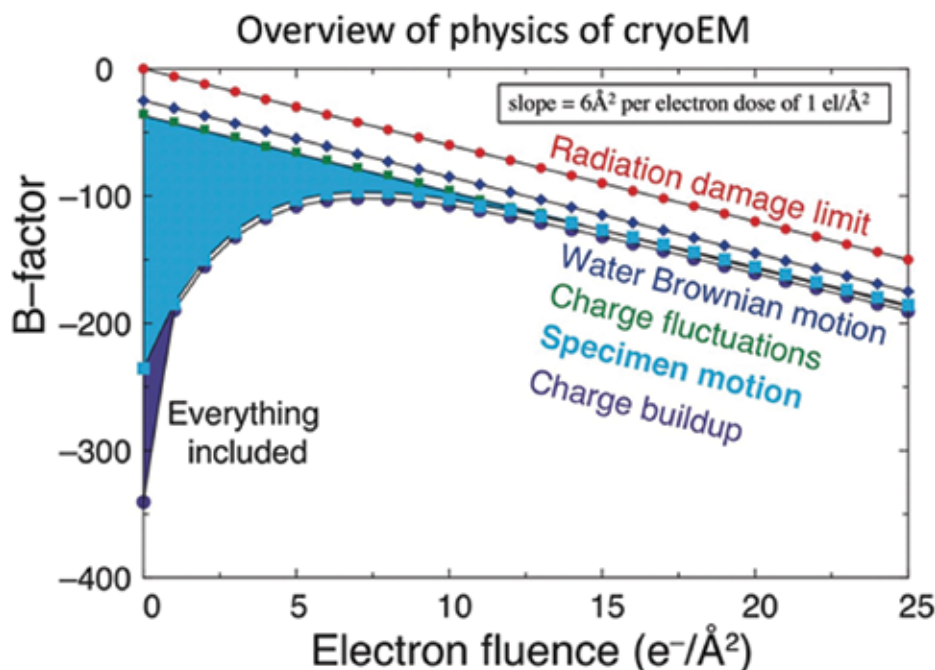


Figure 1. Summary of the effects on B-factor as a function of electron fluence of five different possible sources of information loss in single particle cryoEM [10]. The most important is mechanical specimen motion (shaded area) during the first part of the exposure at electron doses up to about 5 e-/ Å².

ORGANIZER:

Mike Marko, Wadsworth Center

- These full-day courses run from 8:30 AM to 5:00 PM on Sunday, August 4th, 2019.
- A certificate of participation will be issued to each requesting participant, following the conclusion of the M&M 2019 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).

X-10 High-Resolution Structure Determination by Cryo-EM: What Could Possibly Go Wrong?

Room B110-111

LEAD INSTRUCTORS:

Anchi Cheng, New York Structural Biology Center

Steve Ludtke, Baylor College of Medicine

- Specimen preparation and plunge-freezing choices and considerations
- Data collection - Camera and TEM parameters, TEM automation
- Initial image processing from raw data
- Single-particle reconstruction, choices and validation
- Structure modeling and results presentation

In this one-day course, it is not possible to explain and cover all the methods required for successfully determining a structure. However, an overview of the steps, and particularly advice on pitfalls to be avoided, will be especially of interest to those who will wish to employ this method. We identify the range of methods, instrumentation, and software available, and we will illustrate by means of recent successful results.

X-11 Super-Resolution Microscopy: Potential, Mechanics, Implementation, and Practicalities

Room B113

LEAD INSTRUCTORS:

Bryan Millis, Vanderbilt University

Simon Watkins, University of Pittsburgh

- What is “super-resolution microscopy” and do you need it?
- What are the various approaches available and how does each work?
- What are the strengths and weaknesses of each method?
- Practicalities of running super-resolution imaging in a multi-user facility.
- How practical is live-cell super-resolution microscopy?
- Common pitfalls of super-resolution microscopy.

Super-resolution microscopy is becoming a mainstream approach in both individual and core biomedical research laboratories. The diversity and overall capabilities of these techniques are evolving rapidly. As such, the term “super-resolution microscopy” can describe very different fundamental approaches, all quite distinct with respect to implementation, and each with specific strengths and weaknesses. For the researcher looking to get into super-resolution microscopy, the aforementioned can be overwhelming. This workshop primarily attempts to clarify many of the questions that typically go along with getting started with super-resolution microscopy, as well as pairing the right technology with the biological question of interest.

X-12 Selecting and Optimizing Image Information in the SEM and VPSEM

Room B114

LEAD INSTRUCTOR:

(NEW) **Bradley Thiel, SUNY-Polytechnic Institute**

- Understanding the imaging options for materials and biological application-Specific SEM use
- Determining specific conditions for the most-relevant sample imaging
- Modern electron detection systems and stage/column variables for SEM/VPSEM
- Tools for measurement and resolution determination

Below-lens, through-lens and above-lens detection and imaging systems provide complex and exciting imaging options. Selection of the optimal option can be prohibitively time-consuming. To help simplify or speed up this up, each option will be explained and compared by means of a set of standard samples. This will include the effects of angular selectivity of annular backscattered electron detection. Effects of the stage and chamber on the detected signals will be followed by a comparative overview of VPSEM imaging. Stage biasing, beam deceleration, stage isolation and the effects of contact-protection systems will be discussed. Brief presentations on their detection systems by invited manufacturers will be followed by a general discussion. Effects of sample types, coatings and cleaning will be reviewed. Techniques for resolution measurement, and sourcing of suitable samples, will be presented as a student practical. Using software provided in the course notes. Questions are encouraged throughout the day and can also be submitted prior to the course, following enrolment.

All M&M 2019 symposia, workshops, meetings, and official events are held at the Oregon Convention Center unless otherwise indicated.

X-13 Modern Electron Crystallography for Materials Sciences and Biology

Room B115

LEAD INSTRUCTORS:

Sergei Rouvimov, University of Notre Dame

Peter Moeck, Portland State University

- Recent developments in electron crystallography for nanomaterials including soft and biological materials
- Basics of scanning electron diffraction methods for microstructure analysis including bio-crystals
- Electron crystallography applications for structural biology, including protein crystals
- Cryo-electron crystallography, including single-particle cryo-EM
- New experimental and computer-simulation techniques to improve the speed and reliability of structure characterization

Electron crystallography has many applications in nanotechnology, materials and biological sciences. Due to recent developments in TEM instrumentation, electron crystallography became readily available to study nanostructures and biological materials at the nanoscale. This course addresses recent developments in instrumentation and electron diffraction methods, both experimental techniques and computer-Based data processing, that allow research of a wide range of materials, including Beam-Sensitive materials. This course brings together and provides updates for researchers from both materials and biological sciences on novel techniques for a wide range of materials systems, and new data analyses and computational methods including their application for cryo-EM.

X-14 *In Situ* and *Operando* Approaches to TEM

Room B116

LEAD INSTRUCTORS:

Robert Sinclair, Stanford University

Peter Crozier, Arizona State University

This course introduces the fundamental concepts for *in situ* electron microscopy, and includes:

- Hot stages
- Gas cells
- Liquid cells
- Biasing holders
- Magnetic field
- Light illumination

In situ and *operando* transmission electron microscopy are becoming increasingly important in advanced materials characterization. Being able to observe materials in state that are similar to real world applications is now recognized as vital for relating structure to functionality. The ability to perform atomic level analysis while the sample is exposed to different stimuli/ environments such as heat, strain, gas, liquids, electric field, magnetic field, light, etc....is a key part of the *in situ* approach. *Operando* approach requires simultaneous measurement of some technologically relevant functionality such as current flow, deformation or catalysis.

X-15 Data Analysis in Materials Science

Room B118-119

INSTRUCTORS:

Duncan Johnstone, University of Cambridge, United Kingdom

Katherine E. MacArthur, Forschungszentrum Jülich, Germany

Magnus Nord, University of Antwerp, Belgium

Francisco de la Peña, University of Lille, France

Eric Prestat, University of Manchester, United Kingdom

Joshua Taillon, National Institute of Standards and Technology

- Introduction to HyperSpy and related Python libraries for multi-Dimensional image and spectra processing and analysis
- Machine learning
- Big data analysis strategies
- Curve fitting of multi-Dimensional datasets
- EELS and EDS analysis
- Atomic resolution image analysis

This short course introduces the use of HyperSpy and related Python libraries (atomap, pixStem, pyXem) for analysis of microscopy datasets. No prior Python knowledge is required. Attendees learn how to perform basic machine learning, multi-Dimensional curve fitting for EELS and EDS quantification, atomic resolution image analysis and big data processing (such as 4D STEM) on desktop computers.

X60 Third Annual Pre-Meeting Congress for Students, Post-Docs, and Early-Career Professionals in Microscopy and Microanalysis

Saturday, August 3, 2019 • 8:20 AM–5:00 PM

Oregon Convention Center, Room F150-151

INCLUDED IN REGISTRATION FEE:

Friday Evening Welcome Reception; Breakfast; AM Break; Lunch; PM Break; Saturday Evening Banquet

Organized by



PROGRAM CHAIR:

Ethan Lawrence, Arizona State University

BIOLOGICAL SCIENCES CO-CHAIR:

Mike Casasanta, Pennsylvania State University

PHYSICAL SCIENCES CO-CHAIR:

Eric Hoglund, University of Virginia

The Pre-meeting Congress X60 (PMCx60) is an annual meeting organized by the MSA Student Council (StC) for Students, Postdocs, and Early-career Professionals in Microscopy and Microanalysis. The PMCx60 is held in conjunction with the annual Microscopy and Microanalysis (M&M) Meeting.

In addition to the premier technical program, the PMCx60 features informal get-togethers on Friday and Saturday nights so participants can meet in a relaxed setting. The PMCx60 is scheduled to allow attendees to participate in Sunday Short Courses or Focused Interest Group (FIG) sponsored PMCs, or to enjoy a free day with new friends.

The PMCx60 is organized by, and tailored to, students and early-career professionals, however all are welcome to attend. The PMCx60 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. Invited speakers are selected from the awardees to be honored at M&M, giving attendees a unique opportunity to sample the best research from their peers in biological science, physical science, analytical science, and instrumentation. Contributed posters also give attendees an opportunity to share their work with peers in an intimate and casual setting.

Additional professional development activities include a luncheon featuring a panel of recent graduates currently working in industry, academia, policy, and government labs. The PMCx60 and M&M are wonderful opportunities for students (undergraduate and graduate), postdocs, and early-career professionals to network with peers, members of academia and industry, as well as vendors from a variety of top companies who are invited to exhibit their latest developments during the PMCx60 Poster and Extended Networking Sessions.

Thank you to our sponsors and supporters!



Separate registration fee required. See the Registration Desk if you wish to register.
Please review individual PMC listings below for information on meals and breaks.

X61 NexTEM: Next-Generation Transmission Electron Microscopy

Sunday, August 4, 2019 • 8:30 AM–5:00 PM

Oregon Convention Center, F149-150

INCLUDED IN REGISTRATION FEE:

Breakfast, AM Break, Lunch, PM Break, Late Afternoon Reception

Supported by the Aberration Corrected Electron Microscopy FIG

ORGANIZERS:

Steven R. Spurgeon, Pacific Northwest National Laboratory

Mitra L. Taheri, Drexel University

Demie Kepaptsoglou, SuperSTEM, United Kingdom

The second annual Next-Generation Transmission Electron Microscopy (NexTEM) workshop brings together researchers from diverse backgrounds to present the state-of-the-art in cutting edge electron microscopy tools and related applications.

TOPICS

Advanced Detector and Spectroscopy Developments

- Design and use of novel detectors to investigate material structure and functionality, including 4D STEM and ptychography.
- Vibrational and phonon spectroscopies at unprecedented spatial and energy resolution.
- Methods to conduct high-resolution imaging and spectroscopy of Beam-Sensitive samples.
- Examination of materials structure and chemistry at cryogenic temperatures.

Frontiers of *In Situ* / *Operando* Microscopy

- Advances in S/TEM methods and instrumentation to capture the dynamics of complex materials systems, including alloys, thin films, nanoparticles, and liquids.
- Investigation of materials under stimulus across a range of sample environments and temperatures.
- New workflows for in situ experimentation to ensure reliability, reproducibility, and improve data quality.

Data-Driven Microscopy and Analysis

- Machine learning-Based analysis of materials structure, dynamics, and defects.
- Integration of multiple large-scale imaging and spectroscopic data streams to elucidate physical descriptors of complex systems and phenomena.
- High-throughput simulation approaches to guide the interpretation of experimental datasets.

INVITED SPEAKERS

David Muller, Cornell University

Naoya Shibata, University of Tokyo

Stig Helveg, Haldor Topsøe

Quentin Ramasse, SuperSTEM

Luiz Tizei, Université Paris-Sud

Paul Voyles, University of Wisconsin-Madison

Hamish Brown, Lawrence Berkeley National Laboratory

Rama Vasudevan, Oak Ridge National Laboratory

Chongmin Wang, Pacific Northwest National Laboratory

We are grateful to our sponsors for their generous support:



All symposia are held in the Oregon Convention Center.

A01 Advances in Phase Retrieval Microscopy

ORGANIZERS:

Kai He, Clemson University
Charudatta Phatak, Argonne National Laboratory
Martha McCartney, Arizona State University
Toshiaki Tanigaki, Hitachi, Ltd., Japan

Room B114

Check mobile app for session & poster days

In the past few years, there have been significant advances in new detectors, computational algorithms and experimental implementations for phase retrieval down to atomic level in electron and X-Ray microscopy, such as 4D-STEM, holography, ptychography, differential phase contrast, etc. This symposium focuses on latest theory, algorithms, and instrumentation developments in phase retrieval microscopy using coherent electrons and X-Rays, as well as their applications in quantitative and functional imaging of local strain, polarity, electric and magnetic fields for functional materials and biological matters.

A02 Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy

ORGANIZERS:

Eric Prestat, University of Manchester and SuperSTEM, United Kingdom
Francisco de la Peña, University of Lille, France
Philippe T. Pinard, Oxford Instruments NanoAnalysis, United Kingdom

Room C123

Check mobile app for session & poster days

Cutting-edge microscopy does not only require state-of-the-art instruments and detectors but also innovative approaches and programs to collect and analyze data. Recent advances in instrumentation and computing capabilities enable the application of machine learning for the processing of microscopy datasets. Furthermore, the development of sustainable, open-source and user-friendly software is of paramount importance to make these algorithms and workflows available widely in the scientific community and to promote reproducible research. This symposium features recent progress in data acquisition scheme, processing workflow, algorithm and software in electron microscopy with a focus on, but not limited to, open-source software and machine learning.

A03 Low-Energy X-Ray Spectroscopy: Novel Applications Using Soft X-Ray Emission Spectroscopy (SXES), Cathodoluminescence (CL) and Synchrotron Techniques

ORGANIZERS:

Anette von der Handt, University of Minnesota
Emma Bullock, Carnegie Institution for Science
Juliane Gross, Rutgers University
Zach Gainsforth, University of California, Berkeley

Room D139

Check mobile app for session & poster days

This symposium discusses applications and advances in low-energy X-Ray spectroscopy utilizing techniques such as soft X-Ray emission spectroscopy (SXES), cathodoluminescence (CL), electron Energy-Loss Spectroscopy (EELS), X-Ray photoelectron spectroscopy (XPS), synchrotron-Based analyses (including both absorption and emission spectroscopy), and the software designed to simulate, fit and model electron and X-Ray interactions. Applications to be discussed include but are not limited to geological and extraterrestrial materials, semiconductors, biological materials, ceramics, and metals.

A04 Recent Developments in Atom Probe Tomography

ORGANIZERS:

Ty Prosa, CAMECA Instruments, Inc.
Baptiste Gault, Max-Planck-Institut für Eisenforschung, Germany
David J. Larson, CAMECA Instruments, Inc.

Room F151

Check mobile app for session & poster days

The field of atom probe tomography sees current, extensive research to understand field evaporation of different material systems, to establish theories and models, and also to develop methods that address opportunities for improving the technique (e.g. decreased reconstruction artifacts). New instrumentation developments in APT and field ion microscopy (FIM) are contributing to the expanding range of materials that can be analyzed by these techniques. This symposium focuses on key areas of recent theoretical and methodological developments and highlight the contributions on topics related, but not restricted to:

- New developments in field evaporation theories and mechanisms
- Advances in APT instrumentation and technique development (including FIM)
- Reconstruction improvements and future directions
- Standards development for Atom Probe Tomography

ANALYTICAL SCIENCES SYMPOSIA continued

A05 Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science

ORGANIZERS:

Ashwin Shahani, University of Michigan

Roland Brunner, Materials Center Leoben Forschung GmbH, Germany

Wil Harris, Carl Zeiss Microscopy

Erdmann Spiecker, Universität Erlangen-Nürnberg, Germany or

Friedrich-Alexander-Universität Erlangen-Nürnberg

Room C122

Check mobile app for session & poster days

In this symposium, contributions from researchers developing or leveraging 3D imaging and analysis methods to drive new discoveries in materials science are presented. This encompasses data acquisition with a variety of microscopy methods (optical, electron, ion, X-Ray, neutron, and more) including 3D and multiscale modal correlative workflows; as well as challenges associated with big data handling, image processing analysis, and linking imaging data with computational methods (FEM, CFD, etc.). Examples of relevant classes of materials include, but are certainly not limited to, porous materials, complex intermetallics, energy storage and conversion devices, catalysts, bio-scaffolds, fiber-reinforced composites, hierarchical biomaterials, and additively manufactured components.

A06 Low Voltage, Low Energy Electron Microscopy Imaging and Analysis

ORGANIZERS:

David C. Bell, Harvard University

Natasha Erdman, JEOL USA, Inc.

Hector Calderon, Instituto Politécnico Nacional, Mexico OR National Polytechnic Institute of Mexico

Room B112

Check mobile app for session & poster days

This symposium covers the physical and instrumental aspects as well as the application of Low Voltage SEM, TEM and STEM, including Low Dose applications to hard and soft materials imaging and analysis. With this symposium we attempt to find out if there are optimum energies/strategies when working with beam sensitive materials and what are the limitations with respect of resolution, applicable dose, achievable contrast and specimen preparation. Use of novel electron column design, beam deceleration techniques and new detector technologies for improvements of both imaging and microanalysis at low voltages are covered. Analytical aspects of operating at low electron energies are also discussed from both materials science and biological perspectives.

A07 Vendor Symposium

ORGANIZERS:

Elizabeth Dickey, North Carolina State University

Deborah Kelly, Virginia Carilion Research Institute

Room C120-121

Check mobile app for session & poster days

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 exchange of ideas and best practices.

A08 Current Trends and Challenges in Electron Energy-Loss Spectroscopy

ORGANIZERS:

Matthieu Bugnet, University of Lyon - CNRS, France

Patricia Abellan, SuperSTEM Laboratory, United Kingdom

Xiaoqing Pan, University of California-Irvine

Peter Crozier, Arizona State University

Room B111

Check mobile app for session & poster days

Electron Energy-Loss Spectroscopy (EELS) has shed light on countless scientific challenges where correlated (sub) nanometer structural information was key for the elucidation of the local electronic properties and chemistry of materials. This symposium brings together the scientific community for exchanges on the latest research progress in acquisition, processing, and interpretation of low-loss and core-loss EELS. Topics covered include (not limited to): low-energy excitations, q-dependence, aloof EELS, elemental/fine structure mapping, temperature effects and non-destructive analytical characterization of materials by EELS. Studies where EELS is combined with complementary imaging and spectroscopy techniques are also presented.

A09 Microscopy and Microanalysis for Real-World Problem Solving**ORGANIZERS:**

Janet H. Woodward, Buckman

Ke-Bin Low, BASF Corporation

Xiaofeng Zhang, Nanosys Inc.

Room B113*Check mobile app for session & poster days*

Microscopy and microanalysis of real-world samples present special challenges. Non-ideal samples may not lend themselves to established methodologies for preparation and analysis. Sample amounts and background information about the material and the problem may be limited, and the time frame for producing results may be very short. This symposium focuses on ways in which biologists and physical scientists develop unique and creative solutions for sample preparation, data acquisition, analysis, and providing meaningful results to solve problems in the real world.

A10 Advances in Focused Ion Beam Instrumentation, Applications and Techniques**ORGANIZERS:**

Suzy Vitale, Carnegie Institution of Washington

Joshua Sugar, Sandia National Laboratories

Bruce Arey, Pacific Northwest National Laboratory

Alan Bahm, Thermo Fisher Scientific

Room F151*Check mobile app for session & poster days*

The MSA Focused Ion Beam (FIB) Focused Interest Group (FIG) seeks to promote continuous advancement in the instrumentation, applications and techniques involved in focused ion beam work. The objective of this FIG-sponsored symposium provides an overview of recent developments of focused ion beam instrumentation, as well as a platform wherein FIB users share and discuss new, novel applications and techniques across multiple scientific disciplines. Our emphasis is on innovative approaches to sample preparation, fabrication, and analytics that go beyond conventional methods.

A11 Current and Emerging Microscopy for Quantum Information Sciences**ORGANIZERS:**

Miaofang Chi, Oak Ridge National Laboratory

Sonia Conesa-Boj, Delft University of Technology, Netherlands

Lena F. Kourkoutis, Cornell University

Room B117*Check mobile app for session & poster days*

Urgent needs for transformative developments in information and energy sciences require the understanding of unusual phenomena at the nanoscale. For example, the strong correlations between electrons, spins, and atoms in many materials, and how they respond to external stimuli (T, E or B) or are modified by atomic structural and chemical defects must be elucidated. However, current experimental tools that can enable visualization, understanding, and control of the electrons, spin states, and ions, are insufficient. This symposium highlights new technique developments, applications, and breakthroughs in characterizing quantum materials and their functionality.

A12 Advances in Cryo-EM Technology**ORGANIZERS:**

Mike Marko, Wadsworth Center

Anchi Cheng, NY Structural Biology Center

Radostin Danev, Tokyo University, Japan

Room D137*Check mobile app for session & poster days*

Cryo-EM provides single-particle maps with resolution in the sub-3Å range, and sub-tomogram-averaged maps in the 1 nm range, all with the sample in a near-native, hydrated state. This symposium highlights new technology for specimen preparation, new instrumentation and software that improves the image quality, and processing advancement that pushes the resolution boundary. The symposium has invited speakers who are key to the latest developments, and includes contributed papers from participants in this exciting field.

All symposia are held in the Oregon Convention Center.

B01 Multi-Modal, Large-Scale, and 3D Correlative Microscopy

ORGANIZERS:

James Fitzpatrick, Washington University School of Medicine
Ben Giepmans, University Medical Center Groningen, Netherlands
Jacob Hoogenboom, Delft University of Technology, Netherlands

Room D137

Check mobile app for session & poster days

Imaging using electron microscopy has evolved from taking structural 'snapshot' images to generating large and complex multi-Dimensional datasets. Correlative Microscopy is a unique approach to locate rare events and has evolved into a semi-routine technique. However, data acquisition, navigation, molecular recognition, and interpretation of biological function still remains a challenge. We highlight scientific innovations such as correlating 3D structural to 3D functional data, multi-color EM to "fingerprint" biomolecules, and volume-EM approaches. By disseminating these methods, as well as initiatives to share volume-EM data we enable researchers to infer insights into the regulation of organelles, cells and tissues.

B02 Element Analysis of Biological Materials

ORGANIZERS:

Peta Clode, University of Western Australia
Stefan Vogt, Argonne National Laboratory
Nicole Hondow, University of Leeds, United Kingdom

Room D138

Check mobile app for session & poster days

This session encompasses all aspects of elemental and isotopic analysis of cells, tissues, and biominerals. Techniques include (but not be limited to) electron, ion, and X-Ray based analytical platforms. Papers are expected to cover a wide range of applications from the biomedical and biological sciences and extend into bio-nanotechnology applications. Submissions will be encouraged from experts through to students, with the view to inspiring interaction between biologists, materials scientists, and microanalysts at all levels.

B03 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals

ORGANIZERS:

Ru-ching Hsia, University of Maryland, Baltimore
Marcela Redigolo, West Virginia University
Han Chen, Penn State College of Medicine

Room D136

Check mobile app for session & poster days

Microscopy is critically important in the ongoing research, detection, diagnosis and treatment of diseases. Advances that improve rapid and accurate detection and treatment often involve the use of various microscopic techniques in basic and clinical practice and research. These varied techniques provide us with an improved ability to diagnose and study the mechanism, development and pathology of diseases in human, plant and animal specimens. This symposium shares information on the investigation of pathogenic cells, tissues and entire organisms in clinical, diagnostic and research laboratories. Emphasis is placed on using latest microscopy in both clinical and research laboratories.

B04 Cutting Edge Microscopy in the Pacific Northwest

ORGANIZERS:

Claudia Lopez, Oregon Health & Science University /Pacific Northwest Center for Cryo-EM
Douglas Keene, Shriners Hospital for Children

Room D133-134

Check mobile app for session & poster days

The Pacific Northwest has a diverse scientific community crossing many life science disciplines. Each discipline has unique resources to offer the regional community that many researchers from other scientific focuses may not be aware of. On a national scale and as part of the NIH Transformative High Resolution Cryo-Electron Microscopy program, the "Pacific Northwest Center for Cryo-EM" will be introduced to the community. Researchers present available resources to foster collaborations and pool resources. This symposium discusses different advances in both fluorescence and electron microscopy, the use of analytical tools to maximize data information and also visualization.

B05 **Light and Fluorescence Microscopy for Imaging Cell Surface and Structure****ORGANIZERS:**

Justin Taraska, National Institutes of Health - Laboratory of Molecular & Cellular Imaging

David Zenisek, Yale University School of Medicine

David Perrais, CNRS UMR, Institut interdisciplinaire de Neurosciences, France

Xiaolin Nan, Oregon Health & Sciences University

Room B114

Check mobile app for session & poster days

Advances in light and laser fluorescence resolution, particularly those seen in confocal instruments and total internal reflection fluorescence microscopy, continue to reveal both structural diversity and 4D complexity in cell biology. This symposium reports on new developments in instrumentation for light, fluorescence, total internal reflection, light sheet and expansion fluorescence microscopy, and correlative microscopies for light, laser and electron instruments. Presentations include advances in exocytosis and endocytosis and membrane remodeling, and resolution of cell signaling structures and pathways. Student posters and platform presentations on emerging research in these modalities and methodologies are also included in this symposium.

B06 **Pharmaceuticals FIG—Imaging, Analysis, and Regulation of Medical Products, Devices and Data Integrity****ORGANIZERS:**

Gianpiero Torraca, Amgen, Inc.

Daniel Skomski, Merck & Co.

Room B111

Check mobile app for session & poster days

This symposium presents diverse content related to the manufacturing and use of pharmaceuticals, medical products/devices and data integrity. 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, there is a focus on data integrity, 21 CFR part 11 and understanding regulations as they specifically apply to the pharmaceutical industry.

B07 **3D Structures: From Macromolecular Assemblies to Whole Cells (3DEM FIG)****ORGANIZERS:**

Melanie Ohi, University of Michigan Life Sciences Institute

Elitza Tocheva, University of British Columbia, Canada

Teresa Ruiz, University of Vermont

Room D139

Check mobile app for session & poster days

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.

B08 **Cryo-EM—from Physics to Cell Biology: Honoring the Remarkable Legacy of Ken Downing****ORGANIZERS:**

Melanie Ohi, University of Michigan Life Sciences Institute

Eva Nogales, University of California, Berkeley, Lawrence Berkeley National Laboratory

Room D139

Check mobile app for session & poster days

This symposium honors Dr. Ken Downing's legacy by showcasing work in single particle cryo-EM, cryo-electron tomography, and microscopy methods that build on his seminal discoveries. Dr. Downing, MSA Fellow and former president, was a titan in the field of electron microscopy (EM). His scientific accomplishments span an amazing range of widely-recognized techniques and methods. Work in his laboratory led to the first high-resolution structure of tubulin using electron crystallography and he made important contributions in the current "resolution revolution" in single particle cryo-EM. Perhaps even more importantly, Ken Downing was a wonderful mentor to the next generation of scientists.

B09 **From Images to Insights: Working with Large Data in Cell Biological Imaging****ORGANIZERS:**

Kedar Narayan, National Institutes of Health-National Cancer Institute

Camenzind Robinson, St. Jude Children's Research Hospital

Jonathan Lefman, NVIDIA Corporation

Room C120-121

Check mobile app for session & poster days

"So you've collected these massive image data. Now what?"

Technological advances in cell biological imaging have resulted in the generation of massive amounts of data, yet the ability to handle (store, move, access, use, share) these data often lags far behind, especially in smaller labs and core facilities. Appropriate integration and correlation of disparate data streams at various scales, automated feature extraction, and portability of automated solutions remain daunting. This symposium addresses issues and solutions stemming from large image data in cell biology, including image processing, correlation and segmentation, as well as archiving, annotating and distributing large data especially in the context of available or open-source options.

All symposia are held in the Oregon Convention Center.

P01 In Situ TEM Characterization of Dynamic Processes During Materials Synthesis and Processing

ORGANIZERS:

Dongsheng Li, Pacific Northwest National Laboratory

Haimei Zheng, Lawrence Berkeley National Laboratory and University of California-Berkeley

Benjamin Bammes, Direct Electron

Yu Han, King Abdullah University of Science and Technology, Saudi Arabia

Room B116

Check mobile app for session & poster days

In situ imaging and spectroscopy techniques have emerged as primary tools for characterizing the dynamics of materials formation. The development of in situ capabilities for TEM has led to rapid advances in our understanding of nucleation, growth, assembly in colloidal, electrochemical, organic, semiconductor, and other systems. The symposium covers a broad range of topics including particle nucleation, crystal growth, phase transformations, polymeric and organic/inorganic self-assembly, electrochemical processes, and interface dynamics in gases and liquids. This symposium aims to provide a platform of discussion to understand the physics and chemistry of materials formation for researchers from various fields.

P02 Microscopy and Microanalysis of Nuclear and Irradiated Materials

ORGANIZERS:

Chad Parish, Oak Ridge National Laboratory

Khalid Hattar, Sandia National Laboratories

Pater Hosemann, University of California-Berkeley

Assel Aitkaliyeva, University of Florida

Room D133-134

Check mobile app for session & poster days

Materials for modern and future nuclear energy systems will be subject to high radiation damage doses, high temperatures, severe corrosion, and other extreme conditions. Designing materials to withstand these conditions and understanding the response of materials to service or irradiation testing, requires high fidelity microstructural characterization. This symposium brings together experts in nuclear materials science and advanced microscopy, with an emphasis on application of latest-generation methods of microscopy and microanalysis, such as atom probe tomography, Aberration-Corrected microscopy, transmission Kikuchi diffraction, plasma FIB, advanced data analytics, scanned probe microscopy and nano-mechanics, in situ microscopy, and other new methods, to problems in both traditional and cutting-edge nuclear and irradiated materials.

P03 Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions

ORGANIZERS:

Joerg Jinschek, The Ohio State University

David Flannigan, University of Minnesota

Dalaver H. Anjum, King Abdullah University of Science & Technology (KAUST), Saudi Arabia

Stig Helveg, Haldor Topsøe A/S, Denmark

Room D135

Check mobile app for session & poster days

Atomic-Scale studies performed on Beam-Sensitive soft and hard matter, including metal-organic frameworks, zeolites, polymers, catalysts, liquid crystals, emulsions, etc. often require novel electron microscopy characterization approaches. It is thus of critical importance to develop new techniques and concepts that control the probing beam in both space and time, to optimize the detection of every scattering event, and to understand the role of sample temperature and environment on irradiation-induced defect accumulation. Submissions involving the development or optimization of EM imaging techniques as well as electron detection tools and schemes that aim for characterizing matter in its genuine atomic state are presented.

PHYSICAL SCIENCES SYMPOSIA *continued*

P04 Spectroscopy and Imaging of Nanostructured Low-Z Materials in the Electron Microscope

ORGANIZERS:

Dan Hodoroaba, Federal Institute for Materials Research and Testing (BAM), Germany

Andrew Stewart, University of Limerick, Ireland

Meiken Falke, Bruker Nano GmbH, Germany

Room F149

Check mobile app for session & poster days

Accurate morphological, structural and chemical analysis of low-Z materials at the nanoscale is possible by high-resolution electron microscopy and related spectroscopies/microscopies, but often presents substantial challenges. The symposium includes qualitative and quantitative analysis of nanostructured light element materials, be that organic, inorganic, bio-, bio-mimetic materials, nano-inclusions or the challenge of quantifying light elements in a heavy matrix. We present a wide range of techniques. High-Resolution SEM, TEM, STEM in SEM combined with EDS, EELS, CL, or in combination with Raman or Auger electron spectroscopy when used to improve the quantification of the analysis of low-Z materials are also presented.

P05 Theory and Applications of Electron Tomography in the Materials Sciences

ORGANIZERS:

Peter Ercius, Lawrence Berkeley National Laboratory

Robert Hovden, University of Michigan

Sandra Van Aert, University of Antwerp, Belgium

Room D135

Check mobile app for session & poster days

Transmission electron microscopy (TEM) and scanning TEM (STEM) reveal the structure of materials across the Nano-Scale with achievable resolutions below one Ångström. However, these are only two-Dimensional (2D) projections of complex three-Dimensional (3D) structures. 3D morphology and composition are critical to determine the function of Nanostructures used across many fields—such as energy, catalysis, and electronics. The success of electron tomography has fueled rapid innovation in quantitative, sub-nanoscale 3D analysis in electron microscopy that include recent achievements of atomic resolution and methods to determine the 3D structure from few or even a single projection image.

P06 In Situ TEM of Nanoscale Materials and Electronic Devices for Phase Transformation Studies

ORGANIZERS:

Leopoldo Molina-Luna, Technische Universität Darmstadt, Germany

Lin Zhou, Ames Laboratory

Judy Cha, Yale University

Thomas Pekin, University of California-Berkeley

Room B118-119

Check mobile app for session & poster days

Phase transformations of nanoscale materials, and corresponding changes in material properties and functionalities, are critical for fundamental science and device applications. In situ transmission electron microscopic (TEM) observations of such phase transformations provide atomic scale information to illuminate the transformation mechanisms and processes, and reveal complexities associated with the phase transformations. This symposium presents in situ (S)TEM experiments that apply heating, cooling, electrical biasing, and mechanical testing to induce and probe phase transformations of functional materials and devices at the nanoscale.

P07 Electron Crystallography of Nano-Structures in Nanotechnology, Materials and Bio-Sciences

ORGANIZERS:

Sergei Rouvimov, University of Notre Dame

Roberto Reis, Northwestern University

Alex Eggeman, University of Manchester, United Kingdom

Room D138

Check mobile app for session & poster days

Electron crystallography is a powerful tool for studying the atomic arrangement of Nano-Scale structures and their organization into micro-structures and objects, applicable to man-made as well as naturally occurring (biological) materials. This symposium addresses recent developments in electron diffraction, both experimental (including the growth of scanning diffraction approaches) as well as new detectors allowing the study of materials that were traditionally unsuitable for electron microscopy. This symposium brings together researchers from physical and biological sciences to share understanding with particular focus on novel materials/systems, new data analyses and computational methods applied to such rich structural data.

P08 **Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications**

ORGANIZERS:

Chongmin Wang, Pacific Northwest National Laboratory
Matthew T. McDowell, Georgia Institute of Technology
Yuan Yuan Zhu, University of Connecticut

Room B115

Check mobile app for session & poster days

We have witnessed significant progress in the development of new microscopic and spectroscopic techniques based on photons, electrons and ions that have improved spatial and temporal resolution. This has resulted in the unprecedented ability to investigate local structure and chemistry coupled with charge and mass transport in energy materials and devices. This symposium focuses on recent advances in microscopy imaging, diffraction and spectroscopy methods and their application to probe structural and chemical properties of materials with different dimensionalities, such as 2D materials, for energy applications, including batteries, fuel cells, catalyst, photovoltaics and thermoelectric systems.

P09 **The Success of TMBA: TEM and STEM Developments in Techniques, Applications and Education**

ORGANIZERS:

Masashi Watanabe, Lehigh University
Joseph Michael, Sandia National Laboratories
Paul Kotula, Sandia National Laboratories

Room D137

Check mobile app for session & poster days

Techniques and applications of TEM and STEM are developing at an increasing rate. Reasons include computerization and automation, aberration correction, cryo-microscopy and others. TEM and STEM users can focus more on the data that is available from the instrument and less on the actual operations. Initially, users were educated in the laboratory, more recently, education is through textbooks and lecture courses. This symposium includes developments in TEM and STEM and to link these to improvements in the way TEM and STEM knowledge is transferred by TMBA (successful Textbooks of Microscopy from Basics to Advances, a.k.a. Too Many Bloody Acronyms!).

P10 **Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing Natural and Synthetic Materials**

ORGANIZERS:

Donggao Zhao, University of Missouri-Kansas City
Minghua Ren, University of Nevada-Las Vegas
Owen Neill, University of Michigan

Room F150

Check mobile app for session & poster days

Electron microbeam techniques, such as SEM/ESEM, EPMA and TEM/STEM, use a focused electron probe or a small parallel electron beam to bombard a specimen and generate signals at a scale from micrometer down to Angstrom level. These signals include secondary electron (SE), backscattered electron (BSE), characteristic X-Ray, Cathodoluminescence (CL), transmitted electron, diffracted or scattered electron, etc. Information acquired using these signals includes image, chemistry and crystal structure of a specimen at micrometer, nanometer and sub-Angstrom levels. These symposium sessions cover applications of integrated electron probe microscopy and microanalysis techniques in characterizing natural and synthetic materials.

P11 **Advances in Characterization of Geological and Extraterrestrial Samples**

ORGANIZERS:

Bradley De Gregorio, U.S. Naval Research Laboratory
Kultaransingh (Bobby) Hooghan, Weatherford Laboratories
Lori Hathon, University of Houston

Room B112

Check mobile app for session & poster days

This symposium is a forum for the exchange of knowledge regarding the formation, history, and use of geological and extraterrestrial samples enabled by advances in microscopy and microanalytical techniques. Invited papers include investigations of natural samples where microscale and nanoscale imaging and analytical techniques are essential for characterization. Of particular interest are novel applications of advanced microscopy and microanalysis to geological problems and innovative solutions to long-standing technical challenges for sample preparation and characterization. Attendees include scientists and engineers with backgrounds in a broad range of imaging and analytical techniques, but with research interests related to geological and extraterrestrial samples.

PHYSICAL SCIENCES SYMPOSIA continued

P12 New Frontiers in Atom Probe Tomography Applications

ORGANIZERS:

Baishakhi Mazumder, University at Buffalo
Arun Devaraj, Pacific Northwest National Laboratory

Room D136

Check mobile app for session & poster days

This symposium focuses on the key areas of where atom probe tomography (APT) is being deployed to provide near-atomic scale compositional analyses and relate this information to physical properties of biological activities. Indeed, APT is used for characterizing an ever-increasing diverse range of material systems starting from wide variety of alloys, semiconductors, large band gap insulators and more recently different minerals and biomaterials. Its use in biology and medicine is also being pushed, following early efforts over 30 years ago. This symposium covers the use of APT to provide a unique characterization of all types of materials.

P13 Advanced Characterization of Components Fabricated by Additive Manufacturing

ORGANIZERS:

Isabella van Rooyen, Idaho National Laboratory
Mukesh Bachhav, Idaho National Laboratory
Federico Sciammarella, Northern Illinois University
Cesar Terrazas, The University of Texas-EI Paso

Room D140

Check mobile app for session & poster days

Additive manufacturing (AM) has emerged as a global disruptive technology in industries such as advanced transportation, nuclear, aerospace for manufacturing complex three-Dimensional components by the deposition of ceramic, alloy, or metal precursors. AM techniques provide a unique advantage for multiple industries due to the shortened development and fabrication times, quality of the product, and repeatability of the process. This symposium intends to be an information exchange forum for cutting-edge microscopy and microanalysis techniques to assess the microstructural design aspect of existing materials and novel materials by various AM method types.

P14 Microstructural and Mechanical Characterization of Metallic Alloys

ORGANIZERS:

Philipp Kurnsteiner, Max-Planck-Institute für Eisenforschung GmbH, Germany
Baptiste Gault, Max-Planck-Institute für Eisenforschung GmbH, Germany, and Imperial College London, United Kingdom

Room B116

Check mobile app for session & poster days

Special Educational Opportunities. All symposia are held in the Oregon Convention Center.

X91 Microscopy Explorations for Attendees & Families/Friends, and Kids of All Ages

ORGANIZERS:

Elaine Humphrey, University of Victoria, Canada
Pat Connelly, National Institutes of Health

Wednesday, August 7 • 1:30 PM–3:00 PM
Room B118-119

- All session participants will receive a foldscope (an origami microscope) to put together in the session.
- Have fun with “Microscopy Activities” adapted for different age groups (From 6 to 106 years), including how to make a LEGO microscope for use with your smart phone and how to use the foldscope effectively.
- Come and try many different microscopes suitable for home or school and determine which ones you like best. You can bring your own samples taken from your blooming garden, your favorite pet fur, or your own mouth cells.
- A visit to the vendor hall to put a “Solve the Mystery” sample on a scanning electron microscope.

X92 Microscopy Outreach – ProjectMICRO

ORGANIZERS:

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

Monday-Thursday • Exhibit Hall Hours
MSA MegaBooth (#502)

Visit the Outreach booth every day to see how to set up different stations in a classroom and share your experiences with how you have fun with microscopy outreach. See different microscope systems for use in a classroom, in action; peruse the books suitable for elementary school age children; and put your name into a draw for the daily door prize.

X93 Microscopy Outreach – High School & Undergraduate STEM Student Workshop

ORGANIZERS:

Eric Sanchez, Portland State University
Josh Silverstein, Pacific Northwest National Laboratory
Jennifer Wells, Center for Research in Environmental Science and Technology (CREST)

High school and undergraduate STEM students from the Portland area attend a day-long workshop at Portland State University, then attend M&M 2019 for a day of professional learning and experiences. The students are presenting original research during the poster presentations on Monday in the exhibit hall.

X94 Microscopy Outreach – STEM Roundtable: Building Skills for the Future

ORGANIZERS:

Lori Harvey, Hitachi High Technologies America
Mario Cuellar, Hitachi High Technologies America

Tuesday, August 6 • 8:30 – 10:00 AM
Room C124

There is a lot of exciting work being done around STEM and there is a shared optimism that the time is right to explore ways in which we can collectively propel efforts. This can be done by exploring how working together to integrate varied resources can have broader, sustainable impacts, bridge K-12 outreach and undergraduate and graduate education, understand the importance of diversity and inclusion and that “STEM is for all, not some” will lead to a stronger workforce for us all.

****Session is open to all! No separate registration required.****

We welcome and encourage participants in Academia; Education; all levels of Government; Business/Industry; and Change Leaders within Science, Technology, Engineering, and Math Sectors

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 Utilization of the National NIH Funded Cryo-EM Centers: Transformative High Resolution Cryo-Electron Microscopy

ORGANIZERS:

Claudia Lopez, Oregon Health & Science University
Janice G. Pennington, University of Wisconsin-Madison

Wednesday, August 7 • 10:30 AM

Room B117

- Sample Preparation "Do's & Don'ts"
- Best approaches for data collection
- Direct Electron detectors: uses and preferences
- Data processing and handling
- Best practices in a national laboratory
- "Personalities" of different centers

X31 Roundtable: Technical Careers in Microscopy—For the Love of Microscopy

ORGANIZERS:

Phoebe J. Doss, University of Texas Southwestern Medical Center
Janice G. Pennington, University of Wisconsin-Madison

Wednesday, August 7 • 8:30 AM

Room B110

A panel of technologists with diverse backgrounds discuss their careers in microscopy. Learn how they found out about microscopy, why they chose it, and how their career has evolved through the years. The panel includes early and late career technologists from academia and industry. Learn how to become a Certified Electron Microscopy Technologist (CEMT) and what it can do for you to promote your career. Join in the conversation and share your story!

- Technologists from diverse backgrounds in microscopy will speak about their careers.
- How did they find out about microscopy as a career? Why did they choose that instead of all the other options available?
- How has their career developed through the years and what advice do they have for technologists new to the field?

X32 Imaging Resin Embedded Samples for Serial Block Face Imaging or Array Tomography

ORGANIZERS:

Janice G. Pennington, University of Wisconsin-Madison
Phoebe J. Doss, University of Texas Southwestern Medical Center

Wednesday, August 7 • 1:30 PM

Room B117

Array tomography, a technique for imaging serial sections for 3D reconstruction, will be compared with SBFSEM and FIB SEM.

- Tips for resin embedding of samples for SEM imaging
- Tips for preparing serial sections for array tomography
- Techniques for correlative light and electron mic

The physical sciences and biological sciences tutorials offer 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.

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

PHYSICAL SCIENCES TUTORIALS Room B110

ORGANIZER:

Donovan Leonard, Oak Ridge National Laboratory

X40 Following the Electrons: Simulation for High-Resolution STEM and CBEDs

INSTRUCTOR:

Mark P. Oxley, Oak Ridge National Laboratory

Mark Oxley is a research scientist in the Materials Science and Technology Division at Oak Ridge National Laboratory. His expertise is the simulation and quantification of scanning transmission electron microscopy images and spectroscopy. He is also working on the accurate simulation of 4D STEM data sets to be used as training sets for deep learning algorithms.

- Introduction to basic STEM simulation techniques and the requirement for convergence
- Simulation of electron Energy-Loss Spectroscopy for core and low loss excitations
- The importance of including the contribution of electrons that have undergone thermal diffuse scattering
- Convergent beam diffraction patterns: requirements for quantitative simulation

X41 Entrepreneurship in the Microscopy Community

INSTRUCTOR:

Daniel Masiel, Integrated Dynamic Electron Solutions

Dan founded Integrated Dynamic Electron Solutions (IDES) fresh out of grad school. IDES allows researchers to illuminate nanoscale dynamics with its line of time-resolved imaging products spanning femtosecond to millisecond time scales.

- Instrumentation development and commercialization
- Practical steps to take when starting your own business
- Business start-up best practices
- Financing a scientific instrumentation company

X42 Efficient Phase Contrast Imaging via Electron Ptychography

INSTRUCTOR:

Timothy J. Pennycook, Max Planck Institute for Solid State Research, Germany

Timothy Pennycook is a Scientist at the Max Planck Institute for Solid State Research. His research focuses on developing methods to extract the maximum information out of samples, including Using dose efficient 4D STEM methods such as ptychography to see beam sensitive materials more clearly before they are destroyed. He programmed the first implementation of single side band ptychography which has now evolved into pythoSTEM, a free and open source package for performing ptychography.

- Introduction to ptychography
- Hardware considerations; fast cameras
- Introduction to the free and open source pythoSTEM package
- Processing the data and performing post collection aberration correction and optical sectioning

TUTORIALS continued

BIOLOGICAL SCIENCES TUTORIALS Room B110

ORGANIZER:

Tommi White, University of Missouri

X43 Expanding the Computational Toolbox for CryoEM

INSTRUCTOR:

Alberto Bartesaghi, Duke University

Alberto Bartesaghi, PhD is currently an Associate Professor of Computer Science, Electrical Engineering and Biochemistry. He pushed the resolution of cryoEM protein structure determination during his tenure as a post-doctoral fellow and staff scientist at the National Cancer Institute in the Sriram Subramaniam lab.

- Robust strategies for particle picking and sorting
- Per-particle frame alignment for high-resolution cryoEM
- Data-driven approaches for optimal exposure weighting
- Unsupervised image sorting Using Machine Learning algorithms
- Towards fully automated cryoEM workflows

X44 High-End Data Collection for Single- Particle Cryo-EM

INSTRUCTOR:

Felix Weis, The European Molecular Biology Laboratory - Heidelberg, Germany

Felix Weis joined EMBL Heidelberg in April 2017. He is a cryo-EM support scientist taking care of the EMBL platform, providing help, training and support to internal users as well as to external visitors of the facility. His research interests cover many aspects of cryo-EM, including sample preparation, imaging and processing.

- Sample optimization
- Acquisition strategies
- Automation and throughput
- Alternatives for difficult samples

X45 Tips and Tricks for High-Pressure Freezing / Freeze Substitution

INSTRUCTOR:

Martin Schauflinger, University of Missouri

Martin Schauflinger, PhD is currently a Senior Research Specialist at University of Missouri's Electron Microscopy Core. Martin has been refining advanced biological specimen preparative techniques, with his major focus on obtaining optimal contrast of high pressure frozen cellular membranes upon freeze substitution.

- Sample preparation for high-pressure freezing
- Sample loading into a high-pressure freezer
- Modifying freeze substitution solutions
- Quick freeze substitution

NEW for 2019!
OPEN TO ALL!

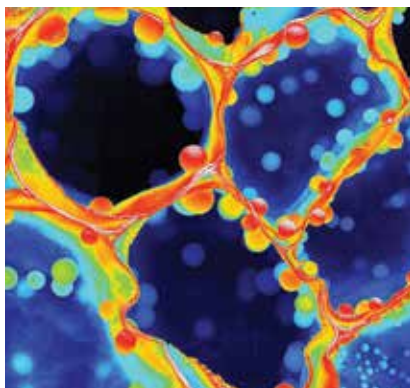
Microscopy Workshop: Micrographs that Win

Wednesday, August 7 1:30 – 2:30 PM

Room C123

This workshop will outline the characteristics of winning entries for the *Microscopy Today* Micrograph Awards competition. Visual impact, scientific relevance, and adherence to the contest rules head a list of criteria that the judges consider when evaluating each entry.

Chief Judge Robert Simmons, *Microscopy Today* Editor-in-Chief Charles Lyman, and **Celebrity Judge David Scharf** will provide some guidance on preparing entries for micrograph competitions.



**Spherical organelles in
a root cross section of
chickpea (*Cicer arietinum*)**

Timothy Pegg

Miami University

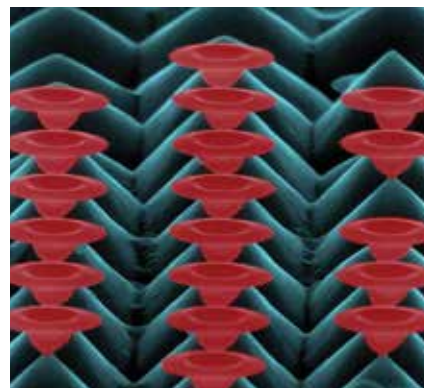
(2018 MSA MICROGRAPH WINNER)



***Penicillium* sp.**

Alice Dohnalkova

Pacific Northwest National Laboratory



A nanofabrication pattern in silicon

Vivek Garg

IITB-Monash Research Academy (India)

(2018 MSA MICROGRAPH RUNNER-UP)

Scientific Program Information

Monday, August 5, 2019



PLENARY LECTURES AND AWARDS

SESSION CHAIRS:

Paul Kotula, President, Microscopy Society of America
Rhonda Stroud, President, Microanalysis Society
David Larson, President, International Field Emission Society
Alice Dohnalkova, M&M 2019 Program Chair

MONDAY 8:30 AM • Room: Portland Ballroom

OPENING WELCOME:

Paul Kotula, MSA President
Rhonda Stroud, MAS President
David Larson, IFES President

- 8:45 AM 1 (Invited)** *Studying Kinetics by Counting Particles in Time-Resolved Cryo-EM*; **Joachim Frank**, Professor of Biochemistry, Molecular Biophysics, and Biological Sciences, Columbia University
- 9:45 AM**
- 10:00 AM** **MAS Awards Presentation**
- 10:05 AM** **IFES Awards Presentation**
- 10:30 AM** **Coffee Break**
- 10:45 AM** **MSA Awards Presentation**
- 11:00 AM 2 (Invited)** *Single-Particle CryoEM: Potential for Further Improvement*; **Richard Henderson**, Professor of Biochemistry, Medical Research Council Laboratory of Molecular Biology (MRC LMB) - Cambridge, United Kingdom

A

Analytical Sciences Symposia – Monday Afternoon

A01.1 Advances in Phase Retrieval Microscopy

SESSION CHAIRS:

Kai He; Clemson University
Xiaoqing Pan; University of California-Irvine

PLATFORM SESSION

Monday 1:30 PM • Room: B114

- 1:30 PM 3 (Invited)** *Phase Imaging Beyond the Diffraction Limit with Electron Ptychography*; **DA Muller**, Z Chen, Y Jiang, M Odstrcil, Y Han, P Purohit, MW Tate, SM Gruner, V Elser
- 2:00 PM 4** *Three-Dimensional Electron Ptychography of Catalyst Nanoparticles Using Combined HAADF STEM and Atom Counting*; **E Liberti**, GT Martinez, CM O'Leary, PD Nellist, AI Kirkland
- 2:15 PM 5 (Invited)** *Advanced Phase Reconstruction Methods Enabled by Four-Dimensional Scanning Transmission Electron Microscopy*; **C Ophus**, TR Harvey, FS Yasin, HG Brown, PM Pelz, BH Savitzky, J Ciston, BJ McMorran
- 2:45 PM 6** *Unsupervised Machine Learning to Distill Structural-Property Insights from 4D-STEM*; **X Li**, O Dyck, M Oxley, A Lupini, S Jesse, SV Kalinin

A02.1 Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy

SESSION CHAIRS:

Francisco de la Peña; Université Lille, France
Philippe T. Pinard; Oxford Instruments, United Kingdom
Eric Prestat; Manchester University, United Kingdom

PLATFORM SESSION

Monday 1:30 PM • Room: C123

- 1:30 PM 7 (Invited)** *Open Source Image Processing Software for Instrument Control, Data Acquisition, Organization, Visualization, and Analysis Using Python*; **CE Meyer**, N Dellby, JA Hachtel, T Lovejoy, A Mittelberger, O Krivanek
- 2:00 PM 8** *py4DSTEM: Open Source Software for 4D-STEM Data Analysis*; **BH Savitzky**, L Hughes, KC Bustillo, HD Deng, NL Jin, EG Lomeli, WC Chueh, P Herring, A Minor, C Ophus
- 2:15 PM 9** *Distinguishability of Structures via Principal Component Analysis: Application to 4D STEM*; M Oxley, SV Kalinin, **RK Vasudevan**
- 2:30 PM 10 (STUDENT)** *Atomic Resolution Convergent Beam Electron Diffraction Analysis Using Convolutional Neural Networks*; **C Zhang**, J Feng, LR DaCosta, PM Voyles
- 2:45 PM 11** *Statistical Physics-Based Framework and Bayesian Inference for Model Selection and Uncertainty Quantification*; L Vlcek, S Yang, M Ziatdinov, SV Kalinin, **RK Vasudevan**

A03.1 Low-Energy X-Ray Analysis: Novel Applications Using Soft X-Ray Emission Spectroscopy (SXES), Cathodoluminescence (CL), and Synchrotron Techniques

SESSION CHAIRS:

Anette von der Handt; University of Minnesota
Zack Gainsforth; University of California-Berkeley

PLATFORM SESSION

Monday 1:30 PM • Room: D139

- 1:30 PM 12 (Invited)** *Fast Hyperspectral Soft X-Ray Mapping*; CM MacRae, NC Wilson, A Torpy, AE Hughes
- 2:00 PM 13** *Information of Valence Charge of 3D Transition Metal Elements Observed in L-emission Spectra*; **M Terauchi**
- 2:15 PM 14 (STUDENT)** *The Impact of Phase on Mass Absorption Coefficients Using Soft X-Ray Emission Spectrometry*; S Rudinsky, CM MacRea, NC Wilson, H Demers, R Gauvin
- 2:30 PM 15 (Invited)** *An EPMA Study of the Soft Fe L α -L β X-Ray lines in Fe-silicide, Olivine and Fe-sulfide Minerals by SXES and WDS*; **A Moy**, AV der Handt, JH Fournelle

Scientific Program

A

Analytical Sciences Symposia – Monday Afternoon cont.

A04.1 Recent Developments in Atom Probe Tomography

SESSION CHAIRS:

Ty J. Prosa; CAMECA Instruments Inc.

