Microscopy & Microanalysis

The Official M&M 2016 Proceedings
Cleveland, Ohio, USA • July 24-28, 2016

M&M 2016 MICROSCOPY & MICROANALYSIS
July 24-28, 2016 • Columbus, Ohio

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https://doi.org/10.1017/S1431927616011508 Published online by Cambridge University Press

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2016 *Characterization of Sphere-like Structure in Aluminum Based Alloy*; C Li, L Wang, H Hampikian, M Bair, A Baker, A Sobolewski, M Hua, D Li

2018 *Analysis of Strain Localization at High Angle Grain Boundaries During Creep of a Polycrystalline Superalloy Using SEM-Based Digital Image Correlation*; CE Slone, MJ Mills

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Welcome from the Society Presidents

Dear Fellow Microscopists, Microanalysts, Students, Colleagues, and Friends:

On behalf of our respective societies, we are excited to welcome you to Columbus, Ohio for Microscopy & Microanalysis 2016! The state capital of Ohio, and home to the Ohio State University, Columbus is a vibrant, bustling city with great restaurants, fun nightspots, an up-and-coming culinary scene, and a great family-friendly place to visit.

We look forward to another exciting and informative M&M meeting in 2016. The Program Committee has created a wonderfully diverse program that illustrates our members' diverse fields of work.

The technical program commences Monday morning with two plenary lectures. One will be given by Prof. Mark Miodownik, University College London Professor of Materials and Society and a well-known BBC presenter of programs on materials science and engineering, whose talk is entitled *Materials for the 21st Century.* The other plenary speaker, Drew Berry, is a biomedical animator with a background in cell biology and microscopy, whose work has been exhibited at storied art venues including the Guggenheim Museum, MoMA, the Royal Institute of Great Britain, and the University of Geneva. His talk is entitled *Beyond the Limits of Microscopy: Revealing the Unseeable through Hollywood Visual Effects*.

Between the two presentations, we will honor the winners of our major society and meeting awards. The exhibit floor showcases the latest state-of-the-art microscopy-related equipment. The ever-popular free vendor tutorials are again available. The meeting also features the traditional Sunday Short Courses, Physical Sciences and Biological Sciences Tutorials, as well as two Pre-Meeting Congresses: *Exploiting the Diffractive Properties of Electrons for Solving Materials Problems,* organized by the Electron Crystallography and Automated Mapping Methods FIG, and *Essentials of Atom Probe Tomography,* organized by the Atom Probe FIG.

Participating at M&M 2016 gives you the opportunity to stay abreast of new technologies, learn new techniques, see the latest instrumentation, and most importantly, network with colleagues and make new connections. Have a wonderful week and we hope to see you next year in St. Louis, Missouri!

Mike Marko
PRESIDENT
Microscopy Society of America

Thomas F. Kelly
PRESIDENT
Microanalysis Society

Jaret J. Frafjord
PRESIDENT
International Metallographic Society

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Welcome from the Program Chairs

Welcome to Microscopy and Microanalysis 2016 in Columbus, Ohio!

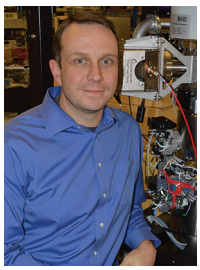
The Microscopy Society of America, the Microanalysis Society and the International Metallographic Society welcome you to Microscopy and Microanalysis 2016 in Columbus, Ohio.

As you have come to expect, Microscopy and Microanalysis 2016 will highlight the latest innovations in many different microscopy and microanalysis techniques as well as their applications to important research in both biological, physical and materials sciences. One new aspect of Microscopy and Microanalysis 2016 is that many of the 30+ featured symposia in biological, physical and analytical sciences presented at the meeting were suggested by you, the membership of MSA, MAS and IMS. In addition, we have two exciting pre-meeting Congresses planned. The Exhibition will again show off the newest developments in commercial technologies aimed at providing new and improved capabilities in your laboratory. Each day the poster sessions will be held in the exhibition hall giving the unique opportunity for lively discussion of the poster while enjoying a social event.

We are excited to have two excellent Plenary lectures scheduled. Drew Berry, a biomedical animator at the Walter and Eliza Hall Institute of Medical Research, Melbourne, Australia, will present his work in his lecture *"Beyond the limits of microscopy: Revealing the unseeable through Hollywood visual effects".* Drew uses state-of-the-art animation techniques to produce eye-popping animations of cellular processes and mechanisms. Drew's work has been seen all over the world and he has received numerous awards and honors for his work. Our second Plenary speaker is Professor Mark Miodownik from University College London where he is the Director of the UCL Institute of Making. Prof. Miodownik regularly presents BBC TV programs on materials science and engineering which have reached millions of viewers in more than 200 countries and is author of Stuff Matters which won the Royal Society Winton Prize in 2014.

The Executive Program Committee and all of our symposium organizers have worked tirelessly to produce the technical program for Microscopy and Microanalysis 2016. On behalf of the program committee, MSA, MAS and IMS, welcome to Microscopy and Microanalysis 2016 and Columbus, Ohio!

Joseph Michael
Program Committee Chair
Sandia National Laboratories



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PLENARY SPEAKER

Drew Berry

Walter and Eliza Hall Institute of Medical Research, Melbourne, Australia

"Beyond the Limits of Microscopy: Revealing the Unseeable through Hollywood Visual Effects"

MONDAY, JULY 25, 2016

Columbus Convention Center, Columbus, OH

Drew Berry is a biomedical animator who creates scientifically accurate and aesthetically rich visualisations that reveal the cellular and molecular processes for a wide range of audiences. Beginning his career as a cell biologist and microscopist Drew brings a rigorous scientific approach to each project, immersing himself in relevant research to ensure current data are represented. Since 1995, he has been a biomedical animator at the Walter and Eliza Hall Institute of Medical Research. His animations have exhibited at venues such as the Guggenheim Museum, MoMA, the Royal Institute of Great Britain and the University of Geneva. In 2010 he received a MacArthur Fellowship "Genius Grant". He has been profiled in articles in the New York Times, the New Yorker and the American Scientist. He has also received an Emmy for his contribution to a documentary on DNA.

Drew Berry[1]

1. The Walter and Eliza Hall Institute of Medical Research, Melbourne Australia

This report describes the research and visualisation techniques used to create The Malaria Lifecycle animations. The animation required one year of full time production, including three months of research, two months of model building and seven months of animation development. The goal was to visualize the entire malaria lifecycle, accurately represented for parasite behaviour and cellular structure, founded on an extensive review of the malaria research literature. The intended audience was as broad as possible, including scientists, students, the media and the general public. Technical scientific jargon was avoided in the narration to make it more accessible to non-experts.

