

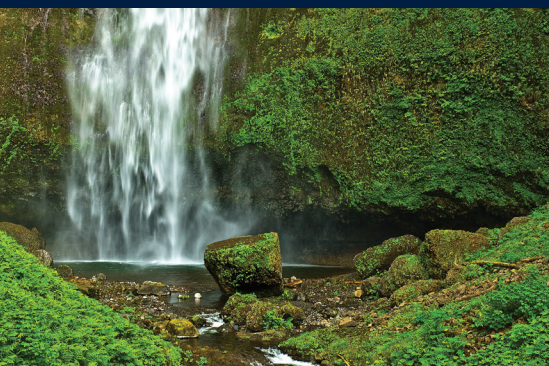
ONSITE PROGRAM GUIDE & EXHIBITOR INFORMATION

Exhibition Guide
INCLUDED!



M&M 2015 **MICROSCOPY & MICROANALYSIS**

August 2-6 • Portland, OR



<http://microscopy.org/MandM/2015>

Inspire Innovation Through Collaboration

**M&M 2015
Booth #1376**

YOUR SUCCESS IS OUR SUCCESS!

Hitachi continues to provide technologically advanced instrumentation serving the increasing challenges of today's labs. Through collaboration with industry leaders, academia, technology partners, and of course, our valued customers, we constantly improve our capabilities and our contribution to society. Let us help you succeed!

Our ever-expanding product offering now includes Standard and Variable-Pressure SEM, Field-Emission SEM, TEM/STEM, Sample Preparation Systems, Atomic Force Microscopy, and more.

Visit Hitachi at Booth #1376 at Microscopy & Microanalysis 2015 in Portland, Oregon, demo our instruments, and attend our Learning Lab sessions to explore innovative solutions and techniques for your laboratory.



120 kV Digital TEM



300 kV TEM/STEM



Environmental AFM



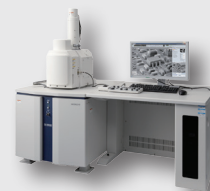
Sample Cleaner



Ion Milling



Tabletop SEM



Premium VP-SEM



UHR FE-SEM



FIB/FIB-SEM

Table of Contents



Future Meeting Dates	4
Welcome from the Society Presidents	5
Essential Meeting Information	6
Oregon Convention Center	8
Social Events	9
Meetings & Events Schedule	10-11
Microscopy Society of America (MSA)	12-18
MSA Council & Appointed Officers	12
MSA Fellows	13
MSA Distinguished Scientist Awards	14
MSA Major Society Awards	15-17
MSA Sustaining Members	18
Microanalysis Society (MAS)	20-25
MAS Officers	20
Major Society Awards	21-23
Sustaining Members	24
M&M Meeting Awards	25
International Metallographic Society (IMS)	26-29
IMS Awards	27-29
Week At-A-Glance	30-38
Welcome from the Program Chairs	39
Plenary Session: <i>New Molecular Tools for Light and Electron Microscopy</i>	40-41
Plenary Session: <i>Some Unexpected Difficulties in Microscope Operation in Microgravity</i>	42-43
Symposia	44-54
Tutorials	55
Special Educational Opportunities	56
Scientific Program	57-144
Monday, August 3	57-68
Tuesday, August 4	69-94
Wednesday, August 5	95-121
Thursday, August 6	122-144
Author Index	145-161
Exhibitor Directory	162-174
Product and Services Index	175-181
Exhibitor List by Booth	182
Exhibitor List by Name	183
Exhibit Hall Diagram	184
M&M 2015 Sponsors	185

Future Meeting Dates

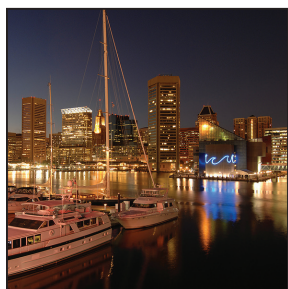
Download the
**Microscopy &
Microanalysis
Annual Scientific
Meeting
MOBILE APP!**



August 6-10, 2017
ST. LOUIS, MO



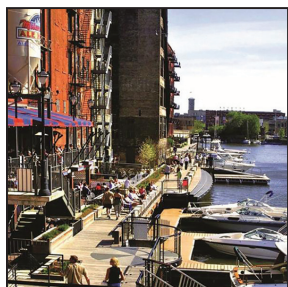
August 5-9, 2018
BALTIMORE, MD



August 4-8, 2019
PORTLAND, OR



August 2-6, 2020
MILWAUKEE, WI



Navigate the event like
a pro with the **M&M 2015 mobile
app**, powered by **core-apps.com**

With the M&M 2015 mobile app, you can:

- Stay organized with up-to-the-minute Exhibitor, Presenter, and Program/Event information
- Sync the app across all of your devices with Multi-Device Sync
- Receive important real-time communications
- Build a personalized schedule and bookmark exhibitors
- Take notes and download event handouts and presentations
- Rate the sessions you attend and comment on them, too
- Locate sessions and exhibitors on the Oregon Convention Center maps
- Find attendees and connect with your colleagues through **Friends**
- Stay in-the-know and join in on social media with **#MM15Port**
- Find Portland Local Places
- And much, much more!

Downloading the App is Easy!



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

SCAN:



For All Other Device Types

(including BlackBerry, Windows, and all other web browser-enabled devices):

While on your smartphone, point your mobile browser to

http://m.core-apps.com/msa_2015 to be directed to the proper download version for your phone.

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



Welcome from the Society Presidents

Dear Fellow Microscopists, Microanalysts, Students, and Friends,

On behalf of our respective societies, we are excited to welcome you once again to Portland, Oregon, the City of Roses, and one of the most beautiful cities in America, for the 2015 Microscopy & Microanalysis meeting. M&M, serving as the annual meeting of the Microscopy Society of America, the Microanalysis Society, and the International Metallographic Society, continues to be the premier meeting for scientists, technologists, and students who use microscopy or microanalysis in their research.

The Program Committee for 2015 has assembled an exceptional, diverse scientific program with a record number of over 1250 papers, featuring researchers from around the world presenting the latest advances in the biological and physical sciences, techniques and instrumentation. In synchrony with this remarkable program is one of the world's largest exhibitions of state-of-the-art microscopy and microanalysis instrumentation. In addition, there are number of educational opportunities during M&M, in particular the excellent Short Courses, tutorials, educational outreach events, and the always-popular evening vendor tutorials during the week.

Whether you are new to M&M or a longtime participant, M&M 2015 is the perfect place to network with others in your field, to learn the newest techniques, to see the latest exhibits, and to check out future job opportunities. Sunday night's Opening Reception provides an enjoyable start to the meeting. You can renew old friendships and make new acquaintances while enjoying a selection of locally sourced dishes and your favorite beverages.

The Monday morning plenary session will be highlighted by talks from two extraordinary microscopists: Nobel laureate Roger Y. Tsien who will discuss "New Molecular Tools for Light and Electron Microscopy" and NASA Astronaut Donald Pettit who will present "Some Unexpected Difficulties in Microscope Operation in Microgravity." In addition, participating Societies will recognize their major society award winners, as well as student, post-doc and technologist Meeting winners. During the week, there will be daily student poster awards acknowledging the talents of the best young researchers in instrumentation and techniques, and biological and physical applications of microscopy & microanalysis.

Portland is an inviting location with hotels, shops, numerous restaurants, a number of craft breweries and historical sites for your enjoyment. We hope the science presented at Microscopy & Microanalysis 2015 will inspire you to great things!

Have a wonderful week and we look forward to seeing you next year in Columbus, Ohio!



John F. Mansfield
President, MSA



Thomas F. Kelly
President, MAS



Jaret J. Frafjord
President, IMS



Essential Meeting Information



M&M 2015 MICROSCOPY & MICROANALYSIS *August 2-6 • Portland, OR*

ONSITE REGISTRATION DESK OREGON CONVENTION CENTER

Pick up your badge and materials at the Registration desk according to the schedule below. The Sunday Social starts at 6:30 pm in the Portland Ballroom, which is under the same roof at the Oregon Convention Center.

Registration Hours – Attendee & Exhibitor

Friday, July 31 12:00 PM – 6:00 PM*

*Exhibitor registration will open at 8:00 AM

Saturday, August 1 8:00 AM – 6:00 PM

Sunday, August 2 7:00 AM – 7:30 PM

Monday, August 3 7:00 AM – 6:00 PM

Tuesday, August 4 7:30 AM – 5:00 PM

Wednesday, August 5 7:30 AM – 5:00 PM

Thursday, August 6 7:30 AM – 3:00 PM

Commercial Exhibition Hours:

Monday, August 3 12:00 PM – 5:30 PM

Tuesday, August 4 10:00 AM – 5:30 PM

Wednesday, August 5 10:00 AM – 5:30 PM

Thursday, August 6 10:00 AM – 2:00 PM

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 after July 1 or onsite at the meeting will be accommodated as much as possible.

Awards

Major Society Awards for the three societies, along with M&M student awards, will be presented at the Plenary Session immediately following the first Keynote Session (Monday morning). Other IMS Awards are presented at the IMS Awards Banquet on Wednesday evening (ticket purchase required). For detailed listings of all awards, criteria, and award winners, please visit <http://microscopy.org/MandM/2015/>

Cancellation and Refund Policy

Refund requests received prior to July 24, 2015 will be honored less a \$60 administrative fee. No refunds will be issued for cancellations (for any reason) received on or after July 24, 2015 and no refunds will be issued onsite in Portland, Oregon.

Email: MMRegistration@microscopy.org or fax (703) 964-1246.

Food for Purchase

Inexpensive, portable breakfast and snack items are available for purchase in the convention center on the ground level (7:30 AM–10:30 AM). Lunch concessions are available for purchase inside the exhibit hall during lunch hours (11 AM–2 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. Located on the main level of the Oregon Convention Center, it's staffed during the meeting and stocked with visitor information on Portland and surrounding areas.

Internet & Email

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 19.

Job & Resume Postings/ Placement Office

See MSA MegaBooth info on Page 19.

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 2016 – Meeting & City Information

Get the inside scoop on all the great plans for next year's M&M Meeting in Columbus, OH. The 2016 booth is staffed with an Experience Columbus representative, and located in the main registration area.

Maps showing the location of the hotels and convention center, and MAX light-rail and streetcar routes, are also available on the **M&M 2015 site**, and maps of the area are downloadable from: <http://travelportland.com/plan-your-trip/maps-of-portland/>

MSA MegaBooth [Booth # 354]

See complete details on Page 19.

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. **New for 2015!** See a demo of a vintage Elektros electrostatic TEM.

Phone Numbers & Information

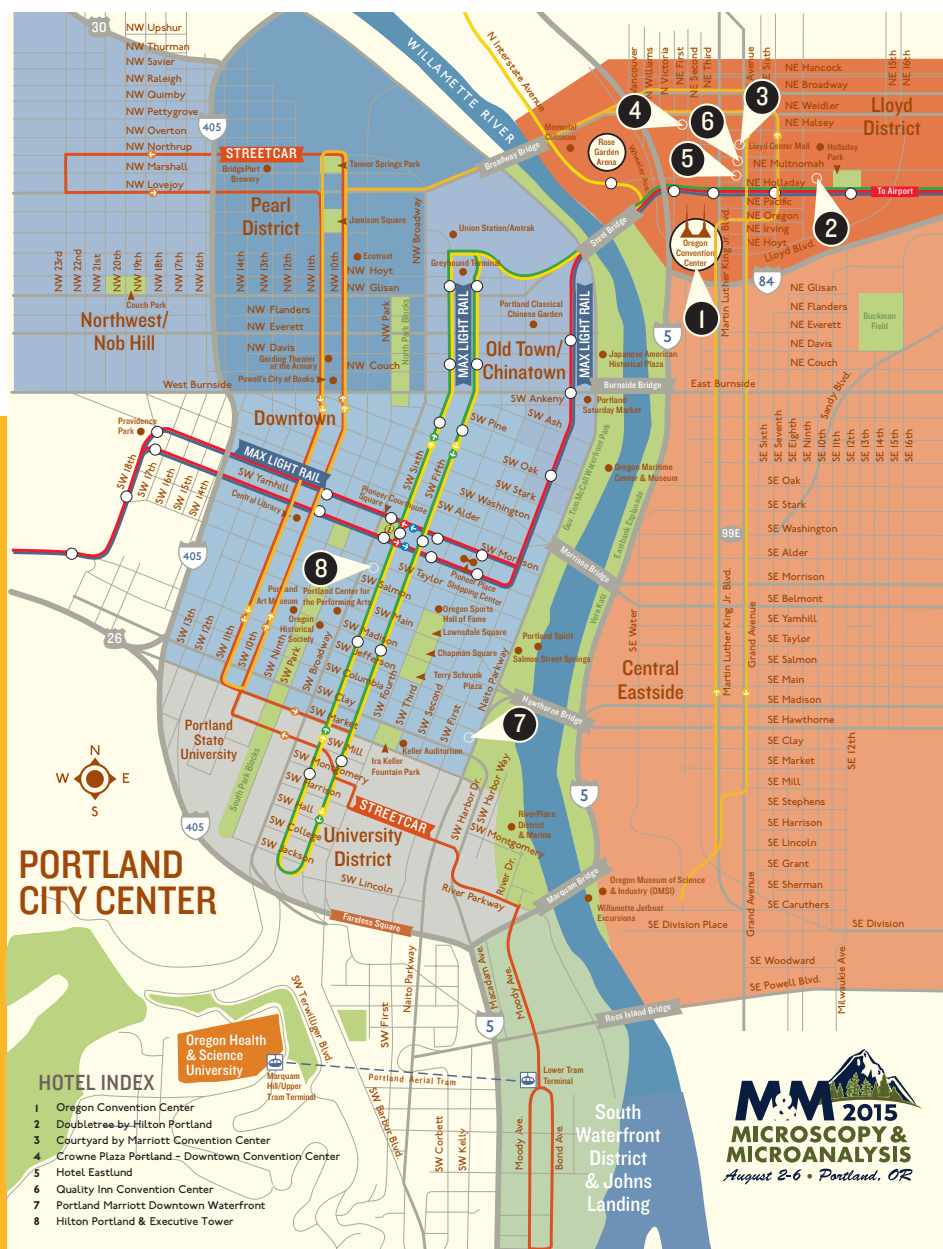
- Oregon Convention Center Main: 503-235-7575
- Oregon Convention Center - Exhibitor Services 503-731-7801; <http://oregoncc.org/ExhibitorServices>
- ZoomCare Downtown Portland: 503-608-3082; <http://zoomcare.com>

Proceedings

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

Society Booths

MAS and IMS each has a membership and information booth located in the main registration foyer on the 1st level outside the exhibit hall C entrance. Sign up for membership, get information on Society events at or after the M&M Meeting, and find out all that the joining societies have to offer.



Smoking Policy

M&M 2015 is a smoke-free meeting. If you wish to smoke, you will need to go to designated outdoor areas.

Tote Bags

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

Volunteer Room

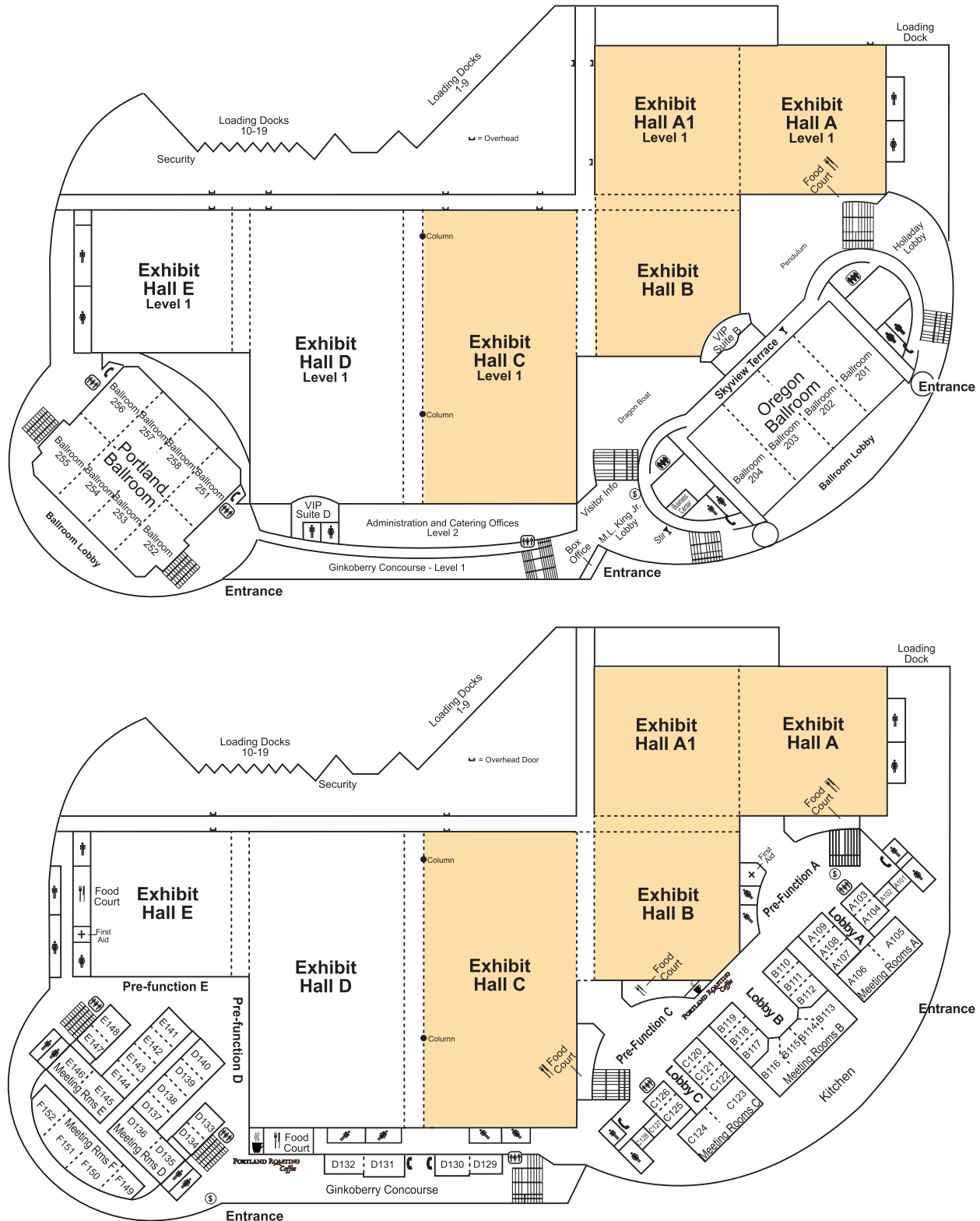
The volunteer & student bursary office is in Room 126. Check in here for volunteer assignments and sign-outs.

Phone Charging Station

Low battery? No problem! Stop by the MSA MegaBooth [Booth #354] and charge your mobile phone.

Oregon Convention Center

All official conference events are being held at the Oregon Convention Center, which is located on the east side of the Willamette River in downtown Portland.
<http://oregoncc.org>



Social Events



MAS Social Event *for MAS Members Only!*

Wednesday, August 5, 2015
6:30 PM - 8:30 PM

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



IMS Icebreaker *all are welcome!*

Monday, August 3, 2015
7 PM - 9 PM

Swing by the IMS Icebreaker at the Multnomah Grille at the Doubletree Hotel for appetizers and beverages, compliments of Precision Surfaces International, Inc.



IMS Awards Banquet

Wednesday, August 5, 2015
6:30 PM - 9 PM

Be sure to purchase your ticket (available at Registration, subject to availability) and inquire at the IMS booth for additional information on the IMS Awards Banquet on Wednesday evening.

M&M 2015 Sunday Evening Social Event

Oregon Convention Center – Portland Ballroom (Upper Level; West Side)
Sunday, August 2, 2015 **6:30 PM – 9 PM**

One ticket is included with most registrations (see Registration Page for details). Additional tickets: \$75 each for adults; \$35 each for children 12 and under. Children under 3 are free.

***PLEASE NOTE:**

Onsite availability of tickets is not guaranteed. Register for the meeting and, if needed, buy your extra tickets early to be sure that you're able to attend.

This year's welcome event at the Oregon Convention Center will be a fun and informal get-together. Catch up with friends and colleagues, enjoy some local wine or beer, and tuck in to some delicious Pacific Northwest-inspired food.

After the reception, grab some friends and check out some of Portland's famed microbrew spots, quirky donut shops, and fantastic nightlife.



Meetings & Events Schedule

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

All events held at Oregon Convention Center unless otherwise noted.

Friday, July 31, 2015

	START TIME	ROOM
MSA Council	8:30 AM	A107

Saturday, August 1, 2015

	START TIME	ROOM
MSA Council	8:30 AM	A107

Sunday, August 2, 2015

	START TIME	ROOM
IMS Board of Directors	8:30 AM	C124
IMS Poster Judging	8:30 AM	C123
MAS Council	9:00 AM	A107
Microscopy Today Editors	1:00 PM	D131
MaM Editors	3:00 PM	D131
Sunday Evening Social Event	6:30 PM	Portland Ballroom

Monday, August 3, 2015

	START TIME	ROOM
Technologists' Forum Board	7:15 AM	D129
MaM Editorial Board	7:15 AM	D131
MSA Awards + Fellowship Committees	7:15 AM	A107
MAS Meal with a Mentor	12:15 PM	A108-109
FOM FIG "Lunch with a Facility Manager"	12:15 PM	D132
Focused Ion Beam FIG	12:15 PM	D130
Diagnostic FIG	12:15 PM	D131
IMS General Members' Meeting	2:30 PM	C123
3D EM in the Biological Sciences FIG	3:00 PM	B111
Technologists' Forum Business Meeting	3:30 PM	D130
Student Mixer	5:30 PM	A108-109
Student Committee Meeting	7:00 PM	B112
Vendor Tutorials (<i>Sign up at MSA MegaBooth</i>)	5:45 – 6:45 PM	Exhibit Hall
IMS Icebreaker	7:00 PM	Doubletree Hotel

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

All events held at Oregon Convention Center unless otherwise noted.

Tuesday, August 4, 2015

	START TIME	ROOM
MSA Local Affiliated Societies' Breakfast	7:15 AM	A108-109
Microscopy Today Editorial Board Meeting	7:15 AM	D130
M&M 2016 - Program Planning Meeting	10:00 AM	NEW! B118
FOM FIG Business Meeting & Lunch	12:15 PM	A108-109
MSA Distinguished Scientist Awardee Lectures	12:15 PM	C123
Cryo-Preparation FIG	12:15 PM	D130
MSA Standards Committee Meeting	12:15 PM	C128
Electron Crystallography FIG	12:15 PM	D131
FIG Business Meeting	3:30 PM	A107
MSA Education Committee Meeting	3:30 PM	D130
Open Source Software for Quantitative Microanalysis	4:00 PM	B118
ACEM FIG	5:15 PM	D131
Symposium Organizers - Appreciation Event	5:30 PM	A108-109
Vendor Tutorials (<i>Sign up at MSA MegaBooth</i>)	5:45 PM	Exhibit Hall
Presidents' Reception (<i>Invitation Only</i>)	6:30 PM	Offsite

Wednesday, August 5, 2015

	START TIME	ROOM
MSA Certification Board	7:15 AM	D131
MSA Membership Committee	7:15 AM	D130
M&M 2016 Conference Publications	8:30 AM	A107
MAS - ANSI Meeting	12:15 PM	D131
MSA Members Meeting	12:15 PM	C123
MAS Affiliated Regional Societies	12:15 PM	A108-109
Atom Probe FIG	12:15 PM	A107
Pharma FIG	12:15 PM	D130
MSA-CUP Book Series Advisory Board Meeting	4:15 PM	D130
MAS Business Meeting	5:15 PM	C123
Vendor Tutorials (<i>Sign up at MSA Megabooth</i>)	5:45 PM	Exhibit Hall
IMS Awards Banquet	6:30 PM—See IMS Booth for Details	Offsite
MAS Members Social	6:30 PM—See MAS Booth for Details	Offsite

Thursday, August 6, 2015

	START TIME	ROOM
M&M Sustaining Members Meeting	8:30 AM	A108-109
M&M 2015 Wrap-Up & Debrief (<i>Invitation Only</i>)	5:30 PM	A107

2015 COUNCIL – OFFICERS & DIRECTORS

President	John Mansfield
Past President	Jeanette Killius
President Elect	Michael Marko
Secretary	Pamela Lloyd
Treasurer	Peter Crozier
Director	Esther Bullitt
Director	Chris Kiely
Director	Bill Russin
Director	Paul Voyles
Director	Paul Kotula
Director	Teresa Ruiz
Director, Local Affiliated Societies	Beverly Maleeff

APPOINTED OFFICERS

Archives	Michael Marko
Awards Committee Chair	Esther Bullitt
Bylaws	Jeanette Killius
Certification Board Chair	Pat Kysar
Educational Outreach Committee Chairs	Craig Queenan, Alyssa Calabro
Educational Resources Chair	Liz Wright
Fellowship Chair	Michael Marko
Finance	Peter Crozier
International Committee Chair	Raynald Gauvin
Membership Committee Chair	Jeffrey Lengyel

FOCUSED INTEREST GROUPS

Focused Interest Group Chairs	Jim DiOrio, Andy Vogt
3D Electron Microscopy in the Biological Sciences	Teresa Ruiz, Michael Radermacher
Aberration-Corrected Electron Microscopy	Paul Voyles
Atom Probe Field Ion Microscopy	Richard L. Martens
Cryo-Preparation	Caroline A. Miller
Diagnostic Microscopy	Jon Charlesworth
Electron Crystallography & Automated Mapping Techniques	Jorg Wiezorek
Electron Microscopy in Liquids and Gas (EMLG)	Renu Sharma
Facility Operation and Management	Randy Nessler
Focused Ion Beam	Nicholas Antoniou
Pharmaceuticals	Joseph Neilly
Information Technology	Nestor Zaluzec

MICROSCOPY AND MICROANALYSIS

Editor in Chief	Robert L. Price
Official Meeting and Program Guide	Richard E. Edelman, Richard Martens
Proceedings Editor	Gail J. Celio, John P. Shields
<i>Microscopy Today</i> Editor	Charles E. Lyman

M&M ANNUAL MEETING

Program Chair 2015	Mark A. Sanders
Program Chair 2016	Joseph Michael
Program Chair 2017	Jay Potts
Program Chair 2018	Yousuf Picard
Nominating Committee Chair	Jeanette Killius
Placement Office	David Tomlin
Publications Liaison	John Mansfield
Sustaining Members Chair	Noel T. (Tom) Nuhfer
Student Committee Chair	James Kilcrease
Technologists' Forum	Caroline A. Miller
Association Management	Drohan Management Group
Managing Director	Robert Dziuban
Meeting Management	Nicole Guy, Conference Managers
Exhibition Management	Doreen Bonnema, Corcoran Expositions, Inc.

MSA PAST PRESIDENTS

1942	G.L. Clark	1967	Joseph J. Comer	1991	Charles Lyman
1943-44	R. Bowling Barnes	1968	John H. Luft	1992	Patricia Calarco
1945	James Hillier	1969	W.C. Bigelow	1993	Michael Issacson
1946	David Harker	1970	Russell Steere	1994	Robert Cardell
1947	William G. Kinsinger	1971	Robert M. Fisher	1995	Terence E. Mitchell
1948	Perry C. Smith	1972	Daniel C. Pease	1996	Margret Ann Goldstein
1949	F.O. Schmitt	1973	Benjamin Siegel	1997	C. Barry Carter
1950	Ralph W.G. Wyckoff	1974	Russell J. Barnett	1998	Ralph M. Albrecht
1951	Robley C. Williams	1975	Gareth Thomas	1999	David Joy
1952	R. D. Heidenreich	1976	Etienne de Harven	2000	Kenneth Downing
1953	Cecil E. Hall	1977	T.E. Everhart	2001	Ron Anderson
1954	Robert G. Picard	1978	Myron Ledbetter	2002	Stanley L. Erlandsen
1955	Thomas F. Anderson	1979	John Silcox	2003	Alwyn Eades
1956	William L. Grube	1980	Michael Beer	2004	Sara Miller
1957	John H.L. Watson	1981	John Hren	2005	M. Grace Burke
1958	Max Swerdlow	1982	Lee Peachey	2006	W. Gray (Jay) Jerome
1959	John H. Reisner	1983	David Wittry	2007	Michael O'Keefe
1960	D. Gordon Sharp	1984	J. David Robertson	2008	William T. Gunning
1961	D. Maxwell Teague	1985	Dale Johnson	2009	David J. Smith
1962	Keith R. Porter	1986	Robert M. Glaeser	2010	David W. Piston
1963	Charles Schwartz	1987	Linn W. Hobbs	2011	Nestor Zaluzec
1964	Sidney S. Breese	1988	Jean Paul Revel	2012	Janet Woodward
1965	Virgil G. Peck	1989	Ray Carpenter	2013	Ernest Hall
1966	Walter Frajola	1990	Keith R. Porter	2014	Jeanette Killius

2015

Rafal Dunin-Borkowski
E. Ann Ellis
Miguel Jose-Yacamán
Kent McDonald
Stanley Platek
Michael Postek
Susanne Stemmer
Michael Treacy

2014

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

2013

Timothy Baker
Nigel Browning
Hamish Fraser
David C. Muller
Michael Radermacher
David J. Smith
Eric Stach
David DeRosier

2012

Uli Dahmen
Ann Goldstein
Moon Kim
William J. Landis
Jingyue Liu
Beverly Maleeff
Bob Price
Frances Ross
David Seidman
Debra Sherman
Nan Yao

2011

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

2010

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

2009 (Inaugural Class)

Marc Adrian
Ron Anderson
James Bentley
Mary Grace Burke
Ray W. Carpenter
C. Barry Carter
Albert V. Crewe
Marc De Graef
Vinayak P. Dravid
Jacques Dubochet
Patrick Echlin
Raymond F. Egerton
Marilyn G. Farquhar
Don W. Fawcett
Joachim Frank

Robert M. Glaeser
Audrey M. Glauert
Raymond Kenneth Hart
Hatsujiro Hashimoto
Richard Henderson
Sir Peter B. Hirsch
Archibald Howie
Hugh E. Huxley
Takeo Ichinokawa
Sumio Iijima
Shinya Inoue
David C. Joy
Morris J. Karnovsky
Aaron Klug
Ondrej L. Krivanek
Myron C. Ledbetter
Dennis McMullan
Joseph Richard Michael
Sara Elizabeth Miller
Terrence E. Mitchell
Thomas Mulvey
Dale E. Newbury
Gertrude Rempfer
Jean-Paul Revel
Harald Rose
F.O. Schmitt
Caroline Schooley
Ryuichi Shimizu
John Silcox
Robert Sinclair
S. J. Singer
Fritiof Sjostrand
Kenneth C.A. Smith
Avril V. Somlyo
John C.H. Spence
Alasdair Steven
Peter R. Swann
Gareth Thomas
Kiyoteru Tokuyasu
Nigel Unwin
Joseph S. Wall
Oliver Wells
Michael J. Whelan
Nestor J. Zaluzec
Elmar Zeitler
Yimei Zhu

PHYSICAL SCIENCES (2015)

Peter Hawkes

Peter Hawkes, now retired, was Director of Research at the CNRS Laboratory of Electron Optics (now the CEMES) in Toulouse. He has a PhD (1963) and Sc.D. (1982) from the University of Cambridge, where he was a Research Fellow of Peterhouse and later, a Senior Research Fellow of Churchill College. He was Director of the Laboratory of Electron Optics in 1987 and received the Silver Medal of the CNRS in 1983. He was founder-president of the European Microscopy Society (1988-1990) and President of the French Microscopy Society (1998-1999), of which he is an honorary member. He has written several books on electron optics and electron microscopy as well as long book chapters, especially on electron lens aberrations. He writes regular round-ups of publications in the broad area of microscopy and charged-particle optics for Ultramicroscopy; he is a member of the editorial board of the Journal of Microscopy and Ultramicroscopy and editor-in-chief of Advances in Imaging & Electron Physics, launched more than 50 years ago by Bill Marton, who was the second recipient of the DSA award, in the same year as Albert Crewe (1976).

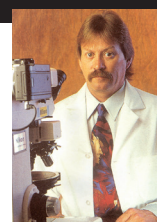


Over the years he has worked on many aspects of electron optics and electron image processing, with special reference to aberration studies, and has attempted to introduce image algebra into the world of electron imaging. He has also contributed to the history of electron microscopy, notable by editing "The Beginnings of Electron Microscopy" and attracting biographies of Ernst and Helmut Ruska, Bodo von Borries and Jan Le Poole and a tribute to Sir Charles Oatley to the Advances and writing histories of aberration correction in electron microscopy.

In 1987, he was elected Fellow of the Optical Society of America, sponsored by Emil Wolf.

BIOLOGICAL SCIENCES (2015)

Michael Davidson, Florida State University Director, Optical Microscopy Division of the National High Magnetic Field Laboratory



Michael W. Davidson is the director of the Optical Microscopy Division of the National High Magnetic Field Laboratory at The Florida State University. As research scientist, he has been deeply involved in microscopy for over 3 decades and his scientific interests include the packaging of DNA into viruses, liquid crystallinity in biological systems and is considered one of the world's experts in developing fluorescent probes and techniques for microscopy; a subject he has published on extensively. He has coauthored numerous research articles with some of the top researchers in their fields, including several Nobel Laureates, and the imaging tools that he helped create have deeply impacted the work of hundreds of microscopists around the world. His facility at FSU houses the largest and most diverse collection of fluorescent proteins and related tools which he has made readily available and that has become an indispensable resource to the biomedical research community. He created several immensely popular educational websites, including Molecular Expressions, Nikon's MicroscopyU and the Olympus Microscopy Resource Center, all providing a tremendous resource not only to those wishing to learn about microscopy, but also to expert microscopists wishing to broaden their knowledge base. Mike is the driving force behind the two preeminent microphotography competitions; Nikon's Small World and Olympus' BioScapes, both of which recognize the intersection of art and science under the microscope and draw thousands of entries annually. His popular "Pioneers in Optics" series he writes for Microscopy Today serves as a K-12 educational resource to introduce kids to optics and microscopy. Mike has mentored hundreds of students who have come through his laboratory on their way to careers in biomedical research and imaging and his tireless work and dedication to advancing the state-of-the-art in optical microscopy will have an enduring impact on science.

	BIOLOGICAL SCIENCES	PHYSICAL SCIENCES
1975	Keith Porter	Robert Heidenreich
1976	L.L. Marton	Albert 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	Sir Charles Oatley
1985	Gaston Dupouy	Ernst Ruska
1986	F. O. Schmitt	Peter 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	Archie Howie
1992	Fritiof Sjöstrand	Oliver C. Wells
1993	Jean-Paul Revel	Kenneth C.A. Smith
1994	Andrew P. Somlyo	Dennis McMullan

	BIOLOGICAL SCIENCES	PHYSICAL SCIENCES
1995	Shinya Inoue	David B. Wittry
1996	Myron C. Ledbetter	John Silcox
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 Steven	Ondrej L. Krivanek
2009	Jacques Dubochet	Robert Sinclair
2010	George Papas	Michael Isaacson
2011	Ueli Aebi	Hannes Lichte
2012	Timothy Baker	Ulrich Dahmen
2013	David DeRosier	C. Barry Carter
2014	Wah Chiu	David J. Smith

BURTON MEDAL AWARD

Andrew Minor (2015)
University of California, Berkeley

Andrew Minor received a B.A. in Economics and Mechanical Engineering from Yale University and his MS and PhD in Materials Science and Engineering from the University of California, Berkeley. Currently, he is an Associate Professor at U.C. Berkeley in the Department of Materials Science and Engineering and also holds a joint appointment at the Lawrence Berkeley National Laboratory where he is the Acting Director of the National Center for Electron Microscopy in the Molecular Foundry. He has co-authored over 120 publications and presented over 80 invited talks on topics such as nanomechanics, lightweight alloy development, characterization of soft materials, and in situ TEM technique development. He was twice awarded the LBL Materials Science Division Outstanding Performance Award (2006, 2010) and in 2012 he was awarded the AIME Robert Lansing Hardy Award from TMS.



YEAR RECIPIENT

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

ALBERT CREWE AWARD

Meng Gu (2015)
University of California, Davis

Meng Gu received his B.S. degree (2008) in materials science and engineering in Shanghai Jiao Tong University in China and PhD degree (2011) in materials science in the University of California Davis. His PhD research centered on the growth and atomic scale characterization of complex oxide thin films using pulsed laser deposition and aberration corrected scanning transmission electron microscopy (STEM). After joining Environmental Molecular Sciences Laboratory in the Pacific Northwest National Laboratory in 2011, his research shifted to the study of energy materials including batteries materials, and catalyst, metal-oxide electronics. He has developed the operando setup of a nano-battery for in-situ TEM observations and three dimensional chemical imaging using X-ray energy dispersive spectroscopy (XEDS) tomography. Recently, Dr. Gu has joined Dow Corning Corporation as a senior analytical scientist focusing on Cryo-TEM study of soft materials and advanced microscopy analysis of silicon alloy, catalysis, and solar energy. He has 63 peer-reviewed journal publications and 20 meeting abstracts and proceedings. His publications have been highlighted by U.S. DOE, PNNL, SLAC national lab, London Center for Nanotechnology, Imperial College London and other social media.



YEAR RECIPIENT

2012	Wu Zhou
2013	Lena Fitting-Kourkoutis
2014	Jinwoo Hwang

MORTON D. MASER DISTINGUISHED SERVICE AWARD

JoAn Hudson (2015) Clemson University

JoAn Hudson has been an MSA member since 1982. She served on the Education Committee (1989-1994) and was appointed chair of the committee from 1997-1999. Elected to Council as Biological Director (1997-1999), she was appointed to the Editorial Board (2000-2003) and the Publications Committee (2005-2008). Two terms as Elected Treasurer, from 2008-2013, are followed by her attention to the ongoing concerns and interests of MSA.

JoAn's professional work began at Clemson University in 1974. In 2001, she joined CAMCOR at the University of Oregon where she taught and served as Director of the Electron Microscopy, Confocal and Histology Facilities. She returned to Clemson University in 2004 where she was appointed Director of the Electron Microscopy Facility in the newly founded Advanced Materials Laboratory. As Research Professor in the Department of MSE and as Director of the EM Facility, JoAn retired from Clemson University in 2014.



GEORGE PALADE AWARD

Alexey Amunts (2015) Medical Research Council, Laboratory of Molecular Biology (U.K.)

During his PhD at Tel Aviv University, Alexey Amunts elucidated X-ray crystal structure of plant Photosystem I. It is a multi-subunit complex of protein and pigment components that catalyzes the capture of sunlight and its transformation into electrochemical energy, regarded as the most efficient energy conversion device in nature.

Since 2011, Alexey has been a postdoctoral researcher in Venki Ramakrishnan's lab at MRC-LMB. He is working on elucidating the molecular mechanism of how the mitochondrial genetic code is translated into proteins, with the aim of harnessing this knowledge to develop novel therapeutics. Recently, the team achieved a major breakthrough by resolving the architecture of mitochondrial protein synthesis machinery at atomic details entirely by cryo-EM. Methodologically, this work shows that we are moving toward a time when structural knowledge of otherwise intractable multi-component, low abundant complexes that are at the heart of many biological processes will be determined by cryo-EM that would transform the structural biology.



YEAR RECIPIENT

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

YEAR RECIPIENT

2012	Gabriel Lander
2013	Peng Ge
2014	Ricardo Guerrero-Ferreira

HILDEGARD H. CROWLEY OUTSTANDING TECHNOLOGIST AWARD FOR BIOLOGICAL SCIENCES

Norman Olson (2015)
University of California, San Diego



Norm Olson was born and grew up in a small town in Northwestern Minnesota. He got his Bachelor of Arts degree in Biology from Concordia College in Moorhead, Minnesota and his Master's degree from North Dakota State University. He did his graduate research in electron microscopy at NDSU. Norm then taught college for several years before accepting a microscopist position at Purdue University. There he did research on the structure of viruses and he worked to set up a state-of-the-art microscopy facility. In 2004, Norm followed his supervisor, Dr. Timothy Baker, out to the University of California San Diego where he set up another state-of-the-art-electron microscopy facility. Since that time he has mentored well over 100 graduate students. Norm retired in October of 2014.

CHUCK FIORI OUTSTANDING TECHNOLOGIST AWARD FOR PHYSICAL SCIENCES

Masahiro Kawasaki (2015)
JEOL



Masahiro Kawasaki is a technical director at JEOL USA Inc. and has been enthusiastically involved in the application and development of electron microscopy techniques since joining JEOL Ltd. in 1985. He received Bachelor of Engineering and Doctor of Engineering degrees from Kyoto Institute of Technology in 1985 and 1998, respectively. In the 1990s, he collaborated on the development of JEOL's first commercial field emission (FE) high-resolution analytical TEM. In 1996 when a scanning unit was installed for general scanning purposes on an FE-TEM, he became curious about high resolution STEM imaging and successfully developed the electron optics conditions that enabled the first atomically resolved Z-contrast imaging capability. He collaborated with a number of researchers on materials characterization using this new STEM technique with TEM. He has continued to work with various researchers by assisting them to advance microscopy techniques including phase plate, high energy backscattered electron and analytical electron microscopies.

YEAR RECIPIENT

1993	Ben O. Spurlock
1994	Bernard J. Kestel
1995	Kai Chien
1996	David W. Ackland
1997	John P. Benedict Stanley J. Klepeis
1998	Charles J. Echer Hilton H. Molehauer
1999	John C. Wheatley John M. Basgen
2000	Nancy Crise Smith
2001	Conrad G. Bremer
2002	José A. Mascorro
2003	Edward A. Ryan
2004	Mark C. Reuter
2005	Chris Nelson John J. Bozzola
2007	Thomas Deerinck
2009	Lynne Gignac Mary Morphew
2010	E. Ann Ellis
2011	Robert Grassucci
2012	Kunio Nagashima
2013	Robyn Roth K. Shawn Reeves
2014	Hong Yi Eddy Garcia-Meitin

(as of May 20, 2015)

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ibss Group, Inc.
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Mager Scientific, Inc.
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Scientific Instrumentation Services, Inc.
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Ted Pella Inc.
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PAST PRESIDENTS

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

DUNCUMB AWARD FOR EXCELLENCE IN MICROANALYSIS

Sponsored by Bruker-Nano Analytics

Peter J. Statham (2015)
Oxford Instruments (U.K.)



Dr. Peter J. Statham has been a leader in the science and technology of microanalysis for 40 years, responsible for many contributions in the scientific literature (more than 90 papers) as well as patents and important advances in commercial energy-dispersive X-ray spectrometry measurement platforms. Beginning with an invited paper at the 1974 MAS conference in Ottawa, he has a long and distinguished history with the Microanalysis Society, serving our organization in many roles over the years, and he is the recipient of some of the most prestigious awards granted by our society.

Peter began his career in the United Kingdom, receiving a first degree in Physics from Cambridge before obtaining a PhD from the same institution based on a thesis entitled "Quantitative X-ray energy spectrometry". He then continued his work on energy-dispersive spectrometry in the United States as a post-doctoral fellow at the University of California at Berkeley, where he also began a long-term interest in image processing. Peter returned to the UK to accept a position at Link Systems, which in 1989 became part of the Oxford Instruments Group; he is currently Director of Research at Oxford Instruments Nanoanalysis.

Peter has served on MAS Council and on the Institute of Physics EMAG Committee, and he is currently the UK technical expert for energy-dispersive spectrometry appointed to the ISO/TC 202 Committee on Microbeam Analysis. It is perhaps not surprising that Peter has earned such recognition during his career in microanalysis because in 1986 then-MAS-President Gordon Cleaver presented Peter with the very first K. F. J. Heinrich Award, honoring his distinguished technical contributions as a scientist under the age of forty. Peter also received the Presidential Science Award from the Microanalysis Society in 2011 and Honorary Membership of EMAS in 2015.

Previous Awardees

2007	D.B. Williams
2008	J. I. Goldstein
2009	D.E. Newbury
2010	D. Joy
2011	J. Michael
2012	J. Bentley
2013	E. Lifshin
2014	O. L. Krivanek

KURT F.J. HEINRICH AWARD

Philippe Pinard (2015)
RWTH Aachen University, Central Facility for Electron Microscopy (Germany)



Philippe Pinard obtained a Master of Engineering degree in materials engineering from McGill University under the supervision of Prof. Raynald Gauvin and Dr. Pierre Hovington. He is currently pursuing a PhD at the RWTH Aachen University in Germany under the supervision of Prof. Joachim Mayer and Dr. Silvia Richter. His research interests include scanning electron microscopy, x-ray microanalysis, Monte Carlo simulations, and electron backscattered diffraction. As a programming enthusiast, he has developed throughout his studies three open source software for electron microscopy: EBSD-Image (post-processing of electron diffraction patterns), pyPENELOPE (application and graphical interface for the Monte Carlo code PENELOPE) and pyMonteCarlo (generic interface for Monte Carlo simulation programs).

In his young career, Philippe received several awards. In 2010, he was presented a Distinguished Scholar award from the Microanalysis Society and the Gerald T. Simon award from the Microscopical Society of Canada. He was honoured to be selected among the Early Career Scholars at the International Union of Microbeam Analysis Societies meeting in 2014. He received a Young Scientist award at the European Microbeam Analysis workshops in 2011 and 2013, as well as the Presidential award for the best contributed paper in 2015. For his studies, he was granted two scholarships from the Natural Sciences and Engineering Research Council of Canada, including the Julie Payette scholarship given to the top 24 Master candidates in the country. He is author or co-author of 9 papers in international journals and 12 conference presentations including 3 invited talks.

Previous Awardees

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

PRESIDENTIAL SCIENCE AWARD

Mike Keenan (2015) Sandia National Laboratories (Ret.)

Prior to his retirement, Dr. Mike Keenan was a Distinguished Member of the Technical Staff at Sandia National Laboratories. He joined Sandia after being awarded a PhD in physical chemistry by the University of Illinois at Urbana-Champaign. Dr. Keenan spent most of his career in the Materials Science Center where his early research interests included the physical properties of polymers and packaging of electronic components. Subsequently, Dr. Keenan managed Sandia's Analytical Chemistry Department; following that, he took advantage of an opportunity to pursue long-standing interests in computing and statistics by applying them to the multivariate analysis of hyperspectral images. The analysis of such images, where a full spectrum is acquired at each point in a 2D or 3D sample, poses significant challenges ranging from the massive sizes the data sets generated by current imaging systems to the low signal-to-noise typical of the individual spectra.

Dr. Keenan's contributions included developing efficient algorithms to extract chemical information from spectral images in an optimal and unbiased manner, and providing approaches to deal with the critically important task of accounting for the noise characteristic of counting measurements. These accomplishments were recognized by a 2002 R&D 100 Award shared with Paul Kotula, also at Sandia, for Component Analysis Software. This development enabled the routine multivariate statistical analysis of large spectral images, given the modest computing resources generally available in the lab. Dr. Keenan was also member of the Sandia team that was awarded an R&D 100 Award in 2009 for the Hyperspectral Confocal Fluorescence Microscope System.

Since his retirement from Sandia, Dr. Keenan has continued to pursue research in this area as an independent scientist. His interests include developing and applying efficient numerical algorithms, general noise models, and new analysis approaches that accentuate selectable aspects of the multivariate models with the goal of improving interpretability.



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

PRESIDENTIAL SERVICE AWARD

Stuart McKernan (2015) 3M

Stuart McKernan received his initial education at Bristol University in the UK, earning his B.Sc., M.Sc., and PhD in Physics. His interest in electron microscopy began as a final-year B.Sc. project on the handedness determination of quartz by electron microscopy. Following a postdoctoral fellowship at Bristol he moved to Cornell University in 1986 when he became a member of the Society. In 1991 Stuart moved to the University of Minnesota and also became a member of the Minnesota Microscopy Society where he has been a director, president, and webmaster as well as being involved locally with project MICRO. He now works for 3M in the electron microscopy group at the central research and analytical lab.

Stuart has supported MAS in a number of different capacities including serving as a Director on Council from 2008-10. He was the Program Chair for the Microscopy and Microanalysis 2000 meeting in Philadelphia, and coordinator of the database used to program annual meeting since 1998. He was the editor of the meeting proceedings from 2002 to 2012, and has attended every program planning meeting since 1996.



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. McGee
2014	I.M. Anderson

MAS OUTSTANDING PAPER AWARDS (2014)

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

BIRKS AWARD:

Hideyuki Takahashi, JEOL

(For best contributed paper) – Sponsored by JEOL USA

Exciting Possibilities of Soft X-ray Emission Spectroscopy as Chemical State Analysis in EPMA and FE-SEM

MACRES AWARD:

Kirstin Alberi, National Renewable Energy Laboratory

(For best instrumentation or software paper) – Sponsored by Oxford Instruments, Inc.

Photoluminescence Imaging of Semiconductors

COSSLETT AWARD:

Xavier Llovet, University of Barcelona (Spain)

(For best invited paper) – Sponsored by MAS

Application of Monte Carlo Calculations to Improve Quantitative Electron Probe Microanalysis

CASTAING AWARD:

Chantelle Venter, University of Pretoria (South Africa)

(For best student paper) – Sponsored by CAMECA, Inc.

An In Ovo Investigation of the Ultrastructural Effects of the Heavy Metals Cadmium and Chromium on Liver Tissue

Advanced MicroBeam, Inc.
Applied Physics Technologies, Inc.
Bruker-Nano Analytics
CAMECA Instruments, Inc.
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SEMTEch Solutions, Inc.
South Bay Technology, Inc.
SPI Supplies/Structure Probe, Inc.
Ted Pella, Inc.
TESCAN USA
Thermo Fisher Scientific, Inc.
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M&M Meeting Awards

(Student, Post-Doctoral & Staff)

M&M Student Awards

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Diego Alducin, University of Texas, San Antonio
Lourdes Bazán-Díaz, University of Texas, San Antonio
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Simon Fowler, Portland State University
Tyler Harvey, University of Oregon
Jordan Hechtel, Vanderbilt University
Jared Johnson, Ohio State University
Ryosuke Kagawa, Kagawa University School of Medicine (Japan)
Junhao Lin, Vanderbilt University
Haithem Mansour, University of Lorraine (France)
Christine Nolan, University of Vermont
Angelina Orthacker, Center for Electron Microscopy, Graz (Germany)
Tasia Pyburn, Vanderbilt University
Sibylle Schilling, Manchester University (UK)
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Kaydee Smith, University of South Carolina
Qiyue Yin, Binghamton University
Kai Zweacker, University of Pittsburgh



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Julia Deitz, Ohio State University
Jie Feng, University of Wisconsin
Chao Li, Xi'an Jiaotong University (China)
Jing Li, Brookhaven National Laboratory
Linze Li, University of Michigan
Jinglin Liu, University of Delaware
Michael Odlyzko, University of Minnesota
Paul Rottmann, Johns Hopkins University
Nicholas Schneider, University of Pennsylvania
Beata Turonova, Saarland University (Germany)
Ryan Wu, University of Minnesota
Michael Zanetti, Washington University
Wenhui Zhu, Binghamton University

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Eric Samuel Scholarship

sponsored by



Michael Zachman, Cornell University

Robert P. Apkarian Memorial Scholarship (Post-Doctoral; Biological Sciences)

sponsored by



Kem Sochacki, National Institutes of Health

Robert P. Apkarian Memorial Scholarship (Post-Doctoral; Physical Sciences)

sponsored by



Eric Prestat, Manchester University (U.K.)

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Hao Yang, Oxford University (U.K.)
Layla Mehdi, Pacific Northwest National Laboratory
Andreas Walter, University of California, San Francisco
Edward White, Imperial University (U.K.)
Pengfei Yan, Pacific Northwest National Laboratory

MSA Professional Technical Staff Award

sponsored by



Julio Rodriguez-Manzo, University of Pennsylvania

International Metallographic Society

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1995-1997	E. Daniel Albrecht
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1999-2001	Elliot A. Clark
2001-2003	Richard K. Ryan
2003-2005	Allan J. Lockley
2005-2007	Dennis W. Hetzner
2007-2009	David J. Fitzgerald
2009-2011	Frauke Hogue
2011-2013	Natalio T. Saenz
2013-2015	Richard A. Blackwell

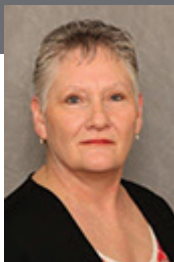
We would like to thank the following volunteers who helped organize the M&M 2015 Meeting:

James E. Martinez, *M&M 2015 IMS Co-Chair*
Daniel P. Dennies, *M&M 2016 IMS Co-Chair*
Coralee McNee, *M&M 2017 IMS Co-Chair*
Frederick Schmidt, *Sunday Short Course Instructor*
Rhonda Stroud, *Symposium Co-Chair*
George Vander Voort, *Symposium Co-Chair*
Andre Mkhoyan, *Symposium Co-Chair*
Jay Potts, *Symposium Co-Chair*
Elaine Schumacher, *Symposium Co-Chair*
Ke-Bin Low, *Symposium Co-Chair*
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Masashi Watanabe, *Symposium Co-Chair*
Greg Haugsted, *Symposium Co-Chair*
Jorg Wiezorek, *Symposium Co-Chair*
David Bell, *Symposium Co-Chair*
Brendan Griffin, *Symposium Co-Chair*

PRESIDENT'S AWARD (SERVICE TO IMS)

Judith L. Arner (2014)

Judith Arner, senior metallographer at Struers Inc., in Westlake, Ohio, since 1989, received her associate's degree in metallurgical engineering technology from Penn State University, Shenango Valley Campus, Sharon, Pa. Her responsibilities at Struers include developing metallographic techniques for a wide range of materials and teaching metallography, and the use of semiautomatic and automatic metallographic preparation equipment. She also serves as a volunteer "Materials Mentor" at the ASM International Eisenman Materials Camp, helping high-school students learn about metallography.



Judy was presented the 2014 IMS President's Award "in sincere and grateful appreciation for many years of service to IMS as Secretary of the Board of Directors."

History of the IMS Awards

HENRY CLIFTON SORBY AWARD: The Sorby Award was established to recognize outstanding contributions to the field of metallography by an internationally recognized senior figure in the field of metallography. This award is a personalized plaque, and the recipient is honored during the M&M Conference Sorby lecture and at the IMS Annual Meeting banquet.

PIERRE JACQUET-FRANCIS F. LUCAS AWARD: The Jacquet-Lucas Award is given each year to the International Metallographic Contest entry judged "Best in Show" by a panel of judges. This is a joint IMS/ASM award with origins dating back to 1946, and has been endowed by Buehler Ltd. since 1976. The winners receive the Jacquet Gold Medal, the ASM Lucas Award, a cash award, and are honored at banquets at both the IMS Annual Meeting and the ASM Annual Event.

PRESIDENT'S AWARD: This award is presented to an individual deemed deserving of special recognition by the Society. This award is a plaque personalized for the recipient.

BUEHLER TECHNICAL PAPER MERIT AWARD: This award shall be given annually to the authors of the technical paper published that year in the journal Materials Characterization that was determined most outstanding by a panel of IMS judges. A plaque and cash award is given to the recipients each year by Buehler Ltd.

PAST-PRESIDENTS AWARD: This award shall be presented by the Board of Directors to the out-going Past-President in recognition of their contributions to the Society. This award is a plaque personalized for the recipient.

PRESENTATION OF THE IMS AWARD: The awards are presented at the annual banquet on Wednesday, August 5, 2015, at 6:30 PM.

Previous Awardees

1977	Carus K. H. DuBose
1978	Richard D. Buchheit
1979	Arthur E. Calabra
1980	James L. McCall
1981	E. Daniel Albrecht
1982	James H. Richardson
1983	Robert J. Gray
1984	Japnell D. Braun
1986	P. Michael French
1987	George F. Vander Voort
1988	Robert S. Crouse
1989	Ian Le May
1990	William E. White
1991	Chris Bagnall
1992	Gary W. Johnson
1993	Donald W. Stevens
1994	MacIntyre R. Louthan, Jr.
1995	Gunter Petzow
1996	James Nelson
1997	John Wylie
1998	John W. Simmons
1999	William Forgeng, Jr.
2000	Natalio T. Saenz
2001	William W. Scott, Jr.
2002	George Blann
2003	Jeff Stewart
2004	Elliot A. Clark
2005	Chris Bagnall
2006	Art Geary
2007	Richard K. Ryan
2008	Thomas S. Passek
2009	David & Dale Fitzgerald
2010	Jaret Frafjord
2011	Donald F. Susan
2012	Sarina Pastoric
2013	Frauke Hogue

Major Society Awards

JACQUET-LUCAS AWARD

Thomas Nizolek (2014)



The ASM Metallographic Award was established in 1946 for the best entry in the annual ASM metallographic competition. In 1958, it became known as the Francis F. Lucas Metallographic Award. In 1972, ASM joined with The International Metallographic Society (IMS) in sponsoring the Pierre Jacquet Gold Medal and the Francis F. Lucas Award for Excellence in Metallography. This award has been endowed by Buehler Ltd. since 1976.

The 2014 Recipient of the Jacquet-Lucas Award is Thomas Nizolek, a doctoral student at the University of California Santa Barbara, advised by Prof. Tresa Pollock, FASM, for his entry entitled: *Deformation of Bulk Metallic Nanolaminates*.

Nizolek received his B.S. in Materials Science and Engineering from Lehigh University in 2010 where he was a Dean's Scholar and an active member of the local chapter of ASM. During his undergraduate studies, he worked on a variety of research projects on topics including laminated steels, titanium nitride thin films, and titanium-tantalum shape memory alloys.

During the course of his PhD research, Nizolek worked at Los Alamos National Laboratory as part of a team focused on improving the deformation processing and properties of bulk bimetallic nanolaminates. He is a previous Jacquet-Lucas recipient (2008), a Department of Defense NDSEG fellow, and a member of ASM since 2005.

Previous Awardees

1946	G.R. Kuhn
1947	R.H. Hays
1948	E.C. Pearson
1949	D.H. Rowland
1950	S.O. Modin
1951	H.P. Roth
1952	H. Griffin
1953	B.C. Leslie, R.J. Gray
1954	R.D. Buchheit, J.E. Boyd, A.A. Watts, F.C. Holden
1955	F.M. Cain, Jr.
1956	D. Mannas
1957	T.K. Bierlein, B. Mastel
1958	J.C. Gower, E.P. Griggs, W.E. Denny, J.E. Epperson, R.J. Gray
1959	F.M. Beck
1960	G.C. Woodside
1961	J.F. Radavich, W. Coutts, Jr
1962	D. Medlin
1963	W.C. Coons
1964	B.C. Leslie, R.J. Gray
1965	W.C. Coons, A. Davinroy
1966	D.M. Maher, A. Eikum
1967	J.F. Kisiel
1968	R.M.N. Pelloux, Mrs. H. Wallner

1969	R.H. Beauchamp, R.P. Nelson
1970	D.R. Betner, W.D. Hepfer
1971	R.J. Gray
1972	C.J. Echer, S.L. Digiallonardo
1973	M.S. Grewal, B.H. Alexander, S.A. Sastri
1974	M.P. Pinnel, D.E. Heath, J.E. Bennett, G.V. McIlharagie
1975	W.C. Coons
1976	L.E. Soderqvist
1977	R.H. Beauchamp, D.H. Parks, N.T. Saenz, K.R. Wheeler
1978	C. Bagnall, R. Witkowski
1979	M.J. Bridges, S.J. Dekanich
1980	R.H. Beauchamp, K. Fredriksson
1981	F. Kurosawa, I. Taguchi, H. G. Suzuki
1982	M.J. Carr, M.C. Mataya, T.O. Wilford, J.L. Young
1983	V. Carle, E. Schmid
1984	R.H. Beauchamp, N.T. Saenz, J.T. Prater
1985	U. Taffner, R. Telle
1986	N.T. Saenz, C.A. Lavender, M.T. Smith, D.H. Parks, G.M. Salazar
1987	S.A. David, J.M. Vitek, C.P. Haltom, A.G. Barcomb
1988	A. David, J.M. Vitek, A. Boatner, G.C. Marsh, A.B. Baldwin
1989	G. Hoerz, M.C. Kallfass
1990	A. David, J.M. Vitek, A.B. Baldwin
1991	M.R. Jones
1992	G.F. VanderVoort
1993	T. Leonhardt, F. Terepka, M. Singh, G. Soltis
1994	J.W. Simmons, B.S. Covino, Jr., S.D. Cramer, J.S. Dunning
1995	Kamal, K. Soni, R. Levi-Setti, S. Shah, S.J. Gentz
1996	R.L. Bodnar, S.J. Lawrence
1997	J. Yewko, D.L. Marshall
1998	R. Pereyra, E.G. Zukas
1999	K.R. Luer
2000	D.J. Lewis, S. Allen
2001	D. Chakrapani
2002	F.F. Noecker, II
2003	F.F. Noecker, II
2004	R. Unocic, P.M. Sarosi, M.J. Mills
2005	K. Kimura, S. Hata, S. Matsumura, T. Horiuchi
2006	R. Deacon
2007	K.A. Unocic, G.S. Daehn
2008	T. Nizolek
2009	B. Gerard
2010	C. Roberts
2011	C. Marvel
2012	Z. Luo
2013	N. H. Alharthi

HENRY CLIFTON SORBY AWARD

David K. Matlock (2014)

David K. Matlock received his B.S. in engineering science from the University of Texas at Austin. He then attended Stanford University in California where he received his M.S. and PhD in materials science and engineering and also served as a research assistant. His early career included working at Esso Production Research Co. in Houston and Lawrence Radiation Laboratory in Livermore, Calif.



The bulk of his career was spent teaching at the Colorado School of Mines. He started out as an Assistant Professor in 1972, was the Armco Foundation Forgarty Professor (1980-2013), and is now Emeritus Professor at the school. He also has served as the Director of Advanced Steel Processing and Products Research Center at the Colorado School of Mines.

His specialty courses include Mechanical Properties of Materials, Metal Forming Operations, Analysis of Metallurgical Failures, Fatigue and Fracture, and Strengthening Mechanisms.

He is a member of ASM, AIME, ASTM, SAE, and AIST. Over 400 publications, primarily related to microstructures and mechanical properties with an emphasis on steels, bear his name.

He is a member of the National Academy of Engineering, Honorary Member of AIME, and Fellow of the American Welding Society. His numerous awards also include the AIME Robert Lansing Hardy Gold Metal (1975), the ASM Bradley Stoughton Award for Young Teachers in Metallurgy (1979), SAE/AISI Sydney H. Melbourne Award (1998), three time winner of the AIST Jerry's Silver Awards, and American Iron and Steel Institute Medal (2013).

Previous Awardees

1976	Georg L. Kehl
1977	Cyril Stanley Smith
1978	Adolph Buehler
1979	Frederick N. Rhines
1980	Len E. Samuels
1981	Robert J. Gray
1982	Gunter Petzow
1983	William D. Forgeng
1984	Ervin E. Underwood
1985	Alan Price
1986	Robert W. K. Honeycombe
1987	Gareth Thomas
1988	Franz Jeglitsch
1989	Tanjore R. Anantharaman
1990	E. Daniel Albrecht
1991	W. C. Leslie
1992	Charles S. Barrett
1993	Raimond B. Castaing
1994	F. Brian Pickering
1995	Erhard Hornbogen
1996	Peter Duncumb
1997	Robert T. DeHoff
1998	Kay Geels
1999	Joseph Goldstein
2000	Hans Eckhart Exner
2001	Brian Ralph
2002	Walter Mannheimer
2003	Enrica Stagno
2004	George F. Vander Voort
2005	Iain LeMay
2006	Arlan Benschoter
2007	McIntyre R. Louthan, Jr.
2008	Lawrence E. Murr
2009	Chris Bagnall
2010	Albert C. Kneissl
2011	David Williams
2012	Michael Pohl
2013	Arun M. Gokhale
2014	Stanley P. Lynch

FRIDAY, JULY 31

8:30 AM

MSA Council

A107

SATURDAY, AUGUST 1

8:30 AM

MSA Council

A107

SUNDAY, AUGUST 2

8:30 AM

IMS Board of Directors

C124

8:30 AM – 5:00 PM

Sunday Short Courses

X10 – Cryo-Preparation for Biological EM

B110

X11 – Immunolabeling Technology for Light and Electron Microscopy

B111

X12 – Electron Tomography in Life and Materials Sciences

B112

X13 – Imaging and Analysis with Variable Pressure or Environmental SEM

B113

X14 – Advanced Focused Ion Beam Methods

B114

X15 – Practical Considerations for Image Analysis; ImageJ

B115

X16 – Overview of Scanning Probe Microscopy (SPM/AFM) for Nanoscale Morphological, Mechanical, and Optical Characterization of Materials

B116

X17 – Standard Practice for Production and Evaluation of Field Metallographic Replicas

B117

X18 – Nanomaterial Microscopy & Microanalysis: Tools & Preparation

B118

8:30 AM – 5:00 PM

Pre-Meeting Congress (Sponsored by ACEM FIG)

Measuring Materials' Functionalities and Dynamics in Liquid and Gaseous Environments

A105-106

8:30 AM

IMS Poster Judging

C123

9:00 AM

MAS Council

A107

1:00 PM

Microscopy Today Editors

D131

3:00 PM

MaM Editors

D131

6:30 PM

Sunday Evening Social Event

Portland Ballroom

MONDAY, AUGUST 3

7:15 AM

MSA Awards + Fellowship Committees

A107

7:15 AM

Technologists' Forum Board

D129

7:15 AM

MaM Editorial Board

D131

8:30 AM – 12:00 PM

M&M 2015 Plenary Sessions

Oregon Ballroom

Opening Welcome

PLENARY TALK #1: Dr. Roger Tsien, University of California, San Diego, 2008 Nobel Laureate
“*New Molecular Tools for Light and Electron Microscopy*”

MAS Awards Presentation

IMS Awards Presentation

Coffee & Donuts Break

MSA Awards Presentation

M&M Meeting Awards Presentation

PLENARY TALK #2: Dr. Donald Pettit, NASA Johnson Space Center, Houston, TX
“*Some Unexpected Difficulties in Microscope Operation in Microgravity*”

MONDAY, AUGUST 3 CONTINUED

12:00 PM – 1:30 PM	Lunch Break	Exhibit Hall
12:00 PM – 5:30 PM	Exhibit Hall Open	Exhibit Hall
12:15 PM	MAS Meal with a Mentor	A108-109
12:15 PM	FOM FIG “Lunch with a Facility Manager”	D132
12:15 PM	Diagnostic FIG Meeting	D131
12:15 PM	Focused Ion Beam FIG	D130
1:00 PM – 5:00 PM	In-Week Intensive Workshops	
	X19 – Introduction to SEM Imaging and X-ray Compositional Analysis	A103
	X20 – Specimen Preparation for Biological Microscopy	A104
1:30 PM – 3:00 PM	P.M. Symposia & Sessions	
	X99 – IMS Henry Clifton Sorby Award & Lecture	C123
	A01 – Vendor Symposium: New Tools for Life and Materials Sciences	C125
	A11 – Electron Vortex Beams and Higher-Order Beam Modes	D139
	A12 – Low Voltage Electron Microscopy	B117
	A13 – Advancing Data Collection and Analysis for Atom Probe Tomography	B115
	B01 – Apkarian Memorial Symposium: Cryo-HRSEM	B112
	B05 – 3D Structure of Macromolecular Assemblies, Cellular Organelles, and Whole Cells	B111
	B07 – Microscopy, Microanalysis, and Image Cytometry in the Pharmaceutical Sciences	B119
	B08 – DynAMic Fluorescence Microscopy	C122
	B09 – Utilizing Microscopy for Research and Diagnosis of Diseases	D138
	B10 – Multiscale Biological Imaging: From Micro to Macro – Animal to Clinical Models	C120
	P01 – Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on <i>In Situ</i> TEM and STEM	B116
	P04 – Nano-characterization of Low Dimensional Materials: Carbon to 2D TMDs	B114
	P05 – Nuclear and Irradiated Materials: Fundamental Defect Properties	D135
	P08 – Microscopy and Characterization of Ceramics, Polymers, and Composites	D136
	P09 – Microscopy of Additive Manufacturing and 3D Printing in Materials and Biology in Humans, Plants & Animals	D137
	P11 – Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials	B113
2:30 PM	IMS General Members’ Meeting	C123
3:00 PM – 5:00 PM	Monday Poster Presentations	Exhibit Hall
	A01 – Vendor Symposium: New Tools for Life and Materials Sciences	
	A18 – Core Facility Management (FOM FIG)	
	B01 – Apkarian Memorial Symposium: Cryo-HRSEM	
	B07 – Microscopy, Microanalysis, and Image Cytometry in the Pharmaceutical Sciences	
	B08 – DynAMic Fluorescence Microscopy	
	B09 – Utilizing Microscopy for Research and Diagnosis of Diseases	
	P01 – Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on <i>In Situ</i> TEM and STEM	
	P06 – Failure Analysis, Applications of Microanalysis, Microscopy, Metallography, and Fractography	
	P08 – Microscopy and Characterization of CerAMics, Polymers, and Composites	
	P11 – Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials	
	PDP – Post Deadline Posters (all)	
3:00 PM	3D EM in the Biological Sciences FIG	B111
3:30 PM	Technologists’ Forum Business Meeting	D130

MONDAY, AUGUST 3 CONTINUED

5:00 PM	Student Poster Awards	Exhibit Hall Poster Stage
5:30 PM	Student Mixer	A108-109
5:45 – 6:45 PM	Vendor Tutorials (<i>Sign up at MSA MegaBooth</i>)	Exhibit Hall
7:00 PM	Student Committee Meeting	B112
7:00 PM – 9:00 PM	IMS Icebreaker	Doubletree Hotel

TUESDAY, AUGUST 4

7:15 AM	MSA Local Affiliated Societies' Breakfast	A108-109
7:15 AM	Microscopy Today Editorial Board Meeting	D130
8:30 AM – 10:00 AM	A.M. Symposia & Sessions	
	X90 – Microscopy Outreach: Microscopy in the Classroom	B110-111
	A01 – Vendor Symposium: New Tools for Life and Materials Sciences	C125
	A12 – Low Voltage Electron Microscopy	B117
	A13 – Advancing Data Collection and Analysis for Atom Probe Tomography	B115
	A18 – Core Facility Management (FOM FIG)	C124
	B01 – Apkarian Memorial Symposium: Cryo-HRSEM	B112
	B04 – Advances in Specimen Preparation and Correlative LM-EM (CLEM) of Biological Samples	C122
	B07 – Microscopy, Microanalysis, and Image Cytometry in the Pharmaceutical Sciences	B119
	B09 – Utilizing Microscopy for Research and Diagnosis of Diseases	D138
	B10 – Multiscale Biological Imaging: From Micro to Macro – Animal to Clinical Models	C120
	P01 – Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on <i>In Situ</i> TEM and STEM	B116
	P04 – Nano-characterization of Low Dimensional Materials: Carbon to 2D TMDs	B114
	P05 – Nuclear and Irradiated Materials: Fundamental Defect Properties	D135
	P06 – Failure Analysis, Applications of Microanalysis, Microscopy, Metallography, and Fractography	D140
	P07 – Metallography and Microstructural Characterization of Metals	C123
	P09 – Microscopy of Additive Manufacturing and 3D Printing in Materials and Biology in Humans, Plants & Animals	D137
	P11 – Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials	B113
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 2016 - Program Planning Meeting	B118
10:30 AM – 12:00 PM	A.M. Symposia & Sessions (Cont'd.)	
	X90 – Microscopy Outreach: Microscopy in the Classroom	B110-111
	A05 – Fast and Ultrafast Imaging with Electrons and Photons	A105
	A06 – Advanced Analytical TEM/STEM	A106
	A11 – Electron Vortex Beams and Higher-Order Beam Modes	D139
	A12 – Low Voltage Electron Microscopy	B117
	A13 – Advancing Data Collection and Analysis for Atom Probe Tomography	B115
	A18 – Core Facility Management (FOM FIG)	C124
	B04 – Advances in Specimen Preparation and Correlative LM-EM (CLEM) of Biological Samples	C122

TUESDAY, AUGUST 4 CONTINUED

10:30 AM – 12:00 PM	A.M. Symposia & Sessions (Cont'd.)	
	B05 – 3D Structure of Macromolecular Assemblies, Cellular Organelles, and Whole Cells	B112
	B07 – Microscopy, Microanalysis, and Image Cytometry in the Pharmaceutical Sciences	B119
	B09 – Utilizing Microscopy for Research and Diagnosis of Diseases	D138
	P01 – Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on <i>In Situ</i> TEM and STEM	B116
	P04 – Nano-characterization of Low Dimensional Materials: Carbon to 2D TMDs	B114
	P05 – Nuclear and Irradiated Materials: Fundamental Defect Properties	D135
	P06 – Failure Analysis, Applications of Microanalysis, Microscopy, Metallography, and Fractography	D140
	P07 – Metallography and Microstructural Characterization of Metals	C123
	P08 – Microscopy and Characterization of CerAMics, Polymers and Composites	D136
	P09 – Microscopy of Additive Manufacturing and 3D Printing in Materials and Biology in Humans, Plants & Animals	D137
	P10 – Microscopy and Microanalysis for Real-World Problem Solving	C120
	P11 – Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials	B113
12:00 PM – 1:30 PM	Lunch Break	
12:15 PM	FOM FIG Business Meeting & Lunch	A108-109
12:15 PM	MSA Distinguished Scientist Awardee Lectures	C123
12:15 PM	Cryo-Preparation FIG Meeting	D130
12:15 PM	MSA Standards Committee	C128
12:15 PM	Electron Crystallography FIG	D131
1:00 PM – 5:00 PM	In-Week Intensive Workshops	
	X19 – Introduction to SEM Imaging and X-ray Compositional Analysis	A103
	X20 – Specimen Preparation for Biological Microscopy	A104
1:30 PM – 3:00 PM	P.M. Symposia & Sessions	
	X92 – Project MICRO	B110-111
	A05 – Fast and Ultrafast Imaging with Electrons and Photons	A105
	A06 – Advanced Analytical TEM/STEM	A106
	A11 – Electron Vortex Beams and Higher-Order Beam Modes	D139
	A12 – Low Voltage Electron Microscopy	B117
	A13 – Advancing Data Collection and Analysis for Atom Probe Tomography	B115
	A16 – Advances in Electron and Ion Scanning Microscopies	B118
	B02 – To the Rhizosphere — And Beyond!	B112
	B06 – Deep Tissue Imaging and Light Sheet Microscopy	C122
	C13 – Pharmaceuticals FIG Session	B119
	P01 – Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on <i>In Situ</i> TEM and STEM	B116
	P04 – Nano-characterization of Low Dimensional Materials: Carbon to 2D TMDs	B114
	P05 – Nuclear and Irradiated Materials: Fundamental Defect Properties	D135
	P06 – Failure Analysis, Applications of Microanalysis, Microscopy, Metallography, and Fractography	D140
	P07 – Metallography and Microstructural Characterization of Metals	C123
	P08 – Microscopy and Characterization of CerAMics, Polymers, and Composites	D136
	P10 – Microscopy and Microanalysis for Real-World Problem Solving	C120
	P11 – Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials	B113



WEEK AT-A-GLANCE

TUESDAY, AUGUST 4 CONTINUED

3:00 PM – 5:00 PM	Tuesday Poster Presentations	Exhibit Hall
	X90 – Microscopy Outreach: Microscopy in the Classroom	
	A05 – Fast and Ultrafast Imaging with Electrons and Photons	
	A06 – Advanced Analytical TEM/STEM	
	A12 – Low Voltage Electron Microscopy	
	A13 – Advancing Data Collection and Analysis for Atom Probe Tomography	
	B02 – To the Rhizosphere — And Beyond!	
	B04 – Advances in Specimen Preparation and Correlative LM-EM (CLEM) of Biological Samples	
	B05 – 3D Structure of Macromolecular Assemblies, Cellular Organelles, and Whole Cells	
	B10 – Multiscale Biological Imaging: From Micro to Macro – Animal to Clinical Models	
	B11 – Specimen Prep for Biological Sciences	
	P01 – Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on <i>In Situ</i> TEM and STEM	
	P04 – Nano-characterization of Low Dimensional Materials: Carbon to 2D TMDs	
	P05 – Nuclear and Irradiated Materials: Fundamental Defect Properties	
	P08 – Microscopy and Characterization of CerAMics, Polymers and Composites	
	P11 – Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials	
3:30 PM	FIG Business Meeting	A107
3:30 PM	MSA Education Committee Meeting	D130
4:00 PM	Open Source Software for Quantitative Microanalysis	B118
5:00 PM	Student Poster Awards	Exhibit Hall
5:15 PM	ACEM FIG	D131
5:30 PM	Symposium Organizers – Appreciation Event	A108-109
5:45 PM	Vendor Tutorials (<i>Sign up at MSA MegaBooth</i>)	Exhibit Hall
6:30 PM	Presidents' Reception (<i>Invitation Only</i>)	Offsite

WEDNESDAY, AUGUST 5

7:15 AM	MSA Certification Board	D131
7:15 AM	MSA Membership Committee	D130
8:30 AM	M&M 2016 Conference Publications	A107
8:30 AM – 10:00 AM	A.M. Symposia & Sessions	
	X31 – Technologists' Forum: Safety in the Microscopy Laboratory	D139
	X42 – Biological Sciences Tutorial: Maximizing the Likelihood of Successful Maximum Likelihood Classification	C125
	A06 – Advanced Analytical TEM/STEM	A106
	A08 – Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques	B115
	A10 – Advances in Electron Diffraction and Automated Mapping Techniques	B112
	A16 – Advances in Electron and Ion Scanning Microscopies	B118
	B04 – Advances in Specimen Preparation and Correlative LM-EM (CLEM) of Biological Samples	D138
	P01 – Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on <i>In Situ</i> TEM and STEM	B116
	P02 – Materials Problem Solving with Aberration-Corrected Electron Microscopy	C124
	P03 – Advances in Microanalysis of Earth and Planetary Materials	C122

WEDNESDAY, AUGUST 5 CONTINUED

8:30 AM – 10:00 AM	A.M. Symposia & Sessions	
	P04 – Nano-characterization of Low Dimensional Materials: Carbon to 2D TMDs	B114
	P06 – Failure Analysis, Applications of Microanalysis, Microscopy, Metallography, and Fractography	D140
	P07 – Metallography and Microstructural Characterization of Metals	C123
	P10 – Microscopy and Microanalysis for Real-World Problem Solving	C120
	P11 – Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials	B113
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 – Technologists' Forum: Emerging New Specialized Techniques for Correlative Microscopy	D139
	X44 – Biological Sciences Tutorial: Optimizing Specimen Preparation for Macromolecular Electron Microscopy	C125
	A05 – Fast and Ultrafast Imaging with Electrons and Photons	A105
	A06 – Advanced Analytical TEM/STEM	A106
	A08 – Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques	B115
	A09 – Advances in Combining Simulation and Experiment for Materials Design	B119
	A10 – Advances in Electron Diffraction and Automated Mapping Techniques	B112
	A14 – Surface Plasmons, Cathodoluminescence, and Low-Loss EELS	D137
	A16 – Advances in Electron and Ion Scanning Microscopies	B118
	B04 – Advances in Specimen Preparation and Correlative LM-EM (CLEM) of Biological Samples	D138
	B05 – 3D Structure of Macromolecular Assemblies, Cellular Organelles, and Whole Cells	B111
	P01 – Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on <i>In Situ</i> TEM and STEM	B116
	P02 – Materials Problem Solving with Aberration-Corrected Electron Microscopy	C124
	P03 – Advances in Microanalysis of Earth and Planetary Materials	C122
	P04 – Nano-characterization of Low Dimensional Materials: Carbon to 2D TMDs	B114
	P05 – Nuclear and Irradiated Materials: Fundamental Defect Properties	D135
	P07 – Metallography and Microstructural Characterization of Metals	C123
	P08 – Microscopy and Characterization of Ceramics, Polymers, and Composites	D136
	P10 – Microscopy and Microanalysis for Real-World Problem Solving	C120
	P11 – Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials	B113
12:00 PM – 1:30 PM	Lunch Break	
12:15 PM	MAS - ANSI Meeting	D131
12:15 PM	MSA Members Meeting	C123
12:15 PM	MAS Affiliated Regional Societies	A108-109
12:15 PM	Atom Probe FIG Meeting	A107
12:15 PM	Pharma FIG	D130
1:00 PM – 5:00 PM	In-Week Intensive Workshops	
	X19 – Introduction to SEM Imaging and X-ray Compositional Analysis	A103
	X20 – Specimen Preparation for Biological Microscopy	A104
1:30 PM – 3:00 PM	P.M. Sessions & Symposia	
	X30 – Technologists' Forum: Emerging New Specialized Techniques for Correlative Microscopy	D139
	X43 – Biological Sciences Tutorial: Advances in Light Sheet Microscopy	C125



WEEK AT-A-GLANCE

WEDNESDAY, AUGUST 5 CONTINUED

1:30 PM – 3:00 PM

P.M. Sessions & Symposia

X91 – It's a Family Affair	B110
A02 – TEM Phase Contrast Imaging	D135
A03 – Electron Holography for Nanofields in Solids	C120
A04 – Advances in FIB: New Instrumentation and Applications in Materials and Biological Sciences	B117
A05 – Fast and Ultrafast Imaging with Electrons and Photons	A105
A06 – Advanced Analytical TEM/STEM	A106
A07 – Scanning Probe Microscopy: New Methods and Applications	B118
A08 – Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques	B115
A09 – Advances in Combining Simulation and Experiment for Materials Design	B119
A10 – Advances in Electron Diffraction and Automated Mapping Techniques	B112
A14 – Surface Plasmons, Cathodoluminescence, and Low-Loss EELS	D137
A17 – Standardization and Metrology in Electron Microscopy and Microbeam Analysis	B114
B02 – To the Rhizosphere – And Beyond!	B111
B04 – Advances in Specimen Preparation and Correlative LM-EM (CLEM) of Biological Samples	D138
P01 – Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on <i>In Situ</i> TEM and STEM	B116
P02 – Materials Problem Solving with Aberration-Corrected Electron Microscopy	C124
P03 – Advances in Microanalysis of Earth and Planetary Materials	C122
P08 – Microscopy and Characterization of CerAMics, Polymers, and Composites	D136
P11 – Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials	B113
P12 – Advanced Microscopy and Microanalysis of Soft and Hybrid Nanomaterials	D140

3:15 PM

MSA-CUP Book Series Advisory Board Meeting

D130

3:00 PM – 5:00 PM

Wednesday Poster Presentations

Exhibit Hall

A02 – TEM Phase Contrast Imaging
A05 – Fast and Ultrafast Imaging with Electrons and Photons
A06 – Advanced Analytical TEM/STEM
A07 – Scanning Probe Microscopy: New Methods and Applications
A08 – Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques
A09 – Advances in Combining Simulation and Experiment for Materials Design
A10 – Advances in Electron Diffraction and Automated Mapping Techniques
A14 – Surface Plasmons, Cathodoluminescence, and Low-Loss EELS
A16 – Advances in Electron and Ion Scanning Microscopies
A17 – Standardization and Metrology in Electron Microscopy and Microbeam Analysis
B06 – Deep Tissue Imaging and Light Sheet Microscopy
P02 – Materials Problem Solving with Aberration-Corrected Electron Microscopy
P07 – Metallography and Microstructural Characterization of Metals
P10 – Microscopy and Microanalysis for Real-World Problem Solving
P11 – Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials
P12 – Advanced Microscopy and Microanalysis of Soft and Hybrid Nanomaterials

5:00 PM

Student Poster Awards

Exhibit Hall

5:15 PM

MAS Business Meeting

C123

5:45 PM

Vendor Tutorials (Sign up at MSA MegaBooth)

Exhibit Hall

6:30 PM

IMS Awards Banquet

Offsite

6:30 PM

MAS Members Social

Offsite

THURSDAY, AUGUST 6

8:30 AM	M&M Sustaining Members Meeting	A108-109
8:30 AM – 10:00 AM	A.M. Symposia & Sessions	
	X40 – Physical Sciences Tutorial: Advances in Light Sheet Microscopy	C125
	A02 – TEM Phase Contrast Imaging	D135
	A04 – Advances in FIB: New Instrumentation and Applications in Materials and Biological Sciences	B117
	A05 – Fast and Ultrafast Imaging with Electrons and Photons	A105
	A06 – Advanced Analytical TEM/STEM	A106
	A07 – Scanning Probe Microscopy: New Methods and Applications	B118
	A08 – Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques	B115
	A09 – Advances in Combining Simulation and Experiment for Materials Design	B119
	A10 – Advances in Electron Diffraction and Automated Mapping Techniques	B112
	A14 – Surface Plasmons, Cathodoluminescence, and Low-Loss EELS	D137
	A15 – Imaging Mass Spectrometry (MALDI)	B111
	P01 – Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on <i>In Situ</i> TEM and STEM	B116
	P02 – Materials Problem Solving with Aberration-Corrected Electron Microscopy	C124
	P11 – Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials	B113
10:00 AM – 2:00 PM	Exhibit Hall Open	Exhibit Hall
10:00 AM – 12:00 PM	Coffee Break + Poster Session	Exhibit Hall
10:00 AM – 12:00 PM	Thursday Poster Sessions	
	A02 – TEM Phase Contrast Imaging	
	A03 – Electron Holography for Nanofields in Solids	
	A04 – Advances in FIB: New Instrumentation and Applications in Materials and Biological Sciences	
	A05 – Fast and Ultrafast Imaging with Electrons and Photons	
	A08 – Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques	
	A10 – Advances in Electron Diffraction and Automated Mapping Techniques	
	A14 – Surface Plasmons, Cathodoluminescence, and Low-Loss EELS	
	A15 – Imaging Mass Spectrometry (MALDI)	
	P02 – Materials Problem Solving with Aberration-Corrected Electron Microscopy	
	P03 – Advances in Microanalysis of Earth and Planetary Materials	
	P07 – Metallography and Microstructural Characterization of Metals	
	P11 – Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials	
12:00 PM	Student Poster Awards	Exhibit Hall Poster Stage
12:00 PM – 1:30 PM	Lunch Break	
1:00 PM – 5:00 PM	In-Week Intensive Workshops	
	X19 – Introduction to SEM Imaging and X-ray Compositional Analysis	A103
	X20 – Specimen Preparation for Biological Microscopy	A104



WEEK AT-A-GLANCE

THURSDAY, AUGUST 6 CONTINUED

1:30 PM - 3:00 PM

P.M. Symposia

X41 - Physical Sciences Tutorial: <i>In Situ</i> Liquid S/TEM: Practical Aspects, Challenges, and Opportunities	C125
A02 - TEM Phase Contrast Imaging	D135
A03 - Electron Holography for Nanofields in Solids	C120
A04 - Advances in FIB: New Instrumentation and Applications in Materials and Biological Sciences	B117
A05 - Fast and Ultrafast Imaging with Electrons and Photons	A105
A06 - Advanced Analytical TEM/STEM	A106
A07 - Scanning Probe Microscopy: New Methods and Applications	B118
A08 - Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques	B115
A09 - Advances in Combining Simulation and Experiment for Materials Design	B119
A10 - Advances in Electron Diffraction and Automated Mapping Techniques	B112
A14 - Surface Plasmons, Cathodoluminescence, and Low-Loss EELS	D137
A15 - Imaging Mass Spectrometry (SIMS)	B111
A17 - Standardization and Metrology in Electron Microscopy and MicrobeAM Analysis	B114
P02 - Materials Problem Solving with Aberration-Corrected Electron Microscopy	C124
P03 - Advances in Microanalysis of Earth and Planetary Materials	C122
P07 - Metallography and Microstructural Characterization of Metals	C123
P11 - Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials	B113
P12 - Advanced Microscopy and Microanalysis of Soft and Hybrid Nanomaterials	D140

3:00 PM -3:30 PM

Coffee Break

3:30 PM -5:00 PM

Late P.M. Symposia (Cont'd.)