Baptiste Gault; Max Planck Institute, Germany

PLATFORM SESSION

Monday 1:30 PM • Room: F151

- 1:30 PM **16 (Invited)** *Exploring New Science Domains with Atom Probe Tomography Enabled by an Environmental Transfer Hub*; **DE Perea**, DK Schreiber, A Devaraj, DD Reilly, SV Lambeets, EJ Kautz, TG Lach, MG Wirth, JE Evans
- 2:00 PM **17** *A Toolchain for the Analysis of Hydrogen in Materials at the Atomic Scale*; **PJ Felfer**
- 2:15 PM **18** *Comprehensive Analysis of Hydrogen, Deuterium, Tritium and Isotopic Ratios of Other Light Elements in Neutron Irradiated TPBAR Components*; **A Devaraj**, B Matthews, B Arey, EJ Kautz, G Seigny, D Senor
- 2:30 PM **19 (Invited)** *Building Laboratory-on-Tip for Imaging Biological Samples with Atom Probe Tomography*; **J Fu**

A05.1 Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science

SESSION CHAIR:

Will Harris; Carl Zeiss Microscopy USA

PLATFORM SESSION

Monday 1:30 PM • Room: C122

- 1:30 PM **20** *3D Reconstruction of an Additive Manufactured IN625 Tensile Sample Using Serial Sectioning and Multi-Modal Characterization*; MG Chapman, **MD Uchic**, JM Scott, MN Shah, SP Donegan, PA Shade, WD Musinski, M Obstalecki, MA Groeber, D Menasche, ME Cox, EJ Schwalbach
- 1:45 PM **21 (STUDENT)** *Correlative 3D X-Ray, Laser Ablation, and SEM/EDS Mapping Establishing Access Point for FIB Tomography of Defects in Multi-Layer Ceramic Capacitors*; **J Favata**, V Ray, S Shahbazmohamadi
- 2:00 PM **22 (Invited)** *Combining EBSD with Serial Sectioning for the 3D Analysis of Materials*; **DJ Rowenhorst**, RW Fonda
- 2:30 PM **23 (STUDENT)** *3D Characterization of Porous Copper Thin Films*; **A Wijaya**, B Eichinger, M Mischitz, R Brunner
- 2:45 PM **24** *Plasma FIB Spin Milling for Large Volume Serial Sectioning Tomography*; **B Winiarski**, C Rue, PJ Withers

A08.1

Current Trends and Challenges in Electron Energy-Loss Spectroscopy

SESSION CHAIRS:

Peter Crozier; Arizona State University

Xiaoqing Pan; University of California-Irvine

PLATFORM SESSION

Monday 1:30 PM • Room: B111

- 1:30 PM **25 (Invited)** *Atomic-Plane Resolved Electron Magnetic Circular Dichroism by Achromatic Spatially-Resolved Electron Energy-Loss Spectroscopy*; **X Zhong**
- 2:00 PM **26** *Rapid Simulation of Elemental Maps in Core-Loss Electron Energy-Loss Spectroscopy*; **HG Brown**, SD Findlay, LJ Allen, J Ciston, C Ophus
- 2:15 PM **27** *Development of Monochromatic Analytical Electron Microscope Equipped with Higher-Order Aberration Corrector*; **M Mukai**, E Okunishi, A Nakamura, T Ishikawa, H Sawada
- 2:30 PM **28 (STUDENT)** *Understanding the Complex Structure of CeO₂/TiO₂ Nanocatalyst. Key Contributions of the Combined Use of HAADF, X-EDS and EELS Spectroscopies*; **R Manzorro**, JA Perez-Omil, JJ Calvino, S Trasobares
- 2:45 PM **29 (STUDENT) (M&M Meeting Scholar Award)** *Harnessing Local Sample Variations to Generate Self-Consistent EELS References for Stoichiometry Quantification*; **BH Goodge**, HP Nair, JP Ruf, NJ Schreiber, KM Shen, DG Schlom, LF Kourkoutis

A11.1

Current and Emerging Microscopy for Quantum Information Sciences

SESSION CHAIRS:

Miaofang Chi; Oak Ridge National Laboratory

PLATFORM SESSION

Monday 1:30 PM • Room: B117

- 1:30 PM **30** *Emerging Microscopy for Quantum Information Sciences*; Q Qiao, L Wu, J Li, S Cheng, M Han, J Garlow, SD Pollard, X Fu, J Tao, **Y Zhu**, J Wall
- 2:00 PM **31 (STUDENT)** *Atomic Resolution CryoSTEM Across Continuously Variable Temperatures*; **BH Goodge**, E Bianco, HW Zandbergen, LF Kourkoutis
- 2:15 PM **32** *New Advanced Electron Microscopy to Discover New Quantum Materials*; **DC Bell**, C Ozsoy-Keskinbora, F VonCube, J Checkelsky, RW Westervelt
- 2:30 PM **33 (Invited) (STUDENT)** *Low Temperature Electron Microscopy of “Charge-Ordered” Phases*; **I El Baggari**, DJ Baek, BH Savitzky, MJ Zachman, R Hovden, LF Kourkoutis

B

Biological Sciences Symposia – Monday Afternoon

B03.1

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

SESSION CHAIRS:

Ru-ching Hsia; University of Maryland-Baltimore
Marcela Redigolo; West Virginia University
Han Chen; Penn State College of Medicine

PLATFORM SESSION

Monday 1:30 PM • Room: D136

- 1:30 PM **34** *Analysis of Ultrastructural Properties Reveals SP-D Protective Roles in Lung and Pancreatic Injury of Severe Acute Pancreatitis in Mouse Model*; **H Chen**, J Yu, G Wang
- 1:45 PM **35** (Invited) *Isolation and Characterization of Cell- and Size-Specific Extracellular Vesicles by Nanoscale High Resolution Flow Cytometry*; **TK Morgan**
- 2:15 PM **36** *Scanning Electron Microscopy as a New Tool for Diagnostics in Pathology*; **T Cohen Hyams**, MC Killingsworth
- 2:30 PM **37** (Invited) *Multi-Scale Imaging of Tissues and Organoid Models by Backscattered Electron Scanning Microscopy after Pre- and Post-Embedding Immuno-Labeling*; **M Reichelt**, D Mandikian, A Lopez, AK Katakam, D Smith, W Meilandt, J Imperio, M Sagolla

B04.1

Cutting-Edge Microscopy in the Pacific Northwest

SESSION CHAIRS:

Doug Keene; Shriners Hospitals for Children
Claudia López; Oregon Health & Science University

PLATFORM SESSION

Monday 1:30 PM • Room: D133-134

- 1:30 PM **38** (Invited) *3DEM Data Collection of Cancer Biopsies: Comparing FIB-SEM and SBF-SEM*; **JL Riesterer**, K Loftis, K Stoltz, E Stempinski, M Williams, CS Lopez, G Thibault, JW Gray
- 2:00 PM **39** (Invited) *Computer Vision Techniques for Cancerous Cells Analysis in FIB-SEM Images*; **G Thibault**, J Riesterer, K Stoltz, K Loftis, G Schau, E Stempinski, C Lopez, YH Chang, J Gray
- 2:15 PM **40** (Invited) (STUDENT) (M&M MEETING SCHOLAR AWARD) *Multiscale Cardiac Imaging: From Whole Heart Images to Cardiac Ultrastructure*; **G Rykiel**, CS Lopez, JL Riesterer, M Williams, K Courchain, A Maloyan, K Thornburg, S Rugonyi
- 2:45 PM **41** *ELVIS: A Correlated Light-Field and Digital Holographic Microscope for Field and Laboratory Investigations*; **J Nadeau**, M Schadeegg, C Snyder, I Hanczarek

P

Physical Sciences Symposia – Monday Afternoon

P06.1

In situ TEM of Nanoscale Materials and Electronic Devices for Phase Transformation Studies

SESSION CHAIRS:

Thomas C. Pekin; Humboldt Universität zu Berlin, Germany
Judy Cha; Yale University

PLATFORM SESSION

Monday 1:30 PM • Room: B118-119

- 1:30 PM **42** (Invited) *In Situ TEM on Formation of Monatomic Metallic Glasses Through Ultrafast Liquid Quenching*; **S Mao**
- 2:00 PM **43** *Electric Field-Induced Surface Melting of Gold Observed In Situ at Room Temperature and at Atomic Resolution Using TEM*; L de Knoop, M Juhani Kuisma, J Löfgren, K Lodewijks, M Thuvander, P Erhart, A Dmitriev, E Olsson
- 2:15 PM **44** (STUDENT) *In situ TEM Investigation of the Electroplasticity Phenomenon in Metals*; **X Li**, AM Minor
- 2:30 PM **45** (Invited) *Microstructure and Defect Characterization Using Advanced STEM Techniques: 4D-STEM and WB DF STEM*; J Miao, I Casalena, J Ciston, T Pekin, M Ghazisaeidi, **MJ Mills**

P07.1

Electron Crystallography of Nanostructures in Nanotechnology, Materials and Bio-Sciences

SESSION CHAIRS:

Roberto Reis; Northwestern University
Sergei Rouvimov; University of Notre Dame

PLATFORM SESSION

Monday 1:30 PM • Room: D138

- 1:30 PM **46** (Invited) *Scanning Precession Electron Diffraction to aid Aluminum Alloy Development*; JK Sunde, E Christiansen, E Thronsen, S Wenner, CD Marioara, AT van Helvoort, **R Holmestad**
- 2:00 PM **47** *Revealing Embedded Crystals through their Diffracting Signals in Transmission Electron Microscopy*; **EF Rauch**, M Veron
- 2:15 PM **48** (STUDENT) *Microstructure Evolution and Its Effect on Magnetic Properties of Mn-Al Alloy Fabricated via End Milling Machining Process*; **J Jo**, B Vishwanadh, R Shankar, J Wiezorek
- 2:30 PM **49** *Advantages of Precession Electron Diffraction in the Study of Small Metallic Nanoparticles*; C Fernando, M Hoque, J Reyes Gasga, **A Ponce**
- 2:45 PM **50** *Dynamical Diffraction Calculations of Incommensurate Modulations in Crystals*; **L Wu**, S Deng, Y Zhu

Scientific Program

P

Physical Sciences Symposia – Monday Afternoon cont.

P08.1 Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications

SESSION CHAIRS:

Chongmin Wang; Pacific Northwest National Laboratory
Yuanzhuo Zhu; University of Connecticut

PLATFORM SESSION

Monday 1:30 PM • Room: B115

- 1:30 PM **51 (Invited)** *Designing Energy Materials via Atomic-resolution Microscopy and Spectroscopy*; **S Pennycook**, X Zhao, J Lu, W Zang, H Wu, J Wang
- 2:00 PM **52** *Ultrafast Laser-Pump Electron-Probe Microscopy for Imaging Semiconductor Carrier Dynamics*; MWH Garming, GIGC Weppelman, P Kruit, **JP Hoogenboom**
- 2:15 PM **53 (STUDENT)** *Direct Imaging of Incoherent-to-Coherent Structural Dynamics in Plasmonic Nanorods with Ultrafast Electron Microscopy*; **R Gnabasik**, D Valley, M Quan, V Ferry, D Flannigan
- 2:30 PM **54** *In Situ Tracking of Picoscale Atomic Displacements with Millisecond Time-Resolution During Exchange and Diffusion Processes in Energy Materials in TEM*; **BD Levin**, EL Lawrence, P Haluai, PA Crozier
- 2:45 PM **55 (STUDENT)** *Exploring the Connection between Coherent Acoustic Phonons and Bright-Field Contrast in Ultrafast Electron Microscopy*; **DX Du**, DJ Flannigan

P09.1 The Success of TMBA: TEM and STEM Developments in Techniques, Applications and Education

SESSION CHAIRS:

Paul Kotula; Sandia National Laboratories
Joe Michael; Sandia National Laboratories
Masashi Watanabe; Lehigh University

PLATFORM SESSION

Monday 1:30 PM • Room: D137

- 1:30 PM **56** *Transmission Microscopy: Beginning Automation*; **CB Carter**, DB Williams
- 1:45 PM **57** *High-Throughput Identification of Crystal Structures Via Machine Learning*; K Kaufmann, C Zhu, AS Rosengarten, D Maryanovsky, T Harrington, E Marin, **KS Vecchio**
- 2:00 PM **58** *The Power of AEM and Data Analytics: 20 Years of Teaching MSA at M&M*; **P Kotula**
- 2:15 PM **59 (STUDENT)** *Ion Beam Induced Artifacts in Lead Based Chalcogenides*; **X Zhang**, S Hao, G Tan, X Hu, EW Roth, MG Kanatzidis, C Wolverton, VP Dravid
- 2:30 PM **60 (Invited)** *Analytical Electron Microscopy: Rivaling / Complementing Atom Probe Tomography*; **M Burke**, JJH Lim

P11.1

Advances in Characterization of Geological and Extraterrestrial Samples

SESSION CHAIRS:

Lori Hathon; University of Houston
Kultaransingh Hooghan; Sandia National Laboratories

PLATFORM SESSION

Monday 1:30 PM • Room: B112

- 1:30 PM **61** *Michrons to Millimeters: Multi-range Hyperspectral Imaging of Organic and Inorganic Reservoir Rock Samples*; **TD Jobe**, C Sandu, SL Eichmann, L Stout
- 1:45 PM **62** *Innovative Mapping of Mineral and Organic Matter of Source Rocks at the Nanometer Scale Using Back Scatter Electron and Energy Dispersive Spectroscopy*; **DJ Jacobi**, Q Sun, JM Longo, J Brothers, J Kone
- 2:00 PM **63** *Digital Rock Evaluation of the Thermal Conductivity and Electrical Resistivity of Source Rocks*; **SL Eichmann**, A Kotb, M Sengupta
- 2:15 PM **64** *Correlative Petrographic and Spectroscopic Characterization of Boquillas Shale Samples Before and After Hydrous Pyrolysis: Understanding Diagenetic and Thermogenesis as it Relates to Storage and Expulsion*; **AR Boehlke**, J Hatcherian, P Hackley, J Birdwell, A Jubb, B Valentine
- 2:30 PM **65** *Optimization of Specimen Preparation Methods for Cryo Electron Microscopy of Oil-and-Water Emulsions*; **DH Anjum**, P Guida, AR Behzad, S Saxena, WL Roberts
- 2:45 PM **66** *New Insights to Characterize Fluid/Carbonate Rock Interfaces Using Transmission Electron Microscopy with Liquid Cell Holder*; **D Cha**, M Alotaibi, S Enezi, AA Yousef, K Song, X Li, Y Han

P14.1

Microstructural and Mechanical Characterization of Metallic Alloys

SESSION CHAIRS:

Philipp Kürnsteiner; Max Planck Institute, Germany
Baptiste Gault; Max Planck Institute, Germany

PLATFORM SESSION

Monday 1:30 PM • Room: B116

- 1:30 PM **67 (STUDENT) (M&M MEETING SCHOLAR AWARD)** *Characterization of Misfit Dislocations at Heterovalent II-VI/III-V Interfaces*; **BS McKeon**, X Liu, JK Furdyna, DJ Smith
- 1:45 PM **68** *Structure, Morphology and Coarsening Behavior of MX (NbC) Nanoprecipitates in Fe-Ni-Cr Based Alloys*; **M Heczko**, BD Esser, R Gröger, L Feng, V Mazánová, Y Wang, MJ Mills
- 2:00 PM **69 (STUDENT)** *Characterization of Complex Retained Austenite on a TRIP800 Automotive Steel*; **N-I Makris**, S Deligiannis, A Alexandratou, P Tsakiridis, G Fourlaris

- 2:15 PM **70** (STUDENT) *Effect of High-Temperature Impact on the Formation of Adiabatic Shear Bands*; **A Eliasu**, S Boakye- Yiadom
- 2:30 PM **71** *Ternary Fe-Al-Si Alloys Prepared by Mechanical Alloying and Spark Plasma Sintering*; **J Kopeček**, F Laufek, M Karlík, P Haušild, J Čech, A Školáková, K Nová, B Severa, J Šesták, P Novák, F Průša

T

Tutorials – Monday Afternoon

X44.1

Electron Optics for CryoEM: Facts and Myths

SESSION CHAIRS:

Tommi White; University of Missouri

PLATFORM SESSION

Monday 2:00 PM • Room: B110

- 2:00 AM **72** (Invited) *High-End Data Collection for Single-Particle Cryo-EM*; **F Weis**

A

Analytical Sciences Poster Sessions–Monday

A01.P1

Advances in Phase Retrieval Microscopy

POSTER SESSION

Monday 3:00 PM • Room: Exhibit Hall

POSTER # 1

- 3:00 PM **73** *Electromagnetic Field Reconstructions of 4D-STEM Datasets Using Ptychography and Differential Phase Contrast Imaging*; **S Cao**, M Chi, KL More

POSTER # 2

- 3:00 PM **74** *Effectively Synchronizing 4D-STEM Detectors with Probe Movement*; **B Bammes**, C Zhang, R Bilhorn, PM Voyles

POSTER # 3

- 3:00 PM **75** *Assessing the Phase Accuracy of ePIE Reconstructions of Crystalline Materials*; **AM Blackburn**, RA McLeod

POSTER # 4

- 3:00 PM **76** *Electron Ptychography of Single Biological Macromolecules*; **PM Pelz**, R Bucker, G Ramm, H Venugopal, G Kassier, D Eggert, P-H Lu, RE Dunin-Borkowski, RJD Miller

POSTER # 5

- 3:00 PM **77** *Three-Dimensional Electrostatic Field at an Electron Nano-Emitter Determined by Differential Phase Contrast in Scanning Transmission Electron Microscopy*; **M Wu**, A Tafel, P Hommelhoff, E Spiecker

POSTER # 6

- 3:00 PM **78** (M&M POST-DOCTORAL RESEARCHER AWARD) *Structure Retrieval of Strongly Scattering Materials in the Transmission Electron Microscope*; **HG Brown**, Z Chen, M Weyland, C Ophus, J Ciston, LJ Allen, SD Findlay

POSTER # 7

- 3:00 PM **79** *Spatial and Temporal Incoherence in Scanning Diffraction and Differential Phase Contrast*; **MP Oxley**

POSTER # 8

- 3:00 PM **80** (STUDENT) *Nanoscale Quantification of Jahn-Teller Distortion in LaMnO_3* ; **B Wang**, BD Esser, N Bagués, J Yan, DW McComb

POSTER # 9

- 3:00 PM **81** *Local Phase Curvature Measurement in STEM With a Pixelated Detector*; **M Krajnak**, DM Paganin, K Fallon, S McVitie, J Etheridge

POSTER # 10

- 3:00 PM **82** *Phase Plate STEM Imaging Using Two-Dimensional Electron Detector*; M Tsubouchi, **H Minoda**

POSTER # 11

- 3:00 PM **83** (STUDENT) *Large Field of View Strain Characterization in a Scanning Transmission Electron Microscope Using a Designed Coherent Sampler*; **A Pofelski**, S Ghanad-Tavakoli, D Thompson, G Botton

Scientific Program

A

Analytical Sciences Poster Sessions— Monday cont.

A05.P1 Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science

POSTER SESSION

Monday 3:00 PM • Room: Exhibit Hall

POSTER # 12

3:00 PM **84** *Mapping the Evolution of Grains in Strontium Titanate through Laboratory-Based 4D Diffraction Contrast Tomography*; A Krause, **H Bale**, J Sun, W Harris, E Lauridsen, C Marvel, C Krill, M Harmer

POSTER # 13

3:00 PM **85** *Exploration of TATB Grain Structure on Detonation Sensitivity Using X-Ray CT*; **L Kuettner**, LG Hill, J Yeager, K Henderson, BM Patterson

POSTER # 14

3:00 PM **86** *What Lies Beneath: 3D vs 2D Correlative Imaging Challenges and How to Overcome Them*; **RL Mitchell**, S Freitag, T Volkenandt, J Russell, P Davies, C Pleydell-Pearce, R Johnston

POSTER # 15

3:00 PM **87** (STUDENT) *A Correlative and Multi-Modal Approach to Analyzing Microscopic Particulate Contaminants in Carbon Black*; **A Poozhikunnath**, J Favata, B Ahmadi, J Xiong, S Shahbazmohamadi, L Bonville, R Maric

POSTER # 16

3:00 PM **88** *Bubbles in the Bullion: Micro-CT Imaging of the Internal Structure of Ancient Coins*; **LL Van Loon**, AJ Nelson, U Wartenberg Kagan, K Barron, NR Banerjee

POSTER # 17

3:00 PM **89** (STUDENT) *Structural Analysis of Liquid Metal Catalysts in Porous Silica Utilizing Nano-CT and Analytical Transmission Electron Microscopy*; **J Wirth**, S Englisch, C Wiktor, N Taccardi, B Apeleo Zubiri, P Wasserscheid, E Spiecker

POSTER # 18

3:00 PM **90** *The Dynamics of Abnormal Grain Growth in a Particle-Containing System: Integration of 3D Experimental Data into a Capillarity Driven Model*; **N Lu**, J Kang, N Senabulya, N Gueninchault, A Shahani

A08.P1

Current Trends and Challenges in Electron Energy-Loss Spectroscopy

POSTER SESSION

Monday 3:00 PM • Room: Exhibit Hall

POSTER # 19

3:00 PM **91** (STUDENT) *Low Loss EELS of Lateral MoS₂/WS₂ Heterostructures*; **S Susarla**, LHG Tizei, SY Woo, A Zobelli, O Stephan, PM Ajayan

POSTER # 20

3:00 PM **92** (STUDENT) *Localization of Plasmon Resonance Using Momentum-Resolved EELS*; **ER Hoglund**, JM Howe

POSTER # 21

3:00 PM **93** (STUDENT) *Nanoscale Probing of Adsorbates on Pt/CeO₂ with Aloof-beam Vibrational Electron Energy-Loss Spectroscopy*; **K Venkatraman**, J Vincent, K March, P Rez, PA Crozier

POSTER # 22

3:00 PM **94** (STUDENT) *Manipulation of Optical Phonon Polaritons in Patterned SiO₂ Thin-Films*; **K Venkatraman**, S Situ, K March, P Rez, PA Crozier

POSTER # 23

3:00 PM **95** *Model-Based EELS Quantification and ELNES Phase Mapping Using Experimentally Measured Cross-Sections*; B Schaffer, L Spillane, **PJ Thomas**

POSTER # 24

3:00 PM **96** (STUDENT) *Simultaneous Multi-Region Background Subtraction for EELS Spectra*; **JT Held**, H Yun, KA Mkhoyan

POSTER # 25

3:00 PM **97** (STUDENT) *Effects of Beam-Induced Carbon Deposition on Electron Energy-Loss Spectroscopy Analysis of Compositional Fluctuations in InGaN/GaN Quantum Well LEDs*; **SA Goodman**, GJ Syaranamual, JY Chung, Z Li, A Singh, K Kisslinger, R Armitage, I Wildeson, D Su, P Deb, E Stach, S Gradecak

POSTER # 26

3:00 PM **98** (STUDENT) *Towards Quantitative Nanomagnetism in Transmission Electron Microscope by the Use of Patterned Apertures*; **H Ali**, T Warnatz, L Xie, B Hjärvarsson, K Leifer

POSTER # 27

3:00 PM **99** (STUDENT) *Decomposition of Core-Loss EEL Edges into a Linear Combination of Refined 'Pure' Spectra*; **JT Held**, K Hunter, UR Kortshagen, KA Mkhoyan

POSTER # 28

3:00 PM **100** *Determination of Mn Valences in Li_{1-x}Mg_xMn₂O₄ Using Monochromated EELS in an Aberration-Corrected STEM*; X Zhan, **J-M Zuo**, W Chen, Q Chen

B

Biological Sciences Poster Sessions—Monday

B03.P1

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

POSTER SESSION

Monday 3:00 PM • Room: Exhibit Hall

POSTER # 29

3:00 PM **101** *Histopathology and in situ Hybridization of Coatomeer (CopI) Knockdown in Western Corn Rootworm (Diabrotica virgifera virgifera);* **AJ Bowling**, HE Pence, E Fishilevich

POSTER # 30

3:00 PM **102** *Scanning Confocal Microscopy for Study of the Neuromuscular Junction (NMJ) Acetylcholine Receptors (nAChRs): One Model of the Peripheral Nerve Injury Recovered After Fibrin Sealant Use;* **SMM Matheus**, CG Pinto, APS Leite, AA Sartor, FC Tibúrcio, RS Ferreira Junior, AL Filadelpho, SC de Carvalho

POSTER # 31

3:00 PM **103** *The Examination on Corneal Nerve in Diabetic WBN/Kob Rat is Useful for Detecting Peripheral Sensory Neuropathy;* **K Ozaki**, Y Terayama, T Matsuura

POSTER # 32

3:00 PM **104** (STUDENT) *The Role of Tyramine within the Mouse Ovary;* **SM Peck**, SB Obayomi, DP Baluch

POSTER # 33

3:00 PM **105** (STUDENT) *Morphologic Analysis of Multiple Tissues in Caveolin-1 Null Mice;* **B Qu**, L Li

POSTER # 34

3:00 PM **106** *Correlative Structural, Biochemical, and Behavioral Study in Neuroprotection with Palmitoylethanolamide after Perinatal Asphyxia in the Immature Brain;* MI Herrera, T Kobiec, L Udovin, N Toro-Urrego, CF Kusnier, JP Luaces, R Kolliker, **F Capani**

POSTER # 35

3:00 PM **107** (STUDENT) *Ultrastructural Modifications of the Mouse Uterus upon Biogenic Amine Stimulation;* **SB Obayomi**, S Peck, DP Baluch

POSTER # 36

3:00 PM **108** (STUDENT) *Transient Exposure to 450 nm Light Alters Phagocytosis by Retinal Pigment Epithelium Without Compromising Viability;* **J Blaize**, JV Fabozzi

POSTER # 37

3:00 PM **109** *Chronic Oxidative Stress and Comorbidities in the HIV-1 Transgenic Rat;* **F Denaro**, M Worthington, F Benedetti, S Curreli, D Zella, J Bryant

POSTER # 38

3:00 PM **110** (M&M POST-DOCTORAL RESEARCHER AWARD) *Localization of the Herpesvirus Portal;* **MH Buch**, J Heymann, WW Newcomb, DC Winkler, AC Steven

POSTER # 39

3:00 PM **111** *Using Electron Microscopy to Enhance the Knowledge of Biological Systems;* **K Ishikawa**, Z Wang, C Burks, M Larion, N de Val, J Schneider

POSTER # 40

3:00 PM **112** (STUDENT) *Microscopy Techniques Used to Visualize Immune-Labeled Chlamydial Inclusion Membrane Proteins in 2D and 3D;* **B Crews**, ER Fischer, FH Hoyt, BT Hansen, T Hackstadt

POSTER # 41

3:00 PM **113** (STUDENT) *Using Correlative Light and Electron Microscopy (CLEM) To Understand Ultrastructural Changes Induced by Salmonella typhimurium Infection in a Calf Ileum Loop Model;* **S Antonioli-Schmit**, A Chong, BT Hansen, M Pulliam, V Nair

B04.P1

Cutting-Edge Microscopy in the Pacific Northwest

POSTER SESSION

Monday 3:00 PM • Room: Exhibit Hall

POSTER # 42

3:00 PM **114** *Studying Ras Nanocluster Formation on the Cell Membrane with Correlative Superresolution and Electron Microscopies;* Y Zhang, K Tao, L Wu, Y Lee, YH Chang, **X Nan**

POSTER # 43

3:00 PM **115** *#Protein Lights Up in Cryo-EM;* **J Chen**

POSTER # 44

3:00 PM **116** *Structural Characterization of Immune Responses to HPV Infection and HPV Vaccination;* **S Singh**, J Carter, K Cohen, J McElrath, D Galloway, M Pancera

Scientific Program

P

Physical Sciences Poster Sessions—Monday

P07.P1

Electron Crystallography of Nanostructures in Nanotechnology, Materials and Bio-Sciences

POSTER SESSION

Monday 3:00 PM • Room: Exhibit Hall

POSTER # 45

3:00 PM **117** *High Throughput Grain Mapping with Sub-Nanometer Resolution by 4D-STEM*; **FI Allen**, TC Pekin, A Persaud, SJ Rozeveld, GF Meyers, J Ciston, C Ophus, AM Minor

POSTER # 46

3:00 PM **118** (STUDENT) *Indexing Electron Backscatter Diffraction Patterns with a Refined Template Matching Approach*; **A Foden**, DM Collins, AJ Wilkinson, TB Britton

POSTER # 47

3:00 PM **119** *When Ion or Electron Channeling Meets Crystal Orientation Mapping*; C Langlois, C Lafond, T Douillard, S Dubail, S Cazottes, J Silvent, **A Delobbe**

POSTER # 48

3:00 PM **120** *The role of Cluster Analysis in Automated Serial Electron Crystallography*; **S Smeets**, B Wang, X Zou

POSTER # 49

3:00 PM **121** *Two Beam Toy Model for Dislocation Contrast in ECCI*; **E Pascal**, B Hourahine, C Trager-Cowan, M De Graef

POSTER # 50

3:00 PM **122** *Nano-Scale Crystallographic Aspects of Discontinuous Precipitation and Coarsening Reactions in Cu-10% Co alloy*; NM Suguihiro, **G Solórzano**

POSTER # 51

3:00 PM **123** *Determination of Crystallinity in Li_{1-x}MgxMn₂O₄ Nanocrystals Based on Diffraction Patterns Correlation Analysis and Strain Mapping*; **X Zhan**, R Yuan, W Chen, Q Chen, J-M Zuo

POSTER # 52

3:00 PM **124** *The Structural Changes in the Human Teeth during Their Calcination From 25 To 1200 °C by Electron Microscopy*; **J Reyes-Gasga**, NV Becerril

POSTER # 53

3:00 PM **125** (STUDENT) *Effect of Magnetic Stirring on the Green Synthesis of Silver Nanoparticles Using Lavandula angustifolia Plant Extract*; **MA Villalpando**, GA Rosas

POSTER # 54

3:00 PM **126** (STUDENT) *Study of 0D, 1D and 3D Zinc Oxide Morphologies by SEM and TEM*; **JE Morales-Mendoza**, F Paraguay-Delgado, E Guerrero, D Lardizabal, L de la Torre

POSTER # 55

3:00 PM **127** *An Electron Microscopy Collaboratory for Correlative Imaging Sciences*; DE Huber, FJ Scheltens, RE Williams, DB Williams, **DW McComb**

POSTER # 56

3:00 PM **128** *An Interactive and Adaptive Online Electron Microscopy Education Platform*; N Freed, D Butler, A Cairns, R Hugo, J Jiao, **Z Chen**

POSTER # 57

3:00 PM **129** *Evolution of Microstructures and Interfaces in Compositionally Graded Mixed Oxide Thin Films for Nanoelectronics and Energy*; A Singh Pal, A Singh, RK Mandal, **J Basu**

POSTER # 58

3:00 PM **130** *A TD-DFT Treatment of Electronic Excitations in the STEM Spanning Dipole and Impact Scattering Regimes*; **DB Lingerfelt**, J Jakowski, P Ganesh, B Sumpter

POSTER # 59

3:00 PM **131** *In situ Cathodoluminescence and Monitoring Electronic Structure Change Using Optical TEM Holder*; **M Xu**, S Dai, W Gao, T Blum, X Pan

P14.P1

Microstructural and Mechanical Characterization of Metallic Alloys

POSTER SESSION

Monday 3:00 PM • Room: Exhibit Hall

POSTER # 60

3:00 PM **132** *Effect of Ni Addition and T6 Heat Treatment on Microstructure and Microhardness of Hot Plastic Deformed (Al-Si- Mg) Alloys*; **HM Medrano Prieto**, CG Garay Reyes, I Estrada Guel, JM Mendoza Duarte, JC Guía Tello, JS Castro Carmona, H Camacho Montes, MC Maldonado Orozco, R Martínez Sánchez

POSTER # 61

3:00 PM **133** *Improvement of Mechanical Properties of an Aluminum Alloy 7075 by Adding Reduced Graphene Oxide Through Mechanical Milling*; E Cuadros Lugo, I Estrada Guel, JM Herrera Ramirez, C López Meléndez, **C Carreño Gallardo**

POSTER # 62

3:00 PM **134** *Exploring the Reinforcing Effect of AgcNP and Al₂O₃NP in Aluminum Alloy 2024 Matrix Composites*; **C Carreño Gallardo**, E Cuadros Lugo, I Estrada Guel, C López Meléndez, JM Herrera Ramirez

POSTER # 63

3:00 PM **135** *Effect of the Age-hardening Time on the Microstructure of Cold Rolled Al2024 Alloy*; **JC Guía Tello**, CG Garay Reyes, HM Medrano Prieto, MA Ruiz-Esparza Rodriguez, MC Maldonado Orozco, G Rodriguez Cabriaes, R Martínez Sánchez

POSTER # 64

3:00 PM **136** (STUDENT) *Wear Behavior in Al-Cu-Mg Alloy Reinforced With WC Particles Fabricated by Mechanical Alloying*; **G Rodriguez-Cabriaes**, CG Garay-Reyes, I Estrada-Guel, MC Maldonado-Orozco, R Martínez-Sánchez

POSTER # 65

3:00 PM **137** (STUDENT) *Scanning Electron Microscopy of the Electrochemical Corrosion Products of a Titanium based Metallic Foam*; **L Béjar**, E Huape, A Medina, AA Mejía, C Aguilar, I Alfonso

POSTER # 66

3:00 PM **138** *Evaluation of Mechanical Properties of Ti/Al/Zr-N and Zr/Al/Ti-N Thin Films*; CD Gómez-Esparza, RP Talamantes- Soto, **A Duarte-Moller**

POSTER # 67

3:00 PM **139** (STUDENT) *Microstructural Evolution of Cold-Rolled β Metastable Ti-29Nb-2Mo-6Zr Alloy*; **AR Vieira Nunes**, S Borborema, L Malet, J Dille, LH de Almeida

POSTER # 68

3:00 PM **140** (STUDENT) *A Comparative TEM Study of Nanoprecipitate Formation in Waspaloy® Welds*; A Alexandratou, S Deligiannis, **NI Makris**, PE Tsakiridis, G Fourlaris

POSTER # 69

3:00 PM **141** (STUDENT) *Rationalization of Thermo-Mechanical Instabilities in Transient Additive Manufacturing of Ni-Based Superalloys*; **B Lim**, XC Cui, SP Ringer

POSTER # 70

3:00 PM **142** *Microstructural Behavior of AA319 Aluminum Alloy Modified with Nickel*; J Camarillo-Cisneros, R Martinez- Sanchez, H Arcos-Gutierrez, IE Garduño-Olvera, **R Pérez-Bustamante**

POSTER # 71

3:00 PM **143** *Microstructural and Hardness Behavior of AlCoCuFeNi and AlCoCuFeNiCr High-Entropy Alloys Synthesized by Milling and Arc Melting*; CD Gomez-Esparza, M Hernandez-Hernandez, VH Mercado-Lemus, **R Pérez-Bustamante**

POSTER # 72

3:00 PM **144** (STUDENT) *Densification, Microhardness and Microstructural Evolution by Fast Low-Temperature Consolidation of AlxCoCrFeMnNi High Entropy Alloy*; **MA Ruiz Esparza Rodriguez**, CG Garay Reyes, JM Mendoza Duarte, I Estrada Guel, R Martinez Sanchez

POSTER # 73

3:00 PM **145** *Microstructural Study and Antibacterial Response of an AlCoCrCuFeMoNi High-Entropy Alloy*; **CD Gómez- Esparza**, CA Ramírez-Valdespino, I Estrada-Guel, A Duarte-Moller

POSTER # 74

3:00 PM **146** *Microstructural Study of Fe-Cr-Al-X (X=Nd,Pr) Alloys for High Temperature Structural Applications*; MA Encinas Ocejo, **O Hernández-Negrete**, G Tiburcio Munive, F Brown, A Valenzuela Soto, HE Esparza Ponce

POSTER # 75

3:00 PM **147** (STUDENT) *Discontinuous Precipitation of α -Cr Phase in Alloy 33 (Cr-Fe-Ni-N)*; JC Spadotto, MG Burke, **IG Solórzano**

POSTER # 76

3:00 PM **148** (STUDENT) *Influence of the Powder Pack Boriding Mixture on the FeB and Fe2B Layers*; M Ortiz Domínguez, G Ares de Parga, A Arenas Flores, I Morgado Gonzalez, OA Gómez Vargas, J Zuno Silva, **A Cruz Avilés**

POSTER # 77

3:00 PM **149** *Investigation of Digital Imaging Processing in Determining Nano-Particle Size Distribution Based on Scanning Electron Microscopic Image*; **BC Park**, MJ Kwak

POSTER # 78

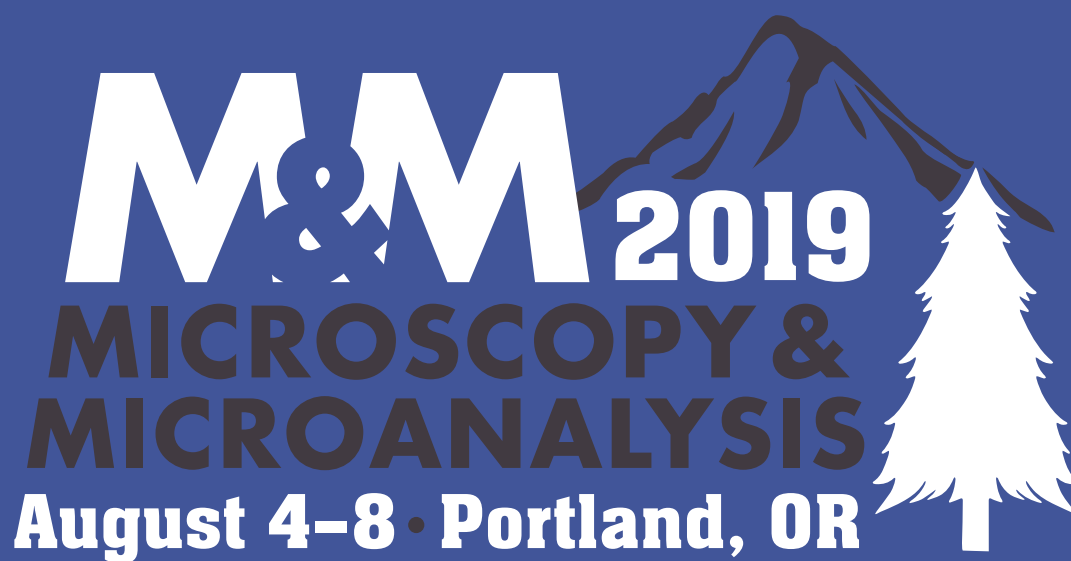
3:00 PM **150** (STUDENT) *Effect of Finishing and Coiling Temperatures on the Nanoprecipitate Dispersion in Novel HSLA Steels*; **S Deligiannis**, A Alexandratou, NI Makris, P Tsakiridis, G Fourlaris

Notes

[illegible]

Scientific Program Information

Tuesday, August 6, 2019



Scientific Program

Tuesday, August 6

A

Analytical Sciences Symposia – Tuesday Morning

A01.2 Advances in Phase Retrieval Microscopy

SESSION CHAIRS:

Jian-Min Zuo; University of Illinois–Urbana-Champaign
Toshiaki Tanigaki; Hitachi Ltd.

PLATFORM SESSION

Tuesday 8:30 AM • Room: B114

- 8:30 AM **151** (Invited) *Differential Phase Contrast Scanning Transmission Electron Microscopy at Atomic Resolution*; **N Shibata**
- 9:00 AM **152** (M&M POST-DOCTORAL RESEARCHER AWARD) *Measuring Charge State at the Single-Atomic-Column-Base with Four-Dimensional Scanning Transmission Electron Microscopy*; **W Gao**, C Addiego, H Huyen, X Pan
- 9:15 AM **153** (STUDENT) *Charge Density Mapping via Scanning Diffraction in Scanning Transmission Electron Microscopy*; **C Addiego**, W Gao, X Pan

See above

A02.2 Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy

SESSION CHAIRS:

Francisco de la Peña; Université Lille, France
Philippe T. Pinard; Oxford Instruments, United Kingdom
Eric Prestat; Manchester University, United Kingdom

PLATFORM SESSION

Tuesday 8:30 AM • Room: C123

- 8:30 AM **155** (Invited) *Scientific Python: A Mature Computational Ecosystem for Microscopy*; **SJ VanderWalt**
- 9:00 AM **156** *Fuzzy Clustering to Merge EDS and EBSD Datasets with Crystallographic Ambiguity*; **CM Parish**
- 9:15 AM **157** (STUDENT) *Utilizing an Open-Source Workflow for the Analysis of Atom Dynamics in Two-Dimensional Materials*; **EN O'Connell**, M Hennessy, E Courtney, QM Ramasse, B Kardynal, H Hofsaess, M Ghorbani-Asl, A Krashennnikov, U Bangert
- 9:30 AM **158** *Open Source Development Tools for Robust and Reproducible Electron Microscopy Data Analysis*; **M Nord**, J Verbeeck
- 9:45 AM **159** *Harvesting Microscopy Experimental Context with a Configurable Laboratory Information Management System*; **JA Taillon**, RF Devers, RL Plante, MW Newrock, JW Lau, G Greene

A03.2 Low-Energy X-Ray Analysis: Novel Applications Using Soft X-Ray Emission Spectroscopy (SXES), Cathodoluminescence (CL), and Synchrotron Techniques

SESSION CHAIRS:

Emma Bullock; Carnegie Science
Juliane Gross; Rutgers University

PLATFORM SESSION

Tuesday 8:30 AM • Room: D139

- 8:30 AM **160** (Invited) *Spatially Resolved Soft X-Ray Spectroscopy in Scanning X-Ray Microscopes*; **AP Hitchcock**, P Krüger, C Bittencourt, GD Swerhone, JR Lawrence
- 9:00 AM **161** *Total Electron Yield Mapping of Electronic Device Features via Measurement of X-Ray Beam-Induced Currents*; **WA Hubbard**, JJ Lodico, B Zutter, D Shapiro, YH Lo, A Rana, D Morrill, C Gentry, HL Chan, BC Regan
- 9:15 AM **162** *XAS between the Stars*; **Z Gainsforth**, AL Butterworth, JA Tomsick, AJ Westphal
- 9:30 AM **163** *Barite Cathodoluminescence as a Potential Indicator of Undiscovered Ore Deposits*; **H Lowers**, D Olinger, D Adams
- 9:45 AM **164** *Development of LVSEM-EDS Analyzer Utilizing Superconducting X-Ray Detector Toward Nanometer-scale Elemental Mapping of CFRP/Adhesive Interface*; **G Fujii**, M Ukibe, S Shiki, M Ohkubo

A04.2 Recent Developments in Atom Probe Tomography

SESSION CHAIRS:

David J. Larson; CAMECA Instruments Inc.
Daniel Perea; Pacific Northwest National Laboratory

PLATFORM SESSION

Tuesday 8:30 AM • Room: F151

- 8:30 AM **165** (Invited) *Atomistic-Simulation Based Modeling of Atom Probe Tomography*; **C Oberdorfer**, T Withrow, EA Marquis, W Windl
- 9:00 AM **166** *A Mesoscopic Field Evaporation Model*; C Hatzoglou, **F Vurpillot**
- 9:15 AM **167** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Fast Continuum Models for Atom Probe Simulation and Reconstruction*; **CEA Fletcher**, MP Moody, D Haley
- 9:30 AM **168** *Interpreting Voids in Atom Probe Tomography Data via Experiment and Theory*; **J Poplawsky**, X Wang, C Hatzoglou, W Guo, K Jin, H Bei, Y Wang, W Weber, Y Zhang, F Vurpillot, K More
- 9:45 AM **169** (STUDENT) *Improving Spatial Accuracy in Atom Probe Tomography through a Crystallography-Mediated Reconstruction (CMR)*; **AC Day**, AV Ceguerra, SP Ringer

Scientific Program

A

Analytical Sciences Symposia – Tuesday Morning cont.

A05.2 Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science

SESSION CHAIR:

Rich Johnston, Swansea University, United Kingdom

PLATFORM SESSION

Tuesday 8:30 AM • Room: C122

- 8:30 AM **170** *Femtosecond Laser-Enabled TriBeam as a Platform for Analysis of Thermally- and Charge-Sensitive Materials*; **S Randolph**, R Geurts, J Wang, B Winiarski, C Rue
- 8:45 AM **171** (Invited) *Acquisition, Reconstruction and Curation of Multimodal 3D TriBeam Data*; AT Polonsky, M- A Charpagne, MP Echlin, BS Manjunath, **TM Pollack**
- 9:15 AM **172** *3D Microstructure Characterization of a Silicon Based Anode Material on Different Length Scales Suitable for Storage Applications*; **T Vorauer**, P Kumar, F Chamasemani, J Rosc, B Fuchsichler, S Koller, L Helfen, P-H Jouneau, S Lyonard, R Brunner
- 9:30 AM **173** (STUDENT) *Multi-Method 3D Characterization of Different Tissue Types in Healing Bone*; **V Schemenz**, FF Chamasemani, A Gjardy, P Roschger, P Fratzl, L Helfen, R Weinkamer, R Brunner, BM Willie, W Wagermaier
- 9:45 AM **174** *Evolution of Material Properties and Macropores in Thermally Crept Nuclear Graphite*; **JJ Kane**, AC Matthews, T Yoder, WE Windes

A07.1 Vendor Symposium

SESSION CHAIRS:

Elizabeth C. Dickey, North Carolina State University

Deb Kelly, Pennsylvania State University

PLATFORM SESSION

Tuesday 8:30 AM • Room: C120-121

- 8:30 AM **175** *Advances in STEM and EELS: New Operation Modes, Detectors and Software*; AL Bleloch, NJ Bacon, GJ Corbin, N Dellby, MV Hoffman, MT Hotz, P Hrnčirik, N Johnson, TC Lovejoy, CE Meyer, A Mittelberger, B Plotkin-Swing, GS Stone, ZS Szilagy, **OL Krivanek**
- 8:45 AM **176** *Improvement of Spatial Resolution in Z Direction with Improved Energy Spread Measured Using Aberration Corrected STEM with Cold Field Emission Gun*; H Hashiguchi, **R Sagawa**, N Endo, E Okunishi, Y Kondo
- 9:00 AM **177** *News on Silicon Drift Detectors for High Resolution EDX Imaging and Spectroscopy*; **A Niculae**, T Barros, A Bechteler, R Lackner, K Hermenau, K Heizinger, T Mönninghoff, H Soltau, L Strüder
- 9:15 AM **178** *BX-1: A New Detector Window for Microanalysis Applications*; **J Abbott**, J Sommer, B Law, J Wong

- 9:30 AM **179** *Use of Wavelength- and Angle-Resolved Cathodoluminescence for Spectroscopic Analysis of the Emission Pattern of a Nitride Semiconductor Micro Pillar Array*; **J Lee**, M Bertilson, DJ Stowe, T Worsley, JA Hunt

A08.2 Current Trends and Challenges in Electron Energy-Loss Spectroscopy

SESSION CHAIRS:

Matthieu Bugnet, University of Lyon – CNRS, France

Peter Crozier, Arizona State University

PLATFORM SESSION

Tuesday 8:30 AM • Room: B111

- 8:30 AM **180** (Invited) *Atomic-Resolution Spectroscopy of Quantum Materials at Cryogenic Temperatures*; BN Goodge, DJ Baek, I El Baggari, MJ Zachman, **LF Kourkoutis**
- 9:00 AM **181** (STUDENT) *Direct Detection EELS at High Energy: Elemental Mapping and EXELFS*; **JL Hart**, AC Lang, RB Cummings, I MacLaren, ML Taheri
- 9:15 AM **182** *The Performance of Electron Counting Direct Detection in Electron Energy-Loss Spectroscopy*; **S Cheng**, P Longo, RD Twisten, GA Botton
- 9:30 AM **183** *Unveiling the Ferroelectric Behavior of HfO₂ Thin Films Using Fast DualEELS Analysis*; **P Longo**, P Favia, M Popovici, B Vermeulen, L Spillane, RD Twisten
- 9:45 AM **184** *Atomic-Scale Characterization of Ferro-Electric Domains in Lithium Niobate - Revealing the Electronic Properties of Domain Walls*; M Conroy, K Moore, EN O'Connell, JPV McConville, H Lu, P Chaudhary, A Lipatov, A Sinitskii, A Gruverman, JM Gregg, **U Bangert**

A09.1 Microscopy and Microanalysis for Real-World Problem Solving

SESSION CHAIRS:

Janet H. Woodward, Buckman

Ke-Bin Low, BASF

Xiaofeng Zhang, Nanosys, Inc.

PLATFORM SESSION

Tuesday 8:30 AM • Room: B113

- 8:30 AM **185** (Invited) *Sample Preparation Challenges in Advanced Semiconductor Test Structures*; **JJ Demarest**, L Tierney, Y Lu, K Dovidenko
- 9:00 AM **186** *Improved Sample Preparation of Beam-Sensitive Ultra-Thin Cuprate Films*; **V Srot**, Y Wang, U Salzberger, B Fenk, M Kelsch, M Minola, B Keimer, PA van Aken, M Salluzo, GM De Luca
- 9:15 AM **187** *Combining Emerging Sample Preparation Methods, SEM, and TEM investigations for Microelectronics Device Characterization at Multiple Scales*; **P Nowakowski**, C Bonifacio, M Ray, P Fischione
- 9:30 AM **188** (Invited) *Industrial Applications of Electron Microscopy: A Shared Laboratory Perspective*; **P Zhang**, M Salmon, S Wang, J Zhang, M Izquierdo, J Sun

A11.2 Current and Emerging Microscopy for Quantum Information Sciences

SESSION CHAIR:

Lena F. Kourkoutis; Cornell University

PLATFORM SESSION

Tuesday 8:30 AM • Room: B117

- 8:30 AM **189** (Invited) *In situ Materials Characterization of 2-Dim Materials at High Energy and Spatial Resolution*; X Hu, JR Jokisaari, S Ogut, RF Klie
- 9:00 AM **190** *Electron-beam Manipulation of Lattice Impurities in Graphene and Single-Walled Carbon Nanotubes*; T Susi, M Tripathi, K Mustonen, A Markevich, C Mangler, C Su, J Li, JC Idrobo, J Meyer, J Kotakoski
- 9:15 AM **191** *Towards Atomic Scale Quantum Structure Fabrication in 2D Materials*; O Dyck, A Lupini, M Ziatdinov, X Li, SV Kalinin, S Jesse
- 9:30 AM **192** *Atomic-Scale Study of Intrinsic Defects Suppressing the Thermal Conductivity of Boron Arsenide*; Q Zheng, CA Polanco, M-H Du, LR Lindsay, M Chi, J Yan, BC Sales
- 9:45 AM **193** *Double-slit Electron Interference Experiment with Zero Propagation Distance Using Electron Biprism*; K Harada, T Kodama, T Akashi, Y Takahashi, K Shimada, YA Ono, D Shindo, H Shinada, S Mori



Microscopy Outreach Session – Tuesday Morning

NEW!

X94

STEM Roundtable: Building Skills for the Future

Tuesday, August 6 • Room C124

8:30 AM – 10:00 AM

There is a lot of exciting work being done around STEM and there is a shared optimism that the time is right to explore ways in which we can collectively propel efforts. This can be done by exploring how working together to integrate varied resources can have broader, sustainable impacts, bridge K-12 outreach and undergraduate and graduate education, understand the importance of diversity and inclusion and that “STEM is for all, not some” will lead to a stronger workforce for us all.