The Malaria Lifecycle is presented as two animations "Human Host" and "Mosquito Host". The animations were designed as succinct as possible with a duration under 4 minutes each, which is considered to be a reasonable attention span for a motivated audience listening to technical content, and the utility of brief visuals for use in classrooms, YouTube and lecture presentation.

The animation was created on an Apple MacPro with Maya animation software. Image rendering used Pixar's Renderman, Maya's internal renderer, Mental Ray, and OpenGL hardware. Most shot sequences were made of 20-50 layers which were then composited together in After Effects for the final result.

The animation begins with the neck of a sleeping child in the early evening, somewhere in the tropics. Early evening is the primary feeding time when *Anopheles* typically hunts for a blood meal. The colour of the shot is tinted towards dark blue to suggest the evening, supported by the nighttime jungle noises. An attempt was made to make the skin tone racially neutral and therefore relate to as broad an audience as possible.

The flight, landing and stance of the *Anopheles* mosquito (Fig 1) were derived from published video studies of the insect's behaviour. The mechanics of the bite, such as the proboscis bending into the wound and the fold of the labrum, were derived from papers on the mosquito feeding action. The 3D model for the mosquito required substantial detailing of textures, hairs and other features to make it resemble a realistic female *Anopheles* insect. The model also required kinematic rigging for movement. The mouthparts were accurately constructed with labrum and multiple mandible stylets and maxillae that make up the proboscis tube.

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The capillaries and arterioles (Fig 2) were modelled from SEM of resin cast blood vessels from human skin. The blood flows in each of these vessel types was based upon video microscopy of a live mouse's ear. The malaria sporozoite gliding motility and infection in the liver was based on many excellent papers by Sinden *et al.*

The adherence of the merozoite to the erythrocyte is via a sticky coat of hairs (Fig 3). The parasite then reorients itself vertically, with its cytoplasmic entry apparatus pressed against the membrane. As the parasite pulls itself inside the red blood cell, it sheds its coat of hairs. Inside the infected cell, the parasite devours the haemoglobin and asexually reproduces to create 16 new parasites (Fig 4). When the merozoites are mature, they induce the infected shizont to inflate and rupture, releasing all of the parasites. The infected cell's membrane was generated with Maya nCloth dynamics to shred the membrane at the appropriate moment. The red blood cells and merozoites were particle sprites.

The freeze frame of the flying *Anopheles* mosquito was inspired by the extraordinary photography of Hugh Sturrock, Edinburgh University. The 'X-ray' view of the abdomen was based on multiple published studies of mosquito anatomy.

Depicted in this shot are the stomach, ovaries, malphigian tubules, circulatory, nervous and respiratory systems. All of the abdomen organs were created with Maya Paint FX and were accurate for scale, structure and location. The red blood cells were made with over 100,000 particle image sprites with Maya.

The rapidly maturing gametocytes expand approximately 3 times in size before rupturing the infected erythrocyte's membrane. The rupturing red blood cell membrane was created with Maya nCloth dynamics. The sperm flagella were driven by Maya Hair dynamics. The red blood cell random rotation was driven by a fractal node. The collision of red blood cells with the egg, Ookinete and sperm was keyframed by hand.

The distribution and number of cysts on the stomach wall were derived from a number of SEM studies of malaria-infected mosquitos. It is not clear from the literature how the sporozoites migrate from the cysts to the salivary glands, with evidence both for active motility and passive travel. The sporozoites and salivary glands were created with Maya Paint FX.

Figure 1. Animated *Anopheles* mosquito biting skin.

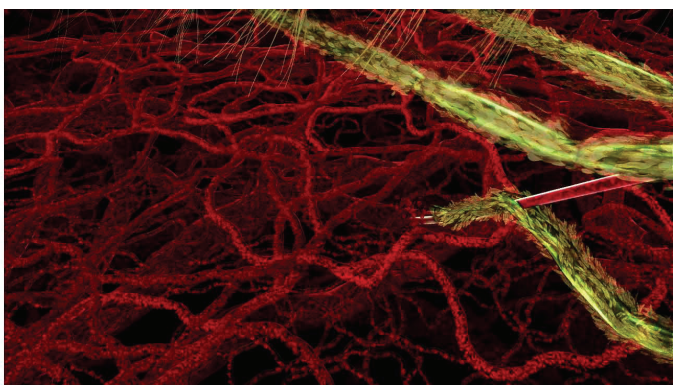

Figure 2. 'X-ray' view of proboscis and capillaries.

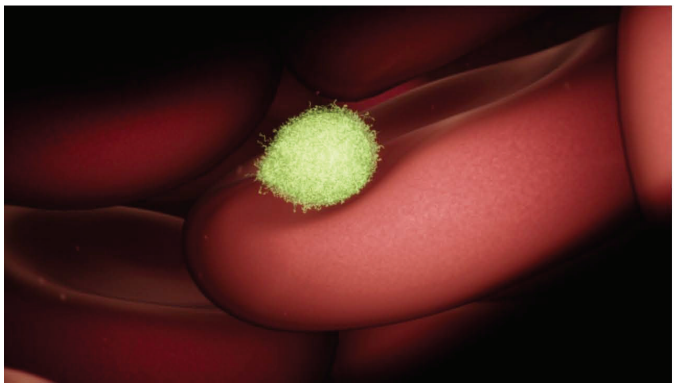

Figure 3. Merozoite invading red blood cell.

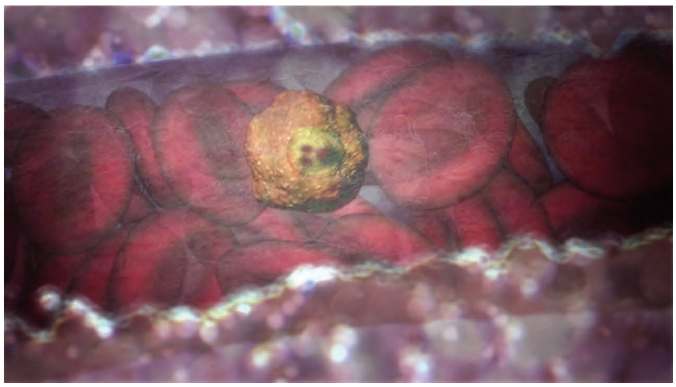

Figure 4. Infected red blood cell in bloodstream.

https://doi.org/10.1017/S1431927616011508 Published online by Cambridge University Press

PLENARY SPEAKER

Professor Mark Miodownik
University College London, UK

"Materials for the 21st Century"

MONDAY, JULY 25, 2016
Columbus Convention Center

Professor Mark Miodownik is the UCL Professor of Materials & Society. He received his Ph.D in turbine jet engine alloys from Oxford University, and has worked as a materials engineer in the USA, Ireland and the UK. For more than ten years he has championed materials research that links the arts and humanities to medicine, engineering and materials science. This culminated in the establishment of the UCL Institute of Making where he is Director and runs the research programme (www.instituteofmaking.org.uk). Prof Miodownik is a well known author and broadcaster. He regularly presents BBC TV programmes on materials science and engineering which have reached millions of viewers in more than 200 countries. In 2013 he was awarded the Royal Academy of Engineering Rooke Medal, and he was elected a fellow of the Royal Academy of Engineering in 2014. He is author of Stuff Matters which won the Royal Society Winton Prize in 2014.