A02 - TEM Phase Contrast Imaging	D135
A03 - Electron Holography for Nanofields in Solids	C120
A04 - Advances in FIB: New Instrumentation and Applications in Materials and Biological Sciences	B117
A05 - Fast and Ultrafast Imaging with Electrons and Photons	A105
A06 - Advanced Analytical TEM/STEM	A106
A07 - Scanning Probe Microscopy: New Methods and Applications	B118
A08 - Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques	B115
A09 - Advances in Combining Simulation and Experiment for Materials Design	B119
A10 - Advances in Electron Diffraction and Automated Mapping Techniques	B112
A14 - Surface Plasmons, Cathodoluminescence, and Low-Loss EELS	D137
A17 - Standardization and Metrology in Electron Microscopy and MicrobeAM Analysis	B114
P02 - Materials Problem Solving with Aberration-Corrected Electron Microscopy	C124
P07 - Metallography and Microstructural Characterization of Metals	C123
P11 - Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials	B113
P12 - Advanced Microscopy and Microanalysis of Soft and Hybrid Nanomaterials	D140

5:30 PM

M&M 2015 Wrap-Up & Debrief (By invitation only)

A107

Welcome from the Program Chairs

Welcome to Microscopy & Microanalysis 2015 in Portland, Oregon!

The Microscopy Society of America, the Microanalysis Society, and the International Metallographic Society welcome you to Microscopy & Microanalysis 2015 in Portland, Oregon.



The overarching M&M 2015 Portland theme is correlative imaging, with a nod to light-based technologies. The United Nations General Assembly proclaimed 2015 as the “International Year of Light and Light-Based Technologies” which blends well with the interdisciplinary symposia that reflect the current environment of collaboration between scientists in different disciplines synonymous with our annual M&M meeting.

Once again the latest and most innovative applications and instrumentation developments are on show utilizing microscopy and microanalysis techniques in the biological and physical sciences. This year’s program features two plenary lectures, 40+ symposia covering a broad range of topics, numerous educational opportunities in the form of Outreach opportunities, Biological and Physical Sciences tutorials, Sunday Short Courses, and a pre-meeting Congress, organized by the MSA Electron Microscopy in Liquids and Gases (EMLG) Focused Interest Group.

This year we are excited to host Professor Roger Tsien as one of two plenary speakers, who will discuss “*New Molecular Tools for Light and Electron Microscopy*”. He is a member of the National Academy of Sciences and the Royal Society. Dr. Tsien is best known for designing and building molecules that either report or perturb signal transduction inside living cells. These efforts lead to a Nobel Prize in Chemistry (shared with O. Shimomura and M. Chalfie, 2008). The second plenary speaker is NASA Astronaut Donald Pettit who will present “*Some Unexpected Difficulties in Microscope Operation in Microgravity*.” As is typical, M&M 2015 will have the largest microscopy/microanalysis instrument exhibition in the world. Over 100 companies will display their latest equipment and services. The social activities of the opening reception and accompanying each day’s poster and awards sessions have now become an afternoon tradition in the exhibition hall.

The Executive Program Committee and the large number of symposium organizers have created the palette for Microscopy & Microanalysis 2015. This 2015 M&M meeting promises to be the showcase meeting of the year. On behalf of MSA, MAS, and IMS, welcome to Portland!



Mark A. Sanders
Program Committee Chair
University of Minnesota



Donovan Leonard
MAS Co-Chair
Oak Ridge National
Laboratories



Joseph Michael
Program Vice Chair
Sandia National Laboratories



James E. Martinez
IMS Co-Chair
NASA Johnson Space Center

Plenary Session

PLENARY SPEAKER

Professor Roger Y. Tsien
University of California – San Diego

“New Molecular Tools for Light and Electron Microscopy”

MONDAY, AUGUST 3, 2015
Oregon Convention Center,
Oregon Ballroom



Dr. Roger Y. Tsien is best known for designing and building molecules that either report or perturb signal transduction inside living cells. These molecules, created by organic synthesis or by engineering naturally fluorescent proteins, have enabled many new insights into signaling. Extension of these methods to electron microscopy aims to reveal biochemistry at nanometer resolution. At mm-cm scales, he is exploiting new ways to target contrast agents and therapeutic agents to tumors and sites of inflammation based on their expression of extracellular proteases, and to highlight peripheral nerves to aid surgery. Also he is testing the hypothesis that life-long memories are stored as the pattern of holes in the perineuronal net, a specialized form of extracellular matrix deposited around selected neurons during critical periods of brain development.

Dr. Tsien is an Investigator of the Howard Hughes Medical Institute and Professor in the Depts. of Pharmacology and of Chemistry & Biochemistry. Honors include the Artois-Baillet-Latour Health Prize (1995), Gairdner Foundation International Award (1995), Award for Creative Invention from the American Chemical Society (2002), Heineken Prize in Biochemistry and Biophysics (2002), Wolf Prize in Medicine (shared with Robert Weinberg, 2004), Rosenstiel Award (2006), E.B. Wilson Medal of the American Society for Cell Biology (shared with M. Chalfie, 2008), and Nobel Prize in Chemistry (shared with O. Shimomura and M. Chalfie, 2008). Dr. Tsien is a member of the National Academy of Sciences and the Royal Society.

Erik A. Rodriguez¹, John T. Ngo¹, Sakina F. Palida², Stephen R. Adams¹, Mason R. Mackey³, Ranjan Ramachandra³, Mark H. Ellisman³, and Roger Y. Tsien^{1,4}

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². Biomedical Sciences Graduate Program, University of California San Diego, La Jolla CA, USA.

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⁴. Howard Hughes Medical Institute.

Fluorescent proteins (FPs) are invaluable tools for biology, enabling tracking of gene expression, cell fate, and genetically encoded fusion proteins for precise localization within a cell. Traditional FPs developed from jellyfish and coral are limited in wavelengths, consume O₂, and produce a stoichiometric amount of H₂O₂ upon chromophore formation, thus requiring an aerobic environment tolerant of reactive oxygen species. Far-red/near-infrared FPs are desirable for imaging in living animals because less light is scattered or absorbed or reemitted by endogenous biomolecules. Previous near-infrared FPs were engineered from nonfluorescent phytochrome precursors and have had poor quantum yield (QY). We have developed a new class of FP by evolving an allophycocyanin α -subunit from a cyanobacterium, *Trichodesmium erythraeum*. Native allophycocyanin is a highly fluorescent hexamer composed of three β + α dimers and uses an auxiliary protein, known as a lyase, to incorporate phycocyanobilin (PCB). The new FP, named small Ultra-Red FP (smURFP), was engineered to bind biliverdin (BV), an endogenous heme metabolite ubiquitous to mammals, without an auxiliary lyase or autooxidation chemistry. It is a dimer of 15 kDa subunits or a tandem dimer of 32 kDa, and has excitation and emission maxima at 642 and 666 nm and the largest QY (0.18), BV incorporation rate, metabolic stability, and photostability of any BV binding FP so far. SmURFP is even more photostable than GFP or Cy5. Collaborations are currently underway to utilize smURFP for superresolution imaging. SmURFP expressed in HT1080 mouse xenografts show significant, visible fluorescence without exogenous BV, but provision of extra chromophore by various means increases the fluorescence yet further. Using smURFP and a phytochrome FP, a far-red/near-infrared fluorescent ubiquitination cell cycle indicator (FUCCI) was created, which should be suitable for monitoring cell cycle progression in intact mammals. The development of this new class of FP and far-red/near-infrared biosensors should dramatically increase our ability to image and monitor dynamics deep in tissues of living animals.

Electron microscopy (EM) achieves the highest spatial resolution in protein localization and has long been the main technique to image cell structures with nanometer resolution. However, making specific molecules stand out for EM is a challenge. Recently, powerful genetically-encoded tags have been introduced that allow specific proteins to be tracked by EM via genetic fusion, in a manner similar to how green fluorescent protein (GFP) is used to track proteins

New Molecular Tools for Light and Electron Microscopy

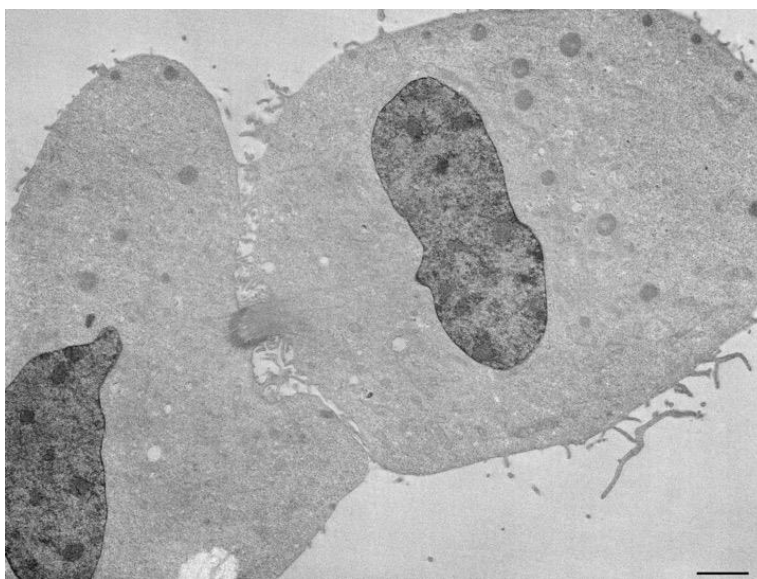
by light microscopy (LM). Tagged proteins are revealed by tag-mediated conversion of 3,3'-diaminobenzidine (DAB) into a localized osmiophilic polymer that is readily distinguished under the electron microscope. Currently available EM tags precipitate DAB either enzymatically through peroxidase activity or via photo-generated singlet oxygen. While such tags are powerful tools for “painting” individual proteins, researchers lack analogous tools for marking biochemical processes, or non-proteinaceous molecular species for EM. To complement the existing EM tags, we describe “Click-EM,” a new method for imaging nucleic acids, lipids, and glycans via bio-orthogonal ligation of photo-sensitizing dyes to functionalized metabolic analogs. These analogs mimic the fates of their natural counterparts and can be used to track cellular metabolism. Analogs functionalized with azides and alkynes can be selectively ligated to chemical probes that do not react with endogenous (unlabeled) biomolecules. For detection, azide- and alkyne-functionalized analogs can be revealed by Cu(I)-catalyzed azide-alkyne cycloaddition (CuAAC), a reaction often referred to as “click chemistry,” to appropriately functionalized dyes. These labeled structures, conjugated to a singlet oxygen-generating fluorescent dye (a “photosensitizer”), can be visualized first by fluorescence and subsequently by EM through photogeneration of singlet oxygen for DAB precipitation. Using these methods, we have imaged neuronal protein assemblies within the full context of cellular ultrastructure and have visualized DNA replication (see Fig. 1) and mRNA transcription at the nanometer scale.

Distinguishing multiple biomolecules in EM is presently limited to attachment of different sizes of gold particles or quantum dots to specific antibodies, which poorly penetrate into the strongly fixed cells or tissue required for optimal cellular ultrastructure. Localized precipitation of DAB by antibody conjugates or genetically-encoded chimeras with photosensitizers and subsequent staining with osmium can overcome many of these constraints but is limited to a single protein or tracer “color”. For “multi-color” EM, we have now synthesized “Ce-DAB” and “Pr-DAB”, shorthand for conjugates of DAB with chelates of Ce or Pr. Ce-DAB is locally photooxidized with the first photosensitizer tracer, and then the polymer is quenched. Pr-DAB is either oxidized

by a peroxidase-antibody conjugate to a second label, or photooxidized with a second targeted photosensitizer irradiated at much longer wavelengths than the first. The two deposited lanthanides can be detected by electron energy loss spectroscopy (EELS), selectively imaged with energy-filtered transmission EM, and overlaid as elemental maps on a conventional electron micrograph. Pancreatic cancer cells labeled with NBD-ceramide and an EpCAM antibody gave the expected Golgi and plasma membrane staining respectively. We detect sharing of a single synapse by two adjacent astrocytes in mouse brain slices and reveal the endosomal localization of cell-penetrating peptides in tissue culture cells, demonstrating high spatial resolution and selectivity.

Supported by NIH grants GM86197, GM103412 and NS27177 and HHMI.

Fig. 1. Click-EM imaging of newly replicated DNA in a dividing HeLa cell. Live cells were pulsed for 12 hr with 5-ethynyl-2'-deoxyuridine (EdU), a nucleoside analog readily in-corporated into DNA during replication. After fixation with glutaraldehyde, alkyne-containing DNA was conjugated to azidodibromofluorescein (DBF) via CuAAC. Cells were incubated with DAB and illuminated for 5 min with blue light for singlet oxygen generation and photo-oxidation of DAB, which formed optically dense precipitates coincident with DBF fluorescence. Cells were stained with OsO₄, embedded in resin, and thin sectioned for EM. Scale bar 2 μ m.



Plenary Session

PLENARY SPEAKER

Donald R. Pettit, PhD

NASA-Johnson Space Flight Center, Houston

“Some Unexpected Difficulties in Microscope Operation in Microgravity”

MONDAY, AUGUST 3, 2015

Oregon Convention Center, Oregon Ballroom



Dr. Donald Pettit is a veteran NASA astronaut and scientist who has spent a total of 370 days in space and over 13 EVA (spacewalk) hours during three separate spaceflights. He received a Bachelor of Science in Chemical Engineering from Oregon State University in 1978, and a Doctorate in Chemical Engineering from the University of Arizona in 1983.

Before joining NASA, he served as a staff scientist at Los Alamos National Laboratory, Los Alamos, New Mexico. Projects included reduced gravity fluid flow and materials processing experiments onboard the NASA KC-135 airplane, atmospheric spectroscopy on noctilucent clouds seeded from sounding rockets, fumarole gas sampling from volcanoes and problems in detonation physics. He was a member of the Synthesis Group, slated with assembling the technology to return to the moon and explore Mars (1990) and the Space Station Freedom Redesign Team (1993).

Selected as a NASA astronaut in April 1996, Dr. Pettit completed his first spaceflight in 2003 as an International Space Station Science Officer, logging more than 161 days in space. The Expedition 6 crew launched on STS-113 Space Shuttle Endeavour and returned to Earth on Soyuz TMA-1, after completing more than five months of science experiments and continuing to prepare the orbital outpost for further growth.

He returned to space aboard Space Shuttle Endeavour on STS-126 (November 14 to November 30, 2008,) the 27th shuttle/station assembly mission, which expanded the living quarters of the space station and delivered a new resident to the station, replacing Greg Chamitoff with Sandy Magnus. The STS-126 crew returned to Earth with Chamitoff after completing 250 orbits in more than 6 million miles.

On his most recent spaceflight, Expedition 30/31 (December 21, 2011 to July 1, 2012), he launched aboard the Soyuz TMA-03M craft from Kazakhstan. As a NASA Flight Engineer, Dr. Pettit continued microgravity scientific research and mark a new era of U.S. commercial resupply services by greeting the first SpaceX Dragon spaceship. Following a series of tests of its maneuverability and abort systems, the capsule was grappled and berthed to the space station by the crew members of Expedition 31. Dr. Pettit landed in Kazakhstan after 193 days in space orbiting the Earth 3,088 times and traveling more than 76 million miles.

Donald Pettit¹

¹ NASA Johnson Space Center, Houston, TX

The International Space Station (ISS) is a research laboratory in low earth orbit where the magnitude of gravitational forces are reduced by a factor of one million. Changing any other earthly parameter by this magnitude rapidly takes one into an experimental frontier, and this orbital environment is no exception. Many facilities typical of ground-based laboratories are onboard ISS: furnaces, centrifuges, freezers, incubators, plant growth and combustion chambers, with supplied resources of vacuum, inert gas, oxygen, liquid and forced air cooling, 28 and 120 volt DC power, and near-continuous real-time communication of data, voice and high definition video transmitted over distances approaching 50,000 miles (roundtrip to geostationary orbit). Microscope facilities include many state-of-the-art imaging techniques: transmission, reflection, brightfield, darkfield, epi illumination, phase contrast, differential interference contrast, fluorescent, confocal, polarization, and student educational instruments [1]. During the operation of these microscopes in low earth orbit, some unexpected difficulties unrelated to the undergoing research but directly resulting from their operation in microgravity can delay the progress of an experiment. Difficulties can stem from errant fluid behavior, residual gravity gradients, cosmic rays, and safety of flight.

Subtle forces stemming from surface tension, liquid-solid contact angle, and static electric charge dominate fluid behavior in microgravity. These can conspire to give non-intuitive behaviors [2] resulting in possible operational delays or equipment maintenance. The precise placement of immersion oil on a slide using a pipette can be challenging (Fig. 1 left). Filling a sample chamber with bubble free liquid requires significant on-orbit practice. Flow induced charging of liquids, a small charge developed when a dielectric fluid (such as immersion oil) is forced through a small insulated capillary (such as a Teflon pipette), can result in subtle charge forces making the liquid misbehave [3]. These subtle forces under microgravity can interfere with the sample placement within the optical path (bubbles) or result in the fouling of optical surfaces (Fig. 1 center). The time necessary to learn the handling skills or to keep the instrument in operating order can cause delays in experimental progress.

Some Unexpected Difficulties in Microscope Operation in Microgravity

The magnitude of residual acceleration on ISS is near 1.2 E-6g, nominally referred to as microgravity, where g is the acceleration due to gravity on the surface of Earth. At this level of residual acceleration, sample motion is possible [4,5]. The direction of this residual acceleration in relation to the orientation of the experimental sample can cause unexpected fluid-particle-bubble motion within a sample chamber. Such motion might cause the intended subject to settle out of suspension or migrate outside the optical field of view over a period of a few hours.

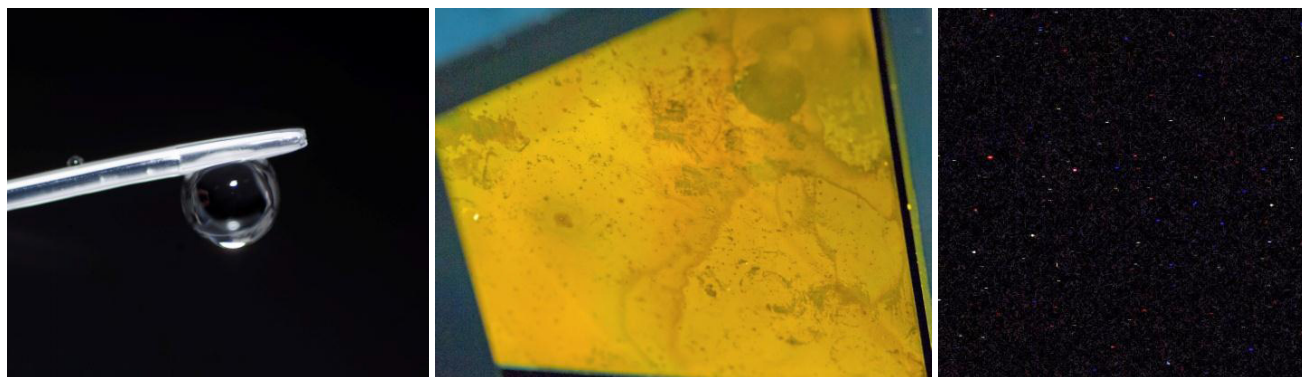
The flux of cosmic rays in low earth orbit causes camera CCD or CMOS detector arrays to degrade after periods of about one year. They produce images strewn with hot pixel “snow” that can compromise their scientific usefulness (Fig 1. right). By design, some instrument cameras were never meant to be replaced, and after years in orbit, can suffer significant image degradation. A maintenance plan including periodic camera replacement should be considered.

When subjected to microgravity while living in a sealed thin shell surrounded by infinite vacuum, flight crew safety becomes paramount. Standard means of conducting research on ISS may require seemingly prohibitive constraints when compared to similar ground-based research. Other than water (recovered from urine,) there are no cleaning solvents available on ISS due to their detrimental effects on the regenerative life support systems. The lack of solvents complicates cleaning of optics and other delicate surfaces especially from unintended fluid migration (Fig. 1 center). Microgravity promotes the possibility of inhalation or eye damage from small free floating objects with possible serious consequences. On ISS, the handling of small parts (screws and nuts) or shards created from accidental breakage of fragile glass components (cover slips and slides) presents a significant crew hazard. Laborious, time-consuming practices are often required for what would normally be a trivial operation on Earth. Sometimes a

compromise must be made between the safety requirements needed for the best scientific practices versus non-optimum materials, substituted to ease the handling requirements, such as plastic cover slips and slides.

- [1] https://iss-science.jsc.nasa.gov/investigation_detail.cfm?investigationid=541
- [2] Pettit, D, “Exploring the Frontier: Science of Opportunity on the International Space Station”, Proc. Am. Philo. Soc. vol. (153), No. 4, Dec. 2009, pp. 381-402.
- [3] Pettit, D, “Flow Induced Charging of Liquids in Reduced Gravity”, Eng. Const. & Op. in Space, Space 96, S Johnson, Ed., ASCE Pub. Vol. I (1996), pp.545-551.
- [4] Alexander, I, and Lundquist, C, “Residual Motions Caused by Micro-Gravitational Accelerations,” Jour. Astro. Sci., Vol (35), no. 2, 1987, pp 193-211.
- [5] Delombard, R, Kelly, E, Hrovat, K, Nelson, E, Pettit, D, “Motion of Air Bubbles in Water Subjected to Microgravity Accelerations”, 43rd AIAA, Reno, Jan. (2005), AIAA-2005-0722.

FIGURE 1. Examples of unexpected experimental difficulties on ISS: pipette tip (1.5mm diameter) showing migration of a water drop from the tip to the side during fluid operations on Exp. 6 (left) complicating its precise placement; front surfaced gold mirror (100mm wide) inadvertently contaminated with silicone oil that migrated from the experimental stage during Exp. 30 requiring about two hours of crew time with a three week schedule delay to clean (center); and a 450 by 450 pixel enlargement from a camera C-MOS detector dark frame image showing red-green-blue-white hot pixels from one year of cosmic ray damage during Exp. 42 (right). Cells were incubated with DAB and illuminated for 5 min with blue light for singlet oxygen generation and photo-oxidation of DAB, which formed optically dense precipitates coincident with DBF fluorescence. Cells were stained with OsO₄, embedded in resin, and thin sectioned for EM. Scale bar 2 μm.



A

ADVANCES IN INSTRUMENTATION AND TECHNIQUES SYMPOSIA

A01 Vendor Symposium: New Tools for Life and Materials Sciences

ORGANIZERS: William Russin, Chris Kiely

Room C125 Convention Center

MONDAY 1:30 PM
3:00 PM Poster Session

TUESDAY 8:30 AM

This symposium provides an opportunity for instrument manufacturers and vendors to showcase new developments resulting in improved technology solutions. Topics include: new methods and techniques; new developments and technologies; breakthrough and new instrumentation; and improvements to existing instrumentation.

A02 TEM Phase Contrast Imaging

ORGANIZERS: Mike Marko, Radostin Danev

Room D135 Convention Center

WEDNESDAY 1:30 PM
3:00 PM Poster Session

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

Conventional defocus phase-contrast imaging provides poor contrast at low resolution, and transfers information in a non-uniform manner with regard to spatial frequency. Phase plates can provide a practical solution to these problems. The theory, construction, and practical use of phase plates will be explored. In biological cryo-TEM, high-contrast, high-resolution imaging at low electron dose is facilitated. In materials science, the combination of a physical phase plate with tunable Cs offers an unparalleled opportunity for characterization of both atomic details and larger structures. The number of laboratories exploring the use of phase plates is growing, and applications in biology are soon becoming routine. This will be a timely opportunity to learn from each other.

A03 Electron Holography for Nanofields in Solids

ORGANIZERS: Hannes Lichte, Molly McCartney, Ken Harada

Room C120 Convention Center

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

Conventional intensity images do not reveal the phase

modulation hence are blind, e.g., for electric and magnetic nanofields. Electron holography is uniquely healing this phase loss in that it records the complete electron wave passing through the TEM specimen. Reconstructed amplitude and phase allow both atomic-scale analysis as well as measurement of nano-scale items such as electrostatic and magnetic fields. However, uniquely attributing the findings to specific object properties is an increasing challenge. This symposium will consider recent advances in electron holography techniques and applications. Platform and poster presentations will include the emergence of novel approaches and instrumentation for electron holography, as well as providing an overview of latest applications to piezoelectric and ferroelectric materials, measurement of charge, magnetic nanostructures, both natural and man-made, and dopant profiling in semiconductor devices.

A04 Advances in FIB: New Instrumentation and Applications in Materials and Biological Sciences

ORGANIZERS: Srinivas Subramaniam, Keana Scott,
Lucille Giannuzzi

Room B117 Convention Center

WEDNESDAY 1:30 PM
3:00 PM Poster Session

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

The recent decade has seen a renaissance in FIB instrumentation with research and development of multiple ion sources aimed at addressing a wide range of scientific issues. A broad spectrum of FIB instrumentation using Helium, Neon, Gallium, Xenon and Laser sources are available for applications ranging from high spatial resolution imaging and lithographic applications to high throughput material removal and macrofabrication, enabling researchers to probe current and emerging fields of interest.

This session will try to showcase new developments and research in FIB/Laser instrumentation with the aim of better understanding their capabilities and application sweet spot. Design, performance and practical applications in physical and biological research will be looked at while attempting to make objective comparisons between different FIB technologies. Theoretical understanding and computational modeling of limiting and enabling features of these instruments will also be discussed.

A05 Fast and Ultrafast Imaging with Electrons and Photons

ORGANIZERS: David Flannigan, Hermann Durr, Joanna Atkin

Room A105 Convention Center

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

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

THURSDAY 8:30 AM, 1:30 PM and 3:30 PM

The successful development of methods for visualizing the atomic-scale nature of matter has proven to be invaluable for enhancing our understanding of structure-function relationships in biological, chemical, and materials systems. Owing to the dynamic nature of function, the advent of techniques for generating femtosecond laser pulses has now led to the emergence of new approaches for the direct elucidation of such relationships on the necessary spatiotemporal scales. This symposium will highlight imaging methodologies that have been developed for probing a variety of dynamic processes spanning a range of distance and time, from atoms to the mesoscale and from femtoseconds to milliseconds. Such methodologies will include (but are not limited to): electron-based approaches such as ultrafast and dynamic electron microscopy, photon-based approaches such as fast and ultrafast (near-field) optical and X-ray microscopies, and tip-based near-field approaches such as ultrafast STM.

A06 Advanced Analytical TEM/STEM

ORGANIZERS: Paul Kotula, Masashi Watanabe, Gerald Kothlietner

Room A106 Convention Center

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

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

THURSDAY 8:30 AM, 1:30 PM and 3:30 PM

Recent innovations in STEM / TEM hardware including high-brightness guns, high-energy resolution monochromators, and collection-efficient detectors for both XEDS and EELS signals, have made analytical investigations much more powerful and reliable. Enhancement in the acquisition speed also allows us to apply tilt-series tomography with these analytical signals in reasonable times. In addition, improved analysis software, new ways in image simulation and totally new approaches such as chiral techniques, precession acquisition or the use of cathodoluminescence signals now allow obtaining more comprehensive information about materials than ever before. This session aims to review the latest scientific achievements and their impact on the field as well as new applications of analytical electron microscopy.

A07 Scanning Probe Microscopy: New Methods and Applications

ORGANIZERS: Greg D. Haugstad, Dalia G. Yablon

Room B118 Convention Center

WEDNESDAY 1:30 PM
3:00 PM Poster Session

THURSDAY 8:30 AM, 1:30 PM and 3:30 PM

This symposium covers developments in scanning probe microscopy (SPM) in the areas of (i) biomedical and pharmaceutical materials; (ii) controlled environmental conditions including gas, liquid and sample temperature; and (iii) hybrid instrumentation systems that combine force microscopy with other near-field probes like SNOM and tip-enhanced Raman spectroscopy, or far-field imaging methods utilizing light or electron/ion beams. The application space for topics (i) and (ii) continues to foster new SPM-based research, given an array of heterogeneous material systems in biomed/pharma as well as many scientific issues for which environmental variables are central. Topic (iii) includes very new combination methods such as AFM/SEM or AFM/SIMS, whereas hybridization with near- and far-field light microscopy has been under continual development for more than two decades. This symposium aims to both familiarize the uninitiated and provide a forum for the exchange of ideas among experts.

A08 Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques

ORGANIZERS: Nicholas Ritchie, Paul Carpenter, Phillipe Pinard

Room B115 Convention Center

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

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

This session will cover the techniques of SDD EDS and WDS for quantitative analysis and focus on capabilities of scanning electron microscopy (SEM) and electron-probe microanalysis (EPMA). Presentations will focus on: research, technical, and applications of these analytical tools with an emphasis on how to make analysis easier, more precise and accurate, and how real-world samples can be treated; the role of SDD-EDS and WDS in quantitative analysis and how should we best merge the strengths of the wavelength dispersive spectrometry (WDS) with the strengths of the SDD; the role of Monte Carlo modeling in the quantification of ideal and non-ideal samples and how can we best take advantage of recent advances in CPU and GPU power and parallelism; advances in: hardware, software, and multi-beam energy analysis of bulk and thin-film samples.

A09 Advances in Combining Simulation and Experiment for Materials Design

ORGANIZERS: Paul Voyles, Gianluigi Botton

Room B119 Convention Center

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

THURSDAY 1:30 PM and 3:30 PM

Simulation plays an ever-increasing role in the quantitative interpretation of microscopy data for materials characterization, and microscopy provides essential constraints and feedback to simulations of fundamental materials structure and properties with density functional theory, molecular dynamics, and other methods. This symposium covers advances in simulation of electron imaging, diffraction, and spectroscopy (EELS and EDS) and how those simulations are used to increase the information obtained from electron microscopy experiments. It also covers how microscopy can interact and be integrated with simulations for materials discovery and design across length scales, in the spirit of the Materials Genome Initiative.

A10 Advances in Electron Diffraction and Automated Mapping Techniques

ORGANIZERS: Jorg Wiezorek, Sergei Rouvimov, Ben Britton, Muriel Veron

Room B112 Convention Center

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

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

Advances in electron diffraction and automated mapping techniques enable quantitative crystal orientation, phase, structure, strain and defect analyses. Robust automated mapping techniques and new instrumentation provide high spatial and angular resolution required to drive forward studies of exciting materials, such as nano-crystals, utilizing TEM and SEM platforms. This symposium celebrates these advances and presents state-of-the-art developments in instrumentation, methods and research applications of quantitative electron diffraction. Topics such as precession, convergent-beam, diffraction tomography, Kikuchi (EBSD) electron diffraction and electron channeling are discussed. This will highlight new approaches to acquisition, data handling and processing to realize new insights in materials.

A11 Electron Vortex Beams and Higher-Order Beam Modes

ORGANIZERS: Benjamin J. McMorran, Juan Carlos Idrobo

Room D139 Convention Center

MONDAY 1:30 PM

TUESDAY 10:30 AM and 1:30 PM

Electron vortex beams, composed of free electrons with helical wavefronts possessing quantized orbital angular momentum, are a specific example of higher ordered electron beam modes with engineered wavefront dislocations. The unique phase, coherence, and angular momentum properties of these beams hold promise for providing new contrast mechanisms in electron microscopy, and are already being used to gain new insights in electrodynamics, the evolution of quantum systems, and into the operation of the electron microscope itself. These beams can be produced in conventional electron microscopes using a variety of new experimental techniques, which themselves have uses for phase imaging and electron interferometry. This symposium will highlight recent experimental and theoretical advances in these areas, as well as opportunities for future investigations with electron vortex beams.

A12 Low Voltage Electron Microscopy

ORGANIZERS: David C. Bell, Natasha Erdman, Jingyue Liu

Room B117 Convention Center

MONDAY 1:30 PM

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

This symposium will cover the physical and instrumental aspects as well as the application of Low Voltage SEM, TEM and STEM. With this symposium we attempt to find out if there are optimum energies 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. Applications from both materials science and biological perspectives are presented.

A13 Advancing Data Collection and Analysis for Atom Probe Tomography

ORGANIZERS: Brian Gorman, R. Prakash Kolli, Richard Martens

Room B115 Convention Center

MONDAY 1:30 PM

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

Atom probe tomography is a rapidly advancing area of materials characterization. Hardware advancements in the recent past have allowed data acquisition from semiconductor, organic, and insulating materials, but also have illustrated difficulties in data interpretation and reconstruction. This symposium highlights recent research focused on APT analysis of energy materials, steel nanostructures, organic materials, and oxidation and corrosion reactions. Advances in mathematical methods for data analysis as applied to these materials are able to advance the atomic scale understanding of materials science processes. Improved reconstruction research performed using correlative analyses combining APT and computational methods such as first principles, Monte Carlo simulations, and finite element methods are also highlighted.

A14 Surface Plasmons, Cathodoluminescence, and Low-Loss EELS

ORGANIZERS: Gerd Duscher, David McComb, Ritesh Sachan, Robert Williams

Room D137 Convention Center

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

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

Spatially resolved measurements of low energy (0-10eV) excitations can now be probed using methods such as probe microscopies, confocal methods, STEM-cathodoluminescence and monochromated EELS. Correlation of optical and electronic transitions with collective excitations such as localized surface plasmons resonances (LSPR) and phonons provides an opportunity for improved understanding of materials that are the basis of future technologies. Applications using low-loss EELS to characterize phonons, LSPRs, optical properties and low energy electronic transitions are presented, in particular, correlative approaches using optical/electron/probe microscopies. Presentations include: new instrumentation and methods such as the influence of monochromators to low-loss EELS; STEM-cathodoluminescence techniques and new methods of quantification and acquisition of low-loss EELS data; theory and data interpretation.

A15 Imaging Mass Spectrometry

ORGANIZERS: Joseph Dalluge, Christopher Anderton

Room B111 Convention Center

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

Imaging mass spectrometry (Imaging MS) offers direct examination of chemical patterns from cells, tissues, and materials. It is accomplished by acquiring mass spectra across selected material or tissue areas. A two-dimensional image of mass spectral data for each material slice reveals the spatial distribution of chemicals at sub-micron to 100 Å resolution. Its ability to generate beautiful chemical images from a variety of surfaces makes it a seemingly ideal tool for diagnostics and histology. This symposium covers instrumentation, strategies and applications for imaging MS. Application areas of both MALDI and SIMS imaging MS, including biomarker discovery, pharmaceutical metabolism, imaging of endogenous proteins and metabolites, compositional characterization of cell membranes, and imaging MS in art and archaeology are showcased. These examples demonstrate the capabilities of a range of imaging mass spectrometry technologies, including recent advances. Each platform session consists of invited and contributed presentations with opportunities for discussion. In addition, there is one 2-hour imaging MS poster session.

A16 Advances in Electron and Ion Scanning Microscopies

ORGANIZERS: David Joy, Brendan Griffin

Room B118 Convention Center

TUESDAY 1:30 PM

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

Scanning ion and electron microscopies continue to develop rapidly. Neon is routinely available as an alternative to helium, for example. Detector technologies for both conventional imaging signals (SE and BSE) increase with most SEM have at least 2 or 3 SED and 2 BSED. The BSED include annular rings designs. Stage biasing is also being used more widely to enhance signal collection and improve final probe size (resolution). Of particular interest is the re-examination of origins of the signals (electrons) collected by the new detectors. Presentations include addressing or comparing such developments; their strengths, weaknesses and applications and exploring the new regimes of SEM.

A17 Standardization and Metrology in Electron Microscopy and Microbeam Analysis

ORGANIZERS: Dan V. Hodoroaba, Ryna B. Marinenko, Mike Matthews

Room B114 Convention Center

WEDNESDAY 1:30 PM
3:00 PM Poster Session

THURSDAY 1:30 PM and 3:30 PM

Significant effort has been made in the recent two decades to the development of written standards on the measurement, parameters, methods and reference materials used in electron microscopy and microbeam analysis. Contributions of ongoing standardization projects in the technical committee ISO/TC 202 -- Microbeam Analysis and envisioned proposals are the focus of the symposium. In addition, reports on metrological activities dealing with measurement uncertainties, e.g. intra- and interlaboratory comparisons, for quality assurance are included. Because such a special topic is more rigorously considered just at a later career stage, the participation of young(er) scientists can bring their own ideas on how to accurately measure specific instrumental parameters or sample properties.

A18 Core Facility Management “Microscopy in the Digital Age”

ORGANIZER: Randy A Nessler

Room C124 Convention Center

MONDAY 3:00 PM Poster Session

TUESDAY 8:30 AM and 10:30 AM

The last two decades have seen changes for those managing microscopes and imaging facilities. Everything has gone digital, both instrumentation and image recording. How do electron microscopy labs manage digital information? The digital revolution has scientists scrambling to keep up with the most current vendor supported operating systems. We are all in the process of coping with yet another operating system becoming obsolete. How have people been dealt with the end of Windows XP? What lessons can a Facility apply to the next dead operating system? Where the analog instruments might have an indefinite life expectancy, the typical digital systems with their latest software versions will be old before a year is out. Is the software readily upgraded? What about hardware when software is upgraded?

- Best practices to store, transmit and secure large data sets
- Keeping legacy systems functional after operating system becomes obsolete and
- Life expectancy of digital microscopes hardware, software, upgrades, etc.

B

BIOLOGICAL SCIENCES SYMPOSIA

B01 The R.P. Apkarian Memorial Symposium on Cryo-HRSEM

ORGANIZERS: Elizabeth Wright, Cameron Ackerley

Room B112 Convention Center

MONDAY 1:30 PM
3:00 PM Poster Session

TUESDAY 8:30 AM

This symposium honors the work of Robert P. Apkarian by presenting and discussing the history of and most recent work in the field of cryo-HRSEM. Many biological systems and bio-inspired materials are extremely challenging to prepare for SEM analysis because conventional preparation methods dehydrate and fix the specimens, which subsequently introduce structurally-significant artifacts. Cryo-HRSEM methods were pioneered to enable investigators to examine a broad range of materials in their bulk phase and in a near-to-native frozen-hydrated state. This symposium covers technique development; highlight important biological findings that have been facilitated by cryo-HRSEM; and feature several future directions emerging in the field.

B02 To the Rhizosphere - and Beyond!

ORGANIZERS: Alice Dohnalkova, Marvin Whiteley

Room B111 Convention Center

TUESDAY 1:30 PM
3:00 PM Poster Session

WEDNESDAY 1:30 PM

From Arabidopsis to Zaluzianskya, this symposium covers topics in environmental, agricultural and ecosystems areas, including but not limited to the plant physiology, plant-pathogen interactions, light energy capture, and nutrient and carbohydrate transport. Fundamental and applied research in biomass crops and biofuels production, and soil conservation are discussed. We will also focus on the belowground portion of the plants, where the interaction of roots, soil fungi and microbes occurs, resulting in carbon sequestration and mineral weathering. Presentations on advanced microscopy methods such as multimodal, multi-scale and high-speed imaging are presented in this session.

B04 Advances in Specimen Preparation and Correlative LM- EM (CLEM) of Biological Samples

ORGANIZERS: Kent McDonald, Danielle Jorgens

Room C122 Convention Center

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

Change to Room D138 Convention Center:

WEDNESDAY 8:30 AM, 10:30 AM and 1:30 PM

Embedding samples in resins is still the predominant specimen preparation procedure for electron microscopy of biological samples. While projection imaging of thin sections is the most common form of data output, exciting new technologies such as serial block face-SEM, focused ion beam-SEM, array tomography, and correlative light and electron microscopy are also generating spectacular images and 3D models of cell structures. In the best cases some form of rapid freezing is the fixation method of choice, followed by freeze substitution and resin embedding. Topics include: novel freezing methods, ultra-rapid freeze substitution and embedding procedures, preservation of fluorescence in polymerized resin for correlative light and electron microscopy, 3D imaging of cells and tissues, and novel methods for preparing cells for on-section immunolabeling. Applications of these methods to wide-ranging questions in molecular, cellular, and developmental biology will be presented.

B05 3D Structures of Macromolecular Assemblies, Cellular Organelles, and Whole Cells

ORGANIZERS: Teresa Ruiz, Esther Bullitt, Melanie Ohi

Room B111 Convention Center

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

We are advancing the basic understanding of 3D structures of macromolecular assemblies, viruses and cells, as well as their communication with the host environment, through advanced EM techniques and hybrid methodologies. This symposium highlights structural and ultrastructural studies of cells, macromolecules and macromolecular assemblies using techniques including electron tomography; electron crystallography; single-particle EM analysis; EM helical reconstruction; scanning and transmission electron microscopy; atomic force microscopy, X-ray crystallography, and modeling. Topics include cellular metabolism, cell division and protein translation; cellular and bacterial adhesion; flagellar and filopodial motility; secretion systems;

cell-cell communication and cell signaling; virus structure and virus-host interactions.

B06 Deep Tissue Imaging and Light Sheet Microscopy

ORGANIZERS: Meng Cui, Liang Gao

Room C122 Convention Center

TUESDAY 1:30 PM
WEDNESDAY 3:00 PM Poster Session

In vivo fluorescence microscopy has revolutionized biomedical research in recent years. Two of the frontiers of the technological development are the deep tissue imaging and the high spatial-temporal resolution volumetric imaging. Various schemes have been employed to extend the imaging depth, including adaptive optics, long wavelength multi-photon excitation and optical clearing. With minimum photobleaching and phototoxicity, light sheet microscopy has emerged as a popular solution for high spatial-temporal resolution imaging. This session covers the latest progress of the two exciting research fields and provides an opportunity to germinate ideas and explore new applications.

B07 Microscopy, Microanalysis and Image Cytometry in the Pharmaceutical Sciences

ORGANIZERS: Lynn M. DiMemmo, John Bruce Green

Room B119 Convention Center

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

Pharmaceutical research and development presents unique challenges that have led to the development of highly specialized analytical methods. This symposium presents applications of microscopy associated techniques to biological and materials science problems that arise during drug discovery, vaccine research, formulation and production. Topics include high-content/ high-throughput screening, therapeutic targets and mechanisms, pathology, foreign material (particulate and contaminant) analysis, and characterization of drug substance and drug product.

B08 Dynamic Fluorescence Microscopy

ORGANIZERS: Michelle Digman, Alan F. "Rick" Horwitz

Room C122 Convention Center

MONDAY 1:30 PM
3:00 PM Poster Session

The ability to detect molecular interactions in live cellular systems has been evolving over the past decade through the advancement of fluorescence correlation spectroscopy (FCS) techniques. Most recently the use of laser scanning and light sheet imaging microscopes, has led to the development of fluorescence imaging correlation microscopy techniques and 3D particle tracking allowing access to spatio-temporal information of fluorescently tagged molecules in living cells. Improvements on super-resolution microscopy approaches have also been developed to monitor molecular dynamics at a high spatial scales. This session focuses on the latest developments which are able to detect protein-protein interactions, molecular aggregation dynamics as well as mapping diffusion, flows and velocity.

B09 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants, and Animals

ORGANIZERS: W. Gray Jerome, Jon Charlesworth, Gang Ning, Betty Johns

Room D138 Convention Center

MONDAY 1:30 PM
3:00 PM Poster Session

TUESDAY 8:30 AM and 10:30 AM

Microscopy is not only useful but critically important in the ongoing research, detection, diagnosis and treatment of disease. Advances that improve rapid and accurate detection and treatment often involve the use of various microscopic techniques. These varied techniques provide us with an improved ability to diagnose and research the origins, development and response of diseases in human, plant and animal specimens. This is an opportunity to share 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.

B10 Multiscale Biological Imaging: From Micro to Macro - Animal to Clinical Models

ORGANIZERS: Kevin Eliceiri, David Entenberg

Room C120 Convention Center

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

The ability to understand modern biological or medical phenomena be it the conformational dynamics of proteins, cellular division or tumor progression requires sophisticated methods that would allow interrogation in a variety of environments across multiple time and size scales. Imaging is the method of choice, but its success requires the ability to not only image the structure, but also the associated electronic, magnetic, optical, chemical and behavioral properties. There are great challenges and opportunities of scale in imaging, not only in spatial and temporal but non-spatial dimensions.

B11 Specimen Preparation for Biological Sciences

Room B119 Convention Center

TUESDAY 1:30 PM
3:00 PM Poster Session

P

PHYSICAL SCIENCES SYMPOSIA

P01 Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on *In situ* TEM and STEM

ORGANIZERS: Grace Burke, Ondrej Krivanek, Peter Crozier

Room B116 Convention Center

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

Peter Swann had a huge impact on TEM and materials science with his many outstanding contributions. He designed over 600 pioneering instruments, including a differentially-pumped gas reaction cell that brought the "real world" inside the electron microscope. With his brother Rex, Peter founded Gatan, which introduced in-situ cooling/heating, imaging

of cryo-transferred samples, many new TEM specimen preparation tools, EELS as a popular analytical technique, CCD cameras and digital TEM imaging, among others. Dr. Swann died in 2013. This symposium honors his legacy with presentations in the fields he pioneered, with particular emphasis on in-situ TEM and STEM.

P02 Materials Problem Solving with Aberration-Corrected EM

ORGANIZERS: David Smith, Lena Kourkoutis, Jian-Min Zuo

Room C124 Convention Center

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

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

Aberration-corrected instruments nowadays produce striking pictures of carefully chosen test objects, and information-rich images and spectra are readily obtained. However, providing meaningful solutions “Real-World” problems is a continuing challenge. This symposium brings technical experts together with existing and potential users of AC-TEMs and AC-STEMs, in particular to illuminate the path towards practical materials problem solving using these sophisticated (and expensive) machines. Successful applications are featured, while further topics of interest include improvements to instrumentation, practical aspects of specimen preparation, data acquisition, and artifacts, and extracting quantitative information about atomic column positions, identity and bonding environment using modeling and simulations.

P03 Advances in Microanalysis of Earth and Planetary Materials

ORGANIZERS: Rhonda Stroud, Eve L. Berger

Room C122 Convention Center

WEDNESDAY 8:30 AM, 10:30 AM and 1:30 PM

THURSDAY 1:30 PM
10:00 AM Poster Session

Microscopy and microanalysis studies can provide powerful constraints on the formation and processing histories of natural materials, ranging from refractory oxides to macromolecular organic polymers. Recent technical advances in analysis methods for natural materials include isotopic composition measurements at the 10 nm scale for determination of materials origin, and low voltage aberration-corrected electron microscopy for investigation of nanocarbon phases with single atom sensitivity. Presentations address these or other technical advances in microanalysis methods, and/or novel applications of established methods, for Earth and planetary materials research.

P04 Nano-characterization of Low Dimensional Materials: Carbon to 2D TMDs

ORGANIZERS: Moon Kim, Zonghoon Lee, Quentin Ramasse

Room B114 Convention Center

MONDAY 1:30 PM

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

WEDNESDAY 8:30 AM and 10:30 AM

New materials and devices can lead to disruptive advances in nano-electronics, energy and environment-related areas. For example, carbon-based materials and devices have made significant progresses, and yet still more to be accomplished. Advent of recent 2D transition metal dichalcogenides is stimulating new applications in many new areas. This symposium focuses on analytical transmission electron microscopy techniques, aberration-correction, spectroscopy, and in-situ methods to characterize these emerging low dimensional materials of interest. Presentations include the areas of nanoparticles, nanowires and nanotubes, growth morphology of various 2D materials, defects and healing of defects, interfaces, and new and emerging devices.

P05 Nuclear and Irradiated Materials: Fundamental Defect Properties

ORGANIZERS: Chad M. Parish, Khalid Hattar, Arthur T. Motta

Room D135 Convention Center

MONDAY 1:30 PM

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

WEDNESDAY 10:30 AM

Materials in fission, fusion, accelerator, or space environments are subjected to irradiation and undergo compositional and structural evolution as a result. Because damage cascades and transmutation are atomistic processes, understanding and predicting the changes in properties and performance in radiation environments require atomistic and microstructural tools. Radiation environments vary from low temperatures, high energy, and low flux environments often found in space applications, to neutron damage of liquid helium-cooled superconductors and 1200A°C tungsten under helium and neutron bombardment in fusion reactors. Modern tools provide the means to study the smallest defects at the atomic scale and the real-time evolution of radiation damage. Coupling these techniques with modeling can enable the understanding to be extended from nm through mm or larger. This symposium brings together instrumentation, modelling, and applications in materials for radiation environments.

P06 Failure Analysis Applications of Microanalysis, Microscopy, Metallography, and Fractography

ORGANIZERS: Daniel Dennies, William Kane

Room D140 Convention Center

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

This symposium is a forum for the exchange of information and knowledge regarding the use of microanalysis, microscopy, metallography and fractography in materials-related failure analysis. Invited papers include those involving failure investigations where microstructures, metallography and fractography are critical to identifying the root cause. Of particular interest are unique, innovative, and/or challenging applications of microscopy, metallography, fractography, and sample preparation in failure analysis. Target attendees include engineers and scientists from all levels of analytical expertise and all related backgrounds, not just materials engineers.

P07 Metallography and Microstructural Characterization of Metals

ORGANIZERS: George Vander Voort, James E. Martinez

Room C123 Convention Center

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

The realm of materials science offers many challenges for revealing and characterizing microstructures of metals. The art and science of metallography continue to meet these challenges with new automated techniques for new materials and traditional engineering alloys. This symposium covers all aspects of specimen preparation for metals, microelectronics, and virtually any other material, as they influence characterization techniques. Contributions are welcome for all specimen preparation methods, not solely mechanical grinding/polishing, such as ion-beam techniques. The effects of specimen preparation on revealing and characterizing microstructure will be highlighted in this symposium, including applications of light microscopy, quantitative metallography and image analysis, micro- and nano-indentation hardness, SEM imaging, EBSD or EDS, and any other relevant method.

P08 Microscopy and Characterization of Ceramics, Polymers, and Composites

ORGANIZERS: Andre Mkhoyan, Jong Seok Jeong, Laxmikant Saraf

Room D136 Convention Center

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

This symposium covers application of analytical scanning and transmission electron microscopy and spectroscopy on variety of ceramic, polymer and composite materials. While in recent years substantial advances are made in higher special and energy resolution instrumentations, many new phenomena in materials are still remained to be discovered by use of these microscopes. Therefore, in particular, contributions will show successful implementations of aberration-corrected STEM combined with high sensitivity X-ray or electron energy-loss spectroscopy to study and characterize such ceramic, polymer and composite materials.

P09 Microscopy of Additive Manufacturing and 3D Printing in Materials and Biology

ORGANIZERS: John Porter, John Wooten, Jay Potts

Room D137 Convention Center

MONDAY 1:30 PM
TUESDAY 8:30 AM and 10:30 AM

Additive manufacturing/3D printing encompasses multiple methods for building parts directly from feedstock such as powders, wires, and biomaterials with only minimal or no post build machining to produce a final shape. Resultant microstructures can be unique to the process and properties can be strongly dependent on such microstructures. In recent years, technologies have been developed for the additive manufacturing of polymers, metals, and ceramics. Processes include layer-based processes as well as spray processes for repair of worn parts. More recently, biological and medical opportunities have sprung up taking advantage of 3D bioprinting. Heart valves, blood vessels and whole organs have begun to be manufactured. Each of these processes brings unique challenges to build parts and tissues that meet specifications and biocompatibility. Papers will highlight additive manufacturing and 3D printing in all areas of science from materials and ceramics to biology and medicine.

P10 Microscopy and Microanalysis for Real-World Problem Solving

ORGANIZERS: Elaine Schumacher, Janet Woodward, Stuart McKernan, Ke-Bin Low

Room C120 Convention Center

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

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 materials and the problem may be limited, and the time frame for producing results may be short. This symposium will focus on ways in which microscopists and microanalysts develop unique and creative solutions for sample preparation, data acquisition and analysis, providing meaning results to solve problems in the real world.

P11 Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials

ORGANIZERS: Chongmin Wang, Raymond Unocic, Arda Genc

Room B113 Convention Center

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

The key challenges for imaging and spectroscopy study of energy materials are twofold: (1) Probing the structure and chemistry of energy related materials at high spatial resolution and sensitivity, (2) Real time observation of the structural and chemical evolution of the material under dynamic operating condition. We have witnessed dramatic progress along these directions, such as direct atomic resolution imaging of lithium and oxygen ions using ABF imaging, advances in chemical analysis using high efficient XEDS and EELS and in situ to operando TEM studies of catalytic reactions in gas environment, electrodes during electrochemical charge and discharge for Li ion batteries, and the nucleation and growth of nanoparticles in liquids. This symposium will provide an outstanding opportunity for participants to exchange ideas and promote discussions on recent advances in the field of using TEM and STEM imaging and spectroscopy method for energy related materials.

P12 Advanced Microscopy and Microanalysis of Soft and Hybrid Nanomaterials

ORGANIZERS: Jihua Chen, Honggang Cui

Room D140 Convention Center

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

This symposium is focused on the use of cutting-edge microscopy and microanalysis techniques to characterize synthetic or naturally occurring nanomaterials, relevant to important applications in energy-related and biomedical/biological research. The techniques include, but are not limited to cryo-TEM, low-dose high-resolution TEM, energy-filtered TEM, STEM, X-ray microscopy, X-ray and neutron scattering. Of particular interest is the use of these state-of-art instrumentations to investigate emerging nanomaterials, ranging from organic semiconductors, polymeric materials, biomimetic or bioinspired materials, to inorganic nanoparticles and hybrid nanomaterial systems including new technique advances and novel applications of microscopy and microanalysis tools.

TF

TECHNOLOGISTS' FORUM SYMPOSIA

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 workshop, and roundtable discussion and an exhibit booth at the annual M&M meeting. A semiannual newsletter, website, and bulk e-mailer are used to increase contact among its members and expand their participation to MSA. Forum services that are available to members include the Microscopy Facilities Directory. The Forum also sponsors the Professional Technical Staff Awards; it is a competitive program to encourage participation of the technologists at the annual meeting

X30 Technologists' Forum: Emerging New Specialized Techniques for Correlative Microscopy

ORGANIZERS: Caroline Miller, John Chandler, Frank Macaluso

Room D139 Convention Center

WEDNESDAY 10:30 AM and 1:30 PM

This symposium explores emerging new technologies to advance correlative microscopy from LM to EM; correlative techniques and instrumentation development and extending basic preparation techniques to new imaging modes.

X31 Technologists' Forum: Safety in the Microscopy Laboratory

ORGANIZERS: E. Ann Ellis, Beverly E. Maleeff

Room D139 Convention Center

WEDNESDAY 8:30 AM

This symposium covers basic laboratory safety and problems specific to EM labs including: fume hoods, biohazards and waste disposal.

T

TUTORIALS

The physical sciences and biological sciences tutorials allow for a select group of researchers to give extended lectures on the practical aspects of certain microscopy techniques, methods, and computations. Generally focused on cutting-edge and/or immediately relevant microscopy, these tutorials give speakers the opportunity to venture well beyond the cursory introductory material of a platform presentation, providing attendees with an in-depth and practical understanding of a given technique.

PHYSICAL SCIENCES TUTORIALS

One Continuing Microscopy Education Unit is available for each Physical Sciences Tutorial attended (fee \$10/members; \$50/non-members; register & pay at Registration Desk)

X40 ABF STEM - Direct and Robust Atomic-resolution Imaging of Light Elements in Crystalline Materials

Instructor: Scott Findlay, Monash University, Australia

Thursday 8:30 AM • Room: C125

Annular bright field (ABF) imaging in atomic-resolution scanning transmission electron microscopy has been shown to give direct, robust and real-time imaging of light elements in crystalline materials. Columns of lithium, even hydrogen, can be imaged in some circumstances. This brief tutorial will promote the usefulness of the technique. Practical aspects will be emphasized; in particular what specimen characteristics and experimental parameters are most suited to this imaging mode. The conceptual underpinnings and limitations of ABF imaging will be discussed, drawing from a mix of exploratory simulations and experimental results. Strategies for implementing ABF imaging and recent extensions of the technique will be described.

X41 In situ Liquid S/TEM: Practical Aspects, Challenges, and Opportunities

Instructor: Raymond R. Unocic, Oak Ridge National Laboratory

Thursday 1:30 PM • Room: C125

Recent advances in platforms for in situ/operando liquid S/TEM experimentation has brought forth new research opportunities in the physical and life sciences, where it is now feasible to image static and dynamic processes of materials in their native liquid environment, at high spatial resolution, and under an external stimuli. In the context of performing quantitative in situ experiments and across this progressively growing research field, there is a need to understand complex

electron beam interactions, recognizing and separating out experimental artifacts, coupling analytical microscopy methods for chemical analysis, performing electrochemical measurements for electrochemistry, data collection and interpretation.

BIOLOGICAL SCIENCES TUTORIALS

One Continuing Microscopy Education Unit is available for each Physical Sciences Tutorial attended (fee \$10/members; \$50/non-members; register & pay at Registration Desk)

X42 Maximizing the Likelihood of Successful Maximum Likelihood Classification

Instructors: Lyumkis D Oliveira dos Passos, and Dmitry Lyunkis; The Salk Institute

Wednesday 8:30 AM • Room: C125

Maximum likelihood methods are being increasingly used in three-dimensional electron microscopy to determine the structures of challenging biological molecules. This tutorial will feature a brief introduction to maximum likelihood methods and will discuss best practices for performing maximum likelihood classification of EM data.

X43 Advances in Light Sheet Microscopy

Instructor: Liang Gao, Stony Brook University

Wednesday 1:30 PM • Room: C125

Light sheet microscopy is an up-and-coming technique in light microscopy as it offers reduced photobleaching, highly efficient image recording, and significant depth penetration. This tutorial will feature an introduction to the technique and will discuss new developments and results that the technique has enabled.

X44 Optimizing Specimen Preparation for Macromolecular Electron Microscopy

Instructor: Deborah Kelly, Virginia Tech Carilion School of Medicine and Research Institute

Wednesday 10:30 AM • Room: C125

Specimen preparation can be one of the most challenging steps for macromolecular electron microscopy. This tutorial will discuss some new approaches for preparing optimal samples for three-dimensional electron microscopy.



MICROSCOPY OUTREACH SESSIONS

X90 Microscopy in the Classroom - Strategies for Education and Outreach

ORGANIZERS: Craig Queenan, Alyssa Waldron, Dave Becker, Bergen County Academies, High School

Tuesday 8:30 AM, 10:30 AM • Room: B110/B111

3:00 Poster Session in Exhibit Hall

- Best practices for incorporating microscopy into K-12 classrooms and curricula
- Local and national institutions and programs involved in microscopy outreach
- Methods to expose students to microscopy in an engaging and successful manner

X91 It's a Family Affair

ORGANIZERS: Elaine Humphrey, Frauke Hogue, Stuart McKernan

Wednesday, 1:30 PM • Room: B110/B111

This exciting session will pique the scientific interest of children of all ages - no previous microscopy experience needed!

- Program designed for the delegates' families and friends
- Hands-on activities and demonstrations will prove that science is fun
- Solve the mystery using clues left at the scene of the crime using electron microscopes on the exhibit floor

Delegates interested in developing outreach opportunities at their home institutions are encouraged to attend as well.

X92 Project MICRO Workshop: Learn To See With the Private Eye

ORGANIZERS: Kerry Ruef, David Melody

Tuesday, 1:30 PM • Room: B110/B111

Project MICRO is pleased to present this workshop of microscopy in classrooms for teachers and meeting attendees. Does your funding source require outreach? The Private Eye workshop can help you. Learning how to SEE is more basic than learning how to use a microscope.

Think with the eyes and see with the brain. Come to this workshop to learn how to do this! Learn how to bring arts-based teachers into science with the Private Eye.

EXHIBITOR TUTORIALS AND DEMOS

ORGANIZER: MSA Education Committee

Monday, Tuesday & Wednesday, August 3-5

5:45 PM – 6:45 PM

Exhibit Hall

Signup sheets with titles and descriptions are at the MSA Education desk in the MSA MegaBooth. You must sign up in advance! When you sign up you will be issued a ticket, which you will need to access the Exhibit Hall after it closes at 5:30 PM.

Scientific Program

Monday, August 3

M&M 2015 PLENARY LECTURES AND AWARDS

John F. Mansfield, MSA President
Tom Kelly, MAS President
Jaret J. Frafjord, IMS President
Mark A. Sanders, Program Chair

Monday 8:30 AM • Oregon Ballroom

8:30 AM OPENING WELCOME:

John F. Mansfield, MSA President
Tom Kelly, MAS President
Jaret J. Frafjord, IMS President

9:00 AM 1 M&M PLENARY LECTURE

How Cutting-Edge Atomic Resolution Microscopy Can Help to Solve Some of the World's Energy Problems by Professor Roger Y. Tsien, University of California, San Diego

10:00 AM MAS Awards Presentation

10:15 AM IMS Awards Presentation

10:30 AM Coffee Break, Oregon Ballroom Foyer

10:50 AM MSA Awards Presentation

11:00 AM M&M Meeting Awards Presentation

11:15 AM 2 M&M PLENARY LECTURE

Some Unexpected Difficulties in Microscope Operation in Microgravity by Donald Pettit, PhD, NASA Johnson Space Center, Houston

IMS HENRY CLIFTON SORBY AWARD AND LECTURE

SESSION CHAIR:

Jaret J. Frafjord, IMS President

Monday 1:30 PM • Room: C123

- 1:00 PM 3 (Invited) *Microstructural Developments Leading to New Advanced High Strength Sheet Steels: A Historical Assessment of Critical Metallographic Observations*; DK Matlock, LS Thomas, MD Taylor, E De Moor, JG Speer; Colorado School of Mines

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—MONDAY AFTERNOON

A01.1 Vendor Symposium: New Tools for Life and Materials Sciences

SESSION CHAIR:

Bill Russin, Northwestern University

PLATFORM SESSION

Monday 1:30 PM • Room: C125

- 1:30 PM 4 *The Biodynamic Microscope: Doppler Imaging Inside Living 3D Biological Tissues*; D Nolte, R An, J Turek; Animated Dynamics Inc.
- 1:45 PM 5 *Field-portable Nano-imaging: A New Tool for On-Demand Microscopy*; CS Own, MF Murfitt, LS Own; Project VOXA
- 2:00 PM 6 *Automated, Programmable Processing of Specimens and Grids with the mPrep™ ASP-1000*; TE Strader, SL Goodman; Microscopy Innovations LLC
- 2:15 PM 7 *Correlative Microscopy based on Secondary Ion Mass Spectrometry for High-Resolution High-Sensitivity Nano-Analytics*; T Wirtz, D Dowsett, S Eswara-Moorthy; Luxembourg Institute of Science and Technology
- 2:30 PM 8 *Mastering the Multi-scale Challenge: A Modern Correlation Environment*; AP Merkle, L Lechner, A Steinbach, J Gelb; Carl Zeiss X-ray Microscopy, Inc. F Perez-Willard; Carl Zeiss Microscopy GmbH, Germany; D Unrau, MW Phaneuf; Fibics Inc., Canada
- 2:45 PM 9 *RISE Microscopy: Correlative Raman and SEM Imaging*; U Schmidt, O Hollricher; WITec GmbH, Germany; W Liu; WITec Instruments Corp., EL Principe; Tescan USA

A11.1 Electron Vortex Beams and Higher-Order Beam Modes

SESSION CHAIRS:

Benjamin J. McMorran, University of Oregon
Juan-Carlos Idrobo, Oak Ridge National Laboratory

PLATFORM SESSION

Monday 1:30 PM • Room: D139

- 1:30 PM 10 (Invited) *The Surprising Dynamics of Electron Vortex Beams*; S Löffler, T Schachinger; McMaster University, Canada; M Stöger-Pollach, P Schattschneider; Vienna University of Technology, Austria
- 2:00 PM 11 *Unveiling the OAM and Acceleration of Electron Beams*; R Shiloh, Y Tsur, R Remez, Y Lereah, BA Malomed; Tel-Aviv University, Israel; V Shvedov, C Hnatovsky, W Krolikowski; Australian National University, et al.

Scientific Program

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—MONDAY AFTERNOON *continued*

- 2:15 PM **12 M&M 2015 STUDENT AWARD** *An Orbital Angular Momentum Spectrometer for Electrons*; TR Harvey, V Grillo, BJ McMorran; University of Oregon
- 2:30 PM **13** (Invited) *Structured Electron Beam Illumination: a New Control over the Electron Probe. Weird probes and new experiments*; V Grillo, J Pierce; CNR-Istituto Nanoscienze, Italy; E Karimi; University of Ottawa, Canada; TR Harvey; of Oregon; R Balboni; CNR-IMM Bologna, Italy; GC Gazzadi; CNR-Istituto Nanoscienze, Italy; E Mafakheri, F Venturi; Università di Modena e Reggio Emilia, Italy; et al.

A12.1 Low Voltage Electron Microscopy

SESSION CHAIRS:

David C. Bell, Harvard University
Natasha Erdman, JEOL USA Inc.
Jingyue Liu, Arizona State University

PLATFORM SESSION

Monday 1:30 PM • Room: B117

- 1:30 PM **14** (Invited) *Direct Observation of Nano-porous Materials Using Low Voltage High Resolution SEM*; S Asahina, Y Sakuda; JEOL Ltd, Japan; O Terasaki; Stockholm University, Sweden
- 2:00 PM **15** *Examination of Graphene in a Scanning Low Energy Electron Microscope*; I Müllerová, E Mikmeková, L Frank; Institute of Scientific Instruments ASCR, Czech Republic
- 2:15 PM **16** *Conductivity Contrast in SEM Images of Hydrogenated Graphene Grown on SiC*; I Jozwik, JM Baranowski, K Grodecki; Institute of Electronic Materials Technology; P Dabrowski; University of Łódź, Poland; W Strupinski; Institute of Electronic Materials Technology, Poland
- 2:30 PM **17** *Improved Low Voltage SEM Image Resolution Through the Use of Image Restoration Techniques*; MD Zotta, YP Kandel, AN Caferra, E Lifshin; SUNY Polytechnic Institute
- 2:45 PM **18** *20-kV Diffractive Imaging of Graphene by using an SEM-based Dedicated Microscope*; O Kamimura, T Dobashi; Hitachi, Ltd, Japan; Y Maehara; Hokkaido University; R Kitaura, H Shinohara; Nagoya University, Japan; K Gohara; Hokkaido University, Japan

A13.1 Advancing Data Collection and Analysis for Atom Probe Tomography

SESSION CHAIRS:

Brian Gorman, Colorado School of Mines
R. Prakash Kolli, University of Maryland
Richard Martens, University of Alabama

PLATFORM SESSION

Monday 1:30 PM • Room: B1115

- 1:30 PM **19** (Invited) *Bridging the Gap Between the Modeling Approach and the Experiment in Atom Probe Tomography*; F Vurpillot, W Lefebvre, L Rigutti, N Rolland, F Moyon, H Hideur, D Blavette; Université et INSA de Rouen, France
- 2:00 PM **20** *Atom-Probe Tomography Measurements of Isotopic Ratios of High-field Materials with Corrections and Standardization: a Case Study of the $^{12}\text{C}/^{13}\text{C}$ of Meteoritic Nanodiamonds*; JB Lewis, D Isheim, C Floss, TL Daulton; Washington University; DN Seidman; Northwestern University
- 2:15 PM **21** *Data Quality Improvements in the Voltage-Pulsed LEAP 5000 R/XR*. RM Ulfing, TJ Prosa, DR Lenz, TR Payne; CAMECA Instruments, Inc., France
- 2:30 PM **22** *Targeting Grain Boundaries for Structural and Chemical Analysis Using Correlative EBSD, TEM and APT*; A Stokes, M Al-Jassim, D Diercks; Colorado School of Mines; B Egaas; Nation Renewable Energy Laboratory; B Gorman; Colorado School of Mines
- 2:45 PM **23** *Development of Quantitative Standards for Atom Probe Reconstruction Parameters for Analysis of Interfacial Chemistry*; S Broderick, S Dumpala, S Young, K Kaluskar, S Srinivasan, K Rajan; Iowa State University

B

BIOLOGICAL SCIENCES SYMPOSIA

MONDAY AFTERNOON

B01.1 The R.P. Apkarian Memorial Symposium on Cryo-HRSEM

SESSION CHAIRS:

Elizabeth Wright, Emory University
Cameron Ackerley, Hospital for Sick Children

PLATFORM SESSION

Monday 1:30 PM • Room: B112

- 1:30 PM **24** *Introduction*; E Wright; Emory University; C Ackerley; Hospital for Sick Children
- 1:45 PM **25** *Ongoing Developments of the Cryo-SEM/STEM Technique*; AC Robins; E A Fischione Instruments, Inc.
- 2:15 PM **26** *Imaging Macromolecules and Viruses in a Hydrated State Using a Field Emission Scanning Electron Microscope (FESEM)*; CA Ackerley, C Nielsen; Hospital for Sick Children; G Rodek; SPI Supplies
- 2:30 PM **27** (Invited) *Field Emission In-Lens Scanning Electron Microscopy of the Nuclear Envelope and Other Cellular Structures*; MW Goldberg, J Fišerová; Durham University, United Kingdom; TD Allen; University of Manchester, United Kingdom

B05.1 3D Structures of Macromolecular Assemblies, Cellular Organelles, and Whole Cells

SESSION CHAIRS:

Teresa Ruiz, University of Vermont
Melanie Ohi, Vanderbilt University Medical School

PLATFORM SESSION

Monday 1:30 PM • Room: B111

- 1:30 PM **28** (Invited) *Heterogeneity in the Pre-40S Ribosomal Subunit Reveals Two Distinct Regions of Variation at Functionally Important Structural Elements*; MC Johnson, H Ghalei; Florida State University; K Karbstein; The Scripps Research Institute; ME Stroupe; Florida State University
- 2:00 PM **29** **M&M 2015 STUDENT AWARDEE** *Determining a Subnanometer Resolution Structure of a Helicobacter pylori VacA Toxin Oligomer*; TM Pyburn, NJ Foegeding, TL Cover, MD Ohi; Vanderbilt University Medical Center
- 2:15 PM **30** (Invited) *Sar1 Forms Ordered Arrays That Can Facilitate Vesicle Scission in the COPII Pathway*; H Hariri, A Noble, A Omran, S Staggs; Florida State University
- 2:45 PM **31** *Regulation of Cytoplasmic Dynein by Lis1*; K Toropova, S Zou; Harvard University; AJ Roberts, SL Reck-Peterson; Harvard Medical School; AE Leschziner; Harvard University

B07.1 Microscopy, Microanalysis, and Image Cytometry in the Pharmaceutical Sciences

SESSION CHAIRS:

Lynn M. DiMemmo, Bristol-Meyers Squibb
John Bruce Green, Baxter

PLATFORM SESSION

Monday 1:30 PM • Room: B119

- 1:30 PM **32** (Invited) *Microscopy, Microbiology and Regulations of Paper and Paperboard Utilized in Pharmaceutical Packaging*; JH Woodward; Buckman
- 2:00 PM **33** (Invited) *Microscopic Techniques for Sterility Assurance Support in the Medical Products Industry*; JR Mantei, MA Murphy, L Stojanovic, L Wahlen, M Pasmore, J DiOrio; Baxter Healthcare
- 2:30 PM **34** (Invited) *Electron Microscopy as an Emerging Analytical Tool for Characterizing Biopharmaceuticals*; B Carragher, A Schneemann, JJ Sung, SK Mulligan, JA Speir, K On, J Quispe, CS Potter; NanoImaging Services, Inc.

B08.1 Dynamic Fluorescence Microscopy

SESSION CHAIRS:

Michelle Digman, University of California, Irvine
Alan F. "Rick" Horwitz, University of Virginia

PLATFORM SESSION

Monday 1:30 PM • Room: C122

- 1:30 PM **35** (Invited) *Imaging the Dynamic Release and Capture of Vesicle Membrane Proteins in Mammalian Cell*; JW Taraska, KA Sochacki, BT Larson; National Institutes of Health
- 2:00 PM **36** (Invited) *Focal Adhesion Kinase Anchoring Kinetics and Regulatory Interactions Quantified by Total Internal Reflection Fluorescence Microscopy*; T Zak, AM Samarel, SL Robia; Loyola University Chicago
- 2:30 PM **37** (Invited) *The Biogenesis of Endophilin B1 Containing Vesicles*; Y Chen, J Li, JD Mueller; University of Minnesota; B Barylko, JP Albanesi; University of Texas Southwestern Medical Center

Scientific Program

B

BIOLOGICAL SCIENCES SYMPOSIA

MONDAY AFTERNOON *continued*

B09.1 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants, and Animals

SESSION CHAIRS:

W. Gray Jerome, Vanderbilt University
Jon Charlesworth, Mayo Clinic
Gang Ning, Pennsylvania State University
Betty Thompkins, University of Pennsylvania

PLATFORM SESSION

Monday 1:30 PM • Room: D138

- 1:30 PM **38** (Invited) *Ebola Virus Hemorrhagic Fever*; CS Goldsmith; Centers for Disease Control and Prevention
- 2:00 PM **39** *Microwave Assisted Rapid Diagnosis of Plant Virus Diseases by TEM*; B Zechmann, G Zellnig; Baylor University
- 2:15 PM **40** *Immunolectron Microscopy Reveals Varied Surface Expression of Potential Vaccine Targets of Chlamydia trachomatis*; R-C Hsia, JM Sotiris, PM Bavoil; University of Maryland Baltimore
- 2:30 PM **41** (Invited) *EM Detection of Viruses in Organ Transplant Patients*; SE Miller, DN Howell; Duke University

B10.1 Multiscale Biological Imaging: From Micro to Macro — Animal to Clinical Models

SESSION CHAIRS:

Kevin Eliceiri, University of Wisconsin Madison
David Entenberg, Albert Einstein College of Medicine

PLATFORM SESSION

Monday 1:30 PM • Room: C120

- 1:30 PM **42** *In Situ Topographical and Elemental Characterisation of Biological Soft Matter*; CL Collins, C McCarthy; Oxford Instruments NanoAnalysis, United Kingdom
- 1:45 PM **43** *Biom mineralization at Interfaces Revealed with 4D Electron and Atom Probe Tomographies*; X Wang, B Langelier; McMaster University, Canada; A Palmquist; University of Gothenburg, Sweden; K Grandfield; McMaster University, Canada
- 2:00 PM **44** *Magnetotactic Bacteria and Honey Bees: Model Systems for Characterising an Iron Oxide Mediated Magnetoreceptor*; J Shaw, A Boyd, M House, M Saunders, F Mathes, B Baer; The University of Western Australia

- 2:15 PM **45** (Invited) *Development of a Bioinspired Stroma Model to Study the Role of Collagen Topology in Pancreatic Ductal Adenocarcinoma*; C Drifka, A Loeffler, K Eliceiri, J Kao; University of Wisconsin-Madison

- 2:45 PM **46** *From Image Tiles to Web-Based Interactive Measurements in One Stop*; A Vandecreme, T Blattner, M Majurski, P Bajcsy, K Scott, JHJ Scott; National Institute of Standards and Technology

P

PHYSICAL SCIENCES SYMPOSIA

MONDAY AFTERNOON

P01.1 Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on *In Situ* TEM and STEM

SESSION CHAIRS:

M. Grace Burke, University of Manchester, United Kingdom
Ondrej Krivanek, Nion Co.
Peter Crozier, Arizona State University

PLATFORM SESSION

Monday 1:30 PM • Room: B116

- 1:30 PM **47** *Zen-like Simplicity Is Hard Work, and Other Secrets I Learned from Peter Swann*; OL Krivanek; Nion Co
- 1:45 PM **48** (Invited) *Peter Swann's Key Role in the Past, Present and Future of Dynamic In Situ TEM*; ED Boyes, PL Gai; University of York, United Kingdom; A Howie; University of Cambridge, United Kingdom
- 2:15 PM **49** *In Situ Tensile Deformation of Additively Manufactured Ti 6Al 4V*; JR Porter, M Velez; UES Inc. R Wheeler; UES Inc.
- 2:30 PM **50** *Computer-Controlled In Situ Gas Reactions via a MEMS-based Closed-Cell System*; LF Allard, WC Bigelow, Z Wu, SH Overbury, KA Unocic, M Chi; Oak Ridge National Laboratory; WB Carpenter, FS Walden; Protochips, Inc. et al.
- 2:45 PM **51** *Approaching the "Lab in the Gap": First Results from a Versatile In Situ (S)TEM*; F Börrnert, H Müller; Speziallabor Triebenber; M Linck; CEOS GmbH, Germany; A Horst; IFW Dresden; AI Kirkland; University of Oxford, United Kingdom; B Büchner; Leibniz-Institut für Festkörper- und Werkstoffforschung Dresden, Germany; H Lichte; Technische Universität Dresden, Germany

P04.1 Nano-Characterization of Low Dimensional Materials: Carbon to 2D TMDs

SESSION CHAIRS:

Moon Kim, University of Texas at Dallas
Zonghoon Lee, Ulsan National Institute of Science and Technology, South Korea
Quentin Ramasse, SuperSTEM Laboratory, United Kingdom

PLATFORM SESSION

Monday 1:30 PM • Room: B114

- 1:30 PM **52** (Invited) *Growth Morphology and Defects in 2D Heterostructures and Interfaces*; JA Robinson, S Eichfeld, Y-C Lin; The Pennsylvania State University; N Lu, MJ Kim; The University of Texas at Dallas
- 2:00 PM **53** *Characterization of Layer Thickness and Orientation of 2D WSe₂/MoS₂ Heterostructures Using EDS, EBSD and AFM*; C Lang, M Hiscock; Oxford Instruments Nanoanalysis, United Kingdom; R Sundaram; Oxford Instruments Plasma Technology, United Kingdom; J Moffat; Asylum Research
- 2:15 PM **54** *Interfaces in Two-Dimensional Heterostructures of Transition Metal Dichalcogenides*; W Zhou, J Lin; Oak Ridge National Laboratory; Y Gong; Rice University; X Wang, BK Tay; Nanyang Technological University, Singapore; J Lou; Rice University; Z Lou; Nanyang Technological University, Singapore; S Pantelides; Vanderbilt University, et al.
- 2:30 PM **55** *Cross Sectional STEM Imaging and Analysis of Multilayered Two Dimensional Crystal Heterostructure Devices*; SJ Haigh, AP Rooney, E Prestat; University of Manchester, United Kingdom
- 2:45 PM **56 M&M 2015 STUDENT AWARDEE** *Measuring the Atomic and Electronic Structure of Black Phosphorus with STEM*; RJ Wu, M Topsakal, MC Robbins, N Haratipour, JS Jeong, RM Wentzcovitch, SJ Koester, A Mkhoyan; University of Minnesota

P05.1 Nuclear and Irradiated Materials: Fundamental Defect Properties

SESSION CHAIRS:

Chad M. Parish, Oak Ridge National Laboratory
Khalid Hattar, Sandia National Laboratories
Arthur T. Motta, Pennsylvania State University

PLATFORM SESSION

Monday 1:30 PM • Room: D135

- 1:30 PM **57** (Invited) *Using In Situ TEM to Characterize the Microstructure Evolution of Metallic Systems under External Solicitation*; D Kaoumi, T Gautier, J Adamson; University of South Carolina; M Kirk; Argonne National Laboratory

- 2:00 PM **58** *In Situ TEM He⁺ Implantation and Thermal Aging of Nanocrystalline Fe*; BR Muntifering, A Dunn; Northwestern University; RP Dingreville; Sandia National Laboratories; J Qu; Northwestern University; KM Hattar; Sandia National Laboratories

- 2:15 PM **59** *A New Method for Studying He Damage in Materials Demonstrated on Nanotwinned Cu Nanopillars*; Z Wang, F Allen, Z Shan; Center for Advancing Materials Performance from the Nanoscale, China, Xi'an Jiaotong University, China; P Hosemann; University of California, Berkeley

- 2:30 PM **60** (Invited) *In Situ Electron Microscope Observations and Analysis of Radiation Damage in Tungsten*; X Yi, ML Jenkins; University of Oxford, United Kingdom; MA Kirk; Argonne National Laboratory; SG Roberts; University of Oxford, United Kingdom

P08.1 Microscopy and Characterization of Ceramics, Polymers, and Composites

SESSION CHAIRS:

Andre Mkhoyan; University of Minnesota
Jong Seok Jeong, University of Minnesota
Laxmikant Saraf, Clemson University

PLATFORM SESSION

Monday 1:30 PM • Room: D136

- 1:30 PM **61** (Invited) *Convergent-beam Electron Diffraction Study of Local Structural Fluctuations in Perovskite-type Ferroelectrics*; K Tsuda; Tohoku University, Japan
- 2:00 PM **62 M&M 2015 STUDENT AWARDEE** *Chemical Bonding Effects in HAADF-STEM Imaging of Light-Element Ceramics*; M Odlyzko, J Held, A Mkhoyan; University of Minnesota, Twin Cities
- 2:15 PM **63** *Enhancement of Oxygen Contrast in a STEM HAADF Image of Perovskite Oxide SrTiO₃ Using Maximum Entropy Method*; L Xie, X Pan; University of Michigan
- 2:30 PM **64** (Invited) *Cationic Ordering and Magnetic Properties of Re-based Double Perovskite Oxides*; S-Y Choi, M Choi, S-D Kim; Korea Institute of Materials Science, South Korea; HJ Jeon; Pusan National University, South Korea; Y-M Rhym; Korea Institute of Materials Science, South Korea

Scientific Program

P

PHYSICAL SCIENCES SYMPOSIA

MONDAY AFTERNOON *continued*

P09.1 Microscopy of Additive Manufacturing and 3D Printing in Materials and Biology

SESSION CHAIRS:

John Porter, UES Inc.

John Wooten, CalRAM Inc.

Jay Potts, University of South Carolina

PLATFORM SESSION

Monday 1:30 PM • Room: D137

1:30 PM **65** (Invited) *High Performance Polymers in Additive Manufacturing Processes: Understanding Process, Structure and Property*; M Garcia-Leiner, DP Dennies, A Yardimci; Exponent, Inc.

2:00 PM **66** *Micro-scale X-ray Computed Tomography of Additively Manufactured Cellular Materials under Uniaxial Compression*; NL Cordes, K Henderson; Los Alamos National Laboratory; JJ Williams; Arizona State University; X Xiao; Advanced Photon Source; MW Robinson; Atomic Weapons Establishment; TA Schaedler; HRL Laboratories, LLC; N Chawla; Arizona State University; BM Patterson; Los Alamos National Laboratory, et al.

2:15 PM **67** *Recent Advancements in 3D X-ray Microscopes for Additive Manufacturing*; L Lavery, W Harris, A Merkle; Carl Zeiss X-ray Microscopy Inc.