****Session is open to all! No separate registration required.****

The organizers welcome and encourage participants in Academia; Education; all levels of Government; Business/ Industry; and Change Leaders within Science, Technology, Engineering, and Math Sectors

B

Biological Sciences Symposia – Tuesday Morning

B03.2

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

SESSION CHAIRS:

Ru-ching Hsia; University of Maryland-Baltimore

Marcela Redigolo; West Virginia University

Han Chen; Penn State College of Medicine

PLATFORM SESSION

Tuesday 8:30 AM • Room: D136

- 8:30 AM **194** (STUDENT) *Real-Time Observation of Ferritin Biomineralization Using Graphene Liquid Cells Electron Microscopy*; S Narayanan, R Shahbazian-Yassar, T Shokuhfar
- 8:45 AM **195** (Invited) *Quantitative Anatomical Approaches to Examining Plasticity in Neural Circuits*; DM Hegarty, AE Gonzales, JH Harkness, BA Sorg, SA Aicher
- 9:15 AM **196** (Invited) *Optical Clarity and Cataract: The Contributions of Intermediate Filaments to the Biology of the Ocular Lens*; P FitzGerald, B Shibata, N Sun
- 9:45 AM **197** *Investigating the Mucoid Switch of Pseudomonas aeruginosa at Oil-Water Interfaces*; SD House, SR Balmuri, JC Yang, TH Niepa

B04.2

Cutting-Edge Microscopy in the Pacific Northwest

SESSION CHAIRS:

Doug Keene; Shriners Hospitals for Children

Claudia López; Oregon Health & Science University

PLATFORM SESSION

Tuesday 8:30 AM • Room: D133-134

- 8:30 AM **198** (Invited) *Simple Chemical Stains for Feature-Rich Super-Resolution and Cleared-Tissue Microscopy*; C Mao, MY Lee, J-R Jhan, J Vaughan
- 9:00 AM **199** (Invited) (STUDENT) (M&M MEETING SCHOLAR AWARD) *VIPER: a Genetically-Encoded Tag for Fluorescence and Electron Microscopy*; JK Doh, JD White, HK Zane, YH Chang, CS López, CA Enns, KE Beatty
- 9:15 AM **200** (STUDENT) *Antibody Conjugated Oligonucleotides as a Platform for Cyclic Immunofluorescent Staining*; N McMahon, J Jones, A Solanki, J Eng, S Kwon, Y-H Chang, G Thibault, K Chin, M Nederlof, J Gray, SL Gibbs
- 9:30 AM **201** (Invited) *The Not-Boring Talk*; EC Humphrey

Scientific Program

P

Physical Sciences Symposia – Tuesday Morning

P01.1 *In situ* TEM Characterization of Dynamic Processes during Materials Synthesis and Processing

SESSION CHAIRS:

Benjamin Bammes; Direct Electron
Yu Han; King Abdullah University of Science and Technology,
Saudi Arabia

PLATFORM SESSION

Tuesday 8:30 AM • Room: B116

- 8:30 AM **202** (Invited) *Mapping Electronic State Changes with STEM EBIC*; **B Regan**, T Joshi, JJ Lodico, BT Zutter, HL Chan, M Mecklenburg, D Lederman, WA Hubbard
- 9:00 AM **203** *Atomic-Scale Chemical Manipulation of Materials in the Scanning Transmission Electron Microscope under Controlled Atmospheres*; GT Leuthner, C Mangler, JC Meyer, T Susi, **J Kotakoski**
- 9:15 AM **204** *Site Dependent Oxidation and Reduction Mechanisms in Nanoparticles Investigated via Environmental Scanning Transmission Electron Microscopy*; **AP LaGrow**, DC Lloyd, ED Boyes, PL Gai
- 9:30 AM **205** (Invited) *Cryo-Focused Ion Beam Applications in High Resolution Electron Microscopy Studies of Beam Sensitive Crystals*; **D Zhang**, N Wei, L Liu, K Song, A Behzad, A Genovese, Y Han

P05.1 Theory and Applications of Electron Tomography in the Materials Sciences

SESSION CHAIRS:

Peter Ercius; Lawrence Berkeley National Laboratory
Robert Hovden; University of Michigan

PLATFORM SESSION

Tuesday 8:30 AM • Room: D135

- 8:30 AM **206** (Invited) *3D Electron Ptychography*; S Gao, Z Ding, X Pan, AI Kirkland, **P Wang**
- 9:00 AM **207** (Invited) *Engineering Chiral Structures Through Strain Release: Electron Tomography Study of Twisted Nanowires*; X Song, A Bruefach, PM Pelz, H Devyldere, **M Scott**
- 9:30 AM **208** (Invited) *Reconstruction of Projected and 3D Magnetization Distributions from Electron-Optical Phase Images Using an Iterative Model-Based Algorithm*; J Caron, J Ungermann, A Kovacs, P Diehle, **RE Dunin-Borkowski**

P06.2 *In situ* TEM of Nanoscale Materials and Electronic Devices for Phase Transformation Studies

SESSION CHAIRS:

Leopoldo Molina-Luna; Technische Universität Darmstadt, Germany
Lin Zhou; Ames Laboratory

PLATFORM SESSION

Tuesday 8:30 AM • Room: B118-119

- 8:30 AM **209** *Differential Phase Contrast Imaging of the Magnetostructural Transition and Phase Boundary Motion in Uniform and Gradient-Doped FeRh-Based Thin Films*; **TP Almeida**, L Clark, R Temple, J Massey, M Thomas, D McGrouther, C Marrows, S McVitie
- 8:45 AM **210** (STUDENT) (M&M MEETING SCHOLAR AWARD) *in situ Ferroelectric Domain Dynamics Probed with Differential Phase Contrast Imaging*; **A Kumar**, R Dhall, JM LeBeau
- 9:00 AM **211** *Real-Space Observation of a Transformation from Antiskyrmion to Skyrmion by Lorentz TEM*; **L Peng**, R Takagi, W Koshibae, K Shibata, T Arima, N Nagaosa, Y Tokura, S Seki, X Yu
- 9:00 AM **212** *Correlation of Structural Modifications by Multiscale Phase Mapping in Filamentary Type HfO₂-based RRAM: Towards a Component-specific in situ TEM Investigation*; A Zintler, R Eilhardt, S Petzold, N Kaiser, S Ulhas, L Alff, L Molina-Luna
- 9:30 AM **213** *In situ Electric Field Manipulation of Ferroelectric Vortices*; **CT Nelson**, Z Hong, C Zhang, AK Yadav, S Das, S- L Hsu, M Chi, PD Rack, L-Q Chen, LW Martin, R Ramesh
- 9:45 AM **214** (STUDENT) *Mapping Ferroelectricity in Hafnia Thin Films with STEM EBIC*; **HL Chan**, WA Hubbard, JJ Lodico, BC Regan

P07.2 Electron Crystallography of Nanostructures in Nanotechnology, Materials and Bio-Sciences

SESSION CHAIR:

Alexander Eggeman; University of Manchester, United Kingdom

PLATFORM SESSION

Tuesday 8:30 AM • Room: D138

- 8:30 AM **215** (Invited) *The 4D Camera: Very High-speed Electron Counting for 4D-STEM*; **J Ciston**, IJ Johnson, BR Draney, P Ercius, E Fong, A Goldschmidt, JM Joseph, JR Lee, A Mueller, C Ophus, A Selvarajan, DE Skinner, T Stezelberger, CS Tindall, AM Minor, P Denes
- 9:00 AM **216** *k-Scanning: an Alternative to 4D-STEM*; **A Barnum**
- 9:15 AM **217** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Sub-nm Resolution, Sub-pm Precision Structure Mapping Robust to Thickness and Tilt Variations by Cepstral Analysis of Scanning Nanodiffraction 4D-STEM*; **P Cueva**, E Padgett, DA Muller

9:30 AM **218** *Crystallographic Symmetry Classifications of Noisy 2D Periodic Images in the Presence of Pseudo-Symmetries of the Fedorov Type*; **P Moeck**, A Dempsey

9:45 AM **219** *Decoupling Polarization, Crystal Tilt and Symmetry in Epitaxially-Strained Ferroelectric Thin Films Using 4D-STEM*; **Y-T Shao**, Z Chen, A Mei, M Holtz, E Padgett, D Schlom, DA Muller

P08.2 Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications

SESSION CHAIRS:

Thomas Hansen; Denmark Technical University, Denmark
Yaobin Xu; Pacific Northwest National Laboratory

PLATFORM SESSION

Tuesday 8:30 AM • Room: B115

8:30 AM **220** *Operando Transmission Electron Microscopy of Noble Metal Nano-catalysts during CO Oxidation*; **SW Chee**, U Mirsaidov

8:45 AM **221** (STUDENT) *Atomic Structure of Extended Defects in GaAs-Based Heterostructures*; **A Gangopadhyay**, A Maros, N Faleev, RR King, DJ Smith

9:00 AM **222** *Room Temperature Reduction of Carbon Dioxide to Carbon Monoxide Initiated by Localized Surface Plasmon Resonance of Aluminum*; **C Wang**, C Park, TJ Woehl

9:15 AM **223** (STUDENT) *Visualizing Platinum Supraparticle Formation with Liquid Cell Electron Microscopy and Correlative Investigation of Catalytic Activity*; **M Wang**, C Park, TJ Woehl

9:30 AM **224** (Invited) *High-resolution Electron Imaging and Spectroscopy of Reactive Materials and Liquid-Solid Interfaces in Energy Storage Devices*; **M Zachman**, Z Tu, S Choudhury, T Moon, Q Zhao, L Archer, L Kourkoutis

P09.2 The Success of TMBA: TEM and STEM Developments in Techniques, Applications and Education

SESSION CHAIRS:

Joe Michael; Sandia National Laboratories
Masashi Watanabe; Lehigh University
Paul Kotula; Sandia National Laboratories

PLATFORM SESSION

Tuesday 8:30 AM • Room: D137

8:30 AM **225** *Teaching Microscopy Beats Analysis*; **DB Williams**, CB Carter

8:45 AM **226** *Teaching Electron Microscopy; A Variety of Options for a Diverse Range of Students*; **S McKernan**

9:15 AM **228** *TEM Characterization of a Refractory HEA Synthesized by High Energy Milling*; **JA Smeltzer**, CJ Marvel, BC Hornbuckle, AJ Roberts, JM Marisco, AK Giri, KA Darling, JM Rickman, **HM Chan**, MP Harmer

9:30 AM **229** (Invited) *Some Reflections on Collaborative Research in the Education of Young Scientists*; **J Bentley**

P11.2 Advances in Characterization of Geological and Extraterrestrial Samples

SESSION CHAIRS:

Lori Hathon; University of Houston
Bradley De Gregorio; U.S. Naval Research Laboratory

PLATFORM SESSION

Tuesday 8:30 AM • Room: B112

8:30 AM **230** (Invited) *A Multi-Platform Microanalysis Approach to Unravelling Geological Problems: A Case Study From Olympic Dam South Australia*; **AK Netting**, BP Wade, MM Verdugo-Ihl, L Courtney-Davies, C Ciobanu, N Cook, KJ Ehrig, A Slattery, S Gilbert, K Neubauer

9:00 AM **231** *Ice Nucleation Properties of Soil Derived Mineral and Soil Organic Particles*; **S China**, G Kulkarni, K-P Tseng, N Sharma

9:15 AM **232** *A Correlative Bimodal Surface Imaging Method to Assess Hyphae-Rock Interactions*; **O Qafoku**, RA Lybrand, V Shutthanandan, RE Gallery, JC Austin, PA Schroeder, J Fedenko, E Rooney, DG Zaharescu

9:30 AM **233** *Mineral-Organic Interface on Clay Minerals: Imaging and Analytical Approaches*; **A Dohnalkova**, M Smith, S Bell, L Kovarik, M Bowden, K Hofmockel

9:45 AM **234** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Nanoscale Analysis of Manganeous Oxide Rock Varnish on the Smithsonian Castle, Washington, DC*; **MC Sharps**, EP Vicenzi, CA Grissom

Scientific Program

T

Tutorials – Tuesday Morning

X43.1 (Biological Sciences) Expanding the Computational Toolbox for CryoEM

SESSION CHAIRS:

Tommi White; University of Missouri

PLATFORM SESSION

Tuesday 9:00 AM • Room: B110

9:00 AM **235** (Invited) *Expanding the Computational Toolbox for Single-Particle Cryo-Electron Microscopy*; **A Bartesaghi**

A

Analytical Sciences Symposia – Tuesday Late Morning

A01.3 Advances in Phase Retrieval Microscopy

SESSION CHAIRS:

Rafal Dunin-Borkowski; Ernst Ruska-Centre Jülich, Germany

Kai He; Clemson University

PLATFORM SESSION

Tuesday 10:30 AM • Room: B114

10:30 AM **236** (Invited) *Quantitative Analysis of Topological, Chiral Spin Textures Stabilized by the Dzyaloshinskii–Moriya Interaction in Co/Pd Multilayers*; **Y Zhu**, J Garlow, S Pollard, M Han, X Fu, L Wu, H Yang, Y Zhu

11:00 AM **237** (STUDENT) *Lorentz TEM Imaging of Topological Magnetic Features in Asymmetric [Pt/(Co/Ni)M/Ir] N Based Multi- layers*; **M Li**, D Lau, M De Graef, V Sokalski

11:15 AM **238** *Understanding Curvature Effects on Magnetic Domains in 3D Nanostructures*; **C Phatak**, CS Miller, Z Thompson, A Petford-Long

11:30 AM **239** (Invited) *Imaging Magnetic Vortices Including Skyrmions by Lorentz TEM and Differential Phase-contrast Microscopy*; **X Yu**

A02.3 Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy

SESSION CHAIRS:

Francisco de la Peña; Université Lille, France

Philippe T. Pinard; Oxford Instruments, United Kingdom

Eric Prestat; Manchester University, United Kingdom

PLATFORM SESSION

Tuesday 10:30 AM • Room: C123

10:30 AM **240** (Invited) *ImageJ for the Next Generation of Scientific Image Data*; **CT Rueden**, **KW Eliceiri**

11:00 AM **241** *Semantic SEM Image Segmentation of Concrete with Contextual Labels*; **P Bajcsy**, S Feldman, M Brady, K Snyder

11:15 AM **242** *Enhancement for MAINMAST, de Novo Main-Chain Tracing Method: Symmetric Multi-Chain Modeling, Local Refinement, and Graphical User Interface*; **G Terashi**, Y Zha, D Kihara

11:30 AM **243** *Comparison of Techniques for Fine Alignment of Image Stacks in Serial Block-Face Electron Microscopy*; **Q He**, M Guay, G Zhang, R Leapman

11:45 AM **244** (STUDENT) (M&M MEETING SCHOLAR) *Machine Learning for High Throughput HRTEM Analysis*; **C Groshner**, C Choi, D Nguyen, C Ophus, M Scott

A04.3 Recent Developments in Atom Probe Tomography

SESSION CHAIRS:

Baptiste Gault; Max Planck Institute, Germany

Frédéric De Geuser; University Grenoble Alpes, France

PLATFORM SESSION

Tuesday 10:30 AM • Room: F151

10:30 AM **245** (Invited) *Bridging Reciprocal and Direct Space by Using the Small-Angle Scattering Formalism for Atom Probe Tomography*; **F De Geuser**

11:00 AM **246** (STUDENT) *Multiplicity vs. Composition Study to Understand the Field Evaporation of Polar Al_xGa_{1-x}N Heterostructures: A New Approach*; **B Mazumder**, **OG Licata**

11:15 AM **247** *On Strong Scaling Open Source Tools for Mining Atom Probe Tomography Data*; **M Kühbach**, P Bajaj, A Breen, EA Jägle, B Gault

11:30 AM **248** *Modularity Optimization for Fast Automated Detection of Solute Clusters in Atom Probe Tomography*; **A Mukherjee**, **S Broderick**, T Zhang, K Rajan

11:45 AM **249** *Improved Data Analysis with IVAS 4 and AP Suite*; **DA Reinhard**, TR Payne, EM Strennen, E Oltman, BP Geiser, GS Sobering, J Mandt

A05.3 Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science

SESSION CHAIRS:

Ashwin J. Shahani; University of Michigan

PLATFORM SESSION

Tuesday 10:30 AM • Room: C122

- 10:30 AM **250** *Multiscale 3D Investigation of Damage in Angle-Interlocked Ceramic Matrix Composite under in situ Loading*; A Badran, **H Bale**, S Kelly, D Marshall
- 10:45 AM **251** (Invited) *In situ Four Dimensional (4D) X-Ray Microtomography of the Compressive Behavior of eTPU Foam for High Performance Footwear*; A Singararelu, JJ Williams, J Walter, C Holmes, M Henderson, **N Chawla**
- 11:15 AM **252** *Mapping Grain Morphology and Grain Orientations by Laboratory Diffraction Contrast Tomography*; J Sun, **H Bale**, F Bachmann, J Oddershede, ST Kelly, W Harris, EM Lauridsen
- 11:30 AM **253** (STUDENT) *The Dynamics of Abnormal Grain Growth in a Particle Containing System: New Insights from Multimodal Three-Dimensional X-Ray Imaging*; **J Kang**, N Lu, N Senabulya, N Gueninchault, AJ Shahani
- 11:45 AM **254** *Three-Dimensional in situ Reconstructions of Microstructures with Bimodal Grain Size Distributions*; **A Bucsek**, L Casalena, D Pagan, P Paul, Y Chumlyakov, M Mills, A Stebner

A07.2 Vendor Symposium

SESSION CHAIRS:

Deb Kelly; Pennsylvania State University

Elizabeth C. Dickey; North Carolina State University

PLATFORM SESSION

Tuesday 10:30 AM • Room: C120-121

- 10:30 AM **255** *Atom Probe Tomography Productivity Enhancements*; **DA Reinhard**, TR Payne, EM Strennen, E Oltman, BP Geiser, GS Sobering, DR Lenz, J Mandt, GA Groth, DJ Larson, RM Ulfig, TJ Prosa
- 10:45 AM **256** *Helios 5 – New Generation DualBeam Technology for Materials Science*; **M Dutka**, B Van Leer
- 11:00 AM **257** *ZEISS ORION NanoFab: New SIMS Spectrometer*; **JA Notte**, D Runt, F Khanom, B Lewis, S Sijbrandij, C Guillemler, D Dowsett
- 11:15 AM **258** *Cryogenic UHV Specimen Preparation for APT: A Transfer Solution*; **KP Rice**, RM Ulfig, U Maier, RG Passey
- 11:30 AM **259** *ZEISS Orion NanoFab New Features: “Shuttle and Find” and Automation*; A Morin, **J Notte**, D Runt

A08.3 Current Trends and Challenges in Electron Energy-Loss Spectroscopy

SESSION CHAIRS:

Matthieu Bugnet; University of Lyon – CNRS, France

Xiaoqing Pan; University of California-Irvine

PLATFORM SESSION

Tuesday 10:30 AM • Room: B111

- 10:30 AM **260** (Invited) *Atomically Resolved Vibrational Spectroscopy in the Electron Microscope*; **FS Hage**, D Kepaptsoglou, QM Ramasse, LJ Allen
- 11:00 AM **261** *Prospects for Spatially-Resolved EELS of Atomic Point Defects*; **C Dwyer**, D Kordahl, W Xu, SLY Chang
- 11:15 AM **262** (STUDENT) *Atomic Resolution Vibrational Spectroscopy with On-Axis Detector Geometry*; **K Venkatraman**, BDA Levin, K March, P Rez, PA Crozier
- 11:30 AM **263** *Probing Phonon and Infrared-Plasmons in Nanoscale Interfaces*; **MJ Lagos**, U Hohenester, A Trugler, V Amarasinghe, LC Feldman, PE Batson, GA Botton
- 11:45 AM **264** *Characterization of Sub-Bandgap Plasmon Excitations in Transparent Conducting Oxides with Electron Energy-Loss Spectroscopy*; **Ji Deitz**, JM Walls, JW Bowers, TJ Grassman, DW McComb

A09.2 Microscopy and Microanalysis for Real-World Problem Solving

SESSION CHAIRS:

Janet H. Woodward; Buckman

Ke-Bin Low; BASF

Xiaofeng Zhang; Nanosys, Inc.

PLATFORM SESSION

Tuesday 10:30 AM • Room: B113

- 10:30 AM **265** (Invited) *Unique Challenges, Solutions and Methodologies for Planetary Sample Analyses*; **ZU Rahman**, LP Keller, A Nguyen, CJ Snead, SA Messenger
- 11:00 AM **266** *Evaluation of High-Resolution STEM Imaging Advancement under Gas-Environment with Open Window MEMS Holder and Gas Injection System*; **A Hanawa**, Y Kubo, H Kikuchi, K Nakamura, M Shirai, H Inada, H Matsumoto, M Kawasaki
- 11:15 AM **267** *Simultaneous Topographical and Electrochemical Mapping Using Scanning Ion Conductance Microscopy – Scanning Electrochemical Microscopy (SICM-SECM)*; **G Mendoza**, B Kim, K Lee
- 11:30 AM **268** *Controlled Environments from Sample Preparation to Electron Microscopy Characterization*; **CS Bonifacio**, P Nowakowski, K Costello, ML Ray, R Morrison, PE Fischione
- 11:45 AM **269** *Flight Readiness of Mochii S: Portable Spectroscopic Scanning Electron Microscope Facility on the International Space Station*; **JE Martinez**, CS Own, MP Galeano, G Weppelman, DR Pettit

Scientific Program

A

Analytical Sciences Symposia – Tuesday Late Morning cont.-

A11.3 Current and Emerging Microscopy for Quantum Information Sciences

SESSION CHAIRS:

Conesa-Boj, Sonia; Delft University of Technology, Netherlands

PLATFORM SESSION

Tuesday 10:30 AM • Room: B117

- 10:30 AM **270** (Invited) *High Spatial and Energy Resolution Analytical Scanning Transmission Electron Microscopy for Quantum Materials*; D Kepaptsoglou, K Holsgrove, F Azough, B Kuerbanjiang, V Lazarov, R Freer, M Arredondo, **Q Ramasse**
- 11:00 AM **271** *Microstructure Effect on LaPtBi Superconductivity*; **C Ozsoy Keskinbora**, Y Ou, D Nandi, K Huang, S Kraemer, P Kim, A Yacoby, J Moodera, DC Bell
- 11:15 AM **272** (STUDENT) *Correlating Atomic-Scale Lattice and Nanoscale Structural Dynamics with Ultrafast Electron Microscopy*; **SA Reisbick**, DJ Flannigan
- 11:30 AM **273** (Invited) *Tracking Quantum Effects at the Nanometer Scale with EELS and Cathodoluminescence*; **M kociak**, L Galvao-Tizei, H Lourenço-Martins, A Campos, S Meuret, A Zobelli, M Hillenkamp, O Stéphan, J-D Blazit, M Tencé

B

Biological Sciences Symposia – Tuesday Late Morning

B03.3 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals

SESSION CHAIRS:

Ru-ching Hsia; University of Maryland-Baltimore
Marcela Redigolo; West Virginia University
Han Chen; Penn State College of Medicine

PLATFORM SESSION

Tuesday 10:30 AM • Room: D136

- 10:30 AM **274** (Invited) *Imaging Neuromodulatory Signaling Events at Single Cell Resolution in Behaving Animal*; L Ma, BC Jongbloets, W-H Xiong, H Zhong, **T Mao**
- 11:00 AM **275** (Invited) *Utilizing Correlated Light and Electron Microscopy to Examine Alpha-Synuclein Pathology in a Mouse Model of Parkinson's Disease*; **AJ Schaser**, CS López, VK Unni
- 11:30 AM **276** (STUDENT) *A Correlative Imaging Approach for Extracellular Matrix Characterization in Mice*; **Y Liu**, Y-U Lee, T Yi, K Wu, C Bouchet-Marquis, H Chan, CK Breuer, DW McComb
- 11:45 AM **277** (STUDENT) (M&M MEETING SCHOLAR AWARD); *Indirect CLEM Identifies Proarrhythmic Remodeling of*

Intercalated Disk Nanodomains in Murine Atria Following Acute VEGF Treatment; **L Mezache**, H Struckman, A Greer-Short, TJ Hund, R Veeraraghavan

B04.3 Cutting-Edge Microscopy in the Pacific Northwest

SESSION CHAIRS:

Doug Keene; Shriners Hospitals for Children
Claudia López; Oregon Health & Science University

PLATFORM SESSION

Tuesday 10:30 AM • Room: D133-134

- 10:30 AM **278** (Invited) *Seeing with Phase: Interferometric Electron Microscopy for Magnetic Materials and Biological Specimens*; **BJ McMorran**
- 11:00 AM **279** (M&M POST-DOCTORAL RESEARCHER AWARD) *HOTSPUR: A Real-Time Interactive Preprocessing System for Cryo-EM Data*; **J Elferich**, R Posert, C Yoshioka, E Gouaux
- 11:15 AM **280** (Invited) *Dual Native MS and Cryo-EM Approach to Resolve Heteromeric Protein Assemblies and Subunit Stoichiometry*; I Novikova, M Zhou, J Shaw, H Hellmann, **JE Evans**
- 11:30 AM **281** (Invited) (STUDENT) *Visualization of Protein-Lipid Interactions in Connexin-46/50 Intercellular Communication Channels at 2.1 Å Resolution*; **JA Flores**, KA Dolan, BG Haddad, JB Myers, CC Yoshioka, DM Zuckerman, SL Reichow
- 11:45 AM **282** *NMDA Receptors' Structural Asymmetry*; **F Jalali-Yazdi**, E Gouaux

B08.1 Cryo-EM—from Physics to Cell Biology: Honoring the Remarkable Legacy of Ken Downing

SESSION CHAIRS:

Eva Nogales; University of California-Berkeley
Melanie Ohi; University of Michigan

PLATFORM SESSION

Tuesday 10:30 AM • Room: D139

- 10:30 AM **283** (Invited) *Taking the Road Less Travelled – The Downing Legacy*; **SG Wolf**
- 11:00 AM **284** (Invited) *Microscale Fluid Mechanics of Making Thin Specimens for Cryo-EM*; **RM Glaeser**, M Armstrong, B- G Han, DA Fletcher
- 11:30 AM **285** (Invited) *Cryo-EM Studies of Respiratory Complexes in a Hyperthermophilic Archaeon Pyrococcus furiosus Suggest an Evolutionary Path to Modern-Day Complex I*; H Yu, GJ Schut, C-H Wu, DK Haja, MWW Adams, **H Li**

P

Physical Sciences Symposia – Tuesday Late Morning

P01.2 *In situ* TEM Characterization of Dynamic Processes during Materials Synthesis and Processing

SESSION CHAIRS:

B.C. Regan; University of California-Los Angeles
Benjamin Bammes; Direct Electron

PLATFORM SESSION

Tuesday 10:30 AM • Room: B116

- 10:30 AM **286** (Invited) Colloidal Nanostructures: In situ Electron Microscopy of Plasmon-Mediated Synthesis, Chemistry and Self-Assembly; **E Sutter**
- 11:00 AM **287** Liquid Pockets Encapsulated in MoS₂ Liquid Cells; J Yang, MK Choi, P Ercius, **H Zheng**
- 11:15 AM **288** Nucleation and Growth of Pharmaceutical Crystals in situ Using Liquid Cell Electron Microscopy; **J Cookman**, V Hamilton, S Hall, U Bangert
- 11:30 AM **289** Supercluster-Coupled Crystal Growth in Metallic Glass Forming Liquids; Y Xie, S Sohn, M Wang, H Xin, Y Jung, M Shattuck, C O'Hern, J Schroers, **J Cha**
- 11:45 AM **290** (STUDENT) In situ TEM Etching of Gold Nanocrystals: Elucidating the Shape Transformation Mechanisms and Chemistry of the Graphene Liquid Cell; **MR Hauwiler**, JC Ondry, AP Alivisatos

P05.2 Theory and Applications of Electron Tomography in the Materials Sciences

SESSION CHAIRS:

Peter Ercius; Lawrence Berkeley National Laboratory
Robert Hovden; University of Michigan

PLATFORM SESSION

Tuesday 10:30 AM • Room: D135

- 10:30 AM **291** (Invited) Quantification of 3D Atomic Structures and Their Dynamics by Atom-Counting from an ADF STEM Image; **A De Backer**, A De wael, I Lobato, T Altantzis, A Béché, L Jones, PD Nellist, S Bals, S Van Aert
- 11:00 AM **292** (STUDENT) (M&M MEETING SCHOLAR AWARD) Defining Theoretical Limits for Aberration-Corrected Electron Tomography: New Limits of Resolution, Object Size, and Dose; **R Yalisove**, SH Sung, R Hovden
- 11:15 AM **293** STEM/EDS Tomography of Cometary Dust; **Z Gainsforth**, P Ercius, K Bustillo, AL Butterworth, CE Jilly-Rehak, AJ Westphal
- 11:30 AM **294** (Invited) 4D Atomic Electron Tomography; **J Miao**, J Zhou, Y Yang, Y Yang, D Kim, A Yuan, X Tian, C Ophus, F Sun, A Schmid, M Nathanson, H Heinz, Q An, H Zeng, P Ercius

P06.3 *In situ* TEM of Nanoscale Materials and Electronic Devices for Phase Transformation Studies

SESSION CHAIRS:

Leopoldo Molina-Luna; Technische Universität Darmstadt, Germany
Lin Zhou; Ames Laboratory

PLATFORM SESSION

Tuesday 10:30 AM • Room: B118-119

- 10:30 AM **295** (Invited) Direct Observation of Field-induced Modulation of Two-Dimensional Electron Gas at Oxide Interfaces; J Seo, B Park, CT Koch, H Lee, J Lee, C-B Eom, **SH Oh**
- 11:00 AM **296** Atomic Resolution Probing of Phase Transformations and Domain Evolution during Large Superelastic Deformation in Ferroelectrics with in situ TEM; **Y Deng**, C Gammer, J Ciston, P Ercius, C Ophus, KC Bustillo, C Song, R Zhang, AM Minor
- 11:15 AM **297** Unraveling the Relationship between Layer Stacking and Magnetic Order in Nb₃X₈ Systems via Controlled- Temperature Cryo-STEM; **EF Bianco**, I El Baggari, BH Goodge, C Pasco, TM McQueen, LF Kourkoutis
- 11:30 AM **298** (Invited) Developing Multifunctional and High-resolution in situ TEM Holders; S Cai, M Xu, S Dai, P Wang, **X Pan**

P07.3 Electron Crystallography of Nanostructures in Nanotechnology, Materials and Bio-Sciences

SESSION CHAIR:

Jim Ciston; Lawrence Berkeley National Laboratory

PLATFORM SESSION

Tuesday 10:30 AM • Room: D138

- 10:30 AM **299** (Invited) Advances in the Structure Analysis from Electron Diffraction Data: Determination of Absolute Structure in Organic Crystals; **L Palatinus**, P Brazda
- 11:00 AM **300** Multidimensional Electron Diffraction-Microscopy of Cabotegravir Nanocrystals; **DN Johnstone**, RCB Copley, RG Graves, J Brum, PA Midgley
- 11:15 AM **301** 4D-STEM Pair Distribution Function Mapping of the Morphology and Structure of Amorphous Organic Materials; X Mu, A Mazilkin, C Sprau, A Colsmann, **C Kuebel**
- 11:30 AM **302** In situ Electron Diffraction Using Lliquid-Electrochemical TEM for Monitoring Structural Transformation in Single Crystals of Cathode Materials for Li-Ion Batteries; OM Karakulina, W Dachraoui, AM Abakumov, J Hadermann, A Demortière
- 11:45 AM **303** Electron Crystallography in the Age of Pixelated Detectors: From Crystalline/Amorphous Organic Structural Models and Phase Mapping of Beam-Sensitive Materials; **S Nicolopoulos**, A Gomez Perez, PP Das

Scientific Program

P

Physical Sciences Symposia – Tuesday Late Morning cont.

P08.3 Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications

SESSION CHAIRS:

Stephen Pennycook; National University of Singapore, Singapore
Feng Wang; Brookhaven National Laboratory

PLATFORM SESSION

Tuesday 10:30 AM • Room: B115

- 10:30 AM **304** (Invited) *Using in situ Methods to Characterize Phase Changes in Charged Lithium Nickel Cobalt Aluminum Oxide Cathode Materials*; **EA Stach**, S Hwang, K Karki, SM Kim, W Chang, K-Y Chung, G Zhou, Q-X Yang, MS Whittingham
- 11:00 AM **305** *In situ Studies for Understanding Intragranular Nanopore Evolution In Ni-Rich Layered Oxide Cathode Material*; **A Pokle**, S Ahmed, A Beyer, S Schweidler, M Bianchini, P Hartmann, T Brezesinski, J Janek, K Volz
- 11:15 AM **306** *Understanding the Structure of LiMn_2O_4 by Differential Phase Contrast*; **S Calderon**, JD Guimarães, R Ribeiro, PJ Ferreira
- 11:30 AM **307** (STUDENT) *Determination of the Crystal Structure of Gamma-Alumina by Electron Diffraction and Electron Energy-Loss Spectroscopy*; **H Ayoola**, CS Bonifacio, MT Curnan, SD House, M Li, JJ Kas, JJ Rehr, E Stach, WA Saidi, JC Yang
- 11:45 AM **308** (STUDENT) *Mechanical and Electrical Failure of Silver Nanowire Electrodes: A Scale Bridging in situ Electron Microscopy Study*; **N Schrenker**, P Schweizer, M Moninger, N Karpstein, M Mackovic, GD Spyropoulos, M Göbelt, S Christiansen, CJ Brabec, E Specker

P09.3 The Success of TMBA: TEM and STEM Developments in Techniques, Applications, and Education

SESSION CHAIRS:

Masashi Watanabe; Lehigh University
Paul Kotula; Sandia National Laboratories
Joe Michael; Sandia National Laboratories

PLATFORM SESSION

Tuesday 10:30 AM • Room: D137

- 10:30 AM **309** (Invited) *Exploration of Novel Nano-Scale Instabilities in Metastable Beta Titanium Alloys Using Transmission Electron Microscopy and Aberration-Corrected Scanning Transmission Electron Microscopy*; Y Zheng, R Banerjee, **H Fraser**
- 11:00 AM **310** *Structure of TiN/CrN Interface in Nanolaminate Coatings with Enhanced Mechanical and Tribological Properties*; **S Yarmolenko**, M Konchady, S Neralla, A Kvit, Z Xu, J Sankar

- 11:15 AM **311** *Phase Formation and Microstructural Evaluation in V-Ti-Cr System Using Advanced Microscopy Analysis*; C Ghosh, **J Basu**, R Divakar

- 11:30 AM **312** (Invited) *Electron Microscopy Informed Catalyst Design*; **CJ Kiely**, L Lu, S Althahban, Q He, GJ Hutchings

P11.3 Advances in Characterization of Geological and Extraterrestrial Samples

SESSION CHAIRS:

Bradley De Gregorio; U.S. Naval Research Laboratory
Kultaransingh Hooghan; Sandia National Laboratories

PLATFORM SESSION

Tuesday 10:30 AM • Room: B112

- 10:30 AM **313** (Invited) *Hayabusa2: Sample Acquisition at a Near-Earth-Type Asteroid Ryugu and Analysis Plan of Returned Samples*; **S Tachibana**
- 11:00 AM **314** *Evaluation of Various Methods for Determining Bulk Compositions of Chondrules and Other Objects in Petrographic Thin Sections*; **DK Ross**, JI Simon
- 11:15 AM **315** *Space Rocks and Optimizing Scanning Electron Channeling Contrast*; **B Britton**, D Goran, V Tong
- 11:30 AM **316** *A Nanoscale Record of Impact-Induced Pb Mobility in Lunar Zircon*; **TB Blum**, DA Reinhard, MA Coble, MJ Spicuzza, Y Chen, AJ Cavosie, L Nasdala, C Chanmuang N, TJ Prosa, DJ Larson, JW Valley
- 11:45 AM **317** *Structure Determination of Donwilhelmsite by Electron Diffraction Tomography*; **M Klementova**, L Palatinus, J Fritz, A Greshake, R Wirth, V Assis Fernandes, L Ferrière

T

Tutorials – Tuesday Late Morning

X40.1 Following the Electrons: Simulation for High-Resolution STEM and CBEDs

SESSION CHAIR:

Donovan Leonard; Oak Ridge National Laboratory

PLATFORM SESSION

Tuesday 11:00 AM • Room: B110

- 11:00 AM **318** (Invited) *Following the Electrons: Simulation for High-Resolution STEM and CBED*; **MP Oxley**

MSA Distinguished Scientist Awards & Talks

TUESDAY, AUGUST 6, 2019, 12:15 PM | Oregon Convention Center, C124 | Complimentary box lunch served to first 100 attendees.

DISTINGUISHED SCIENTIST – PHYSICAL SCIENCES

Philip Batson, Rutgers University, Rutgers, NJ

Mapping Quantum Excitations in Space-Time Using Electron Energy-Loss Spectroscopy

DISTINGUISHED SCIENTIST – BIOLOGICAL SCIENCES

Bridget Carragher, New York Structural Biological Center, New York City, NY

Fun with Automation, and Some Thoughts About What Happens Next

A

Analytical Sciences Symposia – Tuesday Afternoon

A01.4 Advances in Phase Retrieval Microscopy

SESSION CHAIRS:

Toshiaki Tanigaki; Hitachi Ltd.

Kazuo Yamamoto; Japan Fine Ceramics Center

PLATFORM SESSION

Tuesday 1:30 PM • Room: B114

1:30 PM **319** (Invited) *Scaling and Channelling Behavior of Helical and Skyrmion Spin Textures in Thin Films of Te-Doped Cu₂OSeO₃*; **M-G Han**, J Garlow, Y Kharkov, L Camacho, G Vats, K Kisslinger, K Kato

2:00 PM **320** *Resolving Internal Magnetic Structures of Skyrmions by Lorentz Electron Ptychography*; **Z Chen**, E Turgut, Y Jiang, KX Nguyen, GC Correa, MJ Stolt, S Jin, DC Ralph, GD Fuchs, DA Muller

2:15 PM **321** *In situ Lorentz Electron Microscopy Imaging of Skyrmions in Geometric Confined Structures*; **N Bagués**, BD Esser, AS Ahmed, J Rowland, JQ Yan, DE Huber, M Randeria, DW McComb

2:30 PM **322** (Invited) *Formation and Relaxation Dynamics of Magnetic Skyrmion*; T Kim, L Peng, Y Zhang, L Ke, B Jensen, XG Zhang, M Kramer, L Zhou

A02.4 Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy

SESSION CHAIRS:

Francisco de la Peña; Université Lille, France

Philippe T. Pinard; Oxford Instruments, United Kingdom

Eric Prestat; Manchester University, United Kingdom

PLATFORM SESSION

Tuesday 1:30 PM • Room: C123

1:30 PM **323** (STUDENT) *Performance Analysis of Interaction-Free-Measurement-Based Electron Microscopy*; **A Agarwal**, V Goyal, KK Berggren

1:45 PM **324** *An Adaptive Sparse Sampling Scheme for Scanning Electron Microscopy Using Delauney Triangulation*; **T Dahmen**, P Trampert

2:00 PM **325** (STUDENT) *Statistical Machine Learning and Compressed Sensing Approaches for Analytical Electron Tomography-Application to Phase Change Materials*; **M Jacob**, L El Gueddari, G Navarro, M-C Cyrille, P Bayle-Guillemaud, P Ciuciu, Z Saghi

2:15 PM **326** *Deep Learning for Sparse Scanning Electron Microscopy*; **P Trampert**, S Schlabach, T Dahmen, P Slusallek

2:30 PM **327** (STUDENT) *Maximal Resolution from the Ronchigram: Human vs. Deep Learning*; **N Schnitzer**, SH Sung, R Hovden

2:45 PM **328** *Dynamic Random Scan Approach of Spectrum Imaging for Temporal Evolution of Spectroscopic Signals*; A Zobelli, **SY Woo**, LH Tizei, N Brun, X Li, A Tararan, O Stéphan, M Kociak, M Tencé

A04.4 Recent Developments in Atom Probe Tomography

SESSION CHAIRS:

Ann Chiaromonti; National Institute of Standards and Technology

David J. Larson; CAMECA Instruments Inc.

PLATFORM SESSION

Tuesday 1:30 PM • Room: F151

1:30 PM **329** (Invited) *An Atomic Renaissance for Pulsed Field Ion Microscopy*; S Katnagallu, I Mouton, F Oliveira, B Gault, D Raabe, LT Stephenson

2:00 PM **330** (STUDENT) (M&M MEETING SCHOLAR AWARD) *An Integrated Workflow To Investigate Electrocatalytic Surfaces By Correlative X-Ray Photoemission Spectroscopy, Scanning Photoemission Electron Microscopy and Atom Probe Tomography*; **K Schweinar**, O Kasian, RL Nicholls, CR Rajamathi, P Zeller, M Amati, L Gregoratti, D Raabe, M Greiner, B Gault

2:15 PM **331** *In situ HR-TEM and Simulation of Si Field Emitter Tips under Field Evaporation*; Y He, DE Perea, SX Mao, C Wang, T Withrow, **C Oberdorfer**, W Windl

Scientific Program

A

Analytical Sciences Symposia – Tuesday Afternoon cont.

- 2:30 PM **332** (STUDENT) *Understanding Fundamental Processes on Au-Ag Catalysts during Oxidation Reactions: A Correlative Microscopy Approach*; **L Jacobs**, C Barroo, B von Boehn, M Homann, R Imbihl, TV de Bocarmé

A05.4 Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science

SESSION CHAIR:

Ashwin J. Shahani; University of Michigan

PLATFORM SESSION

Tuesday 1:30 PM • Room: C122

- 1:30 PM **333** *Correlating Microstructure to in situ Micromechanical Behaviour and Toughening Strategies in Biological Materials*; **RE Johnston**, RL Mitchell, C Pleydell-Pearce, M Coleman, L North, D LaBonte, M Oyen, R Board, EC Pope, H Arora, D Howells
- 1:45 PM **334** (Invited) *Probing Material Morphology and Deformation as a Response to in situ Loading Using X-Ray Tomography*; **BM Patterson**, L Kuettner, N Cordes, K Henderson, M Herman, C Welch, J Carpenter, C Montgomery, T Sun, K Fezzaa, X Xiao, J Williams, N Chawla
- 2:15 PM **335** *X-Ray CT Reconstruction of Additively Manufactured Parts Using 2.5D Deep Learning MBIR*; **AK Ziabari**, M Kirka, V Paquit, P Bingham, S Venkatakrishnan
- 2:30 PM **336** *Formation of Faceted Spirals during Directional Eutectic Solidification*; S Moniri, **H Bale**, T Volkenandt, S Kelly, A Shahani
- 2:45 PM **337** *Opportunities for Time-resolved Dynamic CT Imaging in the Laboratory*; **AP Merkle**, M Boone, D Van Loo, J Dewanckele, F Coppens

A07.3 Vendor Symposium

SESSION CHAIRS:

Deb Kelly; Pennsylvania State University

Elizabeth C. Dickey; North Carolina State University

PLATFORM SESSION

Tuesday 1:30 PM • Room: C120-121

- 1:30 PM **338** *New Developments and Applications of Electron Beam Absorbed Current in SEM*; **G Moldovan**
- 1:45 PM **339** *Elastic and Plastic Strain Measurement Using Electron Backscatter Diffraction Technique: The Influence of Sample Preparation*; **P Nowakowski**, J Wieszorek, I Spinelli, M Ray, P Fischione
- 2:00 PM **340** *AZtecICE: A New Dawn in EBSD Data Processing*; J Goulden, **P Trimby**, K Thomsen, K Mehnert

- 2:15 PM **341** *Optimizing Workflow in Electron Microscopes with Fast BSE/STEM Diodes and Preamplifier Modules*; **M Schmid**, A Liebel, H Soltau

- 2:30 PM **342** *Visualizing Evactron® Turbo Plasma™ Cleaning in nanoflight® Movies*; **B Armbruster**, S Diller, J Grande, R Vane

- 2:45 PM **343** *Advancements in Plasma-Based Decontamination Equipment and Related Metrology*; **CA Moore**, GJ Collins

A08.4 Current Trends and Challenges in Electron Energy-Loss Spectroscopy

SESSION CHAIRS:

Patricia Abellan; SuperSTEM, United Kingdom

Xiaoqing Pan; University of California-Irvine

PLATFORM SESSION

Tuesday 1:30 PM • Room: B111

- 1:30 PM **344** (Invited) *First-Principles Modeling of Vibrational Electron Energy Loss Spectra*; **G Radtke**, D Taverna, M Lazzeri, E Balan, FS Hage, QM Ramasse, OL Krivanek, TC Lovejoy
- 2:00 PM **345** *Luminescence from Isolated Tb-Based Metallocrown Molecular Complexes on h-BN*; **SY Woo**, T Mallah, V Pecoraro, M Kociak, O Stéphan, A Zobelli
- 2:15 PM **346** *Local Coordination in Metal-Organic Frameworks Probed in the Vibrational and Optical Regime by EELS*; **SM Collins**, DM Kepaptsoglou, K Butler, L Longley, J Hou, TD Bennett, QM Ramasse, PA Midgley
- 2:30 PM **347** (STUDENT) *Harnessing Shape Effects for Adsorbate Signal Enhancement in Vibrational EELS*; **D Kordahl**, C Dwyer
- 2:45 PM **348** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Optimizing Nanostructure Size to Yield High Raman Signal Enhancement by Electron Energy-Loss Spectroscopy*; **Y Zeng**, S Madsen, A Yankovich, E Olsson, R Sinclair

A09.3 Microscopy and Microanalysis for Real-World Problem Solving

SESSION CHAIRS:

Janet H. Woodward; Buckman

Ke-Bin Low; BASF

Xiaofeng Zhang; Nanosys, Inc.

PLATFORM SESSION

Tuesday 1:30 PM • Room: B113

- 1:30 PM **349** *Routine Microscopy in Quantum Dot Industry*; **X Zhang**
- 1:45 PM **350** (STUDENT) *Quantitative Nanomechanical Property Mapping and in situ SPM Imaging of Polyetherimide Nanocomposites*; **F Syed**, S Zainuddin, I Wilson, M Elafandi, S Jeelani
- 2:00 PM **351** *Quantifying the Dispersion of Nanoparticles by Electron Microscopy*; **N Hondow**, M Ilett, J Wills, S Micklethwaite, R Brydson, A Brown

- 2:15 PM **352** *Quantification and Precision in Particle Analysis Using SEM and EDS*; **S Mu**, J Rafaelsen
- 2:30 PM **353** (STUDENT) *TEM Investigation on the Relationship between Catalytic Activity and Structure in Rh/Al₂O₃ Catalysts*; **C-H Li**, J Wu, C Chae, JR Jinschek
- 2:45 PM **354** *Understanding the Composition of Dispersed Phases in Silicon-Rich Metal-Silicon Alloys by Parsing SEM/EDS Hyperspectral Images*; **JM Beebe**, MA Gave, JR Sootsman, AA Klele, JR Young, VA Shamamian

A11.4 Current and Emerging Microscopy for Quantum Information Sciences

SESSION CHAIR:

Ismail El Baggari; Cornell University

PLATFORM SESSION

Tuesday 1:30 PM • Room: B117

- 1:30 PM **355** (Invited) *Advanced Scanning Transmission Electron Microscopy as a Tool for Direct Real-Space Visualization and Artificial Control of Quantum Spin Textures*; **T Matsumoto**, Y Ikuhara, N Shibata
- 2:00 PM **356** *STEM Study of Structure and Local Short-Range Orders in the Fe_{5-x}GeTe₂ Crystals with Ferromagnetism Near Room Temperature*; **Q Zheng**, MA McGuire, AF May
- 2:15 PM **357** (STUDENT) *Investigation of Spin Manipulation in Pt/CoFe₂O₄ via Scanning Transmission Electron Microscopy*; DW McComb, IV Pinchuk, REA Williams, RK Kawakami, W Amamou, **AH Trout**
- 2:30 PM **358** (Invited) *Mapping Local Structural and Electronic Properties of 2D Materials by Multi-Dimensional STEM*; **MJ Zachman**, M Chi

B

Biological Sciences Symposia – Tuesday Afternoon

B03.4 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals

SESSION CHAIRS:

Ru-ching Hsia; University of Maryland-Baltimore
 Marcela Redigolo; West Virginia University
 Han Chen; Penn State College of Medicine

PLATFORM SESSION

Tuesday 1:30 PM • Room: D136

- 1:30 PM **359** (Invited) *Segmentation, Modeling and Quantification of Electron Cryotomographic Datasets*; R Hylton, V Seader, **MT Swulius**
- 2:00 PM **360** (Invited) *Microscopy Assists Understanding Important Aspects of Bioenergy Grasses*; **G Sarath**, LM Baird, H Chen, NA Palmer, SJ Edme, RB Mitchell
- 2:30 PM **361** (Invited) *Passion of a Different Kind: Working Career as an Electron Microscopist*; **MB Ard**

B08.2 Cryo-EM—from Physics to Cell Biology: Honoring the Remarkable Legacy of Ken Downing

SESSION CHAIRS:

Eva Nogales; University of California-Berkeley
 Melanie Ohi; University of Michigan

PLATFORM SESSION

Tuesday 1:30 PM • Room: D139

- 1:30 PM **362** *Imaging of Polypeptoid Nanosheets with Atomic Scale Precision (In Honor of Ken Downing)*; X Jiang, S Xuan, RK Spencer, RN Zuckermann, KH Downing, **NP Balsara**
- 1:45 PM **363** (STUDENT) *Reconstitution of Tubulin Methylation by SETD2*; **S Kearns**, M Cianfrocco, K Verhey
- 2:00 PM **364** (Invited) *Electron Microscopy of the Microtubule Framework in Primary Cilia*; S Sun, RL Fisher, BT Pentecost, **H Sui**
- 2:30 PM **365** (Invited) *Severed Actin and Microtubules with Motors Walking All Over Them: Cryo-EM Studies of Seriously Perturbed Helical Assemblies*; G Debs, A Huehn, M Cha, X Liu, WA Elam, W Cao, EM DeLa Cruz, **CV Sindelar**

P

Physical Sciences Symposia – Tuesday Afternoon

P01.3 In situ TEM Characterization of Dynamic Processes during Materials Synthesis and Processing

SESSION CHAIRS:

Eli Sutter; University of Nebraska-Lincoln
 B.C. Regan; University of California-Los Angeles

PLATFORM SESSION

Tuesday 1:30 PM • Room: B116

- 1:30 PM **366** (Invited) *Liquid-Phase TEM Imaging of Self-Assembly Pathways of Anisotropic Nanoparticles*; Z Ou, B Luo, C Liu, **Q Chen**
- 2:00 PM **367** *Real-Time Investigation of Nanoparticle Self-Assembly Mechanisms and Its Controlling Factors*; J Lee, E Nakouzi, J Chun, D Li
- 2:15 PM **368** *Radiation-Induced Dissolution of a Recalcitrant Aluminum Oxyhydroxide in Liquid Cell TEM*; **JA Soltis**, TR Graham, X Zhang, GA Kimmel
- 2:30 PM **369** *Characterization and Modeling of Coarsening Mechanisms in Supported Nanoparticle Ensemble*; **DN Zakharov**, A Tkachenko, X Qu, H Wang, Y Lin, JP Horwath, S Yoo, EA Stach
- 2:45 PM **370** *Spatially Mapping Heterogeneous Nucleation Kinetics of Silver Nanocrystals with Liquid Cell Scanning Transmission Electron Microscopy*; M Wang, TU Dissanayake, C Park, **TJ Woehl**

Scientific Program

P

Physical Sciences Symposia – Tuesday Afternoon cont.

P02.1 Microscopy and Microanalysis of Nuclear and Irradiated Materials

SESSION CHAIRS:

Rachel Seibert; Oak Ridge National Laboratory

Assel Aitkaliyeva; University of Florida

PLATFORM SESSION

Tuesday 1:30 PM • Room: D133-134

- 1:30 PM **371** (Invited) *Depth Resolved Measurements of Atomic Scale Defects in Ion Irradiated Fe*; **F Selim**, S Agarwal, MO Liedke, M Butterling, A Wagner, P Hosemann, N Li, Y Wang, B Ueberuaga
- 2:00 PM **372** *Towards the Synthesis of Mixed Actinide Particulate Reference Materials: Microscopy and Spectroscopic Characterization of U/Ce-Containing Specimens*; T Williamson, M DeVore, T Tenner, R Smith, L Inabinet, J Mershon, J Hiller, **M Wellons**
- 2:15 PM **373** *Spectroscopic Ellipsometry and White-Light Interferometry Investigation into Time-Dependent Oxidation Rates of Uranium in Pure Oxygen*; **Y Idell**, W Siekhaus, W McLean II
- 2:30 PM **374** (STUDENT) *Electron Probe Microanalysis of U and U-Alloys... How Hard Can It Be?*; **MB Matthews**, SL Kearns, B Buse
- 2:45 PM **375** *Using Atom Probe Tomography as a Forensic Tool to Determine Burnup from Nuclear Fuels*; **M Bachhav**, J Gan, J Giglio, D Wachs, D Keiser

P03.1 Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions

SESSION CHAIRS:

Joerg R Jinschek; The Ohio State University

David Flannigan; University of Minnesota

PLATFORM SESSION

Tuesday 1:30 PM • Room: D135

- 1:30 PM **376** (Invited) *Temporally Resolved HyperSpectral Analysis vs Radiation Damage in Hard and Soft Matter*; **NJ Zaluzec**
- 2:00 PM **377** (STUDENT) *Mapping Non-Crystalline Nanostructure in Beam Sensitive Systems with Low-dose Scanning Electron Pair Distribution Function Analysis*; **JEM Laulainen**, DN Johnstone, I Bogachev, SM Collins, L Longley, TD Bennett, PA Midgley
- 2:15 PM **378** *2D Materials Characterization: Should We Rely on HR STEM Imaging?*; **S Lopatin**, V Roddatis, T Meyer, A Aljarb, L-J Li, V Tung
- 2:30 PM **379** *Challenges in Determining Structure of Supported Subnano Metal Clusters*; **J Liu**
- 2:45 PM **380** (STUDENT) *Atomic Scale Debye-Waller Thermometry*; **M Zhu**, J Johnson, J Hwang

P06.4 In situ TEM of Nanoscale Materials and Electronic Devices for Phase Transformation Studies

SESSION CHAIRS:

Lin Zhou; Ames Laboratory

Leopoldo Molina-Luna; Technische Universität Darmstadt, Germany

PLATFORM SESSION

Tuesday 1:30 PM • Room: B118-119

- 1:30 PM **381** (Invited) *In situ Analytical Electron Microscopy and Cryogenic Electron Microscopy for Characterizing Nanoscale Materials in Electrochemical Process*; M Zhang, X Wang, **YS Meng**
- 2:00 PM **382** *Investigation of the Oxidation Reaction of LiFePO₄ Cathode Material Using Environmental TEM*; M Bugnet, T Epicier, M Duchamp, N Recham, T Lombard, C Masquelier, **A Demortière**
- 2:15 PM **383** (STUDENT) *Facile in situ Lithiation and Sodiation Observation in TEM Employing MF (M=Li, Na)*; **JY Park**, JH Chang, SJ Kim, HK Seo, JM Yuk
- 2:30 PM **384** (Invited) *In situ Electron Microscopy for Electrically Induced Charge Transport and Phase Transformation*; **K He**

P07.4 Electron Crystallography of Nanostructures in Nanotechnology, Materials and Bio-Sciences

SESSION CHAIRS:

Sergei Rouvimov; University of Notre Dame

Roberto Reis; Northwestern University

PLATFORM SESSION

Tuesday 1:30 PM • Room: D138

- 1:30 PM **385** (Invited) *Understanding Deformation and Failure Mechanisms via Multimodal and Multiscale Electron Diffraction Analysis*; **J Kacher**, YSJ Yoo
- 2:00 PM **386** *In situ Bending and Structural Characterization of Penta-Twinned Silver Nanowires*; **A Eggeman**, H Zhao, B Derby
- 2:15 PM **387** *Gazing at Crystal Balls – Electron Backscatter Diffraction Indexing and Cross Correlation on a Sphere*; R Hielscher, F Bartel, **B Britton**
- 2:30 PM **388** (STUDENT) *Diffraction Mapping with a Pixelated Detector to Quantify Crystal Orientation in 3D Structures Made from 2D Materials*; **MC Cao**, J Suh, Z Chen, E Padgett, C Park, J Park, D Muller
- 2:45 PM **389** (STUDENT) *Improved 4D-STEM Strain Mapping Precision Using Patterned Probes*; **SE Zeltmann**, A Müller, KC Bustillo, BH Savitzky, AM Minor, C Ophus

P08.4 Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications

SESSION CHAIRS:

Lin Gu; Institute of Physics, China

Raymond Unocic; Oak Ridge National Laboratory

PLATFORM SESSION

Tuesday 1:30 PM • Room: B115

- 1:30 PM **390** (Invited) *The Light Years: Combined Optical and Environmental Electron Microscopy to Visualize Photonic Processes with Atomic-Scale Resolution*; **JA Dionne**, F Hayee, M Vadai, D Angell, A Saleh, K Sytwu
- 2:00 PM **391** *Understanding Structure Changes during Cycling of MoS₂-Based Mg Batteries*; X Mu, Z Li, Z Zhao-Karger, M Fichtner, **C Kubel**
- 2:15 PM **392** (STUDENT) *Strained Phase Boundaries in Li-Rich Cathodes; An Atomic Resolution Study*; **S Sharifi-Asl**, A Gutierrez, J Croy, M Balasubramanian, R Shahbazian-Yassar
- 2:30 PM **393** (Invited) *In situ Scanning/Transmission Electron Microscopy and Spectroscopy of Local Ionic Transport in Battery Electrodes*; **F Wang**

P09.4 The Success of TMBA: TEM and STEM Developments in Techniques, Applications and Education

SESSION CHAIRS:

Joe Michael; Sandia National Laboratories

Paul Kotula; Sandia National Laboratories

Masashi Watanabe; Lehigh University

PLATFORM SESSION

Tuesday 1:30 PM • Room: D137

- 1:30 PM **394** (Invited) *TMBA: DBW @70, STEM EELS SI @30, PANS TBD*; **JA Hunt**
- 2:00 PM **395** *The Role of Simulation of Valence Electron Energy-Loss Spectroscopy (EELS) for Understanding Electronic Structure and Optical Properties of Materials*; **VJ Keast**
- 2:15 PM **396** *The Major Developments In Camera And Electron Energy Loss Spectrometer Technology Since The Turn Of The Century*; **A Papworth**, L Houben
- 2:30 PM **397** *A STEM-Based Path Towards Atomic-Scale Silicon-Based Devices*; **BM Hudak**, S Jesse, J Song, A Borisevich, PC Snijders, SV Kalinin, AR Lupini
- 2:45 PM **398** *Toward More Brilliant Quantitative X-Ray Analysis in (S)TEM*; **M Watanabe**

P11.4 Advances in Characterization of Geological and Extraterrestrial Samples

SESSION CHAIRS:

Bradley De Gregorio; U.S. Naval Research Laboratory

Lori Hathon; University of Houston

PLATFORM SESSION

Tuesday 1:30 PM • Room: B112

- 1:30 PM **399** (Invited) *Amorphous and Nano-Crystalline Materials in Pristine Carbonaceous Chondrite Meteorites*; **NM Abreu**, CM Corrigan, DC Hezel, LP Keller, KT Howard, BT De Gregorio, KL Crispin, J Gray, H Wang
- 2:00 PM **400** *In situ Ion Irradiation and Heating Experiments in the Transmission Electron Microscope: Simulations of Dust Processing in Circumstellar Environments*; **P Haenecour**, MS Thompson, TJ Zega, JY Howe, W-Y Chen
- 2:15 PM **401** *Analysis of in situ Nanodiamonds in Organic Matter from Primitive Meteorites with Electron Energy-Loss Spectroscopy and Energy Dispersive X-Ray Spectroscopy*; **BT De Gregorio**, CMO Alexander, RM Stroud
- 2:30 PM **402** (STUDENT) *Understanding the Origin and Evolution of Meteoritic Refractory Minerals Through Transmission Electron Microscopy*; **T Ramprasad**, P Haenecour, L Seifert, TJ Zega
- 2:45 PM **403** *Non-Invasive 3D Crystallography of Geological Media in the Laboratory*; **M Andrew**, H Bale, N Gueninchault, J Sun, R Hanna, J Maisano, R Ketcham, M Pankhurst, M Zolensky

T

Tutorials – Tuesday Afternoon

X45.1 Biological Sciences Tutorial: Tips and Tricks for High-Pressure Freezing / Freeze Substitution

SESSION CHAIR:

Tommi White; University of Missouri

PLATFORM SESSION

Tuesday 2:00 PM • Room: B110

- 2:00 PM **404** (Invited) *Tips and Tricks for High-pressure Freezing / Freeze Substitution*; **M Schauflinger**