Mark Miodownik[1,2]

1. Institute of Making, University College London, London, United Kingdom.
2. Mechanical Engineering Department, University College London, London, United Kingdom.

In this talk I look fifty years into the future of materials science to assess the needs for materials characterisation. Topics such as cities, energy, food and drink, and healthcare are explored in terms of their materials requirements and the requirements for microscopy and analysis. As the number of available materials increases, I assess the likelihood that the methodology of materials development itself might evolve. Will experiment combined with materials characterisation continue to dominate, or will approaches that combine big data and theory become more important forms of materials discovery?

Traditionally, approaches to materials selection and development were experimental and therefore slow. Much progress has been made, but it still takes decades to optimize suitable materials for a technological application. A principal reason for this long discovery process is that materials design is a complex, multidimensional optimization problem and the data needed to make informed choices usually do not exist. Theory blossomed in the 20th century, but its actual use in the invention of new materials in 2015 is still limited [2].

The US federal government's Materials Genome Initiative [2] recommends a change in methodology from a fragmented, experimentally based approach to a more integrated, theory- and data-led approach. This sounds appealing but this approach misses one very important issue, namely that there has been an increased specialization of materials practitioners, to the point where the scientists, technologists, and microscopists (i.e., the materials science community) involved in the development of new materials now move in both academic and social circles widely separated from those of industrial designers, architects, clothes makers, and medical experts (i.e., the materials arts community). It is the materials arts community who are experts in understanding the needs of society and therefore the materials requirements for future cities, energy, food and drink, and healthcare. In this talk I discuss ways to include the materials arts community into the development of new materials through a design-led methodology [3].

Materials are fundamentally multiscale, and there is as much to be learned about materials design through the production and trial of full-scale prototypes as through the application of theory. To assemble multidisciplinary teams with experts in each different scale requires laboratories that facilitate analysis, microscopy, and equipment to build and test physical prototypes. This will be a significant switch for materials scientists, who often hand over a material technology to the materials arts community and consider their work to be done [3].

There is much at stake, because materials have an immense cultural and environmental significance and the introduction of new materials by an isolated materials science community holds the prospect of a further deepening of the rift between scientists and society. Some combination of this materials arts approach and the materials genome approach is likely to be the hallmark of materials laboratories in the 21st century [4].

https://doi.org/10.1017/S1431927616004308 Published online by Cambridge University Press

References:

[1] A. Jain *et al,* APL Mater. 1 (2013), p. 011002.

[2] "Materials Genome Initiative Strategic Plan" (National Science and Technology Council, Washington, DC, 2014), available at https://www.whitehouse.gov/sites/default/files/microsites/ostp/NSTC/mgi_strategic_plan_-_dec_2014.pdf (accessed Feb 2016)

[3] M.A. Miodownik, MRS Bulletin 40 (2015), p, 1188.

[4] The author acknowledges funding from the EPSRC and the European Union's Seventh Framework Programme (FP7/2007-2013) under grant agreement no. 310311; the help of all members of the UCL Institute of Making for their help and technical support with this work; Ruby Wright for inspiration and the illustration.

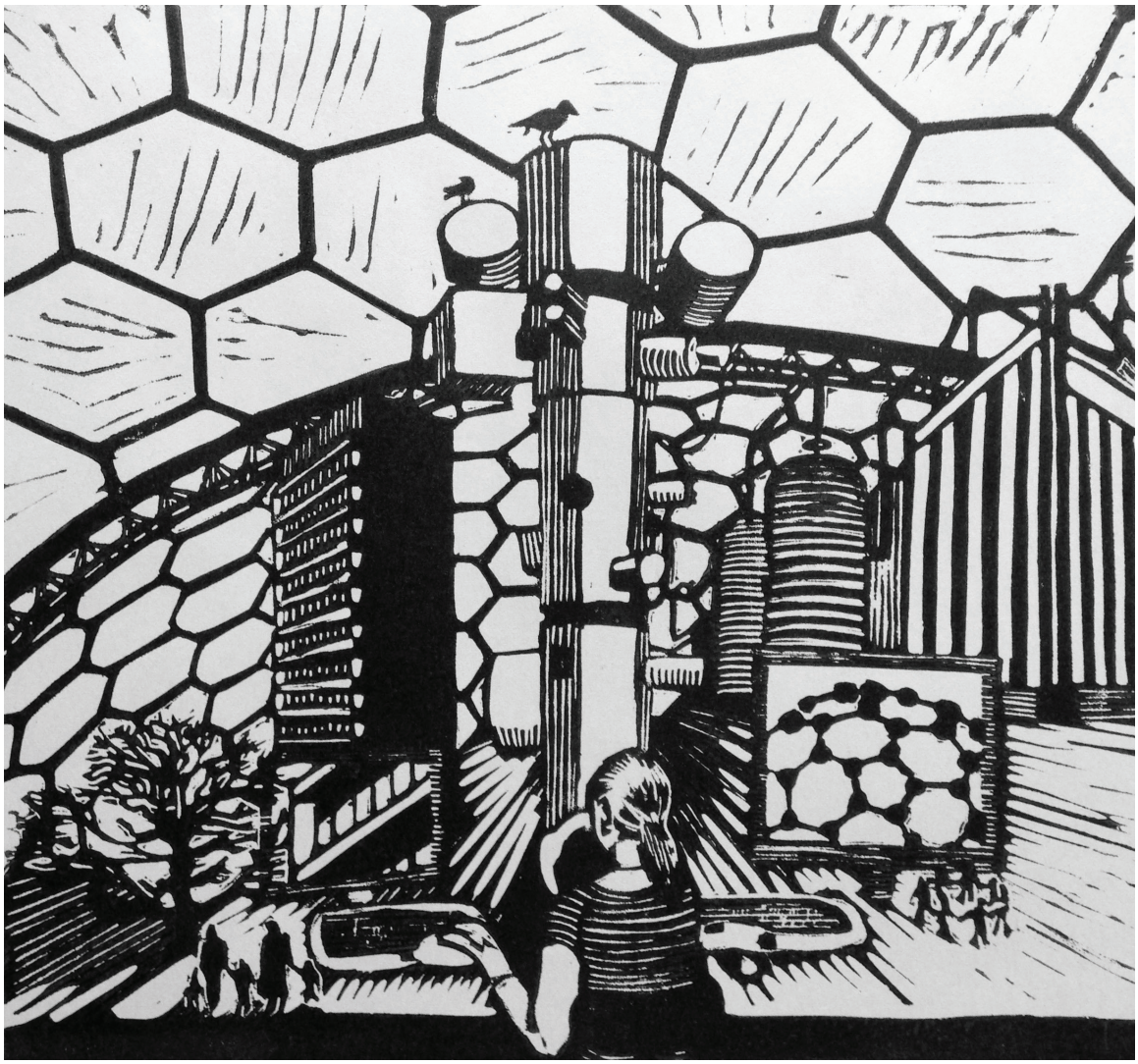

Figure 1. A possible future where buildings are designed using truly multiscale methods.