2:30 PM **68** *Characterization of Grain Structure and Porosity in Selective Laser Melted Cu-4.3Sn for Enhancing Electrical Connector Fabrication*; AP Ventura, CA Wade, WZ Misiolek, M Watanabe; Lehigh University; G Pawlikowski, M Bayes; TE Connectivity

2:45 PM **69** *Examination of 3D Manufactured Alloys and Materials for High-performance Drilling and Oilfield Service Tools*; JN Williard, S Mukherjee, J Leal; Baker Hughes

P11.1 Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials

SESSION CHAIRS:

Chongmin Wang, Pacific Northwest National Laboratory

Raymond Unocic, Oak Ridge National Laboratory

Arda Genc, FEI

PLATFORM SESSION

Monday 1:30 PM • Room: B113

1:30 PM **70** (Invited) *AC-STEM Studies of Phase Transformation and Evolution of Li-rich Layered Cathode Materials Induced by Battery Charge-discharge Cycling and by Electron-beam Irradiation*; P Lu, P Yan, E Romero, ED Spoerke; Sandia National Laboratories; J-G Zhang, CM Wang; Pacific Northwest National Laboratory

2:00 PM **71** *Structural Evolution During Electrochemical Cycling of Epitaxial LiCoO₂ Films Studied by S/TEM*; LA Bendersky, H Tan; National Institute of Standards and Technology

2:15 PM **72** *Structural and Chemical Evolution of Li and Mn Rich Layered Oxide Cathode and Correlation with Capacity and Voltage Fading*; C Wang, P Yan, J-G Zhang; Pacific Northwest National Laboratory

2:30 PM **73** *Multiscale Structural Architectures of Novel Sulfur Copolymer Composite Cathodes for High-Energy Density Li-S Batteries Studied by Analytical Multimode STEM Imaging and Tomography*; VP Oleshko, A Herzing, J Kim, JL Schaefer, CL Soles; National Institute of Standards and Technology; D-C Pyun, AG Simmonds, J Griebel; University of Arizona, et al.

2:45 PM **74** *Structural Characterization of Powders and Thin Films of Layered Li_{1.2}Mn_{0.55}Ni_{0.15}Co_{0.1}O₂ Cathode Materials*; AC Johnston-Peck, KK Bharathi, S Takeuchi, I Levin, AA Herzing, LA Bendersky; National Institute of Standards and Technology

A

ADVANCES IN INSTRUMENTATION

POSTER SESSIONS

MONDAY AFTERNOON

A01.P1 Vendor Symposium: New Tools for Life and Materials Sciences

POSTER SESSION

Monday 3:00 PM • Exhibit Hall

3:00 PM **75** *Application of a Semi-in-Lens FE-SEM to the Crystallographic Analysis with the EBSD Technique*; H Ito, Y Hashimoto, S Takeuchi, M Sasajima, H Sato; Hitachi High-Technologies Corporation, Japan; H Morita; Oxford Instruments, United Kingdom

POSTER # 1

Scientific Program

Monday, August 3

- 3:00 PM **76** *Optimized Solutions for the Arrangement of Digital Imaging Detectors*; T Hashimoto, J Mancuso, K Nakano, E Nakazawa; Hitachi High-Technologies Corporation, Japan; L Blubaugh, B Armbruster; Hitachi High Technologies America, Inc.
POSTER # 2
- 3:00 PM **77** *Cooling Temperature Control System for the Cross Section Polisher*; S Kataoka, M Kozuka, T Wakasa, K Todoroki, T Kasai, T Negishi, M Matsusita, T Suzuki; JEOL Ltd, Japan, et al.
POSTER # 3
- 3:00 PM **78** *Correlative SEM and Raman Imaging of Hot Spots on SERS Substrate*; R Váň, M Kocman, J Jiruše; TSCAN Brno s.r.o., Czech Republic
POSTER # 4
- 3:00 PM **79** *Electron Diffraction Phase Analysis and Pattern Simulations Using the ICDD Powder Diffraction File (PDF-4+)*; S Gates, K Zhong, T Blanton, J Blanton; International Centre for Diffraction Data
POSTER # 5
- 3:00 PM **80** *Reel-to-Reel Electron Microscopy: Latency-Free Continuous Imaging of Large Sample Volumes*; CS Own, MF Murfitt, LS Own; Voxa; D Brittain, N de Costa, RC Reid; Allen Institute for Brain Science; DG Hildebrand, B Graham; Harvard Medical School, et al.
POSTER # 6
- 3:00 PM **81** *The New Zeiss GeminiSEM 500 Meets the Needs of Challenging Biological Applications*; I Angert, C Berger, M Edelmann, R Kirmse, A Thesen; Carl Zeiss Microscopy GmbH, Germany; K Czymmek; Carl Zeiss Microscopy, LLC
POSTER # 7
- 3:00 PM **82** *Effective new Plasma Cleaning Strategies for Scanning Electron Microscopes and FIBs*; RA Vane, ML Cable; XEI Scientific Inc.
POSTER # 8
- 3:00 PM **83** *Ease of Use Solution for Fast and Automated TEM-Lamella Preparation*; T Volkenandt, G Pavia, I Schulmeyer, M Kienle; Carl Zeiss Microscopy GmbH, Germany
POSTER # 9
- 3:00 PM **84** *Correlative Light and Electron Microscopy for Materials Science*; JL Riesterer, G Heiss; FEI Company
POSTER # 10
- 3:00 PM **85** *Setup and Practical Applications of a pnCCD Based XRF System*; JM Davis, J Schmidt; PNDetector GmbH, Germany; M Huth, S Ihle, D Steigenhöfer, P Holl, G Lutz; PNSensor GmbH, Germany, U Weber; PNDetector, Germany, et al.
POSTER # 11
- 3:00 PM **86** *Electrical Probing and Current Imaging for Failure Analysis in the SEM/FIB*; AJ Smith, A Rummel, M Kemmler, K Schock, G Renka, S Kleindiek; Kleindiek Nanotechnik, Germany
POSTER # 12

- 3:00 PM **87** *Principal Component Analysis in EDS*; DL West; Thermo Fisher Scientific
POSTER # 13
- 3:00 PM **88** *A Software for Lab Access and Chemical Process Logging in Shared Facilities*; S Li, F Camino; FOM Networks, Inc.
POSTER # 14

A18.P1 Core Facility Management

POSTER SESSION

Monday 3:00 PM • Exhibit Hall

- 3:00 PM **89** *Do-It-Yourself Database for Core Facility Management*; R-C Hsia; University of Maryland Baltimore
POSTER # 15
- 3:00 PM **90** *High Performance Remote Electron Microscopy*; DE Huber, J Orsborn, F Scheltens, DW McComb, HL Fraser; The Ohio State University
POSTER # 16
- 3:00 PM **91** *Lock-n-Sync for Secure Data Storage in Shared Electron Microscopy Facilities*; K Li, S Li; FOM Networks, Inc.
POSTER # 17

B

BIOLOGICAL SCIENCES

POSTER SESSIONS

MONDAY AFTERNOON

B01.P1 The R.P. Apkarian Memorial Symposium on Cryo-HRSEM

POSTER SESSION

Monday 3:00 PM • Exhibit Hall

- 3:00 PM **92** *Characterization of a Crude Oil Emulsion by Cryo Electron Microscopies*; AR Behzad, DH Anjum; King Abdullah University of Science and Technology, Saudi Arabia
POSTER # 18
- 3:00 PM **93** *Cryo-SEM and Raman Spectroscopy Study of the Involvement of Polyhydroxyalkanoates in Stress Response of Bacteria*; V Krzyzanek, K Hrubanova, O Samek; Institute of Scientific Instruments of the ASCR, Česká republika; S Obruca, I Marova; Brno University of Technology, Česká republika; S Bernatova, M Siler, P Zemanek; Institute of Scientific Instruments of the ASCR, Česká republika
POSTER # 19
- 3:00 PM **94** *Comparison of Sample Preparation Methods for Analysis of Mucus-Secreting Colon Cancer Cells by Scanning Electron Microscopy*; X Wang, R Bleher, V Backman, GS Shekhawat, VP Dravid; Northwestern University
POSTER # 20

Scientific Program

B

BIOLOGICAL SCIENCES POSTER

SESSIONS MONDAY AFTERNOON *continued*

- 3:00 PM **95** *Monitoring of Multilayered Bacterial Biofilm Morphology by Cryo-SEM for Raman Spectroscopy Measurements*; K Hrubanova, S Bernatova, O Samek, M Sery, P Zemanek; Institute of Scientific Instruments of the ASCR, Česká republika; J Nebesarova; Biology center ASCR, Česká republika; F Ruzicka; Masaryk University, Česká republika, V Krzyzanek; Institute of Scientific Instruments of the ASCR, Česká republika
POSTER # 21
- 3:00 PM **96** *Morphology of Organic Matrix of Human Enamel*; VM Dusevich, JD McGuire, JP Gorski, Y Wang, MP Walker; University of Missouri
POSTER # 22

B07.P1 Microscopy, Microanalysis and Image Cytometry in the Pharmaceutical Sciences

POSTER SESSION

Monday 3:00 PM • Exhibit Hall

- 3:00 PM **97** *Analysis of Glass Vial Interior Surfaces in Parenteral Drug Stability Studies*; RA Carlton; GlaxoSmithKline
POSTER # 23
- 3:00 PM **98** *ESEM Study of Magnetic Bubbles – Surface Morphological and Fluidic Aspects*; Z Barkay, Y Gao; Wolfson Applied Materials Research Center, Tel-Aviv University; C Xu; Division of Bioengineering, Nanyang Technological University; C-D Ohl; Division of Physics and Applied Physics, Nanyang Technological University
POSTER # 24
- 3:00 PM **99** *Measurement of Radiation-induced Autophagic Flux in Human Brain Cancer Cells*; LS Yasui, M Johnson, H Savage, A Baker, E Baker, C Burns; Northern Illinois University
POSTER # 25

B08.P1 Fluorescence Microscopy

POSTER SESSION

Monday 3:00 PM • Exhibit Hall

- 3:00 PM **100** *Sparse Feature Selection Identifies H2A.Z as a Novel, Pattern-Specific Biomarker for Asymmetrically Self-Renewing Distributed Stem Cells*; YH Huh, M Noh; Korea Basic Science Institute, South Korea; FR Burden; CSIRO Manufacturing Flagship, Australia; JC Chen; The Senator Paul D Wellstone Muscular Dystrophy Cooperative Research Center; DA Winkler; CSIRO Manufacturing Flagship, Australia; JL Sherley; Asymmetrex; H-S Kweon; Korea Basic Science Institute, South Korea
POSTER # 26

- 3:00 PM **101** *Novel Regulated Secretion Mechanism For a Nerve-Secreted Cell Signaling Molecule in C. elegans*; RD Schultz, K Beifuss, S Bageshwar, EA Ellis; Texas A&M University; TL Gumieny; Texas Woman's University
POSTER # 27

- 3:00 PM **102** *Mechanics of Interdigitating Morphogenesis in Pavement Cells*; A Jafari Bidhendi, B Altartouri, A Geitmann; University of Montreal, Canada
POSTER # 28

B09.P1 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants, and Animals

POSTER SESSION

Monday 3:00 PM • Exhibit Hall

- 3:00 PM **103** *Loss of STARD7 Expression Compromises Epithelial Barrier Integrity in Airway of the Shh+/-Cre/STARD7-/- Mice*; C-L Na, L Yang, TE Weaver; Cincinnati Children's Hospital Medical Center
POSTER # 29
- 3:00 PM **104** *FIB/SEM Tomography of Wound Biofilm*; B Deng, KG Barki, S Ghatak, S Roy, DM McComb, CK Sen; The Ohio State University
POSTER # 30
- 3:00 PM **105** *Visualization of Plaque/Vessel Interfaces Using FIB-SEM*; G Wetzel, SM Lessner; Clemson University
POSTER # 31
- 3:00 PM **106** *Enhanced Large-Area TEM Analysis on Mitochondrial Alteration in Brain Neuronal Cell of Parkinson's Disease Model Mouse Using Montage Function Installed in JEM 1400-Plus System*; H-J Kim, AR Je, MJ Kim, J-K Hyun; Korea Basic Science Institute, South Korea; H-G Kim; Dankook University, South Korea; YH Huh, H-S Kweon; Korea Basic Science Institute, South Korea
POSTER # 32
- 3:00 PM **107** *Renal Biopsy Diagnosis of IGA Nephropathy in Chin Refugees living in the United States*; N Rush, MP Goheen, CL Phillips; Indiana University
POSTER # 33
- 3:00 PM **108** *Visualizing the Distribution and Stoichiometry of Growth Factor Receptors in Intact Cells in Liquid Phase with Correlative Fluorescence and Scanning Transmission Electron Microscopy*; DB Peckys, J Hermannsdörfer, V Tinnemann; Leibniz Institute for New Materials, Germany; U Korf; German Cancer Research Center; N de Jonge; Leibniz Institute for New Materials, Germany
POSTER # 34
- 3:00 PM **109** *Centrin Phosphorylation and Localization Dynamics During The Centriole Cycle*; TA Christensen, JL Salisbury; Mayo Clinic
POSTER # 35

Scientific Program

Monday, August 3

- 3:00 PM **110** *Immunofluorescence Microscopy As a Critical Confirmation Technique in Cell Cycle-Related Proteomics Studies*; SL Faitar; D'Youville College
POSTER # 36
- 3:00 PM **111** *Using Optical Tweezers to Quantify the Interaction Force of Dengue Virus with Host Cellular Receptors*; B Tsai; National Yang-Ming University, Taiwan
POSTER # 37
- 3:00 PM **112** *Application of FRET Microscopy for Visualizing the Uncoating Process of a Single Dengue Virus in Living Cells*; L-W Chu, Y-H Lin; National Yang-Ming University, Taiwan, C-H Lee; Academia Sinica, Taiwan; Y-H Ping; National Yang-Ming University, Taiwan
POSTER # 38
- 3:00 PM **113** *The Observation of Saccharomyces cerevisiae Ultrastructure Changes under Proline Limitation*; H Chen, X Liang, D Becker; University of Nebraska Lincoln
POSTER # 39
- 3:00 PM **114** *Quick Observation of Tissues in Solution by Atmospheric Scanning Electron Microscope (ASEM)*; N Memtily, M Sato; University of Tsukuba, Japan; T Okada, T Ebihara; National Institute of Advanced Industrial Science and Technology, Japan; K Mio; University of Tsukuba, Japan; M Suga, N Hiditoshi; JEOL Ltd, Japan; C Sato; University of Tsukuba, Japan
POSTER # 40
- 3:00 PM **115** *Wheat Leaf Rust Fungus: RIMAPS Analysis to Detect Germ-tube Orientation Pattern*; LM Setten, N Lendoiro, EA Favret; Instituto Nacional de Tecnología Agropecuaria, Argentina
POSTER # 41
- 3:00 PM **116** *Ice Contamination Issues in the Visualization of the Ultrastructure of the Nuclear Envelope by Freeze- Fracture Technique*; N Vaskovicova, V Krzyzanek, A Patak; Institute of Scientific Instruments of the ASCR, Česká republika
POSTER # 42
- 3:00 PM **117** *Imaging of Polyethylene Glycol Layers on Nanoparticles*; SR Anderson, MC Smith, JD Clogston, AK Patri, SE McNeil, U Baxa; Leidos Biomedical Research, Inc.
POSTER # 43
- 3:00 PM **118** *Treatment of Influenza-Induced Acute Lung Injury with Iron Oxide Nanoparticles Using an Ischemic-Reperfusion Model*; K Chew, A Waldron, C Queenan, R Pergolizzi; Bergen County Academics; T Hoffmann; Englewood Hospital and Medical Center
POSTER # 44
- 3:00 PM **119** *Structure of Microtubule-Based Microtentacles*; AN Killilea, R Csencsits; Lawrence Berkeley National Laboratory; S Kenny, K Xu; University of California Berkeley; KH Downing; Lawrence Berkeley National Laboratory
POSTER # 45

- 3:00 PM **120** *Bartonella spp. Biofilm Identified in Patients*; ME Ericson, M Weber-Sanders; University of Minnesota; M Neves da Silva, VB Pelegati, CL Cesar, G Vieira-Damiani, PE Velho; State University of Campinas, Brazil
POSTER # 46
- 3:00 PM **120.1** *Elemental Analysis of Rat's Femoral Neck with Experimental Diabetes by means of Scanning Electron Microscopy*; XS Ramirez-Gómez, E Rodriguez-Miranda; Universidad de Guanajuato Campus Celaya; R Vargas-Bernal, G Herrera-Pérez; Instituto Tecnológico Superior de Irapuato, Mexico
POSTER #46-A
- 3:00 PM **120.2** *MacCallum's Triangle - Is It Rheumatic? Is It Traumatic? Or Is It Both?* S Siew; Michigan State University
POSTER #46-B
- 3:00 PM **120.3** *Electron Microscopic Study of Novel Endophytic Trichoderma spp. Inhibiting the Fungal Pathogen Colletotrichum gloeosporioides Causing Mango Anthracnose*; Shaik Thahir Basha; Sri Venkateswara University; NP Eswara Reddy; Acharya NG Ranga Agricultural University; M Nagalakshmi Devamma; Sri Venkateswara University
POSTER #46-C

P

PHYSICAL SCIENCES POSTER SESSIONS MONDAY AFTERNOON

P01.P1 Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on *In Situ* TEM and STEM

POSTER SESSION

Monday 3:00 PM • Exhibit Hall

- 3:00 PM **121** *Low Angle Annular Dark Field Scanning Transmission Electron Microscopy is Sensitive to Oxidation State in CeO₂ Nanoparticles*; AC Johnston-Peck, JP Winterstein; National Institute of Standards and Technology; JS DuChene, BC Sweeny, WD Wei; University of Florida; R Sharma; National Institute of Standards and Technology; EA Stach; Brookhaven National Laboratory, AA Herzing; National Institute of Standards and Technology, et al.
POSTER # 47
- 3:00 PM **122** *Reduction of Electron Scattering Image Blur for Atmospheric Scanning Electron Microscopy*; Y Ominami, N Nakahira, S Kawanishi, S Ito; Hitachi High-Technologies Corporation, Japan
POSTER # 48

Scientific Program

P

PHYSICAL SCIENCES POSTER SESSIONS

MONDAY AFTERNOON *continued*

3:00 PM **123** *In Situ ETEM Observation of Propene Epoxidation by Gold Nanoparticles Supported on Anatase TiO₂*; T Kawasaki, H Murase, K Yoshida; Japan Fine Ceramics Center; T Tanji; Nagoya University, Japan
POSTER # 49

3:00 PM **124** *In Situ Observation of Degradation of Electrocatalysts in Humidified Air Atmosphere Using a cold FE 60-300 kV ETEM*; M Shirai, H Matsumoto, I Nagaoki, T Yaguchi; Hitachi High-Technologies Corporation, Japan; T Shimizu, T Kamino; Japan Automobile Research Institute
POSTER # 50

3:00 PM **125** **APKARIAN MEMORIAL SCHOLARSHIP AWARD** *XEDS and EELS in the TEM at Atmospheric Pressure and High Temperature*; E Prestat, M Smith, A Janssen, TJ Slater; University of Manchester, United Kingdom; PH Camargo; Universidade de São Paulo, Brazil; MA Kulzick; BP Corporate Research Center, United Kingdom; MG Burke, SJ Haigh; University of Manchester, United Kingdom, et al.
POSTER # 51

3:00 PM **126** **M&M 2015 STUDENT AWARDEE** *A Controllable Environmental-Cell (EC) for Wet Environmental TEM (WETEM)*; R Kagawa, Y Kuwamura; Tokyo University of Agriculture and Technology, Japan; W-A Chiou; University of Maryland; H Minoda; Tokyo University of Agriculture and Technology, Kapan
POSTER # 52

3:00 PM **127** *Exploring the Carbon Deposition Mechanism on Ni/Gd Ceria Catalysts*; EL Lawrence, PA Crozier; Arizona State University
POSTER # 53

3:00 PM **128** *In Situ TEM study of the Initial Oxidation Behavior of Zry-4*; W Harlow, ML Taheri; Drexel University
POSTER # 54

3:00 PM **129** *Transmission Electron Microscopy of Crystallization of Lysozyme in a Solution*; T Yamazaki, M Shirai; Institute of Low Temperature Science, Hokkaido University, Japan; H Matsumoto; Hitachi High-Technologies Corporation, Japan; Y Kimura; Hokkaido University, Japan
POSTER # 55

3:00 PM **130** *Effect of Electron Beam on Nanoparticle Dynamics in Solution during In Situ TEM Observation*; J Lu, Z Aabdin, U Anand, U Mirsaidov; National University of Singapore
POSTER # 56

3:00 PM **131** *Role of Fluid-mediated Interactions in Guiding Nanoparticle Assembly*; UM Mirsaidov, G Lin; D Loh; J Lu, Z Aabdin; National University of Singapore
POSTER # 57

3:00 PM **132** *The Two Dimensional Nanoplate Dynamics Revealed by In Situ Liquid Cell TEM*; X Tian, UM Mirsaidov; Berkeley Education Alliance for Research in Singapore; H Zheng; Lawrence Berkeley National Laboratory
POSTER # 58

3:00 PM **133** *Dynamic Studies of Solution-based Reactions Using Operando TEM*; K He, Y Yuan, Y-P Lu; Shandong University, China; T Shokuhfar, R Shahbazian-Yassar; Michigan Technological University
POSTER # 59

3:00 PM **134** *Precision In Situ Control of Local Liquid Chemistry via Electron Irradiation*; C Wang, T Shokuhfar, R Klie; University of Illinois at Chicago
POSTER # 60

3:00 PM **135** *Probing Nanoparticle Dynamics in 200 nm Thick Liquid Layers at Millisecond Time Resolution*; SW Chee, D Loh, U Mirsaidov, P Matsudaira; National University of Singapore
POSTER # 61

3:00 PM **136** *Bonding Pathways of Gold Nanocrystals in Solution*; Z Aabdin, J Lu, U Anand, ND Loh, U Mirsaidov; National University of Singapore
POSTER # 62

3:00 PM **137** *Electron Beam Induced Domain Motion in Ferroelectric RKTp Observed By Transmission Electron Microscopy*; JL Hart, M Arredondo, M Taheri; Drexel University
POSTER # 63

3:00 PM **138** **M&M 2015 STUDENT AWARDEE** *In Situ Analysis of the Fracture Behavior of Nanocrystalline Copper Using Precession-Assisted Crystal Orientation Mapping*; PF Rottmann, K Hemker; Johns Hopkins University
POSTER # 64

P06.P1 Failure Analysis Applications of Microanalysis, Microscopy, Metallography, and Fractography

POSTER SESSION

Monday 3:00 PM • Exhibit Hall

3:00 PM **139** *Observation of the Potential Distribution in Gan-based Devices by a Scanning Electron Microscope*; T Karumi, S Tanaka; Nagoya University, Japan
POSTER # 65

3:00 PM **140** *Denickelification and Dezincification of Copper Alloys in Water Environments*; J-F Liu, M Esmacher, D Kotwica; GE Power & Water
POSTER # 66

3:00 PM **141** *Application of EFTEM and XEDS Elemental Mapping to Characterization of Nanometer Devices in Semiconductor Wafer-Foundries*; WW Zhao, M Gribelyuk, JD Russell; GlobalFoundries
POSTER # 67

Scientific Program

Monday, August 3

3:00 PM **142 M&M 2015 STUDENT AWARDEE** *Isolating the Photocatalytic Degradation of Methylene Blue Dye on TiO₂ Surface*; SP Fowler, E Molina, E Rodriguez-Ariza; Portland State University; S Quinton-Cox; Oregon State University; J Jiao; Portland State University

POSTER # 68

3:00 PM **143** *Influence of Hydrogen on Fracture Mode API X60 Steel Aged*; Gg Gonzalez-mancera, Vc Cortes, Ma Alberto; Universidad Autonoma De Mexico

POSTER # 69

3:00 PM **144** *Electron energy-loss Spectroscopy Study of NbO_x Film for Resistive Memory Applications*; J Zhang, K Norris, K Samuels, N Ge, M Zhang; HP Labs; J Park; Stanford University; Z li, RS Williams; HP Labs, et al.

POSTER # 70

3:00 PM **145** *Microscopic Origin of Strength and MicroHardness of Titanium Alloy at Elevated Temperature*; M Islam, C Fermin, H Aglan; Tuskegee University

POSTER # 71

P08.P1 Microscopy and Characterization of Ceramics, Polymers, and Composites

POSTER SESSION

Monday 3:00 PM • Exhibit Hall

3:00 PM **146** *Microstructural Properties of Piezoelectric 0.95(Na_{0.5}Bi_{0.5}TiO₃)-0.5(BaTiO₃) Thin Films on SrTiO₃ (001) Substrates*; X-w Jin, L Lu, S-b Mi, C-l Jia; The School of Electronic and Information Engineering, China

POSTER # 72

3:00 PM **147** *TEM Study of Nano Crystals in Li₂O-Al₂O₃-SiO₂ Glass-Ceramics*; S-C Liou, W-A Chiou; University of Maryland

POSTER # 73

3:00 PM **148** *A New Method to Characterize Non-oxide Thin Film Uniformity at Device Level Using Electron Energy Loss Spectroscopy*; Z li, L chen, J fang, H wang, L hong, X jiang, Y zheng; Western Digital Corporation

POSTER # 74

3:00 PM **149** *The Influence of pH Buffer as Agent Reaction Moderator in the Growth of CdS/ZnS Films by CBD Technique for Solar Cell Applications*; F Vázquez-Monroy, A García-Barrientos; Universidad Tecnológica Tula-Tepeji, Mexico; JL Bernal-Ponce; Universidad Politécnica de Pachuca, Mexico; J Plaza-Castillo; Universidad del Atlántico, Colombia; H Romero-Trejo; Universidad Autónoma del Estado de Hidalgo, Mexico; R Ramírez-Bon; Cinvestav Unidad Querétaro, Mexico

POSTER # 75

3:00 PM **150** *Pressure Effect on the Deposition in the a-Si:H films by PECVD Process for Solar Cell Applications*; J Plaza- Castillo, A Garcia-Barrientos; Universidad del Atlántico, Barranquilla; M Moreno-Moreno; Instituto Nacional de Astrofísica, Óptica y Electrónica, Mexico; K Vizcaíno; Universidad del Atlántico, Columbia; JA Hoyo-Montaño, G Valencia-Palomo; Instituto Tecnológico de Hermosillo, Mexico

POSTER # 76

3:00 PM **151** *Direct evidence of basal-bonded MoS₂ cluster on Al₂O₃ support*; C Angeles-Chavez, JA Toledo-Antonio, MA Cortes-Jacome; Instituto Mexicano del Petroleo

POSTER # 77

3:00 PM **152** *Observations on Orientation Relationships between Rutile and Brookite*; MJ Arellano-Jimenez, MT Janish; The University of Texas at San Antonio; WA Rodriguez-Rodriguez; University of Connecticut; BB McKenzie, JR Michael; Sandia National Laboratories; CB Carter; University of Connecticut

POSTER # 78

3:00 PM **153** *The Use of Electron Microscopy Techniques to Determine the Oxidation Mechanism SiAlON Ceramics Containing Yb₂O₃+Sm₂O₃+CaO as Sintering Additives*; S Baskut, S Turan; Anadolu University, Turkey

POSTER # 79

3:00 PM **154** *Microstructural Characteristics of (Na_{0.5}K_{0.5})NbO₃ Ceramics with Additives: Transmission Electron Microscopy Study*; YH Kim, H Ryu, H-J Lee, Y-K Cho; Korea Research Institute of Standards and Science, South Korea; S Nahm; Korea University, South Korea; SJ Ahn; Korea Research Institute of Standards and Science, South Korea

POSTER # 80

3:00 PM **155** *Synthesis of Mesopores of Zirconia by Using CTAC as Template*; A Medina, S Borjas, B Quezadas, L Béjar; Universidad Michoacana de San Nicolás de Hidalgo, Mexico; C Aguilar; Universidad Técnica Federico Santa María, Chile; JL Bernal; Universidad Politécnica de Pachuca, Mexico

POSTER # 81

3:00 PM **156** *Effect Zirconia's Phases in the Production of Hydroxyapatite*; HE Esparza, KA Jurado, A Reyes, MC Aragón; Centro de Investigación en Materiales Avanzados, Mexico

POSTER # 82

3:00 PM **157** *Closing-Loops Producing Added-Value Products as a Cost-Reduction Strategy in the Operation of Biorefineries*; LA Dempere, W Kerstein, E Ten, W Vermerris; University of Florida

POSTER # 83

3:00 PM **158** *TEM / HREM Observations of Thin Foils Obtained by SEM-FIB for the Study of the Phase Transitions in Chromium Slag Vittrification*; S Ballesteros, JM Rincón; CETYS Universidad, Tijuana, Mexico

POSTER # 84

Scientific Program

P

PHYSICAL SCIENCES POSTER SESSIONS

MONDAY AFTERNOON *continued*

- 3:00 PM **159** *An Improved TEM Sample Preparation Technique for Heavily Deformed Ceramic Materials having Extensive Sub-Surface Cracking*; JJ Swab, CV Weiss Brennan; U S Army Research Laboratory; SD Walck; TKC Global; JC LaSalvia; U S Army Research Laboratory; KD Behler; TKC Global
POSTER # 85
- 3:00 PM **160** *Microtomy on Heat-treated Electro-spun TiO₂ Fibers*; MJ Arellano-Jimenez, M Janish; The University of Texas at San Antonio; P Kotula; Sandia National Laboratories; W Rodriguez, CB Carter; University of Connecticut
POSTER # 86
- 3:00 PM **161** *From Flat Membranes to Fabrication of Hollow Spun Fibers of Polyethersulfone/ Polyvinylpyrrolidone (PES/PVP) - Correlative Scanning Electron Microscopy (FE-SEM), 3D X ray Microscopy and Ultrafiltration Properties*; P Bajaj, A Berzinis, R Halbfinger, CP Strom; Sabic Innovative Plastics; L Peters, M Wessling; RWTH, Aachen University, Germany; N Kotwal; Carl Zeiss Microscopy, Inc.
POSTER # 87
- 3:00 PM **161.1** *Microstructure and Dislocation Analysis of L10 FePt for HAMR Media Application*; Y Yang, J Hu, KK Cher, SK Wong, YYK Hnin, NC Lim, SL Ng, J Shi; Data Storage Institute, A*STAR, Singapore
POSTER # 87-A
- 3:00 PM **165** *STEM-HAADF Imaging Study of Spinel Cubic Li₄Ti₅O₁₂ Nanocrystals*; XS Sun, K Sun, B Cui; University of Waterloo, Canada
POSTER # 91
- 3:00 PM **166** *Dynamic Observation of Tunnel-driven Lithiation Process in Single Crystalline α MnO₂ Nanowires*; Y Yuan, A Nie, G Odegard; Michigan Technological University; K He; Shandong University; D Zhou; Argonne National Laboratory; S Santhanagopalan, D Meng; University of Texas at Arlington, R Klie; University of Illinois at Chicago, et al.
POSTER # 92
- 3:00 PM **167** *EELS Analysis Of Lithiation/Delithiation Reactions In LiFePO₄*; J Schneider-Haefner, D Su; Rutgers University; Y Wang, J Fang, F Omenya, N Chernova; Binghamton University; F Cosandey; Rutgers University
POSTER # 93
- 3:00 PM **168** *Atomic Observation of Phase Transformation from Spinel to Rock Salt in Lithium Manganese Oxide*; P Gao, R Ishikawa, E Tochigi, A Kumamoto, N Shibata, Y Ikuhara; The University of Tokyo, Japan
POSTER # 94
- 3:00 PM **169** *Microscopic Characterization of Electrodeposited Mg Layers for Battery Application*; M Bachhav, P-W Chu, E Nelson, A Crowe, B Bartlett; University of Michigan; N Hahn, K Zavadil; Sandia National Laboratories, E Marquis; University of Michigan
POSTER # 95

P11.P1 Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials

POSTER SESSION

Monday 3:00 PM • Exhibit Hall

- 3:00 PM **162** *Surface Coating Effect on Si Nanowires Anode for Lithium Ion Batteries*; L Luo, P Yan, J-G Zhang, C Ban, C Wang; Pacific Northwest National Laboratory
POSTER # 88
- 3:00 PM **163** *EELS Investigations of Aging Mechanisms in LiFePO₄ Cathodes Resulting From Prolonged Electrochemical Cycling*; Sa Channagiri, Fj Scheltens, Na Warner, M Canova, Y Guezennec, Dw McComb; The Ohio State University
POSTER # 89
- 3:00 PM **164** *Contrasting Reaction Modality between Electrochemical Sodiation and Lithiation in NiO Conversion Electrode Materials*; K He, F Lin, EA Stach; Brookhaven National Laboratory; Y Mo; University of Maryland; HL Xin, D Su; Brookhaven National Laboratory
POSTER # 90

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—TUESDAY MORNING

A01.2 Vendor Symposium: New Tools for Life and Materials Sciences

SESSION CHAIR:

Chris Kiely, Lehigh University

PLATFORM SESSION

Tuesday 8:30 AM • Room: C125

- 8:30 AM **170** *New Developments in Automated Particle Analysis in the Electron Microscope – from Micro to Nano*; C Lang, M Hiscock, J Holland; Oxford Instruments Nanoanalysis; S Yamaguchi; Oxford Instruments, United Kingdom; D Joyce, G Vatougia; Mantis Deposition Ltd., United Kingdom
- 8:45 AM **171** *STEM-EDXS System for Atomic-Sensitivity Elemental Mapping*; TC Lovejoy, RM Stroud; Nion; ND Bassim; Naval Research Lab; GJ Corbin, N Dellby; Nion; W Hahn, M Falke; Bruker Nano GmbH, Germany, O Krivanek; Nion, et al.
- 9:00 AM **172** *Aberration Correction System Using Segmented Detector in STEM*; Y Kohno, H Sawada; JEOL Ltd, Japan; N Shibata; The University of Tokyo, Japan
- 9:15 AM **173** *From Scintillator-based Detector to Direct Electron Detector: High Performance of Next Generation of Camera for In Situ TEM Testing and TEM Imaging*; H Guo, L Jin; Direct Electron, LP; P Lu, Z Wang, Z Shan; Xi'an Jiaotong University, China; B Bammes, M Spilman, R Bilhorn; Direct Electron, LP
- 9:30 AM **174** *Imaging Contrast with Multiple Ion Beams*; H Wu, S Sijbrandij, S McVey, J Nottle; Carl Zeiss Microscopy LLC
- 9:45 AM **175** *The Ultra-stable Scanning Transmission Electron Holography Microscope*; RA Herring, D Hoyle; University of Victoria, Australia

A12.2 Low Voltage Electron Microscopy

SESSION CHAIRS:

David C. Bell, Harvard University

Natasha Erdman, JEOL USA Inc.

Jingyue Liu, Arizona State University

PLATFORM SESSION

Tuesday 8:30 AM • Room: B117

- 8:30 AM **176** (Invited) *Opportunities for Low-Voltage TEM/STEM*; RF Egerton; University of Alberta, Canada

- 9:00 AM **177** *Development of a Monochromated and Aberration-corrected Low-voltage (S)TEM*; M Mukai, S Morishita, H Sawada; JEOL Ltd, Japan; LH Tizei, Y-C Lin; AIST National Institute of Advanced Industrial Science and Technology, Japan; K Kimoto; National Institute for Materials Science, Japan; K Suenaga; National Institute of Advanced Industrial Science and Technology, Japan

- 9:15 AM **178** *Demonstration of 40kV TEM Diffraction of Graphite for Structural Analysis*; A Barnum, J Jiao; Portland State University

- 9:30 AM **179** (Invited) *Strategies for High-Resolution Imaging of Radiation-Sensitive Materials in an Aberration-Corrected Transmission Electron Microscope*; UA Kaiser; Universität Ulm, Germany

A13.2 Advancing Data Collection and Analysis for Atom Probe Tomography

SESSION CHAIRS:

Brian Gorman, Colorado School of Mines

R. Prakash Kolli, University of Maryland

Richard Martens, University of Alabama

PLATFORM SESSION

Tuesday 8:30 AM • Room: B115

- 8:30 AM **180** (Invited) *Investigation into Solute Stabilizing Effects in Nanocrystalline Materials: An Atom Probe Characterization Study*; GB Thompson, M Kapoor, T Kaub; The University of Alabama; B Boyce, B Clarke; Sandia National Laboratories; K Darling; Army Research Laboratory; P Feller, J Cairney; The University of Sydney, Australia
- 9:00 AM **181** *Precipitation in Highly Supersaturated Al-Sc-V, Al-Sc-Nb, and Al-Sc-Ta Alloys During Isochronal Aging*; KE Knipling; U S Naval Research Laboratory
- 9:15 AM **182** *Co-deformation of Crystalline-amorphous Nanolaminates*; W Guo, J Yao, EA Jägle, P-P Choi, D Raabe; Max Planck Institut für Eisenforschung, Germany
- 9:30 AM **183** *An Experimental and Simulation Studies of a High Strain-rate Deformation Shear Band in a High-nickel Steel*; S-I Baik, D Isheim, D Jain; Northwestern University; RK Gupta, S Kumar; Brown University; DN Seidman; Northwestern University
- 9:45 AM **184** *Characterization of Element Partitioning at the Austenite/Ferrite Interface of as Cast CF-3 and CF-8 Duplex Stainless Steels*; RP Kolli, S Mburu; University of Maryland; DE Perea, J Liu; Pacific Northwest National Laboratory; SC Schwarm; University of Maryland; A Eaton; Pacific Northwest National Laboratory; S Ankem; University of Maryland

Scientific Program

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—TUESDAY MORNING *continued*

A18.1 Core Facility Management

SESSION CHAIRS:

Randy Nessler, University of Iowa
Chris Branter, George Washington University
Tom Williams, University of Idaho

PLATFORM SESSION

Tuesday 8:30 AM • Room: C124

- 8:30 AM **185** (Invited) *Designing Analytical Instrument Control Systems for Longevity and Maximum Upward Compatibility*; EL Principe, V Filip; Tescan USA
- 9:00 AM **186** *Now What am I Going to do.....This is Going to be a Large Data Set*; CA Brantner; The George Washington University
- 9:15 AM **187** *Networked Data Storage and Analysis for the Wisconsin Regional Materials Network*; JJ McCarthy, PM Voyles, JA Last, DR Bittner, IW Sadkovich; University of Wisconsin, Madison
- 9:30 AM **188** (Invited) *Strategies for Managing Information Technology (IT) in Microscopy Facilities*; JHJ Scott; National Institute of Standards and Technology

B

BIOLOGICAL SCIENCES SYMPOSIA TUESDAY MORNING

B01.2 The R.P. Apkarian Memorial Symposium on Cryo-HRSEM

SESSION CHAIRS:

Elizabeth Wright, Emory University
Cameron Ackerley, Hospital for Sick Children

PLATFORM SESSION

Tuesday 8:30 AM • Room: B112

- 8:30 AM **189** (Invited) *Cryo-EM Methods for the Structural Analysis of Biomimetic Materials Based on Peptides and Proteins*. VP Conticello; Emory University
- 9:00 AM **190** *Cryo-Planing Vs Freeze Fracture: Sample Preparation for Cryo-HRSEM*; IY Chang, D Joester; Northwestern University
- 9:15 AM **191** *Serial Block Face-Scanning Electron Microscopy of the Developing Rat Brain Exposed to Ketamine Reveals Changes in Mitochondrial Ultrastructure*; T Eustaquio, C Wang, CK Dugard, F Liu, W Slikker, MG Paule, P Howard, AM Paredes; U S Food and Drug Administration, et al.

- 9:30 AM **192** *Architecture of Pancreatic Islets Imaged by Serial Block Face SEM*; RD Leapman, MA Aronova, A Shomorony, CR Pfeifer, JD Hoyne, GN Calco, BC Kuo, G Zhang; National Institute of Biomedical Imaging and Bioengineering, NIH, et al.

- 9:45 AM **193** *Correlating Cryo-Electron Microscopy Methods for Structural Studies of Bacteria*; ER Wright, H Yi, JV Taylor, RC Guerrero-Ferreira, CM Hampton; Emory University

B04.1 Advances in Specimen Preparation and Correlative LM-EM (CLEM) of Biological Samples

SESSION CHAIR:

Kent McDonald, University of California, Berkeley

PLATFORM SESSION

Tuesday 8:30 AM • Room: C122

- 8:30 AM **194** (Invited) *Placing Molecules in a Cellular Context Using Light, Electron and X-ray Microscopy*; LM Collinson; Francis Crick Institute, United Kingdom
- 9:00 AM **195** (Invited) *Important Steps in a Correlative Light Electron Microscopy Experiment*; P Verkade; University of Bristol, United Kingdom
- 9:30 AM **196** (Invited) *Correlating Microscopies From Differing Imaging Modalities: From Experimental Design to Alignment and Overlay of Images*; DR Keene, SF Tufa; Shriners Hospital for Children

B07.2 Microscopy, Microanalysis, and Image Cytometry in the Pharmaceutical Sciences

SESSION CHAIRS:

Lynn M. DiMemmo, Bristol-Meyers Squibb
John Bruce Green, Baxter International Inc.

PLATFORM SESSION

Tuesday 8:30 AM • Room: B119

- 8:30 AM **197** (Invited) *Simultaneously Measuring Red Blood Cell Flux in vivo for a Large Number of Retinal Capillary Vessels Using Optical Coherence Tomography*; RK Wang, Z Zhi; University of Washington
- 9:00 AM **198** *Efficient and Documented Preparation of Pharmaceutical Particles for Correlative Microscopy Analyses Using mPrep™ Capsule Processing*; SL Goodman; Microscopy Innovations LLC
- 9:15 AM **199** (Invited) *Characterization of Glass Delamination by TEM: Results from a New Sample Preparation Technique*; EF Schumacher, HM Talesky, KJ Diebold; McCrone Associates, Inc.

9:45 AM **200** *Prospects for High Resolution Analytical Electron Microscopy of Organic Crystalline Particles*; J Cattle, M S'ari; University of Leeds; N Wilkinson; Gatan United Kingdom; N Hondow, A Brown, R Brydson; University of Leeds, United Kingdom

B09.2 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants, and Animals

SESSION CHAIRS:

W. Gray Jerome, Vanderbilt University

Jon Charlesworth, Mayo Clinic

Gang Ning, Pennsylvania State University

Betty Thompkins, University of Pennsylvania

PLATFORM SESSION

Tuesday 8:30 AM • Room: D138

8:30 AM **201** *The Wisconsin Electron Microscopy Diagnostic Proficiency Program*; CA Radi, SE Miller; Wisconsin Veterinary Diagnostic Laboratory; C Goldsmith; Centers for Disease Control and Prevention; K Toohey-Kurth; Wisconsin Veterinary Diagnostic Laboratory

8:45 AM **202** (Invited) *Micro Computed Tomographic X-ray Imaging (Micro CT): A Versatile and Non-Destructive Method for Biological Specimens*; JC Williams; Indiana University School of Medicine

9:15 AM **204** *Nanoscale 3D Refractive Indices Mapping on Native Cheek Cells by Axial Scanning Transmission Electron Tomography*; Y Li, J Wu, R Bleher, V Dravid, V Backman; Northwestern University

9:30 AM **205** (Invited) *Is Electron Microscopy Relevant Anymore in Diagnosis of Disease?*; WT Ginning; University of Toledo

B10.2 Multiscale Biological Imaging: From Micro to Macro — Animal to Clinical Models

SESSION CHAIRS:

Kevin Eliceiri, University of Wisconsin Madison

David Entenberg, Albert Einstein College of Medicine

PLATFORM SESSION

Tuesday 8:30 AM • Room: C120

8:30 AM **206** (Invited) *Imaging the Alphavirus Exit Pathway*; MG Martinez, E-L Snapp; Department of Cell Biology, Albert Einstein College of Medicine; GS Perumal, FP Macaluso; Analytical Imaging Facility, Albert Einstein College of Medicine; M Kielian; Department of Cell Biology, Albert Einstein College of Medicine

9:00 AM **207** *Localization and Number of Au Nanoparticles in Optically Indexed Cells Using FIB Tomography*; AW Sanders, KM Jeerage, AE Curtin, AN Chiamonti; National Institute of Standards and Technology

9:15 AM **208** (Invited) *Swept Confocally-Aligned Planar Excitation (SCAPE) Microscopy for High Speed Volumetric Imaging in Behaving Animals*; EM Hillman; Columbia University

9:45 AM **209** *Correlative Large Volume Imaging Across Scales*; RR Schroeder, H Blank; Universitätsklinikum Heidelberg, Universität Heidelberg; A Schertel, M Thaler, A Orchowski; Carl Zeiss Microscopy GmbH, Germany; I Wacker; Universität Heidelberg, Germany

P

PHYSICAL SCIENCES SYMPOSIA

TUESDAY MORNING

P01.2 Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on *In Situ* TEM and STEM

SESSION CHAIRS:

M. Grace Burke, University of Manchester, United Kingdom

Ondrej Krivanek, Nion Inc.

Peter Crozier, Arizona State University

PLATFORM SESSION

Tuesday 8:30 AM • Room: B116

8:30 AM **210** (Invited) *Latest Developments for In Situ Measurements of Gas-solid Interactions*; R Sharma, PA Lin; National Institute of Standards and Technology; M Picher; University of Maryland; Z Hussaini; National Institute of Standards and Technology

9:00 AM **211** *Electron Microscopy Advances for Studies of Catalysis at Atomic-Resolution and at Ambient Pressure Levels*; CF Elkjær, SB Vendelbo; Haldor Topsøe A/S, Denmark; P Dona; FEI Company; R van Rijn; Leiden Probe Microscopy BV, Denmark; F Creemer; Delft University of Technology, Denmark; I Chorkendorff; Technical University of Denmark; P Kooyman; Delft University of Technology, Denmark, S Helveg; Haldor Topsøe A/S, Denmark, et al.

9:15 AM **212** *Atomic-scale Dynamics in Catalysts for Sulfur Chemistry*; LP Hansen, F Cavalca, CC Appel, M Brorson, P Beato, J Hyltoft, KA Christensen, S Helveg; Haldor Topsøe A/S, Denmark

9:30 AM **213** *In Situ Observation of Ag Nanoparticle Catalyzed Oxidation of Carbon Nanotubes in an Aberration-corrected Environmental TEM*; Y Yue, D Yuchi, J Xu; Arizona State University; L Guo; Beihang University, China; J Liu; Arizona State University

9:45 AM **214** *In Situ Environmental Transmission Electron Microscopy of Ice Nucleation*; LM Gordon, L Kovarik; Pacific Northwest National Laboratory

Scientific Program

P

PHYSICAL SCIENCES SYMPOSIA

TUESDAY MORNING *continued*

P04.3 Nano-Characterization of Low Dimensional Materials: Carbon to 2D TMDs

SESSION CHAIRS:

Moon Kim, University of Texas at Dallas

Zonghoon Lee, Ulsan National Institute of Science and Technology, South Korea

Quentin Ramasse, SuperSTEM, United Kingdom

PLATFORM SESSION

Tuesday 8:30 AM • Room: B114

8:30 AM **215** *STEM and EELS Investigation on Black Phosphorus at Atomic Resolution*; G Nicotra, AM Mio; CNR-Istituto per la Microelettronica e i Microsistemi, Italy; A Cupolillo; Università della Calabria, Italy; J Hu, J Wei, Z Mao; Tulane University; A Poitano; Università della Calabria, Italy; C Spinella; CNR-Istituto per la Microelettronica e i Microsistemi, Italy, et al.

8:45 AM **216** *Atomic Resolved phase Map of MoS₂ Monolayer Sheet Retrieved by Spherical Aberration Corrected Transport of Intensity Equation*. X Zhang, Y Oshima; Tokyo institute of Technology, Japan

9:00 AM **217** (Invited) *Aberration Corrected High Angle Annular Dark Field (HAADF) Scanning Transmission Electron Microscopy (STEM) and In Situ Transmission Electron Microscopy (TEM) Study of Transition Metal Dichalcogenides (TMDs)*; J Wang, N Lu, JP Oviedo, X Peng, G Lian, MJ Kim; The University of Texas at Dallas

9:30 AM **218** **M&M 2015 STUDENT AWARDEE** *Defect Dynamics in 2D Transition Metal Dichalcogenide Monolayers*; J Lin, Y Zhang, S Pantelides; Vanderbilt University; W Zhou; Oak Ridge National Lab

9:45 AM **219** *Individual Mo Dopant Atoms in WS₂ Monolayers: Atomic Structure and Induced Strain*; A Azizi, B Jiang, Z Lin, A Laura Elías, M Terrones, N Alem; The Pennsylvania State University

P05.2 Nuclear and Irradiated Materials: Fundamental Defect Properties

SESSION CHAIRS:

Chad M. Parish, Oak Ridge National Laboratory

Khalid Hattar, Sandia National Laboratories

Arthur T. Motta, Pennsylvania State University

PLATFORM SESSION

Tuesday 8:30 AM • Room: D135

8:30 AM **220** (Invited) *TEM with In Situ Ion Irradiation of Nuclear Materials: The IVEM-Tandem User Facility*; M Li, MA Kirk, PM Baldo, EA Ryan; Argonne National Laboratory

9:00 AM **221** *Effect of Grain Boundary Structure on Defect Absorption and Denuded Zone Formation in Irradiated Nanocrystalline Iron*; O El-Atwani, K Hattar, GA Vetterick, ML Taheri; Drexel University

9:15 AM **222** *Correlative and Dynamic In Situ S/TEM Characterization of Heavily Irradiated Pyrochlores and Fluorites*; TG Holesinger, S Dey; Los Alamos National Laboratory; JA Aguiar; National Renewable Energy Lab; PA Papin, JA Valdez, Y Wang, BP Uberuaga; Los Alamos National Laboratory, RH Castro; University of California, Davis

9:30 AM **223** (Invited) *In Situ Probing of the Evolution of Irradiation-induced Defects in Copper*; N Li, K Hattar; Los Alamos National Laboratory; A Misra; University of Michigan

P06.1 Failure Analysis Applications of Microanalysis, Microscopy, Metallography, and Fractography

SESSION CHAIRS:

Daniel Dennies, Exponent, Inc.

William Kane, Exponent, Inc.

PLATFORM SESSION

Tuesday 8:30 AM • Room: D140

8:30 AM **224** (Invited) *The Role of Computed X-ray Tomography in a Metallurgical Analysis*; ND Budiansky, O Van Der Schijff, J Forman; Exponent, Inc.

9:00 AM **225** *Characterizing Failure in Commercial Li-Ion Batteries with 4D X-Ray Microscopy*; J Gelb, P Shearing; San Jose State University; D Finegan, D Brett; University College London, United Kingdom

9:15 AM **226** (Invited) *X-Ray Microcomputed Tomography for Analysis of Retrieved Medical Devices*; JS Day, DW MacDonald; Exponent, Inc.; SM Kurtz; Drexel University

9:45 AM **227** *MicroStamping for Improved Speckle Patterns to Enable Digital Image Correlation*; AH Cannon, JD Hochhalter; 1900 Engineering; AW Mello; Purdue University; GF Bomarito; NASA Langley Research Center; MD Sangid; Purdue University

P07.1 Metallography and Microstructural Characterization of Metals

SESSION CHAIRS:

James E. Martinez, NASA Johnson Space Center
George Vander Voort, Vander Voort Consulting

PLATFORM SESSION

Tuesday 8:30 AM • Room: C123

8:30 AM **228** (Invited) *Microstructural Characterization and Image Analysis in Ex-Service Ethylene Pyrolysis Tubes*; AC McLeod, CM Bishop; University of Canterbury, New Zealand; KJ Stevens; Quest Integrity NZL Ltd; MV Kral; University of Canterbury, New Zealand

9:00 AM **229** *MIPAR™: 2D and 3D Microstructural Characterization Software Designed for Materials Scientists, by Materials Scientists*; JM Sosa, DE Huber, BA Welk, HL Fraser; The Ohio State University

9:15 AM **230** (Invited) *Industrial Application of Thixomet Image Analyzer for Quantitative Description of Steel and Alloys Microstructure*; AA Kazakov, D Kiselev; St Petersburg State Polytechnical University, Russia

9:45 AM **231** *Quantitative Image Analysis of White Etching Areas in SAE52100 Bearing Steel*; PT Pinard, M Öz, M Ploß, S Richter; RWTH Aachen University, Germany

P09.2 Microscopy of Additive Manufacturing and 3D Printing in Materials and Biology

SESSION CHAIRS:

John Porter, UES Inc.
John Wooten, CalRAM Inc.
Jay Potts, University of South Carolina

PLATFORM SESSION

Tuesday 8:30 AM • Room: D137

8:30 AM **232** (Invited) *Novel Materials and Structures Fabricated by Electron Beam Melting*; H West, O Harrysson, T Horn; North Carolina State University; D Cormier, R AM An; Rochester Institute of Technology; D Marcellin-Little; North Carolina State University

9:00 AM **233** *Microstructural Analysis of 3D-Printed Alloy 718*; G Bertali, Y Wang, J Lim, F Scenini; The University of Manchester, United Kingdom; CJ Long, PD Freyer; Westinghouse Electric Company LLC; G Burke; The University of Manchester, United Kingdom

9:15 AM **234** *Characterization of Nickel Based Superalloys Processed Through Direct Metal Laser Sintering Technique of Additive Manufacturing*; Y Idell, C Campbell, L Levine, F Zhang; National Institute of Standards and Technology; G Olson, D Snyder; QuesTek Innovations, LLC

9:30 AM **235** *Comparison of Additive Manufactured and Conventional 316L Stainless Steels*; JJ Lim, LR Malheiros, G Bertali, GM Burke; The University of Manchester, United Kingdom; PD Freyer, CJ Long; Westinghouse Electric Company

9:45 AM **236** *Imaging the Rapid Solidification of Metallic Alloys in the TEM*; JD Roehling, A Perron, J-L Fattebert; Lawrence Livermore National Laboratory; DR Coughlin, PJ Gibbs, AJ Clarke; Los Alamos National Laboratory; PE Turchi, JT McKeown; Lawrence Livermore National Laboratory, et al.

P11.2 Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials

SESSION CHAIRS:

Chongmin Wang, Pacific Northwest National Laboratory
Raymond Unocic, Oak Ridge National Laboratory
Arda Genc, FEI

PLATFORM SESSION

Tuesday 8:30 AM • Room: B113

8:30 AM **237** (Invited) *Advanced Electron Microscopy for Energy-Related Materials*; R Ishikawa, N Shibata, Y Ikuhara; Institute of Engineering Innovation, University of Tokyo, Japan

9:00 AM **238 M&M POST-DOCTORAL RESEARCHER AWARDEE** *Charge-discharge Cycling Induced Structural and Chemical Evolution of Li_2MnO_3 Cathode for Li-ion Batteries*; P Yan; Pacific Northwest National Laboratory

9:30 AM **239** *Lithium Ordering in Next-Generation High-Voltage Lithium-Rich Layered Oxide Cathode Battery Materials*; M Behr, M Lowe, B Vanchura, F Zhou, W Liu, J Liu; The Dow Chemical Company

9:45 AM **240 M&M 2015 STUDENT AWARDEE** *Comparison of Co_3O_4 and CoO Nanoparticles as Anodes for Lithium-ion Batteries*; JC Li, K He; Stony Brook University and Brookhaven National Laboratory; EA Stach, D Su; Brookhaven National Laboratory

Scientific Program



OUTREACH TUESDAY MORNING

X90.1 Microscopy in the Classroom

SESSION CHAIRS:

Craig Queenan, Bergen County Academies
Alyssa Waldron, Bergen County Academies
Dave Becker, Bergen County Academies

SPECIAL EDUCATION SESSION

Tuesday 8:30 AM • Room: B110

8:30 AM 241 (Invited) *The Evolution of Project NANO: A Program that Enables Students to Explore in Real Time Several Crosscutting Concepts of the Next Generation Science Standards*; SL Cady, M Blok; PNNL Pacific Northwest National Laboratory; K Grosse; Lake Oswego High School; J Wells; Portland State University

9:00 AM 242 (Invited) *Electron Microscopy Education Outreach for Secondary and Professional Education*; G Baty, B Miner; Portland State University; E Koehler; Saturday Academy; Z Chen; Portland State University



ADVANCES IN INSTRUMENTATION SYMPOSIA—TUESDAY MORNING

A05.1 Fast and Ultrafast Imaging with Electrons and Photons

SESSION CHAIRS:

David Flannigan, University of Minnesota
Hermann Durr, Stanford University
Joanna Atkin, University of Colorado

PLATFORM SESSION

Tuesday 10:30 AM • Room: A105

10:30 AM 243 (Invited) *Direct Observations of Photoexcitation Induced Dynamics of Charge Density Wave and Charge-Orbital Ordered State Using 2.8 MeV Ultrafast Electron Diffraction*; Y Zhu, P Zhu, L Wu, J Li, T Konstantinova; Brookhaven National Laboratory; J Cao; Florida State University; Y Hidaka; Brookhaven National Laboratory, X Wang; SLAC National Accelerator Laboratory, et al.

11:00 AM 244 (Invited) *Pump-probe X-ray Holographic Imaging of Dynamic Magnetization Processes down to the Femtosecond Timescale*; S Eisebitt; Technische Universität Berlin, Germany

11:30 AM 245 (Invited) *Probing Ultrafast Carrier Dynamics by Laser-combined STM*; H Shigekawa, S Yoshida, O Takeuchi; University of Tsukuba, Japan

A06.1 Advanced Analytical TEM/STEM

SESSION CHAIRS:

Paul Kotula, Sandia National Laboratories
Masashi Watanabe, Lehigh University
Gerald Kothlietner, Graz University of Technology, Austria

PLATFORM SESSION

Tuesday 10:30 AM • Room: A106

10:30 AM 246 (Invited) *Advanced Analytical Electron Microscopy: New Perspectives on Real Materials*; MG Burke, SJ Haigh, J Lim, A Janssen; University of Manchester, United Kingdom

11:00 AM 247 *Grain Boundaries Across Length Scales; Correlating SEM, Aberration-Corrected TEM Orientation Imaging and Nanospectroscopy*; WJ Bowman, A Darbal; Arizona State University; M Kelly, GS Rohrer; Carnegie Mellon University; CA Hernandez, K McGuinness, PA Crozier; Arizona State University

11:15 AM 248 *Super-X EDS Characterization of Chemical Segregation within a Superlattice Extrinsic Stacking Fault of a Ni-based Superalloy*; RE Williams, T Smith, BD Esser, N Antolin, W Windl, DW McComb, MJ Mills, HL Fraser; The Ohio State University

11:30 AM 249 *Atomic-scale Dual-EELS/EDX Spectroscopy Applied to Rare-earth Oxide Superlattices*; PJ Phillips, P Longo; University of Illinois at Chicago; E Okunishi; JEOL EM Application Group; RF Klie; University of Illinois at Chicago

11:45 AM 250 *Oxygen Intercalation and Doping-Induced 2D High-T_c Superconductivity at the CaCuO₂/SrTiO₃ Interface*; C Cantoni, D Di Castro; Oak Ridge National Laboratory; G Balestrino; Università di Roma Tor Vergata, Italy

A11.2 Electron Vortex Beams and Higher-Order Beam Modes

SESSION CHAIRS:

Benjamin J. McMoran, University of Oregon
Juan-Carlos Idrobo, Oak Ridge National Laboratory

PLATFORM SESSION

Tuesday 10:30 AM • Room: D139

10:30 AM 251 (Invited) *Mapping Magnetic Properties of Materials At Atomic Spatial Resolution*; J Rusz, J-C Idrobo; Uppsala University, Sweden; S Bhowmick; Indian Institute of Technology; J Spiegelberg; Uppsala University, Sweden; S Bhowmick; Indian Institute of Technology

11:00 AM 252 *At-Focus Observations of High Quality Electron Vortex Beams Created from Ferromagnetic Rods*; AM Blackburn, JC Loudon; Hitachi Cambridge Laboratory, United Kingdom; R Herring; University of Victoria, Canada; A Hrabec; University of Leeds, United Kingdom; D Hoyle; Hitachi High-Technologies Canada

11:15 AM 253 *Electron Holograms Encoding Amplitude and Phase for the Generation of Arbitrary Wavefunctions*; V Grillo, E Karimi; CNR-Istituto Nanoscienze, Italy; R Balboni; CNR-Istituto per la Microelettronica e i Microsistemi, Italy; GC Gazzadi; CNR-Istituto Nanoscienze; F Venturi, S Frabboni; Università di Modena e Reggio Emilia, Italy; BJ McMorran; University of Oregon, RW Boyd; University of Ottawa, Canada, et al.

11:30 AM 254 (Invited) *Electron Vortex Beams for Magnetic Measurements on Ferromagnetic Samples via STEM*; D Pohl, J Ruzs, S Schneider; IFW Dresden; P Tiemeijer; FEI Company; B Rellinghaus; IFW Dresden

A12.3 Low Voltage Electron Microscopy

SESSION CHAIRS:

David C. Bell, Harvard University
Natasha Erdman, JEOL USA Inc.
Jingyue Liu, Arizona State University

PLATFORM SESSION

Tuesday 10:30 AM • Room: B117

10:30 AM 255 (Invited) *Low Voltage SEM and Correlative Microscopy to Analyze Delicate Biological Material*; H-Schatten; University of Missouri

11:00 AM 256 MILLER STUDENT SCHOLARSHIP AWARD
Structural Biology at The Single Particle Level: Imaging Tobacco Mosaic Virus by Low-Energy Electron Holography; J-N Longchamp, T Latychevskaia, C Escher, H-W Fink; University of Zurich, Switzerland

11:15 AM 257 (Invited) *Helium Ion Microscopy of Plant Tissues and Mammalian Cells*; AF Loftus, MS Joens, SE Dunn, MW Adams; Salk Institute for Biological Studies; C Huynh, B Goetze; Carl Zeiss Microscopy LLC; JA Fitzpatrick; Salk Institute for Biological Studies

11:45 AM 258 *Imaging of Carbon Nanotubes Embedded in Polymer Composites via Low Pressure Scanning Electron Microscopy and Scanning Lithium Ion Microscopy*; M Zhao, KA Twedt, JJ McClelland, JA Liddle; National Institute of Standards and Technology

A13.3 Advancing Data Collection and Analysis for Atom Probe Tomography

SESSION CHAIRS:

Brian Gorman, Colorado School of Mines
R. Prakash Kolli, University of Maryland
Richard Martens, University of Alabama

PLATFORM SESSION

Tuesday 10:30 AM • Room: B115

10:30 AM 259 (Invited) *Probing the Organic/Inorganic Interface of the Ferritin Protein Using Atom Probe Tomography*; DE Perea, J Liu, J Bartrand, Q Dicken, T Thevuthasan,

N Browning, JE Evans; Pacific Northwest National Laboratory

11:00 AM 260 *Methods in Creating, Transferring, and Measuring Cryogenic Samples for APT*; SS Gerstl, R Wepf; ETH Zurich, Switzerland

11:15 AM 261 *Atom Probe of Apatites – from Single Crystals to Interphases in Tooth Enamel*; LM Gordon, KA Derocher, MJ Cohen, D Joester; Northwestern University

11:30 AM 262 M&M 2015 STUDENT AWARDEE
3D Atomic Scale Analysis of CMOS Type Structures for 14 nm UTBB-SOI Technology; R Estivill, A Grenier; STMicroelectronics, Switzerland; T Printemps; Commissariat à l'énergie atomique, France; M Juhel, M Gregoire, P Caubet; STMicroelectronics, Switzerland; D Blavette; l'Université de Rouen et l'INSA de Rouen, France

11:45 AM 263 *Microscopy of Chemical and Mechanical Heterogeneities in Lithium Cobalt Oxide*; DR Diercks, M Musselman, M Kumar, BP Gorman, CE Packard; Colorado School of Mines

A18.2 Core Facility Management

SESSION CHAIRS:

Randy Nessler, University of Iowa
Chris Branter, George Washington University
Tom Williams, University of Idaho

PLATFORM SESSION

Tuesday 10:30 AM • Room: C124

10:30 AM 264 *Considerations for Physical Facility Design and Management of a State-of-the-Art Electron Microscopy and Analysis Laboratory*; DE Huber, J Orsborn, H Colijn, C Begg, MJ Mills, D McComb, HL Fraser; The Ohio State University

10:45 AM 265 *The Use of Online Tools in Microscopy and Microanalysis Core Facilities*; MH Apperley, J Whiting, B Cribb; Australian Microscopy and Microanalysis Research Facility; C Anna; The University of Sydney, Australia

11:00 AM 266 (Invited) *Evolution of Data Acquisition, Storage and Analysis in a Multi-user Facility*; NJ Zaluzec; Argonne National Laboratory

11:30 AM 267 *Roundtable Discussion*

Scientific Program

B

BIOLOGICAL SCIENCES SYMPOSIA TUESDAY MORNING

B04.2 Advances in Specimen Preparation and Correlative LM-EM (CLEM) of Biological Samples

SESSION CHAIR:

Danielle Jorgens, Oregon Health & Science University

PLATFORM SESSION

Tuesday 10:30 AM • Room: C122

10:30 AM **268** (Invited) *Detection of GFP-labeled Proteins by Electron Microscopy*; RG Parton, T Hall, N Ariotti; The University of Queensland, Australia

11:00 AM **269** *Systematic Characterization of Fluorophore Behavior in the Presence of Electron Microscopy Sample Preparation Reagents*; H Li, DM Jorgens; Oregon Health & Science University; L Wang, RM Strongin; Portland State University; JW Gray, SL Gibbs; Oregon Health & Science University

11:15 AM **270** *Studying Membrane Trafficking in Toxoplasma gondii Using Correlative Light and Electron Microscopy (CLEM)*; R-C Hsia, JE Strong; University of Maryland Baltimore; JD Romano, I Coppens; Johns Hopkins University

11:30 AM **271** *New CLEM Method to Reveal Ultrastructural Reorganization in the Host Cell during Coronavirus Infection*; G Kiss, C Bouchet-Marquis, L Pullan; FEI Company; D Keene; Shriners Hospital; BW Neuman; University of Reading, United Kingdom

11:45 AM **272** *On the Road to Large Volumes in LM and SEM: New Tools for Array Tomography*; I Wacker, W Spomer; Universität Heidelberg, Germany; A Hofmann, U Gengenbach; Karlsruhe Institute of Technology, Germany; M Thaler; Carl Zeiss Microscopy GmbH, Germany; L Ness, P Brey; Boeckeler Instruments, Inc. R Schröder; Universitätsklinikum Heidelberg, Germany

B05.2 3D Structures of Macromolecular Assemblies, Cellular Organelles, and Whole Cells

SESSION CHAIRS:

Melanie Ohi, Vanderbilt University Medical School

Esther Bullitt, Boston University Medical School

PLATFORM SESSION

Tuesday 10:30 AM • Room: B111

10:30 AM **273** *Modeling Protein Structure in Macromolecular Assemblies at Near Atomic Resolutions*; ML Baker, M Chen, PR Baldwin, SJ Ludtke, W Chiu; Baylor College of Medicine

10:45 AM **274** (Invited) *IP3R1 – Assessing Map Interpretability at Near Atomic Resolution*; SJ Ludtke, G Fan, ML Baker, Z Wang; Baylor College of Medicine; MR Baker; University of Texas at Houston Medical School; SC Murray, W Chiu; Baylor College of Medicine, II Serysheva; University of Texas at Houston Medical School

11:15 AM **275** *Exploiting the Susceptibility of HIV-1 Nucleocapsid Protein to Radiation Damage in Tomo-Bubblegram Imaging*; J Fontana; Laboratory of Structural Biology Research, National Institute of Arthritis, Musculoskeletal and Skin Diseases, NIH; KA Jurado, N Cheng; National Institute of Arthritis, Musculoskeletal and Skin NIH; A Engelman; Dana-Farber Cancer Institute; AC Steven; National Institute of Arthritis, Musculoskeletal and Skin Diseases, NIH

11:30 AM **276** (Invited) *Affinity Cryo-Electron Microscopy Studies of Viral Particles Captured Directly From Cell Culture*; C Zhang, F Vago, F Guo, Z Liu, G Yu; Purdue University; P Serwer; University of Texas Health Science Center; W Jiang; Purdue University

B07.3 Microscopy, Microanalysis, and Image Cytometry in the Pharmaceutical Sciences

SESSION CHAIRS:

Lynn M. DiMemmo, Bristol-Meyers Squibb

John Bruce Green, Baxter International Inc.

PLATFORM SESSION

Tuesday 10:30 AM • Room: B119

10:30 AM **277** (Invited) *Using Microscopy to Qualitatively and Quantitatively Assess Crystalline Content in Amorphous Active Pharmaceutical Ingredients and Drug Product*; A Vogt, J Neilly; AbbVie Inc.

11:00 AM **278** *Advantages of Using Low Voltage for Elemental Mapping by Energy Dispersive X-Ray Spectroscopy in Pharmaceutical Systems*; JP Neilly, JR Roth; AbbVie, Inc.

11:15 AM **279** *Streamlining Identification of Compounds in Pharmaceutical Drug Products*; T Nylese, J Rafaelsen, M Bolorizadeh; EDAX, Inc. D Edwards; JEOL Inc.

B09.3 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants, and Animals

SESSION CHAIRS:

W. Gray Jerome, Vanderbilt University

Jon Charlesworth, Mayo Clinic

Gang Ning, Pennsylvania State University

Betty Thompson, University of Pennsylvania

PLATFORM SESSION

Tuesday 10:30 AM • Room: D138

10:30 AM 280 (Invited) *Mitochondrial Fission Arrest Phenotype in Brain Tissue of Patients and Animal Models of Familial Alzheimer's Disease Revealed with 3D EM*; E Trushina, TA Christensen, L Zhang, S Trushin, JL Salisbury; Mayo Clinic

11:00 AM 281 *A Tunable Approach to Visualize BRCA1 Assemblies in Hereditary Breast Cancer*; CE Winton, BL Gilmore, AC Demmert, Z Sheng, DF Kelly; Virginia Tech Carilion School of Medicine and Research Institute

11:15 AM 282 *mApoE-Functionalized Nanoliposomes Delivering Doxorubicin and Ultrasmall Superparamagnetic Iron Oxide to Glioblastoma Cells Characterized by TEM and Confocal Microscopy*; S Rodighiero, M Gregori; Fondazione Filarete; M Francolini, E Vezzoli, M Tamborini, M Masserini; Università degli Studi di Milano Bicocca, Italy; M Matteoli; Humanitas Clinical and Research Center, L Passoni; Università degli Studi di Milano Bicocca, Italy

11:30 AM 283 (Invited) *Type VII Collagen: From Discovery of the Anchoring Fibril Protein to Clinical Trials Ameliorating the Human Blistering Disease Epidermolysis Bullosa*; DR Keene, SF Tufa; Shriners Hospital for Children

P

PHYSICAL SCIENCES SYMPOSIA

TUESDAY MORNING

P01.3 Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on *In Situ* TEM and STEM

SESSION CHAIRS:

M. Grace Burke, University of Manchester, United Kingdom

Ondrej Krivanek, Nion Inc.

Peter Crozier, Arizona State University

PLATFORM SESSION

Tuesday 10:30 AM • Room: B116

10:30 AM 284 (Invited) *Characterizing Working Catalysts with Correlated Electron and Photon Probes*; EA Stach, Y Li; Brookhaven National Laboratory; S Zhao; University of Illinois at Urbana-Champaign; A Gamalski, K Chen-Weigart, R Tapper; Brookhaven National Laboratory; J Chen; Columbia University

11:00 AM 285 *In Situ Analytical TEM of Ilmenite Reduction in Hydrogen*; A Janssen, E Prestat, M Smith, SJ Haigh, G Burke; The University of Manchester, United Kingdom

11:15 AM 286 M&M 2015 STUDENT AWARDEE *Resolving Surface Structures of Catalytic Ru Nanoparticles during Catalysis*; BK Miller, PA Crozier; Arizona State University

11:30 AM 287 *In Situ Environmental TEM and DFT Studies on the Highly Stable AuIr Bimetallic Catalyst*; CW Han, P Majumdar, EE Marinero; Purdue University; A Aguilar-Tapia, R Zanella; Universidad Nacional Autonoma de Mexico; J Greeley, V Ortalan; Purdue University

11:45 AM 288 *Dynamic Structural Changes in a Single Catalyst Particle During Single Walled Carbon Nanotube Growth*; PA Lin, Z Hussaini; National Institute of Standards and Technology; JC Burgos Beltran, JL Gomez Ballesteros, PB Balbuena; Texas A&M University; R Sharma; National Institute of Standards and Technology

P04.3 Nano-Characterization of Low Dimensional Materials: Carbon to 2D TMDs

SESSION CHAIRS:

Moon Kim, University of Texas at Dallas

Zonghoon Lee, Ulsan National Institute of Science and Technology, South Korea

Quentin Ramasse, SuperSTEM, United Kingdom

PLATFORM SESSION

Tuesday 10:30 AM • Room: B114

10:30 AM 289 (Invited) *Detailed Atomic Structure of Defects in 2D Materials: From Graphene to Transition Metal Dichalcogenides*; JH Warner; University of Oxford, United Kingdom

11:00 AM 290 *Multimodal Characterization of Graphene*; S Freitag; Carl Zeiss Microscopy GmbH, Germany

11:15 AM 291 *Nano-Sculpting of Suspended CVD Graphene with Helium and Neon Ion Beams*; DA Cullen, J Swett, AJ Rondinone; Oak Ridge National Laboratory; P Bedworth, S Heise, S Sinton; Lockheed Martin Space Systems Company

Scientific Program

P

PHYSICAL SCIENCES SYMPOSIA

TUESDAY MORNING *continued*

P05.3 Nuclear and Irradiated Materials: Fundamental Defect Properties

SESSION CHAIRS:

Chad M. Parish, Oak Ridge National Laboratory
Khalid Hattar, Sandia National Laboratories
Arthur T. Motta, Pennsylvania State University

PLATFORM SESSION

Tuesday 10:30 AM • Room: D135

10:30 AM **292** (Invited) *Atomic Scale, 3-Dimensional Characterization of Radiation Effects in Tungsten for Fusion Applications*; P Edmondson; Oak Ridge National Laboratory; LR Hanna, M Dagan, SG Roberts; University of Oxford, United Kingdom; LL Sneed; Oak Ridge National Laboratory; AD Xu, GD Smith, B Gault; University of Oxford, United Kingdom, et al.

11:00 AM **293** *Clustering and Radiation Induced Segregation in Neutron Irradiated Fe-(3-18)Cr Alloys*; M Bachhav, E Marquis; University of Michigan; GR Odette; University of California

11:15 AM **294** *TEM Analysis of Structure Transformation in Al/Ni Nanomaterials under High Energy Ion Irradiation*; S Rouvimov, K Manukyan, CE Shuck, AS Mukasyan; University of Notre Dame

11:30 AM **295** *TEM Examination of Precipitation Behaviour of M23C6 and Sigma Phases and Dislocations in SS 310S under Creep Deformation at 800°C*; B Shalchi Amirkhiz, S Xu; Natural Resources Canada CanmetMATERIALS Laboratory

11:45 AM **296** *Correlative TEM and APT of Helium Bubbles in Ion-Irradiated RAFM Steel*; B Mazumder, C Parish, MK Miller; Oak Ridge National Laboratory

P06.2 Failure Analysis Applications of Microanalysis, Microscopy, Metallography, and Fractography

SESSION CHAIRS:

Daniel Dennies, Exponent, Inc.
William Kane, Exponent, Inc.

PLATFORM SESSION

Tuesday 10:30 AM • Room: D140

10:30 AM **297** (Invited) *Metallographic Characterization of Thermal Damage in Boiler Tubes*; MP Carroll; Lisin Metallurgical Services

11:00 AM **298** *Failure Analysis in Support of Deformation Modeling*; LA Deibler, E Corona, S Williams; Sandia National Laboratories

11:15 AM **299** *Cross-sectioning Sub-millimetre Sized Defects in Ornamental Chrome-plated Component*; AJ Lockley; Canadian Nuclear Laboratories

11:30 AM **300** *Preparing and Etching Titanium to Document Surface Affects*; LM Gammon, RR Boyer; International Metallographic Society

11:45 AM **301** *Microstructure Enhancement Using Ion Beam Milling*; LD Hanke, D Scholz; Materials Evaluation and Engineering, Inc.

P07.2 Metallography and Microstructural Characterization of Metals

SESSION CHAIRS:

James E. Martinez, NASA Johnson Space Center
George Vander Voort, Vander Voort Consulting

PLATFORM SESSION

Tuesday 10:30 AM • Room: C123

10:30 AM **302** (Invited) *Characterization of Hot-Compressed Magnesium Alloys in a Scanning Electron Microscope*; S Kaboli, H Demers, R Gauvin; McGill University, Canada

11:00 AM **303** **M&M 2015 STUDENT AWARDEE** *Characterization of a Sub-Grain Boundary Using Accurate Electron Channeling Contrast Imaging*; H Mansour, MA Crimp, N Gey, N Maloufi; Université de Lorraine, France

11:15 AM **304** *3D Crystallographic Imaging Using Laboratory-Based Diffraction Contrast Tomography (DCT)*; A Merkle, C Holzner, M Feser; Carl Zeiss X-ray Microscopy; S McDonald, P Withers; University of Manchester, United Kingdom; W Harris; Carl Zeiss X-ray Microscopy; E Lauridsen, P Reischig; Xnovo Technology ApS, Denmark, et al.

11:30 AM **305** *Characterization of Elastic Strain Field and Geometrically Necessary Dislocation Distribution in Stress Corrosion Cracking of 316 Stainless Steels by Transmission Kikuchi Diffraction*; A Vilalta-Clemente, M Meisnar, S Lozano-Perez, AJ Wilkinson; University of Oxford, United Kingdom

11:45 AM **306** *Transformation and Deformation Characterization of NiTiHf and NiTiAu High Temperature Shape Memory Alloys*; L Casalena, DR Coughlin, F Yang, X Chen; The Ohio State University; RD Noebe; NASA Glenn Research Center; W Yunzhi, PM Anderson, MJ Mills; The Ohio State University, et al.

P08.2 Microscopy and Characterization of Ceramics, Polymers, and Composites

SESSION CHAIRS:

Andre Mkhoyan, University of Minnesota
Jong Seok Jeong, University of Minnesota
Laxmikant Saraf, Clemson University

PLATFORM SESSION

Tuesday 10:30 AM • Room: D136

- 10:30 AM **307** *Crystallographic Orientation and Deformation Mechanisms of Laser-processed Directionally Solidified WC- W2C Eutectoids*; W-T Chen, EC Dickey; North Carolina State University
- 10:45 AM **308** *Staining Block Copolymers Using Sequential Infiltration Synthesis for High Contrast Imaging and STEM tomography*; T Segal-Peretz, J Winterstein; University of Chicago; M Biswas; Argonne National Laboratory; JA Liddle; National Institute of Standards and Technology; JW Elam; Argonne National Laboratory; NJ Zaluzec; Argonne National Laboratory; PF Nealey; University of Chicago
- 11:00 AM **309** *Understanding the Structure-Process-Property Balance in PC/PEI blends by Morphology (Using Scanning Transmission Electron Microscopy in Field Emission - Scanning Electron Microscopy) and Correlative Deformation Mechanics*; P Bajaj, D Bajaj, C Strom, H Zhou, K Leung; Sabic Innovative plastics
- 11:15 AM **310** *A Green Method for Graphite Exfoliation Using High-Energy Ball Milling*; I Estrada-Guel, FC Robles-Hernandez, JM Mendoza-Duarte, R Pérez-Bustamante, R Martínez-Sánchez; Centro de Investigación en Materiales Avanzados, Mexico
- 11:30 AM **311** *Atomic Resolution STEM-EELS Study of Transition Electronic Localization State Induced by Strain*; Y Gao, MA Roldan, J Zhang; Shanghai University, China; L Qiao, M Chi, D Mandrus; Oak Ridge National Laboratory; X Shen; Chinese Academy of Sciences, G Cao; Oak Ridge National Laboratory, et al.

P09.3 Microscopy of Additive Manufacturing and 3D Printing in Materials and Biology

SESSION CHAIRS:

John Porter, UES Inc.
John Wooten, CalRAM Inc.
Jay Potts, University of South Carolina

PLATFORM SESSION

Tuesday 10:30 AM • Room: D137

- 10:30 AM **312** (Invited) *Biofabrication of Dynamic, 3-Dimensional, In Vitro Models of Disease*; RL Goodwin, P-H Chang; University of South Carolina; RS Jones, KA Harmon, T Perahia, BA Lane, JF Eberth, D Fan; University of South Carolina, et al.

- 11:00 AM **313** (Invited) *Deposition of Cell-Laden Hydrogels in a Complex Geometry Using A 3D BioPrinter*; MJ Yost, SG Dennis; Medical University of South Carolina

- 11:30 AM **314** (Invited) *3D Printable In Situ Fluorescent Microscope*; H Osman; Indiana University School of Medicine

P10.1 Microscopy and Microanalysis for Real-World Problem Solving

SESSION CHAIRS:

Stuart McKernan, 3M Company
Ke-Bin Low, BASF Corporation

PLATFORM SESSION

Tuesday 10:30 AM • Room: C120

- 10:30 AM **315** (Invited) *Nanoscale Materials Characterization in Industry: Aerosols Produced from Abraded Composite Restoratives*; MI Buckett, A Bogdan, D Japuntich; 3M Company
- 11:00 AM **316** *Nanoparticle Safety in the Workplace: Developing a Methodology to Monitor and Remediate Spills*; S Rubino, B Lute, I Guo, K Cadieux, BD Gates; Simon Fraser University, Canada
- 11:15 AM **317** *In Situ Liquid Cell TEM Observations of Silicate Mineral Dissolution*; DN Leonard, R Unocic; Oak Ridge National Laboratory; R Hellmann; Université Grenoble Alpes, France
- 11:30 AM **318** *3D FIB SEM Imaging of Oil Filled Chalk: What Are the Challenges?*; KN Dalby, RP Harti, HO Sørensen, SS Stipp; University of Copenhagen, Denmark
- 11:45 AM **319** *Cryo-Transmission Electron Microscopy of Sea Spray Aerosols*; JP Patterson, NC Gianneschi, KA Prather; University of California San Diego

P11.3 Advances in Transmission Electron Microscopy and Spectroscopy of Energy Related Materials

SESSION CHAIRS:

Chongmin Wang, Pacific Northwest National Laboratory
Raymond Unocic, Oak Ridge National Laboratory
Arda Genc, FEI

PLATFORM SESSION

Tuesday 10:30 AM • Room: B113

- 10:30 AM **320** (Invited) *Towards Atomic Level Understanding of Transition Alumina Phases and Their Phase Transformations*; L Kovarik, M Bowden, D Shi, A Anderson, J Hu, J Sznay; Pacific Northwest National Laboratory; JH Kwak; Ulsan National Institute of Science and Technology, South Korea, CH Peden; Pacific Northwest National Laboratory

Scientific Program

P

PHYSICAL SCIENCES SYMPOSIA

TUESDAY MORNING *continued*

- 11:00 AM **321** *In Situ Studies of Reaction-driven Restructuring of Ni-Co Core-shell Nanoparticles*; CS Bonifacio, HL Xin; University of Pittsburgh; S Carencio, M Salmeron; Lawrence Berkeley National Lab; EA Stach; Brookhaven National Laboratory; JC Yang; University of Pittsburgh
- 11:15 AM **322** *Nano-level Structure-Reactivity Relationships of Ni-NiO Core-shell Co-catalysts on Ta₂O₅ for Solar Hydrogen Production*; Q Liu, L Zhang, PA Crozier; Arizona State University
- 11:30 AM **323** *Atomic Level Element Specific Investigation of Bimetallic Structures by Z-contrast Imaging*; C Akatay, SI Sanchez, SA Bradley; Honeywell UOP LLC, A Honeywell Company
- 11:45 AM **324** *In Situ Study of Coarsening Mechanisms of Supported Metal Particles in Reducing Gas*; S zhang, M Cargnello; University of Michigan; CB Murray; University of Pennsylvania; GW Graham, X Pan; University of Michigan

MSA DISTINGUISHED SCIENTIST AWARDEE LECTURES

Tuesday 12:15 PM • Room: C123

Complimentary boxed lunch will be served to the first 100 participants.