Scientific Program

A

Analytical Sciences Poster Sessions – Tuesday

A01.P2 Advances in Phase Retrieval Microscopy

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 79

3:00 PM **405** (Invited) (STUDENT) *High-Angular Splitting Electron Vortex Beams Generation by Topological Defects*; X Zhong, **S Kao**, J Lin, Z Liao, J Zhu, X Huang, R Zhang, HL Xin

POSTER # 80

3:00 PM **406** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Feasibility of an Electron Orbital Angular Momentum Sorter*; **W Parker**, B McMorran

POSTER # 81

3:00 PM **407** (STUDENT) *Potentially Programmable Virtual Phase Plate for Electron Beams*; **MA Krielaart**, P Kruit

POSTER # 82

3:00 PM **408** (STUDENT) *Transforming a Thermionic Transmission Electron Microscope into an Electron Interferometer*; G Carrillo, **RM Haynes**, F Yasin, BJ McMorran

POSTER # 83

3:00 PM **409** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Lorentz Implementation of STEM Holography*; **A Greenberg**, F Yasin, C Johnson, B McMorran

POSTER # 84

3:00 PM **410** (STUDENT) *Direct Correction of Residual Symmetric Aberrations in Electron Holograms of Weak Phase Objects*; **F Kern**, M Linck, D Wolf, T Niermann, H Arora, N Alem, A Erbe, S Gemming, A Lubk

POSTER # 85

3:00 PM **411** *Improvement of Accuracy in Particle Extraction from Reconstructed Phase Image of Electron Holograms*; **Y Asari**, S Terada, T Tanigaki, Y Takahashi, H Shinada, H Nakajima, A Sato, Y Murakami

POSTER # 86

3:00 PM **412** *Electron Holography on Fraunhofer Diffraction Using Double Slit*; **K Harada**, K Niitsu, K Shimada, T Kodama, T Akashi, YA Ono, D Shindo, H Shinada, S Mori

A02.P1 Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 87

3:00 PM **413** (STUDENT) *Iterative Machine Learning Method for Pore-Back Artifact Mitigation in High Porosity Membrane FIB- SEM Image Segmentation*; **J Tracey**, S Lin, J Jankovic, A Zhu, S Zhang

POSTER # 88

3:00 PM **414** *Two-Stage Neural Architecture Search for Microscopy Image Segmentation*; **M Guay**, Z Emam, R Leapman

POSTER # 89

3:00 PM **415** *Deep Learning as a Tool for Image Denoising and Drift Correction*; **RK Vasudevan**, S Jesse

POSTER # 90

3:00 PM **416** *Towards Fast and Direct Memory Read-out by Multi-beam Scanning Electron Microscopy and Deep Learning Image Classification*; K Crosby, T Garbowski, **S Nickell**

POSTER # 91

3:00 PM **417** *Machine Learning Approaches for Analysis of Multiscale Imaging Data for Atmospheric and Soil Particles*; **S China**, S Colby, AK Battu, T Varga

POSTER # 92

3:00 PM **418** *Sparse Scanning Electron Microscopy and Deep Learning for Imaging and Segmentation of Neuron Structures*; **T Dahmen**, P Potocek, P Trampert, M Peemen, R Schoenmakers

POSTER # 93

3:00 PM **419** (STUDENT) *Machine Learning and Computer Vision for the Classification of Carbon Nanotube and Nanofiber Structures from Transmission Electron Microscopy Data*; T Matson, M Farfel, N Levin, E Holm, **C Wang**

POSTER # 94

3:00 PM **420** *Image Registration of Low-Signal-to-Noise STEM Data with Open Source Software*; **BH Savitzky**, I El Baggari, C Clement, E Waite, R Hovden, LF Kourkoutis

POSTER # 95

3:00 PM **421** (STUDENT) *Quantitative Characterization of Misfit Dislocations at GaP/Si Heteroepitaxial Interfaces via Electron Channeling Contrast Imaging and Semi-Automated Image Analysis*; **AN Blumer**, JT Boyer, JI Deitz, FA Rodriguez, TJ Grassman

POSTER # 96

3:00 PM **422** *A Combination of Unsupervised and Supervised Machine Learning Method for Auto-thresholding Scanning Electron Microscopy Images*; **B Fu**, T Parson, A Das, M Deangelo, E Appiah-Amponsah

POSTER # 97

3:00 PM **423** *Optimizing Reflector Selection for Indexing of EBSD Patterns via Dynamic Pattern Simulation*; **SI Wright**, M De Graef, S Singh

POSTER # 98

3:00 PM **424** (STUDENT) *Application of Forward Modelling and Dictionary Indexing to EBSD Orientation Data as a Means of Quantifying Dislocation Substructure Formation in FCC Metals*; **DL Foley**, C Pate, K Matthews, X Zhao, N Savino, M DeGraef, L Lamberson, ML Taheri

POSTER # 99

3:00 PM **425** (STUDENT) *Simulating Thermal Noise for S/TEM Images from Atom Coordinate Data*; **J Tessmer**, M De Graef

POSTER # 100

3:00 PM **426** (STUDENT) *Expanding the Dimensions of a High Dynamic Range Detector with a Limited Number of Pixels via Scripting*; **X Chen**, T Eldred, M Abdelhamid, JM LeBeau

POSTER # 101

3:00 PM **427** *3D Platform for Machine Learning-Based Segmentation and Visualization Using FIB-SEM Imagery*; **R Pelapur**, MM Heck

POSTER # 102

3:00 PM **428** *Using Neural Networks to Identify Atoms in HRTEM Images*; **J Schiøtz**, J Madsen, BJG Østergaard, AS Dreisig, P Liu, S Helveg, O Winther, J Kling, JB Wagner, TW Hansen

POSTER # 103

3:00 PM **429** *A Workflow for Imaging 2D Materials Using 4D STEM-in-SEM*; **BW Caplins**, RM White, JD Holm, RR Keller

A03.P1 Low-Energy X-Ray Analysis: Novel Applications Using Soft X-Ray Emission Spectroscopy (SXES), Cathodoluminescence (CL), and Synchrotron Techniques

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 104

3:00 PM **430** *Detection of Rare Earth Elements in Appalachian Coal Fly Ash by Cathodoluminescence Spectroscopy*; A Falcon, **JA Poston**, S Montross, C Verba

POSTER # 105

3:00 PM **431** *A Combined WDS, EDS and Cathodoluminescence Study of Carbonate Grains in Water-Rich Meteorites*; **ES Bullock**

POSTER # 106

3:00 PM **432** *Ultrafast SEM*; **P Hlavenka**, E Kieft, EJ Vesseur

POSTER # 107

3:00 PM **433** *Soft X-Ray Emission Spectroscopy of Borosilicate Glasses and Minerals by SXES and EPMA-WDS*; **A von der Handt**, J Mosenfelder

POSTER # 108

3:00 PM **434** *Detection of Low Energy X-Rays with High Efficiency and Spectral Resolution*; **L Strüder**, H Soltan, A Niculae, S Aschauer, R Hartmann, J Davis

POSTER # 109

3:00 PM **435** *Innovative μ XRF Mapping of Ore Samples: A Comparison of Novel Synchrotron- and Lab-Based Technology*; **LL Van Loon**, NR Banerjee, JM Stromberg, A Woll, W Yun, B Stripe, S McIntyre

A04.P1 Recent Developments in Atom Probe Tomography

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 110

3:00 PM **436** *Mechanical Precision Preparation of Atom Probe Tips*; A Bachmaier, GB Rathmayr, **P Felfer**

POSTER # 111

3:00 PM **437** *Imaging Belgian Chocolate by Field Ion Microscopy*; L Jacobs, TV de Bocarmé, **C Barroo**

POSTER # 112

3:00 PM **438** *Hough Transform Based Accurate Composition Extractions from Correlation Histograms in Atom Probe Tomography*; M Fathidoost, **L Stephenson**, D Raabe, B Gault, S Katnagallu

POSTER # 113

3:00 PM **439** (STUDENT) *Three-Dimensional Electric Field Mapping of an Electrically-biased Atom Probe Needle Using Off-axis Electron Holography*; F Zheng, V Migunov, J Caron, H Du, G Pozzi, **RE Dunin-Borkowski**

POSTER # 114

3:00 PM **440** *Investigation of Microstructure and Dispersoids/Precipitates in Additively Manufactured Aluminum Alloys*; L Zhou, H Hyer, S Park, Y Sohn, **KP Rice**, Y Chen

POSTER # 115

3:00 PM **441** *Surface/Subsurface Interactions during Rh Oxidation Revealed by Atom Probe Tomography and Microscopy*; **SVM Lambeets**, T Visart-de-Bocarmé, N Kruse, DE Perea

A05.P2 Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 116

3:00 PM **442** *Quantifying the 3D Distribution of Pd Nanocatalysts Supported on Mesoporous Carbon for Furfural Hydrogenation*; W Wang, A Villa, D Wang, C Kuebel

POSTER # 117

3:00 PM **443** *Correlated Analyses of Corroded Aluminum Alloy with a New SPM and FIB-SEM Linkage System*; **A Morikawa**, T Aiso, M Tyoki, T Yamaoka, T Sat, H Suzuki, C Kamiva

Scientific Program

A

Analytical Sciences Poster Sessions – Tuesday cont.

POSTER # 118

3:00 PM **444** *Correlative Probe and Electron Microscopy CPEM—The Novel Technology for 3D Material Surface Analysis*; **J Neuman**, Z Novacek, M Pavera, V Novotna

POSTER # 119

3:00 PM **445** *Three-Dimensional (3D) Analysis of Inclusions in Structural Alloys with Automated Serial Sectioning*; S Ganti, R Reed, W Davis, **V Sundar**

POSTER # 120

3:00 PM **446** *Structural and Elemental Three-Dimensional Analysis of Dentin Occlusion*; **S Xu**, L Pan

POSTER # 121

3:00 PM **447** *Beyond Volumes: Extraction of Non-manifold Topologies From 3D Microscopy Data*; **PJ Felfer**

POSTER # 122

3:00 PM **448** *Microstructures and Properties of As-Cast $Al_{2.7}CrFeMnV$, $Al_{2.7}CrFeTiV$, and $Al_{2.7}CrMnTiV$ High Entropy Alloys*; **KE Knippling**, R Michi, D Beaudry

POSTER # 123

3:00 PM **449** *Application of Missing Wedge Inpainting in Material Science*; **P Trampert**, T Dahmen, P Slusallek

A07.P1 Vendor Symposium

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 124

3:00 PM **450** *Electron Counting Mode with Fiber-Optically Coupled Camera System*; R Ghadimi, D Tietz, M Oster, A Wisnet, **H Tietz**

POSTER # 125

3:00 PM **451** *Digital Camera System in Transmission Electron Microscope*; **C Han**, J-M Jeung, J-G Kim, S-C Lee

POSTER # 126

3:00 PM **452** *In situ Low Energy Argon Ion Source for Artifact Free High Resolution STEM Imaging*; **M Dutka**, R Isaacs, A Prokhodtseva, T Vystavel

POSTER # 127

3:00 PM **453** *20th Anniversary of Evactron® Plasma Cleaners for SEMs and FIBs*; **R Vane**, B Armbruster, M Cable, E Kosmowska, G Safar

POSTER # 128

3:00 PM **454** *Development of STEM Imaging in SEM Using Photon Detector*; **K Hosoya**, Y Dan, A Muto

POSTER # 129

3:00 PM **455** *AutoTEM 5 – Fully Automated TEM Sample Preparation For Materials Science*; **M Dutka**, A Prokhodtseva

POSTER # 130

3:00 PM **456** *Advancements of Evactron® Plasma Cleaning of Moxtek® X-Ray Windows*; **E Kosmowska**, M Almond, J Wong, B Law, B Armbruster, R Vane

POSTER # 131

3:00 PM **457** *Latest Generation of Silicon Drift Detectors and Readout Electronics*; **A Pahlke**, F Dams, R Fojt, M Fraczek, J Knobloch, C Luckey, N Miyakawa, N Willems

POSTER # 132

3:00 PM **458** *Complementary Standardless Quantitative Methods with EDS*; **F Eggert**

POSTER # 133

3:00 PM **459** *Live Color SEM Imaging*; **EJR Vesseur**

POSTER # 134

3:00 PM **460** *Development of in situ Imaging Capabilities in SEM and Their Applications*; **Y Hashimoto**, A Muto, K Shigeto, H Ito, H Itabashi, M Ohno, T Saito, S Tachibana

POSTER # 135

3:00 PM **461** *TESCAN Cryo FIB-SEM as a Flexible Tool for Advanced Sample Analysis*; S Zachej, K Rosikova, J Javurek, T Novacek, J Havrankova, **R Vana**

POSTER # 136

3:00 PM **462** *A 331-Beam Scanning Electron Microscope*; S Nickell, **D Zeidler**

POSTER # 137

3:00 PM **463** *Latest Developments in Multiple Ion Species Plasma FIB Technology*; **B Van Leer**, M Dutka

A08.P2 Current Trends and Challenges in Electron Energy-Loss Spectroscopy

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 138

3:00 PM **464** (STUDENT) *Defect-Induced Electronic Structure Changes in Cesium Lead Halide Nanocrystals*; **AS Thind**, JA Hachtel, G Luo, MV Morrell, Y Xing, JC Idrobo, R Mishra

POSTER # 139

3:00 PM **465** (STUDENT) *Calculation of Chemical Shift for Ti via EELS White-Line-Ratio Method*; **LR Slick**, Y-J Chang, T Zega

POSTER # 140

3:00 PM **466** *Atomic Scale Near-Edge Structures of a Structurally Abrupt Ni-SrTiO₃ Interface*; G Radtke, **M Bugnet**, QM Ramasse, M Hennes, X Weng, D Demaille, Y Zheng, F Vidal

POSTER # 141

3:00 PM **467** (STUDENT) *Electronic Structure Characterization of the Bi-YIG by EELS-STEM*; **N Herrera-Pineda**, M García-Guaderrama, GM Herrera-Pérez, ME Fuentes-Montero, JM Nápoles-Duarte, JP Palomares-Baez, C Ornelas-Gutiérrez, R Ochoa-Gamboa, W Antunez-Flores

POSTER # 143

3:00 PM **469** *Single Atom Identification of Barium by HAADF-STEM for the new Enriched Xenon Observatory (nEXO)*; **JB Warren**, M Chiu, D Su

POSTER # 144

3:00 PM **470** (STUDENT) *Observation of an Emerging Charged Domain Wall at a Non-ferroelectric Heterointerface with Aberration-Corrected STEM*; **M Li**, C Li, C Tang, SJ Pennycook

POSTER # 145

3:00 PM **471** *Background Modelling for Quantitative Analysis in Vibrational EELS*; **BDA Levin**, K Venkatraman, DM Haiber, K March, PA Crozier

POSTER # 146

3:00 PM **472** *Measurement of the Point Spread Function for Low-Loss Inelastic Scattering*; **RF Egerton**, AM Blackburn, RA Herring, L Wu, Y Zhu

POSTER # 147

3:00 PM **473** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Plasmonic Metalattices: A Correlated Monochromated Electron Energy Loss Study and Theoretical Calculations*; **P Moradifar**, L Kang, P Mahale, Y Liu, NN Nova, A Glaid, TE Mallouk, J Badding, D Werner, N Alem

POSTER # 148

3:00 PM **474** *Benefits of a High Speed Low Point Spread Detector for Monochromated Electron Energy-Loss Spectroscopy*; **L Spillane**, A Yankovich, P Longo, RD Twisten, E Olsson

POSTER # 149

3:00 PM **475** (STUDENT) *Microstructural Characterization of Boride Layers on Gray Cast Iron and Ductil Cast Iron by Dehydrated Paste-pack Boriding*; M Ortiz, A Cruz, **I Morgado**, E Cardoso, OAG Vargas, J Solis, VA Castellanos, EC Guerra

A09.P1 Microscopy and Microanalysis for Real-World Problem Solving

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 150

3:00 PM **476** *TSP Analysis Performed by SEM-EDS to Air Quality Studies*; **R Ramirez-Leal**

POSTER # 151

3:00 PM **477** *TiN and Boride Layers Obtained by Dehydrated Paste-pack Boriding and PVD Treatments Formed on AISI M2 Steel*; **OA Gómez**, M Ortiz, A Cruz, I Morgado, J Solis, VA Castellanos, EC Guerra, E Cardoso

POSTER # 152

3:00 PM **478** *A BKM to Measure BEOL Liner Thickness from XEDS Mapping with Accuracy Within 1%*; **WW Zhao**

POSTER # 153

3:00 PM **479** *Development of Automatic TEM/SEM Specimen Preparation Instrument for Nanomaterial Dispersed in Liquid*; **S Akai**, K Kumagai, N Handa, A Kurokawa, Y Sasaki, N Kikuchi, S-I Kitamura, H Manabe

POSTER # 154

3:00 PM **480** *Understanding Chemical States of Copper Nanoparticles in Wood Structures by Electron Energy-Loss Spectroscopy*; **C Wang**, A Dozier, P Kulkarni

POSTER # 155

3:00 PM **481** *Microscopy Investigation of Surface Contamination Effect on Fatigue Fracture of Al60 (GlidCop) Wire*; **RE Goddard**, VJ Toplosky

POSTER # 156

3:00 PM **482** *SEM and EDS Study in Bidirectional Fabrics of Composites Materials for Aeronautical Applications*; **E Vera Cardenas**, J Mendoza Mendoza, E Avila Davila, S Ledesma Ledesma, A Martinez Perez, M Moreno Rios

POSTER # 157

3:00 PM **483** *Emerging Contaminants: Extracting Micro & Nanomaterial Data from Soil Samples*; **K Varner**

POSTER # 158

3:00 PM **484** *Interfacial Phases in a Graphene-Doped Aluminum/B4C MMC*; **HO Colijn**, D Huber, S Polat

POSTER # 159

3:00 PM **485** *Bridging Industry to Beamline Through an Advanced Laboratory-Based Characterisation Facility*; **RE Johnston**, C Pleydell-Pearce, A Clarke, K Mouzakitis, L Wechie, L Xu, R Allott

POSTER # 160

3:00 PM **486** *Revealing the Microstructural Information of the Quasi-plastic Zone in a Boron Carbide Using the Advanced Precession Electron Diffraction Technique*; **S Xiang**, L Ma, B Yang, C Hwang, KJ Hemker, RA Haber, KY Xie

POSTER # 161

3:00 AM **487** *TEM Sample Preparation of Patterned Quantum Dots*; **H Wang**, V Srot, B Fenk, G Laskin, J Mannhart, P van Aken

POSTER # 162

3:00 PM **488** *In situ Mass Thickness Calibrations Using MWCNTs*; M Malac, **D Homeniuk**, M Hayashida, T Fujii, T Yaguchi, R Egerton

A11.P1 Current and Emerging Microscopy for Quantum Information Sciences

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 163

3:00 PM **489** *Study of Sub-atomic Channeling in SrTiO₃ Crystal Along <100> Direction Using Multislice Simulations*; **JS Jeong**, KA Mkhoyan

POSTER # 164

3:00 PM **490** (STUDENT) *A Versatile Common Platform for Quantum Transport Measurements in Fluidic, Cryogenic, and In situ Electron Microscopy Environments*; J Swett, I Kravchenko, S Jesse, **O Dyck**, J Mol

POSTER # 165

3:00 PM **491** (STUDENT) *Rapid Fourier Masked Domain Mapping to Reveal Head to Head Charged Domain Walls in Lead Titanate*; **K Moore**, U Bangert, E O'Connell, M Conroy, M Gregg

Scientific Program

A

Analytical Sciences Poster Sessions – Tuesday cont.

POSTER # 166

3:00 PM **492** (STUDENT) *Probing the Local Lattice Distortions in Doped SrTiO₃ Using Quantitative STEM*; **S Salmani-Rezaie**, H Kim, K Ahadi, S Stemmer

POSTER # 167

3:00 PM **493** (STUDENT) *Metal Thio/Selenophosphates: A Novel Two-Dimensional Materials System*; **M Cheng**, RD Reis, D Chica, MG Kanatzidis, VP Dravid

POSTER # 168

3:00 PM **494** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Visualization of Misfit Dislocation Network at the BaSnO₃-LaAlO₃ Interface*; **H Yun**, A Prakash, B Jalan, JS Jeong, K Mkhoyan

B

Biological Sciences Poster Sessions – Tuesday

B01.P1 Multi-Modal, Large-Scale and 3D Correlative Microscopy

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 169

3:00 PM **495** *FIB-SEM 3D CLEM of Cultured Cells*; **Y Wu**, S Yu, P De Camilli, T Melia, X Liu

POSTER # 170

3:00 PM **496** *A Versatile En bloc Staining Procedure for Large Tissue Sample Imaging*; **A Graff-Meyer**, B Titze, C Genoud

POSTER # 171

3:00 PM **497** *Improved Ultrastructural Preservation of the Drosophila Neuromuscular Junction by a Combination of Chemical Fixation, High Pressure Freezing and Freeze Substitution*; **NA Iyer**, PK Rivlin

POSTER # 172

3:00 PM **498** (STUDENT) *Use of Negative Bias Potential for High Throughput Array Tomography in an Integrated Light- Electron Microscope*; **R Lane**, Y Vos, P de Boer, BN Giepmans, JP Hoogenboom

POSTER # 173

3:00 PM **499** *Correlative Synchrotron Micro-CT and FIB-SEM Imaging for the Analysis of Multifocal Pathologies*; **P Parlanti**, R Rigolio, G Tromba, C Manzini, A Popratiloff, V Cappello

POSTER # 174

3:00 PM **500** (Technologist/Staff - Bio) *Correlative Light and Electron Microscopy Technique Using Commercially Available Reagents to Facilitate Immunolocalization via Epi-fluorescence and TEM*; **LG Cummins**, V Tu, LM Weiss, F Macaluso

POSTER # 175

3:00 PM **501** (STUDENT) (M&M MEETING SCHOLAR AWARD) *High-Contrast Imaging of Nanodiamonds in Cells by Energy filtered and Correlative Light-Electron Microscopy: Towards a Quantitative Nanoparticle-Cell Analysis*; **S Han**, M Raabe, L Hodgson, J Mantell, P Verkade, T Lasser, K Landfester, T Weil, I Lieberwirth

POSTER # 176

3:00 PM **502** (STUDENT) *Studying the Bioactivity of Tissue Engineering Scaffolds Derived from Egg and Sea Shell Waste Using SEM, EDS, TEM*; **V Hembrick-Holloman**, V Rangari, T Samuel, S Jeelani

POSTER # 177

3:00 PM **503** *Multi-Color Electron Microscopy of Cellular Ultrastructure Using 4D-STEM*; **B Bammes**, R Ramachandra, MR Mackey, R Bilhorn, MH Ellisman

POSTER # 178

3:00 PM **504** *Characterization of Biogenic Nanoparticles Via in situ Correlative Secondary Electron Helium Microscopy and Secondary Ion Mass Spectrometry*; **C Guillermier**, D Medina Cruz, J-N Audinot, T Wirtz

POSTER # 179

3:00 PM **505** *Photoinduced Thermal Desorption on an Atomic Force Microscope Platform Coupled with Mass Spectrometry for Multimodal Imaging*; M Lorenz, R Wagner, R Proksch, **OS Ovchinnikova**

POSTER # 180

3:00 PM **506** *Advancing TEM Based Biomedical Nanoparticle Characterization: GMP Compliant TEM Workflow In a BSL2 Environment and Automation Using MiniTEM*; **M Colomb-Delsuc**, J Härmark, B Eriksson, R Nordström, V Carvalho, G Kylberg, I-M Sintorn

B03.P2 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 181

3:00 PM **507** *Co-Registered Application of Matrix Assisted Laser Desorption/Ionization Mass Spectrometry and Time-of-Flight Secondary Ion Mass Spectrometry Images for Visualizing Signaling Molecules*; **M Lorenz**, ST King, N Borodinov, CA Steed, J Chae, AV Ievlev, OS Ovchinnikova

POSTER # 182

3:00 PM **508** (STUDENT) *Vesicle Structural Changes Control Content Release of Transmitters and Hormones*; **G Arpino**, W Shin, O Shupliakov, L-G Wu

POSTER # 183

3:00 PM **509** *Use of Electron Microscopy for Detecting the Environmental Contamination by Asbestos: Analysis of Sentinel Animal Lung Tissue*; **A Campopiano**, A Cannizzaro, A Olori, F Angelosanto, MR Bruno, BM Bruni, F Casalnuovo, S Iavicoli

POSTER # 184

3:00 PM **510** *Identifying Artifacts from Real Changes in Electron Microscopy of Molecular Era*; **G Ning**

POSTER # 185

3:00 PM **511** *Phaechromacytoma Associated with Fatal Myocardial Infarction*; **S Siew**, JE Richards

POSTER # 186

3:00 PM **512** *Scanning Electron Microscopy Preparation Method for Coolia sp., a Delicate Dinoflagellate*; **LE Gómez-Lizárraga**, LM Durán-Riveroll, HI Pérez-López

POSTER # 187

3:00 PM **513** *Rapid Automated Preparation for Serial Block Face Scanning Electron Microscopy*; **SL Goodman**, EK Benson, JM Campbell, GJ Kidd

POSTER # 188

3:00 PM **514** *Automated Preparation of Core Needle Biopsy Specimens for TEM Imaging*; **TE Strader**, BK August

POSTER # 189

3:00 PM **515** (STUDENT) *Gold Nanorings Encapsulated in PNIPAM Nanoparticles*; **SA Tovar-Cabrera**, A Lucero-Acuna, R Esquivel

POSTER # 190

3:00 PM **516** *Novel Approaches for Treating Cardiac Disease*; A Kumar, D DiPette, **J Potts**

POSTER # 191

3:00 PM **517** *MicroLens Enhancement in Respiratory Infection Diagnosis*; F Teng, X Wu, **T Chou**, M Libera

POSTER # 192

3:00 PM **518** (STUDENT) *Analysis of the Density and Distribution of HER2 In Breast Cancer Cell Subpopulations and Their Response to Anti-Cancer Drugs on the Single Cell Level Using Liquid-Phase Electron Microscopy*; **P Blach**, F Weinberg, D Peckys, N de Jonge

P

Physical Sciences Poster Sessions – Tuesday

P01.P1 *In situ* TEM Characterization of Dynamic Processes during Materials Synthesis and Processing

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 193

3:00 PM **519** *Engineering and Modifying Two-Dimensional Materials via Electron Beams*; **X Zhao**, J Dan, W Zhou, KP Loh, SJ Pennycook

POSTER # 194

3:00 PM **520** (STUDENT) *Quantifying Structural Transformations from Redox Reactions in TiO₂*; B Shindel, **P Haluai**, Q Liu, BD Levin, T Boland, PA Crozier

POSTER # 195

3:00 PM **521** *A Scanning Tunneling Microscopy Study on Surface-Supported Imine-Based Covalent Organic Frameworks: a New Design for Robust 2D Materials*; **N Bilbao**, D Waghray, T Janssen, S De Feyter

POSTER # 196

3:00 PM **522** *Electron-Beam-Induced Nucleation in an Antisolvent*; **T Yamazaki**, Y Kimura

POSTER # 197

3:00 PM **523** (STUDENT) (M&M MEETING SCHOLAR AWARD) *In situ Negative Cs HRTEM Imaging of Topotactic Phase Transformation from Perovskite SrFeO₃ to Brownmillerite SrFeO_{2.5}*; **YL Xing**, B Park, Z Wang, KT Kang, J Seo, JC Kim, HY Jeong, WS Choi, SH Oh

POSTER # 198

3:00 PM **524** (STUDENT) *In situ TEM Investigation on Rotation and Coalescence Behaviors of Au Nanoparticles on h-BN Substrate*; **B Song**, Y Yuan, R Rojaee, R Shahbazian-Yassar

POSTER # 199

3:00 PM **525** (STUDENT) *In situ Observations of Abnormal Pore Size Changes of a Zirconium Based Metal-Organic Framework Using High Resolution S/TEM and EELS*; **P Tieu**, C Gadre, W Gao, X Yan, M Li, Z Xu, X Pan

POSTER # 200

3:00 PM **526** (STUDENT) *Quantifying the Atomic Ordering of Binary Intermetallic Nanocatalysts Using in situ Heating STEM and XRD*; **Y Yang**, Y Xiong, E Padgett, H Joress, V Yarlagadda, A Kongkanand, JD Brock, FJ DiSalvo, HD Abruña, DA Muller

POSTER # 201

3:00 PM **527** *In situ Analysis of nm-Scale Alpha Formation in Titanium Alloys*; **AK Ackerman**, C Ophus, M Danaie, P Karamched, AJ Knowles, A Wilkinson, D Rugg, D Dye

POSTER # 202

3:00 PM **528** (STUDENT) *In situ Liquid Phase Transmission Electron Microscopy Study for Phase Evolution of α -Fe₂O₃ Nanorods upon Lithiation/Delithiation Process*; MW Pin, **Y Kim**, SJ Ahn, J-H Kwon

POSTER # 203

3:00 PM **529** *Atomic Scale Dynamic Process of Cu Oxidation Revealed By Correlated in situ Environmental TEM and DFT Simulations*; **M Li**, MT Curnan, MA Cresh-Sill, SD House, WA Saidi, JC Yang

POSTER # 204

3:00 PM **530** (STUDENT) *Observation of Void Formation in Cubic NaYF₄ Nanocrystals Using in situ Heating Transmission Electron Microscopy*; **AB Bard**, MB Lim, X Zhou, JA Rodríguez Manzo, DH Alsem, PJ Pauzauskie

Scientific Program

P

Physical Sciences Poster Sessions – Tuesday cont.

P02.P1 Microscopy and Microanalysis of Nuclear and Irradiated Materials

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 205

3:00 PM **531** *Development of the in situ Ion Irradiation SEM at Sandia National Laboratories; SA Briggs, A Monterrosa, N Heckman, CM Barr, L Treadwell, BL Boyce, K Hattar*

POSTER # 206 *Nanoscale Quantification of Interstitial Oxygen in Hyperstoichiometric UO_{2+x}; S Spurgeon, M Sassi, C Ophus, J Stubbs, E Ilton, E Buck*

POSTER # 207

3:00 PM **533** *Tungsten Microstructural Results from the Gadolinium-Shielded 19J Irradiation Experiment; CM Parish, L Garrison, E Lang, J-P Allain, Y Katoh*

POSTER # 208

3:00 PM **534** (STUDENT) *Analysis Microstructural on Gray Cast Iron Boriding and Hydrogen of Permeation; I Lopez Velazquez, N Lopez Perrusquia, MA Doñu-Ruiz, ED Garcia Bustos*

POSTER # 209

3:00 PM **535** *Microscopy and Elemental Analysis on a Haynes-25 Crushed Weld Ring; AD Wall, TG Holesinger, JP Romero, TF Cousins, WL Stellwag, J Phillips, A Sandford*

POSTER # 210

3:00 PM **536** *Removal of FIB Damage Using Flash Electropolishing for Artifact-free TEM Foils; A Schemer-Kohn, J Wang, MB Toloczko, DJ Edwards, Y Zhu*

POSTER # 211

3:00 PM **537** *TEM Specimen Preparation Using Low-energy Ion Beam for Nuclear Metallic Materials; JJH Lim, E Prestat, Q Ramasse, MG Burke*

POSTER # 213

3:00 PM **539** *Micro- and Nano- Characterization of Neutron Irradiated TRISO Coated Particles; I Vanrooyen, Y Yang, K Wright, T Lillo, S Meher, Z Fu*

POSTER # 214

3:00 PM **540** *Probing the Irradiation Defects in Enhanced 2G High Temperature Superconducting Wire; Y Zhang, M Rupich, A Goyal*

POSTER # 215

3:00 PM **541** *Dynamic Oxygen Motion in Irradiated-Annealed High Temperature Superconducting Wire; Y Zhang, MW Rupich, A Goyal*

P05.P1 Theory and Applications of Electron Tomography in the Materials Sciences

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 216

3:00 PM **542** *Data Acquisition in 4D Atomic Electron Tomography; J Zhou, Y Yang, Y Yang, C Ophus, F Sun, A Schmid, H Zeng, P Ercius, J Miao*

POSTER # 217

3:00 PM **543** *Characterisation and Categorisation Strategies for Anisotropic Gold Nanoparticles for Applications in Biology; J Cookman, JM de Araujo, KA Dawson*

POSTER # 218

3:00 PM **544** *Towards Routine EDX Tomography in Semiconductor Failure Analysis; FH Baumann, B Popielarski, T Mitchell, Y Lu*

POSTER # 219

3:00 PM **545** *Structure-dependent Conducting Properties of Phosphonated Polypeptoid Electrolyte Membranes Revealed by Cryogenic Electron Tomography; X Jiang, J Sun, RN Zuckermann, NP Balsara*

POSTER # 220

3:00 PM **546** *Shape Determination in Lithium-ion Battery Cathode Materials Using Electron Diffraction-assisted Electron Tomography; AK Shukla, C Ophus, J Mendoza, L Yedra, S Estrade, Q Ramasse*

POSTER # 221

3:00 PM **547** *Three-Dimensional Analysis of Non-stained Polymer Alloy Using Differential Phase Contrast-STEM Tomography; S Inamoto, A Yoshida, Y Otsuka*

P06.P1 In situ TEM of Nanoscale Materials and Electronic Devices for Phase Transformation Studies

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 222

3:00 PM **548** (STUDENT) *In situ Observation of Oxygen Vacancy Order-Disorder Transition in NdBaCo₂O_{5.5} Layered Perovskite Oxide; O Kwon, YI Kim, JC Kim, H Jeong, G Kim, Y-M Kim, HY Jeong*

POSTER # 223

3:00 PM **549** *Tracking Metastable Phase Selection during Devitrification in a Metallic Glass; L Zhou, F Meng, S Zhou, K Sun, T Kim, R Ott, R Napolitano, M Kramer*

POSTER # 224

3:00 PM **550** (STUDENT) *High Resolution S/Transmission Electron Microscopy Investigation of Ca₂Mn₂O₇ Phase Transformation under in situ Heating Condition; L Miao, P Moradifar, D Mukherjee, R Hu, S-W Cheong, N Alem*

POSTER # 225

3:00 PM **551** *Advanced and in situ Electron Microscopy Investigation of Phase Composition and Phase Transformation in Ga-Rh Liquid Metal Catalysts;* **M Wu**, M Grabau, N Taccardi, C Papp, H-P Steinrück, P Wasserscheid, E Spiecker

POSTER # 226

3:00 PM **552** (STUDENT) *Nanoscale Deformation Processes Revealed in Nacre of Pinna Nobilis Mollusk Shells;* **J Gim**, N Schnitzer, Y Cui, LM Otter, SE Wolf, DE Jacob, A Misra, R Hovden

POSTER # 227

3:00 PM **553** *Investigating Ferroelectric Domain and Domain Wall Dynamics at Atomic Resolution by TEM/STEM in situ Heating and Biasing;* **M Conroy**, K Moore, E O'Connell, E Courtney, A Harvey, C Cochard, J Guy, R McQuaid, L Jones, C Downing, R Whatmore, M Gregg, U Bangert

POSTER # 228

3:00 PM **554** *In situ STEM Mechanical Experiments at Atomic-resolution Using a MEMS Device;* **E Tochigi**, T Sato, N Shibata, H Fujita, Y Ikuhara

POSTER # 230

3:00 PM **556** *The in situ Studies on the Anomalous Domain Switching Caused by Trace Amount of Oxygen Vacancies;* **S Cheng**, Q Meng, M-G Han, S Deng, X Li, GA Botton, Y Zhu

POSTER # 231

3:00 PM **557** (STUDENT) *In situ Transmission Electron Microscopy Annealing for Crystallization and Phase Stability Studies in the Ga₂O₃-In₂O₃ System;* **C Wouters**, T Markurt, O Bierwagen, C Sutton, M Albrecht

POSTER # 232

3:00 PM **558** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Understanding the Slip Planarity and Residual Strain Field in Ti₆Al Using Nanobeam Electron Diffraction and First Principles Calculations;* **R Zhang**, S Zhao, T Pekin, E Rothchild, M Asta, D Chrzan, A Minor

POSTER # 233

3:00 PM **559** *Atomic and Electronic Reconstruction at the α -LAO/STO Interface by e-beam Induced Crystallization;* G Lee, S- I Kim, G Han, Y-M Kim, S-H Baek, DH Kim, **HJ Chang**

POSTER # 234

3:00 PM **560** (STUDENT) *In situ Phase Transformation of Monodisperse Manganese Oxide Nanoparticles;* **B Deljoo**, SL Suib, M Aindow

POSTER # 235

3:00 PM **561** *In situ TEM Study of Friction and Wear of Olivine;* **S Bhowmick**, E Hintsala, D Stauffer, S Asif

POSTER # 236

3:00 PM **562** *Size Effect of Charge Density Wave Phase Transformation in EuGa₄ Compound Nanoparticles;* **H Yasuda**, X Zhou

POSTER # 237

3:00 PM **563** (STUDENT) *Accelerated Electromigration Study of Cobalt Thin Films by in situ TEM;* **B Engler**, R Hull

POSTER # 238

3:00 PM **564** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Electronic Biasing of Monolayer Transition Metal Dichalcogenides in a TEM;* **AA Murthy**, TK Staney, R dos Reis, NP Stern, VP Dravid

POSTER # 239

3:00 PM **565** (STUDENT) *Operando TEM Investigation of Sintering Kinetics of Nanocatalysts on MoS₂ in Hydrogen Environment;* **B Song**, Y Yuan, S Sharifi-Asl, Y Liu, R Shahbazian-Yassar

POSTER # 240

3:00 PM **566** *Electron Beam Manipulated Nanoscale Reaction;* H Sheng, J Wang, **J Wen**

POSTER # 241

3:00 PM **567** *Direct Visualization of Polar Nanoregions in BaTiO₃-Based Ferroelectrics above Curie Temperature;* **G Drazic**, A Bencan, T Rojac, D Damjanovic

POSTER # 242

3:00 PM **568** *In situ Observation of Concurrent Oxidation and Mechanical Deformation in Al and Zr;* **Y Yang**, A Kushima, H Xin, P Hosemann, J Li

POSTER # 243

3:00 PM **569** (STUDENT) *Phase Stability of Iron Oxide Evaluated Through Selected Area Electron Diffraction during in situ Heating Experiments;* **B Qu**, AM Thron, K van Benthem

POSTER # 244

3:00 PM **570** *Characterisation of Misfit Dislocations at Semicoherent Interfaces in Biphasic Functional Heusler Intermetallics;* **YM Eggeler**, EE Levin, F Wang, R Seshadri, TM Pollock, DS Gianola

POSTER # 245

3:00 PM **571** (STUDENT) *Electron Microscopy and Spectroscopy Characterization of the Effects of Annealing on the Cu/Graphene/Si Multilayer Thin Films;* **D Shrestha**, N Ries, O Zeitz, J Barnes, A Goforths, Z Chen, J Jiao

Scientific Program

P

Physical Sciences Poster Sessions – Tuesday cont.

P07.P2 Electron Crystallography of Nanostructures in Nanotechnology, Materials and Bio-Sciences

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 246

3:00 PM **572** *Investigation of Strain in core@shell Electrocatalysts with ADF-STEM and 4D STEM Scanning Nanodiffraction*; **D Mukherjee**, JT Gamler, X Sang, S Somnath, SE Skrabalak, RR Unocic

POSTER # 247

3:00 PM **573** *Ni(111) Thin Layers Recrystallization Studied by SEM, EBSD and AFM*; D Teklinska, **I Jozwik**, P Knyps

POSTER # 248

3:00 PM **574** *Structural and Microstructural Analysis for CuO Nanoparticles Prepared by Precipitation Method*; **JS Salas-Leiva**, GM Herrera-Pérez, LE Palma-Cano, G Rojas-George, C Ornelas-Gutiérrez, MA Luna-Velasco

POSTER # 249

3:00 PM **575** (STUDENT) *Coexistence of Tetragonal Spinel Nanowires and Cubic Spinel Nanopillars during Gold-assisted Growth*; **M-H Lin**, Y Liu, F Liu, G-Z Zhu

POSTER # 250

3:00 PM **576** (STUDENT) *Crystallization of Amorphous Alumina Whiskers on Carbon Nanotubes under Electron Beam Irradiation*; **AM Jasim**, X He, T White, Y Xing

POSTER # 251

3:00 PM **577** (STUDENT) *Structure and Morphology Study of Copper/Copper Oxides Nanoparticles*; **LA Hermida-Montero**, N Pariona, AI Martínez-Enríquez, F Paraguay Delgado

POSTER # 252

3:00 PM **578** *Probing Crystalline Defects Using an EBSD-Based Virtual Dark-field Method*; **S Zhao**, R Zhang, T Pekin, A Minor

POSTER # 253

3:00 PM **579** (STUDENT) *Cu₂ZnSnS₄ Agglomeration Nanoparticles Study by TEM*; **JD Crisobal**, F Paraguay, A Arteaga, E Guerrero, D Lardizabal, L De la Torre

POSTER # 254

3:00 PM **580** *Local Structural Study of Ferroelectric Domain Boundaries Using STEM-CBED with a Fast Pixelated STEM Detector*; **K Tsuda**, R Sagawa, H Hashiguchi, Y Kondo

P08.P1 Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications

POSTER SESSION

Tuesday 3:00 PM • Room: Exhibit Hall

POSTER # 255

3:00 PM **581** *Operando Scanning Transmission X-Ray Microscopy of Co(OH)₂ Oxygen Evolution Electrocatalysts*; JT Mefford, **K Karki**, DH Alsem, D Shapiro, N Salmon, WC Chueh

POSTER # 256

3:00 PM **582** (STUDENT) *Understanding the Ordering of Charged Nanoparticles in Water*; **L Bhatt**, N Rosenmann, JR Jokisaari, M Schlossman, RF Klie

POSTER # 257

3:00 PM **583** *Microstructure Study on Initial Lithiation/Delithiation Cycle of Crystalline Silicon Wafer*; **J Liu**, T Yoon, C Ban, M Al-Jassim

POSTER # 258

3:00 PM **584** (STUDENT) *Valence State Transformation of Rh on CeO₂/NR/γ-Al₂O₃ Composite Support*; **Y Wang**, Z Liu, R Wang

POSTER # 259

3:00 PM **585** *STXM Study on Layered Nanomaterials*; **J Park**

POSTER # 260

3:00 PM **586** *Synthesis and Structural Characterization of Co₃O₄ Electrocatalysts on Carbon Fiber Cloth with Tunable Morphologies and Electrochemical Properties*; D Chen, J Yu, Z Cui, Q Zhang, L Yu, **L Dong**

POSTER # 261

3:00 PM **587** (STUDENT) *Identification of Anion Sites in BiCuXO (X= Se, S) Heteroanionic Materials*; **C Zhang**, HJ Jung, X Hu, RD Reis, A Murthy, KR Poeppelmeier, VP Dravid

POSTER # 262

3:00 PM **588** *Operando Electrochemical TEM of Solid-State Energy Storage Materials Using a Probe-Based Biasing Holder*; N Singh, J Horwath, A Foucher, TS Arthur, JA Rodríguez Manzo, **DH Alsem**, EA Stach

POSTER # 263

3:00 PM **589** (STUDENT) *Qualification of La Dopant Level in La: SrSnO₃/SrSnO₃/BaSnO₃ Heterostructures with STEM-ELLS*; **H Yun**, J Held, A Prakash, T Wang, B Jalan, KA Mkhoyan

POSTER # 264

3:00 PM **590** *Structural Analysis of HR-TEM Images of Ni-Doped Zirconia Nanoparticles*; **C Angeles Chavez**, DA Prado Chay, MA Cortes Jacome, JA Toledo Antonio

POSTER # 265

3:00 PM **591** (STUDENT) *TEM Imaging and Electron Diffraction of Vertically Stacked Graphene/h-BN with Fine Control of Twist Angle*; **S Lee**, Y Lee, J-Y Yoon, K Kim

POSTER # 266

3:00 PM **592** *TEM Study of MoOx/Ni and MoOx/Al Contacts for Silicon Solar Cells*; **H Ali**, G Gregory, KO Davis

POSTER # 267

3:00 PM **593** *Analytical Electron Microscopy Characterization of a Temperature-Stable Relaxor Ferroelectric Ceramic*; **T Roncal-Herrero**, J Harrington, A Zeb, SJ Milne, AP Brown

POSTER # 268

3:00 PM **594** *Atomic Scale Recognition of Structure in the Intercalation of Sodium by Aberration-Corrected Scanning Transmission Electron Microscopy*; **X Shen**, X Wang, S Hao, Y Gao, M Tian, R Yu, Z Wang, L Chen

POSTER # 269

3:00 PM **595** (STUDENT) *Lattice Tetragonality and Local Strain Depending on Shape of Gold Nanoparticles*; **K Aso**, J Maebe, T Yamamoto, S Matsumura

POSTER # 270

3:00 PM **596** (STUDENT) *Effect of Metal-Assisted Catalytic Etching (MACE) on Single-Crystal Si Wafers with Faceted Macropores*; **AT Ernst**, KW Kolasinski, BA Unger, M Aindow

POSTER # 271

3:00 PM **597** (STUDENT) *Effect of Graphene on Wear Properties of Aluminum and Alumina Matrix Nanocomposites*; **SH Duntu**, M Islam, S Boakye-Yiadom

POSTER # 272

3:00 PM **598** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Direct Imaging of Localized Anisotropic Acoustic-Phonon Dynamics in MoS₂*; **Y Zhang**, DJ Flannigan

POSTER # 273

3:00 PM **599** *Multi-Modal Analytical Insights into Li-Ion Battery Aging with XFC*; PM Attia, **ST Kelly**, W Harris, J Liao, W Huang, Y Cui, WC Chueh

POSTER # 274

3:00 PM **600** *EBSA Analysis of Undesired Phase Development in Solid Oxide Fuel Cell (SOFC) Lanthanum Strontium Manganese Oxide (LSM) / 8 mol% Yttrium Zirconium Oxide (8YSZ) Cathodes during Long-Term Thermal Anneal*; **N Canfield**, J Hardy, C Coyle, J Stevenson

Notes

[illegible]

Scientific Program Information

Wednesday, August 7, 2019



A

Analytical Sciences Symposia – Wednesday Morning

A01.5 Advances in Phase Retrieval Microscopy

SESSION CHAIRS:

Myung-Geun Han; Brookhaven National Laboratory
Charudatta Phatak; Argonne National Laboratory

PLATFORM SESSION

Wednesday 8:30 AM • Room: B114

- 8:30 AM **601** (Invited) *Femtosecond Lorentz Microscopy for the Mapping of Ultrafast Magnetization Dynamics*; N Rubiano, M Möller, A Feist, H Ulrichs, C Ropers, S Schäfer
- 9:00 AM **602** *Ultrafast Ptychography with 7500 Frames per Second*; M Huth, R Ritz, CM O'Leary, I Griffiths, P Nellist, H Soltau
- 9:15 AM **603** (STUDENT) *Full-Field Stroboscopic Imaging of Acoustic and Thermal Dynamics in Isolated Nanostructures Using Tabletop EUV Coherent Imaging*; B Wang, R Karl, G Mancini, J Knobloch, T Frazer, BA Mayor, M Tanksalvala, C Bevis, H Kapteyn, JN Hernandez-Charpak, M Murnane
- 9:30 AM **604** *Live Measurement of Electrical Charge Density in Materials Using Off-Axis Electron Holography*; E Voelkl, F Zheng, V Migunov, M Beleggia, R Dunin-Borkowski
- 9:45 AM **605** *High-speed and Large Field-of-view Imaging via X-Ray Fly-Scan Ptychography*; Y Jiang, J Deng, JA Klug, Y Yao, C Preissner, C Roehrig, Z Cai, B Lai, S Vogt

A02.5 Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy

SESSION CHAIRS:

Francisco de la Peña; Université Lille, France
Philippe T. Pinard; Oxford Instruments, United Kingdom
Eric Prestat; Manchester University, United Kingdom

PLATFORM SESSION

Wednesday 8:30 AM • Room: C123

- 8:30 AM **606** *DefectNet – A Deep Convolutional Neural Network for Semantic Segmentation of Crystallographic Defects in Advanced Microscopy Images*; G Roberts, R Sainju, B Hutchinson, MB Toloczko, DJ Edwards, Y Zhu
- 8:45 AM **607** *Automated Real-Time Analysis of Atomic-Resolution STEM Images*; J Madsen, A Postl, T Susi
- 9:00 AM **608** *Merging Deep Learning, Chemistry, and Diffraction for High-Throughput Material Structure Prediction*; M Gong, B Miller, RR Unocic, K Hattar, B Reed, D Maisel, T Tasdizen, JA Aguiar

- 9:15 AM **609** *FerroNet: Machine Learning Flow for Analysis of Ferroelectric and Ferroelastic Materials*; M Ziatdinov, C Nelson, SV Kalinin

- 9:30 AM **610** (STUDENT) *Deep Learning-Enabled Measurements of Single-Atom Defects in 2D Transition Metal Dichalcogenides with Sub-Picometer Precision*; C-H Lee, C Shi, D Luo, A Khan, BE Janicek, S Kang, W Zhu, BK Clark, PY Huang

- 9:45 AM **611** (STUDENT) (M&M MEETING SCHOLAR AWARD); *Removing Stripes, Scratches, and Curtaining with Non-Recoverable Compressed Sensing*; J Schwartz, Y Jiang, Y wang, A Aiello, P Bhattacharya, H Yuan, Z Mi, N Bassim, R Hovden

A04.5 Recent Developments in Atom Probe Tomography

SESSION CHAIRS:

Leigh Stephenson; Max Planck Institute, Germany
Ty J. Prosa; CAMECA Instruments Inc.

PLATFORM SESSION

Wednesday 8:30 AM • Room: F151

- 8:30 AM **612** (Invited) *Opportunities and Challenges in APT Metrology for Semiconductor Applications*; C Fleischmann, R Cuduvally, R Morris, D Melkonyan, JO de Beeck, I Makhotkin, P van der Heide, W Vandervorst
- 9:00 AM **613** (Invited) *Atom Probe Tomography Using a Wavelength-Tunable Femtosecond-Pulsed Coherent Extreme Ultraviolet Light Source*; AN Chiamonti, L Miaja-Avila, PT Blanchard, DR Diercks, BP Gorman, NA Sanford
- 9:30 AM **614** *Using a Plasma FIB Equipped with Xe, N₂, O₂ and Ar for Atom Probe Sample Preparation – Ion Implantation and Success Rates*; K Eder, V Bhatia, B Van Leer, JM Cairney
- 9:45 AM **615** *Direct Observation of Zirconium Alloy Oxidation at the Nanoscale*; EJ Kautz, S Lambeets, B Gwalani, D Perea, L Kovarik, A Devaraj

A05.5 Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science

SESSION CHAIR:

Roland Brunner; Materials Center Leoben Forschung GmbH, Germany

PLATFORM SESSION

Wednesday 8:30 AM • Room: C122

- 8:30 AM **616** *Nondestructive 3D Nanoscale X-Ray Imaging of Solid Oxide Fuel Cells in the Laboratory*; ST Kelly, S Ricote, P Weddle, A Dubois, B Kee, W Harris, J Berger, RJ Kee

Scientific Program

A

Analytical Sciences Symposia – Wednesday Morning cont.

- 8:45 AM **617** (Invited) *High Resolution 3D and 4D Characterization of Microstructure Formation in Novel Ti Alloys for Additive Manufacturing*; **G Requena**, P Barriobero-Vila, K Bugelnig, J Haubrich, J Gussone, U Hecht, F Sket, JC da Silva, J Villanova
- 9:15 AM **618** *Full-field X-Ray Imaging, a Workhorse Microscopy Beamline at NSLS II for Material Science Researches*; **X Xiao**, M Ge, C Yin, F Wang, L Zou, F Chen, Y-C Chen-Wiegart, W-K Lee
- 9:30 AM **619** *Energy Tunability in Laboratory 3D Nano-XRM*; **J Gelb**, D Vine, T Lancon, S Lewis, S Lau, W Yun
- 9:45 AM **620** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Correlative 3D Characterization of High Temperature Oxide Scales on Co-Base Superalloys Using Nano-CT and FIB/SEM Tomography*; **J Wirth**, M Lenz, S Englisch, J Rosiwal, N Buchinger, M Weiser, B Apeleo Zubiri, S Virtanen, E Spiecker

A06.1 Low Voltage, Low Energy Electron Microscopy Imaging and Analysis

SESSION CHAIRS:
Natasha Erdman; JEOL USA
Hector Calderon; IPN

PLATFORM SESSION
Wednesday 8:30 AM • Room: B112

- 8:30 AM **621** (Invited) *Ultra Low Voltage Reflected Electron Energy-Loss Spectroscopy*; **Y Sakuda**, **S Asahina**, N Erdman, T Togashi, M Kurihara, O Terasaki
- 9:00 AM **622** *Surface Imaging with UHV SLEEM and SEM LEEM*; **S Mikmekova**, P Jansky, V Kolarik, I Mullerova
- 9:15 AM **623** *Using the EDS Clues: Peak Fitting Residual Spectrum and Analytical Total*; **DE Newbury**, NWM Ritchie
- 9:30 AM **624** *Imaging Li-Ion Battery Material with Low Voltage Backscattered Electrons – Comparison of a Field Emission SEM Crossbeam540/Merlin with the DELTA SEM*; **U Golla-Schindler**, I Wacker, B Schindler, T Bernthaler, G Schneider, RR Schröder
- 9:45 AM **625** *Low-Energy Nano Diffraction (LEND) – Bringing True Diffraction to SEM*; **P Schweizer**, P Denninger, C Dolle, S Rechberger, **E Spiecker**

A08.5 Current Trends and Challenges in Electron Energy-Loss Spectroscopy

SESSION CHAIRS:
Matthieu Bugnet; University of Lyon – CNRS, France
Patricia Abellan; SuperSTEM, United Kingdom

PLATFORM SESSION
Wednesday 8:30 AM • Room: B111

- 8:30 AM **626** (Invited) *Nanoscale Vibrational Spectroscopy of Graphene by Large-q EELS*; **R Senga**, K Suenaga, S Morishita, P Barone, F Mauri, T Pichler
- 9:00 AM **627** (STUDENT) *Bosonic Collective Modes in Quantum Materials Studied with meV-Resolved, Momentum-Resolved EELS*; **AA Husain**, M Mitrano, M Rak, S Ruback, A Kogar, S Vig, J Chen, P Abbamonte
- 9:15 AM **628** (Invited) *Theory for High Energy Resolution EELS of Vibrational and Defect States*; **P Rez**, BDA Levin, A Singh, C Dwyer
- 9:45 AM **629** *Nature of the Vibrational-Loss EELS Peaks Measured from Ionic Specimens*; **RF Egerton**, K March, K Venkatraman, PA Crozier

A09.4 Microscopy and Microanalysis for Real-World Problem Solving

SESSION CHAIRS:
Janet H. Woodward; Buckman
Ke-Bin Low; BASF
Xiaofeng Zhang; Nanosys, Inc.