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Director	Luisa Amelia Dempere
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Director	Paul Kotula
Director	Teresa Ruiz

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Technologist's Forum	Caroline A. Miller

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Aberration-Corrected Electron Microscopy	Paul Voyles
Atom Probe Field Ion Microscopy	Arun Devaraj
Cryo-preparation	Kim Rensing
Diagnostic Microscopy	Jon Charlesworth
Electron Crystallography and Automated Mapping Techniques	Jorg Wiezorek, PhD
Electron Microscopy in Liquids and Gas (EMLG)	Renu Sharma, PhD
Facilities Operation & Management (FOM)	Christine Brantner
Focused Ion Beam	Nicholas Antoniou
Pharmaceuticals	Joseph Neilly
MicroAnalytic Standards FIG	Julien Allaz

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Microscopy and Microanalysis **Editor in Chief**	Robert L. Price
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M&M 2016 Proceedings Editor	Gail J. Celio
Microscopy Today **Editor**	Charles E. Lyman

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M&M 2017	Jay Potts
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Meeting & Registration Managers	Nicole Guy Kristen Strickland Corey Siembieda
Exhibition Management	Corcoran Expositions, Inc.
Exhibits & Sponsorship Managers	Doreen Bonnema Mary Michalik

MSA PAST PRESIDENTS

1942	G.L. Clark	1967	Joseph J. Comer	1992	Patricia Calarco
1943-44	R. Bowling Barnes	1968	John H. Luft	1993	Michael Issacson
1945	James Hillier	1969	W.C. Bigelow	1994	Robert Cardell
1946	David Harker	1970	Russell Steere	1995	Terence E. Mitchell
1947	William G. Kinsinger	1971	Robert M. Fisher	1996	Margret Ann Goldstein
1948	Perry C. Smith	1972	Daniel C. Pease	1997	C. Barry Carter
1949	F.O. Schmitt	1973	Benjamin Siegel	1998	Ralph M. Albrecht
1950	Ralph W.G. Wyckoff	1974	Russell J. Barrnett	1999	David Joy
1951	Robley C. Williams	1975	Gareth Thomas	2000	Kenneth Downing
1952	R.D. Heidenreich	1976	Etienne de Harven	2001	Ron Anderson
1953	Cecil E. Hall	1977	T.E. Everhart	2002	Stanley L. Erlandsen
1954	Robert G. Picard	1978	Myron Ledbetter	2003	Alwyn Eades
1955	Thomas F. Anderson	1979	John Silcox	2004	Sara Miller
1956	William L. Grube	1980	Michael Beer	2005	M. Grace Burke
1957	John H.L. Watson	1981	John Hren	2006	W. Gray (Jay) Jerome
1958	Max Swerdlow	1982	Lee Peachey	2007	Michael O'Keefe
1959	John H. Reisner	1983	David Wittry	2008	William T. Gunning
1960	D. Gordon Sharp	1984	J. David Robertson	2009	David J. Smith
1961	D. Maxwell Teague	1985	Dale Johnson	2010	David W. Piston
1962	Keith R. Porter	1986	Robert M. Glaeser	2011	Nestor Zaluzec
1963	Charles Schwartz	1987	Linn W. Hobbs	2012	Janet Woodward
1964	Sidney S. Breese	1988	Jean Paul Revel	2013	Ernest Hall
1965	Virgil G. Peck	1989	Ray Carpenter	2014	Jeanette Killius
1966	Walter Frajola	1990	Keith R. Porter	2015	John F. Mansfield
		1991	Charles Lyman		

MSA Fellows

2016

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

2015

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

2014

Gianluigi Botton
Abhaya Datye
Marijia Gajdardziska-Josifovska
Lucille A. Giannuzzi
Thomas Kelly
John Mansfield
Martha McCartney
Xiaoquing 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

https://doi.org/10.1017/S1431927616011508 Published online by Cambridge University Press

Distinguished Scientist Awards

PHYSICAL SCIENCES (2016)

George Smith

George Smith began his academic career in the Oxford University Metallurgy and Chemistry Departments. He received his Bachelors degree in Metallurgy in 1965, and his Doctorate in Chemistry in 1968. He was particularly interested in the study of the relationship between the local chemistry, microstructure, and properties of materials. He realised that insight was needed at the atomic level, and decided that field ion microscopy and (later) atom probe microanalysis would provide the most direct and incisive way to obtain the required information.

George built up and led the Oxford research group that developed novel atom probe techniques for the direct observation of solid materials in three dimensions on the atomic scale. For this work, he was awarded the Beilby Medal and Prize (1985), the Rosenhain Medal (1991) the Acta Materialia Gold Medal (2005), and the Institute of Materials Platinum Medal (2006). In 1996, he was elected to Fellowships of the Royal Society, the U.K. Institute of Materials Minerals and Mining, and the Institute of Physics. In 2003, he was elected to a Fellowship of the Royal Society for Chemistry. Together with Oxford colleagues, he also founded a spin-out company, Kindbrisk Ltd., later re-named Oxford Nanoscience Ltd., which was the first commercial producer of three-dimensional atom probe systems. The company won several national and international technology awards, and is now part of Cameca Instruments Inc.

George is the author or co-author of two books and over 400 scientific papers. He has published extensively on the subjects of phase transformations and microstructural stability in a wide range of metals and alloys. He has also worked on the phase stability of compound semiconductor nanostructures, and on the effects of environmental exposure on the atomic-scale structure and surface composition of platinum alloy catalysts. In recent years, he has focussed on the long-term safety and stability of the materials used in the pressure vessels and fuel cladding for current-generation nuclear reactors, and the development of new materials for future nuclear fusion energy systems.

From 2000-2005, George served as Head of the Department of Materials at Oxford University. He gave the Hatfield Lecture at the University of Sheffield in 2011, and the Hume Rothery Lecture at the University of Oxford in 2014. His current research interests are centred on the irradiation response of plasma-facing materials for fusion reactors, and on the durability of supported nanoparticulate catalysts for use in clean energy systems.