12:15 PM BIOLOGICAL DISTINGUISHED SCIENTIST

Michael Davidson

Florida State University, Tallahassee Director,
Optical Microscopy Division of the National High
Magnetic Field Laboratory

12:40 PM PHYSICAL DISTINGUISHED SCIENTIST

*Aberrations: A Way of Life***Peter Hawkes**

Toulouse, France
Emeritus Research Director, CNRS

PRESENTER: **Martin Hytch**, CNRS

O

OUTREACH

TUESDAY MORNING

X90.2 Microscopy in the Classroom

SESSION CHAIRS:

Craig Queenan, Bergen County Technical Schools
Alyssa Calabro, Bergen County Technical Schools
David Becker, Bergen County Technical Schools

SPECIAL EDUCATION SESSION

Tuesday 10:30 AM • Room: B110

- 10:30 AM **325** (Invited) *FEI and National Geographic STEM Outreach - Mysteries of the Unseen World*; J Williams; FEI
- 11:00 AM **326** (Invited) *Using Microscopy for Authentic Science Teaching: A Learning Sciences Perspective*; M Storksdieck; Oregon State University

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—TUESDAY AFTERNOON

A05.2 Fast and Ultrafast Imaging with Electrons and Photons

SESSION CHAIRS:

David Flannigan, University of Minnesota
Hermann Durr, Stanford University
Joanna Atkin, University of Colorado

PLATFORM SESSION

Tuesday 1:30 PM • Room: A105

- 1:30 PM **327** (Invited) *Magnetic Dynamics Studied by Time-resolved Electron Microscopy*; F Carbone; École Polytechnique Fédérale de Lausanne, Switzerland
- 2:00 PM **328** (Invited) *Toward Ultrafast Electron Microscope with Femtosecond Temporal Resolution, Atomic-Level Spatial Resolution, and Single-Shot Imaging Capability*; K Tanimura; Osaka University, Japan
- 2:30 PM **329** *RF Photoinjector Based Time-Resolved MeV Electron Microscopy*; P Musumeci; University of California, Los Angeles
- 2:45 PM **330** *Ultrafast Lattice Dynamics of Granular L10 Phase FePt Measured by MeV Electron Diffraction*; AH Reid, X Shen, RK Li; SLAC National Accelerator Laboratory

A06.2 Advanced Analytical TEM/STEM

SESSION CHAIRS:

Paul Kotula, Sandia National Laboratories
Masashi Watanabe, Lehigh University
Gerald Kothlietner, Graz University of Technology, Austria

PLATFORM SESSION

Tuesday 1:30 PM • Room: A106

- 1:30 PM **331** (Invited) *High Spatial/Energy Resolution Band Gap Measurements: Delocalization and Other Effects in a Monochromated Cold FEG Nion Dedicated STEM*; RW Carpenter, H Xie, T Aoki, F Ponce; Arizona State University
- 2:00 PM **332** *Avoidance of Radiation Damage in Vibrational-Mode Energy-Loss Spectroscopy*; RF Egerton, P Rez; University of Alberta, Canada; PA Crozier; Arizona State University
- 2:15 PM **333** *Hydrogen Analysis by Ultra-High Energy Resolution EELS*; H Cohen, Weizmann Institute of Science, Israel; P Rez, T Aoki, PA Crozier, Arizona State University; N Dellby, Z Dellby, Nion Co.; D Gur, Weizmann Institute of Science, Israel; TC Lovejoy, OL Krivanek, Nion Co.; K March, University of Paris-Sud, France; MC Sarahan, Nion Co.; SG Wolf, Weizmann Institute of Science, Israel

- 2:30 PM **334** *Applications of Plasmon Energy Expansion Thermometry*; MH Mecklenburg, WA Hubbard; University of Southern California; ER White; University of California Los Angeles; R Dhall, S Cronin; University of Southern California; S Aloni; Lawrence Berkeley National Laboratory; BC Regan; University of California Los Angeles

- 2:45 PM **335** *Aberration Corrected STEM-EELS Study of the Hole Distribution in Cuprate Superconductors*; M Bugnet, G Radtke; McMaster University, Canada; S Löffler, P Schattschneider; Vienna University of Technology, Austria; D Hawthorn; University of Waterloo, Canada; GA Sawatzky; University of British Columbia, Canada; GA Botton; McMaster University, Canada

A11.3 Electron Vortex Beams and Higher-Order Beam Modes

SESSION CHAIRS:

Benjamin J. McMorran, University of Oregon
Juan-Carlos Idrobo, Oak Ridge National Laboratory

PLATFORM SESSION

Tuesday 1:30 PM • Room: D139

- 1:30 PM **336** *Holograms for the Generation of Vortex States with $L=500\hbar$ Fabricated by Electron Beam Lithography*; E Mafakheri, V Grillo; Dipartimento FIM, Università di Modena e Reggio Emilia, Italy; R Balboni; CNR-IMM, Italy; GC Gazzadi; CNR-Istituto Nanoscienze, Italy; C Menozzi, S Frabboni; Università di Modena e Reggio Emilia, Italy; E Karimi, RW Boyd; University of Ottawa, Canada
- 1:45 PM **337** *Synthesization of Vortex Beams by Combining Fork-shaped Gratings for Transmission Electron Microscopy*; K Harada, T Kohashi, T Iwane; Hitachi Ltd
- 2:00 PM **338** (Invited) *Propagation Properties of Electron Vortex Beams*; K Saitoh, H Nambu, N Tanaka; Nagoya University, Japan; M Uchida; Saitama Institute of Technology, Japan
- 2:30 PM **339** *Electron Singularities, Matter Wave Catastrophes, and Vortex Lattice Singularimetry*; TC Petersen, M Welyand, DM Paganin, TP Simula, SA Eastwood, AI Bishop, MJ Morgan; Monash University
- 2:45 PM **340** *Holographic Generation of Highly Twisted Electron Beams*; V Grillo, GC Gazzadi; CNR-Istituto Nanoscienze, Italy; E Mafakheri, S Frabboni; Università di Modena e Reggio Emilia, Italy; E Karimi, RW Boyd; University of Ottawa, Canada

Scientific Program

A

ADVANCES IN INSTRUMENTATION

SYMPOSIA—TUESDAY AFTERNOON *continued*

A12.4 Low Voltage Electron Microscopy

SESSION CHAIRS:

David C. Bell, Harvard University
Natasha Erdman, JEOL USA Inc.
Jingyue Liu, Arizona State University

PLATFORM SESSION

Tuesday 1:30 PM • Room: B117

- 1:30 PM **341** *Characterization of Advanced Nanomaterials for Lithium Ion Batteries Cathodes*; H Demers, N Brodusch; McGill University, Canada; P Hovington; Institut de Recherche d'Hydro Québec, Canada; R Gauvin; McGill University, Canada; K Zaghib; Institut de Recherche d'Hydro Québec, Canada
- 1:45 PM **342** (Invited) *Low Accelerating Voltage X-ray Microanalysis – Strategies and Challenges*; PL McSwiggen; McSwiggen & Associates
- 2:15 PM **343** *Advantage of Beam Deceleration for Low kV EDS Analysis*; DC Edwards, N Erdman, D Guarrera, M Shibata, V Robertson; JEOL USA, Inc. F Timischl, Y Nemoto; JEOL Technics Ltd., Japan

A13.4 Advancing Data Collection and Analysis for Atom Probe Tomography

SESSION CHAIRS:

Brian Gorman, Colorado School of Mines
R. Prakash Kolli, University of Maryland
Richard Martens, University of Alabama

PLATFORM SESSION

Tuesday 1:30 PM • Room: B115

- 1:30 PM **345** *Nanoscale Characterization of Li-ion Battery Cathode Nanoparticles by Atom Probe Tomography Correlated with Transmission Electron Microscopy and Scanning Transmission X-ray Microscopy*; A Devaraj, C Szymanski, P Yan, C Wang, V Murugesan, J Zheng, JJ Zhang; Pacific Northwest National Laboratory, T Tyliczszak; LBNL Lawrence Berkeley National Laboratory, et al.
- 1:45 PM **346** *Integrated APT/t-EBSD for Grain Boundary Analysis of Thermally Grown Oxide on a Ni-Based Superalloy*; Y Chen, KP Rice, TJ Prosa; CAMECA Instruments, Inc. France; EA Marquis; University of Michigan; RC Reed; University of Oxford, United Kingdom
- 2:00 PM **347** *A Comparative Analysis of a Si/SiGe Heterojunction-Bipolar Transistors: APT, STEM-EDX and ToF-SIMS*; R Estivill, P Chevalier, F Lorut, M Juhel, L Clément, G Servanton; STMicroelectronics, Switzerland; A Grenier; Commissariat à l'énergie atomique, France; D Blavette; l'Université de Rouen et l'INSA de Rouen, France, et al.

2:15 PM **348** *CdSe1-xTex Phase Segregation in CdSe/CdTe Based Solar Cells*; JD Poplawsky, NR Paudel; Oak Ridge National Laboratory; A Ng; Vanderbilt University; K More; Oak Ridge National Laboratory; Y Yan; The University of Toledo

2:30 PM **349** *Dopant and Interfacial Analysis of Epitaxial CdTe Using Atom Probe Tomography*; GL Burton, DR Diercks, BP Gorman; Colorado School of Mines

2:45 PM **350** *In Situ Deuterium Charging for Direct Detection of Hydrogen in Vanadium by Atom Probe Tomography*; S Dumpala, D Haley, SR Broderick; Iowa State University; PA Bagot, MP Moody; University of Oxford, United Kingdom; K Rajan; Iowa State University

A16.1 Advances in Electron and Ion Scanning Microscopies

SESSION CHAIRS:

David Joy, Oak Ridge National Laboratory
Brendan Griffin, University of Western Australia

PLATFORM SESSION

Tuesday 1:30 PM • Room: B118

- 1:30 PM **351** (Invited) *High-Throughput SEM via Multi-Beam SEM: Applications in Materials Science*; JR Michael, CY Nakakura; Sandia National Laboratories; T Garbowski, A-L Eberle, T Kemen, D Zeidler; Carl Zeiss Microscopy GmbH, Germany
- 2:00 PM **352** *Measurement of the Electron Beam Point Spread Function (PSF) in a Scanning Electron Microscope (SEM)*; YP Kandel, MD Zotta, AN Caferra; State University of New York Polytechnic Institute, RL Moore; Nanojehm Inc. E Lifshin; State University of New York Polytechnic Institute
- 2:15 PM **353** *Imaging Contrast with Multiple Ion Beams*; H Wu, S Sijbrandij, SM McVey, J Notte; Carl Zeiss Microscopy LLC
- 2:30 PM **354** *Low Energy BSE Imaging with a New Scintillation Detector*; J Fiala, J Kolosova, J Jiruse, J Beranek; TESCAN Brno, s.r.o., Czech Republic
- 2:45 PM **355** *Origins and Contrast of the Electron Signals at Low Accelerating Voltage and with Energy-Filtering in the FE-SEM for High Resolution Imaging*; H Demers, N Brodusch; McGill University, Canada; P Woo; Hitachi High-Technologies Canada Inc. R Gauvin; McGill University, Canada

B

BIOLOGICAL SCIENCES SYMPOSIA

TUESDAY AFTERNOON

B02.1 To the Rhizosphere - and Beyond!

SESSION CHAIRS:

Alice Dohnalkova, Pacific Northwest National Laboratory
Marvin Whiteley, University of Texas

PLATFORM SESSION

Tuesday 1:30 PM • Room: B111

- 1:30 PM **356** *The Use of Microcontact Printing of Thiols to Evaluate Attachment of Xylella fastidiosa Under Distinct Conditions of Calcium Availability*; B Leite, L De La Fuente; JEOL USA Inc.
NOW: POSTER #129-A
- 1:45 PM **357** (Invited) *Rhizomes and Roots of Rare Arctic-Alpine Snowfield Plants on the Edges of Retreating Snowfields at Glacier National Park, Montana*; ME Apple, MK Ricketts, LG Carlson; Montana Tech of the University of Montana
- 2:15 PM **358** *Impact of Phenazine-1-carboxylic acid upon Biofilm Development in the Rhizosphere of Dryland and Irrigated Wheat*; MK LeTourneau, MM Marshall; Washington State University; LS Thomashow; United States Department of Agriculture Agricultural Research Service; JB Harsh; Washington State University
- 2:30 PM **359** (Invited) *Imaging Ventral Cell Plate Formation in Guard Cells*; X Qi, KU Torii; University of Washington

B06.1 Deep Tissue Imaging and Light Sheet Microscopy

SESSION CHAIRS:

Meng Cui, Howard Hughes Medical Institute
Liang Gao, StonyBrook University

PLATFORM SESSION

Tuesday 1:30 PM • Room: C122

- 1:30 PM **360** (Invited) *Scanless Lattice Light Sheet Microscopy*; B-C Chen; Academia Sinica, Taiwan
- 2:00 PM **361** (Invited) *Rapid High-resolution Brain Mapping with CLARITY Optimized Light Sheet Microscopy (COLM)*; R Tomer, K Deisseroth; Howard Hughes Medical Institute
- 2:30 PM **362** (Invited) *Three-color two-photon three-axis digital scanned light-sheet microscopy (3c2p3a-DSLM)*; L Chen, W Zong, A Wang; Peking University, China

B11.1 Specimen Preparation for Biological Sciences

SESSION CHAIRS:

D.C. Winkler, National Institutes of Health
N. Benmeradi, Delta Microscopies, France

PLATFORM SESSION

Tuesday 1:30 PM • Room: B119

- 1:30 PM **363** *Easier and Safer Biological Staining: High Contrast Uranyl-Less Staining of TEM Grids Using mPrep/g Capsules*; N Benmeradi, B Payre; Delta Microscopies; SL Goodman; Microscopy Innovations LLC
- 1:45 PM **364** *HSV-1 Scaffolding Protein Bubbles Readily in the Absence or Presence of DNA, Allowing its Localization in Immature and Mature Nucleocapsids*; DC Winkler, WW Newcomb, A Aksyuk, W Wu, N Cheng, AC Steven; National Institutes of Health
- 2:00 PM **365** *Improving the Reliability, Ease, and Efficiency of Section Staining in a Diagnostic Laboratory with the mPrep/g System for TEM Grid Processing*; CA Radi; Wisconsin Veterinary Diagnostic Laboratory
- 2:15 PM **366** *Capabilities of a New Sample Preparation Method for Probing Polymer Penetration and Localization into Wood Without Embedding*; B Dorvel, P Boopalachandran, A Bowling, X Chen, S King; Dow Chemical Company

P

PHYSICAL SCIENCES SYMPOSIA

TUESDAY AFTERNOON

P01.4 Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on *In Situ* TEM and STEM

SESSION CHAIRS:

M. Grace Burke, University of Manchester, United Kingdom
Ondrej Krivanek, Nion Inc.
Peter Crozier, Arizona State University

PLATFORM SESSION

Tuesday 1:30 PM • Room: B116

- 1:30 PM **367** (Invited) *Toward Quantitative In Situ TEM of Materials and Devices in Gases and Liquids at the Atomic Scale*; S Takeda, H Yoshida, K Soma; Osaka University, Japan
- 2:00 PM **368** *Recent Progress with AC E(S)TEM and Application to Single Atom Catalysis*; PL Gai, L Lari, MR Ward, T Martin, RW Mitchell, D Lloyd, A LaGrow, ED Boyes; University of York, United Kingdom, et al.
- 2:15 PM **369** *XEDS Performance of Atmospheric Membrane Holders in the AEM*; NJ Zaluzec; Argonne National Laboratory

Scientific Program

P

PHYSICAL SCIENCES SYMPOSIA

TUESDAY AFTERNOON *continued*

- 2:30 PM **370** *Opportunities and Challenges of In Situ Characterization of Photocatalysts in Environmental TEM*; L Zhang, Q Liu, BK Miller, PA Crozier; Arizona State University

P04.4 Nano-Characterization of Low Dimensional Materials: Carbon to 2D TMDs

SESSION CHAIRS:

Moon Kim, University of Texas at Dallas
Zonghoon Lee, Ulsan National Institute of Science and Technology, South Korea
Quentin Ramasse, SuperSTEM Laboratory, United Kingdom

PLATFORM SESSION

Tuesday 1:30 PM • Room: B114

- 1:30 PM **371** (Invited) *Functionalization of Graphene*; M Chisholm, J Lee; Oak Ridge National Laboratory; J Guo; Taiyuan University of Technology; Z Yang; Chinese Academy of Sciences, Institute of Metal Research; SJ Pennycook; National University of Singapore; ST Pantelides; Vanderbilt University; W Zhou; Oak Ridge National Laboratory
- 2:00 PM **372** *Dynamics of Triangular Hole Growth in Monolayer Hexagonal Boron Nitride under Electron Irradiation*; GH Ryu, HJ Park, Z Lee; Ulsan National Institute of Science and Technology, South Korea
- 2:15 PM **373** *Cu Atoms Reknit the Graphene Structures*; E Kano, A Hashimoto; University of Tsukuba, Japan; M Takeguchi; National Institute for Materials Science, Japan
- 2:30 PM **374** *VEELS Study of Boron and Nitrogen Doped Single Layer Graphene*; FS Hage, D Kepaptsoglou; SuperSTEM Laboratory; T Hardcastle, C Seabourne, A Scott, R Brydson; University of Leeds, United Kingdom; U Bangert; University of Limerick, United Kingdom; Q Ramasse; SuperSTEM Laboratory, United Kingdom, et al.
- 2:45 PM **375** *Electron Exit Wave Reconstruction From a Single Defocused Image Using a Gaussian Basis*; KB Borisenko, CS Allen, JH Warner, AI Kirkland; University of Oxford, United Kingdom

P05.4 Nuclear and Irradiated Materials: Fundamental Defect Properties

SESSION CHAIRS:

Chad M. Parish, Oak Ridge National Laboratory
Khalid Hattar, Sandia National Laboratories
Arthur T. Motta, Pennsylvania State University

PLATFORM SESSION

Tuesday 1:30 PM • Room: D135

- 1:30 PM **376** *Advanced Electron Microscopy Study of Fission Product Distribution in the Failed SiC Layer of a Neutron Irradiated TRISO Coated Particle*; H Wen, IJ van Rooyen; Idaho National Laboratory; JD Hunn, TJ Gerczak, CA Baldwin, FC Montgomery; Oak Ridge National Laboratory

- 1:45 PM **377** *Post-Irradiation Examinations of Irradiation Creep Tested Zircaloy-2*; W Karlsen, M Ivanchenko, U Ehrnsten; VTT Technical Research Centre; KR Anderson; Bechtel Marine Propulsion Corp, Bettis Laboratory

- 2:00 PM **378** *Inert Gas Measurement of Single Bubble in CeO₂*; L He, J Pakarinen, X Bai, J Gan; Idaho National Laboratory; Y Wang; Los Alamos National Laboratory; A El-Azab; Purdue University; TR Allen; Idaho National Laboratory

- 2:15 PM **379** *Exploring Helium Mitigation in Ferritic Alloys by Advanced Microscopy*; CM Parish, PD Edmondson, FW Meyer, ME Bannister, B Mazumder, MK Miller; Oak Ridge National Laboratory

- 2:30 PM **380** *Evolution of Oxide Structures in Friction Stir Welded Alloy MA956*; LN Brewer, BW Baker; University of Alabama; MJ Bird; Naval Postgraduate School; S Osswald; Purdue University

- 2:45 PM **381** *Structural Effects in Oxide Dispersion Strengthened (ODS) Steel Neutron Irradiated to 3 dpa at 500°C*; A Mairov, J He, K Sridharan; University of Wisconsin-Madison

P06.3 Failure Analysis Applications of Microanalysis, Microscopy, Metallography, and Fractography

SESSION CHAIRS:

Daniel Dennies, Exponent Inc.
William Kane, Exponent Inc.

PLATFORM SESSION

Tuesday 1:30 PM • Room: D140

- 1:30 PM **382** (Invited) *Titanium (Ti) Alloy Electron Beam (EB) Weld Fracture Surface Interpretation*; SJ Gentz; NASA Engineering and Safety Center

- 2:00 PM **383** *Space Shuttle Stiffener Ring Foam Failure Analysis, a Non-conventional Approach*; PM Howard; NASA Kennedy Space Center

- 2:15 PM **384** (Invited) *Research Projects and Failure Investigations Conducted Through a Commercial Materials Testing Laboratory*; JJ Frafjord; IMR Test Labs

- 2:45 PM **385** *Using Visual Communication Elements in Technical Reports*; C McNee, A Kueck; Metallurgist; D Christie; Curtiss-Wright Corporation

P07.3 Metallography and Microstructural Characterization of Metals

SESSION CHAIRS:

James E. Martinez, NASA Johnson Space Center and
George Vander Voort, Vander Voort Consulting

PLATFORM SESSION

Tuesday 1:30 PM • Room: C123

- 1:30 PM **386** (Invited) *Failure Analysis to Unambiguously Clarify Hydrogen Fracturing in Steels*; M Pohl; Ruhr-Universität Bochum, Germany
- 2:00 PM **387** *Developing Mechanistic Understanding of the Effect of Temperature and Environment on the Hold Time Fatigue Behavior of Haynes 282 Alloy*; D Ellis, T Hanlon, C Shen, E Hall; GE Global Research
- 2:15 PM **388** (Invited) *Metallography - A Powerful Instrument for Material Characterisation, Material Development and Failure Analysis*; M Panzenböck, F Mendez-Martin, B Rashkova, P Schütz; Montanuniversität Leoben, Austria
- 2:45 PM **389** *Classifying the Severity of Grain Boundary Corrosion in CoCrMo Biomedical Implants*; A Lin, E Hoffman, LD Marks; Northwestern University

P08.3 Microscopy and Characterization of Ceramics, Polymers, and Composites

SESSION CHAIRS:

Andre Mkhoyan, University of Minnesota
Jong Seok Jeong, University of Minnesota and
Laxmikant Saraf, Clemson University

PLATFORM SESSION

Tuesday 1:30 PM • Room: D136

- 1:30 PM **390** (Invited) *Wetting and Dewetting of Ultra-thin Ni Films on Si and SiO₂ Substrates*; K van Benthem; University of California, Davis
- 2:00 PM **391** *Domain Structure of Bulk and Thin-Film Ferroelectrics By Transmission Kikuchi Diffraction*; MJ Burch, DT Harris, CM Fancher, J-P Maria, EC Dickey; North Carolina State University
- 2:15 PM **392** *Origin of Ferroelectricity in Thin Film HfO₂ Probed by Revolving STEM and PACBED*; X Sang, ED Grimley; North Carolina State University; T Schenk, U Schroeder; NaMLab gGmbH, Germany; JM LeBeau; North Carolina State University
- 2:30 PM **393** *Role of Interface Structure and Chemistry in Resistive Switching of NiO Nanocrystals on SrTiO₃*; X Cheng, J Sullaphen; University of New South Wales, Australia; M Weyland; Monash University, Australia; H Liu; University of Sydney, Australia; N Valanoor; University of New South Wales, Australia

- 2:45 PM **394** *Local Domain Wall Structure in Polycrystalline BiFeO₃*; A Bencan, G Drazic, H Ursic; Jozef Stefan Institute; N Sakamoto; Shizuoka University, Japan; B Jancar, B Malic; Jotef Stefan Institute, Slovenian; D Damjanovic; École Polytechnique Fédérale de Lausanne, Switzerland; T Rojac; Jozef Stefan Institute, Slovenian, et al.

P10.2 Microscopy and Microanalysis for Real World Problem Solving

SESSION CHAIRS:

Elaine Schumacher, McCrone Associates
Janet Woodward, Buckman North America

PLATFORM SESSION

Tuesday 1:30 PM • Room: C120

- 1:30 PM **395** (Invited) *X-Ray Microanalysis of Art Glass Surfaces*; RB Simmons; Georgia State University
- 2:00 PM **396** *Homogeneity and Sample Preparation from Grams to Microns Using NAA, μ XRF, and SEM-EDS*; AP Lindstrom, JM Davis, R Zeisler, NW Ritchie, RM Lindstrom; National Institute of Standards and Technology
- 2:15 PM **397** *Quantitative Analysis of Sulfur in Polymer Materials*; S McKernan, MI Buckett, WG Stratton; 3M Company
- 2:30 PM **398** *Quantification of the Boron Speciation and Cu Oxidation States in Alkali Borosilicate Glasses by Electron Energy Loss Spectroscopy*; G Yang, S Cheng, C Li; Xi'an Jiaotong University, China; M Peng; South China University of Technology; Y Yue; Aalborg University, Denmark
- 2:45 PM **399** *Elemental Analysis of Rare-earth Magnet Utilizing Cathodoluminescence*; S Imashuku, J Kawai; Kyoto University, Japan

P11.4 Advances in Transmission Electron Microscopy and Spectroscopy of Energy Related Materials

SESSION CHAIRS:

Chongmin Wang, Pacific Northwest National Laboratory
Raymond Unocic, Oak Ridge National Laboratory
Arda Genc, FEI

PLATFORM SESSION

Tuesday 1:30 PM • Room: B113

- 1:30 PM **400** (Invited) *Toward 5D Imaging in an In Situ Environmental TEM*; H Xin, L Han, R Lin; Brookhaven National Laboratory
- 2:00 PM **401** *In Situ Transmission Electron Microscopy to Probe the Electrochemical Deposition of Nanostructured Materials*; J Yang, C Andrei, G Botton, L Soleymani; McMaster University, Canada

Scientific Program

P

PHYSICAL SCIENCES SYMPOSIA

TUESDAY AFTERNOON *continued*

- 2:15 PM **402** *Quantitative Structural Analysis of Fuel Cell Catalysts and Carbon Supports by TEM and Cryo-STEM Tomography*; E Padgett, N Andrejevic; Cornell University; Z Liu; General Motors; K Moriyama; Honda Motor Co; R Kukreja; General Motors; Y Jiang, V Elser, DA Muller; Cornell University
- 2:30 PM **403** *A Quasi In Situ HRTEM Study of the Air Stability of (Ni/Co)MoS₂ Hydrodesulfurization Catalysts*; GM Bremmer, L van Haandel; Universiteit Leiden, Netherlands; EJ Hensen; Eindhoven University of Technology, Netherlands JW Frenken; Leiden University, Netherlands; PJ Kooyman; Delft University of Technology, Netherlands
- 2:45 PM **404** *Tracking Ionic Transport and Electrochemical Dynamics in Battery Electrodes Using In Situ TEM-EELS*; F Wang, W Zhang; Brookhaven National Laboratory; P Gao, K Karki; Brookhaven National Lab

A

ADVANCES IN INSTRUMENTATION

POSTER SESSIONS—

TUESDAY AFTERNOON

A05.P1 Fast and Ultrafast Imaging with Electrons and Photons

POSTER SESSION

Tuesday 3:00 PM • Exhibit Hall

- 3:00 PM **405** *Effects of Quantized, Transient Chromatic Aberrations in Ultrafast Electron Microscopy*; DA Plemmons, AJ McKenna, DJ Flannigan; University of Minnesota
POSTER # 96
- 3:00 PM **406** *Effects of Electron-Gun and Laser Parameters on Collection Efficiency and Packet Duration in Ultrafast Electron Microscopy*; E Kieft, KB Schliep; FEI; PK Suri, DJ Flannigan; University of Minnesota
POSTER # 97
- 3:00 PM **407** *Ultrafast Point Projection Electron Microscopy*; P Shakya, B Barwick; Trinity College, United Kingdom
POSTER # 98
- 3:00 PM **408** *Quantitative Determination of Thermal Fields and Transformation Rates in Rapidly Solidifying Aluminum by Numerical Modeling and In Situ TEM*; C Liu, K Zweiacker; University of Pittsburgh; JT McKeown; Materials Science Division, Lawrence Livermore National Laboratory; T LaGrange, BW Reed; Integrated Dynamic Electron Solutions, Inc. GH Campbell; Lawrence Livermore National Laboratory; JM Wiezorek; University of Pittsburgh
POSTER # 99

A06.P1 Analytical TEM/STEM

POSTER SESSION

Tuesday 3:00 PM • Exhibit Hall

- 3:00 PM **409** *Dynamical Effects on Atomic-Resolution Imaging and Diffraction of the Tetragonal and Orthorhombic Phases of LaFeAsO*; PK Suri, J Yan; University of Minnesota; D Mandrus; University of Tennessee; F University of Minnesota
POSTER # 100
- 3:00 PM **410** *Phase Determination of Black TiO₂ Nanoparticles*; M Tian; University of Tennessee, Knoxville
POSTER # 101
- 3:00 PM **411** *Scanning Transmission Electron Microscopy Investigation of the Structure of Multilayered Perpendicular Magnetic Tunnel Junctions*; D Reifsnnyder Hickey, KA Mkhoyan; University of Minnesota
POSTER # 102
- 3:00 PM **412** *Dopant Quantification by Atomic-scale Energy Dispersive X-ray Analysis*; Z Chen, SD Findlay, M Weyland; Monash University, Australia; AJ D'Alfonso, LJ Allen; University of Melbourne, Australia
POSTER # 103
- 3:00 PM **413** *Algorithms for Quantitative Symmetry Measurement and Symmetry Mapping Using Convergent Beam Electron Diffraction*; K-H Kim, J-M Zuo; Korea Institute of Industrial Technology, South Korea
POSTER # 104
- 3:00 PM **414** *Concentration at Detection Limit of Dopant for Semiconductor Samples Using Dual SDD Analysis System*; K- I Fukunaga, N Endo; JEOL Ltd, Japan; M Suzuki; Thermo Fisher Scientific; Y Kondo; JEOL Ltd, Japan
POSTER # 105
- 3:00 PM **415** *Application of Bremsstrahlung Background Calculation and Automated Element Identification to TEM EDS Spectra*; F Eggert, PP Camus, A Sandborg; Edax, Inc.; NJ Zaluzec; Argonne National Laboratory
POSTER # 106
- 3:00 PM **416** *Materials Selection for Ultra-Thin Diamond-Like Carbon Film Metrology and Structural Characterization by TEM*; GP Souza, KC Ruthe, L Chen, L Hong, H Wang; Western Digital Corporation
POSTER # 107
- 3:00 PM **417 M&M 2015 STUDENT AWARDEE**
STEM Characterization of Gold-Copper Anisotropic Nanocrystals; LS Bazán-Díaz, R Mendoza-Cruz, JJ Velázquez-Salazar, U Santiago; The University of Texas at San Antonio; D Bahena; Laboratorio Avanzado de Nanoscopia Electrónica, CINVESTAV zacatenco, Mexico; M José-Yacamán; The University of Texas at San Antonio
POSTER # 108

3:00 PM **418** *EFTEM Contrast Tuning and EELS Fine Structure Analysis for Characterization of Carbon Containing Ultra-Low-k Dielectric Materials*; BI Prenitzer, S Schwarz, B Kempshall, I Rezadad; NanoSpective, Inc.
POSTER # 109

A12.P1 Low Voltage Electron Microscopy

POSTER SESSION

Tuesday 3:00 PM • Exhibit Hall

3:00 PM **419** *The OTO Specimen Preparation Method for Optimal Scanning Electron Microscopy Imaging of Pseudomonas aeruginosa*; TYJ Lee, N Avishai, KP Connie Tam; Cleveland Clinic Cole Eye Institute
POSTER # 110

3:00 PM **420** *Thin Film and Multilayer Scintillators for Low Voltage Backscattered Electron Imaging in the Scanning Electron Microscope*; NC Barbi, MB Tzolov, OE Healy, RB Mott; PulseTor LLC; WM McDonald; Lock Haven University of Pennsylvania
POSTER # 111

3:00 PM **421** *Investigation of Image Contrast of Energy-Filtered BSE Image at Ultra Low Voltage*; Y Hashimoto, A Muto; Hitachi High Technologies America, Inc. T Walters, E Woods; Georgia Institute of Technology; DC Joy; The University of Tennessee
POSTER # 112

3:00 PM **422** *Low-Energy Electron Diffractive Imaging Based on a Single-Atom Electron Source*; I-S Hwang, W-T Chang, C-Y Lin, W-H Hsu; Academia Sinica, China
POSTER # 113

A13.P1 Advancing Data Collection and Analysis for Atom Probe Tomography

POSTER SESSION

Tuesday 3:00 PM • Exhibit Hall

3:00 PM **423** *Level Set Method for Tip Shape Evolution Simulation for Atom Probe Tomography*; J Bao, Z Xu, R Colby; Pacific Northwest National Laboratory; S Thevuthasan; Qatar Energy and Environmental Research Institute; A Devaraj; Pacific Northwest National Laboratory
POSTER # 114

3:00 PM **424** *Atom Probe Analysis of Bulk Chemistry in Mineral Standards*; FA Laiginhas, A Perez-Huerta, RL Martens; University of Alabama; TJ Prosa, D Reinhard; CAMECA Instruments, Inc., France
POSTER # 115

3:00 PM **425** *Atom Probe Tomography Characterization of Engineered Oxide Multilayered Structures*; MI Nandasiri, N Madaan, A Devaraj, J Bao, Z Xu, T Varga, V Shutthanandan; Pacific Northwest National Laboratory, S Thevuthasan; Qatar Environment and Energy Research Institute
POSTER # 116

3:00 PM **426** *Creating Isoconcentration Surfaces in Low-Chemical-Partitioning, High Solute-Containing Alloys*; BC Hornbuckle, M Kapoor, GB Thompson; The University of Alabama
POSTER # 117

3:00 PM **427** *Experimental Evaluation of Conditions Affecting Specimen Survivability in Atom Probe Tomography*; TJ Prosa, D Lawrence, D Olson, S Strennen; CAMECA Instruments, Inc., France; RL Martens, J Goodwin; The University of Alabama; A Portavoce, D Mangelinck; Aix-Marseille Université, France, et al.
POSTER # 118

3:00 PM **428** *Atom Probe Tomography of Zircon and Baddeleyite Geochronology Standards*; DA Reinhard, DE Moser; CAMECA Instruments, Inc., France; I Barker; University of Western Ontario, Canada; D Olson, I Martin, KP Rice, Y Chen, D Lawrence; CAMECA Instruments, Inc., France, et al.
POSTER # 119

3:00 PM **429** *Atom Probe Tomography of Feldspars and Aluminosilicate Glasses*; LM Gordon; Pacific Northwest National Laboratory
POSTER # 120

3:00 PM **430** *Catalysis and Atom Probe Tomography: Recent Progresses and Future Developments towards the Analysis of Nanoporous Samples*; C Barroo, AP Magyar, DC Bell; Harvard University
POSTER # 121

3:00 PM **431** *Background Recovery through the Quantification of Delayed Evaporation Multi-Ion Events in Atom-Probe Data*; K Kruska, DK Schreiber; Pacific Northwest National Laboratory
POSTER # 122

3:00 PM **432** *Atom Probe Tomography Analysis of Bulk Chemistry in Mineral Standards*; FA Laiginhas, AP Perez-Huerta, RL Martens; University of Alabama; TJ Prosa, D Reinhard; CAMECA Instruments, Inc. France
POSTER # 123

Scientific Program

B

BIOLOGICAL SCIENCES POSTER SESSIONS—TUESDAY AFTERNOON

B02.P1 To the Rhizosphere - and Beyond!

POSTER SESSION

Tuesday 3:00 PM • Exhibit Hall

3:00 PM **433** *The Importance of Location, Location, Location: As True for Rhodococcus fascians as for Real Estate*; T Sawyer, M Putnam; Oregon State University
POSTER # 124

3:00 PM **434** *Investigation into the Stabilization of Soil Organic Matter by Microbes*; AC Dohnalkova; Pacific Northwest National Laboratory
POSTER # 125

3:00 PM **435** *The Development and Structure of Cornelian Flowers and Fruits*; T Sawyer, B Atkinson, G Rothwell, R Stockey; Oregon State University
POSTER # 126

3:00 PM **436** *Morphology, Anatomy, and Development of Cunninghamia lanceolata (Cupressaceae) Pollen Cones*; T Sawyer, B Atkinson, G Rothwell, R Stockey; Oregon State University
POSTER # 127

3:00 PM **437** *Why Phragmites australis Canes Grown in Udono Reed Bed Are the Best Materials for the Reeds of Japanese Wind Instrument 'Hichiriki' - A Structural and Biomechanical Study*; M Kawasaki, T Nobuchi; JEOL USA Inc. Y Nakafushi, M Nose; University of Toyama, Japan; M Shiojiri; Kyoto Institute of Technology, Japan
POSTER # 128

3:00 PM **438 M&M 2015 STUDENT AWARDEE** *Analysis of Plant Responses to Titanium Dioxide (TiO₂) Nanoparticles*; K Smith, K Ghoshroy, S Ghoshroy; University of South Carolina
POSTER # 129

B04.P1 Advances in Specimen Preparation and Correlative LM-EM (CLEM) of Biological Samples

POSTER SESSION

Tuesday 3:00 PM • Exhibit Hall

3:00 PM **439** *Correlative Light and Electron Microscopy Techniques: Challenges and Successes*. ES Stempinski, XS Wu; National Institutes of Health; CA Brantner; The George Washington University
POSTER # 130

3:00 PM **440** *Characterizing Microtubule Organization in the Arabidopsis Thaliana Root Apical Meristem via Correlative Microscopy*. K Celler, C Ambrose, Y Ruan, B Ross, G Wasteneys; University of British Columbia, Canada
POSTER # 131

3:00 PM **441** *Cryogenic Sample Preparation Preserves Elemental Composition for Correlative Light and X-ray Fluorescence Microscopy*; Q Jin, B Lai; Northwestern University; S chen; Argonne National Lab; T Paunesku; Northwestern University; SC Gleber, L Finney, D vine; Argonne National Lab, G Woloschak; Northwestern University, et al.
POSTER # 132

3:00 PM **442** *Methodology Development at NYULMC Microscopy Core - Correlative Light and Electron Microscopy Applications*; F Liang, C Petzold, K Dancel-Manning, Y Deng, M Cammer; New York University Langone Medical Center
POSTER # 133

3:00 PM **443** *Investigating Kinetochore Structural Dynamics during Mitosis by Employing Combinations of Several Microscopic Techniques*. V Magidson, J He, JG Ault, CB O'Connell, N Yang, H Sui, BF McEwen, A Khodjakov; Wadsworth Center, New York State Department of Health
POSTER # 134

3:00 PM **444** *Cryo-Ultramicrotomy of Complex Molecular Fluids*. M Gao; Kent State University
POSTER # 135

3:00 PM **445** *Optimized and Improved Immunogold Labeling on Ultrathin Sections of Nervous Tissue Following High Pressure Freezing, Freeze Substitution and Low Temperature Embedding*. W-P Li, S Viswanathan, Y Wang, LL Looger, PK Rivlin; Janelia Farm Research Campus
POSTER # 136

3:00 PM **446** *Agar Assisted Embedding: Visualizing Plant Pathogen Interactions at The Root - Soil Interface*; J Kilcrease, J Hammond; National Arboretum Floral and Nursery Plants Research Unit
POSTER # 137

3:00 PM **447** *The Atmospheric Scanning Electron Microscope (ASEM) Observes the Cultured Fluorescent Neuron*. T Ebihara, M Suga; National Institute of Industrial Science and Technology, Japan; H Nishiyama; JEOL Ltd, Japan; C Sato; National Institute of Industrial Science and Technology, Japan
POSTER # 138

3:00 PM **448** *Radiation Damage of Biological Specimen in Environmental Electron Microscopy*. J Hermannsdörfer, N de Jonge; Leibniz Institute for New Materials, Germany
POSTER # 139

Scientific Program

Tuesday, August 4

B05.P1 3D Structures of Macromolecular Assemblies, Cellular Organelles, and Whole Cells

POSTER SESSION

Tuesday 3:00 PM • Exhibit Hall

3:00 PM **449** *The 3D-Structure Analysis of Spermatids in the Seminiferous Epithelia by the Serial Block-face SEM Method*; Y Hasebe, T Haruta; JEOL Ltd, Japan; N Erdman; JEOL USA Inc. M Suga, H Nishioka, T Suzuki; JEOL Ltd, Japan
POSTER # 140

3:00 PM **450** *Crustacean Cuticle: Synthesis and Remodeling of a Dynamic Extracellular Matrix During Molt Cycle*; J Strus, N Znidarsic; Univerza v Ljubljani, Slovenia; A Blejec, M Tusek Znidaric; National Institute of Biology, Slovenia
POSTER # 141

3:00 PM **451** *Structure and Assembly of the Bacillus anthracis Exosporium*; CM Rodenburg, SA McPherson, CL Turnbough, T Dokland; University of Alabama, Birmingham
POSTER # 142

3:00 PM **452** *Tomographic Analysis of EmaA Adhesin Glycosylation in Aggregatibacter actinomycetemcomitans*; A Watson, H Naughton, M Radermacher, KP Mintz, T Ruiz; University of Vermont
POSTER # 143

3:00 PM **453** **M&M 2015 STUDENT AWARDEE** *3D Reconstruction of Mitochondrial Complex I Analyzed After Biogenesis in the Absence of Assembly Factor NB7ML (NDUFAF2)*; CT Nolan, K Kmita; University of Vermont; V Zickemann; University of Frankfurt, Germany; T Ruiz, M Radermacher; University of Vermont
POSTER # 144

3:00 PM **454** *Three-Dimensional Visualization of Herpesvirus Envelopment at High Resolution Using STEM Tomography and Serial Sectioning on High Pressure Frozen/Freeze-Substituted Cells*; M Schauflinger, C Villinger; University of Missouri; J von Einem; University Medical Center Ulm; P Walther; Universität Ulm, Germany
POSTER # 145

3:00 PM **455** *Ebola Virus Reconstruction Using Compressed Sensing Cryo-electron Tomograph*; A AlAfeef, WP Cockshott, IM MacLaren; University of Glasgow, United Kingdom
POSTER # 146

3:00 PM **456** *Whole-Cell Tomography Using a Conventional Scanning Electron Microscope*; T Okumura, M Shoji, A Hisada; Hitachi, Ltd, Japan; Y Ominami; Hitachi High-Technologies Corporation, Japan; T Ushiki, M Nakajima; Niigata University, Japan; T Ohshima; Hitachi, Ltd, Japan
POSTER # 147

3:00 PM **457** *3D Imaging of the Early Embryonic Chicken Heart After Altered Blood Flow with Focused Ion Beam Scanning Electron Microscopy*; M Midgett, CS López, S Rugonyi; Biomedical Engineering, Oregon Health & Science University
POSTER # 148

3:00 PM **458** *Boosting Contrast of Cryo-EM Images Without a Phase Plate*; MS Spilman, H Guo, BE Bammes, L Jin, R Bilhorn; Direct Electron, LP
Poster # 149

3:00 PM **459** *The Best of Both Worlds, How a “Christmas Tree” TEM Can Please Biologist and Material Scientists*; E Hanssen, MP Watts; The University of Melbourne, Australia; ER Smith; The Royal Melbourne, Australia; P Gosavi, PA Gleeson, JW Moreau; The University of Melbourne, Australia
POSTER # 150

3:00 PM **460** *Adhesion Pili from Enterotoxigenic Escherichia coli Share Similar Biophysical Properties Despite Their Different Assembly Pathways*; N Mortezaei, CR Epler; Umeå University, Sweden; PP Shao; Princeton University; M Shirdel, B Singh, BE Uhlin; Umeå University, Sweden; SJ Savarino; Naval Medical Research Center, M Andersson; Umeå University Sweden, et al.
POSTER # 151

B10.P1 Multiscale Biological Imaging: From Micro to Macro – Animal to Clinical Models

POSTER SESSION

Tuesday 3:00 PM • Exhibit Hall

3:00 PM **461** *X-ray Tomographic Microscopy of Drosophila Brain Network and Skeletonized Model Building in the Three-Dimensional Image*; R Mizutani, R Saiga; Tokai University, Japan; K Uesugi, A Takeuchi, Y Terada, Y Suzuki; Japan Synchrotron Radiation Research Institute
POSTER # 152

3:00 PM **462** *Three-Dimensional Neuronal Structure of Human Cerebral Cortex Determined by Synchrotron-Radiation Microtomography*; R Saiga, S Takekoshi, C Inomoto, N Nakamura, A Tsuboi, M Osawa; Tokai University, Japan; M Arai, K Oshima; Tokyo Metropolitan Institute of Medical Science, Japan, et al.
POSTER # 153

3:00 PM **463** *A Reverse Engineering Approach for Imaging Spinal Cord Architecture – Large Area High-Resolution SEM Imaging*; CA Brantner, M Rasche; The George Washington University; KE Burcham, J Klingfus, J Sanabia; Raith America, Inc. CE Korman, A Popratiloff; The George Washington University
POSTER # 154

Scientific Program

B

BIOLOGICAL SCIENCES POSTER SESSIONS—TUESDAY AFTERNOON *continued*

3:00 PM **464** *Simplified Biological Tissue Analysis with Combination of Atmospheric Scanning Electron Microscope and Light Microscope*; A Hisada, Y Ominami; Hitachi Central Research Laboratory, Japan
POSTER # 155

3:00 PM **465** *3D X-ray Microscopy: A New High Resolution Tomographic Technology for Biological Specimens*; L Lavery, A Merkle; Carl Zeiss X-ray Microscopy
POSTER # 156

B11.P1 Specimen Preparation for Biological Sciences

POSTER SESSION Tuesday 3:00 PM • Exhibit Hall

3:00 PM **466** *Cryo Transmission Electron Microscopy of Three Research-Grade Liposomal Formulations of Doxorubicin*; W Monroe, A Paredes, P Sisco, K Ahlschwede, S Linder; U S Food and Drug Administration
POSTER # 157

3:00 PM **467** *Using a White Light Confocal Profiler for Ancient Diet Reconstruction*; ARJ Remy, C Schmidt; University of Indianapolis; R D'Anastasio; Museo Universitario di Chieti, Italy
POSTER # 158

3:00 PM **468** *Testate Amoebae Diversity, from the Atlantic Forest Aquatic and Edaphic Environments, Collected Within the Rio de Janeiro State, Brazil*; ID da Silva-Neto, B Leite; Instituto de Biologia, Brazil
POSTER # 159

3:00 PM **469** *Inactivation of Bacterial Endospores in an Artificial Tissue for Electron Microscopy Analysis*; RM Hannah, BM Leroux, RK Pope; National Biodefense Analysis and Countermeasures Center
POSTER # 160

3:00 PM **470** *Aspergillus fumigatus Biofilms: a Comparison of Processing Techniques for Scanning Electron Microscopy of Fungal Mycelium and Extracellular Matrix*; L-M Joubert, JA Ferreira, DA Stevens, L Cegelski; Stanford University
POSTER # 161

3:00 PM **471** *Sure, We Can Image That! An Attempt to Image the Edge of a Growing Bacterial Colony*; GD Martens, K Hodgson; University of British Columbia, Canada
POSTER # 162

P

PHYSICAL SCIENCES POSTER SESSIONS—TUESDAY AFTERNOON

P01.P2 Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on *In Situ* TEM and STEM

POSTER SESSION Tuesday 3:00 PM • Exhibit Hall

3:00 PM **472** *Atomic-level Fabrication of Crystalline Oxides in STEM*; Q He, S Jesse, AR Lupini, DN Leonard; Oak Ridge National Laboratory; MP Oxley, OS Ovchinnikov; Vanderbilt University; R Unocic, A Tselev; Oak Ridge National Laboratory, et al.
POSTER # 163

3:00 PM **473** *TEM In Situ Plastic Deformation of Silver Nanowires*; JE Ortega Aguilar, D Alducin, A Ponce Pedraza; University of Texas at San Antonio
POSTER # 164

3:00 PM **474 M&M 2015 STUDENT AWARDEE** *In Situ Visualization of Metallurgical Reactions in Nanoscale Cu/Sn Diffusion Couples*; Q Yin, F Gao; State University of New York, Binghamton; Z Gu; University of Massachusetts Lowell; E Stach; Brookhaven National Lab; G Zhou; State University of New York, Binghamton
POSTER # 165

3:00 PM **475** *Visualization of Gold Nanoparticle Self-assembly Kinetics*; TJ Woehl, T Prozorov; The Ames Laboratory
POSTER # 166

3:00 PM **476** *Thermally Driven Cation Exchange at Solid State Between Cu₂Se and CdSe Nanocrystals: an In Situ TEM Study*; A Falqui, A Casu, A Genovese; King Abdullah University of Science and Technology, Saudi Arabia; L Manna; Istituto Italiano di Tecnologia; P Longo; Gatan, Inc. GA Botton; McMaster University, Canada; S Lazar; FEI Electron Optics, M UpadhyayKahaly; King Abdullah University of Science and Technology, Saudi Arabia, et al.
POSTER # 167

3:00 PM **477** *Improved Environmental Control and Experimental Repeatability with New In Situ Devices*; T Moser, T Shokuhfar; Michigan Technological University; J Evans; Pacific Northwest National Laboratory
POSTER # 168

3:00 PM **478** *In Situ STEM Investigation of Shape-Controlled Synthesis of Au-Pd Core-Shell Nanocube*; N Bhattarai, T Prozorov; Ames Laboratory US DOE
POSTER # 169

Scientific Program

Tuesday, August 4

3:00 PM **479** *In Situ STEM Observation of Strain Field Movement in a LiMn₂O₄ Nanowire Battery*; S Lee, Y Oshima; Tokyo Institute of Technology, Japan; E Hosono, H Zhou; National Institute of Advanced Industrial Science and Technology, Japan; R Kanno, K Takayanagi; Tokyo Institute of Technology, Japan; X Zhang; Japan Advanced Institute of Science and Technology, Japan
POSTER # 170

3:00 PM **480 M&M 2015 STUDENT AWARDEE** *On the Weak Forces on nanoparticles*; D Alducin, M José-Yacamán, A Ponce; University of Texas at San Antonio
POSTER # 171

3:00 PM **481** *In Situ Observation of Annealing Effects in Ga(NAsP) Multi Quantum Well Structures*; R Straubinger, A Beyer, L Duschek, T Wegele, W Stolz, K Volz; Philipps-Universität Marburg, Germany
POSTER # 172

3:00 PM **482** *When is Si₃N₄ not Si₃N₄? When it is a Low Stress SiNx Membrane Window*; NJ Zaluzec; Argonne National Laboratory
POSTER # 173

3:00 PM **483** *Modifications to Membrane Heater Holders to Enable XEDS in the AEM*; NJ Zaluzec, A Janssen; Argonne National Laboratory; MG Burke; University of Manchester, United Kingdom; D Gardiner, S Walden; Protochips Inc.
POSTER # 174

3:00 PM **484** *Annular Bright-Field Electron Microscopy Tracking Solid-State Chemical Reaction*; P Gao, R Ishikawa, E Tochigi, A Kumamoto, N Shibata, Y Ikuhara; The University of Tokyo, Japan
POSTER # 175

3:00 PM **485** *Ex Situ and In Situ (S)TEM of Iron Oxide Nanoparticles Synthesized by Decomposition of an Organometallic Precursor*; R Hufschmid, H Arami, KM Krishnan; University of Washington; ND Browning; Pacific Northwest National Laboratory
POSTER # 176

3:00 PM **486** *Diffraction-Ring Contraction as a Method for In Situ Thermometry in TEM*; DR Cremons, DJ Flannigan; University of Minnesota
POSTER # 177

3:00 PM **487** *Studying Perovskite-based Solar Cells with Correlative In Situ Microscopy*; JA Aguiar, S Wozny; National Renewable Energy Laboratory; W Zhou; University of New Orleans; H Guthrey, AG Norman, H Mounthino, CS Jiang, J Berry; National Renewable Energy Laboratory, et al.
POSTER # 178

3:00 PM **488** *Quantitative Analysis of Nucleation and Growth Behavior from In Situ Liquid Cell Studies*; AV Ievlev, S Jesse, SV Kalinin; Oak Ridge National Laboratory; TJ Cochell; University of Kentucky; RR Unocic; Oak Ridge National Laboratory
POSTER # 179

3:00 PM **489** *Imaging of Nano-Structures at High Temperatures and Pressures above One Atmosphere Using a Windowed TEM Gas Cell Specimen Holder*; J Murphy, NJ Salmon, DH Alsem; Hummingbird Scientific
POSTER # 180

P04.P1 Nano-Characterization of Low Dimensional Materials: Carbon to 2D TMDs

POSTER SESSION

Tuesday 3:00 PM • Exhibit Hall

3:00 PM **490** *Structural Analysis of Carbon Nanotubes of Various Diameters Grown by Spray Pyrolysis Using Raman Spectroscopy*; EG Ordoñez, M Roman; Universidad Autonoma de Ciudad Juarez, Mexico; A Aguilar, F Espinosa; Centro de Investigaciones en Materiales Avanzados, Mexico
POSTER # 181

3:00 PM **491** *Cu/MWCNT Interfaces in Room Temperature Aged Nanocomposites Revealed by HRTEM and EELS*; ME Mendoza, G Solórzano; National Institute of Metrology, Quality and Technology, Brazil; T Aoki, DJ Smith; Arizona State University
POSTER # 182

3:00 PM **492** *Graphene Related Nanostructures Synthesized by High-energy Ball Milling*; I Estrada-Guel, O Anderson-Okonkwo; Centro de Investigación en Materiales Avanzados, Mexico; FC Robles-Hernandez; University of Houston
POSTER # 183

3:00 PM **493** *Electron Microscopy and Photocatalytic Studies of 1d TiO₂ Nanostructures Synthesized by Two Different Routes*; DR Acosta; Universidad Nacional Autonoma De Mexico
POSTER # 184

3:00 PM **494** *Strain Relaxation in InAs Quantum Dots and its Suppression by Indium Flushing*; H Xie, FA Ponce; Arizona State University; R Jakomin, M Pires; Universidade Federal do Rio de Janeiro, Brazil; P Rodrigo, PL Souza; Pontifical Catholic University of Rio de Janeiro, Brazil
POSTER # 185

3:00 PM **495** *Peculiar Plasmon Peak Position in Electron Energy Loss Spectrum of Hexagonal Boron Nitride/Graphene Double Layer*; NG Cross, L Liu, A Mohsin, G Gu, G Duscher; University of Tennessee, Knoxville
POSTER # 186

3:00 PM **496** *Nanostructured Ruthenium Disulfide catalyst high active in the HDS of DBT*; CE Ornelas, CC Leyva, A Aguilar-Elguézabal, L Alvarez-Contreras; Centro de Investigación en Materiales Avanzados, Mexico; DM Carrillo; Universidad Autónoma de Ciudad Juárez, Mexico
POSTER # 187

Scientific Program

P

PHYSICAL SCIENCES POSTER SESSIONS— TUESDAY AFTERNOON *continued*

3:00 PM **497** *Template Synthesis of Hollow Carbon Nanofibers*; Y Song, J Wei, J Liu; Arizona State University
POSTER # 188

3:00 PM **498** *Atomic Resolution Study of W-Doped VO₂ Nanowires*; H Asayesh-Ardakani, A Nie; Michigan Technological University; PM Marley; University at Buffalo; Y Zhu; King Abdullah University of Science & Technology, Saudia Arabia; PJ Phillips, RF Klie; University of Illinois at Chicago; S Banerjee; University at Buffalo; R Shahbazian-Yassar; Michigan Technological University, et al.
POSTER # 189

3:00 PM **499** *Influence of Nonlinear Intensity Attenuation in Bright-Field TEM Images on Tomographic Reconstructions of Micron-Scaled Materials*; J Yamasaki, M Mutoh; Osaka University; S Ohta, S Yuasa; JEOL Ltd, Japan; S Arai, K Sasaki, N Tanaka; Nagoya University, Japan
POSTER # 190

3:00 PM **500 M&M 2015 STUDENT AWARDEE** *Atomic-Scale Characterization of the Reduction of $\alpha\text{Fe}_2\text{O}_3$ Nanowires*; W Zhu, JP Winterstein; State University of New York at Binghamton; R Sharma; National Institute of Standards and Technology; G Zhou; State University of New York at Binghamton
POSTER # 191

3:00 PM **501** *Atomic Structure of Amorphous 2D Carbon Structures as Revealed by Scanning Transmission Electron Microscopy*; J Kotakoski, F Eder, G Argentero, S Hummel, D Lindner, JC Meyer; University of Vienna, Austria
POSTER # 192

P05.P1 Nuclear and Irradiated Materials: Fundamental Defect Properties

Poster Session

Tuesday 3:00 PM • Exhibit Hall

3:00 PM **502** *Sample Preparation Artifacts in Nuclear Materials and Mitigation Strategies*; A Aitkaliyeva, JW Madden, BD Miller, J Cole, J Gan; Idaho National Laboratory
POSTER # 193

3:00 PM **503** *Microstructural Characterization of Hydrogen Irradiated Austenitic Stainless Steel*; H-H Jin, E Ko, J Kwon; Nuclear Material Safety Research Division, Korea Atomic Energy Research Institute, South Korea
POSTER # 194

3:00 PM **504** *LAM DA: Irradiated-Materials Microscopy at Oak Ridge National Laboratory*; CM Parish, K Kumar, PD Edmondson, KG Field, CM Silva, M Williams, K Linton, KJ Leonard; Oak Ridge National Laboratory, et al.
POSTER # 195

3:00 PM **505** *Analysis of Radiation Damage in Magnesium Aluminate Spinel by Means of Cathodoluminescence*; I Jozwik, J Jagielski, G Gawlik, P Jozwik; Institute of Electronic Materials Technology, Poland; R Ratajczak; National Centre for Nuclear Research; G Panczer, N Moncoffre; Université Lyon, France, A Wajler; Institute of Electronic Materials Technology, Poland, et al.
POSTER # 196

3:00 PM **506** *Stability of Precipitates in Zirconium Alloys under Self-ion Irradiation*; X Wang, M Zhao, F Zhang; Xiamen University, China; L Wang; University of Michigan
POSTER # 197

3:00 PM **507** *The Evolution of Precipitates in High Cu and High Ni RPV Weld under Long-term Thermal Ageing*; JJ Lim, GM Burke; The University of Manchester, United Kingdom; PD Styman; National Nuclear Laboratory, United Kingdom; I Maclaren; The University of Glasgow, United Kingdom; S Lozano- Perez, CR Grovenor; The University of Oxford, United Kingdom; K Wilford; Rolls Royce, United Kingdom
POSTER # 198

3:00 PM **508** *Amorphization of Indium Phosphide Single Crystals by Swift Heavy Ion Bombardment*; AS Khalil; Tabbin Institute for Metallurgical Studies, Egypt
POSTER # 199

3:00 PM **509** *In Situ Observation of Single Ion Damage in Electronic Materials*; DC Bufford, R Dingreville, K Hattar; Sandia National Laboratories
POSTER # 200

3:00 PM **510** *A Combined Effect of Electron Beam and Stress on Plastic Flow of Amorphous Silica Microparticles*; S Bhowmick, D Staufer, R Major, O Warren, S Asif; Hysitron, Inc.
POSTER # 201

3:00 PM **511** *Quantitative Stress Measurements Near Blocked Slip Bands in Austenitic Stainless Steel Using High Resolution Electron Backscatter Diffraction*; DC Johnson, MD McMurtrey, GS Was; University of Michigan
POSTER # 202

3:00 PM **512** *Microstructural Changes in a Highly Irradiated ODS Ferritic MA957 Alloy*; DJ Edwards, MT Toloczko; Pacific Northwest National Laboratory
POSTER # 203

P08.P2 Microscopy and Characterization of Ceramics, Polymers, and Composites

POSTER SESSION

Tuesday 3:00 PM • Exhibit Hall

3:00 PM **513** *Sulfidation of Metal Oxide Crystallites: An Ex Situ TEM Study*; CE Kliewer, SL Soled, S Miseo; ExxonMobil Research & Engineering
POSTER # 204

Scientific Program

Tuesday, August 4

- 3:00 PM **514** *Synthesis and Characterization of LiNbO₃ Nanofibers*; Mc Maldonado, Je Sosa, Mt Ochoa, F Espinosa; Centro de Investigación en Materiales Avanzados, Mexico
POSTER # 205
- 3:00 PM **515** *ZnO Nanofibers Easily Synthesized by Electrospinning. A New Formula*; JE Sosa-Marquez, MC Maldonado-Orozco, FF Espinosa-Magaña, MT Ochoa-Lara; Centro de Investigación en Materiales Avanzados, Mexico
POSTER # 206
- 3:00 PM **516** *Cr(Al)N/Al₂O₃ Nanocomposite Coatings Fabricated by Differential Pumping Cosputtering*; M Kawasaki, M Nose; JEOL USA Inc. I Onishi; JEOL Ltd, Japan; K Matsuda; University of Toyama, Japan; M Shiojiri; Kyoto Institute of Technology, Japan
POSTER # 207
- 3:00 PM **517** *Synthesis of Hexagonal Bar Shape of ZnO Particles by Using Hydrothermal Treatment*; A Medina, S Borjas, P Martínez, L Béjar; Universidad Michoacana de San Nicolás de Hidalgo, Mexico; C Aguilar; Universidad Técnica Federico Santa María, Chile; JL Bernal; Universidad Politécnica de Pachuca, Mexico
POSTER # 208
- 3:00 PM **518** *Fe Doped-ZnO Nanofibers Synthesized by Electrospinning*; JE Sosa- Marquez, MC Maldonado-Orozco, F Espinosa-Magaña, MT Ochoa-Lara; Centro de Investigación en Materiales Avanzados, Mexico
POSTER # 209
- 3:00 PM **519** *Chemical and Structural Characterization of PbS-SiO₂ Core-shell Structures Synthesized by Ultrasonic Wave-Assisted Chemical Bath Deposition*; P Moreno-Wong, J Alvarado-Rivera, G Moreno, MC Acosta, J Castillo; Universidad de Sonora, Mexico
POSTER # 210
- 3:00 PM **520** *Chemical Synthesis and Structural/Analytical Characterization of CuNi-Al₂O₃ Nanocomposites*. MIR Ramos Navarro, GS Solorzano; Pontifical Catholic University of Rio de Janeiro, BRAZIL
POSTER # 211
- 3:00 PM **521** *Recycled Al Reinforced with Oxide Nanoparticles Produced by Stir-casting Method*; A Santos, V Gallegos; Universidad Tecnológica de Chihuahua Sur; M Santos, FJ Baldenebro, CD Gomez; Centro de Investigación en Materiales Avanzados, Mexico; I Ronquillo; Universidad Tecnológica de Chihuahua Sur, Mexico; R Martinez; Centro de Investigación en Materiales Avanzados, Mexico
POSTER # 212
- 3:00 PM **522** *Microstructure and Mechanical Properties of Al-composites Reinforcing with Gr/Ni Nanoparticles Processed by High-energy Ball Milling*; JM Mendoza-Duarte, R Martínez-Sánchez, C Carreño-Gallardo, I Estrada-Guel; Centro de Investigación en Materiales Avanzados, Mexico
POSTER # 213
- 3:00 PM **523** *Evaluation of Mechanical Properties of Aluminum Alloy (Al-2024) Reinforced with Carbon-coated Silver Nanoparticles (AgCNP) Metal Matrix Composites*; C Carreño-Gallardo, J Mendoza-Duarte; Centro de Investigación en Materiales Avanzados, Mexico; C López-Meléndez; Universidad La Salle Chihuahua, Mexico; I Estrada-Guel, R Martínez-Sánchez; Centro de Investigación en Materiales Avanzados, Mexico
POSTER # 214
- 3:00 PM **524** *Synthesis of Ti-Nb-Ta-Zr Alloys Foams by Powder Metallurgy*; C Aguilar, A Medina; Universidad Técnica Federico Santa María, Chile; L Béjar; Universidad Michoacana de San Nicolás de Hidalgo; D Guzman, S Lascano; Universidad Técnica Federico Santa María, Chile; H Carreón; Universidad Michoacana de San Nicolás de Hidalgo, Mexico; I Alfonso; Universidad Nacional Autónoma de México
POSTER # 215
- 3:00 PM **525** *Synthesis of Ti-Nb-Ta-Mn Alloys by Mechanical Alloying*; L Béjar, A Medina; Universidad Michoacana de San Nicolás de Hidalgo, Mexico; D Guzman, C Aguilar, S Lascano; Universidad Técnica Federico Santa María, Chile; H Carreón; Universidad Michoacana de San Nicolás de Hidalgo, Mexico; I Alfonso; Universidad Nacional Autónoma de México
POSTER # 216
- 3:00 PM **526** *Microstructural Investigation of Multi-state Resistive Switching Characteristics in Multi-layered Platinum/Tantalum Oxide Using In Situ TEM*; S-I Kim, S-P Hong, Y-W Kim; Seoul National University, South Korea
POSTER # 217
- 3:00 PM **527** *Generating Large Magnetic Field in a High Resolution Electron Beam Lithography*; C Wan, P Guo, Q Zhang; Institute of Physics, Chinese Academy of Sciences, Beijing National Laboratory of Condensed Matter Physics; A Rudzinski, T Kliem, R Jede; Raith GmbH, Germany; X Sun; GermanTech Co, Ltd, X Han; Chinese Academy of Sciences
POSTER # 218
- 3:00 PM **528** *Densification and Microhardness of Spark Plasma Sintered ZrB₂+SiC Nano-Composites*; NV Seetala, MT Webb; Grambling State University; LE Matson; Wright-Patterson Air Force Base; H Lee; UES, Inc. CM Carney; Wright-Patterson Air Force Base; TS Key; UES, Inc.
POSTER # 219
- 3:00 PM **529** *Metal/Ceramic Interface Structures and Segregation Behavior in Aluminum-based Composites*; X Zhang, T Hu, J Rufner; University of California, Davis; T LaGrange, GH Campbell; Lawrence Livermore National Laboratory; EJ Lavernia, JM Schoenung, K van Benthem; University of California, Davis
POSTER # 220

Scientific Program

P

PHYSICAL SCIENCES POSTER SESSIONS— TUESDAY AFTERNOON *continued*

P11.P2 Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials

POSTER SESSION

Tuesday 3:00 PM • Exhibit Hall

- 3:00 PM **530** *Preliminary Investigations of Chemical & Morphological Inhomogeneities in $\text{La}_{0.6}\text{Sr}_{0.4}\text{CoO}_{3.8}$ Single-Crystalline Perovskite Thin Films by ACTEM and STEM-EELS*; B gü, ML Machala, AL Koh, R Sinclair, WC Chueh; Stanford University
POSTER # 221
- 3:00 PM **531** *Low Dose Electron Microscopy of Interlayer Expanded Molybdenum Disulfide Nanocomposites*; HA Calderon, Y Liang; Instituto Politecnico Nacional, Mexico; H Deog Yoo, Y Li; University of Houston; FC Hernandez; University of Houston; C Kisielowski; Lawrence Berkeley National Laboratory; Y Yao; University of Houston
POSTER # 222
- 3:00 PM **532** *Structure Evolution of Mo_2C Catalysts upon Exposure to Oxygen*; JT Held, M Sullivan, A Bhan, A Mkhoyan; University of Minnesota
POSTER # 223
- 3:00 PM **533** *TEM and EDX Studies on the Structural and Compositional Evolution of PtNi_3 Concave Nanocubes*; L Zhang, C Wang; Brookhaven National Laboratory; J Fang; State University of New York at Binghamton,
POSTER # 224
- 3:00 PM **534** *Machine-Learning Aided Evolution Studies of Nano-composite Electrodes and Nano-particle Catalysts for Fuel Cell Applications*; D Rossouw, LE Chinchilla, S Prabhudev; McMaster University, Canada; T Trefz, N Kremliaikova; Automobile Fuel Cell Cooperation; GA Botton; McMaster University, Canada
POSTER # 225
- 3:00 PM **535** *Atomic-scale characterization of restructured PtCu Nanocubes*; CS Bonifacio, J Shan; University of Pittsburgh; FF Tao; University of Kansas; JC Yang; University of Pittsburgh
POSTER # 226
- 3:00 PM **536** *Characterization of Core/shell Bi-metallic Cube-shaped Nanoparticles with Scanning Transmission Electron Microscopy*; DH Anjum, A Samal, MA Roldan-Gutierrez; King Abdullah University of Science & Technology, Saudi Arabia
POSTER # 227
- 3:00 PM **537** *Crystal Plane Effect of CeO_2 in Metal-CeO₂ Nanocatalysts for CO Oxidation*; R Wang; Youngstown State University
POSTER # 228



OUTREACH

TUESDAY AFTERNOON

X90.P1 Microscopy in the Classroom

EDUCATION POSTER SESSION

Tuesday 3:00 PM • Exhibit Hall

- 3:00 PM **538** *Democratizing the Micro-Scale: A Simplified, Miniaturized SEM for K-12 and Informal Student Scientists*; L Own, S Whitmer; The Evergreen School; CS Own; Voxa; L Own; HiveBio
POSTER # 229

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—WEDNESDAY MORNING

A06.3 Advanced Analytical TEM/STEM

SESSION CHAIRS:

Paul Kotula, Sandia National Laboratories

Masashi Watanabe, Lehigh University

Gerald Kothleitner, Graz University of Technology, Austria

PLATFORM SESSION

Wednesday 8:30 AM • Room: A106

8:30 AM **539** (Invited) *What Does Quantitative Mean In Atomic-Resolution EDS STEM?*; NR Lugg, G Kothleitner, B Feng, N Shibata, Y Ikuhara; The University of Tokyo, Japan

9:00 AM **540** *Channelling and Atomic Resolution STEM Using X-ray Emissions with Absorption*; CJ Rossouw; Monash University, Australia

9:15 AM **541** *Absolute-Scale Quantitative Energy Dispersive X-ray Analysis in Aberration-Corrected Scanning Transmission Electron Microscopy*; Z Chen, AJ D'Alfonso, M Weyland, DJ Taplin, SD Findlay; Monash University, Australia; LJ Allen; University of Melbourne, Australia

9:30 AM **542** *Theoretical Evaluation of Atomic-Resolution X-ray Analysis toward Quantification*; M Watanabe; Lehigh University

9:45 AM **543** *Quantitative EDS of Surface Modified Powders for Hydrogen Storage*; JD Sugar, M Homer, PG Kotula; Sandia National Laboratories; PJ Cappillino; University of Massachusetts, Dartmouth; M Ong; Whitworth University; DB Robinson; Sandia National Laboratories

A08.1 Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques

SESSION CHAIRS:

Nicholas Ritchie, National Institute of Standards and Technology

Paul Carpenter, Washington University

Phillipe Pinard, RWTH Aachen University, Germany

PLATFORM SESSION

Wednesday 8:30 AM • Room: B115

8:30 AM **544** (Invited) *Computational Method for Composition Determination of Multilayer Epitaxial Semiconductor Structures Using Standards-Based Energy-Dispersive X-Ray Spectrometry*; M Rathi, N Zheng; University of Houston; P Ahrenkiel; South Dakota School of Mines & Technology

9:00 AM **545** *Practical Considerations in Quantitative Nanoscale Energy-Dispersive X-ray Spectroscopy (EDX) and Its Application in SiGe*; W Weng, FH Baumann, Y Ke, R Loesing, A Madan, Z Zhu, AD Katnani; IBM Microelectronics Division

9:15 AM **546** *Quantification of Phase Compositions and Diffusional Profiles in Simulated Solid-State Welds of Ti-17 via Super-X Energy-Dispersive X-Ray Spectroscopy*; J Orsborn, RE Williams, HL Fraser; The Ohio State University

9:30 AM **547** *Effect of Specimen Geometry on Quantitative EDS Analysis with Four-Quadrant Super-X Detectors*; W Xu, JH Dycus, X Sang, AA Oni, JM Lebeau; North Carolina State University

9:45 AM **548** *Influence of Convergence Angle and Finite Effective Source Size for Quantitative Atomic Resolution EDXS*; JH Dycus, SD Findlay, W Xu, XH Sang; North Carolina State University; LJ Allen; University of Melbourne, Australia; JM LeBeau; North Carolina State University

A10.1 Advances in Electron Diffraction and Automated Mapping Techniques

SESSION CHAIR:

Jörg Wiezorek, University of Pittsburgh

PLATFORM SESSION

Wednesday 8:30 AM • Room: B112

8:30 AM **549** (Invited) *TEM Based High Resolution Electron Diffraction Techniques for Three-dimensional Nanostructure Determination*; J-M Zuo, Y Meng, P Vivek Deshpande; University of Illinois, Urbana-Champaign

9:00 AM **550 M&M POST-DOCTORAL RESEARCHER AWARDEE** *Towards Identification of Oxygen Point Defects by Means of Position Averaged CBED*; R dos Reis, C Ophus, J Ciston, P Ercius, U Dahmen; National Center for Electron Microscopy, LBNL

9:15 AM **551** *Mapping Valence Electron Distribution of Iron-Based Superconductors Using Quantitative CBED and Precession Electron Diffraction*; L Wu, C Ma; Brookhaven National Laboratory; B Ge; Chinese Academy of Sciences; W Yin, Y Zhu; Brookhaven National Laboratory

9:30 AM **552** *Transmission Kikuchi Diffraction (TKD) via a Horizontally Positioned Detector*; E Bouzy, J-j Fundenberger; Université de Lorraine, France; D Goran; Bruker Nano GmbH, Germany; J Guyon, H Yuan; Université de Lorraine, France; a Morawiec; Institute of Metallurgy and Materials Science - Polish Academy of Science

9:45 AM **553** *Utility of Precession Electron Diffraction Patterns with Varying Degrees of Non-parallel Illumination from the Same Nominal Sample Area*; P Moeck, JC Straton; Portland State University; DJ Edwards; Pacific Northwest National Laboratory; I Häusler; Humboldt University Berlin, Germany

Scientific Program

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—WEDNESDAY MORNING *continued*

A16.2 Advances in Electron and Ion Scanning Microscopies

SESSION CHAIRS:

David Joy, Oak Ridge National Laboratory
Brendan Griffin, University of Western Australia

PLATFORM SESSION

Wednesday 8:30 AM • Room: B118

- 8:30 AM **554** *Comparison of Secondary, Backscattered and Low Loss Electron Imaging for Dimensional Measurements in the Scanning Electron Microscope*; MT Postek, J Villarrubia, AE Vladár; National Institute of Standards and Technology; A Muto; Hitachi High Technologies America
- 8:45 AM **555** *Variation in Band Gap Contrast in Natural Molybdenum Disulphide (MoS₂) with BSE Collection Angle and Stage Bias Using a Segmented Annular BSED*; BJ Griffin, DC Joy; The University of Western Australia; JR Michael; Sandia National Laboratories
- 9:00 AM **556** (Invited) *Monte Carlo Simulations of Signal Electrons Collection Efficiency and Development of New Detectors for ESEM*; V Nedela, I Konvalina, M Oral, J Hudec; Institute of Scientific Instruments of ASCR, Czech Republic
- 9:30 AM **557** *Electron Microscopy in Air: Transparent Atomic Membranes and Imaging Modes*; Y Han, K Nguyen, Y Ogawa, H Shi, DA Muller, Cornell University
- 9:45 AM **558** *Advances In Variable Pressure Imaging and Detection*; L Han, C Berger, M Boese, A Thesen, F Zhou, S Meyer, E Essers; Carl-Zeiss Microscopy

B

BIOLOGICAL SCIENCES SYMPOSIA WEDNESDAY MORNING

B04.3 Advances in Specimen Preparation and Correlative LM-EM (CLEM) of Biological Samples

SESSION CHAIR:

Danielle Jorgens, Oregon Health & Science University

PLATFORM SESSION

Wednesday 8:30 AM • Room: D138

- 8:30 AM **559** (Invited) *Quick Freeze Substitution Processing of Biological Samples for Serial Block-face Scanning Electron Microscopy*; RI Webb, RE Webb; University of Queensland, Australia

- 9:00 AM **560** (Invited) *The Acquisition of Large Datasets with Serial-block Face Scanning Electron Microscopy Following Light Microscopy Image Acquisition: Workflows from Sample Preparation to Image Acquisition*; C Genoud, AA Wanner, RW Friedrich; Friedrich Miescher Institute for Biomedical Research, Switzerland

- 9:30 AM **561** *In Situ Tomography of Membrane Proteins Enabled by Advanced Cryo-FIB Sample Preparation and Phase Plate Imaging*; M Schaffer, BD Engel, M Wehmer, T Gupta, E Sakata, T Laugks, J Mahamid, W Baumeister; Max Planck Institute of Biochemistry, Germany, et al.

- 9:45 AM **562** *Imaging of Vitrified Biological Specimens by Confocal Cryo-Fluorescence Microscopy and Cryo-FIB/SEM Tomography*; A Rigort, R Kirmse, V Doering; Carl Zeiss Microscopy; M Schwertner; Linkam Scientific Instruments Ltd., United Kingdom; R Wolleschensky; Carl Zeiss Microscopy

P

PHYSICAL SCIENCES SYMPOSIA WEDNESDAY MORNING

P01.5 Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on *In Situ* TEM and STEM

SESSION CHAIRS:

M. Grace Burke, University of Manchester, United Kingdom
Ondrej Krivanek, Nion Inc.
Peter Crozier, Arizona State University

PLATFORM SESSION

Wednesday 8:30 AM • Room: B116

- 8:30 AM **563** (Invited) *Growth of Transition Metal Oxides in Solution under Liquid Cell Electron Microscopy and Electron Beam Effects*; W-I Liang, H Zheng; Lawrence Berkeley National Laboratory
- 9:00 AM **564** *The Stability of Gold Nanoparticles in Liquid Scanning Transmission Electron Microscopy Experiments Studied under Varied Conditions*; A Verch, J Hermannsdörfer, N de Jonge; INM - Leibniz Institut für neue Materialien, Germany
- 9:15 AM **565** *Automated and Shaped-Controlled Liquid STEM Nanolithography*; RR Unocic, AR Lupini, AY Borisevich, SV Kalinin, S Jesse; Oak Ridge National Laboratory
- 9:30 AM **566** *Manipulating Size and Shape of Silica Nanoparticles with Liquid-Phase Transmission Electron Microscopy*; J Zecevic, KP de Jong; Utrecht University, Netherlands; N de Jonge; INM - Leibniz Institute for New Materials, Germany

Scientific Program

P02.1 Materials Problem Solving with Aberration-Corrected EM

SESSION CHAIRS:

David Smith, Arizona State University

Lin Gu, Beijing Laboratory for Electron Microscopy

PLATFORM SESSION

Wednesday 8:30 AM • Room: C124

8:30 AM **567** (Invited) *Materials Science Applications of Aberration Corrected TEM and/or STEM*; G Van Tendeloo, AM Abakumov, S Bals, S Van Aert, J Verbeeck; University of Antwerp, Belgium

9:00 AM **568** (Invited) *50pm Aberration Corrected In Situ Electron Microscopy – How Ions behave in Lithium Ion Nanowire Battery*; K Takayanagi, S Lee; Tokyo Institute of Technology, Japan; Y Oshima; Japan Advanced Institute of Science and Technology; Y Tanishiro; Tokyo Institute of Technology, Japan

9:30 AM **569** *Depth-Resolution Imaging of Crystalline Nano Clusters on/in Amorphous Films Using Aberration-Corrected TEM*; J Yamasaki, A Hirata, Y Hirotsu, K Hirahara; Osaka University, Japan; N Tanaka; Nagoya University, Japan

9:45 AM **570** *Strain Control at Two-Dimensional Oxide Interfaces Probed by Aberration-Corrected STEM-EELS*; DJ Baek, D Lu; Cornell University; Y Hikita, HY Hwang; Stanford University; LF Kourkoutis; Cornell University

P03.1 Advances in Microanalysis of Earth and Planetary Materials

SESSION CHAIRS:

Rhonda Stroud, Naval Research Laboratory

Eve L. Berger, NASA Johnson Space Center

PLATFORM SESSION

Wednesday 8:30 AM • Room: C122

8:30 AM **571** (Invited) *The Use of Auger Spectroscopy for the Elemental Analysis of Presolar Silicate Grains*; C Floss; Washington University in St Louis

9:00 AM **572** *Practical Aspects of the Electron Probe Analysis of Boron in Silicates Using a LSM Device with Large 2D*; GB Morgan; University of Oklahoma

9:15 AM **573** (Invited) *CHILL, a Nanobeam Secondary Neutral Mass Spectrometer with Extraordinary Spatial Resolution, Sensitivity, and Selectivity: First Results*; AM Davis, T Stephan, R Trappitsch; The University of Chicago; MJ Pellin; Argonne National Laboratory; D Rost; The University of Chicago; MR Savina; Argonne National Laboratory; N Dauphas; The University of Chicago

9:45 AM **574** *Electron Microprobe Analysis of Complex Y-REE-Ta-Nb-Ti Minerals from the Petaca Pegmatite District, New Mexico*; MN Spilde, WP Moats; University of New Mexico; S Dubyk, B Salem; Private individual

P04.5 Nano-Characterization of Low Dimensional Materials: Carbon to 2D TMDs

SESSION CHAIRS:

Moon Kim, University of Texas at Dallas

Zonghoon Lee, Ulsan National Institute of Science and Technology, South Korea

Quentin Ramasse, SuperSTEM Laboratory, United Kingdom

PLATFORM SESSION

Wednesday 8:30 AM • Room: B114

8:30 AM **575** (Invited) *New Avenues for Electron and Scanned Probe Studies of 2d Materials*; JC Meyer, J Kotakoski, G Argentero, C Mangler, B Bayer, C Kramberger-Kaplan, S Hummel, A Mittelberger; University of Vienna, Austria, et al.

9:00 AM **576** *Towards the Electron Spectroscopy Graphene Fingerprint*; LF Lampert, A Barnum, J Jiao; Portland State University

9:15 AM **577** *STEM and EELS study of the Graphene/Bi₂Se₃ Interface*; D Kepaptsoglou, D Gilks; SuperSTEM Laboratory, United Kingdom; P Galindo; Universidad de Cádiz, Spain; Q Ramasse; SuperSTEM; L Lari; University of York, United Kingdom; M Weinert; University of Wisconsin Milwaukee; G Nicotra; CNR-Istituto per la Microelettronica e i Microsistemi, Catania, Italy, V Lazarov; University of York, United Kingdom, et al.

9:30 AM **578** *Core Structure of Dissociated Dislocations in Bi₂Te₃ Nanowires*; DL Medlin, KJ Erickson, SJ Limmer, WG Yelton, MP Siegal; Sandia National Laboratories

9:45 AM **579** *Professional Technical Staff Award Fabrication and Simultaneous Electrical Measurement of Graphene Nanoribbon Devices Inside a S/TEM*; JA Rodríguez-Manzo, ZJ Qi, M Puster, A Balan, ATC Johnson, M Drndić; University of Pennsylvania

Wednesday, August 5

Scientific Program

P

PHYSICAL SCIENCES SYMPOSIA

WEDNESDAY MORNING *continued*

P06.4 Failure Analysis Applications of Microanalysis, Microscopy, Metallography, and Fractography

SESSION CHAIRS:

Daniel Dennies, Exponent Inc.

William Kane, Exponent Inc.

PLATFORM SESSION

Wednesday 8:30 AM • Room: D140

8:30 AM **580** (Invited) *Kink Band Formation in High-strength Bulk Metallic Nanolaminates*; TJ Nizolek, NA Mara; University of California Santa Barbara; RJ McCabe; Los Alamos National Laboratory; JT Avallone; University of California Santa Barbara; IJ Beyerlein; Los Alamos National Laboratory; TM Pollock; University of California Santa Barbara

9:00 AM **581** *Nanostructures Formation in Al-B₄C Neutron Absorbing Materials after Accelerated Irradiation and Corrosion Tests*; F Zhang, JB Wierschke, X Wang, L Wang; University of Michigan

9:15 AM **582** *A Study of Glass Composition and Crizzling in Two Claude Laurent Glass Flutes from the Library of Congress*; AC Buechele, LB Brostoff, I Muller; The Catholic University of America; CL Ward-Bamford; Library of Congress; X Xie; The Catholic University of America

9:30 AM **583** *Characterization of Void-Dominated Ductile Failure in Pure Ta*; BG Clark, JR Michael, B McKenzie, J Carroll, H Lim, BL Boyce; Sandia National Laboratories

9:45 AM **584** *Circuit Editing and Failure Analysis Applications Using a Three-Ion-Beam (Ga, He and Ne) System and Gas Injection System (GIS)*; D Xia, H Wu, B Goetze, D Ferranti, L Stern, J Notte; Carl Zeiss Microscopy

P07.4 Metallography and Microstructural Characterization of Metals

SESSION CHAIRS:

James E. Martinez, NASA Johnson Space Center

George Vander Voort, Vander Voort Consulting

PLATFORM SESSION

Wednesday 8:30 AM • Room: C123

8:30 AM **585** *Digital Image Correlation of Heterogeneous Deformation in Polycrystalline Material with Electron Backscatter Diffraction*; J Esquivel, MD Sangid; Purdue University

8:45 AM **586** *Metallographic Preparation of Inconel 800 Tube Material for EBSD*; AJ Lockley; Canadian Nuclear Laboratories

9:00 AM **587** *The Atomic Interfacial Structure between α and γ Phases within a TiAl Alloy in Lamellar Form*; F Liu, G-Z Zhu; Shanghai Jiao Tong University, China

9:15 AM **588** *New Technology and Approaches for the Acceleration and Enhancement of Microstructural Characterization Using Electron Backscatter Diffraction*; MM Nowell, SI Wright, T Rampton; EDAX Inc. RJ Stromberg, S Bhowmick; Hysitron Inc. M Shibata, N Erdman; JEOL USA Inc.

9:30 AM **589** *Electron Microscopy Analysis of Grain Boundary Corrosion in Ni-Cr Binary Alloys Exposed to High Temperature Hydrogenated Water*; MJ Olszta, DK Schreiber, SM Bruemmer; Pacific Northwest National Laboratory

9:45 AM **590** *The Effects of Electron Beam Melting on the Microstructure and Mechanical Properties of Ti-6Al-4V and Gamma-TiAl*; T McLouth, Y-W Chang; University of California, Los Angeles; J Wooten; CalRAM Inc. J-M Yang; University of California, Los Angeles

P10.3 Microscopy and Microanalysis for Real-World Problem Solving

SESSION CHAIRS:

Elaine Schumacher, McCrone Associates

Ke-Bin Low, BASF Corporation

PLATFORM SESSION

Wednesday 8:30 AM • Room: C120

8:30 AM **591** (Invited) *Electron Microscopy Investigations on Catalyst Coatings*; Y Zhao, L Cirjak; Johnson Matthey Process Technologies, Inc. D Ozkaya; Johnson Matthey Technology Centre

9:00 AM **592** *Spatially-Resolved EELS Analysis of Surface Chemistry of Metallic Lithium for the Development of Li-Air Battery*; ML Trudeau, R Veillette, P Bouchard, K Zaghib; Hydro-Quebec Research Institute, Canada

9:15 AM **593** *High Efficiency Chemical State Surface Analysis Imaging with XPS*; S Raman, JF Moulder, JS Hammond; Physical Electronics USA, Inc.