PLATFORM SESSION
Wednesday 8:30 AM • Room: B113

- 8:30 AM **630** (Invited) *Transforming Samples into Data – Experimental Design and Sample Preparation for Electron Microscopy*; **A Liang**, C Petzold, K Dancel-Manning, Y Grobler, J Sall, R Lehmann, C Zhou, PH Ren
- 9:00 AM **631** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Microscopy on Drugs: Characterization and Quantification of Pt-Based Pharmaceuticals Using the STEM*; **AA Sheader**, G Vizcay-Barrena, RA Fleck, SJL Flatters, PD Nellist
- 9:15 AM **632** *Microscopic Evaluation of Fungal Cleaning Protocols for Aircraft Coatings*; **TT Brown**, JS Lee
- 9:30 AM **633** *Microscopy Techniques for Characterization of Hydration in Dairy Powders*; **VA Maidannyk**, N McCarthy, MA Auty
- 9:45 AM **634** *Scanning Electron Microscopy for Fabrication and Imaging of Hydrogel Composites*; **A Kolmakov**, T Gupta

A11.5 Current and Emerging Microscopy for Quantum Information Sciences

SESSION CHAIR:

Michael Zachman; Oak Ridge National Laboratory

PLATFORM SESSION

Wednesday 8:30 AM • Room: B117

- 8:30 AM **635** (Invited) *Structure-Property Relationships of Topological Insulator Nanomaterials*; P Liu, J Cha
- 9:00 AM **636** (STUDENT) *Aberration-Corrected STEM Observations on the Interfacial Structure and Strain Fields of Patterned SrRuO₃ Artificial Atoms*; H Wang, V Srot, G Laskin, H Boschker, J Mannhart, PA van Aken
- 9:15 AM **637** *Structural and Compositional Effects in Epitaxially-Strained Vanadate Thin Films*; DT Alexander, H Meley, B Mundet, J-M Triscone, S Gariglio
- 9:30 AM **638** (Invited) *Pushing the Limits of Absolute Scale Energy Dispersive X-Ray Quantification*; KE MacArthur, SM Collins, HG Brown, SD Findlay, LJ Allen

B

Biological Sciences Symposia – Wednesday Morning

B01.1 Multi-Modal, Large-Scale and 3D Correlative Microscopy

SESSION CHAIR:

Jacob P. Hoogenboom; Delft University of Technology, The Netherlands

PLATFORM SESSION

Wednesday 8:30 AM • Room: D137

- 8:30 AM **639** (Invited) *Smart Microscopy: Automation of CLEM Using in situ Fluorescence Detection*; LM Collinson
- 9:00 AM **640** *Automatic Registration of Correlative Microscopies with Error Assessment and Applications for the Optimization of Multimodal Acquisitions*; A Achaibou, G Potier, R Capoulade, J Merot, F Lavancier, X Heiligenstein, J Salameiro, P Paul-Gilloteaux
- 9:15 AM **641** (Invited) *Synapse to Circuit—Correlative Microscopy Workflows for Functional Analysis of the Brain*; N Kamasawa, CI Thomas, MA Ryan, D Guerrero-Given
- 9:45 AM **642** *Spectral Map Reconstruction Using Pan-Sharpening Algorithm: Enhancing Chemical Imaging with AFM-IR*; N Borodinov, N Bilkey, M Foston, AV Ievlev, A Belianinov, S Jesse, RK Vasudevan, SV Kalinin, OS Ovchinnikova

B02.1 Element Analysis of Biological Materials

SESSION CHAIRS:

Stefan Vogt; Argonne National Laboratory,
Peta Clode; University of Western Australia, Australia

PLATFORM SESSION

Wednesday 8:30 AM • Room: D138

- 8:30 AM **643** (Invited) *X-Ray Microscopy and Spectroscopy Combine to Probe Selenium Biology*; HH Harris, MJ Ceko, CM Weekely, PK Witting, RJ Rodgers
- 9:00 AM **644** *Multiscale Multimodal Multicolor Microscopy*; B Giepmans
- 9:15 AM **645** (M&M POST-DOCTORAL RESEARCHER AWARD) *Selective Ion Accumulation in Biomineralizing Marine Acantharia*; V Merk, J Decelle, S Chen, A Lanzirotti, M Newville, O Antipova, D Joester
- 9:30 AM **646** (Invited) *Visualization of the Ionome in Planktonic Symbioses*; J Decelle, G Veronesi, B Gallet, H Stryhanyuk, S Marro, R Tucoulou, N Musat

B07.1 3D Structures: from Macromolecular Assemblies to Whole Cells (3DEM FIG)

SESSION CHAIRS:

Melanie Ohi; University of Michigan Life Sciences Institute
Elitza Tocheva; University of British Columbia, Canada
Teresa Ruiz; University of Vermont

PLATFORM SESSION

Wednesday 8:30 AM • Room: D139

- 8:30 AM **647** (Invited) *Towards a Mechanistic Understanding of P Element Transposition Using Single-Particle Cryo-EM*; EH Kellogg, G Ghanim, E Nogales, DC Rio
- 9:00 AM **648** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Structural Analysis of Helicobacter pylori VacA Reveals Insights into Oligomerization*; AL Erwin, M Su, AM Campbell, DL Akey, DB Lacy, TL Cover, MD Ohi
- 9:15 AM **649** (Invited) *Computational Methods to Process Highly Heterogeneous Cryo-EM Samples*; J Gomez-Blanco, S Kaur, J Ortega, J Vargas
- 9:45 AM **650** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Cryo-EM Reveals IMP Dehydrogenase I Filaments Adopt Diverse Architectures*; AL Burrell, M Said, C Nie, MC Johnson, JM Kollman

Scientific Program

B

Biological Sciences Symposia – Wednesday Morning cont.

B09.1 From Images to Insights: Working with Large Data in Cell Biological Imaging

SESSION CHAIRS:

Camenzind Robinson; St. Jude Children's Research Hospital
Kedar Narayan; Frederick National Laboratory for Cancer Research

PLATFORM SESSION

Wednesday 8:30 AM • Room: C120-121

- 8:30 AM **651** (Invited) *Automated Reconstruction of a Serial-Section EM Drosophila Brain with Flood-Filling Networks and Local Realignment*; **PH Li**, LF Lindsey, M Januszewski, M Tyka, J Maitin-Shepard, T Blakely, V Jain
- 9:00 AM **652** *Building a Data-Driven Workflow to Streamline Cryo-EM Data Processing*; **Y Li**, MA Cianfrocco
- 9:15 AM **653** *A FAIR Principal Data Model for Focused Ion Beam Scanning Electron Microscopy (FIB-SEM) and the Frederick National Laboratory Data Coordinating Center*; **P Aiyetan**, K Narayan, D Mott, R Kuchipudi, C Zeitler, D Hope, U Mudunuri, A Quong
- 9:30 AM **654** *Scalable Imaging Science Tools to Support Increasingly Efficient Workflows for Research Tasks on Massive Images*; **C Goetze**, CT Zugates, T Ruth, P Boenisch, A Brady-Myerov
- 9:45 AM **655** *Harnessing the Power of the Crowd for Bioimage Analysis*; M Jones, H Songhurst, C Peddie, A Weston, H Spiers, C Lintott, **LM Collinson**

P

Physical Sciences Symposia – Wednesday Morning

P01.4 In situ TEM Characterization of Dynamic Processes During Materials Synthesis and Processing

SESSION CHAIRS:

Qian Chen; University of Illinois
Eli Sutter; University of Nebraska-Lincoln

PLATFORM SESSION

Wednesday 8:30 AM • Room: B116

- 8:30 AM **656** (Invited) *In situ TEM Approaches to Controlling the Growth of Semiconductors on 2D Materials*; P Periwal, JD Thomsen, MC Reuter, D Zakharov, L Gignac, T Booth, S Hofmann, **FM Ross**
- 9:00 AM **657** *Using in situ Gas Heating TEM to Investigate Compound Nanowire Growth Mechanisms*; **M Song**, J Lee, D Li
- 9:15 AM **658** *Tracing Oxygen Transport Pathways with in situ STEM and Theory*; AY Birenbaum, VR Cooper, **AY Borisevich**
- 9:30 AM **659** *Composition Analysis by EDS at Elevated Temperatures and More*; **M Falke**, I Nemeth
- 9:45 AM **660** (STUDENT) *In situ Heating to Investigate Phase Transformations in Individual Powder Particles of a Gas-Atomized Icosahedral-Phase-Strengthened Al Alloy*; **HR Leonard**, S Rommel, S Vijayan, TJ Watson, T Policandriotes, M Aindow

P02.2 Microscopy and Microanalysis of Nuclear and Irradiated Materials

SESSION CHAIRS:

Khalid Hattar; Sandia National Laboratories
Peter Hosemann; University of California-Berkeley

PLATFORM SESSION

Wednesday 8:30 AM • Room: D133-134

- 8:30 AM **661** (Invited) *Cavities Imaged by In-Line Electron Holography in Irradiated Aluminium Alloy*; **J Ribis**, P Donnadieu, C Flament, M Loyer-Prost, F Leprêtre
- 9:00 AM **662** *Investigating Effects of Alloy Chemical Complexity on Helium Bubble Formation by Accurate Segregation Measurements Using Atom Probe Tomography*; **X Wang**, K Jin, D Chen, H Bei, Y Wang, WJ Weber, Y Zhang, J Poplawsky, KL More
- 9:15 AM **663** *Mapping Cation Disorder in Irradiated Gd₂Ti₂O₇ Pyrochlore by 4D-STEM*; **MT Janish**, MM Schneider, C Ophus, J Ciston, JA Valdez, KJ McClellan, DD Byler, D Chen, Y Wang, TG Holesinger, BP Uberuaga
- 9:30 AM **664** *Atomic-Scale Mechanisms for Interfacial Radiation Damage Resistance of Thin Film Oxide Heterostructures*; **SR Spurgeon**, M Sassi, T Kaspar, W Jiang, V Shutthanandan

9:45 AM **665** (STUDENT) *Automated Quantitative Analysis of Extended Irradiation Defects - Dislocations, Voids and Precipitates in Neutron Irradiated HT-9 Steel*; **R Sainju**, C Ophus, MB Toloczko, DJ Edwards, Y Zhu

P03.2 Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions

SESSION CHAIRS:

Stig Helveg; Haldor Topsoe A/S, Denmark
Joerg R Jinschek; The Ohio State University

PLATFORM SESSION

Wednesday 8:30 AM • Room: D135

- 8:30 AM **666** (Invited) *Development of a Dynamic Environment Transmission Electron Microscope for the Study of Fast Phenomena in Nanoscale Materials*; **R vanderVeen**
- 9:00 AM **667** (STUDENT) *Reducing Radiation Damage Using Pulsed Electron Beams in the TEM*; **EJ VandenBussche**, DJ Flannigan
- 9:15 AM **668** *Nanoscale Structural Dynamics Probed by Coherent Ultrafast TEM*; **A Feist**, T Danz, NR da Silva, S Vogelgesang, N Bach, T Domröse, S Schäfer, C Ropers
- 9:30 AM **669** (Invited) *Anisotropic Structural Dynamics of Few-Layer Black Phosphorus Revealed by Ultrafast Electron Microscopy*; Y-J Kim, **O-H Kwon**

P04.1 Spectroscopy and Imaging of Nanostructured Low-Z Materials in the Electron Microscope

SESSION CHAIRS:

Meiken Falke; Bruker, Germany
Dan Hodoroba; Federal Institute for Materials Research and Testing, Germany

PLATFORM SESSION

Wednesday 8:30 AM • Room: F149

- 8:30 AM **670** (Invited) *Imaging and Spectroscopy of Low-Dimensional Low-Z Materials by 20-300kV TEM*; **UKaiser**
- 9:00 AM **671** (STUDENT) *New Metastable Carbon Phases Observed by HRTEM*; **D Luo**, L Yang, H Xie, H-K Mao, J Wen
- 9:15 AM **672** (STUDENT) *Probing the Mechanical Properties of Few-Layer Graphene with Aberration-Corrected, Low-Voltage STEM*; **E Han**, J Yu, K Nguyen, E Ertekin, A van-der Zande, PY Huang
- 9:30 AM **673** (Invited) *Imaging Low Z Materials in Crystalline Environments via Scanning Transmission Electron Microscopy*; **SD Findlay**, N Shibata, Y Ikuhara, L Clark, HG Brown, TC Petersen, DM Paganin, MJ Morgan

P06.5 In situ TEM of Nanoscale Materials and Electronic Devices for Phase Transformation Studies

SESSION CHAIRS:

Judy Cha; Yale University
Thomas C. Pekin; Humboldt Universität zu Berlin, Germany

PLATFORM SESSION

Wednesday 8:30 AM • Room: B118-119

- 8:30 AM **674** (Invited) *In situ S/TEM Heating Experiments to Study the Effects of Cyclic Thermal Gradients in Additive Manufacturing Build Processes*; **JR Jinschek**, S Vijayan, M Shao, C-H Li
- 9:00 AM **675** *In situ Atomic Scale Observation of Cu₂O reduction under Methanol*; **M Li**, H Chi, MT Curnan, MA Cresh-Sill, SD House, WA Saidi, G Vesper, JC Yang
- 9:15 AM **676** (Invited) *TiO₂ Phase Transformation Mechanisms at Atomic Scale Under Heating and Electron Beam*; M Song, **D Li**
- 9:45 AM **677** *Self-Healing of a Confined Phase Change Memory Device with a Metallic Surfactant Layer*; Y Xie, W Kim, Y Kim, S Kim, J Gonsalves, M BrightSky, C Lam, Y Zhu, **J Cha**

P08.5 Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications

SESSION CHAIRS:

Katherine Jungjohann; Sandia National Laboratories
Ruoqian Lin; Brookhaven National Laboratory

PLATFORM SESSION

Wednesday 8:30 AM • Room: B115

- 8:30 AM **678** (Invited) *Multi-Modal Characterization Approach to Understand Proton Transport Mechanisms in Solid Oxide Fuel Cells*; **R Unocic**, J Ding, J Balachandran, X Sang, W Guo, JD Poplawsky, G Veith, C Bridges, N Bassiri-Gharb, P Ganesh
- 9:00 AM **679** (STUDENT) (**M&M MEETING SCHOLAR AWARD**) *Real-Time Imaging of Surface Dynamics on CeO₂ Nanoparticles Using Time-Resolved Aberration-Corrected TEM*; **EL Lawrence**, BD Levin, BK Miller, PA Crozier
- 9:15 AM **680** (STUDENT) *Identical Location STEM analysis on La_{1-x}SrxCoO₃ Oxygen-Evolution Catalysts*; **X Rui**, D Chung, P Papa Lopes, H Zheng, J Mitchell, NM Markovic, RF Klie
- 9:30 AM **681** (Invited) *Transmission Electron Microscopy of Catalytic Nanomaterials at Atomic Resolution*; S Dai, X Yan, W Gao, P Tieu, GW Graham, **X Pan**

Scientific Program

P

Physical Sciences Symposia – Wednesday Morning cont.

P10.1 Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing Natural and Synthetic Materials

SESSION CHAIRS:

Donggao Zhao; University of Missouri-Kansas City
Minghua Ren; University of Nevada-Las Vegas

PLATFORM SESSION

Wednesday 8:30 AM • Room: F150

- 8:30 AM **682** (Invited) *Electron Probe Microanalysis of Actinide Elements: Our Past, Present, and Future*; **KE Wright**
- 9:00 AM **683** *Beyond Rules-of-Thumb: Optimizing EPMA Measurements*; **NWM Ritchie**
- 9:15 AM **684** *Quantitative Compositional Stage Mapping and Cluster Analysis Applied to a Vanadian Slag Sample*; **PK Carpenter**
- 9:30 AM **685** (Invited) *Standard Reference Materials of Microanalysis in China*; **Z Chen, J Zhou**

P12.1 New Frontiers in Atom Probe Tomography Applications

SESSION CHAIRS:

Baishakhi Mazumder; University at Buffalo
Arun Devaruj; Pacific Northwest National Laboratory

PLATFORM SESSION

Wednesday 8:30 AM • Room: D136

- 8:30 AM **686** (Invited) *Correlative UHV-Cryo Transfer Suite: Connecting Atom Probe, SEM-FIB, Transmission Electron Microscopy via an Environmentally-Controlled Glovebox*; **J Cairney, I McCarroll, Y-S Chen, K Eder, T Sato, Z Liu, A Rosenthal, R Wepf**
- 9:00 AM **687** *Local Electrode Atom Probe Tomography of Carbon Fibre*; **RK Marceau, AS Taylor, T Sato, SP Ringer, BL Fox, N Stanford, LC Henderson**
- 9:15 AM **688** *New Applications to Atom Probe Tomography: Insights on Trace Element Diffusion in Naturally Deformed Minerals*; **R Dubosq, B Gault, A Rogowitz, K Schweinar, S Zaefferer, D Schneider**
- 9:30 AM **689** *Three-Dimensional Microstructural Characterization of Novel Chalcogenide Nanocomposites for Gradient Refractive Index Applications*; **HG Francois-Saint-Cyr, M Kang, I Martin, S Antonov, TJ Prosa, K Richardson**
- 9:45 AM **690** *Correlative Analysis in the Semiconductor Industry*; **DJ Larson, TJ Prosa, I Martin, A-S Robbes, A Merkulov, N Bernier, V Delaye, P vander Heide, O Dulac, D Reinhard, R Ulfing**

P13.1 Advanced Characterization of Components Fabricated by Additive Manufacturing

SESSION CHAIRS:

Isabella van Rooyen; Idaho National Laboratory
Mukesh Bachhav; Idaho National Laboratory
Federico Sciammarella; Northern Illinois University
Cesar Terrazas; University of Texas

PLATFORM SESSION

Wednesday 8:30 AM • Room: D140

- 8:30 AM **691** (Invited) (STUDENT) *Porosity Formation and Melt Pool Geometry Analysis Using High-speed, in situ Imaging of Directed Energy Deposition*; **S Webster, S Wolff, J Bennett, T Sun, J Cao, K Ehmann**
- 8:45 AM **692** *High Resolution X-Ray Microscopy for 3D Characterization and Qualification of AM Materials*; **WM Harris, H Bale, ST Kelly**
- 9:00 AM **693** *Understanding the High Strength of L-PBF Metals Using In and Ex Situ Characterization by TEM and Synchrotron XRD*; **T Voisin, J-B Forien, JT McKeown, MJ Matthews, YM Wang**
- 9:15 AM **694** *Melt Pool and Microstructure Characterization for AM Model Development*; **JT McKeown, JD Roehling, A Perron, J-L Fattebert, JM Wiezorek, AJ Clarke, DJ Bober, JN Florando, M Kumar, SA Khairallah, MJ Matthews**
- 9:30 AM **695** *Rapid Analysis as an Integral Part of Additive Manufacturing*; **J Goulden, P Trimby, J Porter, M Hiscock**
- 9:45 AM **696** *In situ Characterization of Laser Powder Bed Fusion Using High-speed Synchrotron X-Ray Imaging Technique*; **N Parab, C Zhao, R Cunningham, L Escano, K Fezzaa, A Rollett, L Chen, T Sun**

T

Tutorials – Wednesday Morning

X31.1 Technologists' Forum Roundtable: Technical Careers in Microscopy – For the Love of Microscopy

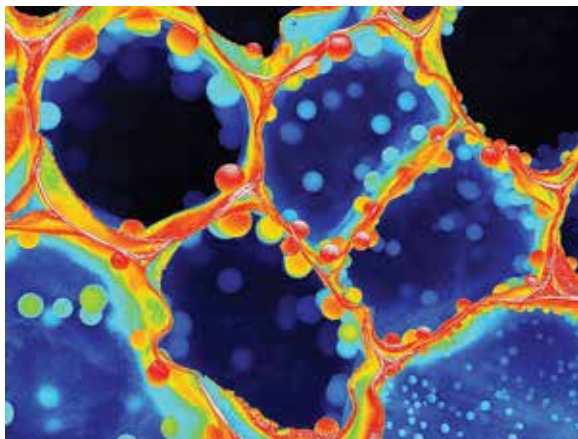
SESSION CHAIRS

Phoebe Doss; University of Texas Southwestern
Janice G Pennington; University of Wisconsin

PLATFORM SESSION

Wednesday 8:30 AM • Room: B110

- 8:30 AM **697** *Tech Forum Roundtable: Technical Careers in Microscopy – For the Love of Microscopy*; **F Macaluso**, RL Martens, T Nylese, L Cohen-Gould, FR Villalovoz
- 698 (Invited)** *Career Advancement: Microscopy Technician to Core Facility Director*; **FP Macaluso**
- 699 (Invited)** *My Life as a Microscopist; Two Dual Beams and an Atom Probe*; **RL Martens**, TF Kelly, GB Thompson
- 700 (Invited)** *A Career with Passion in The Sciences*; **T Nylese**
- 701 (Invited)** *The MSA Certification Program for Biological Electron Microscopy*; **L Cohen-Gould**
- 702 (Invited)** *A Review of Fifty Years of Light and Electron Microscopy at a Two-Year Community College*; **FR Villalovoz**, CJ Davis



FREE & OPEN TO ALL!

**Microscopy Workshop:
Micrographs that Win**

1:30 – 2:30 PM • Room C123

See page 64 for details!

A

Analytical Sciences Symposia – Wednesday Late Morning

A01.6 Advances in Phase Retrieval Microscopy

SESSION CHAIRS:

Martha R. McCartney; Arizona State University
Ben McMorran; University of Oregon

PLATFORM SESSION

Wednesday 10:30 AM • Room: B114

- 10:30 AM **703 (Invited)** *Model-Based Iterative Reconstruction of Charge Density in Nanoscale Materials Using Off-Axis Electron Holography*; **F Zheng**, J Caron, V Migunov, G Pozzi, **RE Dunin-Borkowski**
- 11:00 AM **704** *Precise Measurement of Carrier Concentrations in n-Type GaN by Phase-Shifting Electron Holography*; **K Yamamoto**, K Nakano, A Tanaka, Y Honda, Y Ando, M Ogura, M Matsumoto, S Anada, Y Ishikawa, H Amano, T Hirayama
- 11:15 AM **705** *Electron Hologram Denoising via Sparse Coding and Dictionary Learning*; **S Anada**, Y Nomura, T Hirayama, K Yamamoto
- 11:30 AM **706** *In-Plane Magnetic Field Evaluation with 0.47-nm Resolution by Aberration-Corrected 1.2-MV Holography Electron Microscope*; **T Tanigaki**, T Akashi, T Yoshida, K Harada, K Ishizuka, M Ichimura, Y Murakami, K Mitsuishi, Y Tomioka, D Shindo, X Yu, Y Tokura, H Shinada
- 11:45 AM **707** *Focused Electron-Beam Induced Deposition, In situ TEM and Off-Axis Electron Holography Investigation of Bi- Magnetic Core-Shell Nanostructures*; **TP Almeida**, D McGrouther, A Kovács, RE Dunin-Borkowski, S McVitie

A02.6 Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy

SESSION CHAIRS:

Francisco de la Peña; Université Lille, France
Philippe T. Pinard; Oxford Instruments, United Kingdom
Eric Prestat; Manchester University, United Kingdom

PLATFORM SESSION

Wednesday 10:30 AM • Room: C123

- 10:30 AM **708** *Advancements to the Digital Representation Environment for Analysis of Materials in Three Dimensions—DREAM.3D*; **MA Jackson**, **DM Dimiduk**, MA Groeber, SP Donegan
- 11:00 AM **709 (STUDENT)** *Using Deep Learning to Deconvolute Complex Spectra for Hyperspectral Imaging Applications*; **S Rudinsky**, Y Yuan, F Lavoie, R Gauvin, R Gosselin, N Braid, N Piché, M Marsh
- 11:15 AM **710 (STUDENT)** *Machine Learning for Challenging EELS and EDS Spectral Decomposition*; **TF Blum**, M Chi, X Pan, J Graves, M Zachman, R Kannan

Scientific Program

A

Analytical Sciences Symposia – Wednesday Late Morning cont.

- 11:30 AM **711** *Deep-Learning Based Autofocus Score Prediction of Scanning Electron Microscope*; H Kim, M Oh, H Lee, J Jang, MU Kim, **HJ Yang**, M Ryoo, J Lee
- 11:45 AM **712** *Information Theory-Based Crystallographic Symmetry Classifications of a Noisy 2D Periodic Scanning Tunneling Microscope Image*; **P Moeck**, A Dempsey, C Shu

A05.6 Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science

SESSION CHAIR:

Erdmann Spiecker; Universität Erlangen-Nürnberg, Germany

PLATFORM SESSION

Wednesday 10:30 AM • Room: C122

- 10:30 AM **713** *Scale-Bridging 3D-Analysis of Colloidal Clusters Using 360° Electron Tomography and X-Ray Nano-CT*; **S Englisch**, J Wirth, T Przybilla, B Apeleo Zubiri, J Wang, N Vogel, E Spiecker
- 10:45 AM **714** (Invited) *3D Imaging Using HAADF-STEM and HRTEM Atomic Electron Tomography*; **C Ophus**, D Ren, J Zhou, H Devyldere, M Chen, PM Pelz, P Ercius, J Miao, M Scott, L Waller
- 11:15 AM **715** (M&M POST-DOCTORAL RESEARCHER AWARD) *Scale-Bridging 3D Analysis of Micro-/Macroporous Zeolite Particles Using X-Ray Nano-Tomography and Electron Tomography*; **B Apeleo Zubiri**, T Weissenberger, T Przybilla, J Wirth, S Englisch, D Drobek, W Schwieger, E Spiecker
- 11:30 AM **716** (STUDENT) *3D Structure Determination of Pt-Based Nanocatalysts at Atomic Resolution*; **Y Yang**, J Zhou, Y Yang, Z Zhao, DS Kim, X Tian, C Ophus, J Ciston, P Ercius, Y Huang, J Miao
- 11:45 AM **717** (STUDENT) *Three-Dimensional Imaging of Nanoparticle Chemistry Using Spectroscopic Single Particle Reconstruction*; **Y-C Wang**, TJA Slater, GM Leteba, AM Roseman, CP Race, NP Young, AI Kirkland, CI Lang, SJ Haigh

A06.2 Low Voltage, Low Energy Electron Microscopy Imaging and Analysis

SESSION CHAIRS:

David Bell; Harvard University

Quentin Ramasse; SuperSTEM, United Kingdom

PLATFORM SESSION

Wednesday 10:30 AM • Room: B112

- 10:30 AM **718** (Invited) *Influence of Electron Beam Energy and Dose on in situ Electron Microscopy Studies for Direct Correlation between Structure and Properties*; **E Olsson**

- 11:00 AM **719** *Quantifying Elastic and Inelastic Electron Irradiation Damage in Transmission Electron Microscopy of 2D Materials*; **T Susi**, T Lehnert, U Kaiser, J Meyer, J Kotakoski

- 11:15 AM **720** *Semiconductor and Soft Material Analysis with Low-kV TEM*; **T Yaguchi**, KT Tamura, T Kubo, Y Nodera, K Igarashi, A Wakui, T Kanemura, M Konomi

- 11:30 AM **721** *Trinity Detection System for SEM and FIB/SEM*; **P Wandrol**

- 11:45 AM **722** *Low Voltage Imaging of Quantum Materials imaging the Surface Plasmon Polaritons in Chalcogenides*; C Ozsoy- Keskinbora, K Chaudhary, M Tamagnone, Y Ou, A Devarakonda, T Suzuki, JG Checkelsky, F Capasso, J Moodera, **DC Bell**

A08.6 Current Trends and Challenges in Electron Energy-Loss Spectroscopy

SESSION CHAIRS:

Patricia Abellan; SuperSTEM, United Kingdom

Matthieu Bugne University of Lyon – CNRS, France

PLATFORM SESSION

Wednesday 10:30 AM • Room: B111

- 10:30 AM **723** (Invited) *EELS in STEM: the “Swiss Army Knife” of Spectroscopy*; **JC Idrobo**, A Konečná, J Gazquez, JA Hachtel, TC Lovejoy, N Dellby, FJ Garcia de Abajo, M Kociak, J Aizpurua, OL Krivanek
- 11:00 AM **724** *Probing Thermal-induced Phonon Energy Shift of SiC in Nanoscale by in situ Vibrational Spectroscopy*; **X Yan**, C Liu, CA Gadre, R Wu, X Pan
- 11:15 AM **725** (M&M POST-DOCTORAL RESEARCHER AWARD) *Towards Plasmon-Exciton Hybridization at the Nanoscale Using STEM EELS*; **AB Yankovich**, B Munkhbat, DG Baranov, J Cuadra, E Olsén, H Lourenço-Martins, LHJ Tizei, M Kociak, E Olsson, T Shegai
- 11:30 AM **726** (STUDENT) *Mapping the Nanoscale Redshift of Optical Phonon Modes in a Strained Quantum Dot System*; **CA Gadre**, X Yan, T Aoki, S-W Lee, X Pan
- 11:45 AM **727** *Progress in Ultra-High Energy Resolution EELS*; **TC Lovejoy**, GJ Corbin, N Dellby, N Johnson, MV Hoffman, A Mittelberger, OL Krivanek

A09.5 Microscopy and Microanalysis for Real-World Problem Solving

SESSION CHAIRS:

Janet H. Woodward; Buckman

Ke-Bin Low; BASF

Xiaofeng Zhang; Nanosys, Inc.

PLATFORM SESSION

Wednesday 10:30 AM • Room: B113

- 10:30 AM **728** (Invited) *Failure Analysis of Trace Elements and Surfaces Using Hitachi Dedicated STEM*; **C Vartuli**, B Tracy, J Gu

- 11:00 AM **729** *A Simple Method to Decouple Redeposition-Related Artifacts from Real Defects in the Failure Analysis of Silicon Photonics Modules*; **F Khatkhatay**, PS Pichumani
- 11:15 AM **730** (TECHNOLOGIST/STAFF - PHYSICAL) *Failure Analysis of Polyethylene Products Using Microscopy*; **AF Johnson**, P Boopalachandran, E Garcia-Meitin, SR Athreya
- 11:30 AM **731** *Radiation Damage on Liquid Electrolyte during Spatially Resolved Soft X-Ray Photoemission Measurements*; **CM Arble**, H Gou, B Hoskins, P Zeller, M Amati, L Gregoratti, A Kolmakov
- 11:45 AM **732** *Structural Assessment of (Sub-)Monolayer Coatings in Device Processing at High Spatial Resolving Power by TOF-SIMS Tandem MS Imaging*; **GL Fisher**

A10.1 Advances in Focused Ion Beam Instrumentation and Techniques

SESSION CHAIRS:

Suzy Vitale; Carnegie Institution for Science
Joshua Sugar; Sandia National Laboratories
Bruce Arey; Pacific Northwest National Laboratory
Alan Bahm; Thermo Fisher Scientific

PLATFORM SESSION

Wednesday 10:30 AM • Room: F151

- 10:30 AM **733** (Invited) *Avoiding FIB Damage Using the "Umbrella" Method*; **C Tasan**, T Vermeij, E Plancher
- 11:00 AM **734** (STUDENT) *Ion Induced Bidirectional Bending for Controlled Manipulation at Nanoscale*; **V Garg**, RG Mote, T Chou, A Liu, AD Marco, B Kamaliya, S Qiu, J Fu
- 11:15 AM **735** *Integrated Focused Ion Beam-Ultramicrotomy Method for TEM Specimen Preparation of Porous Fine-Grained Materials*; **KK Ohtaki**, J Bradley, H Ishii
- 11:30 AM **736** *Too Close for Comfort: Creating Two TEM Samples From Areas Separated By 270 Nanometers*; **N Wang**, G Perreault
- 11:45 AM **737** *Two Methods for Measuring Lamellae Thicknesses in situ for Improved FIB Specimen Preparation*; **AM Rakowski**, E Tillotson, AP Rooney, SJ Haigh

B

Biological Sciences Symposia – Wednesday Late Morning

B01.2 Multi-Modal, Large-Scale and 3D Correlative Microscopy

SESSION CHAIR:

James A.J. Fitzpatrick; Washington University School of Medicine

PLATFORM SESSION

Wednesday 10:30 AM • Room: D137

- 10:30 AM **738** (Invited) *In situ Correlative Helium Ion Microscopy and Secondary Ion Mass Spectrometry for High-Resolution Nano-Analytics in Life Sciences*; **J Lovric**, J-N Audinot, T Wirtz
- 11:00 AM **739** *Correlative Live-Cell, Electron Microscopy and Nanoscale Single Ion Mass Spectrometry Elucidates the Mechanism for the Release of Cholesterol-Rich Particles from the Plasma Membrane of Macrophages*; **TA Weston**, X Hu, C He, RS Jung, LG Fong, H Jiang, SG Young
- 11:15 AM **740** (Invited) *Correlative X-Ray Ptychographic and Fluorescence Imaging at the Advanced Photon Source*; **J Deng**, S Chen, Q Jin, E Vacek, C Jacobsen, B Lai, S Vogt
- 11:45 AM **741** *Using 3D X-Ray Microscopy to Study Crown Root Development and Primary Root Tip Growth in Diverse Maize (Zea mays L.) Lines*; **KE Duncan**, AL Bray, TG Dowd, CN Topp

B02.2 Element Analysis of Biological Materials

SESSION CHAIRS:

Peta Clode; University of Western Australia, Australia
Nicole Hondow; University of Leeds, United Kingdom

PLATFORM SESSION

Wednesday 10:30 AM • Room: D138

- 10:30 AM **742** (Invited) *Challenges in Biological X-Ray Microanalysis in the AEM*; **NJ Zaluzec**, J Seeler, R Bleher, T O'Halloran
- 11:00 AM **743** (STUDENT) *Intracellular Elemental Mapping Using Simultaneous EELS and EDS: A Combined Approach to Quantifying Na, K and Ca*; **AA Sheader**, G Vizcay-Barrena, RA Fleck, SJL Flatters, PD Nellist
- 11:15 AM **744** *Analysing Cell Level Allocation of Calcium and Phosphorus in Leaves of Proteaceae from South-Western Australia*; **PE Hayes**, PL Clode, C Guilherme Pereira, H Lambers
- 11:30 AM **745** (Invited) *Assessing Membrane Micro-Domain Physiology from the Inside-Out Using Confocal Microscopy*; **TR Cully**, RM Murphy, I Jayasinghe, GG Rodney, BS Launikonis

NOTE: Two talks in B07.2 were inadvertently omitted from the printed program: #749 (N.Gulati-11:30 am) and #750 (Z.Wang-11:45 am). They are both correctly shown in the M&M mobile app.

Scientific Program

B

Biological Sciences Symposia – Wednesday Late Morning cont.

B07.2 3D Structures: from Macromolecular Assemblies to Whole Cells (3DEM FIG)

SESSION CHAIRS:

Elitza Tocheva; University of British Columbia, Canada
Melanie Ohi; University of Michigan
Teresa Ruiz; University of Vermont

PLATFORM SESSION

Wednesday 10:30 AM • Room: D139

10:30 AM **746** (STUDENT) (M&M MEETING SCHOLAR AWARD)
CryoEM Reveals Multi-step Activation of γ Tubulin and Assemblies to Optimize Microtubule Nucleation;
AF Brilot, DA Agard

10:45 AM **747** (M&M POST-DOCTORAL RESEARCHER AWARD)
Structural Studies of Coronavirus Fusion Proteins;
AC Walls, MA Tortorici, X Xiong, J Snijder, B Frenz, B-J Bosch, F DiMaio, D Corti, FA Rey, D Veessler

11:00 AM **748** (Invited) *Structural Studies of Coronavirus Fusion Proteins;* AC Walls, MA Tortorici, X Xiong, J Snijder, B Frenz, B-J Bosch, F DiMaio, D Corti, FA Rey, D Veessler

SEE ABOVE

B09.2 From Images to Insights: Working with Large Data in Cell Biological Imaging

SESSION CHAIRS:

Jonathan Lefman; NVIDIA Corporation
Camenzind Robinson; St. Jude Children's Research Hospital

PLATFORM SESSION

Wednesday 10:30 AM • Room: C120-121

10:30 AM **751** (Invited) *Visualizing and Interacting with Large Imaging Data;* E Perlman

11:00 AM **752** *Deep Learning Based Segmentation of Nuclei from Fluorescence Microscopy Images;* P Gudla, G Zaki, S Shachar, T Misteli, G Pegoraro

11:15 AM **753** *Good Practices in Data Management Significantly Reduce Costs in Cryo-EM;* MJ Borgnia, A Bartesaghi

11:30 AM **754** *Maturation Times of Pancreatic Beta Cell Secretory Granules Estimated from Serial Block-Face Electron Microscopy;* RD Leapman, MA Aronova, A Rao, EL McBride, G Zhang, H Xu, AL Notkins, T Cai

11:45 AM **755** *Processing Volumetric Data for Correlative Analysis: an Anecdote from a Core Facility;* CI Thomas, N Kamasawa

P

Physical Sciences Symposia – Wednesday Late Morning

P01.5 In situ TEM Characterization of Dynamic Processes during Materials Synthesis and Processing

SESSION CHAIRS:

Frances Ross; Massachusetts Institute of Technology
Qian Chen; University of Illinois

PLATFORM SESSION

Wednesday 10:30 AM • Room: B116

10:30 AM **756** (Invited) *In situ TEM Investigation on Reaction Mechanisms of Conversion Electrode Materials for Batteries;* D Su

11:00 AM **757** (STUDENT) *Dynamic Observation of Li-Ion Movement in a Solid-State Li-Ion Battery;* Y Nomura, K Yamamoto, T Hirayama, E Igaki, K Saitoh

11:15 AM **758** *Operando Liquid-Electrochemical TEM for Monitoring Growth and Dissolution Steps of NaO₂ Cubes in Na-O₂ Battery;* W Dachraoui, L Lutz, LR Johnson, PG Bruce, J-M Tarascon, A Grimaud, A Demortière

11:30 AM **759** *Can the Environmental TEM Confirm Atomistic Models of Adsorbed Molecules at Surfaces of Solids?;* M Bugnet, I Pershukov, O Matz, M Calatavud, T Epicier

11:45 AM **760** *The Utility of Xe-Plasma FIB for Preparing Aluminum Alloy Specimens for MEMS-Based in situ Double-Tilt Heating Experiments;* LF Allard, DN Leonard, JD Poplawsky, MF Chisholm, BD Eckhart, A Shyam, FS Walden, BB Larson, R Kelley, A Stokes, WC Bigelow

P02.3 Microscopy and Microanalysis of Nuclear and Irradiated Materials

SESSION CHAIRS:

Khalid Hattar; Sandia National Laboratories
Farida Selim; Bowling Green State University

PLATFORM SESSION

Wednesday 10:30 AM • Room: D133-134

10:30 AM **761** (Invited) *In situ TEM Measurements of Ion Irradiation Induced Creep;* SJ Dillon, G Jawaharram, C Barr, PM Price, K Hattar

11:00 AM **762** (STUDENT) *The Temperature Dependence of Defect Evolution in Irradiated Graphite;* SD Johns, JJ Kane, WE Windes, R Ubic, K Bustillo, K Chinnathambi

11:15 AM **763** *Investigation of Helium Behavior in Multilayered Hydride Structures Through in situ TEM Ion Implantation;* CA Taylor, K Hattar, B Arey, BE Matthews, D Zschiesche, R Goeke

11:30 AM **764** *In situ Ion Irradiation and Recrystallization in Highly Structured Materials;* JA Aguiar, A Monterrosa, B Reed, D Masiel, S Kwon, M Gong, T Tasdizen, B Coryell, K Jungjohann, K Hattar, E Luther, HT Hartman

- 11:45 AM **765** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Substitutional Si Doping of Graphene and Nanotubes through Ion Irradiation-Induced Vacancies*; **H Inani**, K Mustonen, A Markevich, E-X Ding, M Tripathi, A Hussian, C Mangler, EI Kauppinen, T Susi, J Kotakoski

P03.3 Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions

SESSION CHAIRS:

David Flannigan; University of Minnesota
Stig Helveg; Haldor Topsoe A/S, Denmark

PLATFORM SESSION

Wednesday 10:30 AM • Room: D135

- 10:30 AM **766** (Invited) *Towards Atomic Resolution Electron Microscopy with Structured Temporal Electron Illumination of Picosecond Time Resolution*; **C Kisielowski**, P Specht, B Freitag, E Kieft, W Verhoeven, J van Rens, P Mutsaers, J Luiten, S Rozeveld, J Kang, A McKenna, P Nickias, D Yancey
- 11:00 AM **767** *Measuring Single Electrons – What Does it Mean?*; H Ryll, **M Huth**, R Ritz, CM O'Leary, I Griffiths, P Nellist, R Sagawa, Y Kondo, H Soltau, L Strüder
- 11:15 AM **768** *Secondary-Electron Electron-Beam-Induced Current Measurements at Lattice Resolution*; **M Mecklenburg**, WA Hubbard, JJ Lodico, BC Regan
- 11:30 AM **769** (Invited) *Laser-free GHz Stroboscopic TEM: Construction, Deployment, and Benchmarking*; **JW Lau**, KB Schliep, MB Katz, VJ Dokhale, JJ Gorman, A Liu, Y Zhao, C Jing, A KJanareykin, X Fu, Y Zhu

P04.2 Spectroscopy and Imaging of Nanostructured Low-Z Materials in the Electron Microscope

SESSION CHAIRS:

Andrew Stewart; University of Limerick, Ireland
Meiken Falke; Bruker, Germany

PLATFORM SESSION

Wednesday 10:30 AM • Room: F149

- 10:30 AM **770** (Invited) *Imaging and Analysis of Low Atomic Number Materials in the STEM*; JA Alexander, M Chilcote, E Johnston-Halperin, **DW McComb**
- 11:00 AM **771** *Aberration-Corrected STEM Analysis of Impurities in Cosmic Nanodiamonds and Synthetic Analogs*; **RM Stroud**
- 11:15 AM **772** *Scan Strategies for Electron Energy-Loss Spectroscopy at Optical and Vibrational Energies in Perylene Diimide Nanobelts*; **SM Collins**, DM Kepaptsoglou, DN Johnstone, T Willhammar, R Pandya, J Gorman, R Friend, A Rao, PA Midgley, QM Ramasse

- 11:30 AM **773** *Aggregation Behavior of Detonation Nanodiamond in Solution*; **SLY Chang**, D Williams, M Roldan Gutierrez, C Dwyer, AS Barnard

- 11:45 AM **774** *Transmission Electron Microscopy of Gas-Supersaturated Water Encapsulated in Graphene Liquid Cells*; W- H Hsu, **I-S Hwang**

P08.6 Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications

SESSION CHAIRS:

Chaoying Ni; University of Delaware
Jennifer Dionne; Stanford University

PLATFORM SESSION

Wednesday 10:30 AM • Room: B115

- 10:30 AM **775** (Invited) *Diagnostic Study of Lithium-Rich Cathode Materials at Primary and Sub-Primary Particle Level by Using Chemical-Sensitive STEM Tomography, Aberration-Corrected Imaging and EELS*; **R Lin**, X-Q Yang, H Xin
- 11:00 AM **776** *Probing the Origin of Microcracks in Layered Oxide Cathodes via Electron Microscopy*; **X Liu**, X Zhan, Z Hood, M Chi
- 11:15 AM **777** (STUDENT) *STEM of a Single Crystal Lithium Ion Battery Anode during Electrochemical Cycling*; **J Lodico**, M Mecklenburg, HL Chan, W Hubbard, BC Regan
- 11:30 AM **778** (Invited) *Structure and Electronic Structure of Functional Materials under Symmetric Breaking*; **L Gu**

P10.2 Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing Natural and Synthetic Materials

SESSION CHAIRS:

Owen Neill; University of Michigan
Minghua Ren; University of Nevada-Las Vegas

PLATFORM SESSION

Wednesday 10:30 AM • Room: F150

- 10:30 AM **779** (Invited) *Electron microprobe analysis of minor and trace elements in beam sensitive materials: how far can we go?*; **JM Allaz**, R-G Popa, E Reusser, L Martin
- 11:00 AM **780** *Average Atomic Number and Electron Backscattering in Compounds*; **JJ Donovan**, J Fellowes, B McMorran
- 11:15 AM **781** *SD-WDS: Bremsstrahlung Determination by Theoretical Calculation and Subsequent Estimation of Mass Attenuation Coefficients*; K Moran, **R Wuhrer**
- 11:30 AM **782** (Invited) *An Improved EPMA Method for Gaining High Precision and High Accuracy Determination of Trace Elements in Quartz*; **S-Y Yang**, J-Q Cui, S-Y Jiang, J Xie

Scientific Program

P

Physical Sciences Symposia – Wednesday Late Morning cont.

P12.2 New Frontiers in Atom Probe Tomography Applications

SESSION CHAIRS:

Arun Devaraj; Pacific Northwest Laboratory
Stephan Gerstl; ETH Zurich, Switzerland

PLATFORM SESSION

Wednesday 10:30 AM • Room: D136

- 10:30 AM **783** (Invited) *APT Tip Shape Modifications During Analysis, Its Implications, and the Potential to Measure Tip Shapes in Real Time via Soft X-Ray Ptychography*; **PA van der Heide**, I Mathotkin, W Vandervost, C Fleischmann
- 11:00 AM **784** *Hydride Growth Mechanism in Zircaloy-4: Investigation of the Partitioning of Alloying Elements*; **I Mouton**, Y Chang, S Wang, AJ Breen, A Szczepaniak, LT Stephenson, D Raabe, B Britton, B Gault
- 11:15 AM **785** *Understanding the Growth Mechanism of β -(AlxGa1-x)2O₃ by Atom Probe Tomography*; **J Sarker**, Y Zhang, M Zhu, S Rajan, J Hwang, B Mazumder
- 11:30 AM **786** *Multimodal Atomic-Scale Characterization of Structural and Compositional Changes during Shear Deformation of Materials*; **B Gwalani**, EJ Kautz, T Kaspar, L Kovarik, VV Joshi, SN Mathaudhu, A Rohatgi, P Sushko, A Devaraj
- 11:45 AM **787** (STUDENT) *Quantification of Solute Deuterium in Titanium Deuteride by Atom Probe Tomography with Both Laser Pulsing and High-Voltage Pulsing: Influence of the Global and Local Surface Electric Field*; **Y Chang**, I Mouton, L Stephenson, M Ashton, G Zhang, A Szczepaniak, D Ponge, D Raabe, B Gault

P13.2 Advanced Characterization of Components Fabricated by Additive Manufacturing

SESSION CHAIRS:

Mukesh Bachhav; Idaho National Laboratory
Cesar Terrazas; University of Texas-El Paso
Federico Sciammarella; Northern Illinois University

PLATFORM SESSION

Wednesday 10:30 AM • Room: D140

- 10:30 AM **788** (STUDENT) *Effect of Cyclic Thermal Loadings on the Microstructural Evolution of a Cantor Alloy in 3D Printing Processes*; **H Wang**, Z Zhu, H Chen, SM Nai, X An, R Zheng, S Primig, SP Ringer, X Liao
- 10:45 AM **789** (STUDENT) *Microstructural Analysis of Additively Manufactured Corrosion Resistant Duplex Stainless Steel Clads on Carbon Steel Substrate*; **PV Murkute**, S Pasebani, OB Isgor

11:00 AM **790** *Effect of Part Placement Strategy on the Microstructure of Additively Manufactured 17-4PH Stainless Steel Thin-Wall Parts*; **Y Sun**, R Hebert, M Aindow

11:15 AM **791** *Contribution of Microstructural Features at Various Length Scales to the Strength of Additively Manufactured Austenitic Stainless Steels*; **JD Sugar**, TR Smith, C San Marchi

11:30 AM **792** (STUDENT) *Microstructural Evolution during Heat Treatment of 3D Printed Maraging Steel*; **F Tetteh**, S Boakye- Yiadom

11:45 AM **793** (STUDENT) *Additive Manufacturing of Ni-Mn-Cu-Ga: Influence of Sintering Temperature on Magnetocaloric Effect and Microstructure*; **E Stevens**, D Salazar, K Kimes, R Rodriguez, V Chernenko, M Chmielus

TF

Technologists' Forum Sessions – Wednesday Late Morning

X30.1

Tech Forum Session: Utilization of the National NIH-Funded Cryo-EM Centers: Transformative High Resolution Cryo-Electron Microscopy

SESSION CHAIRS:

Claudia Lopez; Oregon Science and Health University
Janice G Pennington; University of Wisconsin

PLATFORM SESSION

Wednesday 10:30 AM • Room: B117

- 10:30 AM **794** (Invited) *Stanford-SLAC Cryo-EM Center (S2C2)*; **W Chiu**, YT Li, D Bushnell, MF Schmid, G Skiniotis, B Bedman
- 11:00 AM **795** (Invited) *Introducing The Pacific Northwest Center for Cryo-EM*; **CK Yoshioka**
- 11:30 AM **796** (Invited) *Best Practices at the National Center for CryoEM Access and Training (NCCAT)*; **ET Eng**, WJ Rice, A Cheng, B Carragher, CS Potter

T

Tutorials – Wednesday Late Morning

X42.1

Efficient Phase Contrast Imaging via Electron Ptychography

SESSION CHAIR:

Donovan Leonard; Oak Ridge National Laboratory

PLATFORM SESSION

Wednesday 11:00 AM • Room: B110

- 11:00 AM **797** (Invited) *Efficient Phase Contrast Imaging via Electron Ptychography, a Tutorial*; **TJ Pennycook**, GT Martinez, CM O'Leary, H Yang, PD Nellist

A

Analytical Sciences Symposia – Wednesday Afternoon

A01.7 Advances in Phase Retrieval Microscopy

SESSION CHAIRS:

Charudatta Phatak; Argonne National Laboratory

Trevor Almeida; University of Glasgow

PLATFORM SESSION

Wednesday 1:30 PM • Room: B114

- 1:30 PM **798** (Invited) *Towards Ptychography with Structured Illumination, and a Derivative-Based Reconstruction Algorithm*; **W Van-den-Broek**, M Schloz, TC Pekin, PM Pelz, P-H Lu, M Kruth, V Grillo, RE Dunin-Borkowski, RJD Miller, CT Koch
- 2:00 PM **799** *Iterative Algorithm of Atomic Potential Reconstruction Based on DPC Signal from Thick Specimens*; **T Seki**, Y Ikuhara, N Shibata
- 2:15 PM **800** (Invited) *Learning Phase Retrieval with Backpropagation*; YSG Nashed, **S Kandel**, M Du, C Jacobsen
- 2:45 PM **801** (STUDENT) *Contrast Transfer and Noise Minimization in Electron Ptychography*; **CM O'Leary**, GT Martinez, E Liberti, MJ Humphry, AI Kirkland, PD Nellist

A05.7 Leveraging 3D Imaging and Analysis Methods for New Opportunities in Material Science

SESSION CHAIR:

Erdmann Spiecker; Universität Erlangen-Nürnberg, Germany

PLATFORM SESSION

Wednesday 1:30 PM • Room: C122

- 1:30 PM **802** *Simplifying and Streamlining Large-Scale Materials Image Processing with Wizard-Driven and Scalable Deep Learning*; B Provencher, N Piché, **M Marsh**
- 1:45 PM **803** *Determining the 3D atomic Coordinates and Crystal Defects in 2D Materials with Picometer Precision*; **X Tian**, DS Kim, S Yang, CJ Ciccarino, Y Gong, Y Yang, Y Yang, B Duschatko, Y Yuan, PM Ajayan, J-C Idrobo, P Narang, J Miao
- 2:00 PM **804** (Invited) *Understanding Hindered Diffusion & Flow in Hierarchical Porous Networks Combining Electron Tomography and Pore-Scale Simulations*; W Wang, S Schlabach, S-J Reich, A Svidrytski, D Hlushkou, D Stoeckel, A Hoeltzel, U Tallarek, **C Kuebel**
- 2:30 PM **805** *Tomviz: Open Source Platform Connecting Image Processing Pipelines to GPU Accelerated 3D Visualization*; **MD Hanwell**, CJ Harris, A Genova, J Schwartz, Y Jiang, R Hovden
- 2:45 PM **806** (STUDENT) *Projecting into the Third Dimension: 3D Ore Mineralogy via Machine Learning of Automated Mineralogy and X-Ray Microscopy*; **MR Ball**, JF Einsle, M Andrew, DD McNamara, RJM Taylor, RJ Harrison

A06.3 Low Voltage, Low Energy Electron Microscopy Imaging and Analysis

SESSION CHAIRS:

Hector Calderon; Instituto Politécnico Nacional, Mexico

David Bell; Harvard University

PLATFORM SESSION

Wednesday 1:30 PM • Room: B112

- 1:30 PM **807** (Invited) *Atomic Resolution Dynamics of NiO Nano-Particle Studied by Low Dose In-line 3D Holography*; **F- R Chen**, D Van Dyck, C Kisielowski, H Calderon
- 2:00 PM **808** (STUDENT) *Differential Electron Scattering Cross-Section at Low Electron Energies: The Influence of the Screening Parameter*; **M Čalkovský**, M Hugenschmidt, E Müller, D Gerthsen
- 2:15 PM **809** *Application of Low kV EELS to Problematic Samples*; **EV Formo**, JY Howe, T Sunaoshi, A Muto, J Kilcrease, TT Salguero
- 2:30 PM **810** (Invited) *High Spatial Resolution Low-Voltage Electron Imaging and Spectroscopy of Two-Dimensional Materials and Semiconductor Nanostructures*; **X Pan**, X Yan, CA Gadre, T Aoki

A08.7 Current Trends and Challenges in Electron Energy-Loss Spectroscopy

SESSION CHAIRS:

Patricia Abellan; SuperSTEM, United Kingdom

Peter Crozier; Arizona State University

PLATFORM SESSION

Wednesday 1:30 PM • Room: B111

- 1:30 PM **811** (Invited) *High Spectral Resolution EELS to Probe Optics at the Nanometer Scale*; **LHG Tizei**, H Saito, H Lourenço-Martins, M Tencé, J-D Blazit, X Li, A Zobelli, L Bocher, A Gloter, O Stéphan, M Kociak
- 2:00 PM **812** (STUDENT) *Inelastic Momentum Transfer Measurements on Plasmonic Structures in the (S) TEM*; **J Schultz**, J Krehl, G Guzzinati, P Potapov, FS Nogueira, A Lubk
- 2:15 PM **813** *STEM-EELS Imaging of Resonant Modes in Dielectric Silicon Nanostructures*; V Flauraud, **DTL Alexander**
- 2:30 PM **814** (STUDENT) *Surface Plasmon Resonance Mode Behaviour in Sierpinski Fractal Triangles and New Plasmonic Materials*; **IC Bicket**, EP Bellido, D McRae, V Kapetanovic, F Lagugné-Labarthe, GA Botton
- 2:45 PM **815** *Electron Energy-Loss Spectroscopy for Designing Plasmonic Catalysts*; **R Sharma**, A Bruma, W-CD Yang, C Wang

Scientific Program

A

Analytical Sciences Symposia – Wednesday Afternoon cont.

A09.6 Microscopy and Microanalysis for Real-World Problem Solving

SESSION CHAIRS:

Janet H. Woodward; Buckman,
Ke-Bin Low; BASF
Xiaofeng Zhang; Nanosys, Inc.