BIOLOGICAL SCIENCES (2016)

Kenneth Downing

Kenneth Downing received his BS and PhD from Cornell University. He worked at the Institute for Cell Biology at the ETH in Zurich before moving to the Lawrence Berkeley National Laboratory, where he is currently a Senior Scientist.

He began his career in electron microscopy as a grad student and has from the beginning been involved in development and application of techniques for obtaining high resolution data from biological macromolecules. He developed spot-scan imaging, along with focus correction for tilted specimens, which is of particular value in electron crystallography, as well as a decelerator-based CCD camera for intermediate voltage electron microscopes. He has over the years studied several types of DNA condensates along with various protein structures. He was involved in the solution of the first protein structure obtained by electron crystallography, bacteriorhodopsin. His group then solved the structure of tubulin and obtained the first sub-nm resolution structures of microtubules and kinsein motors on microtubules. He has studied larger structures by electron tomography, including tubulin-based structures of the eukaryotic axoneme and a number of features in bacteria. Most recently he has been studying the structure of microtentacles, microtubule-based projections from cancer cells, as well as nanostructures of polymers with applications in batteries and fuel cells.

Dr. Downing served as MSA President in 2000 and was named a Fellow in 2010. He is a co-author of the text "Electron Crystallography of Biological Macromolecules", along with R. M. Glaeser, W. Chiu, J. Frank and D. DeRosier, all of whom have now been awarded the DSA.

	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. Glauert	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
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
2015	Peter Hawkes	Michael Davidson

Major Society Awards

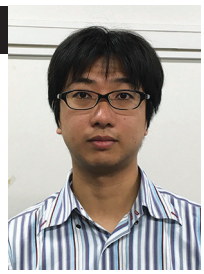
BURTON MEDAL AWARD (2016)

Miofang Chi (2016)
Oak Ridge National Laboratory, Oak Ridge

Miaofang Chi received her Ph.D. in Materials Science and Engineering from University of California, Davis in 2008, and M.S. from Shanghai Institute of Ceramics, Chinese Academy of Sciences in 2003. She currently is a research staff member at the Center for Nanophase Materials Sciences (CNMS) at Oak Ridge National Laboratory (ORNL). Prior to joining ORNL in 2008, she was a visiting scholar at the National Center for Electron Microscopy at Lawrence Berkeley National Laboratory (2004-2006) and was a research fellow at Lawrence Livermore National laboratory (2006-2008). She has extensive research experience in the development and application of novel electron microscopy techniques for energy materials, and has over 120 peer-reviewed journal publications with more than 4500 citations. She was awarded the Lawrence Graduate Research Fellowship in 2006, the Distinguished Scholar Award by the Microanalysis Society in 2007, and twice the significant event awards at ORNL (2014, 2016). In 2015, she received the ORNL Director's Award for Outstanding Individual Accomplishment in Science and Technology and the ORNL's Early Career Research Award.

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 Danev
2012	David Ginger
2013	John L. Rubinstein
2014	Maria Varela
2015	Andrew Minor

ALBERT CREWE AWARD (2016)



Ryo Ishikawa

Ryo Ishikawa received his PhD degree (2011) in Materials Science and Engineering from the University of Tokyo in Japan. During his PhD research at the University of Tokyo, he started atomic-scale structure characterization in luminescent materials by using STEM imaging and spectroscopy. In 2012, he joined the STEM group at Oak Ridge National Laboratory and continued his research on single dopant analysis in nitrides, including the identification of the three-dimensional location of a single dopant combining with single-electron-sensitive quantitative microscopy and tracking a single atom during bulk diffusion. Currently, he is an Assistant Professor in the Institute of Engineering Innovation at the University of Tokyo, and he is working on the development of atomic-scale three-dimensional imaging by STEM.

YEAR	RECIPIENT
2012	Wu Zhou
2013	Lena Fitting-Kourkoutis
2014	Jinwoo Hwang
2015	Meng Gu

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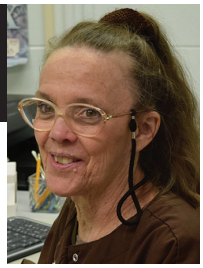
MORTON D. MASER DISTINGUISHED SERVICE AWARD (2016)



Amanda Lawrence

Amanda Lawrence first joined MSA in 2005 and quickly became actively involved in the society's student bursary/volunteer program. Amanda's service mindedness, proactive nature, demeanor, work ethic, and attention to detail was noticed and resulted in her leading the coordination of and having the majority of responsibility for the volunteer/bursary program by 2009. Amanda is also a long-time active member of the Southeastern Microscopy Society (SEMS), her local MSA affiliate society. She serves on the Membership Committee and Executive Council (2008-2009; 2013-2016), and has been a critical part of the Local Arrangement Committee for a number of annual meetings. Service work has always been an integral part of Amanda's life. She was active in local Girl Scouts for many years, serving both as troop leader, service unit newsletter editor, and adult trainer along with coordinating day long multi-troop badge events.

Amanda got her start in electron microscopy in the late 1970s while working at Louisiana State University on the biology of sweet potato diseases. Because of her electron microscopy expertise, she was recruited into the insect pathology program at Mississippi State University in 1985 and in 2004 she became a full-time member of MSU's Institute for Imaging and Analytical Technologies (I2AT; known as the Electron Microscopy Center until 2010). The I2AT is a University-level research center and core facility which serves the larger community with microscopy and analytical technologies and expertise while meeting University missions in research, teaching and service. In addition to Amanda's role as research associate, she serves as I2AT's Outreach Coordinator, increasing awareness of microscopy and analytical technologies in diverse K-12, university and industrial arenas.

GEORGE PALADE AWARD (2016)

Dmitry Lyumkis

Dmitry obtained his PhD at The Scripps Research Institute in La Jolla, CA, where he spearheaded numerous methodological developments in single-particle cryo-electron microscopy (cryoEM) and applied them to the analysis of biological macromolecules. He became particularly interested in the rapidly evolving field of HIV structural biology and led the efforts behind the first high-resolution structural characterization of the complete HIV glycoprotein envelope trimer (at the time, this was one of the remaining "structures of desire" among structural biologists). The resulting model revealed mechanistic details about how the HIV virus enters human cells. It also explained how broadly neutralizing antibodies recognize their epitopes, and why quaternary constraints prevent some non-neutralizing antibodies from binding the trimer. Crucially, the model represents a platform for the ongoing design of novel vaccine candidates to combat the AIDS virus.