9:30 AM **594** *An Analysis of the Formation and Growth Process of the Nanocrystalline Diamond (NCD) particles on various interlayer*; D-B Park, C-H Kang, D-H Cha, Korea Polytechnic University, South Korea

9:45 AM **595** *Characterization of the Thickness and Distribution of Latex Coatings on Polyvinylidene Chloride Beads by Backscattered Electron Imaging*; CS Todd, DE Beyer; The Dow Chemical Company

P11.5 Advances in Transmission Electron Microscopy and Spectroscopy of Energy Related Materials

SESSION CHAIRS:

Chongmin Wang, Pacific Northwest National Laboratory
Raymond Unocic, Oak Ridge National Laboratory
Arda Genc, FEI

PLATFORM SESSION

Wednesday 8:30 AM • Room: B113

- 8:30 AM **596** (Invited) *In Situ TEM Studies of Li and Na ion Transport and Li/Na-Induced Phase Transitions in Crystalline Materials*; R Shahbazian-Yassar; Michigan Technological University
- 9:00 AM **597** *Electrochemical Reactions in an All-solid-state Li-ion Battery Observed by Ex Situ and In Situ Spatially-resolved TEM EELS*; K Yamamoto, A Shimoyamada, T Sato, R Yoshida, H Kurobe; Japan Fine Ceramics Center; H Matsumoto; Hitachi High-Technologies Corporation, Japan; T Hirayama; Japan Fine Ceramics Center, Y Iriyama; Nagoya University, Japan
- 9:15 AM **598** *In Situ Scanning Transmission Electron Microscopy (STEM) of Individual Electrochemical Intercalation Events in Graphite*; JJ Lodico, ER White, WA Hubbard, E Garcia, B Parks, B Zutter, BC Regan; University of California, Los Angeles
- 9:30 AM **599** *Can Na⁺ Transport Faster Than Li⁺ inside Zn-Sb Intermetallic Nanomaterials?*; A Nie, Y Cheng; Michigan Technological University; RF Klie; University of Illinois at Chicago; S Vaddiraju; Texas A&M University; R Shahbazian-Yassar; Michigan Technological University
- 9:45 AM **600** *Reaction Mechanism and Kinetic of Graphene Supported Co₃O₄ Nanocubes with Lithium and Magnesium Studied by In Situ TEM*; J Wu, L Luo, Q Li, V Dravid; Northwestern University; Q Rao; Shanghai Jiao-Tong University, China; J Xu; Hangzhou Dianzi University, China

TF

TECHNOLOGISTS' FORUM WEDNESDAY MORNING

X31.1 Technologists' Forum: Safety in the Microscopy Laboratory

SESSION CHAIRS:

E. Ann Ellis, GlaxoSmithKline
Beverly E. Maleeff, GlaxoSmithKline

PLATFORM SESSION

Wednesday 8:30 AM • Room: D139

- 8:30 AM **601** (Invited) *Technologists' Forum: Safety in the Microscopy Laboratory*; BE Maleeff, EA Ellis; GlaxoSmithKline
- 9:00 AM **602** *Roundtable Discussion*

T

BIOLOGICAL SCIENCES TUTORIAL WEDNESDAY MORNING

X42.1 Biological Sciences Tutorial: Maximizing the Likelihood of Successful Maximum Likelihood Classification

SESSION CHAIR:

Scott Stagg, Florida State University

TUTORIAL SESSION

Wednesday 8:30 AM • Room: C125

- 8:30 AM **603** (Invited) *Large-Scale 3D Heterogeneity Analysis of CryoEM Data Using Likelihood-Based Classification in FREALIGN*; D Oliveira dos Passos, D Lyunkis; The Salk Institute

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—WEDNESDAY MORNING

A05.3 Fast and Ultrafast Imaging with Electrons and Photons

SESSION CHAIRS:

David Flannigan, University of Minnesota
Hermann Durr, Stanford University
Joanna Atkin, University of Colorado

PLATFORM SESSION

Wednesday 10:30 AM • Room: A105

- 10:30 AM **604** (Invited) *Ultrafast Transmission Electron Microscopy with Nanoscale Photoemitters*; A Feist, K Echternkamp, J Schauss, SV Yalunin, S Schäfer, C Ropers; University of Göttingen, Germany
- 11:00 AM **605** (Invited) *Observing Liquid Flow in Nanotubes*; UJ Lorenz, AH Zewail; California Institute of Technology
- 11:30 AM **606** *New Book Proposal: Ultrabright Femtosecond Electron Sources: Ultrafast Structural Dynamics in Labile Organic Crystals*; G Sciaini; University of Waterloo
- 11:45 AM **607** *Development of MeV Ultrafast Electron Scattering Instruments at SLAC National Accelerator Laboratory*; R Li; SLAC National Accelerator Laboratory

Scientific Program

A

ADVANCES IN INSTRUMENTATION SYMPOSIUM—WEDNESDAY MORNING *continued*

A06.4 Advanced Analytical TEM/STEM

SESSION CHAIRS:

Paul Kotula, Sandia National Laboratories
Masashi Watanabe, Lehigh University
Gerald Kothlietner, Graz University of Technology, Austria

PLATFORM SESSION

Wednesday 10:30 AM • Room: A106

10:30 AM **608** *Inconsistent Normalized Intensities for Quantitative STEM: Detector Scans and Single Electron Counting*; X Sang, JM LeBeau; North Carolina State University

10:45 AM **609** *Quantitative Annular Dark-Field Imaging of Single-Layer Graphene*; S Yamashita, S Koshiya; Kyushu University, Japan; K Ishizuka; HREM Research Inc. K Kimoto; National Institute for Materials Science, Japan

11:00 AM **610** *Improving the SNR of Atomic Resolution STEM EELS & EDX Mapping while Reducing Beam-damage by Using Non-rigid Spectrum-image Averaging*; L Jones, R Beanland, S Lozano-Perez; University of Oxford, United Kingdom; K Baba-kishi; Hong Kong Polytechnic University; PD Nellist; University of Oxford, United Kingdom

11:15 AM **611** *Correction of Linear and Nonlinear Raster Distortion from Orthogonal Image Pairs*; CT Nelson, AM Minor; Lawrence Berkeley National Laboratory

11:30 AM **612** *Ptychographic Imaging in an Aberration Corrected STEM*; AR Lupini, M Chi, SV Kalinin, AY Borisevich, JC Idrobo, S Jesse; Oak Ridge National Laboratory

11:45 AM **613** *Atomic Resolution Ptychographic Phase Contrast Imaging of Polar-Ordered Structures in Functional Oxides*; I MacLaren, H Yang; University of Glasgow, United Kingdom; L Jones, PD Nellist; University of Oxford, United Kingdom; H Ryll; PMSensor GmbH, Germany; M Simson, H Soltan; PNDetector GmbH, Germany Y Kondo; JEOL Ltd, Japan, et al.

A08.2 Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques

SESSION CHAIRS:

Nicholas Ritchie, National Institute of Standards and Technology
Paul Carpenter, Washington University
Phillippe Pinard, RWTH Aachen University, Germany

PLATFORM SESSION

Wednesday 10:30 AM • Room: B115

10:30 AM **614** *Practical Measurement of X-ray Detection Performance of Large-Angle Silicon Drift Detectors Toward Quantitative Analysis in the Newly Developed 300 kV Aberration-Corrected Grand ARM*; M Watanabe, T Sasaki; Lehigh University; Y Jimbo, E Okunishi, H Sawada; JEOL Ltd, Japan

10:45 AM **615** *Characterizing Atomic Ordering of High Entropy Alloys Using Super-X EDS Characterization*; RE Williams, B Welk, J Jensen, BD Esser, DW McComb, HL Fraser; The Ohio State University

11:00 AM **616** *Overcoming Traditional Challenges in Nano-scale X-ray Characterization Using Independent Component Analysis*; D Rossouw, P Burdet, F de la Peña, C Ducati, BR Knappett, AE Wheatley, PA Midgley; University of Cambridge, United Kingdom

11:15 AM **617** *Gold and Arsenopyrite Exsolution and Limits of Arsenic Solubility in Pyrite Investigated by SEM, EPMA, and LA-ICPMS*; K Goemann, AS Stepanov, S Meffre, RR Large; University of Tasmania

11:30 AM **618** *Characterization of Stannous Fluoride Uptake in Human Dentine by Super-X XEDS and Dual-EELS Analysis*; IN David, RE Williams, D Huber; The Ohio State University; JC Earl; GlaxoSmithKline; DW McComb; The Ohio State University

A09.1 Advances in Combining Simulation and Experiment for Materials Design

SESSION CHAIRS:

Paul Voyles, University of Wisconsin
Gianluigi Botton, McMaster University, Canada

PLATFORM SESSION

Wednesday 10:30 AM • Room: B119

10:30 AM **619** (Invited) *Three-Dimensional Imaging of Point Defects in Functional Materials Using Quantitative STEM*; J Hwang; The Ohio State University

11:00 AM **620** (Invited) *Removing Elastic Scattering Effects from Chemical Maps Taken under Inherent Conditions*; C Dwyer; Forschungszentrum Juelich, Germany

11:30 AM **621 M&M 2015 STUDENT AWARDEE** *Identifying Atomic Reconstruction at Complex Oxide Interfaces Using Quantitative STEM*; JM Johnson, J Thompson; The Ohio State University; SSA Seo; University of Kentucky; J Hwang; The Ohio State University

11:45 AM **622** *Revealing Unit Cell Level Distortions in Random Oxide Solid Solutions by Scanning Transmission Electron Microscopy and the Projected Pair Distribution Function*; X Sang, E Grimley, C Niu, D Irving, JM LeBeau; North Carolina State University

A10.2 Advances in Electron Diffraction and Automated Mapping Techniques

SESSION CHAIR:

Muriel Veron, Grenoble Institute of Technology, France

PLATFORM SESSION

Wednesday 10:30 AM • Room: B112

10:30 AM **623** (Invited) *Decomposing Electron Diffraction Signals in Multi-component Microstructures*; AS Eggeman, D Johnstone, R Krakow; University of Cambridge, United Kingdom; J Hu; University of Oxford, United Kingdom; PA Midgley; University of Cambridge, United Kingdom; C Grovenor, S Lozano-Perez; University of Oxford, United Kingdom

11:00 AM **624** *Dealing With Multiple Grains in TEM Lamellae Thickness for Microstructure Analysis Using Scanning Precession Electron Diffraction*; A Valery, EF Rauch, A Pofelski, L Clément, F Lorut; STMicroelectronics

11:15 AM **625** *Principles and Applications of Energy-Filtered Scanning CBED for Ferroelectric Domain Imaging and Symmetry Determination*; Y-T Shao, K Kim, J-M Zuo; University of Illinois at Urbana-Champaign

11:30 AM **626** *A Statistical Dictionary Approach to Automated Orientation Determination from Precession Electron Diffraction Patterns*; A Wang, A Leff; Carnegie Mellon University; M Taheri; Drexel University; M DeGraef; Carnegie Mellon University

11:45 AM **627** *Correlation of Electron Diffraction between t-EBSD in the SEM, CBED in the TEM and ACOM Using ASTAR in the TEM Using GaN Nanowires*; RH Geiss; Colorado State University

A14.1 Surface Plasmons, Cathodoluminescence, and Low-Loss EELS

SESSION CHAIRS:

David McComb, Ohio State University
Ritesh Sachan, Oak Ridge National Laboratory
Robert Williams, Ohio State University
Gerd Duscher, University of Tennessee

PLATFORM SESSION

Wednesday 10:30 AM • Room: D137

10:30 AM **628** (Invited) *Quest for an Optical Circuit Probe*; NX Fang, J Xu; Massachusetts Institute of Technology

11:00 AM **629** *Quantum and Time-resolved Nano-optics Using Auto-correlated Cathodoluminescence in a STEM*; S Meuret, L Tizei, R Bourrellier; Laboratoire de Physique des Solides, France; T Auzelle; Commissariat à l'énergie atomique, France; F Treussart; Laboratoire Aimé Cotton, France; B Daudin, B Gayral; Commissariat à l'énergie atomique, France; M Kociak; Laboratoire de Physique des Solides, France, et al.

11:15 AM **630** *Correlative STEM-Cathodoluminescence and Low-Loss EELS of Semiconducting Oxide Nano-Heterostructures for Resistive Gas-Sensing Applications*; DR Miller, S Akbar, P Morris; RE Williams, DW McComb; The Ohio State University

11:30 AM **631** *Investigating the Origin of Luminescence in Zinc Oxide Nanostructures With STEM-Cathodoluminescence*; ER White, A Howkins, CK Williams, MS Shaffer; Imperial College London, United Kingdom

11:45 AM **632** *Combined EELS and Cathodoluminescence Analysis in a STEM Microscope of GaN / InGaN Quantum Wells for LED Applications*; P Longo, DJ Stowe, RD Twisten; Gatan, Inc. A Howkins; Brunel University, United Kingdom

A16.3 Advances in Electron and Ion Scanning Microscopies

SESSION CHAIRS:

David Joy, Oak Ridge National Laboratory
Brendan Griffin, University of Western Australia

PLATFORM SESSION

Wednesday 10:30 AM • Room: B117

10:30 AM **633** *Low kV High Resolution Scanning Electron Microscopy Study of Si Nanowire Surfaces*; C Alfonso, L Roussel, A Charai, C Dominici, AP Campos; Aix-Marseille Université, France; LY Han, F Zhou; Carl Zeiss Microscopy GmbH, Germany

10:45 AM **634** *An Analytical Scattering Model for Low Energy Annular Dark Field Transmission Scanning Electron Microscopy*; TJ Woehl, J Holm, RR Keller; National Institute of Standards and Technology

11:00 AM **635** *Detecting Localized Variation of Chemistry via Atomic-Resolution Secondary Electron Imaging*; JY Howe, Y Hashimoto; Hitachi High-Technologies Canada Inc. X Wang, M Vara; Georgia Institute of Technology; D Hoyle; Hitachi High-Technologies Canada Inc. T Schamp; Hitachi High-Technologies America Inc. Y Xia; Georgia Institute of Technology, DC Joy; Oak Ridge National Laboratory

11:15 AM **636** *Sub-surface Serial Block Face Scanning Electron Microscopy*; Q He, MA Aronova; National Institute of Biomedical Imaging and Bioengineering, NIH; DC Joy; University of Tennessee; G Zhang, RD Leapman; National Institute of Biomedical Imaging and Bioengineering, NIH

11:30 AM **637** *Applications of Energy Dependent Backscatter Yield Variations at Low Voltage*; A Thesen, M Boese; Carl Zeiss Microscopy; K Sempf; Fraunhofer-Institute IKTS, Germany; F Zhou; Carl Zeiss Microscopy

Scientific Program

B

BIOLOGICAL SCIENCES SYMPOSIA WEDNESDAY MORNING

B04.4 Advances in Specimen Preparation and Correlative LM-EM (CLEM) of Biological Samples

SESSION CHAIR:

Kent McDonald, University of California, Berkeley

PLATFORM SESSION

Wednesday 10:30 AM • Room: D138

10:30 AM **638** (Invited) *Correlative Ultrastructural Analysis of Functionally Modulated Synapses Using Automatic Tape-Collecting Ultramicrotome - SEM Array Tomography*; N Kamasawa, Y Sun, T Mikuni, D Guerrero-Given, R Yasuda; Max Planck Florida Institute for Neuroscience

11:00 AM **639** (Invited) *Conjugate Immunofluorescence - SEM Array Tomography for Studying Synapses and Other Subcellular Structures in the Brain*; KD Micheva; Stanford University School of Medicine

11:30 AM **640** *Protocol Development for 3D Reconstructions: Combining In Vivo Imaging, APEX2 and En Bloc Staining of Mouse Visual Cortex*; J Buchanan, M Takeno, T Daigle, A Bleckert, D Bumbarger, A Bodor, D Brittain, N Maçarico da Costa; Allen Institute for Brain Science, et al.

11:45 AM **641** *Advanced Substrate Holder and Multi-axis Manipulation Tool for Ultramicrotomy*; W Spomer, A Hofmann; Karlsruhe Institute of Technology, Germany; I Wacker; Universität Heidelberg, Heidelberg, Germany; L Ness, P Brey; RMC Boeckeler Instruments; RR Schröder; Universitätsklinikum Heidelberg, Germany; U Gengenbach; Karlsruhe Institute of Technology, Germany

B05.3 3D Structures of Macromolecular Assemblies, Cellular Organelles, and Whole Cells

SESSION CHAIRS:

Esther Bullitt; Boston University Medical School and Teresa Ruiz; University of Vermont

PLATFORM SESSION

Wednesday 10:30 AM • Room: B111

10:30 AM **642** (Invited) *Complementary Approaches to Dissecting Mechanisms of Protein-mediated Membrane Fusion*; KK Lee, L Gui, J Ebner, NK Garcia, M Guttman; University of Washington

11:00 AM **643** *Characterization of Outer Membrane Vesicle Release in Vibrio vulnificus*; CM Hampton, RC Guerrero-Ferreira, ER Wright; Emory University

11:15 AM **644** *Molecular Characterization of Leading Edge Protrusions in the Absence of Arp2/3 Complex*; KL Anderson, C Page; Sanford-Burnham Medical research Institute; P Suraneni, R Li; Stowers Institute for Medical Research; N Volkmann, D Hanein; Sanford-Burnham Medical Research Institute

11:30 AM **645** *α Synuclein Amyloid Fibrils Formed of Two Protofibrils*; AD Dearborn, N Cheng, JB Heymann; National Institute of Arthritis and Musculoskeletal and Skin Diseases, NIH; JS Wall; Brookhaven National Laboratory; J Varkey, R Langen; University of Southern California; AC Steven; Laboratory of Structural Biology Research, National Institute of Arthritis and Musculoskeletal and Skin Diseases, NIH

11:45 AM **646** *Bright-Field STEM Tomography of Blood Platelets in Thick Sections*; RD Leapman, GN Calco, JD Hoyne, MM Aronova, BC Kuo, Q He; National Institute of Biomedical Imaging and Bioengineering, NIH; ID Pokrovskaya, LJ MacDonald; University of Arkansas for Medical Sciences, et al.

P

PHYSICAL SCIENCES SYMPOSIA WEDNESDAY MORNING

P01.6 Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on *In Situ* TEM and STEM

SESSION CHAIRS:

M. Grace Burke, University of Manchester, United Kingdom
Ondrej Krivanek, Nion Inc.
Peter Crozier, Arizona State University

PLATFORM SESSION

Wednesday 10:30 AM • Room: B116

10:30 AM **647** (Invited) *Using Graphene Liquid Cells for High-resolution Chemical Analysis of Nano-particle Reactions*; RF Klie, C Wang; University of Illinois, Chicago; T Shokuhfar; Michigan Technical University

11:00 AM **648** **M&M 2015 STUDENT AWARDEE** *Liquid In Situ Analytical Electron Microscopy: Examining SCC Precursor Events for Type 304 Stainless Steel in H₂O*; S Schilling, A Janssen, XL Zhong; The University of Manchester, United Kingdom; NJ Zaluzec; Argonne National Laboratory; MG Burke; The University of Manchester, United Kingdom

11:15 AM **649** *Design of a Heated Liquid Cell for In Situ Transmission Electron Microscopy*; AJ Leenheer, KL Jungjohann, CT Harris; Sandia National Laboratories

11:30 AM **650** *In Situ Liquid TEM Study for Degradation Mechanisms of Fuel Cell Catalysts during Potential Cycling Test*; S Nagashima, K Yoshida, T Hiroshima, K Liu, Y Kang; Japan Fine Ceramics Center; T Ikai, H Kato, T Nagami; Toyota Motor Corporation, Japan, et al.

11:45 AM **651** *In Situ TEM Imaging of Nanoparticles Interacting with Glioblastoma Stem Cells*; ES Pohlmann, K Patel, S Gao; Virginia Tech Carilion School of Medicine and Research Institute; MJ Dukes; Protochips, Inc. Z Sheng, DF Kelly; Virginia Tech Carilion School of Medicine and Research Institute

P02.2 Materials Problem Solving with Aberration-Corrected EM

SESSION CHAIRS:

Lena Kourkoutis, Cornell University
Andrew Yankovich, University of Wisconsin

PLATFORM SESSION

Wednesday 10:30 AM • Room: C124

10:30 AM **652** *Atomic study of $\text{Fe}_3\text{O}_4/\text{SrTiO}_3$ Interface*; D Gilks, D Kepaptsoglou, L Lari; University of York, United Kingdom; QR Ramasse; SuperSTEM Laboratory, United Kingdom; K Matsuzaki, T Susaki; Tokyo Institute of Technology, Japan; K McKenna, VK Lazarov; University of York, United Kingdom

10:45 AM **653** *Interfacial Structure in Epitaxial Perovskite Oxides on (001) Ge Crystal*; X Shen, KA Majlan; Brookhaven National Laboratory; J Ngai; University of Texas at Arlington; D Wu; Nanjing University, China; D Su; Brookhaven National Laboratory

11:00 AM **654 M&M 2015 STUDENT AWARDEE** *Imaging Local Polarization and Domain Boundaries in Multiferroic $(\text{LuFeO}_3)_m/(\text{LuFe}_2\text{O}_4)_n$ Superlattices*; ME Holtz, JA Mundy; Cornell University; JA Moyer; University of Illinois at Urbana-Champaign; R Hovden, CJ Fennie; Cornell University; P Schiffer; University of Illinois Urbana-Champaign; DG Schlom, DA Muller; Cornell University, et al.

11:15 AM **655** *Cross-Sectional Characterization of $\text{SrTiO}_3/\text{Si}(001)$ Interfaces Using Aberration-Corrected STEM*; H Wu, T Aoki; Arizona State University; A Posadas, A Demkov; The University of Texas at Austin; D Smith; Arizona State University

11:30 AM **656 M&M 2015 STUDENT AWARDEE** *Atomic-scale Mechanisms of Defect-Induced Retention Failure in Ferroelectric Materials*; L Li, L Xie, Y Zhang, J Jokisaari; University of Michigan; H Christen; Oak Ridge National Laboratory; X Pan; University of California, Irvine

11:45 AM **657** *Characterization of Two-dimensional Electron Gas at the $\gamma\text{AlO}/\text{SrTiO}$ Interface*; S Lu, K Kormondy; Arizona State University; T Ngo, J Ekerdt, A Demkov; University of Texas at Austin; M McCartney, D Smith; Arizona State University

P03.2 Advances in Microanalysis of Earth and Planetary Materials

SESSION CHAIRS:

Rhonda Stroud, Naval Research Laboratory
Eve L. Berger, NASA Johnson Space Center

PLATFORM SESSION

Wednesday 10:30 AM • Room: C122

10:30 AM **658** (Invited) *Atomic Scale Analysis of Terrestrial and Extra-Terrestrial Geomaterials Using Atom Probe Tomography*; BP Gorman, DR Diercks; Colorado School of Mines; S Parman, R Cooper; Brown University

11:00 AM **659** *Correlative Transmission Electron Microscopy and Atom-Probe Tomography of an Iron Meteorite*; SS Rout, PR Heck; Robert A Pritzker Center for Meteoritics and Polar Studies, The Field Museum of Natural History; D Isheim; Northwestern University; T Stephan, AM Davis; The University of Chicago; DN Seidman; Northwestern University

11:15 AM **660** *Atomic Scale Investigation of Orthopyroxene and Olivine Grain Boundaries by Atom Probe Tomography*; M Bachhav, Y Dong; University of Michigan; P Skemer; Washington University Washington University; E Marquis; University of Michigan

11:30 AM **661** *Quantitative Microstructural Analysis of Geological Materials by Atom Probe: Understanding the Mechano-Chemical Behaviour of Zircon*; JM Cairney, A La Fontaine, P Trimby, L Yang; The University of Sydney, Australia; S Piazzolo; Macquarie University, Australia

11:45 AM **662** *Electron Probe Microanalysis and Microscopy: Focused Electron Beam Techniques and Applications in Characterization of Mineral Inclusions in Diamond*; D Zhao; University of Texas at Austin

P04.6 Nano-Characterization of Low Dimensional Materials: Carbon to 2D TMDs

SESSION CHAIRS:

Moon Kim, University of Texas at Dallas
Zonghoon Lee, Ulsan National Institute of Science and Technology, South Korea
Quentin Ramasse, SuperSTEM Laboratory, United Kingdom

PLATFORM SESSION

Wednesday 10:30 AM • Room: B114

10:30 AM **663** (Invited) *Controlling Beam-sample Interaction in Low Dimensional Materials by Low Dose Rate Electron Microscopy*; C Kisielowski, S Helveg; Lawrence Berkeley National Laboratory; L Hansen; Haldor Topsøe A/S, Denmark; P Specht; University of California, Berkeley

Scientific Program

P

PHYSICAL SCIENCES SYMPOSIA

WEDNESDAY MORNING *continued*

- 11:00 AM 664** *Structural Rearrangement of 2D Zeolite Nanosheets under Electron Beam*; P Kumar, ML Odlyzko, N Rangnekar, M Tsapatsis, AK Mkhoyan; University of Minnesota
- 11:15 AM 665** *Imaging of Quantum Materials; F von Cube, E Kalfon-Cohen; Harvard University*; Y Ivry; Massachusetts Institute of Technology (MIT); A Knöller; Universität Stuttgart, Germany; T Webb, D Huang; Harvard University; T Brower-Thomas; Howard University, DC Bell; Harvard University, et al.
- 11:30 AM 666** *Quantitative High Resolution Chemical Analysis of the $(\text{Pb}_x\text{Sn}_{1-x}\text{Se})_{1+\delta}\text{Se}_2$ Intergrowth System*; J Ditto, D Merrill, DC Johnson; University of Oregon; DL Medlin; Sandia National Laboratories
- 11:45 AM 667** *Long Range Order and Atomic Connectivity in Two-Dimensional Square PbSe Nanocrystal Superlattices*; BH Savitzky, R Hovden, K Whitham, T Hanrath, LF Kourkoutis; Cornell University

P05.5 Nuclear and Irradiated Materials: Fundamental Defect Properties

SESSION CHAIRS:

Chad M. Parish, Oak Ridge National Laboratory
Khalid Hattar, Sandia National Laboratories
Arthur T. Motta, Pennsylvania State University

PLATFORM SESSION

Wednesday 10:30 AM • Room: D135

- 10:30 AM 668** (Invited) *Defect Microstructure in Irradiated Silicon Carbide*; S Kondo; Kyoto University, Japan
- 11:00 AM 669** *Short-range Atomic Ordering in Amorphous Ion-tracks in Pyrochlores*; R Sachan, B Liu, D Aidhy, Y Zhang, MF Chisholm; Oak Ridge National Laboratory; WJ Weber; University of Tennessee
- 11:15 AM 670** *TEM Characterization of Ion Radiation Damage in $\text{Ca}_{(1-x)}\text{La}_{2x}/3\text{TiO}_3$ Perovskites*; M Danaie, S Pedrazzini, NP Young, PA Bagot; University of Oxford, United Kingdom; KR Whittle; University of Sheffield, United Kingdom; PD Edmondson; Oak Ridge National Laboratory
- 11:30 AM 671** (Invited) *Atomic Resolution Imaging of Black Spot Defects in Ion Irradiated Silicon Carbide*; L He, H Jiang, Y Zhai, C Liu, I Szlufarska, B Tyburska-Püschel, K Sridharan, P Voyles; University of Wisconsin-Madison

P07.5 Metallurgy and Microstructural Characterization of Metals

SESSION CHAIRS:

James E. Martinez, NASA Johnson Space Center
George Vander Voort, Vander Voort Consulting

PLATFORM SESSION

Wednesday 10:30 AM • Room: C123

- 10:30 AM 672** (Invited) *Application of Quantitative Metallography to Cast Nickel-Based Superalloys*; A Szczotok, J Cwajna; Silesian University of Technology, Poland
- 11:00 AM 673** *Quantitative Nano-Analysis of Superconducting Materials via SEM-FIB 3D EDS Tomography*; G Pavia, M Kienle, I Schulmeyer; Carl Zeiss Microscopy GmbH, Germany; F Bauer; Oxford Instruments GmbH, Germany; M Cantoni; École Polytechnique Fédérale de Lausanne, Switzerland; K Lagarec; Fibics Inc. rporated, Canada
- 11:15 AM 674** *Microstructural Characterization of Alnico 9 Alloy*; L Zhou, M Miller; Ames Lab; D Cullen; Oak Ridge National Laboratory; P Lu; Sandia National Laboratories; RW McCallum, I Anderson; The Ames Laboratory; S Constantinides; Arnold Magnetic Technologies Corp., MJ Kramer; The Ames Laboratory
- 11:30 AM 675** *Automated Correlative Tomography of an Aluminum 7075 Alloy Spanning Length Scales and Modalities*; AP Merkle, L Lechner, L Hunter, J Gelb; Carl Zeiss X-ray Microscopy, Inc. SS Singh, N Chawla; Arizona State University

P08.4 Microscopy and Characterization of Ceramics, Polymers, and Composites

SESSION CHAIRS:

Andre Mkhoyan, University of Minnesota
Jong Seok Jeong, University of Minnesota
Laxmikant Saraf, Clemson University

PLATFORM SESSION

Wednesday 10:30 AM • Room: D136

- 10:30 AM 676** (Invited) *Toward Deterministic Switching in Ferroelectric Systems: Insight Gained from In Situ TEM*; ML Taheri; Drexel University
- 11:00 AM 677** *Chemical Homogeneity in Entropy-Stabilized Complex Metal Oxides*; A Moballegh, C Rost, J-P Maria, E Dickey; North Carolina State University
- 11:15 AM 678** *Microstructure Evolution of a Cu and Ga_2O_3 Composite Observed by Aberration Corrected HAADF-STEM*; Z Yu, M Kracum, A Kundu, HM Chan, MP Harmer; Lehigh University

11:30 AM 679 *Absence of Phase Separation in Nano-chessboard Super-lattices in A-site Deficient Ca-stabilized Nd₂/3TiO₃*; D Kepaptsoglou, F Azough, QM Ramasse, B Schaffer; SuperSTEM Laboratory, United Kingdom; R Freer; University of Manchester, United Kingdom

11:45 AM 680 *Quantitative Analysis of a Lithium Ion Battery Cathode Material with X-ray Photoelectron Spectroscopy and Auger Electron Spectroscopy*; M Shima, K Tsutsumi, a Tanaka, H Onodera, T Tazawa; JEOL Ltd, Japan

P10.4 Microscopy and Microanalysis for Real-World Problem Solving

SESSION CHAIRS:

Janet Woodward, Buckman North America
Stuart McKernan, 3M Corporation

PLATFORM SESSION

Wednesday 10:30 AM • Room: C120

10:30 AM 681 *Microstructure and Strain Hardening in Tensile-Tested Fe-Mn-Al-Si Steels*; DT Pierce, JA Jiménez; Colorado School of Mines; J Bentley; Microscopy and Microanalytical Sciences; D Raabe; Max-Planck-Institut für Eisenforschung, Germany; JE Wittig; Vanderbilt University

10:45 AM 682 *Stability and Transformation of Quasicrystalline Phase in Transition Metal Modified Al-(Mn-Fe)-based Alloys*; K Stan-Glowinska, L Litynska-Dobrzynska, J Dutkiewicz; Polish Academy of Sciences; MA Gordillo, JM Wiezorek; University of Pittsburgh

11:00 AM 683 (Invited) *An Overview Of How Microscopy Is Employed By the Oregon State Police Forensic Services Division*; CM Grover; Oregon State Police Forensic Services Division

11:30 AM 684 *Firearm Serial Number Restoration with Electron Backscatter Diffraction*; RM White, RR Keller; National Institute of Standards and Technology

11:45 AM 685 *New Possibilities of Using Microscopic Techniques in Forensic Field*; M Kotrlý; Institute of Criminalistics Prague, Czech Republic

P11.6 Advances in Transmission Electron Microscopy and Spectroscopy of Energy Related Materials

SESSION CHAIRS:

Chongmin Wang, Pacific Northwest National Laboratory,
Raymond Unocic, Oak Ridge National Laboratory and
Arda Genc, FEI

PLATFORM SESSION

Wednesday 10:30 AM • Room: B113

10:30 AM 686 (Invited) *Progress Toward Understanding Lithiation Mechanisms of TiO₂ via In Situ TEM*; X Pan, SJ Kim; University of California - Irvine; K Zhang, JR Jokisaari; University of Michigan; A Kargar, D Wang; University of California - San Diego; GW Graham; University of Michigan

11:00 AM 687 *Revealing Near-Surface to Interior Redox upon Lithiation in Conversion Electrode Materials Using Electron Microscopy*; K He, HL Xin, J Li, EA Stach, D Su; Brookhaven National Laboratory

11:15 AM 688 *In Situ TEM Observation of Lithiation and Sodiation Process of ZnO Nanowire*; H Asayesh-Ardakani, A Nie; Michigan Technological University; F Mashayek, RF Klie; University of Illinois at Chicago; R Shahbazian-Yassar; Michigan Technological University

11:30 AM 689 *Microstructural Characterization of Air Electrode Architectures in Lithium-Oxygen Batteries*; JG Wen, J Lu, DJ Miller, X Luo, H-H Wang, KC Lau, S Vajda, LA Curtiss; Argonne National Laboratory, et al.

11:45 AM 690 *Understanding the Surface Structure of LiMn₂O₄ Spinel Cathodes with Aberration-Corrected HAADF STEM and EELS*; CD Amos, M Roldan; The University of Texas, Austin; M Varela; Oak Ridge National Laboratory; JB Goodenough, PJ Ferreira; The University of Texas, Austin

Scientific Program

TF

TECHNOLOGISTS' FORUM WEDNESDAY MORNING

X30.1 Technologists' Forum: Emerging New Specialized Techniques for Correlative Microscopy

SESSION CHAIRS:

Caroline Miller, Indiana University
John Chandler, Colorado School of Mines
Frank Macaluso, Yeshiva University

PLATFORM SESSION

Wednesday 10:30 AM • Room: D139

10:30 AM 691 (Invited) *Optimizing Workflows in Correlative Light and Electron Microscopy*; K Czymmek, J Caplan; Carl Zeiss Microscopy; C Warner, J Sherrier; University of Delaware; A Elli; Carl Zeiss Microscopy

11:00 AM 692 (Invited) *Correlative Light and Electron Microscopy (CLEM) on Biological Samples Using Immuno Electron Microscopy*; J Klumperman, CT ten Brink, VM Oorschot; University Medical Center Utrecht, Netherlands

11:30 AM 693 (Invited) *Correlative Microscopy Using Serial Blockface Scanning EM*; TJ Deerinck, E Bushong, M Ellisman; University of California, San Deigo

T

BIOLOGICAL SCIENCES TUTORIAL WEDNESDAY MORNING

X44.1 Biological Sciences Tutorial: Optimizing Specimen Preparation for Macromolecular Electron Microscopy

SESSION CHAIR:

Scott Stagg, Florida State University

TUTORIAL SESSION

Wednesday 10:30 AM • Room: C125

10:30 AM 694 (Invited) *Improving Our Vision of Nanobiology*; DF Kelly; Virginia Tech Carilion School of Medicine and Research Institute

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—WEDNESDAY AFTERNOON

A02.1 TEM Phase Contrast Imaging

SESSION CHAIRS:

Mike Marko, Wadsworth Center

Radostin Danev, Max Planck Institute of Biochemistry, Germany

PLATFORM SESSION

Wednesday 1:30 PM • Room: D135

1:30 PM **695** (Invited) *Electron Beam-induced Charging and Modifications of Thin Films*; M Malac, M Beleggia; National Institute for Nanotechnology, Canada; T Rowan; University of British Columbia, Canada; RF Egerton; University of Alberta, Canada; M Kawasaki; JEOL USA Inc. Y Okura; JEOL Ltd, Japan; RA McLeod; Fondation Nanosciences, France

2:00 PM **696** (Invited) *Comparison of Cryo TEM Images Obtained with Zernike and Hole-Free Phase Plates*; N Hosogi, H Iijima, A Sen; JEOL Ltd, Japan

2:30 PM **697** *Practical Aspects and Usage Tips for the Volta Phase Plate*; R Danev, B Buijsse, M Khoshouei, Y Fukuda, W Baumeister; Max Planck Institute of Biochemistry, Germany

2:45 PM **698** *Combination of Different Techniques in Cryo-Electron Tomography with a Volta Phase Plate*; M Khoshouei, G Gerisch, M Ecke, J Ortiz, J Plitzko, R Danev, W Baumeister; Max-Planck Institute of Biochemistry, Germany

A03.1 Electron Holography for Nanofields in Solids

SESSION CHAIRS:

Hannes Lichte, Technische Universität Dresden, Germany

Molly McCartney, Arizona State University

Ken Harada, Hitachi Ltd., Japan

PLATFORM SESSION

Wednesday 1:30 PM • Room: C120

1:30 PM **699** (Invited) *Electron Holography for Measuring Electrostatic Potentials and Strain Fields*; M Lehmann; Technische Universität Berlin, Germany

2:00 PM **700** *Characterization of Trapped Charge in Ge/Li_xGe Core/Shell Structure During Lithiation Using Off-axis Electron Holography*; Z Gan, M Gu; Arizona State University; J Tang; University of California at Los Angeles; C-Y Wang; National Taiwan University of Science and Technology; KL Wang; University of California at Los Angeles; C Wang; Pacific Northwest National Laboratory; DJ Smith, MR McCartney; Arizona State University

2:15 PM **701** *Aberration Corrected Off-Axis Electron Holography of Layered Transition Metal Dichalcogenides*; AH Tavabi, F Winkler; Ernst Ruska- Centre for Microscopy and Spectroscopy, Forschungszentrum Jülich, Germany; Y-C Lin, K Suenaga; National Institute of Advanced Industrial Science and Technology, Japan; E Yucelen; FEI Company; RE Dunin-Borkowski, B Kardynal, Forschungszentrum Jülich, Germany

2:30 PM **702** (Invited) *In Situ Electron Holography of Ferroelectric Thin Films*; M-G Han, MS Marshall, L Wu; Brookhaven National Laboratory; FJ Walker, CH Ahn; Yale University; Y Zhu; Brookhaven National Laboratory

A04.1 Advances in FIB: New Instrumentation and Applications in Materials and Biological Sciences

SESSION CHAIRS:

Keana Scott, National Institute of Standards and Technology;

Lucille A. Giannuzzi, EXpressLO LLC

PLATFORM SESSION

Wednesday 1:30 PM • Room: B117

1:30 PM **703** (Invited) *The Perfect Cut: Focused Ion Beam Preparation for In Situ TEM*; ML Taheri; Drexel University

2:00 PM **704** *In Situ EDS Characterization of TEM Lamellae Created by Xe Plasma FIB*; T Hrnčič, C Lang, JV Oboň; TESCAN Brno, s.r.o., Česká republika; T Bartak; Oxford Instruments, United Kingdom

2:15 PM **705** *Vacuum Assisted Ex Situ Lift Out of FIB Prepared Specimens*; LA Giannuzzi, D Hess; EXpressLO LLC; T Clark; The Pennsylvania State University

2:30 PM **706** *Focused Ne⁺ Ion Beams for Final Polishing of TEM Lamella Prepared Through Ga-FIB Systems*; D Wei, C Huynh; Carl Zeiss Microscopy, A Ribbe; University of Massachusetts

2:45 PM **707** *Examining Foil Sidewall Damage During TEM Sample Preparation Using Gallium FIB and Needle Geometries*; M Presley, D Huber, HL Fraser; The Ohio State University

Scientific Program

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—WEDNESDAY AFTERNOON *continued*

A05.4 Fast and Ultrafast Imaging with Electrons and Photons

SESSION CHAIRS:

David Flannigan, University of Minnesota
Hermann Durr, Stanford University
Joanna Atkin, University of Colorado

PLATFORM SESSION

Wednesday 1:30 PM • Room: A105

- 1:30 PM **708** (Invited) *Nanoscale Probes in Ultrafast Transmission Electron Microscopy*; A Yurtsever; Centre Energie, Institut National de la Recherche Scientifique, France
- 2:00 PM **709** (Invited) *Infrared Pump-Probe Spectroscopy of Plasmons in Graphene and Semiconductors*; M Wagner; University of California San Diego
- 2:30 PM **710** *Ultrafast Plasmonic Forces Imposed by Fast Electrons on Metal Particles*; MJ Lagos, A Reyes-Coronado; Rutgers University; A Konecna, P Echenique, J Aizpurua; Universidad del Pais Vasco, Spain; P Batson; Rutgers University
- 2:45 PM **711** *Photonic Processes Visualized with Electrons in Photoemission Electron Microscopy (PEEM)*; R Könenkamp, RC Word, JP Fitzgerald; Portland State University

A06.5 Advanced Analytical TEM/STEM

SESSION CHAIRS:

Paul Kotula, Sandia National Laboratories
Masashi Watanabe, Lehigh University
Gerald Kothlietner, Graz University of Technology, Austria

PLATFORM SESSION

Wednesday 1:30 PM • Room: A106

- 1:30 PM **712** (Invited) *Global Analysis Peak Fitting Applied to EELS Images*; MH Van Benthem, PG Kotula, M Marinella, WM Mook, KL Jungjohann; Sandia National Laboratories
- 2:00 PM **713** *Revisiting Noise Scaling for Multivariate Statistical Analysis*; PG Kotula, MH Van Benthem; Sandia National Laboratories
- 2:15 PM **714** *When Will Low-contrast Features Be Visible in a STEM X-ray Spectrum Image?*; CM Parish; Oak Ridge National Laboratory
- 2:30 PM **715** *Name that Atom in 60 Seconds or Less: Energy Dispersive X-Ray Spectroscopy of Individual Heteroatoms in Low Dimensional Materials*; RM Stroud, TC Lovejoy; Naval Research Laboratory; M Falke; Bruker Nano GmbH, Germany; ND Bassim; Naval Research Laboratory; A Kaepfel; Bruker Nano GmbH, Germany; N Delby, P Hrnčirik, O Krivanek; Nion, Co, et al.

- 2:45 PM **716** *Single Atom Detection Through HAADF-STEM and EELS/EDX Characterization of Fluorophore Ru(bpy)₃2+ for Optical DNA-chip Applications*; G Nicotra, E Sciuto; CNR-Istituto per la Microelettronica e i Microsistemi, Italy; MF Santangelo; distretto Tecnologico Sicilia Micro e Nano Sistemi, Italy; G Villaggio, F Sinatra; Università degli studi di Catania, Italy; C Bongiorno, S Libertino; CNR-Istituto per la Microelettronica e i Microsistemi, Italy

A07.1 Scanning Probe Microscopy: New Methods and Applications

SESSION CHAIR:

Dalia Yablon, SurfaceChar LLC

PLATFORM SESSION

Wednesday 1:30 PM • Room: B118

- 1:30 PM **717** (Invited) *SFM Assisted In Situ by ToF-SIMS: Accessing Chemical Information in True Three Dimensions*; R Dianoux, A Scheidemann; NanoScan AG, Germany; E Niehuis, R Moellers, F Kollmer, H Arlinghaus; ION-TOF GmbH, Germany; H-J Hug, L Bernard; Empa, et al.
- 2:00 PM **718** (Invited) *AFM Integrated with SEM/FIB for Complete 3D Metrology Measurements*; A Lewis, A Komissar; Hebrew University, Israel; A Ignatov, O Fedoroyov, E Maayan; Nanonics Imaging, Israel
- 2:30 PM **719** *Integrating Atomic Force Microscopy in Scanning Electron Microscopy*; AJ Smith, K Schock, G Renka; Kleindiek Nanotechnik; A Lieb; Nanosurf; M Dadrás; Centre Suisse d'Électronique et de Microtechnique; S Kleindiek; Kleindiek Nanotechnik GmbH, Germany
- 2:45 PM **720** *Integrated SIMS-AFM Instrument for Accurate High-Sensitivity and High-Resolution Chemical 3D Analysis*; Y Fleming, T Wirtz, S Eswara-Moorthy; Luxembourg Institute of Science and Technology

A08.3 Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques

SESSION CHAIRS:

Nicholas Ritchie, National Institute of Standards and Technology
Paul Carpenter, Washington University
Phillipe Pinard, RWTH Aachen University, Germany

PLATFORM SESSION

Wednesday 1:30 PM • Room: B115

- 1:30 PM **721** (Invited) *Quantification of Nano-inclusions by EPMA Using Conventional Accelerating Voltages*; C merlet; University Montpellier, France
- 2:00 PM **722** *Multi-beam Energy Acquisition in FE-EPMA*; S Richter, PT Pinard; RWTH Aachen University, Germany
- 2:15 PM **723** *Improvements in EPMA: Spatial Resolution and Analytical Accuracy*; PK Carpenter, BL Joliff; Washington University

2:30 PM **724** *Improving Trace Element Analysis Precision By Not Using Off-Peak Measurements*; JJ Donovan, JT Armstrong; University of Oregon

2:45 PM **725 M&M 2015 STUDENT AWARDEE** *Using EPMA, Raman LS, Hyperspectral CL, SIMS and EBSD to Study Impact Melt Induced Decomposition of Zircon*; M Zanetti, A Wittmann, P Carpenter, BL Jolliff; Washington University in St Louis; E Vicenzi; Museum Conservation Institute, Smithsonian Institution; A Nemchin, NE Timms; Curtin University, Australia

A09.2 Advances in Combining Simulation and Experiment for Materials Design

SESSION CHAIRS:

Paul Voyles, University of Wisconsin
Gianluigi Botton, McMaster University, Canada

PLATFORM SESSION

Wednesday 1:30 PM • Room: B119

1:30 PM **726** (Invited) *Quantitative Electron Microscopy and the Application by Single Electron Signals*; R Ishikawa, AR Lupini; University of Tokyo, Japan; SD Findlay; Monash University, Australia; T Taniguchi; National Institute for Materials Science, Japan; SJ Pennycook; University of Tennessee

2:00 PM **727** (Invited) *Large-Scale Molecular Dynamics and High-Resolution Transmission Electron Microscopy Study of Graphene Grain Boundaries*; C Ophus, HI Rasool; Lawrence Berkeley National Laboratory; A Zettl; University of California Berkeley; A Shekhawat; Lawrence Berkeley National Laboratory

2:30 PM **728** *Applications of Bicrystallography: Revealing Generic Similarities in Coincidence Site Lattice Boundaries of all Holohedral Cubic Materials and Facilitating the Design of 3D Printed Models of such Grain Boundaries*; P Moeck, A Maas, J Stone- Sundberg, B York; Portland State University; W Kaminsky; University of Washington; ND Browning; Pacific Northwest National Laboratory

2:45 PM **729** *Defect Character at Grain Boundary Facet Junctions: A Combined HRSTEM and Atomistic Modeling Study of a $\Sigma=5$ Grain Boundary in Fe*; DL Medlin, KM Hattar, JA Zimmerman, FF Abdeljawad, SM Foiles; Sandia National Laboratories

A10.3 Advances in Electron Diffraction and Automated Mapping Techniques

SESSION CHAIR:

Sergei Rouvimov, University of Notre Dame

PLATFORM SESSION

Wednesday 1:30 PM • Room: B112

1:30 PM **730** (Invited) *Texture and Phase Analysis in Nanocrystalline Ni Thin Films by Precession Electron Diffraction Microscopy*; S-T Hu, L Morganti; University of Texas, Austin; S Rajesekhara, K Hattar; Sandia National Laboratories; P Ferreira; University of Texas, Austin

2:00 PM **731** *Application of EBSD and Precession-Enhanced Diffraction (PED) to Study Crystallography of β Titanium Alloy During $\beta\alpha$ Transformation Under Severe Hot Plastic Deformation*; SV Prikhodko, PE Markovsky; University of California Los Angeles; SD Sitzman; Oxford Instruments America; MA Gordillo, JM Wiezorek; University of Pittsburgh; OM Ivasishin; National Academy of Science of Ukraine

2:15 PM **732** *Precession Electron Diffraction and Orientation Phase Mapping of Assembled Ag/ ZnO Nanoantennas*; JE Sanchez, F Ruiz Zepeda, M Jose Yacaman, A Ponce-Pedraza; The University of Texas at San Antonio

2:30 PM **733** *A Precession Electron Diffraction and EELS Study of Beta-phase Evolution in Nano-crystalline Mg-9 wt.% Al Thin Films during Heat Treatment*; K Kruska, DJ Edwards, RS Vemuri, L Kovarik, A Rohatgi, ND Browning; Pacific Northwest National Laboratory

2:45 PM **734 M&M 2015 STUDENT AWARDEE** *Quantitative Phase Analysis of Rapid Solidification Products in Al-Cu Alloys by Automated Crystal Orientation Mapping in the TEM*; KW Zweier, MA Gordillo, C Liu; University of Pittsburgh; J McKeown, G Campbell; Lawrence Livermore National Laboratory; B Reed, T LaGrange; Integrated Dynamic Electron Solutions, J Wiezorek; University of Pittsburgh

A14.2 Surface Plasmons, Cathodoluminescence, and Low-Loss EELS

SESSION CHAIRS:

David McComb, Ohio State University
Ritesh Sachan, Oak Ridge National Laboratory
Robert Williams, Ohio State University
Gerd Duscher, University of Tennessee

PLATFORM SESSION

Wednesday 1:30 PM • Room: D137

1:30 PM **735** (Invited) *Electron Energy-Loss Spectroscopy of Organic Photovoltaics*; FJ Scheltens, LF Drummy; The Ohio State University; MF Durstock; Wright Patterson Air Force Base; JB Gilchrist, S Heutz; Imperial College London, United Kingdom; JA Alexander, DW McComb; The Ohio State University

Scientific Program

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—WEDNESDAY AFTERNOON *continued*

- 2:00 PM **736** *Vibrational Phonon Spectroscopy of Boron Nitride Polymorphs: a Comparison Between Theory and Experiment*; R Nicholls, FS Hage; University of Oxford, United Kingdom; K Refson; STFC Rutherford Appleton Laboratory, United Kingdom; J Yates; University of Oxford, United Kingdom; DM Kepaptsoglou; SuperSTEM Laboratory, United Kingdom; TC Lovejoy, OL Krivanek; Nion Company, QM Ramasse; SuperSTEM Laboratory, United Kingdom, et al.
- 2:15 PM **737** *Variable Angle Spectroscopic Ellipsometry and Electron Energy-Loss Spectroscopy*; JA Alexander, FJ Scheltens; The Ohio State University; LF Drummy, MF Durstock; Wright Patterson Air Force Base; JB Gilchrist, SE Heutz; Imperial College London, United Kingdom; DW McComb; The Ohio State University
- 2:30 PM **738** *Detection and Characterization of OH Vibrational Modes Using High Energy Resolution EELS*; L Zhang, Q Liu, PA Crozier, T Aoki; Arizona State University
- 2:45 PM **739** *Study Using Low-loss EELS to Compare Properties of TMDs Produced by Mechanical and Liquid Phase Exfoliation*; HC Nerl, FS Hage; Trinity College Dublin, Ireland; L Houben; Ernst Ruska Center for Microscopy and Spectroscopy with Electrons, Germany; QM Ramasse; SuperSTEM Laboratory, United Kingdom; V Nicolosi; Trinity College Dublin, Ireland

A17.1 Standardization and Metrology in Electron Microscopy and Microbeam Analysis

SESSION CHAIRS:

Dan V. Hodoroaba, BAM Federal Institute for Materials Research and Testing, Germany
Ryna B. Marinenko, National Institute of Standards and Technology
M. Matthews, Atomic Weapons Establishment, United Kingdom

PLATFORM SESSION

Wednesday 1:30 PM • Room: B114

- 1:30 PM **740** *Standardization and Metrology for Efficiency and Reliability in Microbeam Analysis: No Pain, No Gain*; V-D Hodoroaba, RB Marinenko; BAM Federal Institute for Materials Research and Testing; M Matthews; Atomic Weapons Establishment, United Kingdom; J Zhao; Chinese Academy of Sciences
- 1:45 PM **741** (Invited) *Characterizing the Geometric Detection Efficiency of EDX Detectors*; FH Schamber; Retired

2:15 PM **742** (Invited) *Determination of the Effective EDS Detector Area Using Experimental and Theoretical X-ray Emission Yields*; M Procop, V-D Hodoroaba; IfG-Institute for Scientific Instruments, Germany; R Terborg; Bruker-nano GmbH, Germany

2:45 PM **743** *Energy Resolution of Modern EDS Spectrometers: Is the current ISO standard definition outdated?*; R Terborg, M Falke; Bruker Nano GmbH

B

BIOLOGICAL SCIENCES SYMPOSIA WEDNESDAY AFTERNOON

B02.2 To the Rhizosphere - and Beyond!

SESSION CHAIRS:

Alice Dohnalkova, Pacific Northwest National Laboratory
Marvin Whiteley, University of Texas

PLATFORM SESSION

Wednesday 1:30 PM • Room: B111

- 1:30 PM **744** *Further Differences in Biochemical Composition of Roots of Ni-Hyperaccumulating and Non-Hyperaccumulating Genotypes of Senecio coronatus*; AD Barnabas, J Mesjasz-Przybylowicz; IThemba LABS, South Africa; I Yousef; SESAME Synchrotron, Jordan; P Dumas; F Jamme; SOLEIL Synchrotron, France; PT Sechogela, WJ Przybylowicz; iThemba LABS, South Africa
- 1:45 PM **745** (Invited) *The Use of Fluorescent In Situ Hybridization in Bacterial Detection in Mycorrhizal Networks*; W Chrisler, G Orr, A Dohnalkova, L Paša-Tolić Pacific Northwest National Laboratory; G Stacey; University of Missouri; C Chun, M Sadowsky; University of Minnesota
- 2:15 PM **746** *A Multiscale Approach to Understanding Calcium Toxicity in Australian Proteaceae*; PL Clode, P Hayes; University of Western Australia; N Honvault; Institut Polytechnique Lasalle Beauvais, France; H Lambers; University of Western Australia
- 2:30 PM **747** (Invited) *Investigation of Structure-function Relationship of Long-distance Transport in Plants: New Imaging Tools to Answer Old Questions*; M Knoblauch, D Mullendore, D Froelich, S Beecher, TJ Ross-Elliott, J Knoblauch; Washington State University

B04.5 Advances in Specimen Preparation and Correlative LM-EM (CLEM) of Biological Samples

SESSION CHAIRS:

Kent McDonald, University of California, Berkeley
Danielle Jorgens, Oregon Health & Science University

PLATFORM SESSION

Wednesday 1:30 PM • Room: D138

Scientific Program

Wednesday, August 5

- 1:30 PM **748** *Dynamics of Thrombus Formation in Mouse Testicular Surface Vein Visualized by Newly Devised "Vascular Mapping" Method for Live-CLEM Imaging In Vivo*; A Sawaguchi, S Nishimura; University of Miyazaki, Japan
- 1:30 PM **749** *Cryo-Planing of Frozen Hydrated Samples by Triple Ion Gun Milling (CryoTIGM)*; IY Chang, D Joester; Northwestern University
- 2:00 PM **750** **APKARIAN MEMORIAL SCHOLARSHIP AWARDEE** *Correlative iPALM and Platinum Replica Electron Tomography to Highlight Single Molecules on Clathrin Endocytic Structures in 3D*; KA Sochacki, G Shtengel, A Dickey; National Heart Lung and Blood Institute, NIH; H Hess; Janelia Farm Research Campus; J Taraska; National Heart Lung and Blood Institute, NIH
- 2:15 PM **751** *Correlative Electron and Fluorescence Microscopy of Magnetotactic Bacteria in Liquid: Toward In Vivo Imaging*; TJ Woehl, S Kashyap, E Firlar; Ames Laboratory; T Perez-Gonzalez, D Faivre; Max Planck Institute of Colloids and Interfaces, Germany; D Trubitsyn, D Bazylinski; University of Nevada, Las Vegas, T Prozorov; Ames Laboratory
- 2:30 PM **752** *Indium-Tin-Oxide (ITO) as Stable and Effective Coating Material for Correlative Confocal and Immuno-Scanning Electron Microscopy Studies*; A Falqui, S Rodighiero, E Sogne; Fondazione Filarete; B Torre; King Abdullah University for Science and Technology, Saudi Arabia; R Ruffilli; Centre d'Elaboration de Matériaux et d'Etudes Structurales, France; M Francolini, C Cagnoli; Fondazione Filarete, Italy, E Di Fabrizio; King Abdullah University for Science and Technology, Saudi Arabia
- 2:45 PM **753** *Wide Area Observation of Fully Hydrophilic Tissue Achieved by Sliding It on the Dish of the Atmospheric Scanning Electron Microscope (ASEM)*; C Sato, M Sato, T Ebihara; National Institute of Advanced Industrial Science and Technology, Japan; H Nishiyama, M Suga; JEOL Ltd, Japan; N Mementy; National Institute of Advanced Industrial Science and Technology, Japan

P

PHYSICAL SCIENCES SYMPOSIA

WEDNESDAY AFTERNOON

P01.7 Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on *In Situ* TEM and STEM

SESSION CHAIRS:

M. Grace Burke, University of Manchester
Ondrej Krivanek, Nion Inc.
Peter Crozier, Arizona State University

PLATFORM SESSION

Wednesday 1:30 PM • Room: B116

- 1:30 PM **754** (Invited) *Building and Imaging Silicide Nanostructures in Nanowires*; F Panciera, Y-C Chou; University of Cambridge, United Kingdom; MC Reuter; IBM T J Watson Research Center; D Zakharov, EA Stach; Brookhaven National Laboratory; K Mølhave; Technical University of Denmark; S Hofmann; University of Cambridge, United Kingdom; FM Ross; IBM T J Watson Research Center, et al.
- 2:00 PM **755** *Understanding Nanomaterial Synthesis with In Situ Transmission Electron Microscopy*; Bm Hudak, Y-J Chang, L Yu; University of Kentucky; G Li; Anhui University, China; DN Edwards, ME Park, BS Guiton; University of Kentucky
- 2:15 PM **756** *In Situ TEM for Quantitative Electrochemistry of Energy Systems*; ME Holtz, Y Yu, J Rivera, HD Abruna, DA Muller; Cornell University
- 2:30 PM **757** *Effects of Non-contact Electric Fields on Consolidation Behavior of Agglomerated Yttria-stabilized zirconia*; H Majidi, K van Benthem; University of California, Davis
- 2:45 PM **758** *In Situ Analytical Transmission Electron Microscopy Study of Electrochemical Lithiation of a Sulfur - Carbon Nanotube Composite Cathode*; J Ticey, V Oleshko, Y Zhu, C Wang, J Cumings; University of Maryland

P02.3 Materials Problem Solving with Aberration-Corrected EM

SESSION CHAIRS:

Jian-Min Zuo, University of Illinois
Gustaaf Van Tendeloo, University of Antwerp

PLATFORM SESSION

Wednesday 1:30 PM • Room: C124

- 1:30 PM **759** (Invited) *Materials Development Aided by Atomic-resolution Electron Microscopy*; R Holmestad, S Wenner, M Nord; Norwegian University of Science and Technology; PE Vullum, CD Marioara; SINTEF Materials and Chemistry, Norway
- 2:00 PM **760** *Characterization of Various Interfaces Structure in a Titanium Alloy Using Aberration-Corrected Scanning Transmission Electron Microscope*; Y Zheng, R Williams, H Fraser; The Ohio State University
- 2:15 PM **761** *Direct Observation of Chemical Pressure in Intermetallic Alloys by Scanning Transmission Electron Microscopy*; A Oni, X Sang; North Carolina State University; A Kumar, SB Sinnott; University of Florida; JM LeBeau; North Carolina State University

Scientific Program

P

PHYSICAL SCIENCES SYMPOSIA

WEDNESDAY AFTERNOON *continued*

2:30 PM **762 M&M 2015 STUDENT AWARDEE** *Physical and Practical Challenges in Analytical Electron Tomography of Aluminum Alloys*; A Orthacker, G Haberfehlner; Graz Centre for Electron Microscopy, Austria; J Tändl, C Poletti; Graz University of Technology, Austria; LJ Allen; University of Melbourne, Australia; G Kothleitner; Graz University of Technology, Austria

2:45 PM **763** *Implementation of Atomic Resolution Electron Tomography of a Needle Sample*; MC Scott, W Theis, R Xu, L Wu, C-C Chen; University of California, Los Angeles; C Ophus, P Ercius; Lawrence Berkeley National Laboratory, J Miao; University of California, Los Angeles

P03.3 Advances in Microanalysis of Earth and Planetary Materials

SESSION CHAIRS:

Rhonda Stroud, Naval Research Laboratory

Eve L. Berger, NASA Johnson Space Center

PLATFORM SESSION

Wednesday 1:30 PM • Room: C122

1:30 PM **764** (Invited) *The Oxidation State of Nanophase Fe Particles Produced by Space Weathering as Revealed Through Aberration-Corrected Transmission Electron Microscopy*; MS Thompson, TJ Zega; University of Arizona

2:00 PM **765** *Aberration-Corrected STEM-EELS Measurements in Fe-bearing Silicate Glasses*; KD Burgess, BT De Gregorio; Naval Research Laboratory; MD Dyar; Mount Holyoke College; MC McCanta; Tufts University; RM Stroud; Naval Research Laboratory

2:15 PM **766** *Ti Valence States in Al, Ti-rich Pyroxenes from Comet Particles: Anchoring Ti ELNES Spectra with Vanadium Thin-films*; D Joswiak, D Brownlee; University of Washington

2:30 PM **767** *Insights Into Regolith Evolution from TEM Studies of Space Weathering of Itokawa Particles*; EL Berger, LP Keller; NASA Johnson Space Center

2:45 PM **768** *Novel Microtomy Methods For Small, Hard And Precious Extraterrestrial And Terrestrial Rocky Materials*; D Brownlee, D Joswiak; University of Washington

P08.5 Microscopy and Characterization of Ceramics, Polymers, and Composites

SESSION CHAIRS:

Andre Mkhoyan, University of Minnesota

Jong Seok Jeong, University of Minnesota

Laxmikant Saraf, Clemson University

PLATFORM SESSION

Wednesday 1:30 PM • Room: D136

1:30 PM **769** (Invited) *Microscopy and Chemical Analysis of Topological Insulator Bi₂Se₃ and Topological Crystalline Insulator SnTe Nanostructures*; J Cha; Yale University

2:00 PM **770** *Characterization of the Oxide-Semiconductor Interface in 4H-SiC/SiO₂ Structures Using TEM and XPS*; JA Taillon, K Gaskell; University of Maryland; G Liu, L Feldman; Rutgers University; S Dhar; Auburn University; T Zheleva, A Lelis; US Army Research Laboratory, L Salamanca-Riba; University of Maryland

2:30 PM **771** *Hybrid Calcium Phosphate Neuron-like Structures under the Microscope*; V Srot, M Espanol; Max Planck Institute for Intelligent Systems, Germany; Z Zhao; Universitat Politècnica de Catalunya, Spain; PA van Aken; Max Planck Institute for Intelligent Systems, Germany; M-P Ginebra; Universitat Politècnica de Catalunya, Spain

P11.7 Advances in Transmission Electron Microscopy and Spectroscopy of Energy Related Materials

SESSION CHAIRS:

Chongmin Wang, Pacific Northwest National Laboratory

Raymond Unocic, Oak Ridge National Laboratory

Arda Genc, FEI

PLATFORM SESSION

Wednesday 1:30 PM • Room: B113

1:30 PM **772** (Invited) *Exploring Lithium-ion Battery Performance through In Situ Characterization*; DJ Miller, A Demortiere, L Wang, J Wen, J Lu, K Amine; Argonne National Laboratory

2:00 PM **773** *Dynamic Study of Sodiation Process in Single Crystalline α MnO₂ Nanowires*; Y Yuan, A Nie, W Yao, R Shahbazian-Yassar; Michigan Technological University

2:15 PM **774** *TEM Study of Heavily Twinned Cu₃Pt Nanoparticles*; G Drazic, M Bele, A Pavlisic, P Jovanovic, M Zorko, B Jozinovic, M Gaberscek; National Institute of Chemistry, China

2:30 PM **775** *The Role of Aberration-Corrected STEM in the Characterization of Oxide Cathode Materials*; PJ Phillips, DP Abraham; University of Illinois at Chicago; J Bareno; Argonne National Lab; C Kim, T Li, J Cabana, RF Klie; University of Illinois at Chicago

2:45 PM **776** *Challenges for ABF-STEM Characterization of Li Battery Materials*; B Levin, DA Muller; Cornell University

P12.1 Advanced Microanalysis and Microscopy of Soft and Hybrid Nanomaterials

SESSION CHAIRS:

Jihua Chen, Oak Ridge National Laboratory
Honggang Cui, John Hopkins University

PLATFORM SESSION

Wednesday 1:30 PM • Room: D140

- 1:30 PM **777** *Artefacts Induced on Soft Layer of Hybrid Metallic Nanoparticles in TEM*; H Qian, L Laurentius; National Institute for Nanotechnology, Canada; RF Egerton; University of Alberta, Canada
- 1:45 PM **778** *Serial block face SEM and TEM Imaging for Quantitative Measurement of Cellular Uptake of Semiconductor Quantum Dot Nanoparticles*; N Hondow, MR Brown; University of Leeds, United Kingdom; T Starborg; University of Manchester, United Kingdom; AG Monteith; Gatan, United Kingdom; R Brydson; University of Leeds, United Kingdom; HD Summers, P Rees; Swansea University, United Kingdom, A Brown; University of Leeds, United Kingdom
- 2:00 PM **779** *Thickness Mapping of Freestanding Ionic Liquid Films Using Electron Energy Loss Spectroscopy in the TEM*; AE Ribbe, P Kim, D Hoagland, T Russell; University of Massachusetts Amherst
- 2:15 PM **780** **M&M 2015 STUDENT AWARDEE** *PSRT: Progressive Stochastic Reconstruction Technique for Cryo Electron Tomography*; B Turonova, L Marsalek, T Davidovic, P Slusallek; Saarland University, Germany
- 2:30 PM **781** *First Results of Integrating a Compression/Tension Load Cell with Nano-scale X-ray Transmission Microscopy*; NL Cordes, K Henderson; Los Alamos National Laboratory; B Hornberger; Carl Zeiss X-ray Microscopy Inc. BM Patterson; Los Alamos National Laboratory
- 2:45 PM **782** *Non-local Prior Modeling for Tomographic Reconstruction of Bright Field Transmission Electron Microscopy Images*; S Sreehari, SV Venkatakrishnan; Purdue University; JP Simmons, LF Drummy; Wright-Patterson Air Force Base, CA Bouman; Purdue University

TF

TECHNOLOGISTS' FORUM WEDNESDAY AFTERNOON

X30.2 Technologists' Forum: Emerging New Specialized Techniques for Correlative Microscopy

SESSION CHAIRS:

Caroline Miller, Indiana University
John Chandler, Colorado School of Mines
Frank Macaluso, Yeshiva University

PLATFORM SESSION

Wednesday 1:30 PM • Room: D139

- 1:30 PM **783** (Invited) *A Modern Correlative Workflow Environment to Master the Multi-scale Challenge*; AP Merkle, L Lechner, A Steinbach; Carl Zeiss X-ray Microscopy, Inc.
- 2:00 PM **784** *Cryo-Correlative Light and Electron Microscopy (Cryo-CLEM): Specimen Workflow Paths and Recent Instrument Developments*; M Schwertner, D Stacey; Linkam Scientific Instruments Ltd., United Kingdom
- 2:15 PM **785** *Correlative Array Tomography - from 2D towards 3D*; AF Elli, R Kirmse; Carl Zeiss Microscopy GmbH, Germany; JL Caplan, CA Warner, J Sherrier; University of Delaware; K Czymmek; Carl Zeiss Microscopy LLC

T

BIOLOGICAL SCIENCES TUTORIAL WEDNESDAY AFTERNOON

X43.1 Biological Sciences Tutorial: Advances in Light Sheet Microscopy

SESSION CHAIR:

Scott Stagg, Florida State University

TUTORIAL SESSION

Wednesday 1:30 PM • Room: C125

- 1:30 PM **787** (Invited) *Optimization of the Excitation Light Sheet in Selective Plane Illumination Microscopy*; L Gao; Stony Brook University

Scientific Program

A

ADVANCES IN INSTRUMENTATION POSTER SESSIONS— WEDNESDAY AFTERNOON

A02.P1 TEM Phase Contrast Imaging

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

3:00 PM **788** *Development of Amorphous Carbon Thin Film Phase Plate*; Y Konyuba, H Iijima, N Hosogi; JEOL Ltd, Japan; Y Abe; Yamagata Research Institute of Technology, Japan; I Ishikawa, Y Ohkura; JEOL Ltd, Japan
POSTER # 230

3:00 PM **789** *Thin-Film-Based Phase Plates for Transmission Electron Microscopy Fabricated From Metallic Glasses*; M Dries, S Hettler, T Schulze, W Send, E Müller, R Schneider, D Gerthsen; Karlsruher Institut für Technologie, Germany, Y Luo; Universität Göttingen, Germany, et al.
POSTER # 231

3:00 PM **790** *Optimization of JEM2200FS for Zernike Phase Contrast Cryo-EM*; HA Khant, C Fu; Baylor College of Medicine; S Motoki; JEOL USA, Inc.; MH Sullivan, G DeRose; California Institute of Technology; W Chiu; Baylor College of Medicine
POSTER # 232 (invited)

3:00 PM **791** *Initial Experience with the Volta Phase Plate*; M Marko, C Hsieh; Wadsworth Center
POSTER # 233

3:00 PM **792** *High-Resolution Transmission Electron Microscopy With Zach Phase Plate*; S Hettler, M Dries, T Schulze; Karlsruhe Institute for Technology, Germany; M Oster, C Wacker, RR Schröder; University of Heidelberg, Germany; D Gerthsen; Karlsruhe Institute for Technology, Germany
POSTER # 234

A05.P2 Fast and Ultrafast Imaging with Electrons and Photons

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

3:00 PM **793** *TEM Video Compressive Sensing*; A Stevens, L Kovarik; Duke University ECE; P Abellan; Pacific Northwest National Laboratory; X Yuan, L Carin; Duke University ECE; ND Browning; Pacific Northwest National Laboratory
POSTER # 235

3:00 PM **794** *Imaging At the Timescale of Micro- And Milliseconds With the pnCCD (S)TEM Camera*; H Ryll, M Simson; PNSensor GmbH, Germany; M Den Hertog; Institut Néel-CNRS, France; R Dunin-Borkowski; Ernst Ruska-Centre, Forschungszentrum Jülich, Germany; K El Hajraoui; Institut Néel-CNRS, France; V Migunov; Ernst Ruska-Centre, Forschungszentrum Jülich, Germany; H Soltan; PNDetector GmbH, Germany, L Strüder; PNSensor GmbH, Germany, et al.
POSTER # 236

3:00 PM **795** *NO₂ Hydrogenation over Pt and Rh Catalysts: a Study at The Atomic Level by Field Emission Microscopy*; C Barroo, Y De Decker; Harvard University; T Visart de Bocarmé; Université libre de Bruxelles, Belgium; N Kruse; Washington State University
POSTER # 237

3:00 PM **796** *Characterization of Dielectric Waveguides Through Photoemission Electron Microscopy (PEEM) in the Infrared Regime*; TA Stenmark, RC Word, R Könenkamp; Portland State University
POSTER # 238

A06.P2 Advanced Analytical TEM/STEM

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

3:00 PM **798** *New Approach to Analysis of Noisy EELS Data*; E Ertel, T Pozorov; Ames Laboratory
POSTER # 240

3:00 PM **799** *Use of a Hybrid Silicon Pixel (Medipix) Detector as a STEM Detector*; D McGrouther, M Krajnak, I MacLaren, D Maneuski, V O'Shea; University of Glasgow, United Kingdom; PD Nellist; University of Oxford, United Kingdom
POSTER # 241

3:00 PM **800** *Development of an Aberration corrected 1.2-MV Field Emission Transmission Electron Microscope*; H Shinada, T Tanigaki, T Akashi, Y Takahashi, T Furutsu, T Shimakura, T Kawasaki, K Kasuya; Hitachi, Ltd, Japan, et al.
POSTER # 242

3:00 PM **801** *Aberration Corrected Electron Microscopy Enhanced for Lower Accelerating Voltages*; T Ishikawa, E Okunishi, T Kaneyama, Y Kondo; JEOL Ltd, Japan; S Matsumura; Kyushu University, Japan
POSTER # 243

3:00 PM **802** *Attention: Building Blocks for Iterative Reconstruction Algorithms*; T Dahmen, L Marsalek; German Research Center for Artificial Intelligence GmbH, Germany; N Marniok; Saarland University, Germany; B Turoňvá; Max-Planck Institute for Informatics, Germany; S Bogachev; Saarland University, Germany, P Trampert; German Research Center for Artificial Intelligence GmbH; S Nickels; Saarland University, Germany, P Slusallek; German Research Center for Artificial Intelligence GmbH
POSTER # 244

3:00 PM **803** *Analysis of TEM Tomography Artifacts with Experiments on Model Specimens*; JP Winterstein, J Schumacher, JA Liddle; National Institute of Standards and Technology
POSTER # 245

3:00 PM **804** *Rapid 3D Reconstruction in the EDS Tomography by Using Iterative Series Reduction (ISER) Method*; Y Aoyama, H Nishioka, Y Kondo; JEOL Ltd, Japan
POSTER # 246

Scientific Program

3:00 PM **805** *Moving Atomic-resolution Imaging into the Age of Deep Data*; O Ovchinnikov, S Jesse; Vanderbilt University; A Belianinov; Oak Ridge National Laboratory; S Pantelides; Vanderbilt University; S Kalinin, A Borisevich; Oak Ridge National Laboratory
POSTER # 247

3:00 PM **806** *High-accuracy Electron Tomography of Semiconductor Devices*; M Hayashida, L Gunawan; National Institute for Nanotechnology, Canada; C Pawlowicz; TechInsights, Canada; M Malac; National Institute for Nanotechnology, Canada; M Couliard; National Research Council Canada
POSTER # 248

A07.P1 Scanning Probe Microscopy: New Methods and Applications

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

3:00 PM **807** *Progress in Crystallographic Image Processing for Scanning Probe Microscopy*; P Moeck, JC Straton; Portland State University
POSTER # 249

3:00 PM **808** *Conductive Atomic Force Microscopy Characterization of Ultra-Thin Diamond-Like Carbon Films on Magnetic Recording Heads*; S Mejia, SP Leary, GP Souza, KC Ruthe; Western Digital Corporation
POSTER # 250

3:00 PM **809** *Characterization of Nanocarrier Complexes with Plasmid DNA Using SEM, TEM and AFM*; J-Y Cho, UD Hemraz; National Institute for Nanotechnology, Canada; P Bhowmik, G Nowak, PL Polowick; National Research Council Canada
POSTER # 251

3:00 PM **810** *Custom Modification of AFM Tips for Fast, High Force Resolution Single-Molecule Force Spectroscopy*; AE Sanders, JK Faulk; National Institute of Standards and Technology; DT Edwards, TT Perkins; University of Colorado
POSTER # 252

3:00 PM **811** *Comparison of Magnetic Domain Observation by Means of Magnetic Force Microscopy and Lorentz Transmission Electron Microscopy*; S Hua, M DeGraef; Carnegie Mellon University
POSTER # 253

3:00 PM **812** *Use of the Unroofing Technique for AFM Direct Imaging of the Intra-cellular Structure at High Resolution*; J Usukura, E Usukura, A Narita; Nagoya University, Japan; A Yagi, S Ito; Olympus Corporation, Japan
POSTER # 254

3:00 PM **813** *Lateral Force Microscopy Using Nanomanipulation*; Y-K Hseu, H McNally; Purdue University
POSTER # 255

3:00 PM **814** *Correlated Atomic Force Microscopy and Single Molecule Localization Microscopy*; PD Odermatt, A Shivanandan, H Deschout, R Jankele, AP Nievergelt, L Feletti, A Radenovic, GE Fantner; École Polytechnique Fédérale de Lausanne, Switzerland, et al.
POSTER # 256

A08.P1 Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

3:00 PM **815** *Pushing the Limits on SEM Quantification – Combined Quantification with SDD and Fully Focussing WD detectors*; CL Collins, J Holland, SR Burgess; Oxford Instruments NanoAnalysis, United Kingdom
POSTER # 257

3:00 PM **816** *Factors Affecting WDS Performance Superiority over EDS*; PP Camus; EDAX Inc.
POSTER # 258

3:00 PM **817** *Enhanced Theoretical Model for Avoiding Mistakes in SEM-EDS Analysis*; PJ Statham; Oxford Instruments NanoAnalysis, United Kingdom
POSTER # 259

3:00 PM **818** *Regarding the Quantitative Analysis of Heterogenous Samples by SEM/EDS*; JF Konopka; Thermo Fisher Scientific
POSTER # 260

3:00 PM **819** *Trace Element Analysis under 100 ppm and Chemical State Analysis in Small Area Using Wavelength Dispersive Soft X-ray Emission Spectrometer in FE-SEM*; H Takahashi, S Asahina; JEOL Ltd, Japan; M Terauchi; Tohoku University, Japan; C Nielsen, P McSwiggen; JEOL USA, Inc.
POSTER # 261

3:00 PM **820** *Characterization and Comparison of Detector Systems for Large Area X-ray Imaging*; J Davis, J Schmidt; PNDetector; M Huth; PNSensor GmbH, Germany; U Weber, H Soltan, A Niculae; PNDetector GmbH, Germany; L Strüder; PNSensor GmbH, Germany
POSTER # 262

3:00 PM **821** *Accurate EPMA Quantification of the First Series Transition Metals Using L_i Lines*; M Moret, C Hombourger, M Outrequin; CAMECA Instruments, Inc., France
POSTER # 263

3:00 PM **822** *Multilayer Thin Films as Pseudo-Homogeneous EDX Standards*; HO Colijn, J Orsborn, DJ Chmielewski, DW McComb; Ohio State University
POSTER # 264

3:00 PM **823** *A Method of Component Extraction of EDS and EELS maps*; S Wang; Micron Technology Inc.
POSTER # 265

Wednesday, August 5

Scientific Program

A

ADVANCES IN INSTRUMENTATION POSTER SESSIONS—

WEDNESDAY AFTERNOON *continued*

- 3:00 PM **824** *Windowless, Silicon Nitride Window and Polymer Window EDS Detectors: Changes in Sensitivity and Detectable Limits*; J Rafaelsen, T Nylese, M Bolorizadeh; EDAX Inc. V Carlino; ibss Group Inc.
POSTER # 266

A09.P1 Advances in Combining Simulation and Experiment for Materials Design

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

- 3:00 PM **825** *Transmission Electron Microscopic and First-principles Study of SrTiO₃/GaAs Hetero-interfaces*; L Hong, S Ogut, R Klie; University of Illinois at Chicago
POSTER # 267
- 3:00 PM **826** *Observation of Skyrmions at Room-temperature in Amorphous Fe/Gd Films*; JJ Chess, S Montoya, J Lee; University of Oregon; S Roy, S Kevan; Lawrence Berkeley National Laboratory; EE Fullerton; University of California, San Diego; BJ McMorran; University of Oregon
POSTER # 268
- 3:00 PM **827** *A Biomimetic-Computational Approach to Optimizing the Quantum Efficiency of Photovoltaics*; LM Perez, A Holzenburg; Texas A&M University
POSTER # 269
- 3:00 PM **828** *Combine Simulation and Experiment EELS to Characterize Ionomer Conformation*; C Wang, SJ Paddison; National Institute for Occupational Safety and Health; G Duscher; University of Tennessee
POSTER # 270
- 3:00 PM **829** *Investigation of the Structural and Electronic Properties of Pt/VAl₂O₃, a Model Catalyst System*; CS Bonifacio, Q Zhu; University of Pittsburgh; D Su; Center for Functional Nanomaterials; F Vila; University of Washington; HO Ayoola, SD House; University of Pittsburgh; J Kas, JJ Rehr; University of Washington, et al.
POSTER # 271
- 3:00 PM **830** *Analysis of Surface Structures in Ru Nanocatalysts*; NP Walker, BK Miller, PA Crozier; Arizona State University
POSTER # 272
- 3:00 PM **831** (Invited) *Medium-Range Structure of Zr-Cu-Al Bulk Metallic Glasses from Structural Refinement Based on Fluctuation Microscopy*; JJ Maldonis, P Zhang; University of Wisconsin, Madison; M Besser, M Kramer, Iowa State University; P Voyles, University of Wisconsin, Madison
POSTER # 273

A10.P1 Advances in Electron Diffraction and Automated Mapping Techniques

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

- 3:00 PM **832** *Orientation Mapping by Precession Transmission Electron Microscopy*; D Wang, A Avishai, A Heuer; Case Western Reserve University
POSTER # 274
- 3:00 PM **833** *Determination of Reliable Grain Boundary Orientation Using Automated Crystallographic Orientation Mapping in the Transmission Electron Microscope*; X Zhang, JF Rufner; University of California, Davis; T LaGrange; École Polytechnique Fédérale de Lausanne, Switzerland; RH Castro, JM Schoenung; University of California, Davis; GH Campell; Lawrence Livermore National Laboratory; K van Benthem; University of California, Davis
POSTER # 275
- 3:00 PM **834** *The Presence of Higher-Order Laue Zone Intensities and the Relrod Effect in Cubic Metals in the Transmission Electron Microscope*; C Miller, R Field, M Kaufman; Colorado School of Mines
POSTER # 276
- 3:00 PM **835** **M&M POST-DOCTORAL RESEARCHER AWARDEE** *Semi-Automated Digital Micrograph Routine for Real-Time Phase Identification*; ER White, J Weiner, A García-Trenco, SD Pike, CK Williams, MS Shaffer; Imperial College London, United Kingdom
POSTER # 277
- 3:00 PM **836** *Improving Spatial Detection of Twins Achieved by Measuring Individual Kikuchi Band Intensity in EBSD Patterns*; TM Rampton, DT Fullwood, SI Wright; EDAX, Inc.
POSTER # 278
- 3:00 PM **837** *Transmission Electron Backscatter Diffraction (tEBSD) analysis of Au Thin Films*; EC Estrine, N Seaton, P Dulal, B Stadler; University of Minnesota
POSTER # 279
- 3:00 PM **838** *Automated Image Alignment and Distortion Removal for 3D Serial Sectioning with Electron Backscatter Diffraction*; AJ Levinson, DJ Rowenhorst; Naval Research Laboratory; AC Lewis; Formerly Naval Research Laboratory
POSTER # 280
- 3:00 PM **839** *Growth and Characterization of (110) InAs Quantum Well Heterostructures by Transmission Electron Microscopy and Electron Channeling Contrast Imaging*; MB Katz, ME Twigg, AA Podpirka; US Naval Research Laboratory; M Hernandez; Hitachi High Technologies America, Inc. SC Mack, BR Bennett; US Naval Research Laboratory
POSTER # 281

3:00 PM **840** *Techniques for Transmission EBSD Mapping of Atom Probe Specimens*; KP Rice, Y Chen, TJ Prosa, DJ Larson; CAMECA Instruments, Inc. France; M Nowell; EDAX Inc. MP Stoykovich; University of Colorado, Boulder
POSTER # 282

3:00 PM **840.1** *High Resolution Strain Mapping Via Precession Electron Diffraction*; AD Darbal, RD Narayan, X.Liu, JK Weiss; AppFive LLC; RJ Graham, F Shaapur; FabMetric, Inc.
POSTER #282-A

A14.P1 Surface Plasmons, Cathodoluminescence, and Low-Loss EELS

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

3:00 PM **841** *Characterization of Sulfonated Polysulfone Polymers by EELS*; C Wang, SJ Paddison; National Institute for Occupational Safety and Health; JR Dunlap, G Duscher; University of Tennessee
POSTER # 283

3:00 PM **842** *Structural and Optical Properties of AlGaN MQWs Grown by MOCVD Using One and Two TMG Sources*; S Wang, H Xie, Y Wei, AM Fischer, FA Ponce; Arizona State University; M Moseley, B Gunning, AW Doolittle; Georgia Institute of Technology
POSTER # 284

3:00 PM **843 M&M 2015 STUDENT AWARDEE** *Probing Plasmons in Three Dimensions within Random Morphology Nanostructures*; JA Hachtel, A Mouti, DC Mayo; Vanderbilt University; SJ Pennycook; National University of Singapore; AR Lupini, MF Chisholm; Oak Ridge National Laboratory; RF Haglund, ST Pantelides; Vanderbilt University, et al.
POSTER # 285

3:00 PM **844** *Strong Coupling between ZnO Exciton and Localized Surface Plasmon in Ag Nanoparticles Studied by STEM-EELS*; J Wei, J Xu, J Liu; Arizona State University
POSTER # 286