PLATFORM SESSION

Wednesday 1:30 PM • Room: B113

- 1:30 PM **816** *Utilizing Correlative Microscopy for the Analysis of Native Tissues and the Development of Novel Tissue Constructs for Regenerative Therapies*; **I Robinson**, J Meiss, N Sopko, N Baetz
- 1:45 PM **817** *Microscopy: The Gateway to Bio-Inspired Design Innovation*; **S Okerstrom**
- 2:00 PM **818** *Petrography Analysis of Northern White and Texas Brown Sands to Understand Its Crush Resistance Behavior for Hydraulic Fracturing Operations*; **MH Haque**, D Jacobi, MA Sayed, RK Saini
- 2:15 PM **819** *New Possibilities of Complex Forensic Analysis in the Field of Cultural Heritage Protection and Counterfeits Identification*; **M Kotrly**, I Turkova
- 2:30 PM **820** *SEM-EDS of Artifacts from the HMAV Bounty Discovered at Pitcairn Island*; **AP Lindstrom**, NWM Ritchie
- 2:45 PM **821** *Characterisation Techniques for the Identification of Composite Cladding Materials*; **R Wuhrer**, L George

A10.2 Advances in Focused Ion Beam Instrumentation and Techniques

SESSION CHAIRS:

Suzy Vitale; Carnegie Institution for Science
Joshua Sugar; Sandia National Laboratories
Bruce Arey; Pacific Northwest National Laboratory
Alan Bahm; Thermo Fisher Scientific

PLATFORM SESSION

Wednesday 1:30 PM • Room: F151

- 1:30 PM **822 (Invited)** *Focused Ion Beams of Xe⁺, Ar⁺, O⁺, and N⁺: Sputter Rate Trends, Chemical Interactions, and Emerging Applications*; **C Rue**, J Wang, S Randolph, G Mitchson
- 2:00 PM **823** *Exploring Heterogeneity in Li Battery Electrodes Using FIB-SEM Integrated with Raman and TOF-SIMS*; **DJ Miller**, D Zapotok, J Hiller, Z Juracka, U Schmidt, T Ezell, N Senabulya, B Kerns, M Fonseca Rodrigues, V Maroni, D Abraham
- 2:15 PM **824** *Focused Ion Beams in Biology: How the Helium Ion Microscope and FIB/SEMs Help Reveal Nature's Tiniest Structures*; **A Wolff**, N Klingner, W Thompson, Y Zhou, J Lin, Y Peng, J Ramshaw, Y Xiao
- 2:30 PM **825** *Focused Ne⁺ Beam for Improved SIMS Analysis of Lithium Ion Batteries*; **F Khanom**, UG Schindler, T Bernthaler, G Schneider, B Lewis

- 2:45 PM **826** *Surface Analysis of Polymers Using Helium Ion Microscopy Coupled with Secondary Ion Mass Spectrometry (HIM- SIMS)*; **AA Trofimov**, M Lorenz, A Ievlev, ST King, OS Ovchinnikova, A Belianinov

B

Biological Sciences Symposia – Wednesday Afternoon

B01.3 Multi-Modal, Large-Scale and 3D Correlative Microscopy

SESSION CHAIR:

Ben N.G. Giepmans; University Medical Center Groningen, Netherlands

PLATFORM SESSION

Wednesday 1:30 PM • Room: D137

- 1:30 PM **827** *A Dedicated Multi-Beam SEM for Transmission Imaging of Thin Samples*; **P Kruit**, W Zuidema
- 1:45 PM **828 (STUDENT)** *Using MicroCT to Evaluate Stain Penetration and Establish Fiducial Marks for High Throughput Electron Microscopy*; **J Buchanan**, MM Takeno, AL Bodor, DJ Bumbarger, AA Bleckert, E Froudarakis, J Reimer, AS Tolias, RC Reid, NM da Costa
- 2:00 PM **829 (STUDENT)** *Integrated Array Tomography for High Throughput Electron Microscopy*; **R Lane**, P de Boer, BN Giepmans, JP Hoogenboom
- 2:15 PM **830** *Multi-Order Scaling of High-Throughput Transmission Electron Microscopy*; **CS Own**, T DeRego, LS Own, G Weppelman, AA Wanner, S Ströh, E Hammerschmith, A Vishwanathan, SH Seung
- 2:30 PM **831 (Invited)** *New Molecular Tools for Protein Detection and Dynamics in Electron Microscopy*; **D Boassa**, JT Ngo, MR Mackey, R Ramachandra, TJ Deerinck, MH Ellisman, **SR Adams**

B02.3 Element Analysis of Biological Materials

SESSION CHAIRS:

Nicole Hondow; University of Leeds, United Kingdom
Stefan Vogt; Argonne National Laboratory

PLATFORM SESSION

Wednesday 1:30 PM • Room: D138

- 1:30 PM **832 (Invited)** *Elemental Analysis and Cryo-STEM Tomography of Vitrified Cells*; **SG Wolf**, M Elbaum
- 2:00 PM **833** *Progress on Cryogenic Analytical STEM of Nanomaterials*; **M Ilett**, T Roncal-Herrero, R Brydson, A Brown, **N Hondow**
- 2:15 PM **834** *Damage-Free Nanoscale Isotopic Analysis of Biological Materials with Vibrational Electron Spectroscopy*; **JA Hachtel**, J Huang, I Popovs, S Jansone-Popova, J Keum, J Jakowski, T Lovejoy, N Dellby, O Krivanek, JC Idrobo

2:30 PM **835** *Optimization of Sample Preparation Methods and SEM Imaging Conditions Enables High Resolution X-Ray Mapping of Essential Elements in Biological Specimens*; **L Hughes**, P Trimby, J McKenna, C Hawes

2:45 PM **836** *Quick 3D Elemental Mapping of Biological Tissues Using Super High Solid Angle EDS*; **Y Yamaguchi**, H Nishioka, Y Moriya, C Nakayama, T Haruta, J Gilbert, S Asahina

B07.3 3D Structures: from Macromolecular Assemblies to Whole Cells (3DEM FIG)

SESSION CHAIRS:

Melanie Ohi; University of Michigan
Elitza Tocheva; University of British Columbia, Canada
Teresa Ruiz; University of Vermont

PLATFORM SESSION

Wednesday 1:30 PM • Room: D139

- 1:30 PM **837** (Invited) *Development of an Intact Mammalian System for High-Resolution Imaging by Cryo-Electron Tomography*; **X Li**, D Park, Y Chang, A Radhakrishnan, H Wu, **J Liu**
- 2:00 PM **838** *Hunting for the Adhesion Molecule, Retinoschisin, in Retina Using CEMOVIS*; **JB Heymann**, CKE Bleck, RN Fariss, C Vijayasathy, DC Winkler, R Huang, AD Dearborn, A Smirnov, PA Sieving, AC Steven
- 2:15 PM **839** *Customizable Cryo-EM Chips Improve 3D Analysis of Macromolecules*; **C Varano**, NA Alden, WJ Dearnaley, MA Casasanta, J Damiano, J McConnell, M Dukes, DF Kelly
- 2:30 PM **840** (Invited) *Structural Studies $\alpha\beta 8$ Integrin in Complex with a Fab that Blocks Ligand Binding*; **MG Campbell**, A Cormier, S Ito, S Wu, J Lou, J Marks, JL Baron, SL Nishimura, Y Cheng

B09.3 From Images to Insights: Working with Large Data in Cell Biological Imaging

SESSION CHAIRS:

Kedar Narayan; Frederick National Laboratory for Cancer Research
Jonathan Lefman; NVIDIA Corporation

PLATFORM SESSION

Wednesday 1:30 PM • Room: C120-121

- 1:30 PM **841** (Invited) *Data Fabric Infrastructure for Heterogeneous Cell Biology Image Data*; **JHJ Scott**
- 2:00 PM **842** *Collaborative Editing and Distributing Large Image-Based Data for Connectomics*; **WT Katz**, SE Berg, SK Plaza
- 2:15 PM **843** *Workflow Automation and Portability Enable High-throughput Image Processing and Segmentation for Cell Biology Systems*; B Provencher, R Makovetsky, E Yen, N Piché, **M Marsh**
- 2:30 PM **844** *Roundtable Discussion: The Current Status and Future Directions of Large Data in Biological Imaging*; **K Narayan**

P

Physical Sciences Symposia – Wednesday Afternoon

P01.6 In situ TEM Characterization of Dynamic Processes During Materials Synthesis and Processing

SESSION CHAIRS:

Dong Su; Brookhaven National Laboratory
Frances Ross; Massachusetts Institute of Technology

PLATFORM SESSION

Wednesday 1:30 PM • Room: B116

- 1:30 PM **845** (Invited) *Development of a Method to Characterize Active Sites in Photocatalysis Using in situ Transmission Electron Microscopy*; **N Glachman**, N Geller, A Shea, VA Verret, K Karki, J Rodriguez Manzo, NJ Salmon, DH Alsem, D Jariwala, **E Stach**
- 2:00 PM **846** *Environmental TEM Study of Oxidation Processes of Catalytic Nanoparticles*; **L Kovarik**, Z Wei, C Peden, J Szanyi
- 2:15 PM **847** *Multimodal Operando Electron Microscopy Approach to Study Pt Catalyst During CO Oxidation Reaction*; **M Plodinec**, E Stotz, L Sandoval-Diaz, R Schlögl, T Lunkenbein
- 2:30 PM **848** (M&M POST-DOCTORAL RESEARCHER AWARD) *Application of Electron-beam-excited Localized Surface Plasmon Resonance to Unveil Catalytically Active Sites on Au Nanoparticles*; **W-CD Yang**, C Wang, LA Fredin, PA Lin, L Shimomoto, HJ Lezec, R Sharma
- 2:45 PM **849** (STUDENT) *In situ Measurements of Single Walled Carbon Nanotube Growth Reveal the Structures of Active and Inactive Catalyst Nanoparticles*; **H-Y Chao**, H Jiang, J Cumings, R Sharma

P02.4 Microscopy and Microanalysis of Nuclear and Irradiated Materials

SESSION CHAIRS:

Peter Hosemann; University of California-Berkeley
Assel Aitkaliyeva; University of Florida

PLATFORM SESSION

Wednesday 1:30 PM • Room: D133-134

- 1:30 PM **850** (Invited) *Direct Comparison of Tungsten Nanoparticles and Foils under Helium Irradiation at High Temperatures Studied via in situ Transmission Electron Microscopy*; **E Aradi**, J Lewis-Fell, RW Harrison, G Greaves, AH Mir, SE Donnelly, **JA Hinks**
- 2:00 PM **851** *In Operando SEM Imaging of Electrochemical Oxidation of UO_2 in Liquid*; **X-Y Yu**, J Yao, E Buck
- 2:15 PM **852** *Focused Ion Beam Serial Sectioning and 3D-Reconstruction of Nuclear Fuel*; **RL Seibert**, JD Arregui-Mena, TJ Gerczak, C McKinney, G Helmreich, KA Terrani

Scientific Program

P

Physical Sciences Symposia – Wednesday Afternoon cont.

- 2:30 PM **853** *Analysis of Radioactive Microparticles Emitted from the Fukushima Nuclear Plant by Using Advanced STEM Techniques*; **T Okumura**, T Hara, T Kogure
- 2:45 PM **854** *Micromanipulation, FIB, STEM, EDS and EELS of UF₄ Particles*; **LA Giannuzzi**, M DeVore II, M Summer, M Wellons

P03.4 Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions

SESSION CHAIRS:

Joerg R Jinschek; The Ohio State University
Dalaver Anjum; King Abdullah University of Science and Technology, Saudi Arabia

PLATFORM SESSION

Wednesday 1:30 PM • Room: D135

- 1:30 PM **855** (Invited) *Cryogenic STEM Imaging and Spectroscopy of Electron Beam Sensitive Materials*; K Spoth, M Zachman, D Muller, **L Kourkoutis**
- 2:00 PM **856** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Electron Ptychography Using Fast Binary 4D STEM Data*; **CM O'Leary**, E Liberti, SM Collins, DN Johnstone, M Rothmann, J Hou, CS Allen, JS Kim, TD Bennett, PA Midgley, AI Kirkland, PD Nellist
- 2:15 PM **857** *Phase Contrast in Quantum Electron Microscopy*; **P Kruit**, M Krielaart, Y van Staaden
- 2:30 PM **858** (Invited) *Resonant RF Cavity Based Beam Chopping for Precise Control over Electron Arrival Time Distribution*; **E Kieft**, J van Rens, W Verhoeven, P Mutsaers, J Luiten

P04.3 Spectroscopy and Imaging of Nanostructured Low-Z Materials in the Electron Microscope

SESSION CHAIRS:

Andrew Stewart; University of Limerick, Ireland
Meiken Falke; Bruker, Germany

PLATFORM SESSION

Wednesday 1:30 PM • Room: F149

- 1:30 PM **859** (Invited) *"Hybrid" Microscopy: Multimodal, Correlative and Dynamic Characterization of Soft and Hybrid Structures*; **VP Dravid**
- 2:00 PM **860** *Low-Dose Scanning Electron Diffraction Microscopy of Mechanochemically Nanostructured Pharmaceuticals*; **DN Johnstone**, CS Allen, M Danaie, RCB Copley, J Brum, AI Kirkland, PA Midgley

- 2:15 PM **861** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Explaining the Magnetic Properties of Oxygen Deficient LSMO Thin Films by iDPC*; **AN Penn**, R Trappen, N Mottaghi, C-Y Huang, A Kumar, M Holcomb, JM LeBeau
- 2:30 PM **862** *Combined Imaging and Analytical STEM of Ultra-Thin Cuprate Films*; **V Srot**, Y Wang, M Minola, U Salzberger, M Salluzzo, GM De Luca, B Keimer, PA van Aken
- 2:45 PM **863** *4D-STEM Characterization of Molecular Ordering in Organic Semiconductors*; G Calderon, L Dou, J Hwang

P08.7 Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications

SESSION CHAIRS:

Yuanyuan Zhu; University of Connecticut
Xiaoqing Pan; University of California-Irvine

PLATFORM SESSION

Wednesday 1:30 PM • Room: B115

- 1:30 PM **864** (Invited) *SEM, TEM, and Cryo-EM of Electrodeposited Li, Mg, and Ca Metal Electrodes*; **K Jungjohann**, K Harrison, S Goriparti, P Cullier, R Fischer, B Boyce, Z Casias, N Hahn, B Perdue, K Zavadil
- 2:00 PM **865** *Resolving Active Sites in Atomically Dispersed Electrocatalysts for Energy Conversion Applications*; **DA Cullen**, KL More, K Neyerlin, HT Chung, P Zelenay, DJ Myers
- 2:15 PM **866** *Relationship between Mechanical Strain and Chemical Composition in LiFePO₄ Via 4D-scanning Transmission Electron Microscopy and Scanning Transmission X-Ray Microscopy*; **LA Hughes**, BH Savitzky, HD Deng, NL Jin, EG Lomeli, WC Chueh, P Herring, C Ophus, AM Minor
- 2:30 PM **867** (STUDENT) *The Correlation of Optical Transmittance with Structural Evolution in Fluorozirconate Glass (ZLANI) Thin Films as a Function of Thermal Annealing*; **Y Jin**, C Bond, R Leonard, Y Liu, J Johnson, A Petford-Long
- 2:45 PM **868** (STUDENT) *Transmission Electron Microscopy (TEM) Studies on Nickel and Molybdenum Nitrides as Oxygen Reduction Reaction Catalysts*; **Y Liu**, ME Kreider, MB Stevens, L King, T Jaramillo, R Sinclair

P10.3 Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing Natural and Synthetic Materials

SESSION CHAIRS:

Minghua Ren; University of Nevada-Las Vegas
Owen Neill; University of Michigan

PLATFORM SESSION

Wednesday 1:30 PM • Room: F150

- 1:30 PM **869** (Invited) *Recent Advances in the Analysis of Nitrogen by EPMA*; **A von der Handt**, J Mosenfelder, C Dalou, M Hirschmann
- 2:00 PM **870** *Accessory Mineral Analysis of Alkali-Rich Granite from Gejiu Tin District*; **M Ren**, X Wang
- 2:15 PM **871** *A Synergistic Materials Characterization Approach for the Evaluation of Particles and Talc Minerals in Cosmetic Powders*; **AC Bohórquez**, K Schepker, GW Scheiffele, LA Dempere
- 2:30 PM **872** *SEM Applied on Magnetic Materials: Magnetic Contrast and Morphology Imaging*; **U Golla-Schindler**, R Loeffler, T Groß, J Laukart, D Goll, G Schneider
- 2:45 PM **873** *Towards Accurate Analysis of Particle Size Distribution for Non-Spherically Shaped Nanoparticles as Quality Control Materials*; U Mansfeld, F Pellegrino, V Maurino, S Marguet, F Testard, O Tache, **V-D Hodoroaba**

P12.3 New Frontiers in Atom Probe Tomography Applications

SESSION CHAIRS:

Stephan Gerstl; ETH Zurich, Switzerland
Baishakhi Mazumder; University at Buffalo

PLATFORM SESSION

Wednesday 1:30 PM • Room: D136

- 1:30 PM **874** (Invited) (STUDENT) *Application of Atom Probe Tomography to Complex Microstructures of Laser Additively Manufactured Samples*; **P Kürsteiner**, A Hariharan, HY Jung, N Peter, MB Wilms, A Weisheit, P Barriobero-Vila, B Gault, D Raabe, EA Jägle
- 2:00 PM **875** (STUDENT) *Combined APT, TEM and SAXS Characterisation of Nanometre-Scale Precipitates in Titanium Alloys*; **FF Dear**, P Kontis, B Gault, J Ilavsky, H Gardner, PA Bagot, MP Moody, D Rugg, D Dye
- 2:15 PM **876** *Nanoscale Spatially Resolved Mapping of Uranium Enrichment in Actinide-Bearing Materials*; EJ Kautz, TG Lach, D Reilly, V Joshi, C Lavender, **A Devaraj**
- 2:30 PM **877** *Atom Probe Tomography Analyses of Solute Segregation in Self-Ion Irradiated Electron-Beam Welded SA508 Grade 3 Reactor Pressure Vessel Steels*; **JO Douglas**, PAJ Bagot, MG Burke, MP Moody

- 2:45 PM **878** *Direct Observation of Hydrogen in Cold-Drawn Pearlitic Steel Wires Using Cryogenic Atom Probe Tomography*; **AJ Breen**, Y Li, LT Stephenson, B Gault, M Herbig

P13.3 Advanced Characterization of Components Fabricated by Additive Manufacturing

SESSION CHAIRS:

Cesar Terrazas; University of Texas-El Paso
Mukesh Bachhav; Idaho National Laboratory
Federico Sciammarella; Northern Illinois University

PLATFORM SESSION

Wednesday 1:30 PM • Room: D140

- 1:30 PM **879** (Invited) (STUDENT) *Corrosion-resistant Microstructure Design Using Mesoscale Modeling of Additive Manufacturing*; X Yan, A Samei, B Mercer, P Priya, **S Chaudhuri**
- 2:00 PM **880** (STUDENT) *Processing-Microstructure Relationships From 3D Characterization of Additively Manufactured Metals*; **AT Polonsky**, N Raghavan, MP Echlin, WC Lenthe, MM Kirka, RR Dehoff, TM Pollock
- 2:15 PM **881** *2D/3D Characterization of AM IN625 For Calibrating and Validating AM Modeling Techniques*; **MG Chapman**, MD Uchic, MA Groeber, EJ Schwalbach, SP Donegan, ME Cox
- 2:30 PM **882** (STUDENT) *Multiscale Characterization of Microstructure and Residual Strain Distribution in Additively Manufactured Inconel 625*; **KA Small**, ML Taheri
- 2:45 PM **883** *TEM Study of Additively Manufactured Metallic Alloys: Nickel Aluminum Bronze*; B Shalchi Amirkhiz, D Chalasani, **M Mohammadi**

Scientific Program

TF

Technologists' Forum Sessions – Wednesday Afternoon

X32.1 Tech Forum Session: Imaging Resin- Embedded Samples for Serial Block Face Imaging or Array Tomography

SESSION CHAIRS:

Claudia Lopez; Oregon Science and Health University

Janice G Pennington; University of Wisconsin

PLATFORM SESSION

Wednesday 1:30 PM • Room: B117

- 1:30 PM **884** (Invited) *Essentials of Specimen Preparation for High Performance Volume Imaging by SEM*; TJ Deerinck
- 2:00 PM **885** (Invited) *Tools for 3D Electron Microscopy in Life Sciences – Generate Meaningful Statistics from 3DEM Data*; J Mancuso, K Czymmek, A Ellil
- 2:30 PM **886** (Invited) *Correlation Of Imaging Technologies: Methodologies*; CS López, K Loftis, G Thibault, S Kwon, E Stempinski, JL Riesterer, JW Gray

T

Physical Sciences Tutorials – Wednesday Afternoon

X41.1 Entrepreneurship in the Microscopy Community

SESSION CHAIR:

Donovan Leonard; Oak Ridge National Laboratory

PLATFORM SESSION

Wednesday 2:00 PM • Room: B110

- 2:00 PM **887** (Invited) *Entrepreneurship in Microscopy: Identifying and Addressing Needs in the Microscopy Market*; D Masiel

A

Analytical Sciences Poster Sessions – Wednesday

A01.P3

Advances in Phase Retrieval Microscopy

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 275

3:00 PM **888** *Dislocation Core Phase Imaging by DBI*; **RA Herring**, S Penkova

POSTER # 276

3:00 PM **889** *Quick Evaluation of Potential Difference on Al/Al₃Fe Interface in a Conventional Transmission Electron Microscope*; **K Sasaki**, H Sasaki, Y Yamamoto, Y Oya

POSTER # 277

3:00 PM **890** (STUDENT) (M&M MEETING SCHOLAR AWARD) *A Semi-Quantitative Predictive Model for SnO₂ Adatom Diffusion & Its Application to Exit Wave Reconstruction*; **AN Moya**, OA Makgae, E Liberti, AI Kirkland

POSTER # 278

3:00 PM **891** *Measurements of Amorphous (a)-C, Au + a-C and a-Metal TEM Specimen Stabilities for HRTEM Studies*; **RA Herring**

POSTER # 279

3:00 PM **892** *SQUARREL: Scattering Quotient Analysis to Retrieve the Ratio of Elements in X-Ray Ptychography*; **C-T Liao**, YH Lo, J Zhou, A Rana, CS Bevis, G Gui, B Enders, K Cannon, D Shapiro, C Bennett, H Kapteyn, R Falcone, J Miao, M Murnane

POSTER # 280

3:00 PM **893** (STUDENT) *Correlative 3D X-Ray Fluorescence and Ptychographic Tomography of Frozen-Hydrated Green Algae*; **YH Lo**, J Deng, M Gallagher-Jones, S Chen, A Pryor, Q Jin, HP Hong, YSG Nashed, S Vogt, C Jacobsen, J Miao

POSTER # 281

3:00 PM **894** (STUDENT) *Ptychographic Complex Imaging Reflectometry for Spatially-Resolved Dopant Profiling Using a Tabletop EUV Source*; **Y Esashi**, CL Porter, M Tanksalvala, GP Miley, N Horiguchi, JL Knobloch, J Zhou, RM Karl, P Johnsen, CS Bevis, B Wang, SL Cousin, M Gerrity, HC Kapteyn, MM Murnane

POSTER # 282

3:00 PM **895** (STUDENT) *Generalized Proximal Smoothing for Phase Retrieval*; M Pham, P Yin, **A Rana**, S Osher, J Miao

POSTER # 283

3:00 PM **896** *Hollow-Cone Foucault Imaging Method for Magnetic Structure Observations*; **K Harada**, A Kawaguchi, A Kotani, Y Fujibayashi, K Shimada, S Mori

A02.P2

Data Acquisition Schemes, Machine Learning Algorithms, and Open Source Software Development for Electron Microscopy

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 284

3:00 PM **897** *USID and Pycroscopy – Open Source Frameworks for Storing and Analyzing Imaging and Spectroscopy Data*; S Somnaths, CR Smith, N Laanait, RK Vasudevan, **S Jesse**

POSTER # 285

3:00 PM **898** (STUDENT) *Extending Monte Carlo Simulations of Electron Microscopy Images and Hyperspectral Images in a User-Friendly Framework*; **S Rudinsky**, Y Yuan, R Gauvin, N Piché, M Marsh

POSTER # 286

3:00 PM **899** (STUDENT) *Scanning Electron Microscope 3D Surface Reconstruction via Optimization*; **Y Sartipi**, A Ross, W Zhang, S Norris, H El-Sherif, C Anand, N Bassim

POSTER # 287

3:00 PM **900** (STUDENT) *First Auto-Magnifier Platform for Hardware Assurance and Reverse Engineering Integrated Circuits*; **R Wilson**, N Asadizanjani, D Forte, DL Woodard

POSTER # 288

3:00 PM **901** (STUDENT) *Processing Structurally Heterogeneous Cryo-EM Data Using Atomic Models*; **G Reggiano**, F DiMaio

POSTER # 289

3:00 PM **902** (STUDENT) *The Effect of Nonuniform Pixel Responses in CCD on Quantitative Analysis*; **B Wang**, BD Esser, N Bagués, J Yan, AN Blumer, DW McComb

POSTER # 290

3:00 PM **903** *Towards Reproducible and Transparent Science of (Big) Electron Microscopy Data Using Version Control*; **M Nord**, J Verbeeck

POSTER # 291

3:00 PM **904** *Real-Time Data Processing Using Python in DigitalMicrograph*; **BK Miller**, S Mick

POSTER # 292

3:00 PM **905** *Novel SEM and DualBeam experiments with Python*; **R Geurts**, E-J Vesseur

POSTER # 293

3:00 PM **906** *Workshop App: the Data Analysis Design Pattern of the Enabler Framework*; **M Kundmann**

POSTER # 294

3:00 PM **907** *How Does the Internal Structure of Cardiac Muscle Cells Regulate Cellular Metabolism?*; S Ghosh, **E Hanssen**, EJ Crampin, V Rajagopal

POSTER # 295

3:00 PM **908** *Evaluation of Crystal Lattice Rotation Around a Stress-Induced Twin in a Step-Graded SiGe / Si (110) Using STEM Moiré Observation and Its Image Analysis*; **J Yamanaka**, C Yamamoto, M Shirakura, KO Hara, K Arimoto, K Nakagawa, A Ishizuka, K Ishizuka

POSTER # 296

3:00 PM **909** *Measurand-Optimized, Content-Aware Scanning Electron Microscopy*; **AE Vladar**, BN Damazo

Scientific Program

A

Analytical Sciences Poster Sessions – Wednesday cont.

A04.P2 Recent Developments in Atom Probe Tomography

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 297

3:00 PM **910** (STUDENT) *Interpreting the Simplified Multicomponent Short-Range Order Parameter*; **WJ Davids**, AV Ceguerra, SP Ringer

POSTER # 298

3:00 PM **911** (STUDENT) *Mass Spectrometry Inside Single Proteins by Atom Probe Tomography*; **S Qiu**, C Zheng, V Garg, J Li, RK Marceau, J Fu

POSTER # 299

3:00 PM **912** *Reconstruction Metrics in Atom Probe Tomography*; BP Geiser, **DA Reinhard**, JH Bunton, TR Payne, KP Rice, Y Chen, DJ Larson

POSTER # 300

3:00 PM **913** (STUDENT) *Recent Developments in APT Analysis Automation and Support for User-Defined Custom Analysis Procedures in IVAS 4*; **AC Day**, H Francois-Saint-Cyr, BP Geiser, T Payne, E Oltman, SP Ringer, DA Reinhard

POSTER # 301

3:00 PM **914** *New Science with Atom Probe Tomography Enabled via an Environmental Transfer Hub*; **MG Wirth**, DE Perea

A06.P1 Low Voltage, Low Energy Electron Microscopy Imaging and Analysis

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 302

3:00 PM **915** *Characterization of Nopal Nanoparticles by Electron Microscopy Techniques*; J Madrigal, JJ Chanona, , Manuel, **HA Calderón**, IC Romero

POSTER # 303

3:00 PM **916** *Microstructural Characterization of Casein by Microscopy and Spectroscopy Techniques*; LE Rojas, **HA Calderón**, JJ Chanona, JV Méndez, CA Resendiz, F Cervantes

POSTER # 304

3:00 PM **917** *Electron Microscopy of Sulfur Selenium Alloy with High -K Dielectric Properties*; **HA Calderón**, FC Robles- Hernandez, PM Ajayan

POSTER # 305

3:00 PM **918** *Visualizing Electron-Molecule Dynamics with in situ Fluorescence in a Few eV-SEM*; Y Vos, KW Hagen, J Hoogenboom

POSTER # 306

3:00 PM **919** (STUDENT) *Soft Microscopy Of Macromolecules: Correlative Imaging and Enhancing Contrast*; **KA Parker**, S Bobbala, IV Drachuk, PA Mirau, JL Chavez, LF Drummy, EA Scott, VP Dravid

POSTER # 307

3:00 PM **920** *Graded Microstructure of Additive Manufactured $Ti_{60}Al_{40}V$ via Electron Beam Melting*; **H Chen**, C Cooper, C Durrant, Y Li, S Primig, X Liao, SS Babu, S Ringer

POSTER # 308

3:00 PM **921** *Contamination Mitigation Strategy for Ultra-Low Energy Electron Microscopy and Spectroscopy*; **E Materna Mikmekova**, L Frank, I Konvalina, I Mullerova, T Zhang, T Asefa

POSTER # 309

3:00 PM **922** *A Compact Aberration Corrector for SEMs with Electrostatic-field formed by Annular and Circular Electrodes*; **T Kawasaki**, R Yoshida, T Kato, T Nomaguchi, S Motomura, K Nishinaka, T Agemura, T Ikuta

A09.P2 Microscopy and Microanalysis for Real-World Problem Solving

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 310

3:00 PM **923** *SEM, EDS and XRD Study of Heavy-Duty Asbestos Brake Pads*; A Martinez Perez, G Luis Raya, G Villagomez Garcia, **E Vera Cardenas**, R Cabrera, M Villanueva Ibanez, M Moreno Rios, E Avila Davila

POSTER # 311

3:00 PM **924** (STUDENT) *Duplex Surface Treatment of an ARMCO Pure Iron by Dehydrated Paste-pack Boriding and Powder- pack Nitriding*; OA Gómez, M Ortiz, **J Solis**, A Arenas, I Morgado, J Zuno, FR Barrientos, J Medina

POSTER # 312

3:00 PM **925** (STUDENT) *Removal of Humic Acid from Natural Water by ZVI/ H_2O_2 Process*; N dos Santos, J Spadotto, G Burke, **G Solórzano**, L Campos, L Teixeira

POSTER # 313

3:00 PM **926** *Application of Innovative Geochemical and Mineralogical Techniques to Understanding the La Victoria Epithermal Gold Deposit, Peru*; K Rozon, NR Banerjee, **LL Van Loon**, B Pearson

POSTER # 314

3:00 PM **927** *Application of Synchrotron Spectroscopy to Understanding Gold Mineralization at the Monument Bay Project, Stull Lake Greenstone Belt, Manitoba, Canada*; HE Cavallin, NR Banerjee, **LL Van Loon**

POSTER # 315

3:00 PM **928** *Long Element Profile of Layered Coastal Sediments by SEM/EDS*; **JF Konopka**

POSTER # 316

3:00 PM **929** *An Integrated in SEM Multi-Purpose AFM Instrument Utilizing an Active Cantilever*; **M Holz**, A Reum, A Ahmad, T Ivanov, M Hofmann, I Rangelow, C Reuter

POSTER # 317

3:00 PM **930** *Microscopy Analysis in CFRP and GFRP Composites Manufactured by LCM and Autoclave Techniques*; M Moreno- Rios, J Mendoza-Mendoza, EO Avila-Davila, **EE Vera Cardenas**, S Ledesma Ledesma, A Martinez Perez

POSTER # 318

3:00 PM **931** (STUDENT) *Effect of Terbium Doping on the Microstructure of $Fe_{81}Al_{19}$ Alloys*; **JS Uribe-Chavira**, CR Santillán- Rodríguez, RJ Sáenz-Hernández, GM Herrera-Pérez, JA Matutes-Aquino, MC Grijalva-Castillo

POSTER # 319

3:00 PM **932** *Layered Structures of Ti-6Al-4V Alloy and Metal Matrix Composites on Its Base Joint by Diffusion Bonding and Friction Welding*; **SV Prihodko**, DG Savvakina, PE Markovsky, OO Stasiuk, E Norbert, F Deley, B Flipo, AA Shirzadi, HM Davies, PD Davies, J Penney, K Bozhilov, OM Ivasishin

POSTER # 320

3:00 PM **933** *Study of Groove Firmation in InP Surface During Zn Diffusion*; **I Grimberg**, A Giladi, M Nitzani, I Lukomsky, Y Furst

POSTER # 321

3:00 PM **934** *Zeolite Crystal Growth Analysis by Dissolution*; **KN Bozhilov**, V Valtchev

POSTER # 322

3:00 PM **935** (STUDENT) *Gold-Assisted Growth of Pyramid-shape $SrTiO_3$ Bases during Thermal Dewetting*; **A Yi**, F Liu, M Lin, G Zhu

POSTER # 323

3:00 PM **936** *Sequential Collective Microanalysis (SCM) Applied on the Characterization of Atmospheric Carbonaceous Particulate Materials Collected in the Metropolitan Area of Monterrey, in México*; LT González, FE Longoria, C Leyva, **IA Estrada**, Y Mancilla, A Mendoza

A10.P1

Advances in Focused Ion Beam Instrumentation and Techniques

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 324

3:00 PM **937** *Characterization of Materials for Energy Storage and Production by Helium Ion Microscopy Coupled to Secondary Ion Mass Spectrometry*; J-N Audinot, **J Lovric**, T Wirtz

POSTER # 325

3:00 PM **938** (STUDENT) *Analytics on the FIB: ORION-SIMS and the Discovery of a Unique, Chondrite-like, Precambrian Impactor*; **MR Ball**, RJM Taylor, JF Einsle, J-N Audinot, RJ Harrison

POSTER # 326

3:00 PM **939** *Understanding Microstructural Evolution in ZrC Inoculated $Zr_{47.5}Cu_{45.5}Al_3Co_2$ Via High Resolution SIMS*; **B Lewis**, MMA Rafique, F Khanom

POSTER # 327

3:00 PM **940** *Semi-Inverted Sample Preparation of Meteorites for High Resolution Analytical Electron Microscopy Using Correlative Raman Spectroscopy and Xe Plasma FIB*; **S Vitale**, A Steele, LG Benning, R Wirth

POSTER # 328

3:00 PM **941** *Novel FIB Torus Milling on Diamond Anvils with FIB gasket Fabrication Enabling 5+ Megabar High Pressures Studies*; **NE Teslich**, ZS Jenei, EF O'Bannon

POSTER # 329

3:00 PM **942** (STUDENT) *"Stand-Out": A Novel Approach for Preparing Sub-100 nm Samples Through in situ Ion Induced Bending*; **V Garg**, S Zhang, RG Mote, Y Chen, L Cao, J Fu

POSTER # 330

3:00 PM **943** *Detailed Investigation of Silicone Nitride Phase Plates Prepared by Focused Ion Beam Milling*; **A Müller**, S Zhang, RG Mote, Y Chen, L Cao, J Fu

POSTER # 331

3:00 PM **944** *Application of Ar Ion Beam Milling on Sectioning of Cells for SEM Observations*; **S Tanaka**, Y Ohmi

POSTER # 332

3:00 PM **945** *Xe Plasma vs Gallium FIB Delaying*; S Sharang, **P Anzalone**, J Obona

POSTER # 333

3:00 PM **946** *Light Ion Beams Interacting with Thin Films*; D Xia, **J Notte**

B

Biological Sciences Poster Sessions – Wednesday

B02.P1

Element Analysis of Biological Materials

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 334

3:00 PM **947** *Visualizing the Hyperaccumulation of Metals in *Fucus gardneri* From Howe Sound, British Columbia, Canada, Using Synchrotron X-Ray Fluorescence Mapping*; **LL Van Loon**, NR Banerjee, D Mitchell, C Dunn

POSTER # 335

3:00 PM **948** (STUDENT) *Investigation of Morphology and Surface Structure of *Stenocara eburnea*, Namib Desert Beetle*; **JJ Lee**, D-Y Kim

POSTER # 336

3:00 PM **949** *Determining and Characterizing if Deer Placenta Stem Cells are Present in Commercial Food Supplement Capsules: Utilizing Microscopy, Elemental Analysis, Cytology, Histology, Immunohistochemistry and Flow Cytometry*; L Santos, S Gune, MC Killingsworth, **T Cohen-Hyams**, R Wuhrer, M Harvey, N McNamara, L Nguyen, S Sabapathy, C Evangelista, JLC Yong

POSTER # 337

3:00 PM **950** (STUDENT) *AFM Structural Analysis of *Colletotrichum gloeosporioides* Interacting with ZnO Nanoparticles*; **M Rodríguez-Nieto**, NM Gomez-Ortiz, G Espinosa, P Martínez-Torres, JL Menchaca, SC de-la-Rosa-García, S Gomez-Cornelio

Scientific Program

B

Biological Sciences Poster Sessions – Wednesday cont.

POSTER # 338

3:00 PM **951** (STUDENT) *Green Synthesis and Characterization of Ag@Au Core-Shell Bimetallic Nanoparticles Using the Extract of Hamelia Patens Plant*; **KDC Chávez**, GA Rosas

POSTER # 339

3:00 PM **952** *The Application of SEM-Based EDS Microanalysis to the Study of Congenital Dyserythropoietic Anaemia Type-1 (CDA-I)*; E Johnson, **P Trimby**, C Scott, J Brown, C Babbs, A-A Olijnik, V Buckle

POSTER # 340

3:00 PM **953** *Orientation of Organic Fibers and the Presence of Amorphous Calcium Phosphate in Elongated Crustacean Skeletal Elements*; M Vittori, **V Srot**, B Bussmann, F Predel, PA van Aken, J Štrus

POSTER # 341

3:00 PM **954** *Freezing and Sublimation Effects on Cryo-SEM Imaging and Microanalysis*; J Liang, X Xiao, **T Chou**, M Libera

POSTER # 342

3:00 PM **955** *Metallic Pollutants in Sargassum of Cancun, Quintana Roo, Mexico Coast*; **G Gonzalez-Mancera**, S Tehuacanero-Cuapa, E Chavira

POSTER # 343

3:00 PM **956** (STUDENT) *SEM/EDS as a Tool to Investigate Pyrolysis-induced Transformations in Chicken Feather Fibers*; Z Mohammed, S Jeelani, **VK Rangari**

B06.P1

Pharmaceuticals FIG – Imaging, Analysis, and Regulation of Medical Products, Devices and Data Integrity

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 344

3:00 PM **957** (STUDENT) *Fluorescent Ligands of Kv1 Channels on the Basis of Hongotoxin: Atto488-Hongotoxin*; N Orlov, O Nekrasova, A Feofanov

POSTER # 345

3:00 PM **958** (STUDENT) *Effect of Arginine and Lysine Substituents on Intracellular Localization and Photocytotoxicity of Dipropoxy-Bacterioporpurinimide*; **E Dyakova**, A Efremenko, P Ostroverkhov, M Grin, A Feofanov

POSTER # 346

3:00 PM **959** (STUDENT) *7-Methylguanine Traps PARP-1 on Nucleosomes: spFRET Microscopy Study*; N Maluchenko, D Nilov, A Feofanov, **A Lys**, M Kutuzov, N Gerasimova, V Studitsky

POSTER # 347

3:00 PM **960** *Ultrastructure of Human Pancreatic Cancer Cells Treated with a TBK1 Inhibitor*; **L Yasui**, N Baker, H Savage, C Der

POSTER # 348

3:00 PM **961** *Application of Cryogenic-Electron Microscopy (cryo-EM) for Morphological Characterization of Complex Drug Products*; **J Zheng**, Y Wu

B07.P1

3D Structures: from Macromolecular Assemblies to Whole Cells (3DEM FIG)

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 349

3:00 PM **962** *Building Cryo-EM at Genentech to Enable Research and Drug Discovery*; **A Estevez**, C Arthur, L Rouge, M Kschonsak, A Rohou, C Ciferri

POSTER # 350

3:00 PM **963** *Imaging and Reconstructing Microglia in 3 Dimensions Using FIB-SEM*; **JC Savage**, SW Novak, M-E Tremblay

POSTER # 351

3:00 PM **964** *Structural Organization of the Guinea Pig α A-Crystallin and α A66-80 Peptide Complex*; **PK Yadav**, M Su, S Jeyarajan, FJ Giblin, MD Ohi

POSTER # 352

3:00 PM **965** *Elucidating Molecular Mechanisms of Mitochondrial Fission Machinery via Helical Studies of Drp1 and Its Partner Proteins*; **KT Whiddon**, RW Clinton, JA Mears

POSTER # 353

3:00 PM **966** (STUDENT) *Determining the Solution Structure of the Drp1 and Its Role in the Assembly of the Mitochondrial Fission Machinery*; **K Rochon**, JA Mears

POSTER # 354

3:00 PM **967** *Structure and Function of the Proteasome Activator PA28 of the Malaria Parasite Plasmodium falciparum*; R Metcalf, **E Hanssen**, SC Xie, D Gillett, A Leis, C Morton, MW Parker, W Wong, M Griffin, L Tilley

POSTER # 355

3:00 PM **968** *Structure of the Cyanobacterial NAD(P) H Dehydrogenase-Like Complex of Oxygenic Photosynthesis*; TG Laughlin, AN Bayne, J-F Trempe, DF Savage, **KM Davies**

POSTER # 356

3:00 PM **969** (STUDENT) (**M&M MEETING SCHOLAR AWARD**) *Cryo-EM Structure of Nipah Virus Fusion Glycoprotein in Complex with a Monoclonal Antibody Reveals Mechanism of Neutralization*; **HV Dang**, Y-P Chan, Y-J Park, CC Broder, D Veisler

POSTER # 357

3:00 PM **970** *The Three-Dimensional Reconstruction of a Full-length Tankyrase 1*; A Chemeris, AM Gautreau, **OS Sokolova**

POSTER # 358

3:00 PM **971** *The Three-Dimensional Structure of (+39) RNA-Polymerase Elongation Complex Determined by Cryo-Electron Microscopy*; O Chertkov, M Karlova, V Studitsky, **OS Sokolova**

POSTER # 359

3:00 PM **972** ATP-bound Conformation of OBP Chaperonin; T Stanishneva-Konovalova, E Pichkur, P Semenuyk, LP Kurochkona, **OS Sokolova**

B09.P1

From Images to Insights: Working with Large Data in Cell Biological Imaging

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 360

3:00 PM **973** (STUDENT) Large Data Considerations in Digital Holographic Microscopy; **C Snyder**, D Cohoe, M Schadeegg, J Nadeau

POSTER # 361

3:00 PM **974** Large Area SEM Backscatter Imaging of GABA Post-Embedding Immunogold, Web-Based Crowdsourcing Segmentation and Local Image Processing for Rigorous Quantification; **C Clarkson**, CT Zugates, CA Brantner, M Rust, A Popratiloff

POSTER # 362

3:00 PM **975** Strategies for Data Flow and Storage for High Throughput, High Resolution Cryo-EM Data Collection; **WJ Rice**, A Cheng, S Dallakyan, S Bhatkar, S Krit, ET Eng, B Carragher, CS Potter

P

Physical Sciences Poster Sessions – Wednesday

P01.P2

In situ TEM Characterization of Dynamic Processes During Materials Synthesis and Processing

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 365

3:00 PM **976** (STUDENT) Real-Time Electron Microscopy of Protein Nanodiscs in Graphene Liquid Cells; **JW Smith**, LN Carnevale, A Das, Q Chen

POSTER # 366

3:00 PM **977** (STUDENT) (M&M MEETING SCHOLAR AWARD) Liquid-Phase STEM-EDS in Graphene and Silicon Nitride Cells; **DJ Kelly**, N Clark, M Zhou, M Lindley, EA Lewis, MG Burke, RV Gorbachev, SJ Haigh

POSTER # 367

3:00 PM **978** In situ Liquid Cell Transmission Electron Microscopy Study of Hydroxyapatite Mineralization Process; **K He**, C Liu, Y Yuan, B Song, Y-P Lu, T Shokuhfar, R Shahbazian-Yassar

POSTER # 368

3:00 PM **979** Liquid Phase Electron Microscopy Study on the Growth Mechanism of Gold Nanoparticles: In Scanning Electron Microscope; **IH Kang**, MD Kim, **YH Kim**

POSTER # 369

3:00 PM **980** (STUDENT) Exploring the Link between Amorphous Structure and Crystallization Behavior of Titania Thin Films by Electron-Based Pair Distribution Functions and in situ TEM; **J Mangum**, LM Garten, V Jacobson, DS Ginley, BP Gorman

POSTER # 370

3:00 PM **981** (STUDENT) Operando Insight into Oxygen Transfer at Pt/CeO₂ Interfaces during CO Oxidation; **JL Vincent**, PA Crozier

POSTER # 371

3:00 PM **982** Probing the Functional Activity Limits of Biomolecules Under Electron Irradiation; **T Moser**, J Evans

POSTER # 372

3:00 PM **983** In situ Heating TEM Study of Phase Change Material; **J Li**, L Hong, H Wang

POSTER # 373

3:00 PM **984** Live EDS Mapping of the Precipitation and Annealing Cycle of Alloys in the TEM Generated Through in situ Heating; **S Marks**, P Pinard, H Kotadia, G West

POSTER # 374

3:00 PM **985** Lattice Registry and Evidence for Surface Reconstructions of Metal Films on Suspended 2D Membranes Following Annealing; **TH Brintlinger**, JF Vega, JC Culbertson, M Zalalutdinov, RM Stroud, JT Robinson

POSTER # 375

3:00 PM **986** Initiation of Grain Growth Observed Using Electrostatic-Subframing; **BW Reed**, AM Monterrosa, AA Moghadam, RS Bloom, ST Park, SA Briggs, PM Price, CM Barr, JT McKeown, D Masiel, **K Hattar**

POSTER # 376

3:00 PM **987** Electron Correlation Microscopy for Studying Fluctuating Systems in situ; **D Chatterjee**, P Zhang, **PM Voyles**

P02.P2

Microscopy and Microanalysis of Nuclear and Irradiated Materials

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 377

3:00 PM **988** (STUDENT) (M&M MEETING SCHOLAR AWARD) Inducing Electrically-Active Defects in a Gallium Arsenide Nanowire with an Electron Beam; **BT Zutter**, H Kim, W Hubbard, D Ren, J Lodico, T-Y Chang, D Huffaker, C Regan

POSTER # 378

3:00 PM **989** TEM Investigations of Ion-Irradiated Cerium Oxide Thin Film; **S Rouvimov**, KV Manukyan

POSTER # 379

3:00 PM **990** (STUDENT) Synthesis of Defect-Fluorite Pyrochlore Sodium Niobate Nanoparticles and Characterization of their Tolerance to Neutron Radiation; **RF Ali**, JS Owens, K Starosta, BD Gates

Scientific Program

P

Physical Sciences Poster Sessions – Wednesday cont.

POSTER # 380

3:00 PM **991** *Radiation Stability of Ti_2InC (M2AX) Nanolaminates Under He Ions Irradiation – Evaluation Through STEM Microscopy*; **S Bakardjieva**, J Vacik, A Cannavo, A Michalcova, R Klie, X Rui

POSTER # 381

3:00 PM **992** *Ion Beam Sputtering for Controlled Synthesis of Thin MAX (MXene) Phases*; P Horak, **J Vacik**, S Bakardjieva, A Cannovo, G Ceccio, J Kupcik, R Klie

POSTER # 382

3:00 PM **993** *Ti-Based MXenes: Preparation by Ion Beam Sputtering and Microstructural Evolution by Ion Irradiation*; P Horak, S Bakardjieva, **J Vacik**, J Plocek, R Klie

POSTER # 383

3:00 PM **994** *Ti_2SnC and Ti_2InC Nanolaminates by Low Energy Ion Facility (LEIF) and Their Resistance Towards Ar^+ Ion Bombardment*; **S Bakardjieva**, J Vacik, R Klie, X Rui

POSTER # 384

3:00 PM **995** *Radiation Resistant Layered Ti_3AlC_2 Ceramics Prepared by LEIF*; **S Bakardjieva**, J Vacik, R Klie, X Rui

P03.P1

Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 385

3:00 PM **996** *Investigation of Image Contrast in Biological Samples by Pixelated STEM Detector*; **R Sagawa**, H Hashiguchi, C Hamamoto, R Ritz, M Simson, M Huth, H Soltau, Y Kondo

POSTER # 386

3:00 PM **997** (STUDENT) *Atomic-Resolution TEM Imaging of Phosphorene Protected by Graphene*; **Y Lee**, J-Y Yoon, HY Jeong, K Kim

POSTER # 387

3:00 PM **998** *Electron Beam-Induced Effects on $Bi_6S_2O_{15}$ Nanowires: An Insight into Stability and Applications*; **H Qian**, J Chen

POSTER # 388

3:00 PM **999** (STUDENT) *Sandwich Structure in Al-Cu(-Au) Alloys—Characterization by Atomic-Resolution HAADF-STEM and EDXS-STEM*; **Y Zheng**, Y Liu, N Wilson, S Liu, X Zhao, H Chen, J Li, Z Zheng, L Bourgeois, J-F Nie

POSTER # 389

3:00 PM **1000** (STUDENT) *The Effect of the Ion Beam Energy on M-Plane InGaN Layer Preparation for STEM*; **T Nguyen**, B Dzuba, Y Cao, A Senichev, R Diaz, G Gardner, M Manfra, O Malis

POSTER # 390

3:00 PM **1001** (STUDENT) *Electron-Beam-Damage in Metal Organic Frameworks in the TEM*; **S Ghosh**, P Kumar, S Conrad, M Tsapatsis, KA Mkhoyan

POSTER # 391

3:00 PM **1002** *Analytical Cryo-Electron Microscopy for Characterization of Pickering Emulsions*; **T Roncal-Herrero**, S Mickelthwaite, M Ilett, J Hitchcock, O Cayre, N Hondow

P04.P1

Spectroscopy and Imaging of Nanostructured Low-Z Materials in the Electron Microscope

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 392

3:00 PM **1003** *Graphite Nanoplatelets in Elastomer Composites*; **IA Estrada-Moreno**, C Leyva-Porras, M Mendoza-Duarte, S Flores Gallardo, JL Rivera-Armenta

POSTER # 393

3:00 PM **1004** *A Case-Study of Bubble Formation Mechanism by Analytical TEM during Evaluation of an Incoming Spin-On-Hardmask at Wafer-Foundries*; **WW Zhao**, F Baumann

POSTER # 394

3:00 PM **1005** *Analysis of Elemental Composition of Fe1-xNix and Si1-xGex Alloy Thin Films by EPMA and μ -XRF*; **V-D Hodoroaba**, R Terborg, S Böhm, KJ Kim

POSTER # 395

3:00 PM **1006** (STUDENT) *HAADF-STEM Study of Filament Material in Hot Filament CVD Diamond Films*; **J Anderson**, R Ahmed, A Siddique, EL Piner

POSTER # 396

3:00 PM **1007** (STUDENT) *Synthesis and Analysis Microstructural of CeO_2 Nanoparticles Using Chelating Agents*; **ML Camacho-Rios**, K Campos-Venegas, RA Ochoa-Gamboa, D Lardizabal-Gutierrez, JD Cristóbal-García, I Estrada-Guel, R Martínez-Sánchez

POSTER # 397

3:00 PM **1008** (STUDENT) *Hydrothermal Synthesis of Nanohybrid Gr- CeO_2* ; **ML Camacho-Ríos**, RA Ochoa-Gamboa, W Antunez-Flores, D Lardizabal-Gutierrez, JD Cristóbal-García, I Estrada-Guel, R Martínez-Sánchez

POSTER # 398

3:00 PM **1009** (STUDENT) *Microstructural, Structural and Mechanical Behavior of WC-Based Hardmetals Bonded with High and Medium Entropy Alloys*; **MA Ruiz-Esparza-Rodriguez**, CG Garay-Reyes, I Estrada-Guel, R Martinez-Sanchez

POSTER # 399

3:00 PM **1010** *Raman Characterization of $LiNbO_3$ Nanofibers Doped with Mn*; **MC Maldonado**, R Narro, CG Nava, JP Flores, MT Ochoa, F Espinosa

POSTER # 400

3:00 PM **1011** (STUDENT) *Energy Dispersive X-Ray Spectroscopic Analysis of Al-Cu-Fe Quasicrystalline Thin Film Layer*; **A Canter**, K Smith, A Baker, C Li

POSTER # 401

3:00 PM **1012** *Correlative STEM and SEM Imaging of PTB7:PC71BM-Based Photoactive Layers in a Scanning Electron Microscope*; **Y Li**, E Müller, C Sprau, A Colsmann, D Gerthsen

P08.P2

Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 403

3:00 PM **1014** *Nanostructured TiO₂ Microrods with 3D Nanovoids for Green Photocatalysis - PEC Water Splitting*; **S Bakardjieva**, M Caplovicova, F Mamon, R Fajgar, V Jandova, T Brovdvova

POSTER # 404

3:00 PM **1015** (STUDENT) *Metal and 2D Material Interaction Investigated via HAADF STEM*; **E Courtney**, E O'Connell, M Conroy, R Nair, U Bangert

POSTER # 405

3:00 PM **1016** *Synthesis of ZnO Nanoparticles at Low Temperature by Hydrothermal Treatment Using the Sol-Gel Method*; B Murguía Martínez, **SE Borjas García**, A Medina Flores, L Béjar Gómez, PG Martínez Torres

POSTER # 406

3:00 PM **1017** *Plasmonic-Photonic Hybrids by Freeze-Casting: Ag decorated 1D and 2D TiO₂ Hollow Patterned Nanostructures for Green Photocatalysis*; J Mares, J Tolasz, MS Slusna, T Brovdvova, B Komarkova, **S Bakardjieva**, R Fajgar

POSTER # 407

3:00 PM **1018** (STUDENT) *Surface Species in Graphene Liquid Cells for Transmission Electron Microscopy*; ND Rosenmann, **L Bhatt**, J Jokisaari, M Schlossman, RF Klie

POSTER # 408

3:00 PM **1019** *Strain and Sn Distribution in Ge/Ge_{1-x}Sn_x Core-Shell Nanowires*; **AF Marshall**, A Meng, M Braun, A Pakzad, H Cheng, PC McIntyre

POSTER # 409

3:00 PM **1020** (STUDENT) *Investigation of Cobalt Oxidation States in PtCo Nanoparticles Using STEM-EELS*; **J Sode**, RJ Nicholls, PD Nellist, T Tran, D Ozkaya

POSTER # 410

3:00 PM **1021** (STUDENT) *Study of Effects of Cl and Se in CdSeTe Solar Cells Using Scanning Transmission Electron Microscopy*; **J Guo**, FG Sen, A Mannodi-Kannakithodi, ES Barnard, W Sampath, A Munshi, MKY Chan, RF Klie

POSTER # 411

3:00 PM **1022** *Atomic Doping Site and Dielectric Property in Perovskite Oxide Nanosheets*; **H Choi**, G Lee, Y Kim, H Yim, J-W Choi, JW Roh, HJ Chang

POSTER # 412

3:00 PM **1023** *Growth Processes of Cu₂ZnSn(S_{1-x}Se_x)₄-Au Nanocomposites: Microanalysis and Corresponding Impacts on Photovoltaic Properties*; S Ma, J Wang, F Xia, Y Chen, H Dong, L Yu, **L Dong**

POSTER # 413

3:00 PM **1024** *SPION-Graphene Nanocomposites for Electrochemical Energy Storage and Conversion*; De; **VN Joshi**, A- R Joshi

POSTER # 414

3:00 PM **1025** *Out-of-Focus STEM Method for Imaging Misfit Dislocations in a Hetero Interface*; **S Kim**, JJ Kim

POSTER # 415

3:00 PM **1026** *Transmission Electron Microscopy Study of Epitaxial Li-Mn-O Films Grown by Pulsed Laser Deposition: The Effect of Temperature on Formation of Phases*; **H Tan**, KK Bharathi, I Takeuchi, LA Bendersky

POSTER # 416

3:00 PM **1027** *Tuning the Composition and Porosity of Structured Catalytic Supports for Electrocatalysts Used in Fuel Cells*; BD Gates, MT Paul, B Kinkead, **RF Ali** (presenter)

POSTER # 417

3:00 PM **1028** *In situ S/TEM Probing of the Coupling among Electrochemical, Thermal, and Mechanical Effect in Rechargeable Batteries*; **C Wang**

POSTER # 418

3:00 PM **1029** *Structural and Compositional Properties of Recrystallized CdS/CdTe Thin-Films Grown on Oxidized Silicon Substrates*; D Maggini, J Aguiar, **H Yoon**

POSTER # 419

3:00 PM **1030** (STUDENT) *EELS Monitoring of Beam-Induced Dynamic Transformation of Lithium Materials at 30 keV*; **F Voisard**, H Demers, N Brodusch, ML Trudeau, K Zaghbi, R Gauvin

POSTER # 420

3:00 PM **1031** *Engineered Sulfur-MoS₂-Graphene Heterostructure Cathodes for Diagnostics of Nanoscale Electrochemical Processes in High Energy Density Li-S Batteries*; **VP Oleshko**, AJ Kriz, W McGehee, S Takeuchi, S Zhang, A Kolmakov, JJ McClelland, CL Soles

POSTER # 421

3:00 PM **1032** *Revealing the Complex Structural Intergrowth within Ternary W-Nb-O Oxide*; **X Hu**, Q Rong, RD Reis, VP Dravid

POSTER # 422

3:00 PM **1033** (STUDENT) *Probing Thermal and Acoustic Dynamics of Inverse Silicon Metallates*; **CS Bevis**, B Abad, JL Knobloch, TD Frazer, A Adak, J Hernández-Charpak, H Cheng, A Grede, N Giebink, N Nova, T Mallouk, P Mahale, W Chen, Y Xiong, I Dabo, V Crespi, D Talreja, HC Kapteyn, V Gopalan, J Badding, MM Murnane

POSTER # 423

3:00 PM **1034** (STUDENT) *Electron Microscopy Investigation of CeO₂ Nanofibers Supported Noble Metal (Pt, Pd and Ru) Catalysts for CO Oxidation*; **Z Liu**, Y Lu, J Li, Y Wang, EK Wujcik, R Wang

Scientific Program

P

Physical Sciences Poster Sessions – Wednesday cont.