This work prompted him to become more broadly interested in the intricate molecular relationships between pathogen and host interactions. He went on to the Salk Research Institute where he became interested in the later phases of the retroviral lifecycle, especially the process of irreversible viral integration into the host genome, which defines a point-of-no-return in establishing permanent infection within the host. Dmitry recently characterized a novel form of a retroviral integration complex, which was completely unexpected from earlier X-ray structures of similar complexes from different retroviruses. He is now very actively trying to understand how HIV integration complexes assemble and function. Given the historical difficulty of their purification and analysis, Dmitry suspects that the HIV complexes will be structurally complex, heterogeneous, and metastable, a characteristic that is, at least in theory, ideally suited for studying using single-particle cryoEM techniques. To grapple with such complexities, Dmitry continues to be involved in methodological developments in cryoEM, as he believes that methodologies and applications are fundamentally intertwined and complement one another to gain deeper insight into one's system of interest.

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
2015	JoAn Hudson

YEAR	RECIPIENT
2012	Gabriel Lander
2013	Peng Ge
2014	Ricardo Guerrero-Ferreira
2015	Alexey Amunts

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HILDEGARD H. CROWLEY OUTSTANDING TECHNOLOGIST AWARD FOR BIOLOGICAL SCIENCES (2016)

Frank Macaluso

Frank Macaluso received his Bachelor of Science Degree in Biology from Long Island University Brooklyn Center. He did graduate studies in Marine Biology and Electron Microscopy at Florida Atlantic University in Boca Raton, completing his Master of Science Degree in Cell Biology at Fordham University. He has been involved in biological microscopy in a core facility environment since 1978 at the Albert Einstein College of Medicine, Bronx, New York.

He became Director of the Analytical Ultrastructure Center in 1991 and was appointed Associate in Cell Biology. He was instrumental in the programmatic and physical merger of two core microscope facilities, the Analytical Ultrastructure Center and the Image Analysis Facility, to form the Analytical Imaging Facility (AIF) in 1995. The AIF provides state of the art methods in modern light and electron microscopy imaging to biomedical scientists with all levels of expertise. Frank was named Director of Electron Microscopy upon the establishment of this new comprehensive microscopy facility and in 2003 he was also appointed Administrative Director. He is currently Senior Associate in Anatomy and Structural Biology.

His broad technical base makes him especially suited to coordinating and supplying technical advice to a wide variety of research projects. Frank has a proven track record of identifying new imaging technology required to meet the scientific needs of the Einstein research community, establishing that technology within the AIF and making that technology immediately available to the entire Einstein research community.

CHUCK FIORI OUTSTANDING TECHNOLOGIST AWARD FOR PHYSICAL SCIENCES

2016—No Recipient

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
2015	Norman Olson
	Masahiro Kawasaki

https://doi.org/10.1017/S1431927616011508 Published online by Cambridge University Press

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(as of June 25, 2016)

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Portland State University
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Established 1968

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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

https://doi.org/10.1017/S1431927616011508 Published online by Cambridge University Press

Major Society Awards

DUNCUMB AWARD FOR EXCELLENCE IN MICROANALYSIS

David Muller

David Muller is a professor of Applied and Engineering Physics at Cornell University, and the co-director of the Kavli Institute at Cornell for Nanoscale Science. He is a graduate of the University of Sydney, received a PhD from Cornell University and worked as a member of the technical staff at Bell Labs for six years before returning as faculty to Cornell. His current research interests include developing the hardware and algorithms for high-speed pixelated detectors, and the atomic-scale control and characterization of matter for applications in energy storage and conversion.

Historically his work has focused on the development of scanning transmission electron microscopy and spectroscopy as quantitative tools for atomic-resolution materials analysis, and its application to unraveling connections between electronic-structure changes on the atomic scale and the macroscopic behavior of materials, including identifying physical limits to transistor scaling by the first direct observation of interface phases in gate oxides, and the structure of dopant complexes. He has developed quantitative imaging and characterization methods to explore the chemistry, electronic structure and bonding inside objects as diverse as fuel cells, batteries, transistors, and two-dimensional superconductors. To help others adopt these new methods, he has also worked on the underlying challenges to turn a one-time science experiment into a widespread and routinely useful technique. As aberration-correctors correct aberrations and not instabilities, he has made a science of room design and environmental remediation to people setting up microscopy laboratories, improved and simplified the tripod polishing specimen preparation method to the point where a beginning student can be trained in the method in a few afternoons. His group has developed freely available software and web resources for EELS and tomographic analysis that have over 3,000 downloads to date.

David is a fellow of both the American Physical Society and the Microscopy Society of America. He was named one of the top 100 young innovators in 2003 by Tech Review Magazine, is the recipient of the MSA Burton Medal, and at 3 atoms thick, and according to the Guinness Book of Records, had the world's thinnest sheet of glass. He has 5 patents, and has published more than 200 papers, with over 21,000 citations.

Previous Awardees

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

KURT F.J. HEINRICH AWARD

Julien M. Allaz
University of Colorado Boulder (USA)

Dr. Julien Allaz obtained an MSc and a PhD in Geology at the Universities of Lausanne and Bern (Switzerland), respectively. During his early career, he focused on structural geology and metamorphic petrology in the Swiss Alps, which required a large dose of electron microprobe analysis, a zest for isotopic work (Ar-Ar dating and stable oxygen isotopes), all served over a generous bed of fieldwork. His attraction to the EPMA led him to the University of Massachusetts-Amherst in 2009, where he pursued a post-doc on trace element analysis and monazite dating by EPMA. He currently is a Research Associate at the University of Colorado-Boulder and manages the electron microprobe laboratory.

Julien's affection for the WWW led him to the development of the "Database for electron Microprobe Analysis (De-MA)", which compiles essential information for EPMA users. In 2015, with the help of A. von der Handt and O.K. Neill, he initiated a Focused Interest Group on MicroAnalytical Standards (FIGMAS) under the umbrella of both MAS and MSA. This group aims to create an international database of standards and reference materials, and facilitate the development of tomorrow's reference materials. Julien has recently taken part in the organization of the EPMA TC 2016 in Madison, WI. Author or co-author on 11 papers in internationally-recognized journals, Julien has also presented at over 20 conferences including 6 invited talks. His current research interests include magmatic and metamorphic petrology, geochronology, ore deposits (REE), and the development of databases for the EPMA community to help acquire precise and accurate data.

Previous Awardees

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

https://doi.org/10.1017/S1431927616011508 Published online by Cambridge University Press

Major Society Awards

PRESIDENTIAL SCIENCE AWARD

Michael J. Jercinovic
University of Massachusetts,
Amherst, MA (USA)

Mike Jercinovic is an Associate Professor in the Department of Geosciences at the University of Massachusetts and the director of the UMass Electron Microprobe/SEM Facility. Mike's general research focuses on EPMA in minor and trace element applications. Specifically, he works toward refinement of background characterization techniques in complex phases, the use of blanks and heterogeneous materials in the assessment of accuracy, and the evaluation of dynamic emission effects due to beam damage and contamination.