3:00 PM **845** (Invited) *Advances in Scanning Transmission Electron Microscope Cathodoluminescence*; S Meuret, L Tizei, A Losquin, R Bourrellier, LF Zagonel, M Tencé, A Zobelli, M Kociak; Laboratoire de Physique des Solides, France, et al.
POSTER # 287

A16.P1 Advances in Electron and Ion Scanning Microscopies

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

3:00 PM **846** *Modeling Ion Beam Induced Secondary Electrons*; U Huh, V Iberi, W Cho; The University of Tennessee, Knoxville; R Ramachandra; The University of California, San Diego; DC Joy; The Oak Ridge National Laboratory
POSTER # 288

3:00 PM **847** *Scanning Helium Ion Microscopy-Induced Secondary Electron Yields of Composite Materials*; V Iberi, U Huh; University of Tennessee Knoxville; Y Wu; University of Tennessee; PD Rack; University of Tennessee Knoxville; AJ Rondinone; Oak Ridge National Laboratory; DC Joy; University of Tennessee, Knoxville
POSTER # 289

3:00 PM **848** *Study of SEM Images Obtained with an Electron Energy and Take-off Angle (E-θ) Selective Detector*; T Otsuka, M Nakamura, K-I Yamashita, M Hara; JEOL Ltd, Japan; F Timischl; JEOL Technics Ltd; K Honda; JEOL Ltd, Japan; M Kudo; JEOL Technics Ltd, S-I Kitamura; JEOL Ltd, Japan
POSTER # 290

3:00 PM **849** *Repetitive Observation of Coniferous Samples in ESEM and SEM*; E Tihlarikova, V Nedela; Institute of Scientific Instruments of ASCR, Czech Republic
POSTER # 291

3:00 PM **850** *The Size and Morphological Study of Spherical Polyelectrolyte Complex Beads Using Environmental Scanning Electron Microscopy*; V Nedela, M Bucko, E Tihlarikova; Institute of Scientific Instruments of ASCR, Czech Republic; T Krajčević P Gemeiner; Slovak Academy of Sciences, Slovak Republic
POSTER # 292

3:00 PM **851** *Morphological and Chemical Analysis of Impurities in Ice Using the Environmental Scanning Electron Microscopy and Fluorescence Spectroscopy*; V Nedela, J Runstuk; Institute of Scientific Instruments of ASCR, Czech Republic; J Krausko, P Klan, D Heger; Masaryk University, Czech Republic
POSTER # 293

3:00 PM **852** *Dynamic Gas Environmental System Development for In Situ Real-time SEM Imaging under Atmospheric Pressure*; T Daio, H-W Li, T Ikuta, T Nishiyama; Kyushu University, Japan; K Takahashi; International Institute for Carbon-Neutral Energy Research, Japan; Y Takata, SM Lyth, K Sasaki; Kyushu University, Japan, et al.
POSTER # 294

3:00 PM **853** *Determining the Causes of Scanning Distortions in SEM and FIB*; M Pluska, A Czerwinski, M Wzorek, M Juchniewicz, J Kącki; Instytut Technologii Elektronowej, Poland
POSTER # 295

Scientific Program

A

ADVANCES IN INSTRUMENTATION POSTER SESSIONS— WEDNESDAY AFTERNOON *continued*

3:00 PM **854** *Secondary Electron Yield at High Voltages up to 300 keV*; JY Howe; Hitachi High-Technologies Canada, Inc.
POSTER # 296

A17.P1 Standardization and Metrology in Electron Microscopy and Microbeam Analysis

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

3:00 PM **855** (Invited) *Thin Film Porosity Determined by X-Rays at SEM*; E Ortel, R Kraehnert; BAM Federal Institute for Materials Research and Testing, Germany; F Galbert; Technical University of Berlin, Germany; V-D Hodoroaba; BAM Federal Institute for Materials Research and Testing, Germany
POSTER # 297

3:00 PM **856** *Specimen Preparation Method for Size Distribution Measurements of Nano-materials by Scanning Electron Microscopy - Fixing of Nano-particles on a Substrate with Adhesive Coating*; K Kumagai, a Kurokawa; National Institute of Advanced Industrial Science and Technology, Japan
POSTER # 298

3:00 PM **857** *Quantitative Measurement of Resolution as a Function of Defocus in Different Microscopy Modalities Using a Simplified Technique*; AW Sanders, AE Curtin; National Institute of Standards and Technology; R Skinner; University of Colorado
POSTER # 299

3:00 PM **858** *Improved Spatial Resolution of EDX/SEM for the Elemental Analysis of Nanoparticles*; J Mielke, S Rades, E Ortel; BAM Federal Institute for Materials Research and Testing, Berlin, Germany; T Salge; Core Research Laboratories, Natural History Museum; V-D Hodoroaba; BAM Federal Institute for Materials Research and Testing, Germany
POSTER # 300

3:00 PM **859** *What about Ionic Liquids as a "Hot " Certified Reference Material Candidate to Check Your EDS below 1 keV?*; M Holzweber, V-D Hodoroaba, WE Unger; BAM Federal Institute for Materials Research and Testing, Germany
POSTER # 301

B

BIOLOGICAL SCIENCES POSTER SESSIONS—WEDNESDAY AFTERNOON

B06.P1 Deep Tissue Imaging and Light Sheet Microscopy

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

3:00 PM **860** *'Rupture' Type Thrombopoiesis from Bone Megakaryocyte Is Regulated by IL-1alpha: Visualization by Two Photon Microscope and Software Analysis*; S Nishimura, A Sawaguchi; Jichi Medical University, Japan
POSTER # 302

3:00 PM **861** *In Vivo Imaging and Software Analysis Revealed the Contribution of Endothelial Damage to Thrombus Development Processes*; S Nishimura, A Sawaguchi; Jichi Medical University, Japan
POSTER # 303

3:00 PM **862** (Invited) *In Vivo Three Photon Imaging of Neuronal Activities from Hippocampus in Intact Mouse Brain*; T Wang, D Ouzounov, NG Horton, JC Cruz Hernández, D Feng, N Nishimura; C Xu; Cornell University
POSTER # 304

3:00 PM **863** *Airy Beams for Light-sheet Microscopy*; J Nytk, Z Yang, M Preciado, M Mazilu; University of St Andrews; T Vettenburg; Universidad Carlos III de Madrid, Spain; C Coll-Llado, DE Ferrier; University of St Andrews, United Kingdom, T Cizmar; University of Dundee, United Kingdom et al.
POSTER # 305

P

PHYSICAL SCIENCES POSTER SESSIONS—WEDNESDAY AFTERNOON

P02.P1 Materials Problem Solving with Aberration-Corrected EM

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

3:00 PM **864** *Effect of Interfacial Structure on Gold-Assisted Growth of Oxides*; G-Z Zhu, X Li, F Liu, W Zhou; Shanghai Jiao Tong University, China
POSTER # 306

3:00 PM **865** *Quantifying and Correlating the Composition and Conductivity of Grain Boundaries in Ca-doped CeO₂ Electrolytes, an AC-STEM EELS Study*; WJ Bowman, CA Hernandez, K McGuinness, PA Crozier; Arizona State University
POSTER # 307

Scientific Program

Wednesday, August 5

3:00 PM **866** *Aberration-Corrected STEM of Highly Loaded Pt1/NiO Single-Atom Catalysts: Structural and Catalytic Stability*; S Duan, R Wang, J Liu; Arizona State University
POSTER # 308

3:00 PM **867** *Aberration-Corrected STEM and Tomography of Pd-t Nanoparticles: Core-shell Cubic and Core-rare Concave Structures*; N Lu, J Wang; The University of Texas at Dallas; S Xie; Georgia Institute of Technology and Emory University; J Brink, K McIlwrath; JEOL USA, Inc. Y Xia; Georgia Institute of Technology; MJ Kim; The University of Texas at Dallas
POSTER # 309

3:00 PM **868** *Aberration-Corrected STEM Study of Atomically Dispersed Pt₁/FeO_x Catalyst with High Loading of Pt*; B Qiao, A Wang; Arizona State University; T Zhang; Chinese Academy of Sciences; JJ Liu; Arizona State University
POSTER # 310

3:00 PM **869** *Multislice HAADF STEM Image Simulation of Complex Oxidation Catalyst "M1"*; DA Blom; University of South Carolina
POSTER # 311

3:00 PM **870** *Structural and Optical Characterization of Biosynthesized CdS Quantum Dots*; L Lu, Z Yang, VF Berard, CJ Kiely, S McIntosh, BW Berger; Lehigh University
POSTER # 312

3:00 PM **871** *Aberration-corrected STEM of Cross-Sectional View of Core-shell Nanowires Prepared by Ultramicrotomy*; J Xu, J Liu; Arizona State University
POSTER # 313

3:00 PM **873** *Direct TEM/STEM Observation and Analysis of Bismuth Segregation to Grain Boundary Dislocation Cores in Bismuth Embrittled Copper Bicrystals*; CA Wade, M Watanabe; Lehigh University
POSTER # 315

3:00 PM **874** *Fe-25Mn-3Al-3Si TWIP-TRIP Steel Deformed at High Strain-Rates*; JT Benzing, J Wittig; Vanderbilt University; M Mills, T Smith; The Ohio State University; G Daehn; The Ohio State University; J Bentley; Microscopy and Microanalytical Sciences; D Raabe; Max-Planck-Institut für Eisenforschung, Germany, C Ophus; Lawrence Berkeley National Laboratory, et al.
POSTER # 316

3:00 PM **875** *Tracking the Evolution of In Situ Radiochemistry with Transmission Electron Microscopy*; JA Aguiar, L Wolfsberg, W Taylor, BP Uberuaga, B Scott, C Stanek; Los Alamos National Laboratory
POSTER # 317

P07.P1 Metallography and Microstructural Characterization of Metals

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

3:00 PM **876** *Nonmetallic Inclusions and Acicular Ferrite in Arc Welds of Pipeline Steels*; AA Kazakov, DA Lyubochko; St Petersburg State Polytechnical University, Russia
POSTER # 318

3:00 PM **877** *Distribution Pattern of Nonmetallic Inclusions on a Cross Section of Continuous-Cast Steel Billets For Rails*; AA Kazakov, AI Zhitenev, PV Kovalev; St Petersburg State Polytechnical University, Russia
POSTER # 319

3:00 PM **878** *As-Cast Structure and Metallurgical Inheritance of High Nitrogen Austenitic Stainless Steel*; AA Kazakov, EY Kolpishon; St Petersburg State Polytechnical University, Russia; AV Shakhmatov, RP Badrak; Weatherford International, Ireland
POSTER # 320

3:00 PM **879** *Research on the Origin of Nonmetallic Inclusions in High-Strength Low-Alloy Steel Using Automated Feature Analysis*; AA Kazakov, S Ryaboshuk, D Lyubochko, L Chigintsev; St Petersburg State Polytechnical University, Russia
POSTER # 321

3:00 PM **880** *Influence of Additional Annealing on Properties of Ni-Mn-In-Co Heusler Alloy*; A Kamantsev, E Dilmieva, A Mashirov, V Koledov, V Shavrov; Kotelnikov Institute of Radio-engineering and Electronics of RAS, Russia
POSTER # 322

3:00 PM **881** *A Microstructure Comparison of Iron Borides Formed on AISI 1040 and D2 Steels*; JL Bernal, AI Martínez, E Vera; Universidad Politécnica de Pachuca, Mexico; A García; Universidad Autónoma del Estado de Hidalgo, Mexico; A Medina, L Béjar, S Borjas; Universidad Michoacana de San Nicolás de Hidalgo, Mexico, A Juanico; Universidad Politécnica del Valle de México, M. Pérez; Universidad Autónoma del Estado de Hidalgo, México.
POSTER # 323

3:00 PM **882** *Effect of Preheating Temperature on the Microstructural Features of Welded Rail Head*; KR Prayakara, H Aglan; Tuskegee University
POSTER # 324

3:00 PM **883** *Study of Precipitation along a Concentration Gradient*; CG Garay-Reyes, I Estrada-Guel; Centro de Investigación en Materiales Avanzados, Mexico; JL Hernández-Rivera; Universidad Autónoma de San Luis Potosí, Mexico; JM Mendoza-Duarte, E Cuadros-Lugo; Centro de Investigación en Materiales Avanzados, Mexico; SE Hernandez-Martinez, JJ Cruz-Rivera; Universidad Autónoma de San Luis Potosí, Mexico, R Martínez-Sánchez; Centro de Investigación en Materiales Avanzados, Mexico
POSTER # 325

Scientific Program

P

PHYSICAL SCIENCES POSTER SESSIONS WEDNESDAY AFTERNOON *continued*

- 3:00 PM **884** *Evolution of Microstructure in an Al-si System Modified with the Transition Element Addition and its Effect on Mechanicals Properties*; HM Medrano-Prieto, CG Garay-Reyes, CD Gómez-Esparza, R Martínez-Sánchez; Centro de Investigación en Materiales Avanzados, Mexico
POSTER # 326
- 3:00 PM **885** *Characterization of Microstructural Inhomogeneities in Rolled Microalloyed Steels Based on EBSD Data*; NY Zolotarevsky, SN Petrov, SN Panpurin, AA Kazakov, O Pakhomova; St Petersburg State Polytechnical University, Ruissia
POSTER # 327
- 3:00 PM **886** *Effect of Cu on Hydrogen Permeation for the Low Carbon Steel under Mildly Sour Environments*; H Nakamichi, K Baba, D Mizuno, K Yasuda, N Ishikawa; JFE Steel Corporation, Japan
POSTER # 328

P10.P1 Microscopy and Microanalysis for Real-World Problem Solving

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

- 3:00 PM **887** *Optical and Structural Properties of Rare Earths-doped ZnO Nanorods Synthesized by Sonochemical Method*; G Moreno, R Sanchez, ME Alvarez, EU Leon; Universidad de Sonora, Mexico
POSTER # 329
- 3:00 PM **888** *Light Microscopic Analysis for Bone Responses to Implant Surfaces*; I-S Yeo, J-H Sim; Seoul National University, South Korea; T-K Kwon; Catholic University of Korea, South Korea
POSTER # 330
- 3:00 PM **889** *SEM and Raman Spectroscopy Applied to Biomass Analysis for Application in the Field of Biofuels and Food Industry*; O Samek, A Haronikova, N Vaskovicova, K Hrubanova, J Jezek; Institute of Scientific Instruments ASCR, Czech Republic I Marova; Brno University of Technology, Czech Republic; V Krzyzanek, P Zemanek; Institute of Scientific Instruments of the ASCR, Czech Republic
POSTER # 331
- 3:00 PM **890** (Invited) *Addressing Catalytic Material Problems Using Automated Feature Analysis*; D Pollick, P Nelson; BASF Corporation
POSTER # 332
- 3:00 PM **891** *Coloration Defects in Industrial-Grade Zirconium Sponge*; M Eastman, J Jiao; Portland State University
POSTER # 333

- 3:00 PM **892** *Synthesis of Mesoporous Zirconia by Using CTAB as Template*; SE Borjas García, A Medina Flores, L Béjar Gómez; Universidad Michoacana de San Nicolás de Hidalgo, Mexico; C Aguilar; Universidad técnica Federico Santa María, Chile; JL Bernal Ponce; Universidad Politécnica de Pachuca, Mexico
POSTER # 334
- 3:00 PM **893** *High Resolution TEM Observation of Nanocrystalline Silicon Fabricated by High Pressure Torsion (HPT)*; Y Fukushima, K Edalati, Y Ikoma, Z Horita; Kyushu University, Japan; DJ Smith; Arizona State University
POSTER # 335
- 3:00 PM **894** *Energy-dispersive X-ray Spectrum Simulation and Emprical Observation of 22nm Node High-k Metal Gate Structure*; I Rezadad, B Prenitzer; University of Central Florida; S Schwarz, B Kempshall; NanoSpective, Inc.; R Peale; University of Central Florida
POSTER # 336
- 3:00 PM **895** *Na-induced Structural Unit in $\Sigma 3$ [-110]/(-1-11) Grain Boundaries of Si*; M Shamsuzzoha; The University of Alabama
POSTER # 337
- 3:00 PM **896** *Towards a Comprehensive TEM Toolbox for Complex Molecular Fluids*; M Gao; Kent State University
POSTER # 338
- 3:00 PM **897** *In Situ LC-TEM Studies of Corrosion of Metal Thin Films in Aqueous Solutions*; JH Park, SW Chee, S Kodambaka; Department of Materials Science and Engineering, University of California Los Angeles; FM Ross; IBM T J Watson Research Center
POSTER # 339
- 3:00 PM **898** *Multi-modal Microscopy of Almost Nothing – Aerogels*; EC Humphrey, GA Beer, A Olin; University of Victoria, Canada
POSTER # 340
- 3:00 PM **899** *Studying Mass Transfer in Glasses Using Cathodoluminescence*; PL McSwiggen, CM MacRae; CSIRO Minerals, Australia
POSTER # 341
- 3:00 PM **900** *Structure and Electrical Property Changes of ZnO:Al Films, Prepared by Radio Frequency Magnetron Sputtering, by Thermal Annealing*; Y-Y Chen, P-Y Chen; National Taiwan University; S-L Cheng; National Central University, Taiwan; B-M Huang, J-R Yang; National Taiwan University; M Kawasaki; JEOL USA Inc. M Shiojiri; Kyoto Institute of Technology, Japan
POSTER # 342
- 3:00 PM **901** *Aluminum and Tantalum Doping of Sputtered TiO_2 Thin Films*; I Goetz, R Liu; Flensburg University of Applied Sciences, Germany; R Wuhler, L Sheppard; University of Western Sydney, Australia
POSTER # 343

3:00 PM **903** *TEM Analysis of Defects in AlGa_N Heterostructures Grown on c-Al₂O₃ by Plasma Assisted Molecular Beam Epitaxy*; S Rouvimov, VN Jmerik; University of Notre Dame; DV Nechaev, SV Ivanov; A F Ioffe Physical-Technical Institute, Russia

POSTER # 345

3:00 PM **904** *Study of the Phase Equilibria in the L-alanine – Sodium Nitrate System by Optical Microscopy and X-ray Powder Diffraction*; D Márquez-Ruiz, J Hernández-Paredes, G Moreno-Corella; Universidad de Sonora, Mexico; HE Esparza-Ponce; Centro de Investigación en Materiales Avanzados, Mexico; O Hernández-Negrete, ME Álvarez-Ramos; Universidad de Sonora, Mexico

POSTER # 346

3:00 PM **905** *Microscopy Study of Morphological and Optical Changes in ZnO Nanostructures Induced by Pulsed Optical Excitation*; ZM Peterson, RC Word, R Könenkamp; Portland State University

POSTER # 347

P11.P3 Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

3:00 PM **906** *TEM Characterization of a Mg₂Si_{0.5}Sn_{0.5} Solid Solution for High-Performance Thermoelectrics*; M Song, J- W Liu, M Takeguchi, N Tsujii, Y Isoda; National Institute for Materials Science, Japan

POSTER # 348

3:00 PM **907** *Real-time Observation of Electrochemical Sodiation of Co₃O₄/CNTs by In Situ Transmission Electron Microscopy*; Q Li, J Wu, VP Dravid; Northwestern University

POSTER # 349

3:00 PM **908** *In Situ TEM Characterization of Nanostructured Dielectrics*; M-S Hsiao, Y Yuan, Wright-Patterson Air Force Base; A Nie, R Shahbazian-Yassar; Michigan Technological University; LF Drummy; Wright-Patterson Air Force Base

POSTER # 350

3:00 PM **909** *Preparation of Electron and X-Ray Transparent Inorganic Particles for Analytical Microscopy Using the Ultramicrotome*; M Homer, F El Gabaly; Sandia National Laboratories; H Gnaegi; Diatome Ltd, Switzerland; DB Robinson, JD Sugar; Sandia National Laboratories

POSTER # 351

3:00 PM **910** *Development of TEM Techniques Dedicated for Characterization of Energy-Related Composites and its Application*; T Yaguchi, K Tamura, T Kubo, M Kondo; Hitachi High-Technologies Corp., Japan; T Shimizu, T Kamino; Japan Automobile Research Institute

POSTER # 352

3:00 PM **911** *Investigation of Li ion and Multivalent Battery Systems Using In Situ TEM and High Resolution EELS*; A Mukherjee, H Asayesh Ardakani, PJ Phillips; University Of Illinois, Chicago; RS Yassar; Michigan Technological University; RF Klie; University Of Illinois, Chicago

POSTER # 353

3:00 PM **912** *Phase Transformation of Molybdenum Carbide in Carburization of MoS₂ Studied by In Situ Environmental TEM*; J Chen, Q Wei, J Chen, Natural Resources Canada

POSTER # 354

P12.P1 Advanced Microanalysis and Microscopy of Soft and Hybrid Nanomaterials

POSTER SESSION

Wednesday 3:00 PM • Exhibit Hall

3:00 PM **914 M&M 2015 STUDENT AWARDEE**

In Situ Electrochemical Deposition of Poly (3,4-ethylenedioxythiophene) (PEDOT); J Liu, B Wei, J Sloppy, L Ouyang, C Ni, D Martin; University of Delaware

POSTER # 356

3:00 PM **915** *Cryo-STEM Reveals Humidity-Controlled Shape Change in Silica Nanoparticles*; KA Spoth, Y Sun, U Wiesner, LF Kourkoutis; Cornell University

POSTER # 357

3:00 PM **916** *Direct Conversion Biogas to Multiwall Carbon Nanotubes and Syngas over Starch Derived Ni@C Nanoparticles*; Q Yan, I-W Chu, A Lawrence; Mississippi State University

POSTER # 358

3:00 PM **917** *The Biomineral-Cell Interface in the Sea Urchin Embryo*; IY Chang, D Joester; Northwestern University

POSTER # 359

Scientific Program

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—THURSDAY MORNING

A02.2 TEM Phase Contrast Imaging

SESSION CHAIRS:

Mike Marko, Wadsworth Center

Radostin Danev, Max Planck Institute of Biochemistry, Germany

PLATFORM SESSION

Thursday 8:30 AM • Room: D135

8:30 AM **918** (Invited) *Automated Cryo-Electron Tomography and Sub-tomogram Averaging with the FEI Volta Phase Plate*; WJ Hagen; European Molecular Biology Laboratory, Germany

9:00 AM **919** (Invited) *In Situ Studies of Cellular Architecture by Electron Cryo-Tomography with Volta Phase Plate*; Y Fukuda, S Asano, U Laugks, F Beck, A Aufderheide, F Förster, V Lučić W Baumeister; Max Planck Institute of Biochemistry, Germany; et al.

9:30 AM **920** (Invited) *Applications and New Investigations of the Volta Phase Plate*; K Sader, B Buijsse; FEI Company; I Peschiera; Novartis Vaccines

A04.2 Advances in FIB: New Instrumentation and Applications in Materials and Biological Sciences

SESSION CHAIRS:

Keana Scott, National Institute of Standards and Technology

Lucille A. Giannuzzi, EXpressLO LLC

Srinivas Subramaniam, Intel Corporation

PLATFORM SESSION

Thursday 8:30 AM • Room: B117

8:30 AM **921** *A Study of Gallium FIB Induced Silicon Amorphization Using TEM, APT and BCA Simulation*; J Huang, M Loeffler; Technische Universitaet Dresden, Germany; U Muehle; Fraunhofer Institute for Ceramic Technologies and Systems, Germany; W Moeller; Helmholtz-Zentrum Dresden-Rossendorf, Germany; H Mulders, L Kwakman; FEI Company, Netherlands; E Zschech, Technische Universitaet Dresden, Germany

8:45 AM **922** *Probe Optimization Studies For High current Focused Ion Beam Instruments*; S Subramaniam, J Richards, K Johnson; Intel Corporation

9:00 AM **923** *Methodology for Studying Nanoscale Details of Focused Ion Beam Gas-Assisted Etching and Deposition by TEM and Numerical Modeling*; V Ray, E Chang, K Toula, S-C Liou, W-A Chiou; University of Maryland

9:15 AM **924** *Using 3D Nanotomography to Visualize Defects in the Fabrication of Superconducting Electronics*; AW Sanders, AE Fox, PD Dresselhaus; National Institute of Standards and Technology

9:30 AM **925** *In Situ Femtosecond Laser and Argon Ion Beams for 3D Microanalysis Using the TriBeam*; MP Echlin, WC Lenthe; University of California, Santa Barbara; J Douglas, M Titus; University of California, Santa Barbara; R Geurts, M Straw; FEI Company; TM Pollock; University of California, Santa Barbara

A05.5 Fast and Ultrafast Imaging with Electrons and Photons

SESSION CHAIRS:

David Flannigan, University of Minnesota

Hermann Durr, Stanford University

Joanna Atkin, University of Colorado

PLATFORM SESSION

Thursday 8:30 AM • Room: A105

8:30 AM **926** (Invited) *Using Ultrafast X-ray Lasers to Image Structure & Dynamics*; S Boutet; SLAC National Accelerator Laboratory

9:00 AM **927** (Invited) *Studying Shocked Material Dynamics with Ultrafast X-ray Sources*; RL Sandberg; Los Alamos National Laboratory

9:30 AM **928** *Imaging Irreversible Transformations with Movie-Mode Dynamic Transmission Electron Microscopy*; JT McKeown, MK Santala, T Li, JD Roehling, GH Campbell; Lawrence Livermore National Laboratory

9:45 AM **929** *Dynamic Transmission Electron Microscope Study on the Crystallization of Ion-Bombarded Amorphous Germanium Thin Films*; TT Li, MK Santala, LB Bayu Aji; Lawrence Livermore National Laboratory; H-YM Cheng; IBM/Macronix PCRAM Joint Project, IBM T J Watson Research Center; SO Kucheyev, GH Campbell; Lawrence Livermore National Laboratory

A06.6 Advanced Analytical TEM/STEM

SESSION CHAIRS:

Paul Kotula, Sandia National Laboratories

Masashi Watanabe, Lehigh University

Gerald Kothlietner, Graz University of Technology, Germany

PLATFORM SESSION

Thursday 8:30 AM • Room: A106

8:30 AM **930** *Simultaneous High-Speed Dual EELS and EDS Acquisition at Atomic Level Across the LaFeO₃ / SrTiO₃ Interface*; P Longo, T Topuria; Gatan, Inc. PM Rice; IBM Research Division; A Aitouchen, PJ Thomas, RD Twisten; Gatan, Inc.

8:45 AM **931** *Parallel Ion Electron Spectrometry (PIES): A New Paradigm for High-Resolution High-Sensitivity Characterization Based On Integrated TEM-SIMS*; S Eswara-Moorthy, D Dowsett, L Yedra, T Wirtz; Luxembourg Institute of Science and Technology

Scientific Program

Thursday, August 6

- 9:00 AM **932** *Improving Analytical Efficiency of EDS Using a Newly-designed X-ray Detecting System for Aberration Corrected 300 kV Microscope*; T Sasaki, H Sawada, E Okunishi, Y Jimbo, Y Iwasawa, K Miyatake, S Yuasa, T Kaneyama; JEOL, Ltd., Japan
- 9:15 AM **933** *STEM in 4 Dimensions: Using Multivariate Analysis of Ptychographic Data to Reveal Material Functionality*; S Jesse, M Chi, AY Borisevich, A Belianinov, RR Unocic, RK Archibald, SV Kalinin, AR Lupini; Oak Ridge National Laboratory, et al.
- 9:30 AM **934** *Resolution Assessment of an Aberration Corrected 1.2-MV Field Emission Transmission Electron Microscope*; Y Takahashi, T Akashi, T Shimakura, T Tanigaki, T Kawasaki, H Shinada, N Osakabe; Hitachi, Ltd., Japan
- 9:45 AM **935** *Analytical Transmission Scanning Electron Microscopy: Extending the Capabilities of a Conventional SEM Using an Off-the-Shelf Transmission Detector*; J Holm, R Keller; National Institute of Standards and Technology

A07.2 Scanning Probe Microscopy: New Methods and Applications

SESSION CHAIR:

Raphaëlle Dianoux, NanoScan AG, Germany

PLATFORM SESSION

Thursday 8:30 AM • Room: B118

- 8:30 AM **936** (Invited) *Nanoscale Chemical Imaging via AFM Coupled IR Spectroscopy*; K Kjoller, C Prater, M Lo, Q Hu, H Yang; Anasys Instruments; C Marcott; Light Solutions
- 9:00 AM **937** (Invited) *Introducing Nano-FTIR - Imaging and Spectroscopy at 10nm Spatial Resolution*; T Gokus, A Huber; Neaspec GmbH, Germany
- 9:30 AM **938** (Invited) *New Hybrid Peak-Force Tapping/Near-Field Microscope for Nano-Chemical and Nano-Mechanical Imaging of Graphene Plasmons, Polymers and Proteins*; M Wagner, G Andreev; Bruker Nano Surfaces; K Carneiro, S Habelitz; University of California; T Mueller; Bruker Nano Surfaces

A08.4 Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques

SESSIONS CHAIRS:

Nicholas Ritchie, National Institute of Standards and Technology
Paul Carpenter, Washington University

Phillipe Pinard, RWTH Aachen University, Germany

PLATFORM SESSION

Thursday 8:30 AM • Room: B115

- 8:30 AM **939** (Invited) *Quantitative Electron-Excited X-ray Microanalysis at Low Beam Energy*; DE Newbury, NW Ritchie; National Institute of Standards and Technology
- 9:00 AM **940** *Comparing the Intensities and Spectral Resolution Achieved by Wavelength-Dispersive Spectrometers on Electron Microprobes and SEMs*; SM Seddio, JH Fournelle; Thermo Fisher Scientific
- 9:15 AM **941** *Evaluation of Combined Quantification of Cr-Ni Steel Using EDS and WDS*; PT Pinard, R Terborg; RWTH Aachen University, Germany; T Salge; Natural History Museum, Germany; S Richter; RWTH Aachen University, Germany
- 9:30 AM **942** (Invited) *Comparison of WDS and EDS Rare Earth Element Analysis*; HA Lowers, PK Carpenter; U S Geological Survey

A09.3 Advances in Combining Simulation and Experiment for Materials Design

SESSION CHAIRS:

Paul Voyles, University of Wisconsin, Madison
Gianluigi Botton, McMaster University, Canada

PLATFORM SESSION

Thursday 8:30 AM • Room: B119

- 8:30 AM **943** (Invited) *Real-Space Simulation of Electron Scattering in Imperfect Crystals and Reconstruction of the Electrostatic Potential*; W Van den Broek, CT Koch; Institute for Experimental Physics, Ulm University, Germany
- 9:00 AM **944** (Invited) *Simulating Inelastic Scattering in Scanning Transmission Electron Microscopy Using μ STEM*; AJ D'Alfonso, SD Findlay, LJ Allen; The University of Melbourne, Australia
- 9:30 AM **945** **M&M 2015 STUDENT AWARDEE** *Prospects for Detecting Single Vacancies by Quantitative Scanning Transmission Electron Microscopy*; J Feng, AV Kvit, AB Yankovich, C Zhang, D Morgan, PM Voyles; University of Wisconsin-Madison
- 9:45 AM **946** *Propagation of Bessel Beams Along Atomic Columns in Crystal: a Bloch Wave and Multislice Analysis*; V Grillo, E Rotunno; CNR-Istituto Nanoscienze, Italy; BJ McMorran; University of Oregon; S Frabboni; Università di Modena e Reggio Emilia, Italy

Scientific Program

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—THURSDAY MORNING *continued*

A10.4 Advances in Electron Diffraction and Automated Mapping Techniques

SESSION CHAIR:

Ben Britton, Imperial College London

PLATFORM SESSION

Thursday 8:30 AM • Room: B112

8:30 AM **947** (Invited) *Analysis of Dislocation Densities using High Resolution Electron Backscatter Diffraction*; A Vilalta-Clemente, J Jiang; University of Oxford; TB Britton; Imperial College London; DM Collins, AJ Wilkinson; University of Oxford

9:00 AM **948** *Nye Tensor Dislocation Density Mapping From Precession Electron Diffraction: Effects of Filtering and Angular Resolution*; AC Leff, CR Weinberger, ML Taheri; Drexel University

9:15 AM **949** *Certified Reference Material for Strain Measurement Using EBSD*; MD Vaudin, WA Osborn, LH Friedman, K Siebein; National Institute of Standards and Technology

9:30 AM **950 M&M 2015 STUDENT AWARDEE** *Novel Applications of Electron Channeling Contrast Imaging*; J Deitz, S Carnevale, D McComb, S Ringel, T Grassman; The Ohio State University

9:45 A **951** *Advances in HREBSD for Elastic Strain Measurement and its Application to Mechanical Testing*; DJ Dingley; University of Bristol, United Kingdom

A14.3 Surface Plasmons, Cathodoluminescence, and Low-Loss EELS

SESSION CHAIRS:

David McComb, Ohio State University
Ritesh Sachan, Oak Ridge National Laboratory
Robert Williams, Ohio State University
Gerd Duscher, University of Tennessee

PLATFORM SESSION

Thursday 8:30 AM • Room: D137

8:30 AM **952** *Valence-loss EELS Spectroscopy of Refractory Plasmonic Nanomaterials*; AA Herzing, U Guler; National Institute of Standards and Technology; X Zhou, TB Norris; University of Michigan

8:45 AM **953** *Bandgaps and Surface Inter-Band States in Photocatalysts with High Energy Resolution EELS*; Q Liu, L Zhang; Arizona State University; K March, Université Paris-Sud, France; T Aoki, PA Crozier; Arizona State University

9:00 AM **954** *Observation of Inter-Bandgap States in Doped Ceria via Monochromated EELS*; WJ Bowman, K March; T Aoki; LeRoy Eyring; CA Hernandez, PA Crozier; Arizona State University

9:15 AM **955** *Introduction to Plasmon Energy Expansion Thermometry*; BC Regan, WA Hubbard, ER White; University of California, Los Angeles; R Dhall, SB Cronin; University of Southern California; S Aloni; Molecular Foundry; M Mecklenburg; University of Southern California

9:30 AM **956** (Invited) *Nanoscale Imaging of Energy Transfer from Single Plasmonic Particles to Semiconductor Substrates via STEM/EELS*; G Li, C Cherqui; University of Notre Dame; N Bigelow; University of Washington; G Duscher; University of Tennessee; P Straney, J Millstone; University of Pittsburgh; D Masiello; University of Washington, JP Camden; University of Notre Dame

A15.1 Imaging Mass Spectrometry

SESSION CHAIRS:

Joseph Dalluge, University of Minnesota
Christopher Anderton, Pacific Northwest National Laboratory

PLATFORM SESSION

Thursday 8:30 AM • Room: B111

8:30 AM **1116** (Invited) *MALDI Imaging MS: Molecular Visualization of Tissues in Drug Discovery and Development*; S Castellino, MR Groseclose; GlaxoSmithKline

9:00 AM **1117** *Development of Laser Ionization Imaging Mass Spectrometry for Multiple Drugs Administered to Cancer Cells*. H Hazama, H Kannen, J Aoki, M Toyoda; Osaka University, Japan; T Fujino; Tokyo Metropolitan University, Japan; Y Kaneda, K Awazu; Osaka University, Japan

9:15 AM **1118** *Mass Spectrometry Imaging of Microbial Interactions Using Matrix-Enhanced Laser Desorption/Ionization Fourier-Transform Ion Cyclotron Resonance Mass Spectrometry*; CR Anderton, RK Chu, JB Shaw, EM Zink; Pacific Northwest National Laboratory; CA Zeiner; Harvard University; D Trede; SCiLS GmbH, Germany; CM Hansel; Woods Hole Oceanographic Institution, L Paša-Tolić; Pacific Northwest National Laboratory

9:30 AM **1119** (Invited) *Multimodal Molecular Imaging: Insight Into the Complexity of Biological Surfaces Through Speed, Resolution and Identification*; RM Heeren, A Bruinen; The Maastricht Multimodal Molecular Imaging Institute, Netherlands; N Mascini; FOM Institute AMOLF, Netherlands; G Fisher; Physical Electronics, Inc.; T Porta, S Ellis; The Maastricht Multimodal Molecular Imaging Institute, Netherlands

P

PHYSICAL SCIENCES SYMPOSIA THURSDAY MORNING

P01.8 Bringing the Real-World into the Electron Microscope: Peter R. Swann Memorial Symposium on *In Situ* TEM and STEM

SESSION CHAIRS:

M. Grace Burke, University of Manchester, United Kingdom
Ondrej Krivanek, Nion Inc.
Peter Crozier, Arizona State University

PLATFORM SESSION

Thursday 8:30 AM • Room: B116

8:30 AM **957** *Time-Resolved Imaging of Electrochemical Switching in Nanoscale Resistive Memory Elements*; WA Hubbard, ER White, A Kerelsky, G Jasmin, J Lodico; University of California, Los Angeles; MH Mecklenburg; University of Southern California; BC Regan; University of California, Los Angeles

8:45 AM **958** *Dynamic Rate Mechanism of V_2O_5 Coated SnO_2 Nanowires for Lithium Ion Batteries Studied by In Situ TEM*; L Wang, Z Xu; Argonne National Laboratory; X Bai; Chinese Academy of Sciences; J Wen, D Miller; Argonne National Laboratory

9:00 AM **959** *Elastic Properties of GaN Nanowires: Revealing the Influence of Planar Defects on Young's Modulus at Nanoscale*; S Dai, J Zhao; University of Michigan; X Wang, Z Shan; Center for Advancing Materials Performance from the Nanoscale; J Zhu; Tsinghua University, China

9:15 AM **960 M&M POST-DOCTORAL RESEARCHER AWARD** *Quantification of Electrochemical Nanoscale Processes in Lithium Batteries by Operando ec-(S)TEM*; BL Mehdi, J Qian, E Nasybulin; Pacific Northwest National Laboratory; C Park; Florida State University; DA Welch; University of California, Davis; H Mehta, ND Browning; Pacific Northwest National Laboratory

P02.4 Materials Problem Solving with Aberration-Corrected EM

SESSION CHAIRS:

Lena Kourkoutis, Cornell University
Randi Holmestad, Norwegian University of Science and Technology

PLATFORM SESSION

Thursday 8:30 AM • Room: C124

8:30 AM **961** *Resolving the Atomic Structure of Materials Containing Light Elements by Annular-Bright-Field Electron Microscopy*; L Gu, D Xiao; Chinese Academy of Sciences; Y Ikuhara; The University of Tokyo, Japan

8:45 AM **962** *Large-Collection-Angle BF STEM Imaging of Compound Semiconductors*; T Aoki, MR McCartney, DJ Smith; Arizona State University

9:00 AM **963 M&M 2015 STUDENT AWARDEE** *Atomic Scale Structure and Bonding Configurations in Monocrystalline $Al_{1-x}B_xPSi_3$ Alloys Grown Lattice Matched on Si(001) Platforms*; P Sims, T Aoki, J Menéndez, J Kouvetakis; Arizona State University

9:15 AM **964** *Local Chemical and Deformation Profiles in InAs/AlSb Multilayer Structures for Quantum Cascade Lasers*; B Warot-Fonrose, J Nicolai, M Vallet, C Gatel; Centre d'Elaboration de Matériaux et d'Etudes Structurales, CNRS, France; R Teissier, A Baranov; Université de Montpellier, France; C Magen; Universidad de Zaragoza, Spain, A Ponchet; Centre d'Elaboration de Matériaux et d'Etudes Structurales, CNRS, France

9:30 AM **965 M&M POST-DOCTORAL RESEARCHER AWARDEE** *STEM Optical Sectioning for Imaging Screw Displacements in Dislocation Core Structures*; H Yang, JG Lozano; University of Oxford, United Kingdom; TJ Pennycook; University of Vienna, Austria; L Jones, PB Hirsch, P Nellist; University of Oxford, United Kingdom

P11.8 Advances in Transmission Electron Microscopy and Spectroscopy of Energy Related Materials

SESSION CHAIRS:

Chongmin Wang, Pacific Northwest National Laboratory
Raymond Unocic, Oak Ridge National Laboratory
Arda Genc, FEI Company

PLATFORM SESSION

Thursday 8:30 AM • Room: B113

8:30 AM **966** (Invited) *A Multiple-Technique Approach for Resolving the Surface Structure of Lithium and Manganese Rich Transition Metal Oxides*; AK Shukla, Q Ramasse; C Ophus; Lawrence Berkeley National Laboratory; H Duncan; Kinestral Technologies; G Chen; Lawrence Berkeley National Laboratory

9:00 AM **967** *Structure of Ru/Pt Nanocomposite Films Fabricated by Plasma-Enhanced Atomic Layer Depositions*; M Kawasaki, C-N Hsiao; JEOL USA Inc.; J-R Yang; National Taiwan University; M Shiojiri; Kyoto Institute of Technology, Japan

9:15 AM **968** *Microstructural and Chemical Analysis of $HgCdTe/CdTe/ZnTe/Si$ (211) for Infrared Detectors*; M Vaghayenagar, BL VanMil; Arizona State University; S Simingalam, Y Chen; Army Research Laboratory; DJ Smith; Arizona State University

9:30 AM **969** *Beam Effects During In Situ Potential Cycling and Imaging of Sulfuric Acid and Platinum Electrodes*; TH Brintlinger, C Love, O Baturina; US Naval Research Laboratory

Scientific Program

P

PHYSICAL SCIENCES SYMPOSIA THURSDAY MORNING *continued*

- 9:45 AM **970** *A Study in the Formation of $\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$ as a Garnet-Type Ionic Conductor Synthesized by Flame Combustion*; JM Roller, Y Wang; FEI Company; R Maric; University of Connecticut

T

PHYSICAL SCIENCES TUTORIAL THURSDAY MORNING

X40.1 ABF STEM – Direct and Robust Atomic-resolution Imaging of Light Elements in Crystalline Materials Tutorial

SESSION CHAIR:
Patrick Phillips, University of Illinois, Chicago

TUTORIAL SESSION
Thursday 8:30 AM • Room: C125

- 8:30 AM **971** (Invited) *Annular Bright Field Scanning Transmission Electron Microscopy – Direct and Robust Atomic-Resolution Imaging of Light Elements in Crystalline Materials*; SD Findlay; Monash University, Australia

A

ADVANCES IN INSTRUMENTATION POSTER SESSIONS—THURSDAY MORNING

A02.P2 TEM Phase Contrast Imaging

POSTER SESSION
Thursday 10:00 AM • Exhibit Hall

- 10:00 AM **972** **M&M POST-DOCTORAL RESEARCHER AWARDEE** *Another Phase Plate in the Zoo: Reducing Charging and Optimizing the Design of Electrostatic Phase Plates*; A Walter, S Steltenkamp; Lawrence Berkeley National Laboratory; D Rhinow, W Kühlbrandt; Max Planck Institute of Biophysics, Germany
POSTER # 360
- 10:00 AM **973** *Development of Phase Contrast Scanning Transmission Electron Microscopy*; H Iijima, H Minoda; JEOL Ltd, Japan; T Tamai; Tokyo University of Agriculture and Technology, Japan; F Hosokawa, T Fukuda, Y Kondo; JEOL Ltd, Japan
POSTER # 361
- 10:00 AM **974** *Electron Differential Phase Microscopy with an A-B Effect Phase Plate*; H Niimi, J Usukura, Y Yamamoto; Nagoya University, Japan; S Ohta; JEOL Ltd., Japan
POSTER # 362

- 10:00 AM **975** *Lorentz Transmission Electron Microscopy for Imaging Magnetic Fields from a Perpendicular Ferromagnetic Stripe Domain Thin Film*; TR Kim, O Hellwig, R Sinclair; Stanford University
POSTER # 363

- 10:00 AM **976** *Fabrication of Self-Supporting Annular Apertures for Use in the Transmission Electron Microscope*; L YU, A Johnston-Peck, A Herzing, V Luciani; National Institute of Standards and Technology
POSTER # 364

A03.P1 Electron Holography for Nanofields in Solids

POSTER SESSION
Thursday 10:00 AM • Exhibit Hall

- 10:00 AM **977** *Low Dose Electron Holography: First Steps*; E Voelkl, R Herring; Hitachi High Technologies America, Inc., B Bammes; Direct Electron, LP; D Hoyle; Hitachi High-Technologies Canada Inc.
POSTER # 365
- 10:00 AM **978** *A Practically Simple and Easy Approach for Minimizing the Influence of Fresnel Fringes on Phase Sensitivity Measured from Electron Holography*; Z Wang; Micron Technology, Inc.
POSTER # 366
- 10:00 AM **979** *Optimising Electron Holography in the Presence of Partial Coherence and Instrument Instabilities with Conventional and Direct Detection Cameras*; SL Chang, C Dwyer, J Barthel, CB Boothroyd, RE Dunin-Borkowski; Forschungszentrum Jülich, Germany
POSTER # 367
- 10:00 AM **980** *Coherent Electron Interference of Diffracted Beams from Amorphous Materials*; RA Herring; University of Victoria, Australia
POSTER # 368
- 10:00 AM **981** *Three Dimensional Magnetic Field Reconstruction of Artificial Skyrmion Heterostructures*; S Zhang, A Petford-Long, C Phatak; Argonne National Laboratory
POSTER # 369
- 10:00 AM **982** *Spin-Multislice Applied to the Electron Spin Interaction with Materials*; V Grillo, S Alexander; CNR-Istituto Nanoscienze, Italy; J Rusz, A Edström; Uppsala University, Sweden; A Lubk; University of Technology Dresden, Germany; BJ McMorran; University of Oregon; E Karimi; University of Ottawa, Canada
POSTER # 370

Scientific Program

Thursday, August 6

10:00 AM **983** *Nanoscale Strain Distributions in Embedded SiGe Semiconductor Devices by Precession Electron Diffraction and Dual Lens Dark Field Electron Holography*; D Cooper, J Rouviere; Commissariat à l'énergie atomique, France; C Murray; IBM Watson Research Center; J Bruley; IBM; N Bernier; Commissariat à l'énergie atomique, France
POSTER # 371

10:00 AM **984** *Strain Measurement through the Thickness of Crystal using DBI*; M Norouzpour, RA Herring; University of Victoria, Australia
POSTER # 372

10:00 AM **985** *Elastic Relaxation of Strained Silicon on Insulator (sSOI) Fins: Nanobeam Diffraction (NBD) and Simulations*; J Li, P Morin; IBM; Q Liu; STMicroelectronics; K Cheng; IBM; N Loubet; STMicroelectronics; B Doris, J Gaudiello; IBM
POSTER # 373

10:00 AM **986** *Electrostatic-Potential Analysis of Charged Particles by Split-Illumination Electron Holography*; T Tanigaki, Z Akase; Hitachi, Ltd; S Aizawa; RIKEN, Japan; HS Park; Dong-A University, South Korea; Y Murakami, D Shindo; Tohoku University, Japan; H Kawase; Ricoh Institute of Technology, RICOH Co, Ltd.
POSTER # 374

10:00 AM **987** *Crystalline Phase Mapping Associated to the Magnetic Flux in Cobalt Nanowires*; A Ponce, BJ Stadler, F Ruiz Zepeda, F Mendoza Santoyo; University of Texas, San Antonio; MM Maqableh; University of Minnesota; I Betancourt, J Cantu Valle, JE Sanchez; University of Texas, San Antonio
POSTER # 375

10:00 AM **988** *New Quantitative Phase Reconstruction Technique using Hollow-cone Probe and Annularly Arrayed Detectors in STEM*; T Ishida, T Kawasaki, T Tanji; Nagoya University, Japan; T Ikuta; Osaka Electro-Communication University, Japan
POSTER # 376

10:00 AM **989** *Analysis of GaAs Compound Semiconductors and the Semiconductor Laser Diode Using Off-axis Electron Holography, Lorentz Microscopy, Electron Diffraction Microscopy and Differential Phase Contrast STEM*; H Sasaki, S Otomo, R Minato; Furukawa Electric Ltd., Japan; K Yamamoto, K Yamamoto; Japan Fine Ceramics Center; J Yamasaki; Osaka University, Japan; N Shibata; The University of Tokyo, Japan
POSTER # 377

10:00 AM **990** *Three Dimensional Visualization of Electromagnetic Fields from One Dimensional Nanostructures*; C Phatak, A Masseboeuf; Argonne National Laboratory; L de Knoop, C Gatel, M Hytch; Centre d'Elaboration de Matériaux et d'Etudes Structurales, CNRS, France
POSTER # 378

A04.P1 Advances in FIB: New Instrumentation and Applications in Materials and Biological Sciences

POSTER SESSION

Thursday 10:00 AM • Exhibit Hall

10:00 AM **991** *Progression of Focused Helium Ion Beam Milling in Gold Substrates*; EM Mutunga, S Tan; University of Tennessee, Knoxville; A Vadar; National Institute of Standards and Technology; K Klein; University of the District of Columbia
POSTER# 379

10:00 AM **992** *Investigation of Ar ion-milling Rates for Transmission Electron Microscopy Specimens*; MH Lee, K-H Kim; Korea Institute of Industrial Technology
POSTER # 380

10:00 AM **993** *Focused Ion Beam Micromachining Enables Novel Optics for X-ray Microscopy*; K Keskinbora, UT Sanli, C Grévent, M Hirscher, G Schütz; Max Planck Institute for Intelligent Systems
POSTER # 381

10:00 AM **994** *In Situ Probing Biological Structures by Combining Focused Ion Beam and Atomic Force Microscopy*; B Liu, V Adineh, J Fu; Monash University, Australia
POSTER # 382

10:00 AM **995** *Multilayer Fresnel Zone Plates for X-ray Microscopy*; UT Sanli, K Keskinbora, C Grévent; Max Planck Institute for Intelligent Systems; A Szeghalmi; Friedrich-Schiller-Universität Jena, Germany; M Knez; Ikerbasque Basque Foundation For Science, Spain; G Schütz; Max Planck Institute for Intelligent Systems
POSTER # 383

10:00 AM **996** *FIB-assisted TEM Sample Preparation Refinement Using TRIM Simulations*; BD Gauntt, AL Sutor; Intel Corporation
POSTER # 384

10:00 AM **997** *Utilization of FIB Technique in TEM Specimen Preparation of GaN-based Devices for Dislocation Investigation*; J-G Zheng, Z Shao; University of California, Irvine; D Chen; Nanjing University, China
POSTER # 385

10:00 AM **998** *Nano and Microscale Patterning on Soft Matters with Ion Beam Irradiation*; Y Kim, J Huang, AY Abuelfilat, J Fu; Monash University, Australia
POSTER # 386

10:00 AM **999** *Xe Plasma FIB-SEM with Improved Resolution of Both Ion and Electron Columns*; J Jiruše, M Havelka, J Polster, T Hrnčř Tescan Brno s r o , Česká republika
POSTER # 387

Scientific Program

A

ADVANCES IN INSTRUMENTATION POSTER SESSIONS— THURSDAY MORNING *continued*

10:00 AM **1000** *Superconducting Nano Wire Circuits Fabricated using a Focused Helium Beam*; EY Cho, MK Ma; University of California, San Diego; C Huynh; Carl Zeiss Microscopy, LLC; RC Dynes, SA Cybart; University of California, San Diego
POSTER # 388

10:00 AM **1001** *Manipulations of Submicro-fibers of Culex Pipiens with the Help of Nano-tweezers with Shape Memory Effect into Vacuum Chamber of FIB*; A Kamantsev, A Mashirov, P Mazaev, V Koledov, V Shavrov; Kotelnikov Institute of Radio-Engineering and Electronics of RAS, Russia
POSTER # 389

10:00 AM **1002** *Advantages of Using Plasma FIB Over a Gallium LMIS Source*; BW Arey, DE Perea, L Kovarik, J Liu; Pacific Northwest National Laboratory; O Qafoku, AR Felmy; Pacific Northwest National Laboratory; R Kelley, T Landin; FEI Company, et al.
POSTER # 390

10:00 AM **1003** *Large Volume 3D Characterization by Plasma FIB DualBeam Microscopy*; T Burnett, R Kelley; University of Manchester, United Kingdom
POSTER # 391

A08.P2 Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques

POSTER SESSION

Thursday 10:00 AM • Exhibit Hall

10:00 AM **1004** *Bulge Testing for Strength Metrics of Detector X-Ray Windows*; JT Rowley, K Berry, RC Davis, RR Vanfleet; Brigham Young University; SW Cornaby, M Harker, J Abbott; MOXTEK, Inc.
POSTER # 392

10:00 AM **1005** *Elemental and Phase Analysis of the Stomatopod Dactyl Club by X-Ray Mapping*; NA Yaraghi, L Grunenfelter; University of California, Riverside; N Suksangpanya, N Guarin; Purdue University; S Herrera; University of California, Riverside; G Milliron; Max Planck Institute for Colloids and Interfaces; P Zavattieri; Purdue University; L Sheppard; University of Western Sydney, Australia, et al.
POSTER # 393

10:00 AM **1006** *EPMA Analysis of Corroded Hot-dip Galvanized Carbon Steel Using the "Phase Map Maker" Software*; R Kamiyama, P McSwiggen, N Kato, S Honda, N Mori; JEOL Ltd, Japan; C Nielsen; JEOL USA, Inc.
POSTER # 394

10:00 AM **1007** *Utilizing Intensity Ratios to Characterize Glass Fragments Via Micro-XRF*; AH Lee; EDAX Inc.
POSTER #395

10:00 AM **1008** *EDX Analysis of Low Concentration Dopant using HD-2700 Aberration Corrected STEM Equipped with Dual SDD*; T Sato, Y Suzuki, H Matsumoto, T Hashimoto, K Nakamura; Hitachi high-Technologies Corporation, Japan; T Miura, H Yoshida; Vacuum Device Inc.
POSTER # 396

10:00 AM **1009** *Quantitative ED(X)S: The Zeta-Factor Method*; M Falke, A Kaepfel, I Nemeth, R Terborg; Bruker Nano GmbH, Germany
POSTER # 397

10:00 AM **1010** *Standardless Quantification Of Actinides By EPMA*; A Moy, C Merlet; University Montpellier, France; O Dugne; Commissariat à l'énergie atomique, France
POSTER # 398

10:00 AM **1011** *Focused Interest Group on Microanalytical Standards (FIGMAS): Assessing the Quality, Availability and Need for Standards in the Microanalytical Community*; JM Allaz, OK Neill; University of Colorado Boulder; A von der Handt; University of Minnesota
POSTER # 399

10:00 AM **1012** *Improved Background Correction for the Quantification of Actinide M-lines in EPMA*; X Ritter, P Pöml; Westfälische Wilhelms-Universität, Germany; S Brémier; European Commission, Joint Research Centre, Institute for Transuranium Elements, EU; J Berndt; Westfälische Wilhelms-Universität, Germany
POSTER # 400

10:00 AM **1013** *Phase Analysis of Large EDS Datasets with Matlab*; RC Hugo, S Bernsen; Portland State University; K Breen; US Geological Survey; A Ruzicka; Portland State University
POSTER # 401

10:00 AM **1014** *Investigation of Mg-Li-Ca Alloys Using a Wavelength Dispersive Soft X-ray Emission Spectrometer and EPMA*; H Takahashi, M Takakura, T Murano; JEOL Ltd, Japan; M Terauchi; Tohoku University, Japan; M Yamasaki, Y Kawamura; Kumamoto University, Japan; P McSwiggen; JEOL USA, Inc.
POSTER # 402

10:00 AM **1015** *Use of a Fast WDS Instrument for Identification of Minor EDS Peaks*; JF Konopka; Thermo Fisher Scientific
POSTER # 403

A10.P2 Advances in Electron Diffraction and Automated Mapping Techniques

POSTER SESSION

Thursday 10:00 AM • Exhibit Hall

- 10:00 AM **1016** *The Reliability of EBSD-based Microstructure Analysis*; K Davut, S Zaefferer; Atilim University, Turkey
POSTER # 404
- 10:00 AM **1017** *Dark-Field Imaging Based on Post-Processing of Electron Backscatter Diffraction Patterns in a Scanning Electron Microscope*; N Brodusch, H Demers, R Gauvin; McGill University, Canada
POSTER # 405
- 10:00 AM **1018** *Real-Time Discrimination of Phases with Similar Kikuchi patterns but Different Chemistry Through Simultaneous EBSD and EDS*; J Goulden, S Sitzman, K Larsen, R Jones; Oxford Instruments, United Kingdom
POSTER # 406
- 10:00 AM **1019** *Optimization of 3D EBSD in a FIB-SEM System Using a Static Sample Setup*; J Guyon, N Gey; Laboratoire d'Etude des Microstructures et de Mécanique des Matériaux-CNS, France; D Goran; Bruker Nano GmbH, Germany; S Chalal, F Pérez-Willard; Carl Zeiss Microscopy GmbH, Germany
POSTER # 407
- 10:00 AM **1020** *Addressing Pseudo-Symmetric Misindexing in EBSD Analysis of Gamma-TiAl with High Accuracy Band Detection*; SD Sitzman, N-H Schmidt; Oxford Instruments NanoAnalysis; A Palomares-Garcia; IMDEA Materials Institute, Spain; R Munoz-Moreno; Rolls Royce UTC, United Kingdom; J Goulden; Oxford Instruments NanoAnalysis
POSTER # 408
- 10:00 AM **1021** *Can EBSD Patterns Be Used for Determination of Grain Boundary Incination?*; M Chapman, S Singh, M DeGraef; Carnegie Mellon University
POSTER # 409
- 10:00 AM **1022** *Automated Dictionary-based Indexing of Electron Channeling Patterns*; S Singh, M DeGraef; Carnegie Mellon University
POSTER # 410
- 10:00 AM **1023** *Quantitative Analysis of Correlated 3D Strontium Titanate Datasets Collected by TriBeam and Diffraction Contrast Tomography*; WC Lenthe, MP Echlin; University of California, Santa Barbara; M Syha, A Trenkle, P Gumbsch; Karlsruhe Institute of Technology, Germany; TM Pollock; University of California, Santa Barbara
POSTER # 411

- 10:00 AM **1024** *Pattern Overlap and High Resolution Electron Backscatter Diffraction*; V Tong, J Jiang; Imperial College London, United Kingdom; AJ Wilkinson; University of Oxford, United Kingdom; B Britton; Imperial College London, United Kingdom
POSTER # 412

- 10:00 AM **1025** *Electron and X-ray Diffraction Measurements of Elastic Stress and Plastic Strain from Ultrasonic Impact Treatment of Aluminum-Magnesium Alloys*; LN Brewer, EF Fakhouri; University of Alabama; ME Haggett; Naval Postgraduate School; KN Tran; Naval Surface Warfare Center-Carver Division
POSTER # 413

A14.P2 Surface Plasmons, Cathodoluminescence, and Low-Loss EELS

POSTER SESSION

Thursday 10:00 AM • Exhibit Hall

- 10:00 AM **1026** *Pushing the Limits of Cathodoluminescence Detection: Analyzing 2D Materials*; A Mouti, R Sachan, A Lupini, MF Chisholm; Oak Ridge National Laboratory; SJ Pennycook; National University of Singapore
POSTER # 414
- 10:00 AM **1027** *SPARC: A Cathodoluminescence Platform for Nanoscale Plasmonics in a Scanning Electron Microscope*; T Coenen, JJ de Boer; Delmic B V, Netherlands
POSTER # 415
- 10:00 AM **1028** *Measuring Gas Adsorption on Individual Facets of a Nanoparticle by a Surface Plasmon Nanoprobe*; PA Lin, JM Kohoutek, J Winterstein, H Lezec, R Sharma; National Institute of Standards and Technology
POSTER # 416
- 10:00 AM **1029** *Evaluating Adhesion Layers for Plasmonic Nanostructures with Monochromated STEM-EELS and Surface Enhanced Raman Spectroscopy*; SJ Madsen, AL Koh, R Sinclair; Stanford University
POSTER # 417
- 10:00 AM **1030** *Unconventional Surface Plasmon Excitations in Bi₂Se₃*; C Ozsoy Keskinbora, N Talebi; Max Planck Institute for Intelligent Systems, Germany; HM Benia; Max Planck Institute for Solid State Research, Germany; CT Koch; Ulm University, Germany; PA van Aken; Max Planck Institute for Intelligent Systems, Germany
POSTER # 418

Scientific Program

A

ADVANCES IN INSTRUMENTATION POSTER SESSIONS— THURSDAY MORNING *continued*

A15.P1 Imaging Mass Spectrometry

POSTER SESSION

Thursday 10:00 AM • Exhibit Hall

10:00 AM **1031** *Imaging Mass Spectrometry Using Ultra-high Mass Resolution Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometer, SpiralTOF*; T Satoh, A Kubo; JEOL Ltd, Japan; M Ubukata; JEOL USA Inc.; N Moriguchi, H Hazama, K Awazu, M Toyoda; Osaka University, Japan
POSTER # 419

10:00 AM **1032** *MALDI and LDI Imaging of Forensic Samples by Using A Spiral-Trajectory Ion Optics Time-of-Flight Mass Spectrometer*; M Ubukata, AJ Dane, RB Cody, D Guarrera, DC Edwards, N Erdman, M Shibata; JEOL USA, Inc., T Satoh; JEOL Ltd, Japan
POSTER # 420

10:00 AM **1033** *Synthesis of Monolayer Molybdenum Disulfide and ToF-SIMS Characterization*; X Chen, M Ambrogio; Northwestern University
POSTER # 421

10:00 AM **1034** *An Investigation of the Pancreatic Islet Tumor Microenvironment with Time-of-Flight Secondary Ion Mass Spectrometry*; BM Bluestein, F Morrish; University of Washington; D Hockenbery; Fred Hutchinson Cancer Research Center; LJ Gamble; University of Washington
POSTER # 422

P

PHYSICAL SCIENCES POSTER SESSIONS THURSDAY MORNING

P02.P2 Materials Problem Solving with Aberration-Corrected EM

POSTER SESSION

Thursday 10:00 AM • Exhibit Hall

10:00 AM **1035** *Manganese Segregation at Antiphase Boundaries Connecting ZrO_2 Pillars in $ZrO_2-La_{2/3}Sr_{1/3}MnO_3$ Pillar-matrix Structures*; O Zhou, W Sigle, M Kelsch; Max Planck Institute for Intelligent Systems, Germany, H-U Habermeier; Max Planck Institute for Solid State Research, Germany; PA van Aken; Max Planck Institute for Intelligent Systems, Germany
POSTER # 423

10:00 AM **1036** *Atomic-resolution EELS Study of Titanium Dopant Effects of $Ca_3Co_4O_9$ Thin Film*; X Hu, P Phillips, S Ogut, R Klie; University of Illinois at Chicago
POSTER # 424

10:00 AM **1037** *Atomic-Scale EDS Mapping for Chemical Imaging and Quantification of Interdiffusion in Self-assembled Vertically Aligned Nanocomposite Thin Films*; P Lu, E Romero, J Ihlefeld, W Pan; Sandia National Laboratories; W Zhang, H Wang; Texas A&M University; Q Jia; Los Alamos National Laboratory
POSTER # 425

10:00 AM **1038** *Electronic Structure of New Line Defect in Strained $NdTiO_3$ on $SrTiO_3$* ; JS Jeong, M Topsakal, P Xu, RM Wentzcovitch, B Jalan, KA Mkhoyan; University of Minnesota
POSTER # 426

10:00 AM **1039** *Characterization of Ultra Low-K Dielectric Materials by STEM EELS Elemental Mapping*; WW Zhao, M Gribelyuk, JD Russell; GlobalFoundries
POSTER # 427

10:00 AM **1040** *Investigation of Co-doped $BaTiO_3$ by atomic-resolution EELS*; D Zhang, T Aoki; Arizona State University; P Ponath, A Posadas, A Demkov; University of Texas, Austin; D Smith; Arizona State University
POSTER # 428

10:00 AM **1041** *Study on the Atomic and Electronic Structure in CrN (VN, TiN) Films Using CS-corrected TEM*; Z Zhang, G Dehm; E Schmid; Austrian Academy of Sciences
POSTER # 429

10:00 AM **1042** *Quantitative Determination of Chemical Composition of Multinary III/V Semiconductors With Sublattice Resolution Using Aberration Corrected HAADF-STEM*; A Beyer, N Knaub, K Volz; Philipps-Universität Marburg, Germany
POSTER # 430

10:00 AM **1043** *Determination of Local Chemistry Composition of Low-dimensional Semiconductor Nanostructures Through the Use of High-Resolution HAADF images*; D Hernandez-Maldonado, M Herrera; SuperSTEM Labroatory, United Kingdom; AR Lupini; Oak Ridge National Laboratory; SI Molina; Universidad de Cadiz, Spain
POSTER # 431

10:00 AM **1044** *TEM Characterization of Ball Milled CIS and CIGS Nanoparticles*; II Santana Garcia, C Kisielowski, HA Calderon; Instituto Politecnico Nacional, Mexico
POSTER # 432

10:00 AM **1045** *Atomic Scale Study of Lomer-Cottrell and Hirth Lock Dislocations in CdTe*; T Paulauskas, C Buurma, B Stafford; University of Illinois at Chicago; C Sun; University of Dallas, Texas; M Chan; Argonne National Laboratory; M Kim; University of Texas, Dallas; R Klie; University of Illinois, Chicago
POSTER # 433

Scientific Program

10:00 AM **1046 M&M 2015 STUDENT AWARDEE** *Atomic Resolution Studies of the (K, Na)NbO₃/SrTiO₃ Interface Using Aberration Corrected STEM*; C Li, G Yang, L Wang, Z Wang; Xi'an Jiaotong University, China
POSTER # 434

P03.P1 Advances in Microanalysis of Earth and Planetary Materials

POSTER SESSION

Thursday 10:00 AM • Exhibit Hall

- 10:00 AM **1047** *Solving the Controversy of Earth's Oldest Fossils using Electron Microscopy*; D Wacey, M Saunders; University of Western Australia; C Kong; University of New South Wales, Australia; M Brasier; Oxford University, United Kingdom
POSTER # 435
- 10:00 AM **1048** *Standards-Based Quantitative EDS Mapping*; SM Seddio; Thermo Fisher Scientific
POSTER # 436
- 10:00 AM **1049** *Survey for Fe-Si in Apollo 16 Regolith Sample 61501,22*; P Gopon, J Fournelle, M Spicuzza, JW Valley; University of Wisconsin
POSTER # 437
- 10:00 AM **1050** *Sintering of Ice Spheres Under Difference Thermal Conditions*; X Wang, I Baker; Dartmouth College
POSTER # 438
- 10:00 AM **1051** *Characterization of Individual Particles in Air Quality Program with SEM-EDS*; R Ramirez-Leal, M Valle- Martinez, ME Cruz-Campas; Sonora State University
POSTER # 439
- 10:00 AM **1052** *Towards Automated Segmentation Methods for 3D Tomography Studies of the Morphology of Carbon Nanoglobules in Chondritic Meteorites*; K Yakal-Kremski, N Bassim; Naval Research Laboratory; K Scott; National Institute of Standards and Technology; R Stroud; Naval Research Laboratory
POSTER # 440
- 10:00 AM **1053** *Combined Major and Trace Element Characterization of Tourmaline: Using EPMA to Address Elemental Fractionation by Laser Ablation*; JW Singer, M Lupulescu; Rennselaer Polytechnic Institute
POSTER # 441
- 10:00 AM **1054** *The First Solar System Solids as Revealed Through Slice-and-View Imaging*; T Zega; University of Arizona
POSTER # 442

P07.P2 Metallography and Microstructural Characterization of Metals

POSTER SESSION

Thursday 10:00 AM • Exhibit Hall

- 10:00 AM **1055** *Comparing Field Emission Electron Microprobe to Traditional EPMA for Analysis of Metallurgical Specimens*; DF Susan, RP Grant, JM Rodelas, JR Michael, MC Maguire; Sandia National Laboratories
POSTER # 443
- 10:00 AM **1056** *Influence of Thermo-mechanical Treatments on the Microstructure and Hardness of the Al-2024 Alloy*; CG Garay-Reyes, L González-Rodelas, E Cuadros-Lugo, I Estrada-Guel, R Martínez-Sánchez; Centro de Investigación en Materiales Avanzados, Mexico
POSTER # 444
- 10:00 AM **1057** *Development of Quantitative Methods for Estimation of Aluminum Alloys Structure by Means of Image Analysis*; AA Kazakov, AA Kur; St Petersburg State Polytechnical University, Russia
POSTER #445
- 10:00 AM **1058** *Microscale Torsion Test to Investigate Initial Yielding Phenomenon of a Single Crystal Copper*; T Yokoyama, N Shishido, K Koiwa, S Kamiya, H Sato; Nagoya Institute of Technology, Japan; M Omiya; Keio University, Japan; T Nokuo, T Suzuki; JEOL Ltd, Japan, et al.
POSTER # 446
- 10:00 AM **1059** *RIMAPS Studies on Structured Copper Foils*; EA Favret, M Flores Zavala; Instituto Nacional de Tecnología Agropecuaria, Argentina; P Löthman; KIST Europe Forschungsgesellschaft GmbH, Germany
POSTER # 447
- 10:00 AM **1060** *Microstructure Evolution of Discontinuous Precipitation and Coarsening of Co Rod-like Precipitates in Supersaturated Cu-Co alloys*; NM Suguihiro, G Solórzano, EM Saitovitch; Brazilian Center for Research in Physics
POSTER # 448
- 10:00 AM **1061** *Effect on Microstructure and Hardness of A2024 Aluminum Alloy Doped Cerium Oxide Nanoparticle*; FJ Baldenebro-Lopez, JA Baldenebro-Lopez; Universidad Autónoma de Sinaloa, Mexico; A Santos-Beltrán, V Gallegos-Orozco; Universidad Tecnológica de Chihuahua Sur, Mexico; CD Gomez-Esparza, R Martínez-Sánchez; Centro de Investigación en Materiales Avanzados, Mexico
POSTER # 449

Thursday, August 6

Scientific Program

P

PHYSICAL SCIENCES POSTER SESSIONS THURSDAY MORNING *continued*

- 10:00 AM **1062** *Characterization of Precipitate Phases in a NiCoAlFeCrTi High Entropy Alloy by Transmission Electron Microscopy*; CD Gómez Esparza, F J Baldenebro López; Centro de Investigación en Materiales Avanzados, Mexico; JA Baldenebro López, R Corral Higuera; Universidad Autónoma de Sinaloa, Mexico; JM Herrera Ramírez, R Martínez Sánchez; Centro de Investigación en Materiales Avanzados, Mexico
POSTER # 450
- 10:00 AM **1063** *Direct Observation of the Strain Aging Effects Using the In Situ Heating and Straining Stage for TEM*; S-P Hong, S-I Kim, T-Y Ahn; Seoul National University; C-S Lee; Posco, South Korea; Y-W Kim; Seoul National University, South Korea
POSTER # 451
- 10:00 AM **1068** *A Correlative Study of HRTEM, HAADF-STEM, and STEM-EELS Spectrum Imaging for Biphasic Electrochemically Active TiO₂*; CW Han, V Etacheri, CN Hong, VG Pol, V Ortalan; Purdue University
POSTER # 456
- 10:00 AM **1069** *Interface Sharpness in Amorphous Multilayer Heterostructures and their Effect on Quantum Confinement*; S Aloni, AM Thron, A Schwartzberg; Lawrence Berkeley National Laboratory
POSTER # 457
- 10:00 AM **1070** *Influence of Device Microstructure on The Optical Properties of Ge_{1-y}Sn_y (y = 0-0.11) LEDs Produced by Next Generation Deposition Methods*; JD Gallagher, T Aoki, P Sims, J Menendez, J Kouvetakis; Arizona State University
POSTER #458
- 10:00 AM **1071** *Inter-Diffusion Characterization of SnO_x/CuO_x Grown on Cu Foil*; G Eng, G Baty, M Hughes, Z Chen; Portland State University
POSTER # 459

P11.P4 Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials

POSTER SESSION

Thursday 10:00 AM • Exhibit Hall

- 10:00 AM **1064** *Controlled Radiolytic Synthesis in the Fluid Stage. Towards Understanding the Effect of the Electron Beam in Liquids*; P Abellan, LR Parent; SuperSTEM laboratory; TH Moser; Michigan Technological University; C Park; Florida State University; N Al Hasan, I Arslan, JE Evans, ND Browning; Pacific Northwest National Laboratory, et al
POSTER # 452
- 10:00 AM **1065** *Development of Quantitative STEM for a Conventional S/TEM and Real-Time Current Calibration for Performing QSTEM with a Cold Field Emission Gun*; SD House, L Li; University of Pittsburgh; CT Schamp, R Henry; Hitachi High Technologies America, Inc. D Su, E Stach; Brookhaven National Laboratory; JC Yang; University of Pittsburgh
POSTER # 453
- 10:00 AM **1066** *High-Speed Analysis of Pt Based Alloys at High Spatial Resolution Using EELS*; P Longo, RD Twisten; Gatan, Inc. M Bugnet, S Prabhudev, GA Botton; McMaster University, Canada
POSTER # 454
- 10:00 AM **1067** *Verifying the Structure and Composition of Prepared Porous Catalytic Supports*; MT Paul, X Zhang, B Yee, BD Gates; Simon Fraser University
POSTER # 455

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—THURSDAY AFTERNOON

A02.3 TEM Phase Contrast Imaging

SESSION CHAIRS:

Mike Marko, Wadsworth Center

Radostin Danev, Max Planck Institute of Biochemistry, Germany

PLATFORM SESSION

Thursday 1:30 PM • Room: D135

1:30 PM **1072** (Invited) *Zernike Phase Contrast Electron Microscopy: Observation of the Image Formation and Improvement of the Image Quality using Direct Detector*; K Murata, N Miyazaki; National Institute for Physiological Sciences, Japan; K Nagayama; The Graduate University for Advanced Studies, Japan

2:00 PM **1073** (Invited) *Zernike Phase Plate Configuration at Intermediate Lens Position on JEM2200FS*; W Chiu, C Fu, H Khant; Baylor College of Medicine; S Motoki; JEOL USA, Inc.

2:30 PM **1074** (Invited) *Zernike Cryo-EM with a Direct Electron Camera Enables Tracking Protein Conformations in the Temporal Dimension*; WH Chang; Institute of Chemistry, Academia Sinica, China

A03.2 Electron Holography for Nanofields in Solids

SESSION CHAIRS:

Hannes Lichte, Speziallabor Triebenbergl, Germany

Molly McCartney, Arizona State University

Ken Harada, Hitachi Ltd.

PLATFORM SESSION

Thursday 1:30 PM • Room: C120

1:30 PM **1075** (Invited) *Off-Axis Electron Holography for the Quantitative Study of Magnetic Properties of Nanostructures: From the Single Nanomagnet to the Complex Device*; C Gatel, A Masseboeuf, E Snoeck; Centre National de la Recherche Scientifique; F Bonnilla, T Blon, L-M Lacroix, A Meffre; University of Toulouse, France; JF Einsle; Queen's University Belfast, Northern Ireland, et al.

2:00 PM **1076** *Three-Dimensional Magnetic Vortex Cores Visualized by Electron Holographic Vector Field Tomography*; T Tanigaki, Y Takahashi, T Shimakura, T Akashi, R Tsuneta, A Sugawara; Central Research Laboratory, Hitachi, Ltd; D Shindo; Tohoku University, Japan

2:15 PM **1077** *Towards Multiresolution Phase Retrieval using Electron Ptychography*; C Phatak, Y Nashed, T Peterka; Argonne National Laboratory

2:30 PM **1078** (Invited) *Skymion Lattices Observed by High-Voltage Holography Electron Microscopes*; HS Park; Dong-A University, South Korea

A04.3 Advances in FIB: New Instrumentation and Applications in Materials and Biological Sciences

SESSION CHAIRS:

Keana Scott, National Institute of Standards and Technology

Lucille A. Giannuzzi, EXpressLO LLC

Srinivas Subramaniam, Intel Corporation

PLATFORM SESSION

Thursday 1:30 PM • Room: B117

1:30 PM **1079** (Invited) *Roles of Self-Assembly and Beam Damage in Gas-Assisted Electron and Ion Beam Induced Processing*; M Toth; University of Technology, Germany

2:00 PM **1080** *Site-Specific TEM Specimen Preparation of Samples with Sub-Surface Features*; J Deitz, S Carnevale, D McComb, S Ringel, T Grassman; The Ohio State University

2:15 PM **1081** *Micro-Micromechanical Properties of Weld Metal*; AK Basak, WL Costin; The University of Adelaide, Australia

2:30 PM **1082** *Three Dimensional Microstructural Characterization of Cathode Degradation in SOFCs Using FIB/SEM and TEM*; JA Taillon, C Pellegrinelli, Y Huang, E Wachsman, L Salamanca-Riba; University of Maryland

A05.6 Fast and Ultrafast Imaging with Electrons and Photons

SESSION CHAIRS:

David Flannigan, University of Minnesota,

Hermann Durr, Stanford University and

Joanna Atkin, University of Colorado

PLATFORM SESSION

Thursday 1:30 PM • Room: A105

1:30 PM **1083** (Invited) *Ultrafast Infrared Nanoscopy with Sub-Cycle Temporal Resolution*; TL Cocker, M Eisele, MA Huber, M Plankl, R Huber, University of Regensburg, Germany; D Ercolani, L Sorba, M Vitiello, CNR-Istituto Nanoscienze and Scuola Normale Superiore, Italy

2:00 PM **1084** (Invited) *Lensless Imaging of Nano- and Meso-Scale Dynamics with X-Rays*; J Clark; Stanford PULSE Institute

2:30 PM **1085** *High-Resolution Phase-Contrast Imaging at XFELs*; A Schropp, R Hoppe; DESY Hamburg; V Meier, J Patommel, F Seiboth; Technische Universität Dresden, Germany; HJ Lee, B Nagler, EC Galtier; SLAC National Accelerator Laboratory, et al.

Scientific Program

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—THURSDAY AFTERNOON *continued*

- 2:45 PM **1086** *Fast Solid State Electron Detectors Based on the Principle of Silicon Drift Detectors for Efficient Soft and Hard Matter Analysis*; A Liebel, G Lutz, U Weber, A Niculae, H Soltan; PNDetector GmbH, Germany

A06.7 Advanced Analytical TEM/STEM

SESSION CHAIRS:

Paul Kotula, Sandia National Laboratories
Masashi Watanabe, Lehigh University
Gerald Kothleitner, Graz University of Technology, Germany

PLATFORM SESSION

Thursday 1:30 PM • Room: A106

- 1:30 PM **1087** (Invited) *Analytical Electron Tomography: Methods and Applications*; G Haberfehlner, A Orthacker, FP Schmidt, A Hörl, D Knez, A Trügler, U Hohenester, G Kothleitner; Graz University of Technology, Germany
- 2:00 PM **1088** *Multi-Dimensional Machine Learning Aided Analysis of a Nickel-Based Superalloy*; D Rossouw, R Krakow, Z Saghi, C Yeoh, P Burdet, R Leary, P Midgley; University of Cambridge, United Kingdom
- 2:15 PM **1089** *Off-Axis Chromatic Scanning Confocal Electron Microscopy for Inelastic Imaging with Atomic Resolution*; C Zheng, Y Zhu; Monash University, Australia; S Lazar; FEI Electron Optics; J Etheridge; Monash University, Australia
- 2:30 PM **1090** *Depth Sensitivity of Atomic Resolution Aberration-Corrected Through-Focus STEM Imaging of Bi Dopants on Cu Grain Boundaries*; CA Wade, M Watanabe; Lehigh University
- 2:45 PM **1091** *Super-X XEDS STEM Tomography of Gamma Prime Precipitates in the LSHR Nickel Superalloy*; S Kuhr, J Sosa, D Huber, H Fraser; The Ohio State University

A07.3 Scanning Probe Microscopy: New Methods and Applications

SESSION CHAIR:

Craig Prater, Anasys Instruments

PLATFORM SESSION

Thursday 1:30 PM • Room: B118

- 1:30 PM **1092** (Invited) *Nanoscale Mechanical Scattering Experiments towards the Local Analysis of Thermal Active Modes and Dispersion Interactions at Interfaces*; RM Overney; University of Washington
- 2:00 PM **1093** *High-Resolution Mapping of Quantitative Elastic Modulus of Polymers*; S Magonov, S Belikov, M Surtchev, S Leesment, I Malovichko; NT-MDT Development Inc.
- 2:15 PM **1094** *Environmental AFM as a Probe of the Morphology, Viscoelasticity and Lubricity of Crosslinked Hydrophilic Biomedical Coatings*; G Haugstad, C Colling, A McCormick, K Wormuth; University of Minnesota; M Zeng; Boston Scientific Corporation
- 2:30 PM **1095** *A New Variable Temperature Solution-Solid Interface Scanning Tunneling Microscope*; A Jahanbekam, U Mazur, KW Hipps; Washington State University
- 2:45 PM **1096** *The Power of confocal Raman-AFM and Raman-SEM (RISE) Imaging in Polymer Research*; U Schmidt, W Liu; J Yang, T Dieing, K Weishaupt; WITec GmbH, Germany

A08.5 Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques

SESSION CHAIRS:

Nicholas Ritchie, National Institute of Standards and Technology
Paul Carpenter, Washington University
Phillipe Pinard, RWTH Aachen University, Germany

PLATFORM SESSION

Thursday 1:30 PM • Room: B115

- 1:30 PM **1097** (Invited) *Dedicated X-Ray Mapping System for Quantitative X-Ray Mapping with Single and Multiple SDD Detectors and Processing the Data*; R Wuhrer, K Moran; University of Western Sydney, Australia
- 2:00 PM **1098** (Invited) *Quantitative Elemental Mapping with Electron Microprobe and Automated Data Analysis*; J Chouinard, J Donovan; University of Oregon
- 2:30 PM **1099** (Invited) *Homogeneity Testing of Microanalytical Reference Materials by Electron Probe Microanalysis*; D Harries; Friedrich Schiller University Jena, Germany

A09.4 Advances in Combining Simulation and Experiment for Materials Design

SESSION CHAIRS:

Paul Voyles, University of Wisconsin, Madison
Gianluigi Botton, McMaster University, Canada

PLATFORM SESSION

Thursday 1:30 PM • Room: B119

- 1:30 PM **1100** (Invited) *Towards Statistically Representative Atomic Resolution 3D Nano-jetology for Materials Modelling and Catalyst Design*; L Jones, KE MacArthur; University of Oxford; J Aarons, C-K Skylaris; University of Southampton; M Sarwar, D Ozkaya; Johnson Matthey; PD Nellist; University of Oxford, United Kingdom
- 1:30 PM **1101** (Invited) *Probing Complex Nanostructures by Combining Atomic-Scale Theory and Scanning Transmission Electron Microscopy*; ST Pantelides, SJ Pennycook; Vanderbilt University
- 2:30 PM **1102** *Integrated Computational and Experimental Structure Determination for Nanoparticles*; M Yu, AB Yankovich, A Kaczmarowski, D Morgan, P Voyles; University of Wisconsin, Madison
- 2:45 PM **1103** *Local Crystallography: Phase Recognition and Local Symmetry Analysis*; A Belianinov, Q He, M Kravchenko, S Jesse, A Borisevich, S Kalinin, Oak Ridge National Laboratory
- 3:00 PM **1104** *HAADF/MAADF Observations and Image Simulations of Dislocation Core Structures in a High Entropy Alloy*; TM Smith, BD Esser, EP George, F Otto; Ruhr University; M Ghazisaeidi, DW McComb, MJ Mills; The Ohio State University
- 3:15 PM **1105** *Strain-Mediated Asymmetric Growth of Plasmonic Nanocrystals: A Monometallic Au Nanorod-Au Nanoparticle Heterodimer*; Y Zhu, J Huang, Y Han; King Abdullah University of Science and Technology, Saudi Arabia

A10.5 Advances in Electron Diffraction and Automated Mapping Techniques

SESSION CHAIR:

Jian-Min Zuo, University of Illinois, Urbana-Champaign

PLATFORM SESSION

Thursday 1:30 PM • Room: B112

- 1:30 PM **1106** (Invited) *Using Electron Diffraction Techniques, CBED and N-PED to measure Strain with High Precision and High Spatial Resolution*; J Rouviere, Y Martin; University Grenoble Alpes, France; N Bernier, M Vigouroux, D Cooper, Commissariat à l'énergie atomique, France, ZM Zuo; University of Illinois

- 2:00 PM **1107** *4D-STEM Imaging with the pnCCD (S)TEM-Camera*; M Simson, H Ryll; PNDetector GmbH, Germany; L Jones; University of Oxford, Kingdom; Y Kondo; JEOL Ltd, Japan; K Müller; Universität Bremen, Germany; PD Nellist; University of Oxford, United Kingdom; H Soltau; PNDetector GmbH, Germany, H Yang; University of Oxford, United Kingdom, et al.
- 2:15 PM **1108** *GPU-Based Defect Image Simulations Using the Scattering Matrix Formalism*; S Singh, M DeGraef; Carnegie Mellon University
- 2:30 PM **1109** *EBSDF Surface Topography Determination in a Martensitic Au-Cu-Zn Alloy*; M Chapman, P Callahan, M DeGraef; Carnegie Mellon University
- 2:45 PM **1110** *High-Resolution Electron Backscatter Diffraction in III-Nitride Semiconductors*; A Vilalta-Clemente, G Naresh-Kumar; University of Oxford, United Kingdom; M Nouf-Allehiani; University of Strathclyde, Scotland P Parbrook; University College Cork, Ireland; ED Le Boulbar, D Allsopp, PA Shields, C Trager-Cowan; University of Strathclyde, Scotland, et al.