P10.P1

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

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 424

3:00 PM **1035** *Uncertainties in Secondary Fluorescence Correction in EPMA*; M Procop, **V-D Hodoroaba**

POSTER # 425

3:00 PM **1036** (STUDENT) *Effect of Beam Diameter on the Accurate Analysis of Silicate Glasses Using Electron Probe Microanalysis*; **R-X Zhang**, S-Y Yang, S-Y Jiang, J Xie

POSTER # 426

3:00 PM **1037** (STUDENT) *Multipoint Background Analysis for Chemical Dating of Monazite*; **J-Q Cui**, S-Y Yang, S-Y Jiang, J Xie

POSTER # 427

3:00 PM **1038** (STUDENT) *Electrospun Rare-Earth Orthovanadate Scintillator Nanofibers Analyzed by EPMA*; **J Guffie**, CD Posada, G George, S Han, Z Luo

POSTER # 428

3:00 PM **1039** (STUDENT) *Cathodoluminescence and EPMA Analysis of Alkaline Earth Fluoride Nanowires*; **JJ Hayes**, RD Jeffery, G George, J Davis, D Ila, Z Luo

POSTER # 429

3:00 PM **1040** (STUDENT) *Compositional Analysis of Electrospun Zn-Doped Ferrite Nanofibers Using an Electron Probe Microanalyzer*; CN Collins, **G George**, Z Luo

POSTER # 430

3:00 PM **1041** (STUDENT) *Green Synthesis of Silver Nanoparticles Using the Mixture of Aqueous Extracts of Sedum praealtum and Origanum vulgare*; **JL Landeros**, GA Rosas

POSTER # 431

3:00 PM **1042** *Green Synthesis of Gold Microspheres Using Schinus Molle Leaf Extract*; F Mares-Briones, **SE Borjas**, JL Lopez- Miranda, R Esparza, GA Rosas

POSTER # 432

3:00 PM **1043** *Green Synthesis of Silver Nanoparticles Using Solar Radiation and Loeselia Mexicana Leaf Extract*; R Herrero, **SE Borjas**, GA Rosas

POSTER # 433

3:00 PM **1044** *Green Synthesis of Gold Nanoparticles Using Origanum Vulgare*; MDS Aguilar, F Mares, **SE Borjas**, GA Rosas

POSTER # 434

3:00 PM **1045** (STUDENT) *Comparison between Commercial and Aquatic Lily Lignins*; **M Mendoza-Duarte**, J Espinoza- Acosta, C Leyva-Porras, I Estrada-Moreno

POSTER # 435

3:00 PM **1046** (STUDENT) *Controlled Growth of Silicon Dioxide Nanospheres by Regulation in the Addition Rate of the Precursor*; I López-Miranda, E Ortiz-Rascón, **L Baez-Castillo**, RC Carrillo-Torres, ME Álvarez-Ramos

POSTER # 436

3:00 PM **1047** (STUDENT) *Study by SEM of Carbon Nanotubes Deposited by CVD Using Al_2O_3 and TiO_2 as Catalysts*; L Béjar, E Huape, A Medina, **A Mejía**, C Aguilar, C Parra, I Alfonso

POSTER # 437

3:00 PM **1048** *Graphite Exfoliation by an Alternative Mechano-Chemical Process Using Sulfur as Exfoliating Agent*; G Tarango- Rivero, CG Garay-Reyes, **I Estrada-Guel**, R Martínez-Sánchez

POSTER # 438

3:00 PM **1049** *Preparation of an Exfoliated Graphite by Mechano-Chemical Processing, in the Presence of Sulfur*; G Tarango- Rivero, CD Gómez-Esparza, D Lardizabal-Gutierrez, C Carreño-Gallardo, I Estrada-Guel, **R Martínez-Sánchez**

P11.P1

Advances in Characterization of Geological and Extraterrestrial Samples

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 439

3:00 PM **1050** (STUDENT) *Three-Dimensional Rock Microstructure Modeling Using Two-Dimensional SEM Micrographs*; **C Zhang**

POSTER # 440

3:00 PM **1051** *Mineral Surface Transformations by Ice Nucleation*; **DP Veghte**, R Lybrand, S China, D Zaharescu, O Qafoku

POSTER # 441

3:00 PM **1052** *Correlative Microscopy of Diverse Filamentous Microfossils from 850 Ma Rocks*; D Wacey, **M Saunders**, A McPherson, S Gain, E Sirantoine, K Eiloart

POSTER # 442

3:00 PM **1053** *Automated Feature Analysis of Complex Geological Materials*; **M Hiscock**, S Burgess, J Zhang, A Stavropoulou

POSTER # 443

3:00 PM **1054** *Microanalytical Characterization of REE Phases in a Glauconitic Sandstone*; **J Yang**, C Verba, S Montross, J Moore, R McDowell, M McKoy

POSTER # 444

3:00 PM **1055** (STUDENT) *Low-dose HRTEM Study of Interstratified Clay Minerals*; **G Wang**, H Wang, L Zhang, H Dong, KM Kemner, J Wen

POSTER # 445

3:00 PM **1056** (STUDENT) *STEM EDS/EELS for Phase Analysis of Deep-Mantle Rock Assemblages Supported by Machine Learning*; **H Chen**, F Nabiei, J Badro, DT Alexander, C Hébert

POSTER # 446

3:00 PM **1057** *Addressing the Difficulties of Differentiating Members of the Feldspar Solid Solution Series via Electron Backscatter Diffraction*; **SW Wallace**, SI Wright

POSTER # 447

3:00 PM **1058** *Application of Combined Mean Atomic Number Backgrounds and Blank Corrections to EPMA Trace Element Measurements: Successes and Challenges*; **OK Neill**, NL La Cruz, D Hernández Uribe, JS Jolles, JR Boro, JJ Donovan

P12.P1

New Frontiers in Atom Probe Tomography Applications

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 448

3:00 PM **1059** *Atom Probe Tomography of Oxidised Grain Boundaries in Highly Irradiated SS316*; K Lindgren, A Jenssen, O Tengstrand, P Ekström, P Efsing, **M Thuvander**

POSTER # 449

3:00 PM **1060** (STUDENT) *Nanoindentation, EPMA and Atom Probe Tomography Characterisation of Oxygen-rich Layer formed on a Titanium Jet Engine Component*; **HM Gardner**, A Radecka, D Rugg, D Armstrong, M Moody, P Bagot

POSTER # 450

3:00 PM **1061** *Spatial Reconstruction of Atom Probe Data from Zircon*; **DW Saxey**, D Fougereuse, WDA Rickard, SM Reddy

POSTER # 451

3:00 PM **1062** *Deformation of Borides in Nickel-Based Superalloys: a Study of Segregation at Dislocations*; L Lilensten, S Antonov, D Raabe, S Tin, **B Gault**, P Kontis

POSTER # 452

3:00 PM **1063** (STUDENT) *Characterization of p-type Doping in Silicon Nanocrystals Embedded in SiO₂*; **R Demoulin**, M Roussel, S Duguay, D Muller, D Mathiot, P Pareige, E Talbot

POSTER # 453

3:00 PM **1064** (STUDENT) *Influence of Composition and Structure on Measured H Concentration in beta-Ti Alloys via Atom Probe Tomography*; **J Ballor**, E Kautz, B Gwalani, C Boehlert, A Devaraj

POSTER # 454

3:00 PM **1065** *Complementary SEM-EDS / FIB-SEM Sample Preparation Techniques for Atom Probe Tomography of nanophase-FeO in Apollo 16 Regolith Sample 61501,22*; **P Gopon**, JO Douglas, J Wade, MP Moody

POSTER # 455

3:00 PM **1066** *Atom Probe Tomography Investigation on the Effect of Ni Additions on the Site Occupation and Partitioning Behavior in Co-Based Superalloys*; **S Antonov**, A Day, H Francois-Saint-Cyr, S Lu, W Li, Q Feng

POSTER # 456

3:00 PM **1067** *In Situ Crystallization of Metallic Glass in an Atom Probe Instrument*; **DR Diercks**, R Jha, CV Ciobanu, AP Stebner

POSTER # 457

3:00 PM **1068** *Performance of Ultra-Violet Laser Pulsing with a Wire-Geometry, Moderately Focused Atom Probe System (EIKOS)*; **RM Ulfig**, J Bunton, D Lenz, Y Chen, KP Rice, TJ Prosa, PH Clifton, DJ Larson

POSTER # 458

3:00 PM **1069** *An Atom-Probe Tomography Study of the Stability of Oxide-Dispersion Strengthening Particles in 14YWT Exposed to Neutron Irradiation*; **K Kruska**, DJ Edwards, J Wang, T Yamamoto, CH Henager, RJ Kurtz, GR Odette

POSTER # 459

3:00 PM **1070** *Post-FIB Specimen Preparation of Atom Probe Specimens under Controlled Environments for Correlative Microscopy*; **CS Bonifacio**, P Nowakowski, K Costello, ML Ray, R Morrison, PE Fischione

P13.P1

Advanced Characterization of Components Fabricated by Additive Manufacturing

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 460

3:00 PM **1071** (STUDENT) *Using Microscopy and Image Analysis to Show Density and Property Variations in Additive Manufactured Ti₆Al₄V*; **E Stevens**, S Schloder, E Bono, D Schmidt, M Chmielus

POSTER # 461

3:00 PM **1072** (TECHNOLOGIST/STAFF - PHYSICAL) *Identification of Twin Formation in Additively Manufactured Stainless Steel by in situ EBSD*; **SM Dickens**, PJ Noell, JM Rodelas, D Wilson

POSTER # 462

3:00 PM **1073** (STUDENT) *Microstructural Analysis of Additively Manufactured 304L Stainless Steel Oxide Dispersion Strengthened Alloy*; **M Ghayoor**, K Lee, Y He, C-H Chang, BK Paul, S Pasebani

POSTER # 463

3:00 PM **1074** *Understanding Microstructural Properties of AlxCrCoFeNiCu High Entropy Alloy by Advanced Scanning Transmission Electron Microscopy*; **P Lu**, A Kustas, N Argibay, M Chandross, S Whetten

POSTER # 464

3:00 PM **1075** (STUDENT) *Quantitative Study on the Effect of Thermal Gradients on the Microstructure of Additively Manufactured Ti₆Al₄V Builds*; **M Shao**, C Blackwell, S Vijayan, S Kumar, SS Babu, J Jinschek

POSTER # 465

3:00 PM **1076** (STUDENT) *Binder Jet 3D Printing of 316L Stainless Steel: Effects of HIP on Fatigue*; K Kimes, K Myers, A Klein, M Ahlfors, **E Stevens**, M Chmielus

Scientific Program

P

Physical Sciences Poster Sessions – Wednesday cont.

POSTER # 466

3:00 PM **1077** *Hardness Variation of Microstructural Heterogeneities in Directed Energy Deposited 304L Stainless Steel*; **H Vega**, TR Smith, CW San Marchi, RW Friddle, JD Sugar

POSTER # 467

3:00 PM **1078** (STUDENT) *Microstructural Characterization of WC-Co Cemented Carbide Processed Using Selective Laser Sintering*; **J Agyapong**, A Czekanski, S Boakye-Yiadom

POSTER # 468

3:00 PM **1079** (STUDENT) *Materials Characterization of Thin Films Printed with $Ge_{20}Se_{80}$ Ink*; **A-A Ahmed Simon**, SM Rahmot Ullah, B Badamchi, H Subbaraman, M Mitkova

POSTER # 469

3:00 PM **1080** (STUDENT) *Studies and Analysis of Ge_xSe_{100-x} -Based, Spin-Coated Chalcogenide Thin Films*; **SMR Ullah**, A- A Ahmed Simon, M Mitkova

O

Microscopy Outreach Poster Session – Wednesday

X91.P1

Microscopy Explorations

POSTER SESSION

Wednesday 3:00 PM • Room: Exhibit Hall

POSTER # 363

3:00 PM **1081** *Suitability of Martian Regolith as Material for Future Dwellings—An Investigation by Middle School Students in Collaboration with MIT and JEOL, USA*; N Miller, M Richmond, B Meagan, S Richardson, O Akubude, W Bao, R Li, K Dinner, H Griffin, **D Shattuck**, F Martin Martinez, Z Qin, M Buehler, K Kupwade-Patil, V Robertson

POSTER # 364

3:00 PM **1082** *The Morgan University STEM EXPO: A STEM Microscopy Workshop Offered at the Community Level*; **F Denaro**, L Givens, D Hill-Bartlett, J Ross, C Sampson, S Sampson, T Smarton, S Nyaga

Scientific Program Information

Thursday, August 8, 2019



A

Analytical Sciences Symposia – Thursday Morning

A06.4 Low Voltage, Low Energy Electron Microscopy Imaging and Analysis

SESSION CHAIRS:

David Bell; Harvard University
Natasha Erdman; JEOL USA

PLATFORM SESSION

Thursday 8:30 AM • Room: B112

- 8:30 AM **1083** (Invited) *Understanding your Material Better—Low Voltage Imaging, Analysis and X-Ray Mapping—Applications and Points to Consider*; **R Wuhrer**, K Moran
- 9:00 AM **1084** *Applications of Low and Ultra-Low Energy Scanning Electron Microscopy*; **I Müllerová**, L Frank, Š Mikmeková, E Materna-Mikmeková
- 9:15 AM **1085** *Reduce Charging Effects on Beam Sensitive Material by Optimized Scanning Routines in SEM*; **M Schmid**, A Liebel, F Michael, G Moldovan, H Soltan
- 9:30 AM **1086** (STUDENT) *Visualization of AMPA Receptor Distribution during Long Term Potentiation with Correlative Light and Electron Microscopy*; **Y Sun**, N Kamasawa, R Yasuda
- 9:45 AM **1087** *Beam Broadening Measured in Transmission Mode at Low Electron Energies in a Scanning Electron Microscope*; **M Hugenschmidt**, **E Müller**, D Gerthsen

A09.7 Microscopy and Microanalysis for Real-World Problem Solving

SESSION CHAIRS:

Janet H. Woodward; Buckman
Ke-Bin Low; BASF
Xiaofeng Zhang; Nanosys, Inc.

PLATFORM SESSION

Thursday 8:30 AM • Room: B113

- 8:30 AM **1088** (STUDENT) *Microstructure Evolution and Corrosion Properties of Electrodeposited SnZn Coatings containing Graphene-Oxide*; **R M Y**, C Srivastava
- 8:45 AM **1089** *Correlative Microscopy Observation (3D EBSD + APT + TEM) on Intergranular Corrosion Behaviors in 316L Stainless Steel*; **S-P Tsai**, P Konijnenberg, S Zaefferer, N Peter, B Gault, K Kawano-Miyata, D An, T Griffiths
- 9:00 AM **1090** (STUDENT) *High Corrosion Resistance Offered by Carbon Nanotubes Directly Grown Over Mild Steel Substrate*; **S Arora**, R M Y, A Gupta, C Srivastava
- 9:15 AM **1091** (STUDENT) *Localized Corrosion Phenomena in Powder-Processed Icosahedral-Phase-Strengthened Aluminum Alloys*; **S Rommel**, HR Leonard, TJ Watson, T Policandriotes, M Aindow

9:30 AM **1092** *Surface Oxide Nanopillars Formed by Atmospheric Plasma*; **DN Leonard**, H Meyer, MP Brady, PJ Yancey

9:45 AM **1093** *Ta/Cu_{1-x}Nd_x/NiFe/Ta Layers Characterized Using TEM/Microanalysis Techniques*; **J-G Zheng**, Q Chen, Y Zhai

A10.3 Advances in Focused Ion Beam Instrumentation and Techniques

SESSION CHAIRS:

Suzy Vitale; Carnegie Institution for Science
Joshua Sugar; Sandia National Laboratories
Bruce Arey; Pacific Northwest National Laboratory
Alan Bahm; Thermo Fisher Scientific

PLATFORM SESSION

Thursday 8:30 AM • Room: F151

- 8:30 AM **1094** (Invited) *Advances in Multi-Beam and Multi-Ion FIB-SEM for 3D Correlative Microscopy*; **B Winiarski**, R Geurts, SJ Randolph, R Gannon, G Pyka, T Varslot, PJ Withers
- 9:00 AM **1095** *Tri-Beam FIB Sample Preparation to Study Alterations in Ancient Glass from Broborg, a Vitrified Swedish Hillfort*; **BE Matthews**, B Arey, C Pearce, A Kruger
- 9:15 AM **1096** *Combining a Nanoprobe Setup with PFIB Sample Deprocessing*; **AJ Smith**, A Rummel, M Kemmler, S Kleindiek
- 9:30 AM **1097** *Three-Dimensional Time-of-Flight Secondary Ion Mass Spectrometry and DualBeam FIB/SEM Imaging of Lithium-ion Battery Cathode*; **C Jiao**, L Pillatsch, J Mulders, D Wall

A12.1 Advances in Cryo-EM Technology

SESSION CHAIR:

Mike Marko; Wadsworth Center

PLATFORM SESSION

Thursday 8:30 AM • Room: D137

- 8:30 AM **1098** (Invited) *Laser-Based Phase Contrast for Transmission Electron Microscopy*; O Schwartz, J Axelrod, S Campbell, C Turnbaugh, A Herman, E Planz, R Glaeser, **H Mueller**
- 9:00 AM **1099** *Optimizing the Electron Energy for Cryomicroscopy*; **MJ Peet**, R Henderson, CJ Russo
- 9:15 AM **1100** *TOPAZ: A Positive-Unlabeled Convolutional Neural Network CryoEM Particle Picker that can Pick Any Size and Shape Particle*; T Bepko, A Morin, M Rapp, J Brasch, L Shapiro, **AJ Noble**, B Berger
- 9:30 AM **1101** (Invited) *Development of Rapid Tilt-Series Collection for Electron Cryo-Tomography*; G Chreifi, S Chen, LA Metskas, M Kaplan, C Oikonomou, **G Jensen**

Scientific Program

B

Biological Sciences Symposia – Thursday Morning

B05.1 Light and Fluorescence Microscopy for Imaging Cell Surface and Cell Structure

SESSION CHAIRS:

Randall Smith; Portland State University
David Zenisek; Yale University School of Medicine
Xiaolin Nan; Oregon Health & Science University

PLATFORM SESSION

Thursday 8:30 AM • Room: D138

- 8:30 AM **1102** (Invited) *Small Volumes in Biology*; **D Axelrod**, JJ Axelrod, RW Holz, NL Thompson
- 9:00 AM **1103** (STUDENT) *Generative Adversarial Networks Enable Cross-Modality Super-Resolution in Fluorescence Microscopy*; **H Wang**, Y Rivenson, Y Jin, Z Wei, R Gao, H Günaydin, LA Bentolila, C Kural, A Ozcan
- 9:15 AM **1104** (STUDENT) *Numerical Analysis of Tightly Focused Spot for Confocal Microscopy Illumination by a Real Lens System*; **R Shi**, S Zhang, C Hellmann, F Wyrowski
- 9:30 AM **1105** (STUDENT) *A Proposed Method for Optimizing the Spectral Discernibility of Engineered Point-spread Functions for Localization Microscopy*; **JT Martineau**, R Menon, EM Jorgensen, J Gerton

B06.1 Pharmaceuticals FIG – Imaging, Analysis, and Regulation of Medical Products, Devices and Data Integrity

SESSION CHAIRS:

Gianpiero Torraca; Amgen, Inc.
Daniel Skomski; Merck & Co., Inc

PLATFORM SESSION

Thursday 8:30 AM • Room: D139

- 8:30 AM **1107** (Invited) *Opportunities for Advanced Imaging Techniques in Pharmaceutical Formulation Development*; **MS Lamm**
- 9:00 AM **1108** *Comprehensive Identification of the Particulate Matter Population Present in Medical Products and their Manufacturing Processes*; **X Gu**, JR Mantei
- 9:15 AM **1109** *Significance of Cryo-scanning Electron Microscopy (cryo-SEM) in Evaluating the Morphology of Multivesicular Liposomes*; **S Manna**, Y Wu, B Koo, X Xu, S Choi, Y Wang, D Kozak, J Zheng
- 9:30 AM **1110** *Characterization of Encapsulated Liposomal Irinotecan*; **JM Noble**, L Chen, R Jog, D Kozak, J Zheng
- 9:45 AM **1111** *The Use of 'Live Chemical Imaging' to Enhance and Increase Productivity in SEM/EDS Investigation of Pharmaceutical Samples, While Still Conforming to 21 CFR part 11 Regulations*; A Hyde, **S Burgess**, J Goulden

P

Physical Sciences Symposia – Thursday Morning

P01.7 In situ TEM Characterization of Dynamic Processes During Materials Synthesis and Processing

SESSION CHAIRS:

Eric Stach; University of Pennsylvania
Dong Su; Brookhaven National Laboratory

PLATFORM SESSION

Thursday 8:30 AM • Room: B116

- 8:30 AM **1112** (Invited) *Low-Dose and High-Speed Observations of Battery Processes by Operando STEM*; **B Mehdi**, ND Browning, J Lee, H Amari, N Johnson, D Nicholls, AJ Stevens
- 9:00 AM **1113** *Surface Topotactic Growth of Edge-Terminated MoS₂ Catalysts*; C Dahl-Petersen, M Saric, M Brorson, LP Hansen, PG Moses, J Rossmessl, JV Lauritsen, **S Helveg**
- 9:15 AM **1114** *Environmental TEM Studies Reveal Catalyst/Support Registry on 2D Zeolites*; **J Carpena-Núñez**, D Zakharov, RS Rao, D Kim, JA Boscoboinik, EA Stach, M Tsapatsis, DJ Stacchiola, B Maruyama
- 9:30 AM **1115** *In situ S/TEM Reactions of Ag/ZrO₂/SBA₁₆ Catalysts for Single-Step Conversion of Ethanol to Rutadiene*; **KA Unocic**, V Lebarbier Dagle, RA Dagle, EC Wegener, J Kropf, TR Krause, DA Ruddy, LF Allard, SE Habas
- 9:45 AM **1116** *Influence of Water Vapor on NiAl Oxidation Using in situ STEM*; **KA Unocic**, FS Walden II, LF Allard

P02.5 Microscopy and Microanalysis of Nuclear and Irradiated Materials

SESSION CHAIRS:

Chad Parish; Oak Ridge National Laboratory
Rachel Seibert; Oak Ridge National Laboratory

PLATFORM SESSION

Thursday 8:30 AM • Room: D133-134

- 8:30 AM **1117** (Invited) *Coupling Multi-Scale Mechanical Testing Techniques with FIB and TEM Characterization to Reveal Mechanisms of Embrittlement of High Dose Inconel X₇₅₀*; **CD Judge**, C Howard, V Bhakhri, C Dixon, C Mayhew, S Hoendermis
- 9:00 AM **1118** *Microstructure and Formation Mechanisms of δ-Hydrides in Variable Grain Size Zircaloy-4 Studied by Electron Backscatter Diffraction*; S Wang, F Giuliani, **B Britton**
- 9:15 AM **1119** *Integrated SEM, EDS, EBSD and EPMA Characterization of Aluminide Coatings on Stainless Steel*; BR Johnson, NL Canfield, BE Matthews, **J Silverstein**
- 9:30 AM **1120** *Electron Microscopy Characterization of Copper Coatings for Canada's Used Nuclear Fuel Containers*; **J Tam**, B Yu, W Li, JD Giallonardo, JY Howe, U Erb

Thursday, August 8

Scientific Program

9:45 AM **1121** *Scanning Transmission Electron Microscopy Characterization of the Native Surfaces Oxides in High Density Ceramic Fuels*; **PD Edmondson**, QB Smith, JW Werden, D Skiff, C Hobbs, JT White, JT Dunwoody, KA Terrani, AT Nelson

P03.5 Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions

SESSION CHAIRS:

Dalaver Anjum; King Abdullah University of Science and Technology, Saudi Arabia

Stig Helveg; Haldor Topsoe A/S, Denmark

PLATFORM SESSION

Thursday 8:30 AM • Room: D135

- 8:30 AM **1122** (Invited) *Challenges in Revealing Soft Matter Structural Dynamics by Liquid-phase Electron Microscopy*; **J Patterson**
- 9:00 AM **1123** *Impact of Electron Energy and Dose on Particle Dynamics Imaging in the Scanning Electron Microscope*; Y Gao, S Srivastava, PY Kim, DA Hoagland, TP Russell, **AE Ribbe**
- 9:15 AM **1124** (STUDENT) *A Fluorescence Microscopy Assay for Assessing Beam Damage to Nanoparticle Capping Ligands during Liquid Cell Electron Microscopy*; **TU Dissanayake**, M Wang, TJ Woehl
- 9:30 AM **1125** (Invited) *Damage by Induced Electric Field versus Radiolysis*; **N Jiang**

P04.4 Spectroscopy and Imaging of Nanostructured Low-Z Materials in the Electron Microscope

SESSION CHAIRS:

Dan Hodoroba; Federal Institute for Materials Research and Testing, Germany

Andrew Stewart; University of Limerick, Ireland

PLATFORM SESSION

Thursday 8:30 AM • Room: F149

- 8:30 AM **1126** (Invited) *Chemical State Mapping of Amorphous Carbon Films by Soft X-Ray Emission Spectroscopy*; **M Terauchi**, Y Sato
- 9:00 AM **1127** *Microstructural and Analytic Characterisation of Li-Ion Batteries by Correlative EDS, SIMS, Light-, Raman-, Ion- and Electron Microscopy*; **U Golla-Schindler**, L Han, P Gnauck, F Khanom, T Bernthaler, G Schneider
- 9:15 AM **1128** *The Benefits of Correlative Scanning Electron - and Confocal Raman Microscopy for the Characterization of Polymers, 2D Materials and Lithium Oxides*; **U Schmidt**, W Liu, D Steinmetz, S Freitag

9:30 AM **1129** *Imaging Extended Defects in low Z materials Using Electron Channelling Contrast Imaging—New Approaches and Challenges*; **NK Gunasekar**, A Alasmari, B Hourahine, C Trager-Cowan

9:45 AM **1130** *High-Quality Experimental Data in Electron Microscopy and Microanalysis—What Can, and Should We Jointly Do?*; **V-D Hodoroba**

P08.8 Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications

SESSION CHAIRS:

Linze Li; Pacific Northwest National Laboratory

Chongmin Wang; Pacific Northwest National Laboratory

PLATFORM SESSION

Thursday 8:30 AM • Room: B115

- 8:30 AM **1131** (Invited) *Structural Evolution of Reaction Bonded Interfacial Zone of Diamond/SiC*; Y Zhang, J Wynn, P Karandikar, **C Ni**
- 9:00 AM **1132** (STUDENT) *Multi-Model Imaging of Local Chemistry and Ferroic Properties of Hybrid Organic-Inorganic Perovskites*; **Y Liu**, AV Ievlev, L Collins, A Belianinov, S Kim, B Doughty, S Jesse, M Ahmadi, ST Retterer, K Xiao, BG Sumpter, SV Kalinin, B Hu, OS Ovchinnikova
- 9:15 AM **1133** *Effect of Chemical Treatment on the Surface Structure of $\text{Li}_{1-x}[\text{Mn}_x]\text{O}_2$* ; **CD Amos**, MA Roldan, JB Goodenough, PJ Ferreira
- 9:30 AM **1134** (Invited) *In situ Probing of Nanostructure Surfaces*; **TW Hansen**, MR Nielsen, P Liu, P Schlexer, J Madsen, AB Andersen, J Schiøtz, B Sebök, I Chorkendorff, JB Wagner

P10.4 Applications of Integrated Electron Probe Microscopy and Microanalysis Technique in Characterizing Natural and Synthetic Materials

SESSION CHAIRS:

Donggao Zhao; University of Missouri-Kansas City

Owen Neill; University of Michigan

PLATFORM SESSION

Thursday 8:30 AM • Room: F150

- 8:30 AM **1135** (Invited) *Effect of Natural Polyphenols from Various Botanical Sources on Dentin Collagen Crosslinking and Stabilization Studied by Electron Microscopy*; H Liu, J Guo, D Zhao, **Y Wang**
- 9:00 AM **1136** *STEM Characterization of Metal Dusting Corrosion in Ni-Based Alloy 600 and Fe-Based Alloy 800H Exposed to a High Pressure Environment*; **W-T Chen**, B Li, M Galetz, B Gleeson
- 9:15 AM **1137** *Microstructural and Chemical Studies of Zirconia/Silicate Glass Interfaces Following Long-term Exposure to Solid Oxide Fuel Cell Environments*; **Q Guo**, KA Unocic, E Lara-Curzio

Thursday, August 8

Scientific Program

P

Physical Sciences Symposia – Thursday Morning cont.

- 9:30 AM **1138** *EDS X-Ray Characterization of S7 Tool Steel Laser Alloyed with Boron and Silicon*; **JD Morrow**, SM Seddio, FE Pfefferkorn
- 9:45 AM **1139** *Microstructural Characterization the Effect of Cementation Treatment on Microalloyed Steel Boronizing*; **N Lopez-Perrusquia**, MA Doñu-Ruiz, GJ Perez-Mendoza, CR Torres-Sanmiguel

P12.4 New Frontiers in Atom Probe Tomography Applications

SESSION CHAIRS:

Baishakhi Mazumder; University at Buffalo
Arun Devaraj; Pacific Northwest National Laboratory

PLATFORM SESSION

Thursday 8:30 AM • Room: D136

- 8:30 AM **1140** (Invited) *Isotopic Composition and Origin of Meteoritic Nanodiamonds Studied by Atom-Probe Tomography and Complementary Techniques*; **JB Lewis**, C Floss, D Isheim, TL Daulton, DN Seidman, RC Ogliore
- 9:00 AM **1141** *Novel Synthesis and Multi-technique Characterisation of Au-Cu Nanoparticles*; Q Yang, M Danaie, V Broadley, DE Joyce, TL Martin, E Marceau, MP Moody, **PAJ Bagot**
- 9:15 AM **1142** *Atomic-Scale Observation of Hydroxyapatite Nanoparticle*; **Y-S Chen**, DS Mosiman, L Yang, TH Pham, B Hawke, BJ Mariñas, JM Cairney
- 9:30 AM **1143** (Invited) *Atomic-Scale Characterisation of Catalyst Nanoparticles in Ionic Liquids by Atom Probe Tomography*; **T Li**, H Meyer, A Ludwig

A

Analytical Sciences Poster Sessions – Thursday Late Morning

A06.P2

Low Voltage, Low Energy Electron Microscopy Imaging and Analysis

POSTER SESSION

Thursday 10:00 AM • Room: Exhibit Hall

POSTER # 470

10:00 AM **1144** *Electron Channelling Contrast Imaging in a Low Voltage Scanning Electron Microscope*; **G Naresh Kumar**, C Trager-Cowan, K Mingard

POSTER # 471

10:00 AM **1145** *Electronic Structure and Coupling of Re Clusters in Monolayer MoS₂*; **S Yang**; P Manchada, Y Gong, ST Pentelides, W Zhou, MF Chisholm

POSTER # 472

10:00 AM **1146** *Sample Orientation for Electron Channelling Contrast Imaging*; **T Vystavěl**, L Strakoš, A Prokhodtseva, H Han, J Stárek, P Stejskal, T Hantschel

POSTER # 473

10:00 AM **1147** *Imaging Reaction Dynamics on Inverse Model Catalyst Surfaces by In Situ Environmental SEM*; **C Barroo**, Z- J Wang, M-G Willinger

A09.P3

Microscopy and Microanalysis for Real-World Problem Solving

POSTER SESSION

Thursday 10:00 AM • Room: Exhibit Hall

POSTER # 474

10:00 AM **1148** (STUDENT) *Analysis of Denton E-Beam 2 Nanofabricated Thin Films by Metrology*; JF Al-Sharab, **R Reilford**

POSTER # 475

10:00 AM **1149** *Analyses of the Morphological Stability of γ' Particles in Turbine Blades Removed from Service Manufactured from a Ni-Based Superalloy*; EO Avila-Davila, VM Lopez-Hirata, ML Saucedo-Muñoz, M Moreno-Ríos, **EE Vera-Cardenas**, N Cayetano-Castro, IA Martinez-Perez

POSTER # 476

10:00 AM **1150** *Time-Resolved in situ Raman Spectroscopic Observations of a Biomineralization Model System*; **B Wingender**, E Tong, J Emery, L Gower, R Kröger

POSTER # 477

10:00 AM **1151** *Characterization of Localized Elemental Composition of Core-Shell Pd/C Catalysts by FESEM/EDS and STEM/EDS*; **YC Wang**, M Kulzick

POSTER # 478

10:00 AM **1152** *Micro structural Evolution of the Boiler Tubes after Long-Term Service*; **L Xu**, Y He, S-Y Bae, K Shin

POSTER # 479

10:00 AM **1153** *Microanalysis of Antigorite in Brake Pads*; AI Martinez Perez, **EE Vera Cardenas**, G Luis Raya, G Villagomez Garcia, M Villanueva Ibañez, F Mejia Hernandez

Scientific Program

POSTER # 480

10:00 AM **1154** *New Insights into Gold Mineralization at the Yellowknife City Gold Project, Northwest Territories from Synchrotron micro-XRF and PXRD*; RJ Botor, HE Cavallin, TJ Flynn, **LL Van Loon**, A Sexton, NR Banerjee

POSTER # 481

10:00 AM **1155** *A Comparative Evaluation of the Intensities, Spectral Resolution, and Overall Time of Acquisition Achievable by SEM-Based Parallel Beam WDS and SEM-Based Rowland Circle WDS*; **SM Seddio**

POSTER # 482

10:00 AM **1156** *In situ Nanoscale Characterization of Polymer Melting and Crystallization via Multimodal Chemical Imaging*; **AV Ievlev**, M Lorenz, O Ovchinnikova

POSTER # 483

10:00 AM **1157** *SEM Study of Growth of SnO₂ Nanoflowers in Thin films by Spray Pyrolysis*; **A Faudoa-Arzate**, HJ Morales- Rodriguez, M Sanchez-Carrillo, A González- Vázquez, PR Realyvazquez-Guevara, JA Rojas, WM Chávez-Montes

POSTER # 484

10:00 AM **1158** *Probing Threading Dislocations in a Micrometer-Thick GaN Film by High-Voltage Scanning Transmission Electron Microscopy*; **K Sato**, H Yasuda

POSTER # 485

10:00 AM **1159** *Mechanical Synthesis of Fullerene-Graphene/Morphed Graphene Architectures*; HA Calderon, O Velazquez Meraz, L Echegoyen, **FC Robles Hernandez**

POSTER # 486

10:00 AM **1160** *Correcting an Aberration with a Wire Corrector for SEM*; **T Nakano**, Y Yamazawa

POSTER # 487

10:00 AM **1161** (STUDENT) *In situ Measurement of Diamond/SiC Interfacial Strength*; **Y Zhang**, C-Y Hsu, Y Zhao, P Karandikar, C Ni

A10.P2

Advances in Focused Ion Beam Instrumentation and Techniques

POSTER SESSION

Thursday 10:00 AM • Room: Exhibit Hall

POSTER # 488

10:00 AM **1162** *Helium Ion Microscopy Imaging of Bottlebrush Copolymers*; N Borodinov, D Chang, A Trofimov, K Hong, B Sumpter, O Ovchinnikova, **A Belianinov**

POSTER # 489

10:00 AM **1163** *A Method for FIB Liftout of Particles in Epoxy Resin*; **W York**, D Robinson, J Sugar

POSTER # 490

10:00 AM **1164** *3D-Printed Lift Outs For EXLO and INLO Practice and Training*; ZA Giannuzzi, KA Gehoski, WJ Mahoney, **LA Giannuzzi**

POSTER # 491

10:00 AM **1165** *FIB Sample Preparation for In-Depth EDS Analysis*; R Garcia, FA Stevie, L Giannuzzi

POSTER # 492

10:00 AM **1166** *In situ Analysis of Cryoformed Metals by STEM*; RS Namur, **DE Huber**, AJ Ramirez, OM Cintho

POSTER # 493

10:00 AM **1167** *A Fast and Accurate Workflow for Analytic 3D FIB-SEM Tomography*; **T Volkenandt**, F Pérez-Willard, F Bauer, N Stephen, J Goulden, P Trimby, K Larsen

POSTER # 494

10:00 AM **1168** *Microstructural and Defect Characterization of Al-Si alloy Using PFIB and EMPAD*; **RE Williams**

POSTER # 495

10:00 AM **1169** (STUDENT) *Demonstration of High Efficiency Diffractive Optics for Electrons Fabricated with Ion Beam Gas- Assisted Etching*; **C Johnson**, B McMorran

POSTER # 496

10:00 AM **1170** *Channeling Contrast Simulation of Secondary Electron Images in Scanning Ion Microscopes*; **K Ohya**

POSTER # 497

10:00 AM **1171** (STUDENT) *Using Plasma Focused Ion Beam Microscopy to Characterize 3D Structure and Porosity of OPC Mortar*; **P Dong**, A Allahverdi, H Yuan, ND Bassim

A12.P1

Advances in Cryo-EM Technology

POSTER SESSION

Thursday 10:00 AM • Room: Exhibit Hall

POSTER # 498

10:00 AM **1172** (Invited) (STUDENT) (M&M MEETING SCHOLAR AWARD) *Cryo-EM Study of Chaperonin Mm-Cpn's Conformational Heterogeneity under Different ATP Conditions*; **Y Zhao**, W Chiu

POSTER # 499

10:00 AM **1173** *The NCI National Cryo-EM Facility*; **U Baxa**, TJ Edwards, AD Wier, H Wang, TM Hutchison, JE Finney, S Subramaniam

POSTER # 500

10:00 AM **1174** *Spotiton and Chameleon Viitrification Robots*; **H Wei**, V Dandey, M Kopylov, E Eng, P Kahn, C Potter, B Carragher

POSTER # 501

10:00 AM **1175** *Advances In Single Particle Analysis Data Acquisition*; **S Konings**, M Kuijper, J Keizer, F Grollios, T Spanjer, P Tiemeijer

POSTER # 502

10:00 AM **1176** *Determining the Differences in Image-Resolutions of Single-Particle CryoTEM Datasets Acquired with Indirect-Electron and Direct-Electron CMOS Cameras*; **DH Anjum**, MA Sobhy, AR Behzad, F Rashid, R Sougrat, SM Hamdan

POSTER # 503

10:00 AM **1177** *Cryo-FIB Workflow for Fabricating Thin Lamellae Using TESCAN S8000G*; S Zachej, T Heuser, Z Hovádková, J Havrankova, K Rosikova, **R Vana**

Thursday, August 8

Scientific Program

B

Biological Sciences Poster Sessions – Thursday Late Morning

B05.P1

Light and Fluorescence Microscopy for Imaging Cell Surface and Cell Structure

POSTER SESSION

Thursday 10:00 AM • Room: Exhibit Hall

POSTER # 504

10:00 AM **1178** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Immunoprofiling of Cell Wall Carbohydrate Modifications During Aerenchyma Formation in Fabaceae Roots*; **TJ Pegg**, RE Edelmann, DK Gladish

POSTER # 505

10:00 AM **1179** *Optimizing F-actin Labeling at the Leading Edge of Cells Using Multiple Actin Probes, Fixation Methods and Imaging Techniques*; **V DesMarais**, RJ Eddy, VP Sharma, O Stone, JS Condeelis

POSTER # 506

10:00 AM **1180** *3D Confocal Fluorescence Microscopy Analysis of Skeletal Muscle Myogenesis in Self Assembled 3D Microtissues*; **GP Ahnrad**, J Morgan, K O'Fallon, P Marek

POSTER # 507

10:00 AM **1181** (STUDENT) *An Alpha-synuclein Overexpression Model of Vocal Symptoms in Parkinson's Disease*; **A Badwal**, CA Medina, SJ Munger, JE Miller

POSTER # 508

10:00 AM **1182** (TECHNOLOGIST/STAFF AWARD-BIOLOGICAL SCIENCES) *Multiplex Immunolabeling and Imaging of Functionally Essential Kidney Structures in X-CLARITY-Cleared Tissue*; **PK Mochama**, R Tyshynsky, MA Sanders

POSTER # 509

10:00 AM **1183** *Fluorescent Ligands on the Basis of Hongotoxin 1: eGFP-Hongotoxin 1*; **MV Savelieva**, KS Kudryashova, OV Nekrasova, AV Feofanov

POSTER # 510

10:00 AM **1184** *Method for Analysis of Excitation-Emission Spectral Scans to Characterize Fluorescent Probes in Confocal Microscopy*; V Cmiel, J Skopalik, L Baiazitova, **I Provaznik**

POSTER # 511

10:00 AM **1185** *Strategy for Compositional Analysis of the Hair Cell Mechanotransduction Complex Using TIRF Microscopy*; **S Clark**, J Elferich, J Gai, A Goehring, J Mitra, T Ha, E Gouaux

B07.P2

3D Structures: from Macromolecular Assemblies to Whole Cells (3DEM FIG)

POSTER SESSION

Thursday 10:00 AM • Room: Exhibit Hall

POSTER # 512

3:00 PM **1186** *Electron Microscopy of Yeast FACT Protein Complex*; MG Karlova, ME Valieva, Y Danilova, AL Kozlova, VM Studitsky, **OS Sokolova**

POSTER # 513

3:00 PM **1187** *SMA-Based Extraction of the Yeast Cell Wall Integrity Sensor Mid2 from Native Membranes of Saccharomyces cerevisiae – Electron Microscopy Study*; N Voskoboinikova, M Karlova, R Kurre, J Heinisch, H-J Steinhoff, KV Shaitan, **OS Sokolova**

POSTER # 514

3:00 PM **1188** (STUDENT) *Interconnection of Actin-Binding Proteins and Septins in Asymmetric Cell Division*; **AV Vakhrusheva**, TB Stanishneva-Konovalova, OS Sokolova

POSTER # 515

3:00 PM **1189** *Atomic Force Microscopy Investigation of Influenza A Virus Nuclear Export Protein Aggregation*; **EV Dubrovin**, ON Koroleva, AO Golovko, NV Kuzmina, DV Klinov, VL Drutsa

POSTER # 516

3:00 PM **1190** *Nanometer-Scale Structures of Neurons Differ between Individuals and Those Differences Become Extraordinary in Schizophrenia*; **R Saiga**, V De Andrade, F De Carlo, A Takeuchi, K Uesugi, Y Terada, Y Suzuki, S Takekoshi, C Inomoto, N Nakamura, Y Torii, I Kushima, S Iritani, N Ozaki, K Oshima, M Itokawa, M Arai, R Mizutani

POSTER # 517

3:00 PM **1191** *Hierarchical Spidroin Micellar Nanoparticles as the Precursors of Spider Silks*; **LR Parent**, D Onofrei, D Xu, D Stengel, JD Roehling, JB Addison, C Forman, SA Amin, BR Cherry, JL Yarger, NC Gianneschi, GP Holland

POSTER # 518

3:00 PM **1192** *Hair-Structure Mystery Solved by Datamining Two Decades of Electron Tomograms*; **DP Harland**, V Novotná, M Richena, M Bostina, S Velamoor, AJ McKinnon

Thursday, August 8

Physical Sciences Poster Sessions – Thursday Late Morning

P01.P3

In situ TEM Characterization of Dynamic Processes During Materials Synthesis and Processing

POSTER SESSION

Thursday 10:00 AM • Room: Exhibit Hall

POSTER # 519

10:00 AM **1193** *In situ* Transmission Electron Microscopic Investigation of Coalescence Dynamics of Au Nanoparticles Embedded in Solid Potassium Bromide; **W Xin**

POSTER # 520

10:00 AM **1194** Application of *in situ* TEM Nanoscale Quantitative Mechanical Testing to Elastomers; **CM Barr**, D Qu, WM Mook, B Korth, JM Kropka, C Burkhart, K Hattar

POSTER # 521

10:00 AM **1195** *In situ* Observation of Catalytic Reaction in Gas Atmosphere Using an Aberration Corrected STEM; **M Shirai**, A Hanawa, H Kikuchi, H Inada, H Matsumoto

POSTER # 522

10:00 AM **1196** HAADF and Analytical TEM of the Metastable α -Al and θ' -Al₂Cu Phases in a Rapidly Solidified Hypo-Eutectic Al-Cu Alloy; **B Vishwanadh**, JT McKeown, JM Wieszorek

POSTER # 523

10:00 AM **1197** (STUDENT) Patterned Ultra-Thin Gold Nanostructures on Graphene; **G Zagler**, C Mangler, J Kotakoski

POSTER # 524

10:00 AM **1198** (STUDENT) Morphology Change Study of Molybdenum Oxide from 3D to 2D Particles; **C Ornelas**, J Lara-Romero, C Campos-Valdez, C Leyva-Porras, F Paraguay-Delgado

POSTER # 525

10:00 AM **1199** (STUDENT) *In situ* TEM Observation of Nanoparticles Formation during Carbothermal Shock; **Z Huang**, Y Yao, L Hu, R Shahbazian-Yassar

POSTER # 526

10:00 AM **1200** (STUDENT) Early Stages of Secondary Phase Formation in Multicomponent Alloys Using an *in situ* TEM Heating Approach; **EA Anber**, E Lass, AC Lang, P Suri, D Scotto D'Antuono, H Diaio, R Feng, P Liaw, ML Taheri

POSTER # 527

10:00 AM **1201** (STUDENT) (M&M MEETING SCHOLAR AWARD) Quantifying Atomic-Scale Quantum Dot Superlattice Behavior Upon *in situ* Heating; **MA Smeaton**, DM Balazs, T Hanrath, LF Kourkoutis

POSTER # 528

10:00 AM **1202** Optimized High-Temperature *in situ* Transmission Electron Microscopy Double-Tilt Sample Heating Platform; **DH Alsem**, J Horwath, JA Rodriguez Manzo, K Karki, EA Stach

POSTER # 529

10:00 AM **1203** *In situ* Transmission Electron Microscopy Investigation on the Vapor-Solid Growth of ZnO Nanowires; **X Li**, S Cheng, J Zhu, Q Chen

POSTER # 530

10:00 AM **1204** Insights into the Formation of Bicontinuous, Porous CuZn nano/micro Particles by *in situ* (S)TEM; **S Kundu**, KA Mkhoyan

P03.P2

Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions

POSTER SESSION

Thursday 10:00 AM • Room: Exhibit Hall

POSTER # 531

10:00 AM **1205** High Resolution TEM Imaging of Polymer Crystals Using Low Dose Techniques; I Lieberwirth, F Wurm, K Wagener, O Suraeva

POSTER # 532

10:00 AM **1206** Co-evolution of Microstructure and Magnetic Properties in Magnetically Aligned MnBi-Bi Composites; **SR Boona**, B Wooten, K Vandaele, JP Heremans

POSTER # 533

10:00 AM **1207** (STUDENT) Single Electron Interferometry: A Step Toward Quantum Electron Microscopy; **AE Turner**, F Yasin, C Johnson, B McMorran

POSTER # 534

10:00 AM **1208** Low Dose-Rate High-Resolution Transmission Electron Microscopy Of Group III – Nitride Electronic Device Structures Using A Direct Electron Detector; **P Specht**, R Kirste, Z Sitar, C Kisielowski

POSTER # 535

10:00 AM **1209** Low Dose TEM on the Degradation of the MAPbI₃ Perovskite; HA Calderon, J Bao, Y Wang, V Hadjiev, **FC Robles Hernandez**

POSTER # 536

10:00 AM **1210** Real-Time Electron Counting for Continuous TEM Imaging of Sensitive Samples; **BK Miller**, A Pakzad, S Mick

POSTER # 537

10:00 AM **1211** Imaging Chiral Materials with Photon-Induced Near-Field Electron Microscopy; TR Harvey, J-W Henke, O Kfir, **A Feist**, C Ropers

POSTER # 538

10:00 AM **1212** (M&M POST-DOCTORAL RESEARCHER AWARD) Atomic-Scale Characterization Reveals Core-Shell Structure of Enamel Crystallites; **PJ Smeets**, K DeRocher, MJ Zachman, BH Goodge, LF Kourkoutis, D Joester

POSTER # 539

10:00 AM **1213** Imaging Metal–Organic Frameworks (MOFs) Using Cryo-TEM and Direct Electron-Detection Camera; L Xing, H Yu, **J-G Zheng**

Scientific Program

P

Physical Sciences Poster Sessions – Thursday Late Morning cont.

P08.P3

Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications

POSTER SESSION

Thursday 10:00 AM • Room: Exhibit Hall

POSTER # 540

10:00 AM **1214** *Effect of Trace Ce/La Addition on the Microstructure and Microhardness of Nanostructured Nickel-Based Superalloy Inconel 718*; **HM Medrano-Prieto**, CG Garay-Reyes, MA Ruiz Esparza-Rodriguez, I Estrada-Guel, JM Silva-Aceves, JS Castro-Carmona, H Camacho-Montes, R Martínez-Sánchez

POSTER # 541

10:00 AM **1215** (STUDENT) *Investigating Surface Structure, Chemistry, and Thickness of NMC Cathodes Blended with LFO Using EELS*; **CJ Villa**, X Hu, W Dose, CS Johnson, VP Dravid

POSTER # 542

10:00 AM **1216** *Interfacial Analysis in AZ31B Magnesium Alloy Reinforced with Multiwalled Carbon Nanotubes*; **CA Isaza Merino**, Y Cardona-Maya, JM Herrera-Ramirez, C Carreno-Gallardo, JM Meza

POSTER # 543

10:00 AM **1217** *SEM Study of Zn/ZnO Transition Obtained by Mechanical Milling*; **HJ Morales-Rodriguez**, A Faudoa-Arzate, WM Chávez-Montes, M Sanchez-Carrillo, OA Chávez-Montes, JA Rojas

POSTER # 544

10:00 AM **1218** *Investigation of the Atomic and Electronic Structure of β -(Al_{0.2}Ga_{0.8})₂O₃ Alloys by STEM-EELS*; **AE Chmielewski**, P Moradifar, L Miao, KA Lopez, Y Zhang, A Mauze, JS Speck, N Alem

POSTER # 545

10:00 AM **1219** *Precipitation Hardening via Chemically Ordered L12 Precipitates in Al-Sc-Zr Alloys— New Insights Using Combined STEM and EDS Study*; **Y Yang**, **P Mukherjee**, P Sanders

POSTER # 546

10:00 AM **1220** *Structural Analysis of MoS₂ Layers in a 3D Assembly*; **JE Samaniego-Benitez**, JJ Velazquez-Salazar, R Mendoza- Cruz, L Bazan-Diaz, JE Ortega, G Plascencia-Villa, **MJ Arellano-Jimenez**, A Garcia-Garcia, J Willars-Rodriguez, JF Perez, SE Favela- Camacho, M Jose Yacaman

POSTER # 547

10:00 AM **1221** (STUDENT) *The Atomic-level Characterization of Platinum Nanoparticles in γ -Alumina Using TEM and DFT*; **A Clauser**, KO Sarfo, C Ophus, R Giulian, L Arnadottir, MK Santala

POSTER # 548

10:00 AM **1222** *TEM Studies of Fe_{1-x}Nix Nanowires by Magnetic-Field-Induced Synthesis*; **S-C Liou**, K Krajewski, **W-A Chiou**, M Tokarczyk, G Kowalski

POSTER # 549

10:00 AM **1223** *Atomic Resolution Characterization of Cr Thin Films Produced from Cr³⁺ Electrolytes*; **FC Robles Hernandez**, K Ahmadi, A Stokes, J McNeil, SR Brankovic

POSTER # 550

10:00 AM **1224** (STUDENT) *Ruthenium Diffusion on Different CeO₂ Surfaces: Support Shape Effect*; **J Li**, Z Liu, DA Cullen, R Wang

POSTER # 551

10:00 AM **1225** *Grain Boundaries and Anti-Phase Boundaries in Ba_{1.015}Zr_{0.8-x}Ce_{0.2-x}O₃ Proton Conductors*; **D Zhou**, W Sigle, Y Huang, R Merkel, PA van Aken, J Maier

POSTER # 552

10:00 AM **1226** (STUDENT) *Structure-Activity Relationships in Pt-Functionalized Graphitic Carbon Nitride Photocatalysts*; **DM Haiber**, PA Crozier

POSTER # 553

10:00 AM **1227** *Probing the Active Sites of ZnO Nanowire Supported Ir Species for CO Oxidation*; **J Xu**, Y Cai, X Li, **J Liu**

POSTER # 554

10:00 AM **1228** *Reconstructions in Atomic and Electronic Structures at Gold-Oxide Interfaces*; **G-Z Zhu**, M-H Lin, F Liu, DY Xie, S-Y Yao, A Yi

POSTER # 556

10:00 AM **1230** *Two-Dimensional Polycrystalline Co₃O₄ Supported High-Number-Density Metal Single Atoms and Clusters*; **J Xu**, D Wang, Y Cai, **J Liu**

POSTER # 558

10:00 AM **1232** *Electron Microscopy Study of TiO₂ Nanoparticle in Mesoporous Silica*; **K Vibulyaseak**, W-A Chiou, M Ogawa

POSTER # 557

10:00 AM **1231** (STUDENT) *Effects of Wavelength Variation on Localized Photoemission in Triangular Gold Antennas*; **CM Scheffler**, RC Word, R Könenkamp

POSTER # 559

10:00 AM **1233** (STUDENT) *Photoemission Electron Microscopy for Analysis of Plasmonic Responses of Silver Nanoparticles*; **T Stenmark**, R Könenkamp

POSTER # 560

10:00 AM **1234** *Development of a Laboratory-Based X-Ray Absorption System for Energy Material Research*; **R Qiao**, S Seshadri, S Lewis, S Lau, W Yun

POSTER # 561

10:00 AM **1235** *Atomic Structure of Electrochemically Deposited Lithium Metal and Its Solid Electrolyte Interphases Revealed by Cryo-electron Microscopy*; **Y Xu**, Y He, H Wu, W Xu, C Wang

POSTER # 562

10:00 AM **1236** (STUDENT) *Synthesis and Structural Characterization of SnO₂ Electron Transport Layer in Perovskite Solar Cells*; **H Dong**, C Gao, X Bao, L Yu, L Dong

POSTER # 563

10:00 AM **1237** *Microscopy Study of the Morphology of Carbonized ZIF-67 Tailored by CTAB*; **C Feng**, J Sui, Y Xia, J Yu, L Yu, **L Dong**

Scientific Program

POSTER # 564

10:00 AM **1238** *Synthesis of Mesoporous Zinc Oxide Without Template*; B Murguía-Martínez, A Medina Flores, **SE Borjas- García**, V Sayil, PG Martínez-Torres, L Béjar-Gómez

POSTER # 565

10:00 AM **1239** *Using Ice Crystals to Template Nanocavities on the Surface of Au Modified 2D TiO₂ Nanosheets: Visible Light Driven Water Splitting*; M Caplovicova, J Mares, J Tolasz, E Koci, **S Bakardjieva**, R Fajgar, V Jandova

POSTER # 566

10:00 AM **1240** *Effect of La Additive on the Morphology and Photocatalytic Performance of 2D TiO₂ Nanosheets: Degradation of 4 Chlorophenol*; **S Bakardjieva**, R Fajgar, VY Zenou, H Bibova, E Chatzisyseon, R Nikolava

POSTER # 567

10:00 AM **1241** *Microstructure of Iron (Fe) Nanowires Synthesized by Chemical Reduction of Different Fe Ionic Precursors*; **S- C Liou**, W-A Chiou, Y Zhou, X-X Cai, M-Y Chen, Y-J Chiou, H-M Lin, C-K Lin

POSTER # 568

10:00 AM **1242** *Electron Microscopy Characterization of Forest Biomass Soot as Solar Energy Absorption Material*; LB López- Sosa, M González-Avilés, LM Hernández-Ramírez, A Medina-Flores, **I Santos-Ramos**, J Zárate-Medina

POSTER # 569

10:00 AM **1243** (STUDENT) *All-Scale Architecturing of Microstructure in Chalcogenide Thermoelectric Materials*; **S Cai**, Y Luo, X Hu, MG Kanatzidis, VP Dravid

POSTER # 570

10:00 AM **1244** (STUDENT) *Tuning the Relaxation of Imprinted Polymer Films with Polymer-Grafted Nanoparticles*; **S Bhadauriya**, X Wang, D Raghavan, M Bockstaller, C Stafford, J Douglas, A Karim

POSTER # 571

10:00 AM **1245** (STUDENT) *Characterization of Etched and Grown GaN-GaN Schottky Diodes*; **P Peri**, DJ Smith, K Fu, Y Zhao, H Fu

POSTER # 572

10:00 AM **1246** (STUDENT) *Effect of Aluminum Concentration and Process Control Agents on synthesis of Al_xCoCrFeMnNi Alloys*; **MA Ruiz Esparza Rodriguez**, CG Garay Reyes, I Estrada Guel, R Martinez Sanchez

POSTER # 573

10:00 AM **1247** (STUDENT) *Synthesis of Ultrathin-Wall Mesoporous Cu₂O Nanotubes for Low-Temperature Carbon Monoxide Oxidation*; **Y Yu**, N Ta, J Liu

POSTER # 574

10:00 AM **1248** *Investigation of Precipitation and Segregation of Secondary Phase Byproducts in Intermetallic Superconducting Materials*; **Y-F Su**, S Balachandran, Y Collantes, F Kametani, C Tarantini, PJ Lee, EE Hellstrom, DC Larbalestier

POSTER # 576

10:00 AM **1250** *Numerical Simulations for Plasmonic Nano-Antenna a-Si:H Solar Cell*; **A Garcia-Barrientos**, J Plaza-Castillo, JA Hoyo-Montaña, MA Garcia-Ramirez, R Balderas-Navarro, FR Castillo-Soria, U Pineda-Rico

POSTER # 577

10:00 AM **1251** (STUDENT) *Non-Aqueous Synthesis of Graphene Supported Spinel Ferrite Nanoparticles*; **N Jansen**, J Yuzon, E McCardle-Blunk, J Barnes, A Goforth, J Jiao

POSTER # 578

10:00 AM **1252** *e-Beam Detection of Buried Open Defects in Semiconductor Device*; CC Hun, LE Fernandez, P-C Kuo, **K Owusu-Boahen**, TH Oo

P10.P2 Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing Natural and Synthetic Materials

POSTER SESSION

Thursday 10:00 AM • Room: Exhibit Hall

POSTER # 579

10:00 AM **1253** *Improved Water Flux of Polyamide Reverse Osmosis Membrane Ontology Doping with g-C₃N₄*; F Shao, Z Yi, C Xu, L Yu, **L Dong**

POSTER # 580

10:00 AM **1254** *Electron Microscopy and Microanalysis Study of La_{1.89}Ce_{0.11}CuO₄/Ba_{0.5}Sr_{0.5}TiO₃/La_{0.67}Sr_{0.33}MnO₃ Heterostructure*; F Xia, J Wang, S Ma, J Feng, **L Dong**

POSTER # 581

10:00 AM **1255** *The Analysis of Sensitive Materials Using EBSD: The Importance of Beam Conditions and Detector Sensitivity*; **P Trimby**, A Bewick, D Abou-Ras, P Caprioglio, D Neher, L Otter

POSTER # 582

10:00 AM **1256** *Microstructural Characterization on AISI H13 Nitrided After a Heat Treatment*; **MA Doñu Ruiz**, N Lopez Perrusquia, VJ Cortés Suárez, MG Buenrostro Arvizu, JA García Sánchez

POSTER # 583

10:00 AM **1257** (STUDENT) *A Microstructure Obtained on AISI 1018 and AISI M2 Steel by Powder Paste Pack Boriding Process*; **GJ Pérez Mendoza**, MA Doñu Ruiz, N López Perrusquia, CR Torres Sanmiguel

POSTER # 584

10:00 AM **1258** *Characterization of Coatings Obtained by Dehydrated Paste-Pack Boriding Process Formed on AISI A36 Carbon and 304 Alloy Steels*; **M Ortiz**, I Morgado, A Cruz, A Soto, R Trujillo, MDLL Moreno, G Moreno, OA Gómez, J Zuno-Silva

POSTER # 585

10:00 AM **1259** (STUDENT) *The Use of Scanning Electron Beam-Based Phase Classification as a Crucial Tool in Alloy Development for Gas Turbine Engine Applications*; **TP McAuliffe**, I Reynolds, I Bantounas, TB Britton, D Dye

Poster #558 was inadvertently omitted from the printed program, but appears correctly in the mobile app under P08.P3.