Applications for this research can be found in such diverse fields as meteoritics, climate science, and igneous and metamorphic petrology. Primarily, however, research at Mike's UMass facility has centered on the potential application of EPMA toward geochronologic problems associated with complex tectonic histories. This endeavor, in collaboration with colleague Michael Williams, has provided the impetus for significant instrumentation and technique development, and has motivated the NSF-sponsored development of the one-of-a-kind Cameca SX-Ultrachron to explore high spatial resolution analysis at high sensitivity. At this point, EPMA has evolved to become a critical and sometimes indispensable contributor in many tectonic/geochronologic evaluations, particularly as high spatial resolution and comprehensive geochemistry are becoming increasingly recognized as vital aspects of the characterization of the pertinent accessory phases. This research has led to the recognition that EPMA can establish evidence of reactions that result in the growth or breakdown of phases such as monazite in structural and petrologic (major phase evolution) context, therefore offering the potential to directly date the reactions themselves. The fine-scale of accessory phase polygenesis can be extraordinary, requiring equally extraordinary analytical methods to characterize. In two cases, sub-micron domains have been successfully dated, revealing new details of tectonic histories, and providing unique evidence for the interpretation of inconsistencies in some spatially coarser geochronologic datasets.

Mike received his PhD in geology from the University of New Mexico (1988). He was first introduced to electron probe micro-analysis by Klaus Keil Of UNM's Institute of Meteoritics, who greatly influenced him and encouraged pursuit of a career in geochemistry and microanalysis. After post doctorate work, Mike directed the MIT electron microprobe facility for several years where he continued to refine his analytical methods. After briefly working on microelectronic evaluation in the private sector, he returned to academia when he became research faculty at UMass in 1997.

Previous Awardees

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

PRESIDENTIAL SERVICE AWARD

Heather Lowers

Heather Lowers received a BS in Geology from Mount Union College and a MS in Geochemistry from the Colorado School of Mines. Heather is the director of the Denver Microbeam Laboratory for the U.S. Geological Survey in Denver. The laboratory is equipped with two SEM/EDS systems with hyperspectral CL, an electron microprobe, and microCT. The laboratory serves USGS scientists and outside collaborators working on a variety of projects including, but not limited to, geologic and tectonic analyses, ore assessments, characterization of volcanic materials, environmental geochemistry related to natural disaster response, and evaluation of inorganic materials and biological tissue.

Heather joined the Microanalysis Society as a student member in 2003. Since that time, she has had various roles with the Society including session chair at M&M meetings, Director (2009-2012), MicroNews Editor (2009-2015), Secretary (2012-present), and co-organizer of the Microanalytical Reference Materials (2012) and EPMA (2016) Topical Conferences.

Previous Awardees

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

https://doi.org/10.1017/S1431927616011508 Published online by Cambridge University Press

MAS OUTSTANDING PAPER AWARDS (2015)

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

RAYMOND CASTAING – STUDENT PAPER AWARD:

Atom-Probe Tomography Measurements of Isotopic Ratios of High-field Materials with Corrections and Standardization: a Case Study of the 12C/13C of Meteoritic Nanodiamonds

J. B. Lewis [1], D. Isheim [2], C. Floss [1], T. L. Daulton [1,3], D. N. Seidman [2]

1. Laboratory for Space Sciences, Physics Department, Washington University, St. Louis, MO, USA.
2. Center for Atom-Probe Tomography, and Dept. of Materials Science and Engineering, Northwestern University, Evanston, IL, USA.
3. Institute of Materials Science and Engineering, Washington University, St. Louis, MO, USA.

V.G. MACRES – SOFTWARE PAPER AWARD:

Dealing With Multiple Grains in TEM Lamellae Thickness for Microstructure Analysis Using Scanning Precession Electron Diffraction

A. Valery [1,2], E. F. Rauch [2], A. Pofelski [1], L. Clément [1], F. Lorut [1]

1. STMicroelectronics, Crolles, France
2. SIMAP/GPM2 Laboratory, Saint Martin d'Hères, France

V.E. COSSLETT – INVITED PAPER AWARD:

Decomposing Electron Diffraction Signals in Multi-Component Microstructures

Alexander S Eggeman [1], Duncan Johnstone [1], Robert Krakow [1], Jing Hu [2], Sergio Lozano-Perez [2], Chris Grovenor [2], and Paul A. Midgley [1]

1. Department of Materials Science and Metallurgy, University of Cambridge, Cambridge, UK
2. Department of Materials Science, University of Oxford, Oxford, UK

L.S. BIRKS – CONTRIBUTED PAPER AWARD:

Quantitative Phase Analysis of Rapid Solidification Products in Al-Cu Alloys by Automated Crystal Orientation Mapping in the TEM

K. W. Zweiacker [1], M. A. Gordillo [1], C. Liu [1], J. T. McKeown [2], G. H. Campbell [2], T. LaGrange [3], B. W. Reed [3], J. M. Wiezorek [1]

1. University of Pittsburgh, Pittsburgh, PA, USA
2. Lawrence Livermore National Laboratory, Livermore, CA, USA
3. Integrated Dynamic Electron Solution, Inc, Pleasanton, CA, USA

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Local Chair	Elvin Beach, Worthington Industries Inc.
	Chris Bagnall, MSC Associates Inc.
	Lee Garrett, Alcoa
	Tom Murphy, Hoeganaes Corp.
	Tim Weber, Buehler
	Sylvia Whitt, Worthington Industries Inc.

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1968–1971	John H. Bender Jr.
1971–1973	Arthur E. Calabra
1973–1975	E. Daniel Albrecht
1975–1977	James H. Richardson
1977–1979	Robert J. Gray
1979–1981	P.M. French
1981–1983	George Vander Voort
1983–1985	James E. Bennett
1985–1987	William E. White
1987–1989	M.R. Louthan, Jr.
1989–1991	Donald W. Stevens
1991–1993	Ian LeMay
1993–1995	Japnell D. Brown
1995–1997	E. Daniel Albrecht
1997–1999	Mahmoud T. Shehata
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 and their co-chairs who helped organize the M&M 2016 meeting:

Daniel P. Dennies, *M&M 2016 IMS Co-Chair, P07 Symposia Co-Chair, P08 Symposia Co-Chair*

Coralee McNee, *M&M 2017 IMS Co-Chair, P11 Symposia Co-Chair*

Noah Budiansky, *P07 Symposia Co-Chair*

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Manuel Garcia-Leiner, *P08 Symposia Co-Chair*

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Adrian J. Brearley, *P09 Symposia Co-Chair*

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Richard E. Chinn, *P10 Symposia Co-Chair*

George Vander Voort, *P11 Symposia Co-Chair*

Major Society Awards

International Metallographic Society
ASM INTERNATIONAL

PRESIDENT'S AWARD (SERVICE TO IMS)

Steve J. Dekanich (2015)

Having a dual background in Metallurgical and Nuclear Engineering, Steve Dekanich serves as a Senior Metallurgist at the Y-12 National Security Complex in Oak Ridge, TN. He is responsible for addressing materials related problems, new technology development and deployment, project management, and chairing local ASM Materials Camps for high school students.