A14.4 Surface Plasmons, Cathodoluminescence, and Low-Loss EELS

SESSION CHAIRS:

David McComb, Ohio State University
Ritesh Sachan, Oak Ridge National Laboratory
Robert Williams, Ohio State University
Gerd Duscher, University of Tennessee

PLATFORM PRESENTATION

Thursday 1:30 PM • Room: D137

- 1:30 PM **1111** (Invited) *Nanoplasmonics in the TEM*; M Bosman; Institute of Materials Research and Engineering, A*STAR, Singapore
- 2:00 PM **1112** *Real-Space Imaging of Plasmonic Modes of Gold Tapers by EFTEM and EELS*; W Sigle, N Talebi, S Guo; Max Planck Institute for Intelligent Systems, Germany; M Esmann, SF Becker, R Vogelgesang, CT Lienau; Carl von Ossietzky Universität Oldenburg, Germany, PA van Aken; Max Planck Institute for Intelligent Systems, Germany
- 2:15 PM **1113** *Local Variations in the Surface Plasmon at Al Grain Boundaries and its Effect on the Optical Properties of Al Nanostructures*; AM Thron, CG Bischak, S Dhuey, S Aloni; Molecular Foundry, Lawrence Berkeley National Laboratory
- 2:30 PM **1114 M&M 2015 STUDENT AWARDEE** *Three-dimensional Surface Charge Reconstructions of Surface Plasmon Modes of Silver Right Bipyramids*; S Collins, M Duchamp; University of Cambridge, United Kingdom; E Ringe; Rice University; Z Saghi, P Midgley; University of Cambridge, United Kingdom

Scientific Program

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—THURSDAY AFTERNOON *continued*

- 2:45 PM **1115** *High-Resolution Characterization of Plasmonic Hybridization in Silver Nanostructures*; EP Bellido, IC Bicket, J McNeil, GA Botton; McMaster University, Canada

A15.2 Imaging Mass Spectrometry

SESSION CHAIRS:

Joseph Dalluge, University of Minnesota
Christopher Anderton, Pacific Northwest National Laboratory

PLATFORM SESSION

Thursday 1:30 PM • Room: B111

- 1:30 PM **1197** (Invited) *Nanoscale Imaging Mass Spectrometry Using Cluster Ion Beams*; N Winograd; Pennsylvania State University
- 2:00 PM **1198** *Multimodal Imaging of Environmental and Biological Liquid Surfaces and Interfaces Using Imaging Mass Spectrometry*; X-Y Yu; Pacific Northwest National Laboratory
- 2:15 PM **1199** *Molecular Characterization of Lubricant Degradation Produced in a Tribological Wear Test Using TOF- SIMS Imaging MS*; GL Fisher, T LeMogne; Physical Electronics; JM Martin, C Forest; École Centrale de Lyon, France
- 2:30 PM **1200** (Invited) *High-Resolution Imaging of the Distributions of Cholesterol, Sphingolipids, and Specific Proteins in the Plasma Membrane with Secondary Ion Mass Spectrometry*; MK Kraft, PK Weber, JF Frisz, HA Klitzing, RL Wilson, A Yeager; University of Illinois; J Zimmerberg; Eunice Kennedy Shriver National Institute of Child Health and Human Development

A17.2 Standardization and Metrology in Electron Microscopy and Microbeam Analysis

SESSION CHAIRS:

Dan V. Hodoroaba; BAM Federal Institute for Materials Research and Testing, Germany
Ryna B. Marinenko; National Institute of Standards and Technology
M. Matthews, Atomic Weapons Establishment, United Kingdom

PLATFORM SESSION

Thursday 1:30 PM • Room: B114

- 1:30 PM **1120** (Invited) *Standard Methods and Reference Materials for Performing a Complete EPMA WDS Instrument Diagnostic*; DC Meier, ES Windsor; National Institute of Standards and Technology; JM Davis; PNDetector GmbH, Germany; RB Marinenko, JR Anderson, F Meisenkothen, SA Wight; National Institute of Standards and Technology
- 2:00 PM **1121** *Testing of the DR Method for Image Sharpness Determination*; M Matthews, J Shah; Atomic Weapons Establishment, United Kingdom
- 2:15 PM **1122** *The Use of Color in Elemental Maps and Electron-Microscope Images.*; RF Egerton; University of Alberta, Canada
- 2:30 PM **1123** *Tomographic Measurement of Buried Interface Roughness*; M Hayashida, S Ogawa, M Malac; National Institute for Nanotechnology, Canada
- 2:45 PM **1124 M&M 2015 Student Awardee** *Highly Accurate Real Space Nanometrology Using Revolving Scanning Transmission Electron Microscopy*; JH Dycus, JS Harris, XH Sang; North Carolina State University; SD Findlay; Monash University, Australia; AA Oni; North Carolina State University; LJ Allen; University of Melbourne, Australia; DL Irving, JM LeBeau; North Carolina State University, et al.

P

PHYSICAL SCIENCES SYMPOSIA THURSDAY AFTERNOON

P02.5 Materials Problem Solving with Aberration-Corrected EM

SESSION CHAIRS:

Jian-Min Zuo, University of Illinois

Kunio Takayanagi, Tokyo Institute of Technology

PLATFORM SESSION

Thursday 1:30 PM • Room: C124

- 1:30 PM **1125** *Atomic Resolution Imaging and Spectroscopy of Pt-Alloy Electrocatalytic Nanoparticles*; S Prabhudev, M Bugnet, CN Chiang, M Chatzidakis; McMaster University, Canada; G-Z Zhu; Shanghai Jiao Tong University, China; GA Botton; McMaster University, Canada
- 1:30 PM **1126** *Atomic-scale Quantitative and Analytical STEM Investigation of Sr-d-doped La_2CuO_4 Multilayers*; Y Wang, W Sigle, D Zhou; Max Planck Institute for Intelligent Systems, Germany; F Baiutti, G Logvenov, G Gregori, G Cristiani, J Maier; Max Planck Institute for Solid State Research, Germany, et al.
- 2:00 PM **1127** *Inversion of STEM EELS Data to Obtain Site Occupancy and Near Edge Structure.*; MP Oxley, MJ Neish; Vanderbilt University; LJ Allen; University of Melbourne, Australia; MF Chisholm; Oak Ridge National Laboratory
- 2:15 PM **1128** *Periodic Artifact Reduction in Fourier Transforms of Full Field Atomic Resolution Images*; R Hovden, Y Jiang; Cornell University; H Xin; Brookhaven National Laboratory; L Kourkoutis; Cornell University
- 2:30 PM **1129** *Aberration-Corrected STEM of Four-Atom Rhenium Nanowires Confined Within Carbon Nanotubes*; F Zhang, P Ren, X Pan, X Bao; Dalian Institute of Chemical Physics, China; J Liu; Arizona State University
- 2:45 PM **1130** *Collective Atomic Motion at a $90^\circ <110>$ Tilt Grain Boundary in Gold*; ML Bowers, A Gautam, C Ophus; Lawrence Berkeley National Laboratory; F Lancon; Institut Nanosciences et Cryogénie-CEA, France; U Dahmen; Lawrence Berkeley National Laboratory

P03.4 Advances in Microanalysis of Earth and Planetary Materials

SESSION CHAIRS:

Rhonda Stroud, Naval Research Laboratory and

Eve L. Berger, NASA Johnson Space Center

PLATFORM SESSION

Thursday 1:30 PM • Room: C122

- 1:30 PM **1131** (Invited) *Electron Holography Unveiled Formation Process of Extraterrestrial Magnetite*; Y Kimura, K Yamamoto; Institute of Low Temperature Science, Hokkaido University, Japan; T Sato; Hitachi High-Technologies Corporation, Japan
- 2:00 PM **1132** *Focused Ion Beam Nanotomography of Chondritic Meteorites: Closing the Mesoscale Length Gap in Paleomagnetic Studies*; JF Einsle, RR Fu; University of Cambridge, United Kingdom; B Weiss; Massachusetts Institute of Technology; T Kasama; Technical University of Denmark; P Conbhuí, W Williams; University of Edinburgh, United Kingdom; PA Midgley, R Harrison; University of Cambridge, United Kingdom
- 2:15 PM **1133** *Correlating Mineralogy and Amino Acid Contents of Milligram-Scale Murchison Carbonaceous Chondrite Samples*; AS Burton, EL Berger, DR Locke; NASA Johnson Space Center, JE Elsila, DP Glavin, JP Dworkin; NASA Goddard Space Flight Center
- 2:30 PM **1134** *Nanoscale Variation in Carbonaceous Matter from Primitive Meteorites Revealed by Aberration-Corrected STEM*; BT De Gregorio, RM Stroud; Nova Research, Inc. KD Burgess; Naval Research Laboratory; CM Alexander; Carnegie Institution of Washington

P07.6 Metallography and Microstructural Characterization of Metals

SESSION CHAIRS:

James E. Martinez, NASA Johnson Space Center and

George Vander Voort, Vander Voort Consulting

PLATFORM SESSION

Thursday 1:30 PM • Room: C123

- 1:30 PM **1135** (Invited) *LOM Characterization of Heat-Resistant Cast Steels for the Lime/Cement Industry*; J Asensio, G Vander Voort; The University of Oviedo
- 2:00 PM **1136** *Metallographic Sample Preparation and Characterisation of Oxide Scales on Hot-Rolled Steel Strips*; O Elkoca, K Davut; Ereğli Iron and Steel Works, Inc.
- 2:15 PM **1137** *Mössbauer Spectroscopy and Transmission Electron Microscopy Analysis of Transition Carbides in Quenched and Partitioned Steel*; DT Pierce, DR Coughlin, DL Williamson; Colorado School of Mines; KD Clarke, AJ Clarke; Los Alamos National Laboratory; JG Speer, DK Matlock, E De Moor; Colorado School of Mines

Scientific Program

P

PHYSICAL SCIENCES SYMPOSIA

THURSDAY AFTERNOON *continued*

2:30 PM **1138** *Measurement of Grain Size Distributions*; GF Vander Voort; Vander Voort Consulting

2:45 PM **1139** *Microstructural Stability of Nanostructured Ferritic Alloys (NFA)*; R Sharghi-Moshtaghin, S Huang, R DiDomizio, L Dial; GE-Global Research Center

P11.9 Advances in Transmission Electron Microscopy and Spectroscopy of Energy Related Materials

SESSION CHAIRS:

Chongmin Wang, Pacific Northwest National Laboratory

Raymond Unocic, Oak Ridge National Laboratory

Arda Genc, FEI

PLATFORM SESSION

Thursday 1:30 PM • Room: B113

1:30 PM **1140** (Invited) *ALCHEMI Studies of Spinel Oxides for SOFC Interconnect Alloy Coatings*; LV Gambino, NJ Magdefrau, M Aindow; University of Connecticut

2:00 PM **1141** *Linking Microstructure and Local Chemistry in Cu(In,Ga)Se₂ Thin-Film Solar Cells*; E Simsek; Max Planck Institute for Intelligent Systems, Germany; QM Ramasse; SuperSTEM Laboratory; D Abou-Ras, R Mainz, A Weber; Helmholtz Zentrum Berlin, Germany; HJ Kleebe; Technische Universität Darmstadt, Germany; PA van Aken; Max Planck Institute for Intelligent Systems, Germany

2:15 PM **1142** *Identical Location Aberration Corrected TEM Study on the Degradation Mechanism of Platinum Nanoparticles on Carbon Nanotubes in High Temperature Fuel Cells*; S Rasouli, MR Berber; The University of Texas, Austin; IH Hafez, T Fujigaya, N Nakashima; Kyushu University, Japan; PJ Ferreira; The University of Texas, Austin

2:30 PM **1143** *Atomic-Resolution STEM-EDS Mapping of Grain Boundary Solute Segregation in Yttria-Stabilized Zirconia*; B Feng, A Kumamoto, N Lugg, N Shibata, Y Ikuhara; The University of Tokyo, Japan

P12.2 Advanced Microanalysis and Microscopy of Soft and Hybrid Nanomaterials

SESSION CHAIRS:

Jihua Chen, Oak Ridge National Laboratory

Honggang Cui, John Hopkins University

PLATFORM SESSION

Thursday 1:30 PM • Room: D140

1:30 PM **1144** (Invited) *Designer Nanoparticle-Liposome Hybrid Capsules for Drug Delivery*; JA Zasadzinski, N Forbes, JE Shin, MO Ogunyankin; University of Minnesota

2:00 PM **1145** *Observations of In Vivo Processing of Metal Oxide Nanoparticles by Analytical TEM/STEM*; UM Graham, AK Dozier; University of Kentucky; G Oberdoerster; University of Rochester Medical Center; C Wang; CDC-National Institute for Occupational Safety and Health; MT Tseng; University of Louisville; JE Fernback, EM Birch; CDC-National Institute for Occupational Safety and Health, BH Davis; University of Kentucky

2:15 PM **1146** *Surprising High Iron Enrichment in Hard Dental Tissues of Rodents*; V Srot, U Salzberger, B Bussmann; Max Planck Institute for Intelligent Systems, Germany; B Pokorny, I Jelenko, ERICO Velenje, Slovenia; PA van Aken; Max Planck Institute for Intelligent Systems, Germany

2:30 PM **1147** Samuel Scholarship Award *Revealing the Internal Structure and Local Chemistry of Nanocrystals Grown in Hydrogel with Cryo-FIB Lift-Out and Cryo-STEM*; MJ Zachman, E Asenath-Smith, LA Estroff, LF Kourkoutis; Cornell University

2:45 PM **1148** *Chemical Imaging of Interfaces and in Interphases in Tooth Enamel*; LM Gordon, MJ Cohen, D Joester; Northwestern University

T

PHYSICAL SCIENCES TUTORIAL

THURSDAY AFTERNOON

X41.1 Physical Sciences Tutorial: In Situ Liquid S/TEM: Practical Aspects, Challenges, and Opportunities

SESSION CHAIR:

Patrick Phillips, University of Illinois, Chicago

TUTORIAL SESSION

Thursday 1:30 PM • Room: C125

1:30 PM **1149** (Invited) *In Situ Liquid S/TEM: Practical Aspects, Challenges, and Opportunities*; R Unocic; Oak Ridge National Laboratory

Scientific Program

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—THURSDAY AFTERNOON

A02.4 TEM Phase Contrast Imaging

SESSION CHAIRS:

Mike Marko, Wadsworth Center

Radostin Danev, Max Planck Institute of Biochemistry, Germany

PLATFORM SESSION

Thursday 3:30 PM • Room: D135

3:30 PM **1150** *Use of Ultrananocrystalline Diamond as a Phase-contrast Aperture Material*; RM Glaeser, D Larson, B Muddiman, S Sassolini, S Cabrini, J Jin; University of California, Berkeley

3:45 PM **1151** (Invited) *Evolution of Magnetic Ring Designs for Phase Plates*; CJ Edgcombe; University of Cambridge, United Kingdom

4:15 PM **1152** *Development of Phase Contrast Scanning Transmission Electron Microscopy and its Application*; H Minoda, T Tamai; Tokyo University of Agriculture and Technology, Japan; H Iijima, K Yukihito; JEOL Ltd. Japan

4:30 PM **1153** *High Efficiency Phase Contrast Imaging In STEM Using Fast Direct Electron Pixelated Detectors*; H Yang, L Jones; University of Oxford, United Kingdom; H Ryll; PNSensor GmbH, Germany; M Simson, H Soltau; PNDetector GmbH, Germany; Y Kondo; JEOL Ltd, Japan; T Pennycook; University of Vienna, PD Nellist; University of Oxford, United Kingdom, et al.

4:45 PM **1154** *Electron Beam Shaping*; R Shiloh, R Remez, A Arie; Tel-Aviv University, Israel

A03.3 Electron Holography for Nanofields in Solids

SESSION CHAIRS:

Hannes Lichte, Speziallabor Triebenbergl, Germany

Molly McCartney, Arizona State University

Ken Harada, Hitachi Ltd.

PLATFORM SESSION

Thursday 3:30 PM • Room: C120

3:30 PM **1155** (Invited) *A Phase Space Perspective on Electron Holography - Building Bridges Between Inline-, Off-axis Holography, Differential Phase Contrast and Diffractive Imaging*; A Lubk, F Röder, H Lichte; Technische Universität Dresden, Germany

4:00 PM **1156** *Lorentz-STEM Imaging of Fields and Domains Using a High-Speed, High-Dynamic Range Pixel Array Detector at Atomic Resolution*; KX Nguyen, RM Hovden, MW Tate, P Purohit, JT Heron, CS Chang, SM Gruner, DA Muller; Cornell University

4:15 PM **1157** *Hybrid Electron Holography*; C Ozsoy Keskinbora, CB Boothroyd; Max-Planck-Institut für Intelligente Systeme, Germany; RE Dunin Borkowski; Forschungszentrum Jülich, Germany; PA van Aken; Max-Planck-Institut für Intelligente Systeme, Germany; CT Koch; Ulm University, Germany

4:30 PM **1158** (Invited) *Interface Magnetism Studied by Electron Holography with Multiple-Biprisms*; Y Murakami; Kyushu University, Japan

A04.4 Advances in FIB: New Instrumentation and Applications in Materials and Biological Sciences

SESSION CHAIRS:

Keana Scott; National Institute of Standards and Technology

Lucille A. Giannuzzi; EXpressLO LLC

Srinivas Subramaniam; Intel Corporation

PLATFORM SESSION

Thursday 3:30 PM • Room: B117

3:30 PM **1159** (Invited) *A Cryo-FIB Lift-Out Procedure for Cryo-TEM Sample Preparation at Soft-Hard Matter Interfaces*; K Leifer; Uppsala University, Sweden

4:00 PM **1160** *Temporospatial Relationship of Lipid Droplets and Mitochondria in Cardiac Muscle by Focused Ion Beam Scanning Electron Microscopy*; T Chou, C Sztalryd-Woodle; Stevens Institute of Technology; R-C Hsia; University of Maryland, Baltimore

4:15 PM **1161** *SIMS on FIB Instruments: a Powerful Tool for High-Resolution High-Sensitivity Nano-Analytics*; T Wirtz, D Dowsett, P Philipp, J-N Audinot, S Eswara-Moorthy; Luxembourg Institute of Science and Technology

4:30 PM **1162** *Application of Focused Helium Ion Beams for Direct-write Lithography of Superconducting Electronics*; SA Cybart, EY Cho, BH Wehlin, MK Ma, TJ Wong, RC Dynes; University of California San Diego; C Huynh; Carl Zeiss Microscope, LLC

A05.7 Fast and Ultrafast Imaging with Electrons and Photons

SESSION CHAIRS:

David Flannigan, University of Minnesota,

Hermann Durr, Stanford University and

Joanna Atkin, University of Colorado

PLATFORM SESSION

Thursday 3:30 PM • Room: A105

3:30 PM **1163** *Materials Processes Observed Using Dynamical Environmental TEM at University of Illinois*; J-M Zuo, A Yoon, W Gao, J Wu, H Park; University of Illinois

Thursday, August 6

Scientific Program

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—THURSDAY AFTERNOON *continued*

- 4:00 PM **1164** *Strain Mapping During In Situ Deformation Using a High-Speed Electron Detector*; C Gammer, J Kacher, J Ciston; Lawrence Berkeley National Laboratory; C Czarnik Gatan, Inc.; OL Warren; Hysitron, Inc.; AM Minor; Lawrence Berkeley National Laboratory
- 4:30 PM **1165** *Characterization of Laser Ablation Dynamics for Nickel Thin Films on Silicon Using Movie Mode Dynamic TEM*; S Hihath, M Santala; University of California Davis; G Campbell; Lawrence Livermore National Laboratory; K van Benthem; University of California Davis
- 4:45 PM **1166** *Compression Algorithm Analysis of In Situ (S) TEM Video: Towards Automatic Event Detection and Characterization*; JR Teuton, RL Griswold, BL Mehdi, ND Browning; Pacific Northwest National Laboratory

A06.8 Advanced Analytical TEM/STEM

SESSION CHAIRS:

Paul Kotula, Sandia National Laboratories
Masashi Watanabe, Lehigh University
Gerald Kothlietner, Graz University of Technology, Germany

PLATFORM SESSION

Thursday 3:30 PM • Room: A106

- 3:30 PM **1167** *A New Discrete Tomographic Reconstruction Method for Electron Tomography*; I Arslan, T Sanders; Pacific Northwest National Laboratory; P Binev; University of South Carolina; B Gates; University of California, Davis; A Katz; University of California, Berkeley
- 3:45 PM **1168** *Challenges and Opportunities in 3D Tri-gate Transistor Characterization*; J Zhang, L Pan; Intel Corporation; AA Herzing; National Institute of Standards and Technology; R Twesten, P Longo; Gatan Inc. N Franco, K Johnson, Z Ma; Intel Corporation
- 4:00 PM **1169** *Robust Physical Alignment Models for Electron Tomography*; T Sanders, M Prange, P Binev; University of South Carolina; C Akatay; UOP LLC, a Honeywell Company; I Arslan; Pacific Northwest National Laboratory
- 4:15 PM **1170** **M&M 2015 Student Awardee** *Reconstruction Strategies for Combined Tilt- and Focal Series Scanning Transmission Electron Microscopy*; T Dahmen, H Kohr, P Slusallek; German Research Center for Artificial Intelligence GmbH, Gernany; N de Jonge; INM Leibniz Institute for New Materials, Germany

4:30 PM **1171** *STEM-HAADF and Super-X™ XEDS Tomographic Reconstruction of Complex Nano-scale Precipitates in a High Entropy Alloy, $\text{IMo}_{0.5}\text{NbTa}_{0.5}\text{TiZr}$* ; JKJensen, JM Sosa, DE Huber, GB Viswanathan, RE Williams, HL Fraser; The Ohio State University

4:45 PM **1172** *Linear Chemically Sensitive Electron Tomography Using DualEELS and Compressed Sensing*; A Al Afeef, W Cockshitt; University of Glasgow, United Kingdom; P Barges, I Zuazo; ArcelorMittal Maizières Research, France; J Bobynko, AJ Craven, I MacLaren; University of Glasgow, United Kingdom

A07.4 Scanning Probe Microscopy: New Methods and Applications

SESSION CHAIR:

Rene Overney; University of Washington

PLATFORM SESSION

Thursday 3:30 PM • Room: B118

- 3:30 PM **1173** *In Situ AFM and SEM Investigation of Slip Steps Evolving During Nanoindentation*; M Cordill, J Kreith; Erich Schmid Institute of Materials Science, Austria; G Fantner; École Polytechnique Fédérale de Lausanne, Switzerland
- 3:45 PM **1174** *Deep Data Analysis of Atomic Level Structure-Property Relationship in an Iron Superconductor $\text{Fe}_{1.5}\text{Te}_{0.75}\text{Se}_{0.25}$* ; A Gianfrancesco, A Belianinov; University of Tennessee; S Kalinin, S Jesse; Oak Ridge National Laboratory
- 4:00 PM **1175** *Nanoscale Photocurrent Microscopy for Thin Film Solar Cells Using Focused Electron Beam and Near-Field Optical Excitations*; H Yoon, Y Yoon, P Haney, S An, J Schumacher, K Siebein, A Myers, N Zhitennev; National Institute of Standards and Technology
- 4:15 PM **1176** *Faster Time-Resolved Electrostatic Force Microscopy*; DU Karatay, JS Harrison, M Glaz, PA Cox, DS Ginger; University of Washington
- 4:30 PM **1177** *Correlative Nanoscopy: Super Resolved Fluorescence and Atomic Force Microscopy Towards Nanoscale Manipulation and Multimodal Investigations*; A Diaspro, J Varghese Chacko, F Cella Zanacchi, R Oropesa, S Dante, C Canale; Istituto Italiano di Tecnologia, Italy

A08.6 Advances in Qualitative and Quantitative X-ray Microanalysis: From Detectors to Techniques

SESSION CHAIRS:

Nicholas Ritchie, National Institute of Standards and Technology
Paul Carpenter, Washington University
Phillipe Pinard, RWTH Aachen University, Germany

PLATFORM SESSION

Thursday 3:30 PM • Room: B115

- 3:30 PM **1178** (Invited) *Nanomineralogy of Meteorites by Advanced Electron Microscopy: Discovering New Minerals and New Materials from the Early Solar System*; C Ma; California Institute of Technology
- 4:00 PM **1179** *Soft X-Ray Emission Spectroscopy on Chemical States of 3D-Transition Metal Elements with SEM*; M Terauchi, H Takahashi; Tohoku University, Japan; T Murano; JEOL Ltd, Japan; T Imazono, M Koike; Japan Atomic Energy Agency; T Nagano, M Koeda; Shimadzu Corp., Japan
- 4:15 PM **1180** *Direct and Indirect Observation of Lithium in a Scanning Electron Microscope; Not Only on Pure Li!*; P Hovington, M Lagacé; Hydro-Quebec; E Principe; Tescan USA; S Burgess; Oxford Instruments NanoAnalysis, United Kingdom; A Guerfi; Hydro-Quebec, Canada; H Demers; McGill University, Canada; K Zaghib; Hydro-Quebec, Canada; R Gauvin; McGill University
- 4:30 PM **1181** (Invited) *High Spatial Resolution Quantification X-ray Microanalysis in a Field Emission Scanning Electron Microscope with an Annular Silicon Drift Detector*; H Demers, N Brodusch; McGill University, Canada; P Woo; Hitachi High-Technologies Canada Inc. R Gauvin; McGill University, Canada

A09.5 Advances in Combining Simulation and Experiment for Materials Design

SESSION CHAIRS:

Paul Voyles, University of Wisconsin, Madison
Gianluigi Botton, McMaster University, Canada

PLATFORM SESSION

Thursday 3:30 PM • Room: B119

- 3:30 PM **1182** (Invited) *Mapping Electronic Orbitals in Real Space*; S Löffler; McMaster University, Canada
- 4:00 PM **1183** *Excitonic Calculations of ELNES: Low Energy and High Energy Spectra*; K Tomita, T Mizoguchi; University of Tokyo, Japan

- 4:15 PM **1184** *Probing Bonding Environments in Osmium-Based Double Perovskites Using Monochromated Dual Electron-Energy Loss Spectroscopy*; BD Esser, MR Ball, RC Morrow; The Ohio State University; AE Goode; Imperial College London, United Kingdom; RE Williams, PM Woodward, WE Windl, DW McComb; The Ohio State University
- 4:30 PM **1185** *Analytical Method for Thickness and Wrinkling Measurements of 2D Zeolites*; P Kumar, VK Agrawal, M Tsapatsis, AK Mkhoyan; University of Minnesota
- 4:45 PM **1186** *Determination of Surface Topography from Laser Ablation Using EBSD*; PG Callahan, MP Echlin, TM Pollock; University of California, Santa Barbara; M DeGraef; Carnegie Mellon University

A10.6 Advances in Electron Diffraction and Automated Mapping Techniques

SESSION CHAIR:

Jörg Wiezorek; University of Pittsburgh

PLATFORM SESSION

Thursday 3:30 PM • Room: B112

- 3:30 PM **1187** (Invited) *Comparison in 3D of Experiments on, and Simulations of Plastic Deformation of Polycrystals*; AD Rollett, R Pokharel; Carnegie Mellon University; RA Lebensohn; Los Alamos National Laboratory; RM Suter; Carnegie Mellon University
- 4:00 PM **1188** *Improved EBSD Map Fidelity through Re-indexing of Neighbor Averaged Patterns*; SI Wright, MM Nowell, LP Lindeman, P Camus; EDAX Inc.
- 4:15 PM **1189** *A Novel Way for Determining Bravais Lattice using a Single Electron Backscatter Diffraction Pattern*; L Li, M Han; Fujian University of Technology, Japan
- 4:30 PM **1190** *Tackling Characterization Challenges in High Deformation/Stress Steel Alloys Using Transmission Kikuchi Diffraction (TKD)*; A Avishai, AH Heuer; Case Western Reserve University; S Sitzman; Oxford Instruments America, Inc. K Abassi, D Wang; Case Western Reserve University; V Bedekar, D Wu, S Hyde; The Timken Company, et al.
- 4:45 PM **1191** *Rotation Axes Analysis of Deformed Magnesium Using Electron Backscatter Diffraction and Rotation Contour Contrast Reconstruction*; S Kaboli, H Demers, R Gauvin; McGill University, Canada

Scientific Program

A

ADVANCES IN INSTRUMENTATION SYMPOSIA—THURSDAY AFTERNOON *continued*

A14.5 Surface Plasmons, Cathodoluminescence, and Low-Loss EELS

SESSION CHAIRS:

David McComb, Ohio State University
Ritesh Sachan, Oak Ridge National Laboratory
Robert Williams, Ohio State University
Gerd Duscher, University of Tennessee

PLATFORM SESSION

Thursday 3:30 PM • Room: D137

- 3:30 PM **1192** (Invited) *Ferroplasmons: Novel Plasmons in Metal-ferromagnetic Bimetallic Nanostructures*; J Ge, A Malasi; The University of Tennessee; N Passarelli, LA Pérez; Instituto de Investigaciones en Fisico-química de Córdoba, Argentina; E Coronado; The University of Tennessee, Knoxville; R Sachan; Oak Ridge National Labs; G Duscher; The University of Tennessee, R Kalyanaraman; The University of Tennessee, Knoxville
- 4:00 PM **1193** *Electron impact investigation of Hybridization Schemes in Coupled Split-Ring Resonators*; Q Liang, Y Wen; Max Planck Institute for Intelligent Systems, Germany; T Reindl; Max Planck Institute for Solid State Research, Germany; N Talebi, PA van Aken; Max Planck Institute for Intelligent Systems, Germany
- 4:15 PM **1194** *Visualizing Plasmonic Coupling in Metamaterials and Applying Angular Resolved EELS*; F von Cube, J Niegemann, DC Bell; Harvard University; S Irsen; Max Planck Gesellschaft, Germany; S Linden; Universität Bonn, Germany
- 4:30 PM **1195** *Edge Modes of Surface Plasmon Nanodisk Antennas Visualized in 3-Photon PEEM*; RC Word, R Könenkamp; Portland State University
- 4:45 PM **1196** *Direct Observation of Plasmonic Enhancement of Emission in Ag-Nanoparticle-Decorated ZnO Nanostructures*; JA Hachtel, DC Mayo, CE Marvinney; Vanderbilt University; R Mu; Fisk University; SJ Pennycook; National University of Singapore; MF Chisholm; Oak Ridge National Laboratory; RF Haglund, ST Pantelides; Vanderbilt University, et al.

A17.3 Standardization and Metrology in Electron Microscopy and Microbeam Analysis

SESSION CHAIRS:

Dan V. Hodoroaba, BAM Federal Institute for Materials Research and Testing, Germany
Ryna B. Marinenko, National Institute of Standards and Technology
M. Matthews, Atomic Weapons Establishment, United Kingdom

PLATFORM SESSION

Thursday 3:30 PM • Room: B114

- 3:30 PM **1201** (Invited) *Standardization on Particle Size Distribution Measurement of Nanomaterials*; K Yamamoto; National Institute of Advanced Industrial Science and Technology, Japan
- 4:00 PM **1202** *Shape Recognition of Nanoparticles by High-Resolution SEM and TSEM*; E Ortel, L Pellutiè; BAM Federal Institute for Materials Research and Testing, Germany; F Pellegrino, V Maurino; University of Turin Italy; J Mielke, I Häusler, W Österle, V-D Hodoroaba; BAM Federal Institute for Materials Research and Testing Germany, et al.
- 4:15 PM **1203** *Assessment of Different Electron Microscopy Techniques for Particle Size Quantification of Potential Nanomaterials*; P Müller, J Mielke; BASF SE; V-D Hodoroaba; BAM Federal Institute for Materials Research and Testing; R Kägi; EAWAG Aquatic Research, Switzerland; M Ryner; Vironova AB, Sweden
- 4:30 PM **1204** *Three Dimensional Accurate Morphology Measurements of Polystyrene Standard Particles on Silicon Substrate by Electron Tomography*; M Hayashida, K Kumagai, M Malac; National Institute for Nanotechnology, Japan
- 4:45 PM **1205** *Repeatable and Transferable Processing for Electron Tomography: An Open Platform for Visualization and Reconstruction of 3D Materials*; R Hovden, MD Hanwell; Cornell University; U Ayachit; Kitware Inc. Y Jiang; Cornell University; M Kitware Inc., D Muller; Cornell University

P02.6 Materials Problem Solving with Aberration-Corrected EM

SESSION CHAIRS:

David Smith, Arizona State University

Ping Lu, Sandia National Laboratories

PLATFORM SESSION

Thursday 3:30 PM • Room: C124

- 3:30 PM **1206** (Invited) *Revealing New Atomic-scale Information about Materials by Improving the Quality and Quantifiability of Aberration-corrected STEM Data*; AB Yankovich, J Feng, A Kvit; University of Wisconsin, Madison; T Slater, S Haigh; University of Manchester, United Kingdom; D Morgan, PM Voyles; University of Wisconsin, Madison
- 4:00 PM **1207** *Opportunities in Angularly Resolved Dark-field STEM Using Pixelated Detectors*; L Jones, H Yang, KE MacArthur; University of Oxford, United Kingdom; H Ryll; PNSensor GmbH, Germany; M Simson, H Soltan; PNDetector GmbH; Y Kondo; JEOL Ltd. Japan, PD Nellist; University of Oxford, United Kingdom
- 4:15 PM **1208** *Increased Fluctuation of Interatomic Distances in Distorted Structure of Stoichiometric LaMnO_3* ; AV Kvit, J Feng, Madison, AB Yankovich, D Morgan, P Voyles; University of Wisconsin, Madison
- 4:30 PM **1209** *Maximizing Information from Aberration-Corrected STEM Images: Applications to Plasmonic, Semiconductor and Battery Materials*; Y Zhu, H Katz-Boon, C Zheng, M Walsh; Monash University, Australia; C Dwyer; Forschungszentrum Juelich, Germany; LN Bourgeois; Monash University, Australia; R Withers; Australian National University, J Etheridge; Monash University, Australia
- 4:45 PM **1210** *Direct Observation of Interfacial Au Atoms Using STEM Depth Sectioning*; W Gao, S Sivaramakrishnan, J Wen, J-M Zuo; University of Illinois, Urbana-Champaign

P07.7 Metallography and Microstructural Characterization of Metals

SESSION CHAIRS:

James E. Martinez, NASA Johnson Space Center

George Vander Voort, Vander Voort Consulting

PLATFORM SESSION

Thursday 3:30 PM • Room: C123

- 3:30 PM **1211** (Invited) *3D Multiscale Characterization of Discontinuities in Underwater Wet Welds*; S Paciornik, LF Silva, VR dos Santos; Pontificia Universidade Católica do Rio de Janeiro, Brazil; N Chawla; Arizona State University; T Bernthaler, G Schneider; Aalen University, Germany
- 4:00 PM **1212** *EBSDF Texture Analysis as a Measure of Local Flow in Friction Stir Welding*; D Rowenhorst, K Knippling, R Fonda; The US Naval Research Laboratory
- 4:15 PM **1213** *EBSDF Characterization of Microstructural Variations in Solid-State Welds as a Function of Distance from the Weld Interface in Ti-17*; J Orsborn, TF Broderick, H Fraser; The Ohio State University
- 4:30 PM **1214** *Optimization and Characterization of a Niobium-Platinum Resistance Spot Weld Using Scanning Transmission Electron Microscopy and Micropillar Compression Testing*; D Sorensen, E Rosario, J Heffelfinger; Medtronic plc; JS Jeong, J Myers; University of Minnesota; J Lippold, A Ramirez; Ohio State University
- 4:45 PM **1215** *Metallography of Robonaut 2 Battery Spot Welds*; JE Martinez, S Yayathi, J Figuered, Z Bilc; NASA Johnson Space Center

Scientific Program

P

PHYSICAL SCIENCES SYMPOSIA THURSDAY AFTERNOON

P11.10 Advances in Transmission Electron Microscopy and Spectroscopy of Energy-Related Materials

SESSION CHAIRS:

Chongmin Wang, Pacific Northwest National Laboratory
Raymond Unocic, Oak Ridge National Laboratory
Arda Genc, FEI Company

PLATFORM SESSION

Thursday 3:30 PM • Room: B113

- 3:30 PM **1216** (Invited) *Phase Transformations and Surface/Interface Properties in Functional Perovskites with Aberration-Corrected STEM/EELS*; JH Jang, R Mishra; Oak Ridge National Laboratory; Y-M Kim; Korea Basic Science Institute; Q He, AY Borisevich; Oak Ridge National Laboratory
- 4:00 PM **1217** *In Situ Liquid Cell TEM Studies of Electrochemical Reactions in Lithium-Ion Batteries*; W Zhang, DH Alsem; Brookhaven National Lab; N Salmon; Hummingbird Scientific; F Wang; Brookhaven National Lab
- 4:15 PM **1218** *Controlled Electrochemical Li Cycling in a TEM to Observe Li Morphology Evolution*; KL Jungjohann, KL Harrison, AJ Leenheer, NT Hahn, KR Zavadil; Sandia National Laboratories
- 4:30 PM **1219 M&M 2015 Student Awardee** *Estimation of Nanoscale Current Density Distributions During Electrodeposition*; NM Schneider, JH Park; University of Pennsylvania; S Kodambaka; University of California Los Angeles; H Bau; University of Pennsylvania; F Ross; IBM T J Watson Research Center
- 4:45 PM **1220** *In Situ Electrochemical TEM for Quantitative Nanoscale Imaging Dynamics of Solid Electrolyte Interphase and Lithium Electrodeposition*; RL Sacci, JM Black, N Balke, NJ Dudney, KL More, RR Unocic; Oak Ridge National Laboratory

P12.3 Advanced Microanalysis and Microscopy of Soft and Hybrid Nanomaterials

SESSION CHAIRS:

Jihua Chen, Oak Ridge National Laboratory and
Honggang Cui, John Hopkins University

PLATFORM SESSION

Thursday 3:30 PM • Room: D140

- 3:30 PM **1221** (Invited) *Understanding the Role of Additives in Improving the Performance of Bulk Heterojunction Organic Solar Cells*; W Chen, SB Darling; Argonne National Laboratory
- 4:00 PM **1222** *Low Dose Electron Microscopy of ZnS-Bipy Based Hybrid Organic-Inorganic Materials for Energy Applications.*; HA Calderon, S Ramirez-Grave; Instituto Politecnico Nacional, Mexico; A Galano; UAM-Iztapalapa, Mexico; C Kisielowski; Lawrence Berkeley National Laboratory; R Gomez; UAM-Iztapalapa, Mexico
- 4:15 PM **1223** *Quantification of the Critical Dose for Radiation Damage to Perfluorosulfonic Acid Membranes Using Soft X-Ray Microscopy*; L Melo, G Botton, A Hitchcock; McMaster University, Canada
- 4:30 PM **1224** *Observing the Self-Assembly of Metal-Organic Frameworks by In Situ Liquid Cell TEM*; J Patterson, P Abellan, MS Denny; University of California, San Diego; C Park; Florida State University; ND Browning; Pacific Northwest National Laboratory; SM Cohen; University of California, San Diego; JE Evans; Pacific Northwest National Laboratory; NC Gianneschi; University of California, San Diego

Author Index

Name, Presentation

- Aabdin, Z 130,131,136
 Aarons, J 1100
 Abakumov, AM 567
 Abassi, K 1190
 Abbott, J 1004
 Abdeljawad, FF 729
 Abe, Y 788
 Abellan, P 793,1064,1224
 Abou-Ras, D 1141
 Abraham, DP 775
 Abruna, HD 756
 Abuefilat, AY 998
 Ackerley, C 24, 26
 Acosta, DR 493
 Acosta, MC 519
 Adams, MW 257
 Adams, SR 1
 Adamson, J 57
 Adineh, V 994
 Aglan, H 145,882
 Agrawal, VK 1185
 Aguiar, JA 222,487,875
 Aguilar-Elguézabal, A 496
 Aguilar-Tapia, A 287
 Aguilar, A 490
 Aguilar, C 155,517,524,525,892
 Ahlschwede, K 466
 Ahn, CH 702
 Ahn, SJ 154
 Ahn, T-Y 1063
 Ahrenkiel, P 544
 Aidhy, D 669
 Aindow, M 1140
 Aitkaliyeva, A 502
 Aitouchen, A 930
 Aizawa, S 986
 Aizpurua, J 710
 Akase, Z 986
 Akashi, T 800,934,1076
 Akatay, C 323,1169
 Akbar, S 630
 Aksyuk, A 364
 Al Afeef, A 1172
 Al Hasan, N 1064
 Al-Jassim, M 22
 AlAfeef, A 455
 Albanesi, JP 37
 Alberto, MA 143
 Alducin, D 473,480
 Alem, N 219
 Alexander, CM 1134
 Alexander, JA 735,737
 Alexander, S 982
 Alfonso, C 633
 Alfonso, I 524,525
 Allard, LF 50
 Allaz, JM 1011
 Allen, CS 375
 Allen, F 59
 Allen, LJ
 412,541,548,762,944,1124,1127
 Allen, TD 27
 Allen, TR 378
 Allsopp, D 1110
 Aloni, S 334,955,1069,1113
 Alsem, DH 489,1217
 Altartouri, B 102
 Alvarado-Rivera, J 519
 Alvarez-Contreras, L 496
 Álvarez-Ramos, ME 904
 Alvarez, ME 887
 Aman, R 232
 Ambrogio, M 1033
 Ambrose, C 440
 Amine, K 772
 Amos, CD 690
 An, R 4
 An, S 1175
 Anand, U 130,136
 Anderson-Okonkwo, O 492
 Anderson, A 320
 Anderson, I 674
 Anderson, JR 1120
 Anderson, KL 644
 Anderson, KR 377
 Anderson, PM 306
 Anderson, SR 117
 Andersson, M 460
 Anderton, CR 1118
 Andreev, G 938
 Andrei, C 401
 Andrejevic, N 402
 Angeles-Chavez, C 151
 Angert, I 81
 Anjum, DH 92,536
 Ankem, S 184
 Anna, C 265
 Antolin, N 248
 Aoki, J 1117
 Aoki, T
 331,333,491,655,738,953,
 954,962,963,1040,1070
 Aoyama, Y 804
 Appel, CC 212
 Apperley, MH 265
 Apple, ME 357
 Aragón, MC 156
 Arai, M 462
 Arai, S 499
 Arami, H 485
 Archibald, RK 933
 Arellano-Jimenez, MJ 152,160
 Arey, BW 1002
 Argentero, G 501,575
 Arie, A 1154
 Ariotti, N 268
 Arlinghaus, H 717
 Armbruster, B 76
 Armstrong, JT 724
 Aronova, MA 192,636
 Aronova, MM 646
 Arredondo, M 137
 Arslan, I 1064,1167,1169
 Asahina, S 14,819
 Asano, S 919
 Asayesh-Ardakani, H
 498,688,911
 Asenath-Smith, E 1147
 Asensio, J 1135
 Asif, S 510
 Atkinson, B 435,436
 Audinot, J-N 1161
 Aufderheide, A 919
 Ault, JG 443
 Auzelle, T 629
 Avallone, JT 580
 Avishai, A 832,1190
 Avishai, N 419
 Awazu, K 1031,1117
 Ayachit, U 1205
 Ayoola, HO 829
 Azizi, A 219
 Azough, F 679
 Baba-kishi, K 610
 Baba, K 886
 Bachhav, M 169,293,660
 Backman, V 94,204
 Badrak, RP 878
 Baek, DJ 570
 Baer, B 44
 Bageshwar, S 101
 Bagot, PA 350,670
 Bahena, D 417
 Bai, X 378,958
 Baik, S-I 183
 Baiutti, F 1126
 Bajaj, D 309
 Bajaj, P 161,309
 Bajcsy, P 46
 Baker, A 99
 Baker, BW 380
 Baker, E 99
 Baker, I 1050
 Baker, ML 273,274
 Baker, MR 274
 Balakrishnan, V 1165
 Balan, A 579
 Balboni, R 13,253,336
 Balbuena, PB 288
 Baldenebro-Lopez, FJ
 521,1061,1062
 Baldenebro-Lopez, JA
 1061,1062
 Baldo, PM 220
 Baldwin, CA 376
 Baldwin, PR 273
 Balestrino, G 250
 Balke, N 1220
 Ball, MR 1184
 Ballesteros, S 158
 Bals, S 567
 Bammes, B 173,458,977
 Ban, C 162
 Banerjee, S 498
 Bangert, U 374
 Bannister, ME 379
 Bao, J 423,425
 Bao, X 1129
 Baranov, A 964
 Baranowski, JM 16
 Barbi, NC 420
 Bareno, J 775
 Barges, P 1172
 Barkay, Z 98
 Barker, I 428
 Barki, KG 104
 Barnabas, AD 744
 Barnum, A 178,576
 Barroo, C 430,795
 Bartak, T 704
 Barthel, J 979
 Bartlett, B 169
 Bartrand, J 259
 Barwick, B 407
 Barylko, B 37
 Basak, AK 1081
 Baskut, S 153
 Bassim, ND 171,715,1052
 Batson, P 710
 Baturina, O 969
 Baty, G 242,1071
 Bau, H 1219
 Bauer, F 673
 Baumann, FH 545
 Baumeister, W 561,697,698,919
 Bavoil, PM 40
 Baxa, U 117
 Bayer, B 575
 Bayes, M 68
 Bayu Aji, LB 929
 Bazán-Díaz, LS 417
 Bazylnski, D 751
 Beanland, R 610
 Beato, P 212
 Beck, F 919
 Becker, D 113
 Becker, SF 1112
 Bedekar, V 1190
 Bedewy, M 1165
 Bedworth, P 291
 Beecher, S 747
 Beer, GA 898
 Begg, C 264

Author Index

Name, Presentation

- Behler, KD 159
 Behr, M 239
 Behzad, AR 92
 Beifuss, K 101
 Béjar Gómez, L 892
 Béjar, L 155,517,524,525,881
 Bele, M 774
 Beleggia, M 695
 Belianinov, A 805,933,1103,1174
 Belikov, S 1093
 Bell, DC 430,665,1194
 Bellido, EP 1115
 Bencan, A 394
 Bendersky, LA 71,74
 Benia, HM 1030
 Benmeradi, N 363
 Bennett, BR 839
 Bentley, J 681,874
 Benzing, JT 874
 Beranek, J 354
 Berard, VF 870
 Berber, MR 1142
 Berger, BW 870
 Berger, C 81,558
 Berger, EL 767,1133
 Bernal-Ponce, JL 149,892
 Bernal, JL 155,517,881
 Bernard, L 717
 Bernatova, S 93,95
 Berndt, J 1012
 Bernier, N 983,1106
 Bernsen, S 1013
 Bernthaler, T 1211
 Berry, J 487
 Berry, K 1004
 Bertali, G 233,235
 Berzinis, A 161
 Besser, M 831
 Betancourt, I 987
 Beyer, A 481,1042
 Beyer, DE 595
 Beyerlein, IJ 580
 Bhan, A 532
 Bharathi, KK 74
 Bhattarai, N 478
 Bhowmick, S 251,251,510,588
 Bhowmik, P 809
 Bicket, IC 1115
 Bigelow, N 956
 Bigelow, WC 50
 Bilc, Z 1215
 Bilhorn, R 173,458
 Binev, P 1167,1169
 Birch, EM 1145
 Bird, MJ 380
 Bischak, CG 1113
 Bishop, AI 339
 Bishop, CM 228
 Biswas, M 308
 Bittner, DR 187
 Black, JM 1220
 Blackburn, AM 252
 Blank, H 209
 Blanton, J 79
 Blanton, T 79
 Blattner, T 46
 Blavette, D 19,262,347
 Bleckert, A 640
 Bleher, R 94,204
 Blejec, A 450
 Blok, M 241
 Blom, DA 869
 Blon, T 1075
 Blubaugh, L 76
 Bluestein, BM 1034
 Bobyenko, J 1172
 Bodor, A 640
 Boese, M 558,637
 Bogachev, S 802
 Bogdan, A 315
 Bolorizadeh, M 279,824
 Bomarito, GF 227
 Bongiorno, C 716
 Bonifacio, CS 321,535,829
 Bonnilla, FJ 1075
 Boopalachandran, P 366
 Boothroyd, CB 979,1157
 Borisenko, KB 375
 Borisevich, A 805,1103
 Borisevich, AY 565,612,933
 Borjas García, SE 892
 Borjas, S 155,517,881
 Börrnert, F 51
 Bosman, M 1111
 Botton, GA
 335,401,476,534,1066,1115,
 1125,1223
 Bouchard, P 592
 Bouchet-Marquis, C 271
 Bouman, CA 782
 Bourgeois, LN 1209
 Bourrellier, R 629,845
 Boutet, S 926
 Bouzy, E 552
 Bowden, M 320
 Bowers, ML 1130
 Bowling, A 366
 Bowman, WJ 247,865,954
 Boyce, B 180
 Boyce, BL 583
 Boyd, A 44
 Boyd, RW 253,336,340
 Boyer, RR 300
 Boyes, ED 48,368
 Bradley, SA 323
 Brantner, CA 186,439,463
 Brasier, M 1047
 Breen, K 1013
 Brémier, S 1012
 Bremmer, GM 403
 Brett, D 225
 Brewer, LN 380,1025
 Brey, P 272,641
 Brink, J 867
 Brintlinger, TH 969
 Brittain, D 80,640
 Britton, B 1024
 Britton, TB 947
 Broderick, S 23
 Broderick, SR 350
 Broderick, TF 1213
 Brodusch, N 341,355,1017,1181
 Brorson, M 212
 Brostoff, LB 582
 Brower-Thomas, T 665
 Brown, A 200,778
 Brown, MR 778
 Browning, N 259
 Browning, ND 485,728,733,793,
 960,1064, 1166,1224
 Brownlee, D 766,768
 Bruemmer, SM 589
 Bruinen, A 1119
 Bruley, J 983
 Brydson, R 200,374,778
 Buchanan, J 640
 Büchner, B 51
 Buckett, MI 315,397
 Bucko, M 850
 Budiansky, ND 224
 Buechele, AC 582
 Bufford, DC 509
 Bugnet, M 335,1066,1125
 Buijsse, B 697,920
 Bumbarger, D 640
 Burch, MJ 391
 Burcham, KE 463
 Burden, FR 100
 Burdet, P 616,1088
 Burgess, KD 765,1134
 Burgess, S 1180
 Burgess, SR 815
 Burgos Beltran, JC 288
 Burke, G 233,285
 Burke, GM 235,507
 Burke, MG 125,246,483,648
 Burnett, T 1003
 Burns, C 99
 Burton, AS 1133
 Burton, GL 349
 Bushong, E 693
 Bussmann, B 1146
 Buurma, C 1045
 Cabana, J 775
 Cable, ML 82
 Cabrini, S 1150
 Cadieux, K 316
 Cady, SL 241
 Caferra, AN 17,352
 Cagnoli, C 752
 Cairney, J 180
 Cairney, JM 661
 Calco, GN 192,646
 Calderon, HA 531,1044,1222
 Callahan, P 1109
 Callahan, PG 1186
 Camargo, PH 125
 Camden, JP 956
 Camino, F 88
 Cammer, M 442
 Campbell, C 234
 Campbell, G 734, 1165
 Campbell, GH 408,529,928,929
 Campell, GH 833
 Campos, AP 633
 Camus, P 1188
 Camus, PP 415,816
 Canale, C 1177
 Cannon, AH 227
 Canova, M 163
 Cantoni, C 250
 Cantoni, M 673
 Cantu Valle, J 987
 Cao, G 311
 Cao, J 243
 Caplan, J 691
 Caplan, JL 785
 Cappillino, PJ 543
 Carbone, F 327
 Carencio, S 321
 Cargnello, M 324
 Carin, L 793
 Carlino, V 824
 Carlson, LG 357
 Carlton, RA 97
 Carneiro, K 938
 Carnevale, S 950,1080
 Carney, CM 528
 Carpenter, P 725
 Carpenter, PK 723,942
 Carpenter, RW 331
 Carpenter, WB 50
 Carragher, B 34
 Carreño-Gallardo, C 522,523
 Carreón, H 524,525
 Carrillo, DM 496
 Carroll, J 583
 Carroll, MP 297
 Carter, CB 152,160
 Casalena, L 306
 Castellino, S 1116
 Castillo, J 519
 Castro, RH 222,833

Author Index

- Casu, A 476
Cattle, J 200
Caubet, P 262
Cavalca, F 212
Cegelski, L 470
Cella Zanacchi, F 1177
Celler, K 440
Cesar, CL 120
Cha, D-H 594
Cha, J 769
Chalal, S 1019
Chan, HM 678
Chan, M 1045
Chang, CS 1156
Chang, E 923
Chang, IY 190,749,917
Chang, P-H 312
Chang, SL 979
Chang, W-H 1074
Chang, W-T 422
Chang, Y-J 755
Chang, Y-W 590
Channagiri, SA 163
Chapman, M 1021,1109
Charaï, A 633
Chatzidakis, M 1125
Chawla, N 66,675,1211
Chee, SW 135,897
Chen-Weigart, K 284
Chen, B-C 360
Chen, C-C 763
Chen, D 997
Chen, G 966
Chen, H 113
Chen, J 284,912,912
Chen, JC 100
chen, L 148
Chen, L 362,416
Chen, M 273
Chen, P-Y 900
Chen, S 441
Chen, W 1221
Chen, W-T 307
Chen, X 306,366,1033
Chen, Y 37,346,428,840,968
Chen, Y-Y 900
Chen, Z 242,412,541,1071
Cheng, H-YM 929
Cheng, K 985
Cheng, N 275,364,645
Cheng, S 398
Cheng, S-L 900
Cheng, X 393
Cheng, Y 599
Cher, KK 161.1
Chernova, N 167
Cherqui, C 956
Chess, JJ 826
Chevalier, P 347
Chew, K 118
Chi, M 50,311,612,872,933
Chiang, CN 1125
Chiaramonti, AN 207
Chigintsev, L 879
Chinchilla, LE 534
Chiou, W-A 126,147,923
Chisholm, M 371
Chisholm, MF 669,843,1026,1127,1196
Chiu, W 273,274,790,1073
Chmielewski, DJ 822
Cho, EY 1000,1162
Cho, J-Y 809
Cho, W 846
Cho, Y-K 154
Choi, M 64
Choi, P-P 182
Choi, S-Y 64
Chorkendorff, I 211
Chou, T 1160
Chou, Y-C 754
Chouinard, J 1098
Chrisler, W 745
Christen, H 656
Christensen, KA 212
Christensen, TA 109,280
Christie, D 385
Chu, I-W 916
Chu, L-W 112
Chu, P-W 169
Chu, RK 1118
Chueh, WC 530
Chun, C 745
Cirjak, L 591
Ciston, J 550,1164
Cizmar, T 863
Clark, BG 583
Clark, JN 1084
Clark, T 705
Clarke, AJ 236,1137
Clarke, B 180
Clarke, KD 1137
Clément, L 347,624
Clode, PL 746
Clogston, JD 117
Cochell, TJ 488
Cocker, TL 1083
Cockshitt, WP 1172
Cockshott, WP 455
Cody, RB 1032
Coenen, T 1027
Cohen, H 333
Cohen, MJ 261,1148
Cohen, SM 1224
Colby, R 423
Cole, J 502
Colijn, H 264
Colijn, HO 822
Coll-Llado, C 863
Colling, C 1094
Collins, CL 42,815
Collins, DM 947
Collins, SM 1114
Collinson, LM 194
Connie Tam, KP 419
Constantinides, S 674
Conticello, VP 189
Cooper, D 983,1106
Cooper, R 658
Coppens, I 270
Corbin, GJ 171
Cordes, NL 66,781
Cordill, MJ 1173
Cormier, D 232
Cornaby, SW 1004
Cornell University, M 1205
Corona, E 298
Coronado, E 1192
Corral Higuera, R 1062
Cortes-Jacome, MA 151
Cortes, VC 143
Cosandey, F 167
Costin, WL 1081
Coughlin, DR 236,306,1137
Couliard, M 806
Cover, TL 29
Cox, PA 1176
Craven, AJ 1172
Creemer, F 211
Cremons, DR 486
Cribb, B 265
Crimp, MA 303
Cristiani, G 1126
Cronin, S 334
Cronin, SB 955
Cross, NG 495
Crowe, A 169
Crozier, PA 127,247,286,322,332,333,370,738,830,865,953,954
Cruz Hernández, JC 862
Cruz-Campas, ME 1051
Cruz-Rivera, JJ 883
Csencsits, R 119
Cuadros-Lugo, E 883,1056
Cui, B 165
Cullen, D 674
Cullen, DA 291
Cumings, J 758
Cupolillo, A 215
Curtin, AE 207,857
Curtiss, LA 689
Cwajna, J 672
Cybart, SA 1000,1162
Czarnik, C 1164
Czerwinski, A 853
Czymmek, K 81,691,785
D'Alfonso, AJ 944
D'Anastasio, R 467
D'Alfonso, AJ 412,541
da Silva-Neto, ID 468
Dabrowski, P 16
Dadras, M 719
Daehn, G 874
Dagan, M 292
Dahmen, T 802,1170
Dahmen, U 550,1130
Dai, S 959
Daigle, T 640
Daio, T 852
Dalby, KN 318
Damjanovic, D 394
Danaie, M 670
Dancel-Manning, K 442
Dane, AJ 1032
Danev, R 697,698
Dankwort, T 913
Dante, S 1177
Darbal, A 247,840.1
Darling, K 180
Darling, SB 1221
Daudin, B 629
Daulton, TL 20
Dauphas, N 573
David, IN 618
Davidovic, T 780
Davis, AM 573,659
Davis, BH 1145
Davis, J 820
Davis, JM 85,396,1120
Davis, RC 1004
Davut, K 1016,1136
Day, JS 226
de Boer, JJ 1027
de Costa, N 80
De Decker, Y 795
De Gregorio, BT 765,1134
de Jong, KP 566
de Jonge, N 108,448,564,566,1170
de Knoop, L 990
De La Fuente, L 356
de la Peña, F 616
De Moor, E 3,1137
Dearborn, AD 645
Deerinck, TJ 693
DeGraef, M 626,811,1021,1022,1108,1109,1186
Dehm, G 1041
Deibler, LA 298
Deisseroth, K 361
Deitz, J 950,1080
Delby, N 715
Dellby, N 171,333

Author Index

Name, Presentation

- Demers, H
2,341,355,1017,1180,1181,1191
- Demkov, A 655,657,1040
- Demmert, AC 281
- Demortiere, A 772
- Dempere, LA 157
- Den Hertog, M 794
- Deng, B 104
- Deng, Y 442
- Dennies, DP 65
- Dennis, SG 313
- Denny, MS 1224
- Deog Yoo, H 531
- Derocher, KA 261
- DeRose, G 790
- Deschout, H 814
- Devaraj, A 345,423,425
- Dey, S 222
- Dhall, R 334,955
- Dhar, S 770
- Dhuey, S 1113
- Di Castro, D 250
- Di Fabrizio, E 752
- Dial, L 1139
- Dianoux, R 717
- Diaspro, A 1177
- Dicken, Q 259
- Dickey, A 750
- Dickey, E 677
- Dickey, EC 307,391
- DiDomizio, R 1139
- Diebold, KJ 199
- Dieing, T 1096
- Diercks, DR 22,263,349,658
- Dilmieva, E 880
- Dingley, DJ 951
- Dingreville, R 58,509
- DiOrio, J 33
- Ditto, J 666,913
- Dobashi, T 18
- Doering, V 562
- Dohnalkova, A 434,745
- Dokland, T 451
- Dominici, C 633
- Dona, P 211
- Dong, Y 660
- Donovan, J 1098
- Donovan, JJ 724
- Doolittle, AW 842
- Doris, B 985
- Dorvel, B 366
- dos Reis, R 550
- dos Santos, VR 1211
- Douglas, J 925
- Downing, KH 119
- Dowsett, D 7,931,1161
- Dozier, AK 1145
- Dravid, V 204,600
- Dravid, VP 94,907
- Drazic, G 394,774
- Dresselhaus, PD 924
- Dries, M 789,792
- Drifka, C 45
- Drndić, M 579
- Drummy, LF 735,737,782,908
- Duan, S 866
- Dubyk, S 574
- Ducati, C 616
- Duchamp, M 1114
- DuChene, JS 121
- Dudney, NJ 1220
- Dugard, CK 191
- Dugne, O 1010
- Dukes, MJ 651
- Dulal, P 837
- Dumas, P 744
- Dumpala, S 23,350
- Duncan, H 966
- Dunin-Borkowski, RE 701,794, 979,1157
- Dunlap, JR 841
- Dunn, A 58
- Dunn, SE 257
- Durstock, MF 735,737
- Duschek, L 481
- Duscher, G
495,828,841,956,1192
- Dusevich, VM 96
- Dutkiewicz, J 682
- Dworkin, JP 1133
- Dwyer, C 620,979,1209
- Dyar, MD 765
- Dycus, JH 547,548,1124
- Dynes, RC 1000,1162
- Earl, JC 618
- Eastman, M 891
- Eastwood, SA 339
- Eaton, A 184
- Eberle, A-L 351
- Eberth, JF 312
- Ebihara, T 114,447,753
- Ebner, J 642
- Echenique, P 710
- Echlin, MP 925,1023,1186
- Echternkamp, K 604
- Ecke, M 698
- Edalati, K 893
- Edelmann, M 81
- Eder, F 501
- Edgcombe, CJ 1151
- Edmondson, P 292
- Edmondson, PD 379,504,670
- Edström, A 982
- Edwards, D 279
- Edwards, DC 343,1032
- Edwards, DJ 512,553,733
- Edwards, DN 755
- Edwards, DT 810
- Egaas, B 22
- Egerton, RF
176,332,695,777,1122
- Eggeman, AS 623
- Eggert, F 415
- Ehrnsten, U 377
- Eichfeld, S 52
- Einsle, JF 1075,1132
- Eisebitt, S 244
- Eisele, M 1083
- Ekerdt, J 657
- El Gabaly, F 909
- El Hajraoui, K 794
- El-Atwani, O 221
- El-Azab, A 378
- Elam, JW 308
- Eliceiri, K 45
- Elkjær, CF 211
- Elkoca, O 1136
- Elli, A 691
- Elli, AF 785
- Ellis, D 387
- Ellis, EA 101,601
- Ellis, S 1119
- Ellisman, M 693
- Ellisman, MH 1
- Elser, V 402
- Elsila, JE 1133
- Endo, N 414
- Eng, G 1071
- Engel, BD 561
- Engelman, A 275
- Epler, CR 460
- Ercius, P 550,763
- Ercolani, D 1083
- Erdman, N 343,449,588,1032
- Erickson, KJ 578
- Ericson, ME 120
- Escher, C 256
- Esmacher, M 140
- Esmann, M 1112
- Espanol, M 771
- Esparza-Ponce, HE 904
- Esparza, HE 156
- Espinosa-Magaña, F
490,541,515,518
- Esquivel, J 585
- Esser, BD 248,615,1104,1184
- Essers, E 558
- Estivill, R 262,347
- Estrada-Guel, I
310,492,522,523,883,1056
- Estrine, EC 837
- Estroff, LA 1147
- Eswara-Moorthy, S
7,720,931,1161
- Etacheri, V 1068
- Etheridge, J 1089,1209
- Eustaquio, T 191
- Evans, J 477
- Evans, JE 259,1064,1224
- Faitar, SL 110
- Faivre, D 751
- Fakhouri, EF 1025
- Falke, M 171,715,743,1009
- Falqui, A 476,752
- Fan, D 312
- Fan, G 274
- Fancher, CM 391
- Fang, J 148
- Fang, J 167,533
- Fang, NX 628
- Fantner, GE 814,1173
- Fattebert, J-L 236
- Faulk, JK 810
- Favret, EA 115,1059
- Fedoroyov, O 718
- Feist, A 604
- Feldman, L 770
- Feletti, L 814
- Felfer, P 180
- Felmy, AR 1002
- Feng, B 539,1143
- Feng, D 862
- Feng, J 945,1206,1208
- Fennie, CJ 654
- Fermin, C 145
- Fernback, JE 1145
- Ferranti, D 584
- Ferreira, JA 470
- Ferreira, P 730
- Ferreira, PJ 690,1142
- Ferrier, DE 863
- Feser, M 304
- Fiala, J 354
- Field, KG 504
- Field, R 834
- Figuered, J 1215
- Filip, V 185
- Findlay, SD
412,541,548,726,944,971,1124
- Finegan, D 225
- Fink, H-W 256
- Finney, L 441
- Firlar, E 751,798
- Fischer, AM 842
- Fišerová, J 27
- Fisher, G 1119
- Fisher, GL 1199
- Fitzgerald, JP 711
- Fitzpatrick, JA 257
- Flannigan, DJ 405,406,486
- Fleming, Y 720
- Flores Zavala, M 1059
- Floss, C 20,571
- Foegeding, NJ 29

Author Index

- Foiles, SM 729
Fonda, R 1212
Fontana, J 275
Forbes, N 1144
Forest, C 1199
Forman, J 224
Förster, F 919
Fournelle, J 1049
Fournelle, JH 940
Fowler, SP 142
Fox, AE 924
Frabboni, S 253,336,340,946
Frafjord, JJ 384
Franco, N 1168
Francolini, M 282,752
Frank, L 15
Fraser, H 760
Fraser, HL 90,229,248,264,546,
615,707,1091, 1171,1213
Freer, R 679
Freitag, S 290
Frenken, JW 403
Freyer, PD 233,235
Friedman, LH 949
Friedrich, RW 560
Frisz, JF 1200
Froelich, D 747
Fu, C 790,1073
Fu, J 994,998
Fu, RR 1132
Fujigaya, T 1142
Fujino, T 1117
Fukuda, T 973
Fukuda, Y 697,919
Fukunaga, K-I 414
Fukushima, Y 893
Fullerton, EE 826
Fullwood, DT 836
Fundenberger, J-J 552
Furutsu, T 800
Gaberscek, M 774
Gai, PL 48,368
Galano, A 1222
Galbert, F 855
Galindo, P 577
Gallagher, JD 1070
Gallegos-Orozco, V 1061
Gallegos, V 521
Galtier, EC 1085
Gamalski, A 284
Gambino, LV 1140
Gamble, LJ 1034
Gammer, C 1164
Gammon, LM 300
Gan, J 378,502
Gan, Z 700
Gao, F 474
Gao, L 787
Gao, M 444,896
Gao, P 168,404,484
Gao, S 651
Gao, W 1163,1210
Gao, Y 98,311
Garay-Reyes, CG 883,884,1056
Garbowski, T 351
Garcia-Barrientos, A 149,150
Garcia-Leiner, M 65
García-Trenco, A 835
García, A 881
Garcia, E 598
Garcia, NK 642
Gardiner, D 483
Gaskell, K 770
Gatel, C 964,990,1075
Gates, BC 1167
Gates, BD 316,1067
Gates, S 79
Gaudiello, J 985
Gault, B 292
Gauntt, BD 996
Gautam, A 1130
Gautier, T 57
Gauvin, R
2,341,355,1017,1180,1181,1191
Gawlik, G 505
Gayral, B 629
Gazzadi, GC 13,253,336,340
Ge, B 551
Ge, J 1192
Ge, N 144
Geiss, RH 627
Geitmann, A 102
Gelb, J 8,225,675
Gemeiner, P 850
Gengenbach, U 272,641
Genoud, C 560
Genovese, A 476
Gentz, SJ 382
Geochronology, DA 428
George, EP 1104
Gerczak, TJ 376
Gerisch, G 698
Gerstl, SS 260
Gerthsen, D 789,792
Geurts, R 925
Gey, N 303,1019
Ghalei, H 28
Ghatak, S 104
Ghazisaeidi, M 1104
Ghoshroy, K 438
Ghoshroy, S 438
Gianfrancesco, AG 1174
Gianneschi, NC 319,1224
Giannuzzi, LA 705
Gibbs, PJ 236
Gibbs, SL 269
Gilchrist, JB 735,737
Gilks, D 577,652
Gilmore, BL 281
Ginebra, M-P 771
Ginger, DS 1176
Ginning, WT 205
Glaeser, RM 1150
Glavin, DP 1133
Glaz, M 1176
Gleber, SC 441
Gleeson, PA 459
Gnaegi, H 909
Goemann, K 617
Goetz, I 901
Goetze, B 257,584
Gohara, K 18
Goheen, MP 107
Gokus, T 937
Goldberg, MW 27
Goldsmith, C 114
Goldsmith, CS 38
Gomez Ballesteros, JL 288
Gómez Esparza, CD 1062
Gomez-Esparza, CD 1061
Gómez-Esparza, CD 884
Gomez, CD 521
Gomez, R 1222
Gong, Y 54
González-Mancera, GG 143
González-Rodelas, L 1056
Goode, AE 1184
Goodenough, JB 690
Goodman, SL 6,198,363
Goodwin, J 427
Goodwin, RL 312
Gopon, P 1049
Goran, D 552,1019
Gordillo, MA 682,731,734
Gordon, LM 214,261,429,1148
Gorman, B 22
Gorman, BP 263,349,658
Gorski, JP 96
Gosavi, P 459
Goulden, J 1018,1020
Grabowski, C 908
Graham, B 80
Graham, GW 324,686
Graham, RJ 840.1
Graham, UM 1145
Grandfield, K 43
Grant, RP 1055
Grassman, T 950,1080
Gray, JW 269
Greeley, J 287
Gregoire, M 262
Gregori, G 1126
Gregori, M 282
Grenier, A 262,347
Grévent, C 993,995
Gribelyuk, M 141,1039
Griebel, J 73
Griffin, BJ 555
Grillo, V
12,13,253,336,340,946,982
Grimley, ED 392,622
Griswold, RL 1166
Grodecki, K 16
Grosedclose, MR 1116
Grosse, K 241
Grovenor, CR 507,623
Grover, CM 683
Grunenfelder, L 1005
Gruner, SM 1156
Gu, G 495
Gu, L 961
Gu, M 700
Gu, Z 474
Guarin, N 1005
Guarrera, D 343,1032
Guerfi, A 1180
Guerrero-Ferreira, RC 193,643
Guerrero-Given, D 638
Guezennec, Y 163
Gui, L 642
Guiton, BS 755
Guler, U 952
Gumbsch, P 1023
Gumienny, TL 101
Gunawan, L 806
Gunning, B 842
Guo, F 276
Guo, H 173,458
Guo, I 316
Guo, J 371
Guo, L 213
Guo, P 527
Guo, S 1112
Guo, W 182
Gupta, RK 183
Gupta, T 561
Gur, D 333
Guthrey, H 487
Guttman, M 642
Guyon, J 552,1019
Guzman, D 524,525
Habelitz, S 938
Haberfehlner, G 762,1087
Habermeier, H-U 1035
Hachtel, JA 843,1196
Hafez, IH 1142
Hage, FS 374,736,739
Hagen, WJ 918
Haggett, ME 1025
Haglund, RF 843,1196
Hahn, N 169
Hahn, NT 1218
Hahn, W 171
Haigh, S 1206
Haigh, SJ 55,125,246,285

Author Index

Name, Presentation

- Halbfinger, R 161
Haley, D 350
Hall, E 387
Hall, T 268
Hammond, J 446
Hammond, JS 593
Hampton, CM 193,643
Han, CW 287,1068
Han, L 400,558
Han, LY 633
Han, M 1189
Han, M-G 702
Han, X 527
Han, Y 557,1105
Hanein, D 644
Haney, P 1175
Hanke, LD 301
Hanlon, T 387
Hanna, LR 292
Hannah, RM 469
Hanrath, T 667
Hansel, CM 1118
Hansen, A 913
Hansen, L 663
Hansen, LP 212
Hanssen, E 459
Hanwell, MD 1205
Hara, M 848
Harada, K 337
Haratipour, N 56
Hardcastle, T 374
Hariri, H 30
Harker, M 1004
Harlow, W 128
Harmer, MP 678
Harmon, KA 312
Haronikova, A 889
Harries, D 1099
Harris, CT 649
Harris, DT 391
Harris, JS 1124
Harris, W 67,304
Harrison, JS 1176
Harrison, KL 1218
Harrison, RJ 1132
Harrysson, O 232
Harsh, JB 358
Hart, JL 137
Harti, RP 318
Haruta, T 449
Harvey, TR 12,13
Hasebe, Y 449
Hashimoto, A 373
Hashimoto, T 76,1008
Hashimoto, Y 75,421,635
Hattar, K 221,223,509,730
Hattar, KM 58,729
Haugstad, G 1094
Häusler, I 553,1202
Havelka, M 999
Hawthorn, D 335
Hayashida, M 806,1123,1204
Hayes, P 746
Hazama, H 1031,1117
He, J 381,443
He, K 133,164,166,240,687
He, L 378,671
He, Q 472,636,646,1103,1216
Healy, OE 420
Heck, PR 659
Heeren, RM 1119
Heffelfinger, J 1214
Heger, D 851
Heise, S 291
Heiss, G 84
Held, J 62
Held, JT 532
Hellmann, R 317
Hellwig, O 975
Helveg, S 211,212,663
Hemker, K 138
Hemraz, UD 809
Henderson, K 66,781
Henry, R 1065
Hensen, EJ 403
Hermannsdörfer, J 108,448,564
Hernandez-Maldonado, D 1043
Hernandez-Martinez, SE 883
Hernández-Negrete, O 904
Hernández-Paredes, J 904
Hernández-Rivera, JL 883
Hernandez, CA 247,865,954
Hernandez, FC 531
Hernandez, M 839
Heron, JT 1156
Herrera Ramírez, JM 1062
Herrera-Pérez, G 120.1
Herrera, M 1043
Herrera, S 1005
Herring, R 252,977
Herring, RA 175,980,984
Herzing, A 73,976
Herzing, AA 74,121,952,1168
Hess, D 705
Hess, H 750
Hettler, S 789,792
Heuer, A 832
Heuer, AH 1190
Heutz, S 735
Heutz, SE 737
Heymann, JB 645
Hidaka, Y 243
Hideur, H 19
Hiditoshi, N 114
Hihath, S 1165
Hikita, Y 570
Hildebrand, DG 80
Hillman, EM 208
Hipps, KW 1095
Hirahara, K 569
Hirata, A 569
Hirayama, T 597
Hirotsu, Y 569
Hiroyama, T 650
Hirsch, PB 965
Hirscher, M 993
Hisada, A 456,464
Hiscock, M 53,170
Hitchcock, AP 1223
Hnatovsky, C 11
Hnin, YYK 161.1
Hoagland, D 779
Hochhalter, JD 227
Hockenbery, D 1034
Hodgson, K 471
Hodoroaba, V-D
740,742,855,858,859,
1202,1203
Hoffman, E 389
Hoffmann, T 118
Hofmann, A 272,641
Hofmann, S 754
Hohenester, U 1087
Holesinger, TG 222
Holl, P 85
Holland, J 170,815
Hollricher, O 9
Holm, J 634,935
Holmestad, R 759
Holtz, ME 654,756
Holzenburg, A 827
Holzner, C 304
Holzweber, M 859
Hombourger, C 821
Homer, M 543,909
Honda, K 848
Honda, S 1006
Hondow, N 200,778
Hong, CN 1068
Hong, L 148
Hong, L 416,825
Hong, S-P 526,1063
Honvault, N 746
Hoppe, R 1085
Horita, Z 893
Hörl, A 1087
Horn, T 232
Hornberger, B 781
Hornbuckle, BC 426
Horst, A 51
Horton, NG 862
Hosemann, P 59
Hosogi, N 696,788
Hosokawa, F 973
Hosono, E 479
Houben, L 739
House, M 44
House, SD 829,1065
Hovden, R
654,667,1128,1156,1205
Hovington, P 341,1180
Howard, P 191
Howard, PM 383
Howe, JY 635,854
Howell, DN 41
Howie, A 48
Howkins, A 631,632
Hoyle, D 175,252,635,977
Hoyne, JD 192,646
Hoyo-Montaño, JA 150
Hrabec, A 252
Hrnčíř, T 704,999
Hrncirik, P 715
Hrubanova, K 93,95,889
Hseu, Y-K 813
Hsia, R-C 40,89,270,1160
Hsiao, C-N 967
Hsiao, M-S 908
Hsieh, C 791
Hsu, W-H 422
Hu, J 215,320,623,161.1
Hu, Q 936
Hu, S-T 730
Hu, T 529
Hu, X 1036
Hua, S 811
Huang, B-M 900
Huang, D 665
Huang, J 921,998,1105
Huang, S 1139
Huang, Y 1082
Hubbard, WA 334,598,955,957
Huber, A 937
Huber, D 618,707
Huber, DE
90,229,264,1091,1171
Huber, MA 1083
Huber, R 1083
Hudak, BM 755
Hudec, J 556
Hufschmid, R 485
Hug, H-J 717
Hughes, M 1071
Hugo, RC 1013
Huh, U 846,847
Huh, YH 100,106
Hummel, S 501,575
Humphrey, EC 898
Hunn, JD 376
Hunter, L 675
Hussaini, Z 210,288
Huth, M 85,820
Huynh, C 257,706,1000,1162

Author Index

- Hwang, HY 570
Hwang, I-S 422
Hwang, J 619,621
Hyde, S 1190
Hyltoft, J 212
Hytch, M 990
Hyun, J-K 106
Iberi, V 846,847
Idell, Y 234
Idrobo, JC 251,612
Ilevlev, AV 488
Ignatov, A 718
Ihle, S 85
Ihlefeld, J 1037
Iijima, H 696,788,973,1152
Ikai, T 650
Ikoma, Y 893
Ikuhara, Y
168,237,484,539,961,1143
Ikuta, T 852,988
Imashuku, S 399
Imazono, T 1179
Inomoto, C 462
Iriyama, Y 597
Irsen, S 1194
Irving, D 622,1124
Isheim, D 20,183,659
Ishida, T 988
Ishikawa, I 788
Ishikawa, N 886
Ishikawa, R 168,237,484,726
Ishikawa, T 801
Ishizuka, K 609
Islam, M 145
Isoda, Y 906
Ito, H 75
Ito, S 122,812
Ivanchenko, M 377
Ivanov, SV 903
Ivasishin, OM 731
Ivry, Y 665
Iwane, T 337
Iwasawa, Y 932
Jafari Bidhendi, A 102
Jagielski, J 505
Jägle, EA 182
Jahanbekam, A 1095
Jain, D 183
Jakomin, R 494
Jalan, B 1038
Jamme, F 744
Jancar, B 394
Jang, JH 1216
Janish, M 160
Janish, MT 152
Jankele, R 814
Janssen, A 125,246,285,483,648
Japuntich, D 315
Jasmin, G 957
Je, AR 106
Jede, R 527
Jeen, HJ 64
Jeerage, KM 207
Jelenko, I 1146
Jenkins, ML 60
Jensen, J 615
Jensen, JK 1171
Jeong, JS 56,1038,1214
Jesse, S 472,488,565,612,805,9
33,1103,1174
Jezek, J 889
JIA, C-L 146
Jia, Q 1037
Jiang, B 219
Jiang, CS 487
Jiang, H 671
Jiang, J 947,1024
Jiang, W 276
Jiang, X 148
Jiang, Y 402,1128,1205
Jiao, J 142,178,576,891
Jimbo, Y 614,932
Jiménez, JA 681
Jin, H-H 503
Jin, J 1150
Jin, L 173,458
Jin, Q 441
JIN, X-W 146
Jiruše, J 78,354,999
Jmerik, VN 903
Joens, MS 257
Joester, D
190,261,749,917,1148
Johnson, ATC 579
Johnson, DC 511,666,913
Johnson, JM 621
Johnson, K 922,1168
Johnson, M 99
Johnson, MC 28
Johnston-Peck, AC 74,121,976
Johnstone, D 623
Jokisaari, J 656,686
Jolliff, BL 723,725
Jones, L
0,613,965,1100,1107,1153,1207
Jones, R 1018
Jones, RS 312
Jorgens, DM 269
José-Yacamán, M 417,480,732
Joswiak, D 766,768
Joubert, L-M 470
Jovanovic, P 774
Joy, DC
421,555,635,636,846,847
Joyce, D 170
Jozinovic, B 774
Jozwik, I 16,505
Jozwik, P 505
Juanico, A 881
Juchniewicz, M 853
Juhel, M 262,347
Jungjohann, KL 649,712,1218
Jurado, KA 156,275
Kaboli, S 302,1191
Kacher, J 1164
Kaczmarowski, A 1102
Kaeppel, A 715,1009
Kagawa, R 126
Kägi, R 1203
Kaiser, UA 179
Kalfon-Cohen, E 665
Kalinin, S 805,1103
Kalinin, SV
488,565,612,933,1174
Kaluskar, K 23
Kalyanaraman, R 1192
Kamantsev, A 880,1001
Kamasawa, N 638
Kamimura, O 18
Kamino, T 124,910
Kaminsky, W 728
kamiya, S 1058
Kamiyama, R 1006
Kandel, YP 17,352
Kaneda, Y 1117
Kaneyama, T 801,932
Kang, C-H 594
Kang, Y 650
Kannen, H 1117
Kanno, R 479
Kano, E 373
Kao, J 45
Kaoumi, D 57
Kapoor, M 180,426
Karatay, DU 1176
Karbstein, K 28
Kardynal, B 701
Kargar, A 686
Karimi, E 13,253,336,340,982
Karki, K 404
Karlsen, W 377
Karumi, T 139
Kas, J 829
Kasai, T 77
Kasama, T 1132
Kashyap, S 751
Kasuya, K 800
Kataoka, S 77
Kąćki, J 853
Katnani, AD 545
Kato, H 650
Kato, N 1006
Katz-Boon, H 1209
Katz, A 1167
Katz, MB 839
Kaub, T 180
Kaufman, M 834
Kawai, J 399
Kawamura, Y 1014
Kawanishi, S 122
Kawasaki, M
437,516,695,900,967
Kawasaki, T 123
Kawasaki, T 800,934,988
Kawase, H 986
Kazakov, AA
230,876,877,878,879,885,1057
Ke, Y 545
Keene, D 271
Keene, DR 196,283
Keller, LP 767
Keller, R 935
Keller, RR 634,684
Kelley, R 1002,1003
Kelly, DF 281,651,694
Kelly, M 247
Kelsch, M 1035
Kemen, T 351
Kemmler, M 86
Kempshall, B 418,894
Kenny, S 119
Kepaptsoglou, D
374,577,652,679, 736
Kerelsky, A 957
Kerstein, W 157
Keskinbora, K 993,995
Kevan, S 826
Key, TS 528
Khalil, AS 508
Khant, HA 790,1073
Khodjakov, A 443
Khoshouei, M 697,698
Kieft, E 406
Kielian, M 206
Kiely, CJ 870
Kienle, M 83,673
Kilcrease, J 446
Killilea, AN 119
Kim, C 775
Kim, H-G 106
Kim, H-J 106
Kim, J 73
Kim, K 625
Kim, K-H 992
Kim, M 1045
Kim, MJ 52,106,217,867
Kim, P 779
Kim, S-D 64
Kim, S-I 526,1063
Kim, SJ 686
Kim, TR 975
Kim, Y 998
Kim, Y-M 1216
Kim, Y-W 526,1063
Kim, YH 154
Kimoto, K 177,609