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Lancok, R

Thursday, August 8

Scientific Program

P

Physical Sciences Poster Sessions – Thursday Late Morning cont.

POSTER # 586

10:00 AM **1260** *Polarity Determination in GaN Nanowires by Electron Backscatter Diffraction*; **NK Gunasekar**, C Trager- Cowan, A Winkelmann

POSTER # 587

10:00 AM **1261** (STUDENT) *Novel Microstructures Produced by Flash Sintering $\text{LaPO}_4/\text{Al}_2\text{O}_3$ Composites*; **Y Yang**, ML Mecartney

POSTER # 588

10:00 AM **1262** *Microscopic Studies of Irradiated Wood by UV light*; **P Svora**, SS Pawelkowicz, Z Prošek

POSTER # 589

10:00 AM **1263** (STUDENT) *Observation of Dislocation-assisted 2-Dimensional Channels Embedded in Perovskite Thin Films*; **H Huyan**, L Li, Y Zhang, C Heikes, D Schlom, X Pan

POSTER # 590

10:00 AM **1264** (STUDENT) *Dispersion of Carbon Nanotubes Using Nonlyphenol Commercial Surfactant*; **I Santos**, GA Rosas, LB López, J Zárte

POSTER # 591

10:00 AM **1265** (STUDENT) *Synthesis and Characterization of Silver Nanoparticles Embedded in Silica Matrix*; JR Montes- Bojorquez, J Carrillo-Pesqueira, **F Rojas-Gonzalez**, O Hernández-Negrete, HE Esparza-Ponce, R Carrillo-Torres, J Hernández- Paredes

POSTER # 592

10:00 AM **1266** *Phase Composition and Hardness of Series of Nanocrystalline CoCrFeMnMoNiTiW High-Entropy Alloys*; **C Gómez-Esparaza**, R Martínez-Sánchez, A Duarte-Moller, C Rodríguez-González

POSTER # 593

10:00 AM **1267** *Precise Measurements of Transmission Attenuation in Mass-Thickness Contrast TEM Images*; **J Yamasaki**, Y Ubata, H Yasuda

POSTER # 597

10:00 AM **1271** *A Showcase of Analytical Techniques: V Metal in Hibonite*; **SE Gain**, WL Griffin, M Saunders, J Shaw, V Toledo

POSTER # 598

10:00 AM **1272** *Putting Stars in the Gap: In situ Irradiation and Heating of Synthetic SiC and Implications for the Origins of C- rich Circumstellar Materials*; **TJ Zega**, J Bernal, JY Howe, P Haenecour, S Amari, L Ziurys

POSTER # 599

10:00 AM **1273** (STUDENT) *Coordinated Analyses of a Supernova Polycrystalline Olivine Aggregate in the CO Chondrite Dominion Range 08006*; **L Seifert**, P Haenecour, T Zega, T Ramprasad

POSTER # 600

10:00 AM **1274** *SEM-Based Quantitative Analysis of Lunar Meteorite Northwest Africa 2727*; **SM Seddio**, SN Valencia

P11.P2

Advances in Characterization of Geological and Extraterrestrial Samples

POSTER SESSION

Thursday 10:00 AM • Room: Exhibit Hall

POSTER # 594

10:00 AM **1268** *Can the Source Location of a Coloured Quartz Gemstone be Determined from Non-destructive Chemical Analysis?*; **A Halfpenny**

POSTER # 595

10:00 AM **1269** *Examination of Heritage and Geological Materials Using Correlated Electron- and X-Ray-Beam Microanalysis in the SEM*; **EP Vicenzi**, T Lam

POSTER # 596

10:00 AM **1270** *Chromium in Corundum: Ultra-high Contents under Reducing Conditions*; **SE Gain**, WL Griffin, M Saunders, V Toledo

A

Analytical Sciences Symposia – Thursday Afternoon

A06.5 Low Voltage, Low Energy Electron Microscopy Imaging and Analysis

SESSION CHAIRS:

Hector Calderon; Instituto Politécnico Nacional, Mexico
Richard Wuhrer; University of Western Sydney, Australia

PLATFORM SESSION

Thursday 1:30 PM • Room: B112

- 1:30 PM **1275** (Invited) *Challenges and Applications of High Spatial and Energy Resolution EELS for Mapping Functional Chemistry in Beam-Sensitive Materials at Low Acceleration Voltages*; **Q Ramasse**, D Kepaptsoglou, C Vollmer, F Hage, P Abellan, J Leitner
- 2:00 PM **1276** *Studying 2D Materials by Means of Microscopy and Spectroscopy with Low Energy Electrons*; **I Konvalina**, B Daniel, M Zouhar, J Piños, T Radlička, L Frank, I Müllerová, E Materna Mikmeková
- 2:15 PM **1277** (STUDENT) (M&M MEETING SCHOLAR AWARD) *Light Element Imaging Technique at Low Dose Condition by Processing Simultaneously Obtained STEM Images Using a Segmented Detector*; **K Ooe**, T Seki, Y Ikuhara, N Shibata
- 2:30 PM **1278** *Ion-Irradiated Damage in Semiconductors Visualized by Means of Low-kV Scanning Electron Microscopy*; **I Jozwik**, A Barcz, E Dumiszewska, E Dabrowska

A09.8 Microscopy and Microanalysis for Real-World Problem Solving

SESSION CHAIRS:

Janet H. Woodward; Buckman
Ke-Bin Low; BASF
Xiaofeng Zhang; Nanosys, Inc.

PLATFORM SESSION

Thursday 1:30 PM • Room: B113

- 1:30 PM **1279** *Quantitative Approaches to Study Elemental Distribution on Fluid Catalytic Cracking Catalyst*; **Y Tang**, M Allahverdi, P Diddams
- 1:45 PM **1280** *Multi-Functional Resin Coated Sand Proppants: Examination Using Microscopy and Energy Dispersive X-Ray Spectroscopy*; A Johnson, A Raghuraman, **D Reuschle**
- 2:00 PM **1281** *A Micro-Scale Experimental Investigation on the Impact of Varying Stress on Geo-Mechanical Deformation of Proppant-Packed Fractured Shale*; **MA Sayed**, M Arshadi, M Piri
- 2:15 PM **1282** *Meso to Atomic Scale Microstructural Changes During Ageing of NCM Li-Ion Battery Materials*; **JR Jokisaari**, J Guo, J Bareno, D Abraham, RF Klie
- 2:30 PM **1283** (STUDENT) *Strategies to Investigate Grain Boundary Structure and Properties of Bulk Thermoelectric Samples*; **JA Grovogui**, P Yasaei, IT Witting, GJ Snyder, VP Dravid

A10.4 Advances in Focused Ion Beam Instrumentation and Techniques

SESSION CHAIRS:

Suzy Vitale; Carnegie Institution for Science
Joshua Sugar; Sandia National Laboratories
Bruce Arey; Pacific Northwest National Laboratory
Alan Bahm; Thermo Fisher Scientific

PLATFORM SESSION

Thursday 1:30 PM • Room: F151

- 1:30 PM **1284** (Invited) *Advanced FIB-Based Preparation of Cryogenically-Prepared Specimens for APT Analysis*; **DE Perea**, DK Schreiber, M Wirth, JE Evans
- 2:00 PM **1285** *Residual Stress in Focused Charged Particle Beam-Deposited Materials*; **G Mitchson**, A Clarke, J Johnson
- 2:15 PM **1286** *Plasma FIB Spin Milling for 3D Residual Stress Measurements*; **B Winiarski**, C Rue, PJ Withers
- 2:30 PM **1287** *Passive Voltage Contrast Applications with Helium Ion Microscopy Imaging*; **D Xia**, S McVey, C Huynh, W Kuehn, D Runt
- 2:45 PM **1288** *Ar+ FIB Milling and Measurement of FIB Damage in Silicon*; **B Van Leer**, H Cheng, M Dutka

A12.2 Advances in Cryo-EM Technology

SESSION CHAIR:

Anchi Cheng; New York Structural Biology Center

PLATFORM SESSION

Thursday 1:30 PM • Room: D137

- 1:30 PM **1289** (Invited) *Streptavidin Affinity Grids for Single-Particle Cryo-EM*; **RM Glaeser**, B-G Han
- 2:00 PM **1290** (Invited) *Exploiting the Dose-Rate Dependence of Radiolysis – a Future for Cryo-STEM ?*; **R Egerton**, H Qian
- 2:30 PM **1291** *chameleon: Next-Generation Sample Preparation for CryoEM-Based on Spotiton*; **MC Darrow**, JP Moore, RJ Walker, K Doering, RS King
- 2:45 PM **1292** *Investigation of the Effects of Low-Energy Plasma Treatment on Amorphous Carbon and Graphene Support Films for Cryo-Electron Microscopy*; **MJ Campin**, MW Stumpf, PE Fischione

Scientific Program

B

Biological Sciences Symposia – Thursday Afternoon

B05.2 Light and Fluorescence Microscopy for Imaging Cell Surface and Cell Structure

SESSION CHAIRS:

David Zenisek; Yale University School of Medicine
Justin Taraska; National Institutes of Health
Xiaolin Nan; Oregon Health & Science University

PLATFORM SESSION

Thursday 1:30 PM • Room: D138

- 1:30 PM **1293 (Invited)** *Mechanism of Syntaxin Clustering Near Secretory Granules in Live Cells*; X Chen, L Wan, W Almers
- 2:00 PM **1294** *Mapping Protein Dynamics during Exocytosis of Single Microvesicles in Neuroendocrine Cells with Evanescent Field Microscopy*; JW Taraska, KA Sochacki, A Somasundaram
- 2:15 PM **1295 (STUDENT)** *Exchange Dynamics of Dynamin Measured in Living Cells During Endocytic Vesicle Formation*; L Claverie, M Rosendale, P Maschalchi, C Butler, N Retailleau, J-B Sibarita, D Choquet, D Perrais
- 2:30 PM **1296 (Invited)** *Visualizing the Molecular Dynamics of Adaptive and Innate Immune Signaling at the Cell Surface*; Y Mun, F Gerpott, M Chupanova, A Schmidt, M Taylor

P

Physical Sciences Symposia – Thursday Afternoon

P01.8 In situ TEM Characterization of Dynamic Processes During Materials Synthesis and Processing

SESSION CHAIRS:

Layla Mehdi; University of Liverpool, United Kingdom
Haimei Zheng; Lawrence Berkeley National Laboratory

PLATFORM SESSION

Thursday 1:30 PM • Room: B116

- 1:30 PM **1297 (Invited)** *Dynamic Restructuring during Processing: Approaches to Higher Temporal Resolution*; PA Crozier, EL Lawrence, JL Vincent, BD Levin
- 2:00 PM **1298** *Subsampled Acquisition to Increase Speed and Reduce Data Size for in situ TEM*; B Bammes, H Amari, BL Mehdi, R Bilhorn, ND Browning
- 2:15 PM **1299** *Electrostatic Subframing and Compressive Sensing Video in in situ Transmission Electron Microscopy*; BW Reed, AA Moghadam, RS Bloom, ST Park, AM Monterrosa, PM Price, CM Barr, SA Briggs, K Hattar, DJ Masiel
- 2:30 PM **1300** *Four Dimensional Scanning Transmission Electron Microscopy during the in situ Annealing of a CuZrAl Bulk Metallic Glass*; TC Pekin, C Gammer, C Ophus, RO Ritchie, AM Minor

- 2:45 PM **1301** *Environmental TEM Study of NiMoO₄ Nanorods Undergoing Thermal Reduction: Observing the Formation of a Ni–Mo Alloy@oxide Core-shell Catalyst*; SD House, RB Patil, A Mantri, JC Yang, JR McKone

P03.6 Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions

SESSION CHAIRS:

Stig Helveg; Haldor Topsoe A/S, Denmark
David Flannigan; University of Minnesota

PLATFORM SESSION

Thursday 1:30 PM • Room: D135

- 1:30 PM **1302 (Invited)** *Advancing Atomic-Resolution TEM of Electron Beam-Sensitive Crystalline Materials from “Impossible” to “Routine”*; D Zhang, L Liu, Y Zhu, Y Han
- 2:00 PM **1303** *From Control of the Electron Beam to Control of Single Atoms*; AR Lupini, BM Hudak, S Jesse, J Song, OE Dyck, PC Snijders, SV Kalinin
- 2:15 PM **1304 (STUDENT)** *Environment-Dependent Electron Beam Reduction of Rutile Nanocrystals at High Temperatures*; A Yoon, J-M Zuo
- 2:30 PM **1305 (Invited)** *Observing Structural Dynamics and Measuring Chemical Kinetics In Low Dimensional Materials Using High Speed Imaging*; AI Kirkland, C Allen, E Besley, C Huang, J Kim, S Skowron, J Warner

P04.5 Spectroscopy and Imaging of Nanostructured Low-Z Materials in the Electron Microscope

SESSION CHAIRS:

Dan Hodoroaba; Federal Institute for Materials Research and Testing, Germany
Andrew Stewart; University of Limerick, Ireland

PLATFORM SESSION

Thursday 1:30 PM • Room: F149

- 1:30 PM **1306 (Invited)** *Carbon Analysis in Steels by FE-EPMA: A Challenge or Contradiction?*; S Richter, P Pinard, H Farivar, G Achuda
- 2:00 PM **1307** *Analysis and Quantification of Transition Metal Borides with WDS and EDS*; R Terborg, S Richter
- 2:15 PM **1308** *Pushing the Measuring Capabilities of Silicon Drift Detectors for EDX Imaging of Low-Z Materials down to Lithium*; A Niculae, T Barros, A Bechteler, K Hermenau, K Heinzinger, A Liebel, H Soltan, L Strüder
- 2:30 PM **1309 (STUDENT)** *Analysis of Elemental Composition and Porosity of Mesoporous Iridium-titanium Mixed Oxide Thin Films for Energy Application by SEM/EDS*; R Sachse, V-D Hodoroaba, A Hertwig, L Kotil, R Kraehnert

P08.9 Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications

SESSION CHAIR:

Chongmin Wang; Pacific Northwest National Laboratory

PLATFORM SESSION

Thursday 1:30 PM • Room: B115

- 1:30 PM **1310** *Silicon Substitution in Monolayer Hexagonal Boron Nitride*; **MR Ahmadpour Monazam**, U Ludacka, H- P Komsa, J Kotakoski
- 1:45 PM **1311** (STUDENT) *Sensing Interfacial Visible Light Absorption in TiO₂-Supported CeO_{2-x} Photocatalyst Nanoparticles*; **DM Haiber**, K Venkatraman, T-U Phan, PA Crozier
- 2:00 PM **1312** (STUDENT) *TEM Analysis of Model Li-Ion battery Cathodes Grown by Molecular Beam Epitaxy*; **B KC**, J Jokisaari, R Klie
- 2:15 PM **1313** *Atomic Resolution Analysis of Defect Structures in Multi-Layer Chalcogenide Films*; **DL Medlin**, R Fischer, R Gannon, DM Hamann, DD Johnson
- 2:30 PM **1314** *Correlation Microanalysis of Localized Molecular Structure and Nano-Mechanical Property of PVDF Based Copolymer*; **W Qian**, S Sun, C Nguyen, S Ducharme, JA Turner
- 2:45 PM **1315** *In situ and Ex Situ Energy-Filtered Transmission Electron Microscopy Studies on the Nanomorphology Evolution of Organic Bulk Heterojunction Solar Cells*; C Harreiß, S Langner, M Berlinghof, S Rechberger, J Will, T Unruh, CJ Brabec, E Spiecker

P10.5 Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing Natural and Synthetic Materials

SESSION CHAIRS:

Minghua Ren; University of Nevada-Las Vegas
Donggao Zhao; University of Missouri - Kansas City

PLATFORM SESSION

Thursday 1:30 PM • Room: F150

- 1:30 PM **1316** (Invited) *Direct Observation of Heavy Metals and Impurities in Minerals Using Z-Contrast Imaging*; **H Xu**
- 2:00 PM **1317** *Characterization of Iron-Containing Nanoparticle Catalyst Using STEM Techniques*; M Xu, Y Yu, J-G Zheng
- 2:15 PM **1318** (STUDENT) *Gold Palladium Thin Films: Multi-Twinned Nanoparticles to Five-Fold Annealing Twins*; **P Parajuli**, A Ponce
- 2:30 PM **1319** *Implications of Point Defects on the Atomic Structure of Domain Walls in BiFeO₃*; **A Bencan Golob**, G Drazic, M Makarovic, H Ursic, M Komelj, T Rojac

A

Analytical Sciences Symposia – Thursday Late Afternoon

A12.3 Advances in Cryo-EM Technology

SESSION CHAIR:

Radostin Danev; Tokyo University

PLATFORM SESSION

Thursday 3:30 PM • Room: D137

- 3:30 PM **1321** (Invited) *CryoTEM with a Cold Field Emission Gun that Moves Structural Biology into a New Stage*; T Kato, F Makino, T Nakane, N Terahara, T Kaneko, Y Shimizu, S Motoki, I Ishikawa, K Yonekura, K Namba
- 4:00 PM **1322** *Initial Results from the CryoARM300 and DE-64 Counting*; **B Bammes**, M Spilman, J Streetley, D Bhella
- 4:15 PM **1323** *Scorpion: Facilitating High-Throughput Electron Microscopy*; **VP Dandey**, P Kahn, H Wei, B Carragher, CS Potter
- 4:30 PM **1324** (Invited) *Charging Dynamics in Low-Dose Cryo-TEM Imaging*; MT Schreiber, A Maigné, M Wolf

B

Biological Sciences Symposia – Thursday Late Afternoon

B05.3 Light and Fluorescence Microscopy for Imaging Cell Surface and Cell Structure

SESSION CHAIRS:

Justin Taraska; National Institutes of Health
David Perrais; CNRS, University of Bordeaux, France
Xiaolin Nan; Oregon Health & Science University

PLATFORM SESSION

Thursday 3:30 PM • Room: D138

- 3:30 PM **1325** (Invited) *Fluorescence Polarization Microscopy Enables Spatial Mapping of the 3D Orientation of Piconewton Integrin Traction Forces*; J Brockman, AT Blanchard, K Salaita, AL Mattheyses
- 4:00 PM **1326** *A Novel Anisotropy Imaging Technique for NAD(P)H Autofluorescence*; **J Varghese Chacko**, K Eliceiri
- 4:15 PM **1327** *Probing Membrane Nanodomain Organization with Single-Particle Tracking via Photoactivated Localization Microscopy (spt-PALM)*; Y Lee, C Phelp, T Huang, B Mostofian, D Zuckerman, X Nan

Scientific Program

P

Physical Sciences Symposia – Thursday Late Afternoon

P03.7 Revealing the Fundamental Structure of Soft and Hard Matter by Minimizing Beam-Sample Interactions

SESSION CHAIRS:

Dalaver Anjum; King Abdullah University of Science and Technology, Saudi Arabia
Joerg R Jinschek; The Ohio State University

PLATFORM SESSION

Thursday 3:30 PM • Room: D135

- 3:30 PM **1329** (Invited) *Making Compressive Sensing Accessible in Scientific Imaging*; **A Stevens**, H Amari, C Buurma, B Bammes, D Wije, D Nicholls, N Johnson, R Bilhorn, ND Browning
- 4:00 PM **1330** *Viability of Compressed Sensing as a Dose Reduction Strategy in STEM*; **W Van-den-Broek**, BW Reed, A Béch , J Verbeeck, CT Koch
- 4:15 PM **1331** *Compressive Sensing on Diverse STEM Scans: Real-Time Feedback, Low-Dose and Dynamic Range*; **X Li**, O Dyck, SV Kalinin, S Jesse
- 4:30 PM **1332** (STUDENT) *Probing Local Structures and Disorder in Graphitic Carbon Nitrides*; **DM Haiber**, BD Levin, PA Crozier
- 4:45 PM **1333** *Characterization of Catalyst-Nanomaterials with Myriad Modalities of Transmission Electron Microscopy*; **DH Anjum**, W Almaksoud, RK Rai, BE Al-Sabban, N Morlanes, J-M Basset

P04.6 Spectroscopy and Imaging of Nanostructured Low-Z Materials in the Electron Microscope

SESSION CHAIRS:

Meiken Falke; Bruker, Germany
Dan Hodooroaba; Federal Institute for Materials Research and Testing, Germany

PLATFORM SESSION

Thursday 3:30 PM • Room: F149

- 3:30 PM **1334** (STUDENT) *Quantitative Chemical Mapping of Anisotropic Molecular Distributions on Gold Nanorods*; **BE Janicek**, JG Hinman, JJ Hinman, SH Bae, M Wu, H-H Chang, KS Suslick, CJ Murphy, PY Huang
- 3:45 PM **1335** *Sub-nm Spectroscopic Mapping of Highly Beam Sensitive Species Using Direct Detection Electron Energy-Loss Spectroscopy*; **MC Akatay**
- 4:00 PM **1336** *STEM and Elemental Analysis by EDS and EELS for Two-Dimensional Atomic Structure Containing Au and Cu*; **H Sawada**, KB Borisenko, I Ohnishi, Y Jimbo, E Okunishi, AI Kirkland

4:15 PM **1337** *Nanoscale Correlative Imaging of Low-Z Elements by in situ Secondary Ion Mass Spectrometry in a Transmission Electron Microscope*; **S Eswara**, **J Lovric**, T Wirtz

4:30 PM **1338** (STUDENT) *Monolayer-Like Behavior of Bilayer Transition-Metal Dichalcogenides*; **JH Kim**, S-Y Kim, HJ Park, S-Y Kwon, Z Lee

P08.10 Microscopy and Spectroscopy of Nanoscale Materials for Energy Applications

SESSION CHAIR:

Linze Li; Pacific Northwest National Laboratory

PLATFORM SESSION

Thursday 3:30 PM • Room: B115

- 3:30 PM **1339** (STUDENT) *AC-STEM and HRSEM Investigation of Silica Nanoparticle Film Structure*; **JV Carpenter**, S Poges, Z Holman
- 3:45 PM **1340** *Atomic Resolution Investigation of Electric Field Effects on Equilibrium Grain Boundary Configurations in Ceramics*; **LA Hughes**, **K van Benthem**
- 4:00 PM **1341** (STUDENT) *Structural, Optical and Thermal Behavior Investigation of 2D Bi₂Te₃/Sb₂Te₃ In-plane Heterostructures via Aberration Corrected STEM and EELS*; **P Moradifar**, S Bachu, T Sharifi, PM Ajayan, N Alem
- 4:15 PM **1342** (STUDENT) *Finite Element Modeling of Gas and Temperature Distributions during Catalytic Reactions in an Environmental Transmission Electron Microscope*; **JT Langdon**, **JL Vincent**, PA Crozier
- 4:30 PM **1343** *Domain Structures and PrCo Antisite Point Defects in Double-perovskite PrBaCo₂O_{5+δ}*; **Y Ding**, Y Chen, M Liu, Z Wang
- 4:45 PM **1344** *Precession Electron Diffraction (PED) Strain Measurements in Stacked Nanosheet Structures*; **J Li**, S Mochizuki, J Zhang, N Loubet, J Gaudiello, B Haran

P10.6 Applications of Integrated Electron Probe Microscopy and Microanalysis Techniques in Characterizing Natural and Synthetic Materials

SESSION CHAIRS:

Owen Neill; University of Michigan

Donggao Zhao; University of Missouri-Kansas City

PLATFORM SESSION

Thursday 3:30 PM • Room: F150

3:30 PM **1345 (Invited)** *Electron Microscopic Characterization of Mineral-Microbe Interactions*; **H Dong**

4:00 PM **1346 (STUDENT) (M&M MEETING SCHOLAR AWARD)**
Analytical STEM/EDS Characterization of Elemental Segregation and Solid Solution Formation in Multiphase Ceramics; **K Syed**, M Xu, D Kok, KK Ohtaki, ML Mecartney

4:00 PM **1346 (STUDENT) (M&M MEETING SCHOLAR AWARD)**
Analytical STEM/EDS Characterization of Elemental Segregation and Solid Solution Formation in Multiphase Ceramics; **K Syed**, M Xu, D Kok, KK Ohtaki, ML Mecartney

4:15 PM **1347** *Adjusting the STEM Sample Holder Potential for Improved EBIC Contrast*; **M Mecklenburg**, WA Hubbard, HL Chan, BC Regan

4:30 PM **1348** *Observation of a Direct Correlation of the Crystallite Morphology and the Optical Properties in Indium Tin Oxide Thin Films*; **AC Leff**, WL Sarney, J Ni, W Zhou

4:45 PM **1349** *Template Synthesis of Ternary Hybrid Nanocrystals of CoS/Ag_{2S-Fe2O3} with Near-Infrared Photoluminescence*; Y Chen, Z Shi, J Feng, B Pang, L Yu, **L Dong**

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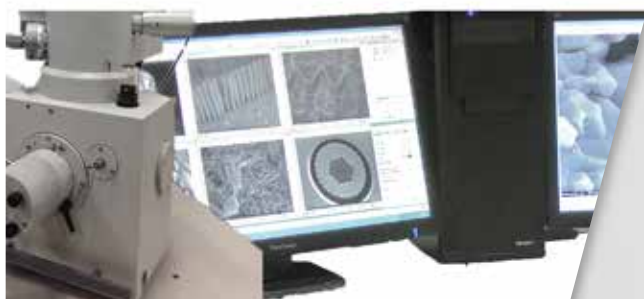
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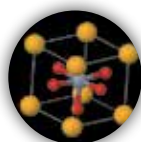
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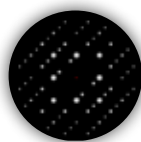
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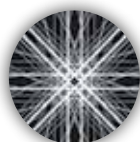
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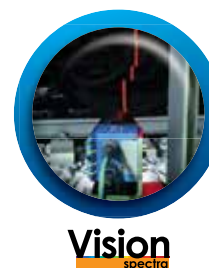
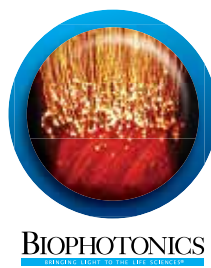
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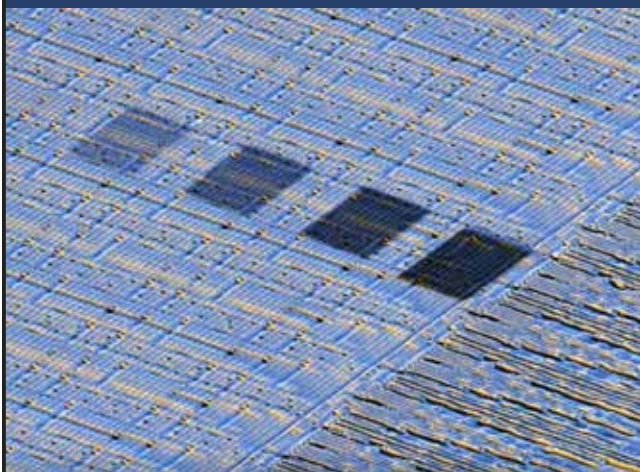
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MPF Products Inc. 1050	1050
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Norcada, Inc.	1551
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Technotrade International Inc.	1148

AFM / STM Accessories

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Atom Probe

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KMLabs, Inc.	1251
K-Tek Nanotechnology	842

Atomic Force Microscopes

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Anton Paar USA	910
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Hitachi High Technologies America, Inc.	1438
Kleindiek Nanotechnik	817
Nanoscience Instruments	1349
NenoVision	750
Quantum Design International	822
RMC Boeckeler	828
Seiwa Optical America, Inc.	813
WITec Instruments Corp.	717

Auger Microscopes

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Backscatter Detectors

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Books

ASM International	1640
Cambridge University Press	616
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Calibration and Reference Standards / Reference Materials

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K-Tek Nanotechnology	842
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RMC Boeckeler	828
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Camera / Digital Camera Systems - CDC, CMOS, Megapixel

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Angstrom Scientific Inc.	1452
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Direct Electron, LP	518
Gatan, Inc.	928
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IDES, Inc	1451
PNSensor GmbH	548
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Consulting

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HREM Research Inc.	537

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HREM Research Inc.	537
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Immuno-Labeling

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Ion Pumps New and Rebuilding

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Journals

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Knife Resharpener / Resharpener Services

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Zygo Corporation	614

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EDAX	428
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KMLabs, Inc.	1251
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Hummingbird Scientific	1045

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zeroK NanoTech Corporation	715

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DECTRIS Ltd	1002
EMCrafts Co., Ltd.	1010
PNDetector GmbH	647
Point electronic GmbH	549
Raith	1129
SEMTECH Solutions, Inc.	530
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Grace Bio-Labs	650
Henan Zhongjingkeyi Technology Co., Ltd	T452
Herzan LLC	1248
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ibss Group, Inc.	1552

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Kammrath and Weiss	1009
Kleindiek Nanotechnik	817
Ladd Research	1014
Mel-Build Corporation	526
MEO Engineering Company	1650
MiTeGen	1152
Nanoscience Instruments	1349
NenoVision	750
Norcada Inc.	1551
Oxford Instruments	915
PIE Scientific LLC	1348
PNDetector GmbH	647
Point electronic GmbH	549
Quantum Design, Inc	822
SEMTECH Solutions, Inc.	530
Spellman High Voltage Electronics Corp.	1250
SPI Supplies	1130
TSS Microscopy, LLC	1441
WITec Instruments Corp.	717
XEI Scientific, Inc.	1230

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Ephemeron Labs	1447
Hitachi High Technologies America, Inc.	1438
Hummingbird Scientific	1045
Kammrath and Weiss	1009
Kleindiek Nanotechnik	817
Mel-Build Corporation	526
MEO Engineering Company	1650
Protochips, Inc.	644
SmarAct Inc	1247
Ted Pella Inc.	1338
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Carl Zeiss Microscopy, LLC	1117
Duniway Stockroom Corp.	1347
MEO Engineering Company	1650
RMC Boeckeler	828
SEMTECH Solutions, Inc.	530
TSS Microscopy, LLC	1441

Service Laboratories

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Nanoscience Instruments	1349
Pacific Northwest CryoEM Center	652
SEMTech Solutions, Inc.	530

Society and Event Organizer

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Royal Microscopical Society	1048

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Cameca	422
DECTRIS Ltd	1002
Digital Surf	1352
Exprodo Software Limited	950
FOM Networks, Inc.	528
HREM Research Inc.	537
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Specimen Preparation & Handling

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Barnett Technical Services/Attolight	1030
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Ephemeron Labs	1447
EXpressLO LLC	1055
Fischione Instruments	846
Henan Zhongjingkeyi Technology Co., Ltd	T452
JEOL USA, Inc.	623
Linkam Scientific Instruments	551
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TTP Labtech	1147
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Specimen Storage

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PIE Scientific LLC	1348

Spectrometers

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EDAX	428
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JASCO	1054
KMLabs, Inc.	1251
Physical Electronics	812
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Rigaku Americas Corp.	437
Sigray, Inc.	524
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SQUID / Superconducting Quantum Interference Devices

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Stage Automation

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Supplies

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Grace Bio-Labs	650
Henan Zhongjingkeyi Technology Co., Ltd	T452
Ladd Research	1014
Microscopy Innovations, LLC	1049
MiTeGen	1152
SPI Supplies	1130
YW MEMS(Suzhou) Co.,Ltd.	838

Surface Analysis

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Barnett Technical Services/Attolight	1030
Digital Surf	1352
HORIBA Scientific	547
JEOL USA, Inc.	623
Keyence Corporation of America	909
KMLabs, Inc.	1251
Nanoscience Instruments	1349
NenoVision	1005

Surface Analysis cont.

Physical Electronics	812
Sigray, Inc.	524
Zygo Corporation	614

Surface Profiling

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Keyence Corporation of America	909
Nanoscience Instruments	1349
NenoVision	1005
Seiwa Optical America, Inc.	813
Zygo Corporation	614

Tabletop SEM/TEM

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Clark-MXR Inc	1204
Coxem Co., Ltd	744
EMCrafts Co., Ltd.	1010
Fischione Instruments	846
Hitachi High Technologies America, Inc.	1438
Nanoscience Instruments	1349
Spellman High Voltage Electronics Corp.	1250
Technex Lab Co., Ltd.	443
Voxa	431

TEM Accessories

3D-Micromac AG	816
Advanced Microscopy Techniques Corp.	1437
Barnett Technical Services/Attolight	1030
Bruker Corporation	638
Clark-MXR Inc	1204
Deben UK Limited	1454
DECTRIS Ltd	1002
Direct Electron, LP	518
EMS / Diatomed	938
EXpressLO LLC	1055
Gatan, Inc.	928
Henan Zhongjingkeyi Technology Co., Ltd	T452
Herzan LLC	1248
Hummingbird Scientific	1045
ibss Group, Inc.	1552
IDES, Inc	1451
IXRF Systems, Inc.	1638
Mel-Build Corporation	526
MiTeGen	1152
NanoMEGAS USA	513
Norcada, Inc.	1551

TEM Accessories cont.

Oxford Instruments	915
PNDetector GmbH	647
SPI Supplies	1130
Tousimis	819
TSS Microscopy, LLC	1441
XEI Scientific, Inc.	1230

TEM Specimen Holders

Clark-MXR Inc	1204
Fischione Instruments	846
Gatan, Inc.	928
Henan Zhongjingkeyi Technology Co., Ltd	T452
Hummingbird Scientific	1045
Mel-Build Corporation	526
MiTeGen	1152
Nanoscience Instruments	1349
Norcada, Inc.	1551
Protochips, Inc.	644
Ted Pella Inc.	1338
Tousimis	819
Voxa	431

Testing Equipment

Anton Paar USA	910
Barnett Technical Services/Attolight	1030
Fluid Imaging Technologies, Inc.	448
Grace Bio-Labs	650
Herzan LLC	1248
Kammrath and Weiss	1009
Olympus America Inc	946
Pace Technologies	809
SmarAct Inc	1247

Transmission Electron Microscopes (TEM)

BioNet Laboratory Inc.	T449
Clark-MXR Inc	1204
Hitachi High Technologies America, Inc.	1438
Hummingbird Scientific	1045
JEOL USA, Inc.	623
Pacific Northwest CryoEM Center	652
PNSensor GmbH	548
Spellman High Voltage Electronics Corp.	1250
TSS Microscopy, LLC	1441

Vacuum Equipment

Duniway Stockroom Corp.	1347
EMS / Diatomed	938
Mel-Build Corporation	526
MPF Products Inc	1050
Pace Technologies	809
Physical Electronics	812
Quorum Technologies	938

Vacuum Evaporators

Henan Zhongjingkeyi Technology Co., Ltd	T452
Ladd Research	1014
SPI Supplies	1130
Quorum Technologies	938

Vibration Isolation Systems

DAEIL SYSTEMS	840
Herzan LLC	1248
K-Tek Nanotechnology	842
Technical Manufacturing Corporation	422
Vibration Engineering Consultants	1642

WDS Detectors & Systems

Bruker Corporation	638
EDAX	428
Oxford Instruments	915
PNSensor GmbH	548

X-Ray Analysis Equipment

3D-Micromac AG	816
Anton Paar USA	910
Bruker Corporation	638
Carl Zeiss Microscopy, LLC	1117
DECTRIS Ltd	1002
EDAX	428
Grace Bio-Labs	650
HORIBA Scientific	547
IXRF Systems, Inc.	1638
KMLabs, Inc.	1251
MiTeGen	1152
Oxford Instruments	915
Physical Electronics	812
PNSensor GmbH	548
Rigaku Americas Corp.	437
SEMTech Solutions, Inc.	530
Sigray, Inc.	524
SmarAct Inc	1247

Exhibitor Name	Booth
3D-Micromac AG	816
Advanced Microscopy Techniques Corp.	1437
Alluxa, Inc.	1150
Analitex	718
Angstrom Scientific, Inc.	1452
Anton Paar USA	910
Applied Beams, LLC	952
Applied Physics Technologies	1646
ASI/Applied Scientific Instrumentation, Inc.	713
ASM International	1640
Barnett Technical Services/Attolight	1030
BioNet Laboratory, Inc.	T449
Bruker Corporation	638
Cambridge University Press	616
Cameca	422
Carl Zeiss Microscopy, LLC	1117
CELLINK	1249
Clark-MXR, Inc.	1204
Coxem Co., Ltd	744
DAEIL SYSTEMS	840
Deben UK Limited	1454
DECTRIS Ltd	1002
Denton Vacuum, LLC	826
DigiM Solution	1254
Digital Surf	1352
Direct Electron, LP	518
Duniway Stockroom Corp.	1347
E. Fjeld Co, Inc.	1445
EDAX	428
EMCrafts Co., Ltd	1010
EMS / Diatomed	938
Ephemeron Labs	1447
EXpressLO LLC	1055
Exprodo Software Limited	950
Fischione Instruments	846
Fluid Imaging Technologies, Inc.	448
FOM Networks, Inc.	528
Gatan, Inc.	928
Grace Bio-Labs	650
Henan Zhongjingkeyi Technology Co., Ltd.	T452
Herzan, LLC	1248
HIROX-USA, Inc.	1449
Hitachi High Technologies America, Inc.	1438

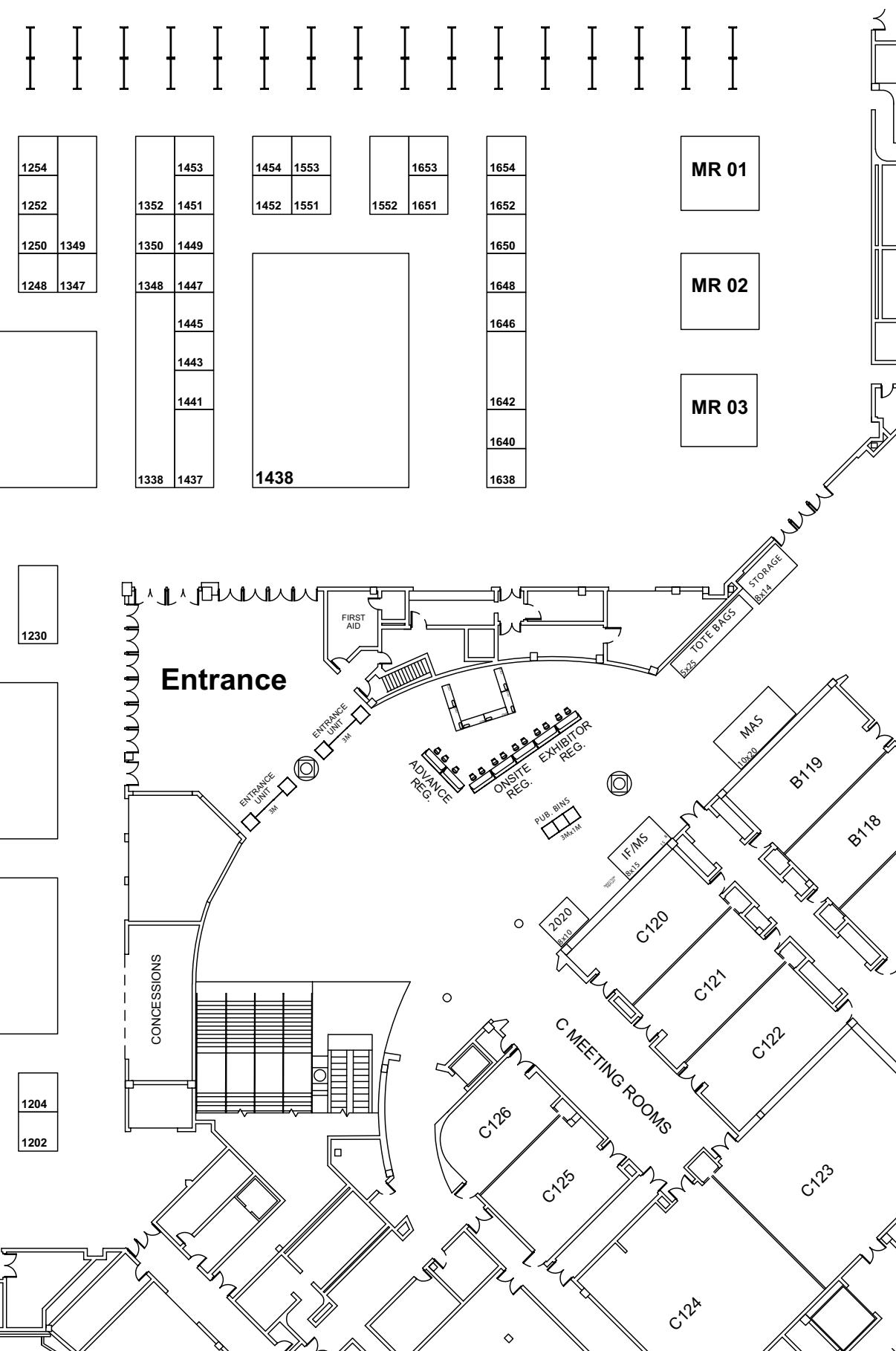
Exhibitor Name	Booth
HORIBA Scientific	547
HREM Research, Inc.	537
Hummingbird Scientific	1045
ibidi USA, Inc.	438
ibss Group, Inc.	1552
IDES, Inc	1451
iLab Solutions / Agilent	1651
Integrated Dynamics Engineering	613
International Centre for Diffraction Data (ICDD)	1350
IXRF Systems, Inc.	1638
JASCO	1054
JEOL USA, Inc.	623
Kammrath and Weiss	1009
Keyence Corporation of America	909
KLA Corporation	1648
Kleindiek Nanotechnik	817
KMLabs, Inc.	1251
K-Tek Nanotechnology	842
Ladd Research	1014
Leica Microsystems	538
Linkam Scientific Instruments	551
Lumencor, Inc.	948
Mel-Build Corporation	526
MEO Engineering Company	1650
Microscopy Innovations, LLC	1049
MIPAR Image Analysis Software	1154
MiTeGen	1152
MPF Products, Inc.	1050
MSA Mega Booth	502
NanoMEGAS USA	513
Nanoscience Instruments	1349
NANOVIZZ	T453
NenoVision	750
Nikon Instruments, Inc.	941
Nion Company	1102
Norcada, Inc.	1551
Object Research Systems	937
Olympus America, Inc.	946
Oxford Instruments	915
Pace Technologies	809
Pacific Northwest CryoEM Center	652
Park Systems	710
PerkinElmer	1443
Photonics Media	849
Physical Electronics	812

Exhibitor Name	Booth
PIE Scientific, LLC	1348
PNDetector GmbH	647
PNSensor GmbH	548
Point electronic GmbH	549
Protochips, Inc.	644
Quantum Design, Inc.	822
Quantum Detectors	954
Quorum Technologies	938
Raith	1129
Renishaw Inc.	1011
Rigaku Americas Corp.	437
RMC Boeckeler	828
Robomet 3D / UES, Inc.	912
Royal Microscopical Society	1048
Sapphire North America	427
Scientific Instruments & Applications, Inc.	719
Seiwa Optical America, Inc.	813
SEMTECH Solutions, Inc.	530
Sigray, Inc.	524
SmarAct, Inc.	1247
Spellman High Voltage Electronics Corp	1250
SPI Supplies	1130
Springer Nature	1032
Syntek Co., Ltd.	T447
Technex Lab Co., Ltd.	443
Technical Manufacturing Corporation	422
Technotrade International Inc	1148
Ted Pella, Inc.	1338
Tescan USA	1108
Thermo Fisher Scientific	1038
Tousimis	819
TSS Microscopy, LLC	1441
TTP Labtech	1147
TVIPS GmbH	720
Vibration Engineering Consultants	1642
Vitatech Electromagnetics, LLC	712
Voxa	431
Wiley	442
WITec Instruments Corp	717
XEI Scientific, Inc.	1230
YW MEMS(Suzhou) Co., Ltd.	838
zeroK NanoTech Corporation	715
Zygo Corporation	614

Booth	Exhibitor Name
422	Cameca
422	Technical Manufacturing Corporation
427	Sapphire North America
428	Edax
431	Voxa
437	Rigaku Americas Corp.
438	ibidi USA, Inc
442	Wiley
443	Technex Lab Co Ltd
T447	Syntek Co., Ltd
448	Fluid Imaging Technologies, Inc.
T449	BioNet Laboratory, Inc.
T452	Henan Zhongjingkeyi Technology Co., Ltd.
T453	NANOVIZZ
502	Microscopy Society of America MegaBooth
513	NanoMEGAS USA
518	Direct Electron, LP
524	Sigray, Inc.
526	Mel-Build Corporation
528	FOM Networks, Inc.
530	Semtech Solutions
537	HREM Research Inc.
538	Leica Microsystems
547	HORIBA Scientific
548	PNSensor GmbH
549	Point electronic GmbH
551	Linkam Scientific Instruments
613	Integrated Dynamics Engineering
614	Zygo Corporation
616	Cambridge University Press
623	JEOL USA, Inc.
638	Bruker Corporation
644	Protochips, Inc.
647	PNDetector GmbH
650	Grace Bio-Labs, Inc.
652	Pacific Northwest CryoEM Center
710	Park Systems Inc.
712	Vitatch Electromagnetics LLC
713	ASI /Applied Scientific Instrumentation Inc.
715	zeroK Nano Tech Corporation
717	WITec Instruments Corp
718	Analitex
719	ScientificInstruments&Applications, Inc.

Booth	Exhibitor Name
720	TVIPS GmbH
744	Coxem Co., Ltd
750	NenoVision
809	Pace Technologies
812	Quantum Design, Inc.
812	Physical Electronics
813	Seiwa Optical America, Inc
816	3D-Micromac AG
817	Kleindiek Nanotechnik
819	Tousimis
826	Denton Vacuum, LLC
828	RMC Boeckeler
838	YW MEMS (Suzhou) Co., Ltd
840	Daeil System Co. Ltd.
842	K-Tek Nanotechnology LLC
846	Fischione Instruments
849	Photonics Media
909	Keyence Corporation of America
910	Anton Paar USA
912	Robomet 3D / UES, Inc.
915	Oxford Instruments
928	Gatan, Inc.
938	EMS / Diatomed
938	Quorum Technologies
941	Nikon Instruments, Inc.
946	Olympus America, Inc.
948	Lumencor, Inc.
950	Exprodo Software Limited
952	Applied Beams LLC
954	Quantum Detectors
1002	DECTRIS Ltd
1009	Kammrath and Weiss
1010	EmCrafts Co., Ltd.
1011	Renishaw Inc.
1014	Ladd Research
1030	Barnett Technical Services
1032	Springer
1038	Thermo Fisher Scientific
1045	Hummingbird Scientific
1048	Royal Microscopical Society
1049	Microscopy Innovations, LLC
1050	MPF Products Inc.
1054	JASCO, Inc.
1055	EXpressLO LLC
1102	Nion Company

Booth	Exhibitor Name
1108	Tescan USA
1117	Carl Zeiss Microscopy, LLC
1129	Raith
1130	SPI Supplies
1147	TTP Labtech
1148	Technotrade International Inc.
1150	Alluxa, Inc.
1152	MiTeGen
1153	Object Research Systems
1154	MIPAR Image Analysis Software
1204	Clark-MXR Inc.
1230	XEI Scientific, Inc.
1247	SmarAct Inc
1248	Herzan LLC
1249	CELLINK
1250	Spellman High Voltage Electronics Corp
1251	KMLabs, Inc.
1254	DigiM Solution LLC
1338	Ted Pella Inc.
1347	Duniway Stockroom Corp.
1348	PIE Scientific LLC
1349	Nanoscience Instruments
1350	International Centre for Diffraction Data (ICDD)
1352	Digital Surf SARL
1437	Advanced Microscopy Techniques Corp.
1438	Hitachi High Technologies America, Inc.
1441	TSS Microscopy, LLC
1443	PerkinElmer
1445	E. Fjeld Co., Inc.
1447	Ephemeron Labs
1449	HIROX-USA, Inc.
1451	IDES, Inc.
1452	Angstrom Scientific Inc.
1454	Deben UK Limited
1551	Norcada, Inc.
1552	ibss Group, Inc.
1638	IXRF Systems, Inc.
1640	ASM International
1642	Vibration Engineering Consultants
1646	Applied Physics Technologies, Inc.
1648	KLA Corporation
1650	MEO Engineering Company
1651	iLab Solutions / Agilent

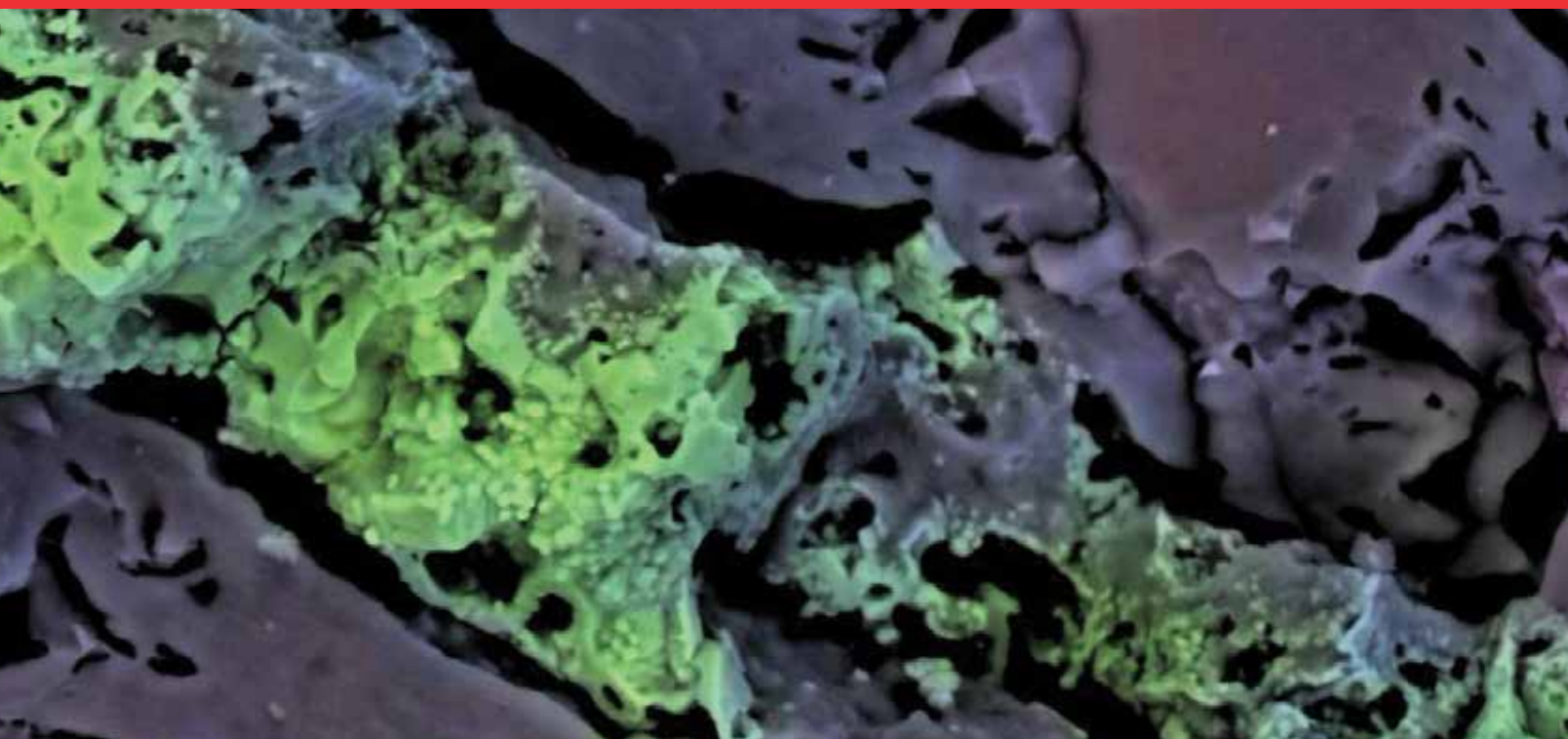




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