After starting as a student metallurgist in 1970, his career experience grew to include metallography, metallurgical, and materials laboratory management, failure analysis, materials applications, process operations, new technology development, and technology transfer. During his 45+ year career, metallography, metallurgy, and materials science became a passion. That passion led him to involvement with three uranium enrichment processes, materials applications for the (US space station, the Navy Sea Wolf program, and the Star Wars program), weapons development, plasma spray filter development, and serving as Chairman and/or Principal Investigator on catastrophic failures. The passion for metallography also led to numerous international metallographic competition awards including the highest achievable award in metallography, the Jacquet-Lucas Award for Excellence in Metallography.

Steve served on the IMS Board of Directors and is currently serving on the Executive Committee for the Oak Ridge Chapter of ASM International and is a member of the Editorial Board of the Metallography, Microstructure and Analysis journal. He has numerous technical and non-technical publications and three patents.

Steve was presented the 2015 IMS President's Award "in sincere and grateful appreciation for lifelong mentoring, unwavering loyalty, and many years of dedicated service."

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	Nat 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
2014	Judith L.Arner

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 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.

IMS BUEHLER TECHICAL PAPER MERIT AWARD—This award shall be given annually to the author of the technical paper published that year in the journal *Metallography, Microstructure and Analysis* that was determined most outstanding by a panel of IMS judges. A plaque and cash award is given to the recipient each year by Buehler.

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 AWARDS—The awards are presented at the annual banquet on Wednesday, July 27, 2016, at 6:30 PM.

https://doi.org/10.1017/S1431927616011508 Published online by Cambridge University Press

Major Society Awards

JACQUET-LUCAS AWARD

Peter Kirbiš (2015)

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 since 1976.

The 2015 recipient of the Jacquet-Lucas Award is Peter Kirbiš from the University of Maribor, Slovenia, for his entry entitled "Welding of Novel High Carbon Bainitic Steel." Kirbiš is currently working as a doctoral candidate at the faculty of mechanical engineering at this university. His thesis is titled "Modeling of Rapid Bainite Formation at Very Low Temperatures" and is a continuation of his master's degree work in mechanical engineering.

He earned his master's in 2014, with the work titled "Development of Nanostructured Bainitic Steels," under the mentorship of Prof. Dr. Ivan Anžel. This resulted in development of three steels, which form fully carbide-free bainitic microstructures during air cooling. The same year, a segment of the work was submitted in Class 3 of the International Metallographic Contest and won third place. In the field of metallography, he grew fond of tint etching and one of his images can be seen in the current Buehler calendar.

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. Couts, 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	Hendrik O. Colijn and Christopher G. Roberts
2011	Christopher Marvel
2012	Zhiping Luo
2013	Nabeel Hussain Alharthi
2014	Thomas J. Nizolek

IMS International Metallographic Society
ASM INTERNATIONAL

HENRY CLIFTON SORBY AWARD

Frank Mücklich (2016)

The Henry Clifton Sorby Award is presented annually to recognize lifetime achievement in the field of metallurgy. Recipients are acknowledged for 25 years or more of dedication to research, teaching, or laboratory sales and service. The 2016 Sorby award, consisting of an engraved plaque, will be presented to Prof. Frank Mücklich of Saarland University, DE. Prof. Mücklich.

Dr. Mücklich is director of the Materials Engineering Center Saarland (MECS), Research Center of the Steinbeis Foundation in Saarbrücken, Germany. His areas of expertise include 3D analysis of materials microstructures in the micro, nano, and atomic scale; new theoretical and experimental methods for microstructure preparation and image analysis; design of high-performance surfaces by laser patterning techniques; and development of advanced functional materials with tailored microstructures for high electrical impact and energetic applications.

He earned his undergraduate degree from the Freiberg Mining Academy in 1985, and his doctorate from the same institution in 1987. In addition to his position as Director of the Materials Engineering Center Saarland (MECS), he heads the Department Functional Materials and is the Chairman of the European School for Materials at Saarland University. He is also Editor of the journal Practical Metallography - Preparation, Imaging and Analysis of Microstructures

He won the Doerrenberg Steel Award 2014 for a metallographic serial sectioning technique for large volumes with exceptional high resolution, and the Copper Prize 2013 for the best copper innovation of the year from the German Copper Institute, as well as many others too numerous to list. Dr. Mücklich will give the Sorby lecture titled From Correlative Microscopy to 3D Understanding of Material Microstructures on Monday, July 25th at M&M 2016.

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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 Benscoter
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
2015	David K. Matlock

IMS BUEHLER TECHNICAL PAPER MERIT AWARD (2016)

M. Cohen, D. Ashkenazi, Y.Kahanov, A.Stern, S. Klein, D. Cvikel,
"The Brass Nails of the Akko Tower Wreck (Israel): Archeometallurgical Analyses,"
Metallography, Microstructure, and Analysis. (2015) 188-206.

https://doi.org/10.1017/S1431927616011508 Published online by Cambridge University Press

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Ramyavardhanee Chandrasekaran, Vanderbilt University
Rebecca Dillard, Emory University
Yimo Han, Cornell University
Soohyun Im, The Ohio State University
Ruoqian Lin, Brookhaven National Laboratory
Pengzi Liu, Cornell University
Jade Noble, Cornell University
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Cameron Varano, Virginia Tech
Xiaoyue Wang, McMaster University (Canada)
Linxi Zhang, Stony Brook University

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Samuel Briggs, University of Wisconsin
Barnaby Levin, Cornell University
Kevin Fisher, University of Michigan
Yu-Tsun Shao, University of Illinois
Sebastian Schneider, TU Dresden (Germany)
Andrew Stevens, Duke University
Eren Suyolcu, MPI Solid State (Germany)
Michael Tanksalvala, University of Colorado-Boulder
Chaoyi Teng, McGill University (Canada)
Yung-Chen Wang, University of Washington
Fehmi Yasin, University of Oregon
Brian Zutter, University of California, Los Angeles

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Zhen Chen, Monash University (Australia)
Bin Feng, University of Toyko (Japan)
Cheri Hampton, Emory University – Robert P. Apkarian Memorial Scholarship
Qian He, Oak Ridge National Laboratory
Robert Hovden, Cornell University – Robert P. Apkarian Memorial Scholarship
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https://doi.org/10.1017/S1431927616011508 Published online by Cambridge University Press