Author Index

Name, Presentation

- Kimura, Y 129,1131
 King, S 366
 Kirk, M 57
 Kirk, MA 60,220
 Kirkland, AI 51,375
 Kirmse, R 81,562,785
 Kiselev, D 230
 Kisielowski, C
 531,663,1044,1222
 Kiss, G 271
 Kitamura, S-I 848
 Kitaura, R 18
 Kitware Inc., M 1205
 Kjoller, K 936
 Klan, P 851
 Kleebe, HJ 1141
 Klein, K 991
 Kleindiek, S 86,719
 Klie, R 134,166,825,1036,1045
 Klie, RF
 249,498,599,647,688,775,911
 Kliem, T 527
 Kliewer, CE 513
 Klingfus, J 463
 Klitzing, HA 1200
 Klumperman, J 692
 Kmita, K 453
 Knappett, BR 616
 Knaub, N 1042
 Knez, D 1087
 Knez, M 995
 Knipling, KE 181,1212
 Knoblauch, J 747
 Knoblauch, M 747
 Knöller, A 665
 Ko, E 503
 Koch, C 913
 Koch, CT 943,1030,1157
 Kociak, M 629,845
 Kocman, M 78
 Kodambaka, S 897,1219
 Koeda, M 1179
 Koehler, E 242
 Koester, SJ 56
 Koh, AL 530,1029
 Kohashi, T 337
 Kohno, Y 172
 Kohoutek, JM 1028
 Kohr, H 1170
 Koike, M 1179
 koiwa, K 1058
 Koledov, V 880,1001
 Kolli, RP 184
 Kollmer, F 717
 Kolosova, J 354
 Kolpishon, EY 878
 Komissar, A 718
 Kondo, M 910
 Kondo, S 668
 Kondo, Y 414,613,801,804,973,
 1107,1153,1207
 Konecna, A 710
 Könenkamp, R
 711,796,905,1195
 Kong, C 1047
 König, J 913
 Konopka, JF 818,1015
 Konstantinova, T 243
 Konvalina, I 556
 Konyuba, Y 788
 Kooyman, P 211
 Kooyman, PJ 403
 Korf, U 108
 Korman, CE 463
 Kormondy, K 657
 Koshiya, S 609
 Kotakoski, J 501,575
 Kothleitner, G 539,762,1087
 Kotrlý, M 685
 Kotula, P 160
 Kotula, PG 543,712,713
 Kotwal, N 161
 Kotwica, D 140
 Kourkoutis, LF
 570,667,915,1128,1147
 Kouvetakos, J 963,1070
 Kovalev, PV 877
 Kovarik, L
 214,320,733,793,1002
 Kozuka, M 77
 Kracum, M 678
 Kraehnert, R 855
 Kraft, MK 1200
 Krajčovič, T 850
 Krajnak, M 799
 Krakow, R 623,1088
 Kral, MV 228
 Kramberger-Kaplan, C 575
 Kramer, MJ 674
 Krausko, J 851
 Kravchenko, M 1103
 Kreith, J 1173
 Kremliakova, N 534
 Krishnan, KM 485
 Krivanek, O 171,715
 Krivanek, OL 47,333,736
 Krolkowski, W 11
 Kruse, N 795
 Kruska, K 431,733
 Krzyzanek, V 93,95,116,889
 Kubo, A 1031
 Kubo, T 910
 Kucheyev, SO 929
 Kudo, M 848
 Kueck, A 385
 Kühlbrandt, W 972
 Kuhr, SJ 1091
 Kukreja, R 402
 Kulzick, MA 125
 Kumagai, K 856
 Kumagai, K 1204
 Kumamoto, A 168,484,1143
 Kumar, A 761
 Kumar, K 504
 Kumar, M 263
 Kumar, P 664,1185
 Kumar, S 183
 Kundu, A 678
 Kuo, BC 192,646
 Kur, AA 1057
 Kurobe, H 597
 KUROKAWA, A 856
 Kurtz, SM 226
 Kuwamura, Y 126
 Kvit, AV 945,1206,1208
 Kwak, JH 320
 Kwakman, L 921
 Kweon, H-S 100,106
 Kwon, J 503
 Kwon, T-K 888
 La Fontaine, A 661
 Lacroix, L-M 1075
 Lagacé, M 1180
 Lagarec, K 673
 Lagos, MJ 710
 LaGrange, T 408,529,734,833
 LaGrow, A 368
 Lai, B 441
 Lai, C-Y 344
 Laiginhas, FA 424,432
 Lambers, H 746
 Lampert, LF 576
 Lancon, F 1130
 Landin, T 1002
 Lane, BA 312
 Lang, C 53,170,704
 Langelier, B 43
 Langen, R 645
 Large, RR 617
 Lari, L 368,577,652
 Larsen, K 1018
 Larson, BT 35
 Larson, D 1150
 Larson, DJ 840
 LaSalvia, JC 159
 Lascano, S 524,525
 Last, JA 187
 Latychevskaia, T 256
 Lau, KC 689
 Laugks, T 561
 Laugks, U 919
 Laura Elías, A 219
 Laurentius, L 777
 Lauridsen, E 304
 Lavernia, EJ 529
 Lavery, L 67,465
 Lawrence, A 916
 Lawrence, D 427,428
 Lawrence, EL 127
 Lazar, S 476,1089
 Lazarov, V 577
 Lazarov, VK 652
 Le Boulbar, ED 1110
 Leal, J 69
 Leapman, RD 192,636,646
 Leary, RK 1088
 Leary, SP 808
 LeBeau, JM
 392,547,548,608,622,761,1124
 Lebensohn, RA 1187
 Lechner, L 8,675,783
 Lee, AH 1007
 Lee, C-H 112
 Lee, C-S 1063
 Lee, H 528
 Lee, H-J 154
 Lee, HJ 1085
 Lee, J 371,826
 Lee, KK 642
 Lee, MH 992
 Lee, S 479,568
 Lee, TYJ 419
 Lee, Z 372
 Leenheer, AJ 649,1218
 Leesment, S 1093
 Lefebvre, W 19
 Leff, A 626
 Leff, AC 948
 Lehmann, M 699
 Leifer, K 1159
 Leite, B 356,468
 Lelis, A 770
 LeMogne, T 1199
 Lendoiro, N 115
 Lenthe, WC 925,1023
 Lenz, DR 21
 Leon, EU 887
 Leonard, DN 317,472
 Leonard, KJ 504
 Lereah, Y 11
 Leroux, BM 469
 Leschziner, AE 31
 Lessner, SM 105
 LeTourneau, MK 358
 Leung, K 309
 Levin, B 776
 Levin, I 74
 Levine, L 234
 Levinson, AJ 838
 Lewis, A 718
 Lewis, AC 838
 Lewis, JB 20
 Leyva, CC 496

Author Index

- Lezec, H 1028
Li, C 398,1046
Li, G 755,956
Li, H 269
Li, H-W 852
Li, J 37
Li, J 243,687,985
Li, JC 240
Li, K 91
Li, L 656,1065,1189
Li, M 220
Li, N 223
Li, Q 600,907
Li, R 607,644
Li, RK 330
Li, S 88,91
Li, T 775,928
Li, TT 929
Li, W-P 445
Li, X 864
Li, Y 204,284,531
Li, Z 144,148
Lian, G 217
Liang, F 442
Liang, Q 1193
Liang, W-I 563
Liang, X 113
Liang, Y 531
Libertino, S 716
Lichte, H 51,1155
Liddle, JA 308,803
Lieb, A 719
Liesel, A 1086
Lienau, CT 1112
Lifshin, E 17,352
Lim, H 583
Lim, J 233,246
Lim, JJ 235,507
Lim, NC 161.1
Limmer, SJ 578
Lin, A 389
Lin, C-Y 422
Lin, F 164
Lin, G 131
Lin, J 54,218
Lin, PA 210,288,1028
Lin, R 400
Lin, Y-C 52,177,701
Lin, Y-H 112
Lin, Z 219
Linck, M 51
Lindeman, LP 1188
Linden, S 1194
Linder, S 466
Lindner, D 501
Lindstrom, AP 396
Lindstrom, RM 396
Linton, K 504
Liou, S-C 147,923
Lippold, J 1214
Litynska-Dobrzynska, L 682
Liu, B 669,994
Liu, C 408,671,734
Liu, F 191,587,864
Liu, G 770
Liu, H 393
Liu, J 184,213,259,497,844,866,871,914, 1002,1129
Liu, J-F 140
Liu, J-W 906
Liu, JJ 868
Liu, K 650
Liu, L 495
Liu, Q 322,370,738,953,985
Liu, R 901
Liu, W 9,1096
Liu, X 840.1
Liu, Z 276,402
Lloyd, D 368
Lo, M 936
Locke, DR 1133
Lockley, AJ 299,586
Lodico, J 957,958
Loeffler, A 45
Loeffler, M 921
Loesing, R 545
Löffler, S 10,335,1182
Loftus, AF 257
Logvenov, G 1126
Loh, D 131,135
Loh, ND 136
Long, CJ 233,235
Longchamp, J-N 256
Longo, P
249,476,632,930,1066,1168
Looger, LL 445
López-Meléndez, C 523
López, CS 457
Lorenz, UJ 605
Lorut, F 347,624
Losquin, A 845
Löthman, P 1059
Lou, J 54
Lou, Z 54
Loubet, N 985
Loudon, JC 252
Love, C 969
Lovejoy, TC 171,333,715,736
Lowe, M 239
Lowers, HA 942
Lozano-Perez, S
305,507,610,623
Lozano, JG 965
Lu, D 570
Lu, J 130,131,136,689,772
Lu, L 146
Lu, L 870
Lu, N 52,217,867
Lu, P 70,173,674,1037
Lu, S 657
Lu, Y-P 133
Lubk, A 982,1155
Luciani, V 976
Lučić, V 919
Ludtke, SJ 273,274
Lugg, N 1143
Lugg, NR 539
Luo, L 162,600
Luo, X 689
Luo, Y 789
Lupini, A 1026
Lupini, AR
472,565,612,726,843,933,1043
Lupulescu, M 1053
Lute, B 316
Lutz, G 85,1086
Lyth, SM 852
Lyubochko, DA 876,879
Lyunkis, D 603
Ma, C 551,1178
Ma, MK 1000,1162
Ma, Z 1168
Maas, A 728
Maayan, E 718
Macaluso, FP 206
Maçarico da Costa, N 640
MacArthur, KE 1100,1207
MacDonald, DW 226
MacDonald, LJ 646
Machala, ML 530
Mack, SC 839
Mackey, MR 1
Maclaren, I 507
MacLaren, I 455,613,799,1172
MacRae, CM 899
Madaan, N 425
Madan, A 545
Madden, JW 502
Madsen, SJ 1029
Maehara, Y 18
Mafakheri, E 13,336,340
Magdefrau, NJ 1140
Magen, C 964
Magidson, V 443
Magonov, S 1093
Maguire, MC 1055
Magyar, AP 430
Mahamid, J 561
Maier, J 1126
Mainz, R 1141
Mairov, A 381
Majidi, H 757
Majlan, KA 653
Major, R 510
Majumdar, P 287
Majurski, M 46
Malac, M 695,806,1123,1204
Malasi, A 1192
Maldonado-Orozco, MC
514,515,518
Maldonis, JJ 831
Maleeff, BE 601
Malheiros, LR 235
Malic, B 394
Malomed, BA 11
Maloufi, N 303
Malovichko, I 1093
Mancuso, J 76
Mandrus, D 311,409
Maneuskis, D 799
Mangelinck, D 427
Mangler, C 575
Manna, L 476
Mansour, H 303
Mantei, JR 33
Manukyan, K 294
Mao, Z 215
Maqableh, MM 987
Mara, NA 580
Marcellin-Little, D 232
March, K 953,954
Marcott, C 936
Maria, J-P 391,677
Maric, R 970
Marinella, M 712
Marinenko, RB 740,1120
Marinero, EE 287
Marioara, CD 759
Marko, M 791
Markovsky, PE 731
Marks, LD 389
Marley, PM 498
Marniok, N 802
Marova, I 93,889
Márquez-Ruiz, D 904
Marquis, E 169,293,660
Marquis, EA 346
Marsalek, L 780,802
Marshall, MM 358
Marshall, MS 702
Martens, GD 471
Martens, RL 424,427,432
Martin, D 914
Martin, I 428
Martin, JM 1199
Martin, T 368
Martin, Y 1106
Martínez Sánchez, R 1062
Martínez-Sánchez, R
310,522,523,883,884,
1056,1061
Martínez, AI 881
Martinez, JE 1215
Martinez, MG 206
Martínez, P 517

Author Index

Name, Presentation

- Martinez, R 521
 Marvinney, CE 1196
 Mascini, N 1119
 Mashayek, F 688
 Mashirov, A 880,1001
 Masiello, D 956
 Masseboeuf, A 990,1075
 Masserini, M 282
 Mathes, F 44
 Matlock, DK 3,1137
 Matson, LE 528
 Matsuda, K 516
 Matsudaira, P 135
 Matsumoto, H 124,129,597,1008
 Matsumura, S 801
 Matsusita, M 77
 Matsuzaki, K 652
 Matteoli, M 282
 Matthews, M 740,1121
 Maurino, V 1202
 Mayo, DC 843,1196
 Mazaev, P 1001
 Mazilu, M 863
 Mazumder, B 296,379
 Mazur, U 1095
 Mburu, S 184
 McCabe, RJ 580
 McCallum, RW 674
 McCanta, MC 765
 McCarthy, C 42
 McCarthy, JJ 187
 McCartney, M 657
 McCartney, MR 700,962
 McComb, D 264,950,1080
 McComb, DM 104
 McComb, DW 90
 MCCOMB, DW 163
 McComb, DW
 248,615,618,630,735,737,822,
 1104,1184
 McCormick, A 1094
 McDonald, S 304
 McDonald, WM 420
 McEwen, BF 443
 McGrouther, D 799
 McGuinness, K 247,865
 McGuire, JD 96
 McIlwrath, K 867
 McIntosh, S 870
 McKenna, AJ 405
 McKenna, K 652
 McKenzie, B 583
 McKenzie, BB 152
 McKeown, JT 236,408,734,928
 McKernan, S 397
 McLeod, AC 228
 McLeod, RA 695
 McLouth, T 590
 McMorran, BJ
 12,253,826,946,982
 McMurtrey, MD 511
 McNally, H 813
 McNee, C 385
 McNeil, J 1115
 McNeil, SE 117
 McPherson, SA 451
 McSwiggen, P
 342,819,899,1006,1014
 McVey, S 174
 McVey, SM 353
 Mecklenburg, MH 334,955,957
 Medina Flores, A 892
 Medina, A 155,517,524,525,881
 Medlin, DL 578,666,729
 Medrano-Prieto, HM 884
 Meffre, A 1075
 Meffre, S 617
 Mehdi, BL 960,1166
 Mehta, H 960
 Meier, DC 1120
 Meier, V 1085
 Meisenkothen, F 1120
 Meisnar, M 305
 Mejia, S 808
 Mello, AW 227
 Melo, LG 1223
 Memtily, N 114
 Memtily, N 753
 Mendez-Martin, F 388
 Mendoza Santoyo, F 987
 Mendoza-Cruz, R 417
 Mendoza-Duarte, JM
 310,522,523,883
 Mendoza, ME 491
 Menéndez, J 963,1070
 Meng, D 166
 Meng, Y 549
 Menozzi, C 336
 Merkle, AP
 8,67,304,465,675,783
 Merlet, C 721,1010
 Merrill, D 666
 Mesjasz-Przybylowicz, J 744
 Meuret, S 629,845
 Meyer, FW 379
 Meyer, JC 501,575
 Meyer, S 558
 MI, S-B 146
 Miao, J 763
 Michael, JR
 152,351,555,583,1055
 Micheva, KD 639
 Midgett, M 457
 Midgley, PA
 616,623,1088,1114,1132
 Mielke, J 858,1202,1203
 Migunov, V 794
 Mikmeková, E 15
 Mikuni, T 638
 Miller, BD 502
 Miller, BK 286,370,830
 Miller, C 834
 Miller, D 958
 Miller, DJ 689,772
 Miller, DR 630
 Miller, M 674
 Miller, MK 296,379
 Miller, SE 41,114
 Milliron, G 1005
 Mills, M 874
 Mills, MJ 248,264,306,1104
 Millstone, J 956
 Minato, R 989
 Miner, B 242
 Minoda, H 126,973,1152
 Minor, AM 611,1164
 Mintz, KP 452
 Mio, AM 215
 Mio, K 114
 Mirsaidov, U 130,135,136
 Mirsaidov, UM 131,132
 Miseo, S 513
 Mishra, R 1216
 Misiolek, WZ 68
 Misra, A 223
 Mitchell, RW 368
 Mittelberger, A 575
 Miura, T 1008
 Miyatake, K 932
 Miyazaki, N 1072
 Mizoguchi, T 1183
 Mizuno, D 886
 Mizutani, R 461
 Mkhoyan, AK
 56,62,411,532,664,1038,1185
 Mo, Y 164
 Moats, WP 574
 Moballeggh, A 677
 Moeck, P 553,728,807
 Moeller, W 921
 Moellers, R 717
 Moffat, J 53
 Mohsin, A 495
 Mølhave, K 754
 Molina, E 142
 Molina, SI 1043
 Moncoffre, N 505
 Monroe, W 466
 Monteith, AG 778
 Montgomery, FC 376
 Montoya, S 826
 Moody, MP 350
 Mook, WM 712
 Moore, RL 352
 Moran, K 1097
 Morawiec, A 552
 More, K 348
 More, KL 1220
 Moreau, JW 459
 Moreno-Corella, G 904
 Moreno-Moreno, M 150
 Moreno-Wong, P 519
 Moreno, G 519,887
 Moret, M 821
 Morgan, D 945,1102,1206,1208
 Morgan, GB 572
 Morgan, MJ 339
 Morganti, L 730
 Mori, N 1006
 Moriguchi, N 1031
 Morin, P 985
 Morishita, S 177
 Morita, H 75
 Moriyama, K 402
 Morris, P 630
 Morrish, F 1034
 Morrow, RC 1184
 Mortezaei, N 460
 Moseley, M 842
 Moser, DE 428
 Moser, T 477
 Moser, TH 1064
 Motoki, S 790,1073
 Mott, RB 420
 Moulder, JF 593
 Mountinho, H 487
 Mouti, A 843,1026
 Moy, A 1010
 Moyer, JA 654
 Moyon, F 19
 Mu, R 1196
 Muddiman, B 1150
 Muehle, U 921
 Mueller, JD 37
 Mueller, T 938
 Mukai, M 177
 Mukasyan, AS 294
 Mukherjee, A 911
 Mukherjee, S 69
 Mulders, H 921
 Mullendore, D 747
 Muller, DA
 402,557,654,756,776,1156
 Müller, E 789
 Müller, H 51
 Muller, I 582
 Müller, K 1107
 Müller, P 1203
 Müllerová, I 15
 Mulligan, SK 34
 Mundy, JA 654
 Munoz-Moreno, R 1020
 Muntifering, BR 58
 Murakami, Y 986,1158

Author Index

- Murano, T 1014,1179
Murase, H 123
Murata, K 1072
Murfitt, MF 5,80
Murphy, J 489
Murphy, MA 33
Murray, C 983
Murray, CB 324
Murray, SC 274
Murugesan, V 345
Musselman, M 263
Musumeci, P 329
Muto, A 421,554
Mutoh, M 499
Mutunga, EM 991
Myers, A 1175
Myers, J 1214
Na, C-L 103
Nagami, T 650
Nagano, T 1179
Nagaoki, I 124
Nagashima, S 650
Nagayama, K 1072
Nagler, B 1085
Nahm, S 154
Nakafushi, Y 437
Nakahira, K 122
Nakajima, M 456
Nakakura, CY 351
Nakamichi, H 886
Nakamura, K 1008
Nakamura, M 848
Nakamura, N 462
Nakano, K 76
Nakashima, N 1142
Nakazawa, E 76
Nambu, H 338
Nandasiri, MI 425
Narayan, R 840.1
Naresh-Kumar, G 1110
Narita, A 812
Nashed, Y 1077
Nasybulin, E 960
Naughton, H 452
Nealey, PF 308
Nebesarova, J 95
Nechaev, DV 903
Nedela, V 556,849,850,851
Negishi, T 77
Neill, OK 1011
Neilly, J 277
Neilly, JP 278
Neish, MJ 1127
Nellist, PD
0,613,799,1100,1107,1153,1207
Nelson, CT 611
Nelson, E 169
Nelson, P 890
Nemchin, A 725
Nemeth, I 1009
Nemoto, Y 343
Nerl, HC 739
Ness, L 272,641
Neuman, BW 271
Neves da Silva, M 120
Newbury, DE 939
Newcomb, WW 364
Ng, A 348
Ng, SL 161.1
Ngai, J 653
Ngo, T 657
Nguyen, K 557
Nguyen, KX 1156
Ni, C 914
Nicholls, R 736
Nickels, S 802
Nicolai, J 964
Nicolosi, V 739
Nicotra, G 215,577,716
Niculae, A 820,1086
Nie, A 166,498,599,688,773,908
Niegemann, J 1194
Niehuis, E 717
Nielsen, C 26,819,1006
Nievergelt, AP 814
Niimi, H 974
Nishimura, N 862
Nishimura, S 748,860,861
Nishioka, H 449,804
Nishiyama, H 447,753
Nishiyama, T 852
Niu, C 622
Nizolek, TJ 580
Noble, A 30
Nobuchi, T 437
Noebe, RD 306
Noh, M 100
Nokuo, T 1058
Nolan, CT 453
Nolte, D 4
Nord, M 759
Norman, AG 487
Norouzpour, M 984
Norris, K 144
Norris, TB 952
Nose, M 437,516
Notte, J 174,353,584
Nouf-Alleghiani, M 1110
Nowak, G 809
Nowell, M 840
Nowell, MM 588,1188
Nylese, T 279,824
Nylk, J 863
Ó Conbhui, P 1132
O'Connell, CB 443
O'Shea, V 799
Oberdoerster, G 1145
Oboña, JV 704
Obruca, S 93
Ochoa-Lara, MT 515,518
Ochoa, MT 514
Odegard, G 166
Odermatt, PD 814
Odette, GR 293
Odlyzko, M 62
Odlyzko, ML 664
Ogawa, S 1123
Ogawa, Y 557
Ogunyankin, MO 1144
Ögüt, B 530
Ogut, S 825,1036
Ohi, MD 29
Ohkura, Y 788
Ohi, C-D 98
Ohshima, T 456
Ohta, S 499,974
Okada, T 201
Okumura, T 456
Okunishi, E 249,614,801,932
Okura, Y 695
Oleshko, V 758
Oleshko, VP 73
Olin, A 898
Oliveira dos Passos, D 603
Olson, D 427,428
Olson, G 234
Olszta, MJ 589
Omenya, F 167
Ominami, Y 122,456,464
Omiya, M 1058
Omran, A 30
On, K 34
Ong, M 543
Oni, A 761
Oni, AA 547,1124
Onishi, I 516
Onodera, H 680
Oorschot, VM 692
Ophus, C
550,727,763,874,966,1130
Oral, M 556
Orchowski, A 209
Ordoñez, EG 490
Ornelas, CE 496
Oropesa, R 1177
Orr, G 745
Orsborn, J 90,264,546,822,1213
Ortalan, V 287,1068
Ortega Aguilar, JE 473
Ortel, E 855,858,1202
Orthacker, A 762,1087
Ortiz, J 698
Osakabe, N 934
Osawa, M 462
Osborn, WA 949
Oshima, K 462
Oshima, Y 216,479,568
Osman, H 314
Osswald, S 380
Oster, M 792
Österle, W 1202
Otomo, S 989
Otsuka, T 848
Otto, F 1104
Outrequin, M 821
Ouyang, L 914
Ouzounov, D 862
Ovchinnikov, O 472,805
Overbury, SH 50
Overney, RM 1092
Oviedo, JP 217
Own, CS 5,80,538
Own, L 538,538
Own, LS 5,80
Oxley, MP 472,1127
Özel, M 231
Ozkaya, D 591,1100
Ozsoy Keskinbora, C 1030,1157
Paciornik, S 1211
Packard, CE 263
Paddison, SJ 828,841
Padgett, E 402
Paganin, DM 339
Page, C 644
Pakarinen, J 378
Pakhomova, O 885
Palida, SF 1
Palmquist, A 43
Palomares-Garcia, A 1020
Pan, L 1168
Pan, W 1037
Pan, X 63,324,656,686,1129
Panciera, F 754
Panczer, G 505
Panpurin, SN 885
Pantelides, S 54,218,805
Pantelides, ST
371,843,1101,1196
Panzenböck, M 388
Papin, PA 222
Paranthaman, P 872
Parbrook, PJ 1110
Paredes, A 466
Paredes, AM 191
Parent, LR 1064
Parish, C 296
Parish, CM 379,504,714
Park, C 960,1064,1224
Park, D-B 594
Park, H 1163
Park, HJ 372
Park, HS 986
PARK, HS 1078
Park, J 144,557
Park, JH 897,1219

Author Index

Name, Presentation

- Park, ME 755
 Parks, B 598
 Parman, S 658
 Parton, RG 268
 Paša-Tolić, L 745,1118
 Pasmore, M 33
 Passarelli, N 1192
 Passoni, L 282
 Patak, A 116
 Patel, K 651
 Patommel, J 1085
 Patri, AK 117
 Patterson, BM 66,781
 Patterson, JP 319,1224
 Paudel, NR 348
 Paul, MT 1067
 Paulauskas, T 1045
 Paule, MG 191
 Paunesku, T 441
 Pavia, G 83,673
 Pavlisic, A 774
 Pawlikowski, G 68
 Pawlowicz, C 806
 Payne, TR 21
 Payre, B 363
 Peale, R 894
 Peckys, DB 108
 Peden, CH 320
 Pedrazzini, S 670
 Pelegati, VB 120
 Pellegrinelli, C 1082
 Pellegrino, F 1202
 Pellin, MJ 573
 Pellutiè, L 1202
 Peng, M 398
 Peng, X 217
 Pennycook, SJ
 371,726,843,1026,1101,1196
 Pennycook, TJ 965,1153
 Perahia, T 312
 Perea, DE 184,259,1002
 Pérez-Bustamante, R 310
 Perez-Gonzalez, T 751
 Perez-Huerta, A 424
 Perez-Huerta, AP 432
 Perez-Willard, F 8
 Pérez-Willard, F 1019
 Pérez, LA 1192
 Perez, LM 827
 Pergolizzi, R 118
 Perkins, TT 810
 Perron, A 236
 Perumal, GS 206
 Peschiera, I 920
 Peterka, T 1077
 Peters, L 161
 Petersen, TC 339
 Peterson, ZM 905
 Petford-Long, A 981
 Petrov, SN 885
 Pettit, DR 2
 Petzold, C 442
 Pfeifer, CR 192
 Phaneuf, MW 8
 Phatak, C 981,990,1077
 Philipp, P 1161
 Phillips, CL 107
 Phillips, P 1036
 Phillips, PJ 249,498,775,911
 Piazzolo, S 661
 Picher, M 210
 Pierce, DT 681,1137
 Pierce, J 13
 Pike, SD 835
 Pinard, PT 231,722,941
 Ping, Y-H 112
 Pires, M 494
 Plankl, M 1083
 Plaza-Castillo, J 149,150
 Plemmons, DA 405
 Plitzko, J 698
 Ploß, M 231
 Pluska, M 853
 Podpirka, AA 839
 Pofelski, A 624
 Pohl, D 254
 Pohl, M 386
 Pohlmann, ES 651
 Poitano, A 215
 Pokharel, R 1187
 Pokorny, B 1146
 Pokrovskaya, ID 646
 Pol, VG 1068
 Poletti, C 762
 Pollick, D 890
 Pollock, TM 580,925,1023,1186
 Polowick, PL 809
 Polster, J 999
 Pöml, P 1012
 Ponath, P 1040
 Ponce Pedraza, A 473
 Ponce-Pedraza, A 732
 Ponce, A 480,987
 Ponce, F 331
 Ponce, FA 494,842
 Ponchet, A 964
 Pope, RK 469
 Poplawsky, JD 348
 Popratiloff, A 463
 Porta, T 1119
 Portavoce, A 427
 Porter, JR 49
 Posadas, A 655,1040
 Postek, MT 554
 Potter, CS 34
 Prabhudev, S 534,1066,1125
 Prange, M 1169
 Prater, C 936
 Prather, KA 319
 Prayakaraao, KR 882
 Preciado, M 863
 Prenitzer, BI 418,894
 Presley, M 707
 Prestat, E 55,125,285
 Prikhodko, SV 731
 Principe, EL 9,185,1180
 Printemps, T 262
 Procop, M 742
 Prosa, TJ
 21,346,424,427,432,840
 Prozorov, T 475,478,751
 Przybylowicz, WJ 744
 Pullan, L 271
 Purohit, P 1156
 Puster, M 579
 Putnam, M 433
 Pyburn, TM 29
 Pyun, D-C 73
 Qafoku, O 1002
 Qi, X 359
 Qi, ZJ 579
 Qian, H 777
 Qian, J 960
 Qiao, B 868
 Qiao, L 311
 Qu, J 58
 Queenan, C 118
 Quezadas, B 155
 Quinton-Cox, S 142
 Quispe, J 34
 Raabe, D 182,681,874
 Rack, PD 847
 Radenovic, A 814
 Radermacher, M 452,453
 Rades, S 858
 Radi, CA 114,365
 Radtke, G 335
 Radu, DR 344
 Rafaelsen, J 279,824
 Rajan, K 23,350
 Rajesekhara, S 730
 Ramachandra, R 1,846
 Raman, S 593
 Ramasse, Q 149,374,577,679,7
 36,739,966,1141
 Ramírez-Bon, R 149
 Ramírez-Gómez, XS 120.1
 Ramirez-Grave, S 1222
 Ramirez-Leal, R 1051
 Ramirez, A 1214
 Ramos Navarro, MIR 520
 Rampton, T 588
 Rampton, TM 836
 Rangnekar, N 664
 Rao, Q 600
 Rasche, M 463
 Rashkova, B 388
 Rasool, HI 727
 Rasouli, S 1142
 Ratajczak, R 505
 Rath, M 544
 Rauch, EF 624
 Ray, V 923
 Reck-Peterson, SL 31
 Reed, B 734
 Reed, BW 408
 Reed, RC 346
 Rees, P 778
 Refson, K 736
 Regan, BC 334,598,955,957
 Rehr, JJ 829
 Reid, AH 330
 Reid, RC 80
 Reifsnnyder Hickey, D 411
 Reindl, T 1193
 Reinhard, D 424,432
 Reischig, P 304
 Rellinghaus, B 254
 Remez, R 11,1154
 Remy, ARJ 467
 Ren, P 1129
 Renka, G 86,719
 Reuter, MC 754
 Reyes-Coronado, A 710
 Reyes, A 156
 Rez, P 332,333
 Rezadad, I 418,894
 Rhinow, D 972
 Rhyim, Y-M 64
 Ribbe, A 706
 Ribbe, AE 779
 Rice, KP 346,428,840
 Rice, PM 930
 Richards, J 922
 Richter, S 231,722,941
 Ricketts, MK 357
 Riesterer, JL 84
 Rigort, A 562
 Rigutti, L 19
 Rincón, JM 158
 Ringe, E 1114
 Ringel, S 950,1080
 Ritchie, NW 396, 939
 Ritter, X 1012
 Rivera, J 756
 Rivlin, PK 445
 Robbins, MC 56
 Roberts, AJ 31
 Roberts, SG 60,292
 Robertson, V 343
 Robia, SL 36
 Robins, AC 25

Author Index

- Robinson, DB 543,909
Robinson, JA 52
Robinson, MW 66
Robles-Hernandez, FC 310
Robles-Hernandez, FC 492
Rodek, G 26
Rodelas, JM 1055
Rodenburg, CM 451
Röder, F 1155
Rodighiero, S 282,752
Rodrigo, P 494
Rodríguez-Ariza, E 142
Rodríguez-Manzo, JA 579
Rodríguez-Miranda, E 120.1
Rodríguez-Rodriguez, WA 152
Rodríguez, EA 1
Rodriguez, W 160
Roehling, JD 236,928
Rohatgi, A 733
Rohrer, GS 247
Rojac, T 394
Roldan-Gutierrez, MA 536
Roldan, M 690
Roldan, MA 311
Rolland, N 19
Roller, JM 970
Rollett, AD 1187
Roman, M 490
Romano, JD 270
Romero-Trejo, H 149
Romero, E 70,1037
Rondinone, AJ 291,847
Ronquillo, I 521
Rooney, AP 55
Ropers, C 604
Rosario, E 1214
Ross-Elliott, TJ 747
Ross, B 440
Ross, F 1219
Ross, FM 754,897
Rossouw, CJ 540
Rossouw, D 534,616,1088
Rost, C 677
Rost, D 573
Roth, JR 278
Rothwell, G 435,436
Rottmann, PF 138
Rotunno, E 946
Roussel, L 633
Rout, SS 659
Rouviere, J 983
Rouviere, J-L 1106
Rouvimov, S 294,903
Rowan, T 695
Rowenhorst, D 1212
Rowenhorst, DJ 838
Rowley, JT 1004
Roy, S 104,826
Ruan, Y 440
Rubino, S 316
Rudzinski, A 527
Ruffilli, R 752
Rufner, J 529
Rufner, JF 833
Rugonyi, S 457
Ruiz Zepeda, F 732,987
Ruiz, T 452,453
Rummel, A 86
Runstuk, J 851
Rush, N 107
Russell, JD 141,1039
Russell, T 779
Rusz, J 251,254,982
Ruthe, KC 416,808
Ruzicka, A 1013
Ruzicka, F 95
Ryaboshuk, S 879
Ryan, EA 220
Ryll, H 613,794,1107,1153,1207
Ryner, M 1203
Ryu, GH 372
Ryu, H 154
S'ari, M 200
Sacci, RL 1220
Sachan, R 669,1026,1192
Sader, K 920
Sadkovich, IW 187
Sadowsky, M 745
Saghi, Z 1088,1114
Saiga, R 461,462
Saitoh, K 338
Saitovitch, EM 1060
Sakamoto, N 394
Sakata, E 561
Sakuda, Y 14
Salamanca-Riba, L 770,1082
Salem, B 574
Salge, T 858,941
Salisbury, JL 109,280
Salmeron, M 321
Salmon, N 1217
Salmon, NJ 489
Salzberger, U 1146
Samal, A 536
Samarel, AM 36
Samek, O 93,95,889
Samuels, K 144
Sanabia, JE 463
Sanchez, JE 732,987
Sanchez, R 887
Sanchez, SI 323
Sandberg, RL 927
Sandborg, A 415
Sanders, AE 810
Sanders, AW 207,857,924
Sanders, T 1167,1169
Sang, X 392,547,608,622,761
Sang, XH 548,1124
Sangid, MD 227,585
Sanli, UT 993,995
Santala, M 1165
Santala, MK 928,929
Santana Garcia, II 1044
Santangelo, MF 716
Santhanagopalan, S 166
Santiago, U 417
Santos-Beltrán, A 1061
Santos, A 521
Santos, M 521
Sarwar, M 1100
Sasajima, M 75
Sasaki, H 989
Sasaki, K 499,852
Sasaki, T 614,932
Sassolini, S 1150
Sato, C 114,447,753
Sato, H 75
Sato, H 1058
Sato, M 201
Sato, M 753
Sato, T 597,1008,1131
Satoh, T 1031,1032
Saunders, M 44,1047
Savage, H 99
Savarino, SJ 460
Savina, MR 573
Savitzky, BH 667
Sawada, H 172,177,614,932
Sawaguchi, A 748,860,861
Sawatzky, GA 335
Sawyer, T 433,435,436
Scenini, F 233
Schachinger, T 10
Schaedler, TA 66
Schaefer, JL 73
Schäfer, S 604
Schaffer, B 679
Schaffer, M 561
Schamber, FH 741
Schamp, CT 1065
Schamp, T 635
Schatten, H- 255
Schattschneider, P 10,335
Schaufinger, M 454
Schauss, J 604
Scheidemann, A 717
Scheltens, F 90
Scheltens, FJ 163,735,737
Schenk, T 392
Schertel, A 209
Schiffer, P 654
Schilling, S 648
Schliep, KB 406
Schlom, DG 654
Schmidt, C 467
Schmidt, FP 1087
Schmidt, J 85,820
Schmidt, N-H 1020
Schmidt, U 9,1096
Schneemann, A 34
Schneider-Haefner, J 167
Schneider, G 1211
Schneider, NM 1219
Schneider, R 789
Schneider, S 254
Schock, K 86,719
Schoenung, JM 529,833
Scholz, D 301
Schreiber, DK 431,589
Schröder, R 272
Schröder, RR 641,792
Schroeder, RR 209
Schroeder, U 392
Schropp, A 1085
Schulmeyer, I 83,673
Schultz, RD 101
Schulze, T 789,792
Schumacher, EF 199
Schumacher, J 803,1175
Schütz, G 993,995
Schütz, P 388
Schwarm, SC 184
Schwartzberg, A 1069
Schwarz, S 418,894
Schwertner, M 562,784
Sciaini, G 606
Sciuto, E 716
Scott, A 374
Scott, B 875
Scott, JHJ 46,188
Scott, K 46,1052
Scott, MC 763
Seabourne, C 374
Seaton, N 837
Sechogela, PT 744
Seddio, SM 940,1048
Seetala, NV 528
Segal-Peretz, T 308
Seiboth, F 1085
Seidman, DN 20,183,659
Sempf, K 637
Sen, A 696
Sen, CK 104
Send, W 789
Seo, SSA 621
Servanton, G 347
Serwer, P 276
Sery, M 95
Serysheva, II 274
Setten, LM 115
Shaapur, F 840.1
Shaffer, MS 631,835

Author Index

Name, Presentation #

- Shah, J 1121
 Shahbazian-Yassar, R
 133,498,596,599,688,773, 908
 Shakhmatov, AV 878
 Shakya, P 407
 Shalchi Amirkhiz, B 295
 Shamsuzzoha, M 895
 Shan, J 535
 Shan, Z 59,173,959
 Shao, PP 460
 Shao, Y-T 625
 Shao, Z 997
 Sharghi-Moshtaghin, R 1139
 Sharma, R
 121,210,288,500,1028
 Shavrov, V 880,1001
 Shaw, J 44
 Shaw, JB 1118
 Shearing, P 225
 Shekhawat, A 727
 Shekhawat, GS 94
 Shen, C 387
 Shen, X 311,330,653
 Sheng, Z 281,651
 Sheppard, L 901,1005
 Sherley, JL 100
 Sherrier, J 691,785
 Shi, D 320
 Shi, H 557
 Shi, J 161.1
 Shibata, M 343,588,1032
 Shibata, N
 168,172,237,484,539,989,1143
 Shields, PA 1110
 Shigekawa, H 245
 Shiloh, R 11,1154
 Shima, M 680
 Shimakura, T 800,934,1076
 Shimizu, T 124,910
 Shimoyamada, A 597
 Shin, JE 1144
 Shinada, H 800,934
 Shindo, D 986,1076
 Shinohara, H 18
 Shiojiri, M 437,516,900,967
 Shirai, M 124,129
 Shirdel, M 460
 Shishido, N 1058
 Shivanandan, A 814
 Shoji, M 456
 Shokuhfar, T 133,134,477,647
 Shomorony, A 192
 Shtengel, G 750
 Shuck, CE 294
 Shukla, AK 966
 Shutthanandan, V 425
 Shvedov, V 11
 Siebein, K 949,1175
 Siegal, MP 578
 Siew, S 120.2
 Sigle, W 1035,1126,1112
 Sijbrandij, S 174,353
 Siler, M 93
 Silva, CM 504
 Silva, LF 1211
 Sim, J-H 888
 Simingalam, S 968
 Simmonds, AG 73
 Simmons, JP 782
 Simmons, RB 395
 Sims, P 963,1070
 Simsek, E 1141
 Simson, M
 613,794,1107,1153,1207
 Simula, TP 339
 Sinatra, F 716
 Sinclair, R 530,975,1029
 Singer, JW 1053
 Singh, B 460
 Singh, S 1021,1022,1108
 Singh, SS 675
 Sinnott, SB 761
 Sinton, S 291
 Sisco, P 466
 Sitzman, S 731,1018,1020,1190
 Sivaramakrishnan, S 1210
 Skemer, P 660
 Skinner, R 857
 Skylaris, C-K 1100
 Slater, T 1206
 Slater, TJ 125
 Slikker, W 191
 Sloppy, J 914
 Slusallek, P 780,802,1170
 Smith, AJ 86,719
 Smith, D 655,657,1040
 Smith, DJ 491,700,893,962,968
 Smith, ER 459
 Smith, GD 292
 Smith, K 438
 Smith, M 125,285
 Smith, MC 117
 Smith, T 248,874
 Smith, TM 1104
 Snapp, E-L 206
 Snead, LL 292
 Snoeck, E 1075
 Snyder, D 234
 Sochacki, KA 35,750
 Sogne, E 752
 Soled, SL 513
 Soles, CL 73
 Soleymani, L 401
 Solórzano, G 491,1060
 Solorzano, GS 520
 Soltau, H
 3,794,820,1086,1107,1153,1207
 Soma, K 367
 Song, M 906
 Song, Y 497
 Sorensen, D 1214
 Sørensen, HO 318
 Sosa-Marquez, JE 514,515,518
 Sosa, JM 229,1091,1171
 Sotiris, JM 40
 Souza, GP 416,808
 Souza, PL 494
 Specht, P 663
 Speer, JG 3,1137
 Speir, JA 34
 Spicuzza, M 1049
 Spiegelberg, J 251
 Spilde, MN 574
 Spilman, MS 173,458
 Spinella, C 215
 Spoerke, ED 70
 Spomer, W 272,641
 Spoth, KA 915
 Sreehari, S 782
 Sridharan, K 381,671
 Srinivasan, S 23
 Srot, V 771,1146
 Stacey, D 784
 Stacey, G 745
 Stach, E 474,1065
 Stach, EA
 121,164,240,284,321,687,754
 Stadler, B 837
 Stadler, BJ 987
 Stafford, B 1045
 Stagg, S 30
 Stan-Glowinska, K 682
 Stanek, C 875
 Starborg, T 778
 Statham, PJ 817
 Stauffer, D 510
 Steigenhöfer, D 85
 Steinbach, A 8,783
 Steltenkamp, S 972
 Stempinski, ES 439
 Stenmark, TA 796
 Stepanov, AS 617
 Stephan, T 573,659
 Stern, L 584
 Steven, AC 275,364,645
 Stevens, A 793
 Stevens, DA 470
 Stevens, KJ 228
 Stipp, SS 318
 Stockey, R 435,436
 Stöger-Pollach, M 10
 Stojanovic, L 33
 Stokes, A 22
 Stolz, W 481
 Stone-Sundberg, J 728
 Storksdieck, M 326
 Stowe, DJ 632
 Stoykovich, MP 840
 Strader, TE 6
 Straney, P 956
 Straton, JC 553,807
 Stratton, WG 397
 Straubinger, R 481
 Straw, M 925
 Strennen, S 427
 Strom, C 309
 Strom, CP 161
 Stromberg, RJ 588
 Strong, JE 270
 Strongin, RM 269
 Stroud, RM
 171,715,765,1052,1134
 Stroupe, ME 28
 Strüder, L 794,820
 Strupinski, W 16
 Strus, J 450
 Styman, PD 507
 Su, D
 164,167,240,653,687,829,1065
 Subramaniam, S 922
 Suenaga, K 177,701
 Suga, M 114
 Suga, M 447,449,753
 Sugar, JD 543,909
 Sugawara, A 1076
 Suguihiro, NM 1060
 Sui, H 443
 Suksangpanya, N 1005
 Sullaphen, J 393
 Sullivan, M 532
 Sullivan, MH 790
 Summers, HD 778
 Sun, C 1045
 Sun, K 165
 Sun, X 527
 Sun, XS 165
 Sun, Y 638,915
 Sundaram, R 53
 Sung, JJ 34
 Suraneni, P 644
 Suri, PK 406,409
 Surtchev, M 1093
 Susaki, T 652
 Susan, DF 1055
 Suter, RM 1187
 Sutor, AL 996
 Suzuki, M 414
 Suzuki, T 77,449
 Suzuki, T 1058
 Suzuki, Y 461,1008
 Swab, JJ 159
 Sweeny, BC 121
 Swett, J 291
 Syha, M 1023

Author Index

- Szczotok, A 672
Szeghalmi, A 995
Szlufarska, I 671
Sznayi, J 320
Sztalryd-Woodle, C 1160
Szymanski, C 345
Taheri, ML
128,137,221,626,676,703,948
Taillon, JA 770,1082
Takahashi, H 819,1014,1179
Takahashi, K 852
Takahashi, Y 800,934,1076
Takakura, M 1014
Takata, Y 852
Takayanagi, K 479,568
Takeda, S 367
Takeguchi, M 373,906
Takekoshi, S 462
Takeno, M 640
Takeuchi, A 461
Takeuchi, O 245
Takeuchi, S 74,75
Talebi, N 1030,1112,1193
Talesky, HM 199
Tamai, T 973,1152
Tamborini, M 282
Tamura, K 910
Tan, H 71
Tan, S 991
Tanaka, A 680
Tanaka, N 338,499,569
Tanaka, S 139
Tändl, J 762
Tang, J 700
Tanigaki, T 800,934,986,1076
Taniguchi, T 726
Tanimura, K 328
Tanishiro, Y 568
Tanji, T 123,988
Tao, FF 535
Taplin, DJ 541
Tappero, R 284
Taraska, J 750
Taraska, JW 35
Tate, MW 1156
Tavabi, AH 701
Tay, BK 54
Taylor, JV 193
Taylor, MD 3
Taylor, W 875
Tawaza, T 680
Teissier, R 964
ten Brink, CT 692
Ten, E 157
Tencé, M 845
Terada, Y 461
Terasaki, O 14
Terauchi, M 819,1014,1179
Terborg, R 742,743,941,1009
Terrones, M 219
Teuton, JR 1166
Thaler, M 209,272
Theis, W 763
Thesen, A 81,558,637
Thevuthasan, S 423,425
Thevuthasan, T 259
Thomas, LS 3
Thomas, PJ 930
Thomashow, LS 358
Thompson, GB 180,426
Thompson, J 621
Thompson, MS 764
Thron, AM 1069,1113
Tian, M 410
Tian, X 132
Ticey, J 758
Tiemeijer, P 254
Tihlarikova, E 849,850
Timischl, F 343,848
Timms, NE 725
Tinnemann, V 108
Titus, M 925
Tizei, L 177,629,845
Tochigi, E 168,484
Todd, CS 595
Todoroki, K 77
Toledo-Antonio, JA 151
Toloczko, MT 512
Tomer, R 361
Tomita, K 1183
Tong, V 1024
Toohey-Kurth, K 114
Topsakal, M 56,1038
Topuria, T 930
Torii, KU 359
Tropova, K 31
Torre, B 752
Toth, M 1079
Toula, K 923
Toyoda, M 1031,1117
Trager-Cowan, C 1110
Trampert, P 802
Tran, KN 1025
Trappitsch, R 573
Trede, D 1118
Trefz, T 534
Trenkle, A 1023
Treussart, F 629
Trimby, P 661
Trubitsyn, D 751
Trudeau, ML 592
Trügler, A 1087
Trushin, S 280
Trushina, E 280
Tsai, B 111
Tsapatsis, M 664,1185
Tselev, A 472
Tseng, MT 1145
Tsien, RY 1
Tsuboi, A 462
Tsuda, K 61
Tsujii, N 906
Tsuneta, R 1076
Tsur, Y 11
Tsutsumi, K 680
Tufa, SF 196,283
Turan, S 153
Turchi, PE 236
Turek, J 4
Turnbough, CL 451
Turonova, B 780
Turoňová, B 802
Tusek Znidaric, M 450
Twesten, R 1168
Twesten, RD 632,930,1066
Twigg, ME 839
Tyburska-Püschel, B 671
Tyliszczak, T 345
Tzolov, MB 420
Uberuaga, BP 222,875
Ubukata, M 1031,1032
Uchida, M 338
Uesugi, K 461
Uhlir, BE 460
Ulfig, RM 21
Unger, WE 859
Unocic, KA 50
Unocic, R 317,472
Unocic, RR
488,565,933,1149,1220
Unrau, D 8
UpadhyayKahaly, M 476
Ursic, H 394
Ushiki, T 456
Usukura, E 812
Usukura, J 812,974
Vaddiraju, S 599
VAGHAYENEGAR, M 968
Vago, F 276
Vajda, S 689
Valanoor, N 393
Valdez, JA 222
Valencia-Palomo, G 150
Valery, A 624
Valle-Martinez, M 1051
Vallet, M 964
Valley, JW 1049
Van Aert, S 567
van Aken, PA
71,1030,1035,1112,1141,1146,
1157,1193
van Benthem, K
390,529,757,1165,833
Van Benthem, MH 712,713
Van den Broek, W 943
Van Der Schijff, O 224
van Haandel, L 403
van Rijn, R 211
van Rooyen, IJ 376
Van Tendeloo, G 567
Váňa, R 78
Vandecreme, A 46
Vander Voort, G 1135
Vander Voort, GF 1138
Vane, RA 82
Vanfleet, RR 1004
VanMil, BL 968
Vara, M 635
Varela, M 690
Varga, T 425
Vargas-Bernal, R 120.1
Varghese Chacko, J 1177
Varkey, J 645
Vaskovicova, N 116,889
Vatougia, G 170
Vaudin, MD 949
Vázquez-Monroy, F 149
Veillette, R 592
Velázquez-Salazar, JJ 417
Velez, M 49
Velho, PE 120
Vemuri, RS 733
Vendelbo, SB 211
Venkatakrishnan, SV 782
Ventura, AP 68
Venturi, F 13,253
Vera, E 881
Verbeeck, J 567
Verch, A 564
Verkade, P 195
Vermerris, W 157
Vettenburg, T 863
Vetterick, GA 221
Vezzoli, E 282
Vicenzi, E 725
Vieira-Damiani, G 120
Vigouroux, M 1106
Vila, F 829
Vilalta-Clemente, A
305,947,1110
Villaggio, G 716
Villarrubia, J 554
Villinger, C 454
Vine, D 441
Visart de Bocarmé, T 795
Viswanathan, GB 1171
Viswanathan, S 445
Viti, L 1083
Vitiello, M 1083
Vivek Deshpande, P 549
Vizcaino, K 150
Vladar, A 991
Vladár, AE 554
Voelkl, E 977
Vogelgesang, R 1112

Author Index

Name, Presentation

- Vogt, A 277
 Volkenandt, T 83
 Volkmann, N 644
 Volz, K 481,1042
 von Cube, F 665,1194
 von der Handt, A 1011
 von Einem, J 454
 Voyles, P 671,1102
 Voyles, PM 187,945,1206,1208
 Vullum, PE 759
 Vurpillot, F 19
 Wacey, D 1047
 Wachsman, E 1082
 Wacker, C 792
 Wacker, I 209,272,641
 Wade, CA 68,873,1090
 Wagner, M 709,938
 Wahlen, L 33
 Wajler, A 505
 Wakasa, T 77
 Walck, SD 159
 Walden, FS 50
 Walden, S 483
 Waldron, A 118
 Walker, FJ 702
 Walker, MP 96
 Walker, NP 830
 Wall, JS 645
 Walsh, MJ 1209
 Walter, A 972
 Walters, T 421
 Walther, P 454
 Wan, C 527
 Wang, A 362,626,868
 Wang, C
 72,134,162,191,345,533,647,
 700,758,828,841, 1145
 Wang, C-Y 700
 Wang, CM 70
 Wang, D 686,832,1190
 Wang, F 404,1217
 Wang, H 148
 Wang, H 416,1037
 Wang, H-H 689
 Wang, J 217,867
 Wang, KL 700
 Wang, L
 269,506,581,772,958,1046
 Wang, R 537,866
 Wang, RK 197
 Wang, S 823,842
 Wang, T 862
 Wang, X 43,54,94,243,506,581,
 635,959,1050
 Wang, Y
 167,222,233,378,445,970,1126
 Wang, Z 59,173,274,978,1046
 Wanner, AA 560
 Ward-Bamford, CL 582
 Ward, MR 368
 Warner, C 691
 Warner, CA 785
 Warner, JH 289,375
 Warner, NA 163
 Warot-Fonrose, B 964
 Warren, O 510
 Warren, OL 1164
 Was, GS 511
 Wasteneys, G 440
 Watanabe, M
 68,542,614,873,1090
 Watson, A 452
 Watts, MP 459
 Weaver, TE 103
 Webb, MT 528
 Webb, RE 559
 Webb, RI 559
 Webb, T 665
 Weber-Sanders, M 120
 Weber, A 1141
 Weber, PK 1200
 Weber, U 85,820,1086
 Weber, WJ 669
 Wegele, T 481
 Wehlin, BH 1162
 Wehmer, M 561
 Wei, B 914
 Wei, D 706
 Wei, J 215,497,844
 Wei, Q 912
 Wei, WD 121
 Wei, Y 842
 Weinberger, CR 948
 Weiner, J 835
 Weinert, M 577
 Weishaupt, K 1096
 Weiss Brennan, CV 159
 Weiss, BP 1132
 Weiss, JK 840.1
 Welch, DA 960
 Welk, B 615
 Welk, BA 229
 Wells, J 241
 Welyand, M 339
 Wen, H 376
 Wen, J 772,958,1210
 Wen, JG 689
 Wen, Y 1193
 Weng, W 545
 Wenner, S 759
 Wentzcovitch, RM 56,1038
 Wepf, R 260
 Wessling, M 161
 West, DL 87
 West, H 232
 Wetzal, G 105
 Weyland, M 393,412,541
 Wheatley, AE 616
 Wheeler, R 49
 White, ER
 334,598,631,835,955,957
 White, RM 684
 Whitham, K 667
 Whiting, J 265
 Whitmer, S 538
 Whittle, KR 670
 Wierschke, JB 581
 Wiesner, U 915
 Wiezorek, J 734
 Wiezorek, JM 408,682,731
 Wight, SA 1120
 Wilford, K 507
 Wilkinson, AJ 305,947,1024
 Wilkinson, N 200
 Williams, CK 631,835
 Williams, J 325
 Williams, JC 202
 Williams, JJ 66
 Williams, M 504
 Williams, R 760
 Williams, RE
 248,546,615,618,630,1171,1184
 Williams, RS 144
 Williams, S 298
 Williams, W 1132
 Williamson, DL 1137
 Williard, JN 69
 Wilson, RL 1200
 Windl, W 248
 Windl, WE 1184
 Windsor, ES 1120
 Winkler, DA 100
 Winkler, DC 364
 Winkler, F 701
 Winkler, M 913
 Winograd, N 1197
 Winterstein, J 308,1028
 Winterstein, JP 121,500,803
 Winton, CE 281
 Wirtz, T 7,720,931,1161
 Withers, P 304
 Withers, R 1209
 Wittig, J 874
 Wittig, JE 681
 Wittmann, A 725
 Woehl, TJ 475,634,751
 Wolfsberg, L 875
 Wolleschensky, R 562
 Woloschak, G 441
 Wong, SK 161.1
 Wong, TJ 1162
 Woo, P 355,1181
 Woods, E 421
 Woodward, JH 32
 Woodward, PM 1184
 Wooten, J 590
 Word, RC 711,796,905,1195
 Wormuth, K 1094
 Wozny, S 487
 Wright, E 24
 Wright, ER 193,643
 Wright, SI 588,836,1188
 Wu, D 653
 Wu, D 1190
 Wu, H 174,353,584,655
 Wu, J 204,600,907,1163
 Wu, L 243,551,702,763
 Wu, RJ 56
 Wu, W 364
 Wu, XS 439
 Wu, Y 847
 Wu, Z 50
 Wuhler, R 901,1097
 Wzorek, M 853
 Xia, D 584
 Xia, Y 635,867
 Xiao, D 961
 Xiao, X 66
 Xie, H 331,494,842
 Xie, L 63,656
 Xie, S 867
 Xie, X 582
 Xin, H 400
 Xin, HL 164,321,687,1128
 Xu, AD 292
 Xu, C 98,862
 Xu, J 213,600,628,844,871
 Xu, K 119
 Xu, P 1038
 Xu, R 763
 Xu, S 295
 Xu, W 547,548
 Xu, Z 423,425,958
 Yagi, A 812
 Yaguchi, T 124,910
 Yakal-Kremiski, K 1052
 Yalunin, SV 604
 Yamaguchi, S 170
 Yamamoto, K
 597,989,989,1131,1201
 Yamamoto, Y 974
 Yamasaki, J 499,569,989
 Yamasaki, M 1014
 Yamashita, K-I 848
 Yamashita, S 609
 Yamazaki, T 129
 Yan, J 409
 Yan, P 70,72,162
 Yan, P 238
 Yan, P 345
 Yan, Q 916
 Yan, Y 348
 Yang, F 306
 Yang, G 398,1046

Author Index

Yang, H
613,936,965,1107,1153,1207
Yang, J 401,1096
Yang, J-M 590
Yang, J-R 900,967
Yang, JC 321,535,1065
Yang, L 103,661
Yang, N 443
Yang, Y 161.1
Yang, Z 371,863,870
Yankovich, AB
945,1102,1206,1208
Yao, J 182
Yao, W 773
Yao, Y 531
Yaraghi, NA 1005
Yardimci, A 65
Yassar, RS 911
Yasuda, K 886
Yasuda, R 638
Yasui, LS 99
Yates, J 736
Yayathi, S 1215
Yeager, A 1200
Yedra, L 931
Yee, B 1067
Yelton, WG 578
Yeo, I-S 888
Yeoh, CS 1088
Yi, H 193
Yi, X 60
Yin, Q 474
Yin, W 551
Yokoyama, T 1058
Yoon, A 1163
Yoon, H 1175
Yoon, M 872
Yoon, Y 1175
York, B 728
Yoshida, H 367,1008
Yoshida, K 123,650
Yoshida, R 597
Yoshida, S 245
Yost, MJ 313
Young, NP 670
Young, S 23
Yousef, I 744
Yu, G 276
Yu, L 755,976
Yu, M 1102
Yu, X-Y 1198
Yu, Y 756
Yu, Z 678
Yuan, H 552
Yuan, X 793
Yuan, Y 133,166,773,908
Yuasa, S 499,932
Yucelen, E 701
Yuchi, D 213
Yue, Y 213,398
Yukihito, K 1152
Yunzhi, W 306
Yurtsever, A 708
Zachman, MJ 1147
Zaefferer, S 1016
Zaghib, K 341,592,1180
Zagonel, LF 845
Zak, T 36
Zakharov, D 754
Zakharov, DN 1165
Zaluzec, NJ
266,308,369,415,482,483,648
Zanella, R 287
Zanetti, M 725
Zasadzinski, JA 1144
Zavadil, K 169,1218
Zavattieri, P 1005
Zecevic, J 566
Zechmann, B 39
Zega, T 1054
Zega, TJ 764
Zeidler, D 351
Zeiner, CA 1118
Zeisler, R 396
Zellnig, G 39
Zemanek, P 93,95,889
Zeng, M 1094
Zettl, A 727
Zewail, AH 605
Zhai, Y 671
Zhang, C 276,945
Zhang, D 1040
Zhang, F 234,506,581,1129
Zhang, G 192,636
Zhang, J 144,311,1168
Zhang, J-G 70,72,162
Zhang, JJ 345
Zhang, K 686
Zhang, L
280,322,370,533,738,953
Zhang, M 144
Zhang, P 831
Zhang, Q 527
Zhang, S 324
Zhang, S 981
Zhang, T 868
Zhang, W 404,1037,1217
Zhang, X 216,529,833,1067
Zhang, Y 218,656,669
Zhang, Z 1041
Zhao, D 662
Zhao, J 740,959
Zhao, M 506
Zhao, S 284
Zhao, WW 141,1039
Zhao, Y 591
Zhao, Z 771
Zheleva, T 770
Zheng, C 1089,1209
Zheng, H 132,563
Zheng, J 345
Zheng, J-G 997
Zheng, N 544
Zheng, Y 148
Zheng, Y 760
Zhi, Z 197
Zhitenev, AI 877
Zhitenev, N 1175
Zhong, K 79
Zhong, XL 648
Zhou, D 166,1035,1037
Zhou, F 558,633,637
Zhou, G 474,500
Zhou, H 309,479
Zhou, L 674
Zhou, W 54,218,371,487,864
Zhou, X 952
Zhu, G-Z 587,864,1125
Zhu, J 959
Zhu, P 243
Zhu, Q 829
Zhu, W 500
Zhu, Y 243,498,551,702,758,10
89,1105,1209
Zhu, Z 545
Zickemann, V 453
Zimmerberg, J 1200
Zimmerman, JA 729
Zink, EM 1118
Znidarsic, N 450
Zobelli, A 845
Zolotarevsky, NY 885
Zong, W 362
Zorko, M 774
Zotta, MD 17,352
Zou, S 31
Zschech, E 921
Zuazo, I 1172
Zuo, J-M 549,625,1163,1210
Zuo, ZM 1106
Zutter, B 598
Zweiacker, K 408
Zweiacker, KW 734

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Product & Services Index

Accessories (miscellaneous)

EMS/DiATOME	753
K-Tek Nanotechnology, LLC	657
Microscopy Innovations, LLC	1145
NANOLANE	1249
Norcada, Inc.	1284

AFM / STM Accessories

Bruker Corporation	974
Herzan LLC	859
K-Tek Nanotechnology, LLC	657
Oxford Instruments	854

Anti-Contamination Systems

Angstrom Scientific Inc.	947
--------------------------	-----

Atomic Force Microscopes

Angstrom Scientific Inc.	947
Bruker Corporation	974
Hitachi High Technologies America, Inc.	1376
Neaspec GmbH	1582
WITec Instruments Corp	882

Auger Microscopes

Evans Analytical Group	661
Physical Electronics	548

Backscatter Detectors

NEWTEC Scientific	1177
-------------------	------

Books

<i>Microscopy & Analysis</i>	1142
Springer	653

Calibration and Reference Standards

HIROX-USA, Inc.	1143
K-Tek Nanotechnology, LLC	657
SPI Supplies	1375
Ted Pella Inc.	844

Camera / Digital Camera Systems

Advanced Microscopy Techniques Corp.	864
Direct Electron, LP	1276
EMSIS GmbH	944
HORIBA Instruments Inc. rporated	1059
TVIPS GmbH 1061	1061
Vision Engineering	939

CCD Cameras

Advanced Microscopy Techniques Corp.	864
Direct Electron, LP	1276
EMSIS GmbH	944
Gatan, Inc.	537
Thorlabs	1044

CMOS Cameras

Advanced Microscopy Techniques Corp.	864
Direct Electron, LP	1276
TVIPS GmbH	1061

Cold Sputtering Equipment

Oerlikon Leybold Vacuum, USA	937
------------------------------	-----

Confocal Microscopes

Carl Zeiss Microscopy, LLC	638
Keyence Corporation	1148
Leica Microsystems	1174
Olympus	1050
Thorlabs	1044
WITec Instruments Corp	882

Consulting

Abbie Gregg, Inc.	943
Analitex	520
Applied Physics Technologies, Inc.	959
Probe Software, Inc.	1383
Wolfram Research	663

Courses / Workshops

Abbie Gregg, Inc.	943
Australian Microscopy and Microanalysis Research Facility	416
ICDD	1078
Object Research Systems	861
Probe Software, Inc.	1383

Critical Point Dryers

EMS / DiATOME	753
Tousimis	950

Cryoequipment

Boeckeler Instruments Inc.	867
Leica Microsystems	1174



Product & Services Index *continued*

Crystallographic Mapping

EDAX Inc.	445
NanoMEGAS USA	981
NEWTEC Scientific	1177
Rigaku Americas Corp.	560

Databases

ICDD	1078
------	------

Detectors

Bruker Corporation	974
Direct Electron, LP	1276
Gatan, Inc.	537
HORIBA Instruments Inc.rporated	1059
IXRF Systems, Inc.	960
PNDetector GmbH	1182
PNSensor GmbH	1281
Rigaku Americas Corp.	560

Diamond Knives

Boeckeler Instruments Inc.	867
----------------------------	-----

Diamond Wire Saws

South Bay Technology Inc.	647
---------------------------	-----

Digital Archiving/Data Storage

EMSIS GmbH	944
------------	-----

Dual Beam FIB/SEM

Carl Zeiss Microscopy, LLC	638
Evans Analytical Group	661
FEI Company	1056
Hitachi High Technologies America, Inc.	1376
ONAMI Technology Labs	1280
Tescan USA	873

E Beam Lithography

Integrated Dynamics Engineering	419
Oregon Physics	1181
Raith America, Inc.	961

EDS Detector Repairs and Upgrades

IXRF Systems, Inc.	960
--------------------	-----

EDS Detectors & Systems

Bruker Corporation	974
--------------------	-----

COXEM	884, 883
EDAX Inc.	445
IXRF Systems, Inc.	960
JEOL	423
Oxford Instruments	854
PNDetector GmbH	1182
PNSensor GmbH	1281
STAR / H.K.N. Inc.	984
Thermo Fisher Scientific	1038

Electrical Characterization

Hysitron, Inc.	654
----------------	-----

Electron Backscattered Diffraction (EBSD)

BLG Vantage	1584
Bruker Corporation	974
EDAX Inc.	445
Evans Analytical Group	661
ICDD 1078	1078
Oxford Instruments	854
Thermo Fisher Scientific	1038

Electron Microprobe Automation Systems

Probe Software, Inc.	1383
----------------------	------

Electron Microprobe Service

ONAMI Technology Labs	1280
-----------------------	------

Electron Microprobes / EPMA

JEOL	423
CAMECA Instruments, Inc.	445

EMI Cancellation

Herzan LLC	859
Integrated Dynamics Engineering	419
Vitatech Electromagnetics LLC	943

Failure Analysis

Abbie Gregg, Inc.	943
Evans Analytical Group	661
ONAMI Technology Labs	1280
Vision Engineering	939

FIB Accessories

EXpressLO LLC	564
Hummingbird Scientific	554

ibss Group, Inc.	420
Oregon Physics	1181

Field Emission Sources

Applied Physics Technologies, Inc.	959
------------------------------------	-----

Filaments and Filament Rebuilding

Applied Physics Technologies, Inc.	959
HREM Research Inc.	1049

Fluorescence Microscopy

BioTek Instruments, Inc.	659
Carl Zeiss Microscopy, LLC	638
EDAX Inc.	445
EMS / DiATOME	753
HORIBA Instruments Inc.rporated	1059
Keyence Corporation	1148
Olympus	1050
Siskiyou Corporation	1082
Thorlabs	1044
Vision Engineering	939

Focused Ion Beam Systems / Workstations

Oregon Physics	1181
Raith America, Inc.	961
Tescan USA	873

FT-IR Microscopy

Daylight Solutions	516
Neaspec GmbH	1582
Siskiyou Corporation	1082
Thermo Fisher Scientific	1038

Glow Discharge Cleaning

Ted Pella Inc.	844
----------------	-----

Image Analysis and Processing

Analitex	520
BioTek Instruments, Inc.	659
BLG Vantage	1584
CAMECA Instruments, Inc.	445
Daylight Solutions	516
EMSIS GmbH	944
FEI Company	1056
HREM Research Inc.	1049
Olympus	1050

ROBO-Met.3D	758
TVIPS GmbH	1061
Wolfram Research	663

Immuno-Labeling

EMS / DiATOME	753
Microscopy Innovations, LLC	1145
NANOLANE	1249
Nanoprobes Inc.rporated	1076

Ion Pumps New and Rebuilding

Duniway Stockroom Corp.	546
-------------------------	-----

Journals

Royal Microscopical Society	857
Springer	653

Knife Resharpener

EMS / DiATOME	754
---------------	-----

Knives

Boeckeler Instruments Inc.	867
EMS / DiATOME	754

Lab6 Sources

Applied Physics Technologies, Inc.	959
------------------------------------	-----

Leak Detection

Pfeiffer Vacuum	1083
Oerlikon Leybold Vacuum, USA	937

Light Microscopes

BioTek Instruments, Inc.	659
Carl Zeiss Microscopy, LLC	638
Daylight Solutions	516
HIROX-USA, Inc.	1143
Keyence Corporation	1148
Leica Microsystems	1174
NANOLANE	1249
Olympus	1050
Siskiyou Corporation	1082
Vision Engineering	939

Megapixel Cameras

Advanced Microscopy Techniques Corp.	864
EMSIS GmbH	944
TVIPS GmbH	1061

Product & Services Index *continued*

Metallography Equipment

Keyence Corporation	1148
Olympus	1050
South Bay Technology Inc.	647

Micromanipulators

Angstrom Scientific Inc.	947
EMS / DiATOME	754
EXpressLO LLC	564
Oxford Instruments	854
Siskiyou Corporation	1082

Microtome and Ultramicrotome Repair

EMS / DiATOME	754
---------------	-----

Microtomes and Ultramicrotomes

Boeckeler Instruments Inc.	867
----------------------------	-----

Microwave Tissue Processing

Ted Pella Inc.	844
----------------	-----

Nano Indentation

Hysitron, Inc.	654
----------------	-----

Nanoprobes / Mechanical Microprobes

Hummingbird Scientific	554
------------------------	-----

New and Used Equipment

Duniway Stockroom Corp.	546
Synergy Systems Corporation	1576

Optical Filters

HIROX-USA, Inc.	1143
-----------------	------

Osmium Coaters

SPI Supplies	1375
--------------	------

Other

Abbie Gregg, Inc.	943
Australian Microscopy and Microanalysis Research Facility	416
Daitron, Inc.	1247
DuctSox	515
Duniway Stockroom Corp.	546
FOM Networks, Inc.	518
Nanoprobes Inc.rporated	1076
Norcada, Inc.	1284

Oregon Physics	1181
ROBO-Met.3D	758
Synergy Systems Corporation	1576
Wolfram Research	663

Phase Identification

ICDD	1078
NanoMEGAS USA	981

Plasma Cleaners

South Bay Technology Inc.	647
SPI Supplies	1375
XEI Scientific, Inc.	853

Publishers

Microscopy & Analysis	1142
Physics Today	558
Springer	653

Raman Spectroscopy / Microscopy

Daylight Solutions	516
Evans Analytical Group	661
HORIBA Instruments Inc.rporated	1059
Rigaku Americas Corp.	560
TechnoSpex Pte Ltd	1047
Thermo Fisher Scientific	1038
WITec Instruments Corp	882

Reference Materials / Reference Standards

Microscopy & Analysis	1142
-----------------------	------

Scanning Electron Microscopes (SEM)

Carl Zeiss Microscopy, LLC	638
COXEM	884, 883
FEI Company	1056
Hitachi High Technologies America, Inc.	1376
ibss Group, Inc.	420
Integrated Dynamics Engineering	419
JEOL	423
Tescan USA	873
Raith America, Inc.	961
Synergy Systems Corporation	1576

Scanning Probe Microscope Accessories

Herzan LLC	859
Hysitron, Inc.	654
K-Tek Nanotechnology, LLC	657
Neaspec GmbH	1582

Scanning Transmission Electron Microscopes (STEM)

FEI Company	1056
Hitachi High Technologies America, Inc.	1376
HREM Research Inc.	1049
ibss Group, Inc.	420
NanoMEGAS USA	981

Secondary Ion Mass Spectrometer (SIMS)

CAMECA Instruments, Inc.	445
Evans Analytical Group	661
ibss Group, Inc.	420
Oregon Physics	1181

SEM / STEM Digital Imaging Systems

COXEM	884, 883
ROBO-Met.3D	758

SEM Accessories

Angstrom Scientific Inc.	947
EXpressLO LLC	564
Gatan, Inc.	537
Herzan LLC	859
Hummingbird Scientific	554
Hysitron, Inc.	654
NEWTEC Scientific	1177
Norcada, Inc.	1284
PNDetector GmbH	1182
PNSensor GmbH	1281
Raith America, Inc.	961
SPI Supplies	1375
Ted Pella Inc.	844
Tescan USA	873
Tousimis	950
XEI Scientific, Inc.	853

SEM Stages, Mounts and Holders

BLG Vantage	1584
EXpressLO LLC	564
Hummingbird Scientific	554
NEWTEC Scientific	1177
South Bay Technology Inc.	647
Tousimis	950

Service & Repair

Duniway Stockroom Corp.	546
EMSIS GmbH	944
FEI Company	1056
NEWTEC Scientific	1177

Service Laboratories

Australian Microscopy and Microanalysis Research Facility	416
FOM Networks, Inc.	518
ONAMI Technology Labs	1280
Oregon Physics	1181

Society and Event Organizer

Royal Microscopical Society	857
-----------------------------	-----

Software

Analitex	520
BioTek Instruments, Inc.	659
BLG Vantage	1584
FOM Networks, Inc.	518
Gatan, Inc.	537
HIROX-USA, Inc.	1143
HREM Research Inc.	1049
ICDD	1078
IXRF Systems, Inc.	960
Object Research Systems	861
Probe Software, Inc.	1383
Wolfram Research	663



Product & Services Index *continued*

Specimen Preparation & Handling

BLG Vantage	1584
Boeckeler Instruments Inc.	867
EMS / DiATOME	753
EXpressLO LLC	564
JEOL	423
Leica Microsystems	1174
Microscopy Innovations, LLC	1145
SCIENION US INC	1147
South Bay Technology Inc.	647
SPI Supplies	1375
Tousimis	950
XEI Scientific, Inc.	853

Specimen Storage

Microscopy Innovations, LLC	1145
South Bay Technology Inc.	647

Spectrometers

Daylight Solutions	516
HORIBA Instruments Inc.rporated	1059
IXRF Systems, Inc.	960
Neaspec GmbH	1582
Rigaku Americas Corp.	560

SQUID / Superconducting Quantum Interference Devices

STAR / H.K.N. Inc.	984
--------------------	-----

Stage Automation

SCIENION US INC	1147
Siskiyou Corporation	1082

Stage Micrometers

Siskiyou Corporation	1082
----------------------	------

Stereoscopic Viewing Systems

Leica Microsystems	1174
Vision Engineering	939

Supplies

Duniway Stockroom Corp.	546
K-Tek Nanotechnology, LLC	657
Microscopy Innovations, LLC	1145
Norcada, Inc.	1284
Nanoprobes Inc.rporated	1076

Surface Analysis

BLG Vantage	1584
CAMECA Instruments, Inc.	445
HIROX-USA, Inc.	1143
HORIBA Instruments Inc.rporated	1059
JEOL	554
Keyence Corporation	1148
NANOLANE	1177
Object Research Systems	861
Oerlikon Leybold Vacuum, USA	937
ONAMI Technology Labs	1280
Physical Electronics	548
Thermo Fisher Scientific	1038
Vision Engineering	939
Zygo Corporation	445

Tabletop SEM/TEM

Angstrom Scientific Inc.	947
COXEM	884, 883
Delong America Inc.	562
Hitachi High Technologies America, Inc.	1376

TEM Accessories

Advanced Microscopy Techniques Corp.	864
Direct Electron, LP	1276
EXpressLO LLC	564
Gatan, Inc.	537
Hummingbird Scientific	554
Hysitron, Inc.	654
NanoMEGAS USA	981
Norcada, Inc.	1284
PNDetector GmbH	1182
PNSensor GmbH	1281
SCIENION US INC	1147
TVIPS GmbH	1061
Scientific Instruments & Applications, Inc.	519
SPI Supplies	1375
Ted Pella Inc.	844
Tousimis	950

TEM Specimen Holders

Angstrom Scientific Inc.	947
Gatan, Inc.	537
Hummingbird Scientific	554
SCIENION US INC	1147
Tousimis	950

Testing Equipment

Herzan LLC	859
Hysitron, Inc.	654
Object Research Systems	861
Olympus	1050
Pfeiffer Vacuum	1083
Vitatech Electromagnetics LLC	943
Zygo Corporation	445

Transmission Electron Microscopes (TEM)

Delong America Inc.	562
FEI Company	1056
Hitachi High Technologies America, Inc.	1376
HREM Research Inc.	1049
ibss Group, Inc.	420
Integrated Dynamics Engineering	419
JEOL	423
ONAMI Technology Labs	1280
TVIPS GmbH	1061

Ultramicrotomes

Boeckeler Instruments Inc.	867
Leica Microsystems	1174

Vacuum Equipment

Denton Vacuum, LLC	645
Duniway Stockroom Corp.	546
EMS / DiATOME	753
Oerlikon Leybold Vacuum, USA	937
Pfeiffer Vacuum	1083
Synergy Systems Corporation	1576

Vacuum Evaporators

Oerlikon Leybold Vacuum, USA	937
Ted Pella Inc.	844

Vibration Isolation Systems

Herzan LLC	859
Integrated Dynamics Engineering	419

WDS Detectors & Systems

Bruker Corporation	974
EDAX Inc.	445
Oxford Instruments	854
PNSensor GmbH	1281

X-ray Analysis Equipment

Carl Zeiss Microscopy, LLC	638
EDAX Inc.	445
IXRF Systems, Inc.	960
Object Research Systems	861
Oxford Instruments	854
PNDetector GmbH	1182
Rigaku Americas Corp.	560
Thermo Fisher Scientific	1038



Exhibitor List by Booth

Exhibitor Name	Booth
Phenom-World BV.	338
Microscopy Society of America MegaBooth	354
Applied Beams LLC	415
Australian Microscopy and Microanalysis Research Facility	416
BioPhotonics, a Photonics Media Publication	417
E Fjeld Co., Inc.	418
Integrated Dynamics Engineering	419
ibss Group, Inc.	420
JEOL	423
CAMECA Instruments, Inc.	445
EDAX / AMETEK	445
TMC Ametek	445
Zygo Corporation	445
AIST-NT Inc.	512
Hinds Instruments, Inc.	514
DuctSox	515
Daylight Solutions	516
Eclipse Technologies	517
FOM Networks, Inc.	518
Scientific Instruments & Applications, Inc.	519
Analitex	520
Gatan, Inc.	537
Duniway Stockroom Corp.	546
Physical Electronics	548
ibidi LLC	550
Hummingbird Scientific	554
Physics Today	558
Rigaku Americas Corp.	560
Delong America Inc.	562
EXpressLO LLC	564
Carl Zeiss Microscopy, LLC	638
Denton Vacuum, LLC	645
South Bay Technology Inc.	647
Springer	653
Hysitron, Inc.	654
K-Tek Nanotechnology, LLC	657
Amptek Inc.	658
BioTek Instruments, Inc.	659
Evans Analytical Group	661
Cambridge University Press	662

Exhibitor Name	Booth
Wolfram Research	663
EMS / DiATOME	753, 754
ROBO-Met.3D	758
Navitar	762
Pace Technologies	764
Evex Global	838
Ted Pella Inc.	844
XEI Scientific, Inc.	853
Oxford Instruments	854
Royal Microscopical Society	857
Herzan LLC	859
Technotrade	860
Object Research Systems	861
Renishaw, Inc.	862
TEMwindows	863
Advanced Microscopy Techniques Corp.	864
Boeckeler Instruments Inc.	867
Protochips, Inc.	868
Tescan USA	873
Barnett Technical Services	881
WITec Instruments Corp	882
	883, 884
COXEM	
Oerlikon Leybold Vacuum, USA	937
Nion Company	938
Vision Engineering	939
Abbie Gregg, Inc.	943
Vititech Electromagnetics, LLC	943
EMSIS GmbH	944
ResAlta Research Technologies	946
Angstrom Scientific Inc.	947
Lumencor	948
Tousimis	950
Applied Physics Technologies, Inc.	959
IXRF Systems, Inc.	960
Raith America, Inc.	961
E. A. Fischione Instruments, Inc.	966
Bruker Corporation	974
NanoMEGAS USA	981

Exhibitor Name	Booth
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Thorlabs	1044
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HREM Research Inc.	1049
Olympus	1050
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Exhibitor List by Name

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AIST-NT Inc.	512
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Analitex	520
Angstrom Scientific Inc.	947
Applied Beams, LLC	415
Applied Physics Technologies, Inc.	959
Australian Microscopy and Microanalysis Research Facility	416
Barnett Technical Services	881
BioPhotonics, a Photonics Media Publication	417
BioTek Instruments, Inc.	659
BLG Vantage	1584
Boeckeler Instruments Inc.	867
Bruker Corporation	974
Cambridge University Press	662
CAMECA Instruments, Inc.	445
Carl Zeiss Microscopy, LLC	638
COXEM	883, 884
Crytur spol. s r.c. (Ltd.)	1084
Daitron, Inc.	1247
Daylight Solutions	516
DeLong America Inc.	562
Denton Vacuum, LLC	645
Direct Electron, LP	1276
DuctSox	515
Duniway Stockroom Corp.	546
E Fjeld Co., Inc.	418
E. A. Fischione Instruments, Inc.	966
Eclipse Technologies	517
EDAX / AMETEK	445
EMS / DiATOME	753, 754
EMSIS GmbH	944
Evans Analytical Group	661
Evex Global	838
EXpressLO LLC	564
FEI Company	1056
FOM Networks, Inc.	518
Gatan, Inc.	537

Exhibitor Name	Booth
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HREM Research Inc.	1049
Hummingbird Scientific	554
Hysitron, Inc.	654
ibidi LLC	550
ibss Group, Inc.	420
ICDD	1078
iLab Solutions	1048
Integrated Dynamics Engineering	419
Intel Corporation	1149
IXRF Systems, Inc.	960
JEOL	423
Keyence Corporation	1148
Keysight	1043
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Lumencor	948
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Microscopy Innovations, LLC	1145
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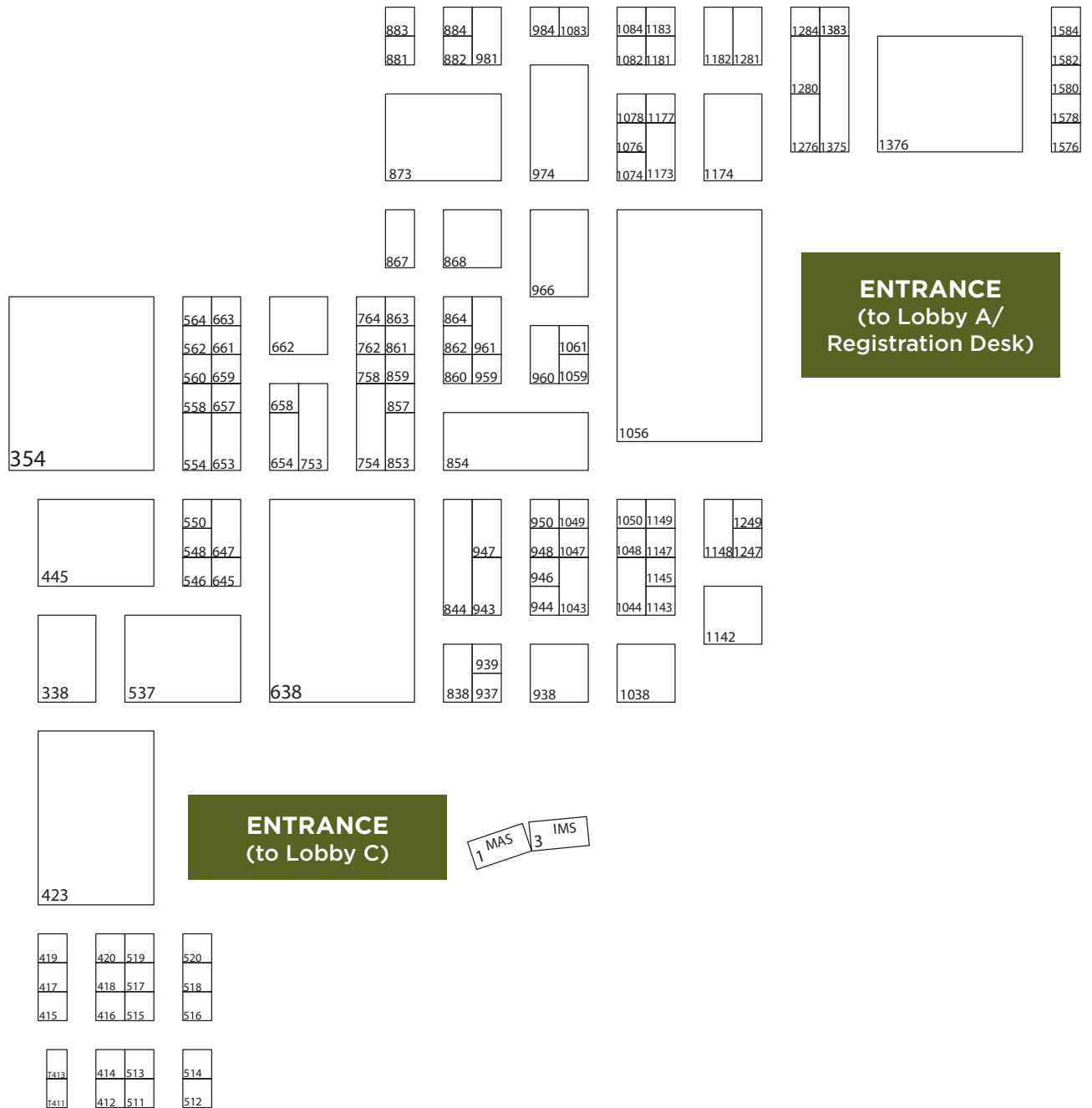
Exhibitor Name	Booth
Pfeiffer Vacuum	1083
Phenom-World BV.	338
Physical Electronics	548
Physics Today	558
PNDetector GmbH	1182
PNSensor GmbH	1281
Probe Software, Inc.	1383
Protochips, Inc.	868
PulseTor LLC	1173
Raith America, Inc.	961
Renishaw, Inc.	862
ResAlta Research Technologies	946
Rigaku Americas Corp.	560
ROBO-Met.3D	758
Royal Microscopical Society	857
SCIENION US INC	1147
Scientific Instruments & Applications, Inc.	519
Siskiyou Corporation	1082
SmarAct Inc. A Subsidiary of Smartact GmbH	1578
South Bay Technology Inc.	647
SPI Supplies	1375
Springer	653
STAR / H.K.N. Inc.	984
Synergy Systems Corporation	1576
TechnoSpex Pte Ltd	1047
Technotrade	860
Ted Pella Inc.	844
TEMwindows	863
Tescan USA	873
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Thorlabs	1044
TMC Ametek	445
Tousimis	950
TVIPS GmbH	1061
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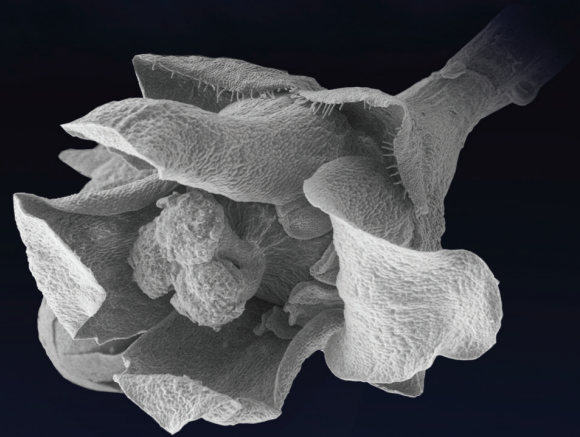
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