

PROCEEDINGS

MICROSCOPY AND MICROANALYSIS 2011

Part 1: Biological Sciences Symposia

Microscopy Society of America
69th Annual Meeting

Microanalysis Society
45th Annual Meeting

International Metallographic Society
44th Annual Meeting

Nashville, Tennessee, USA
August 7–11, 2011

Edited by
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Stuart McKernan
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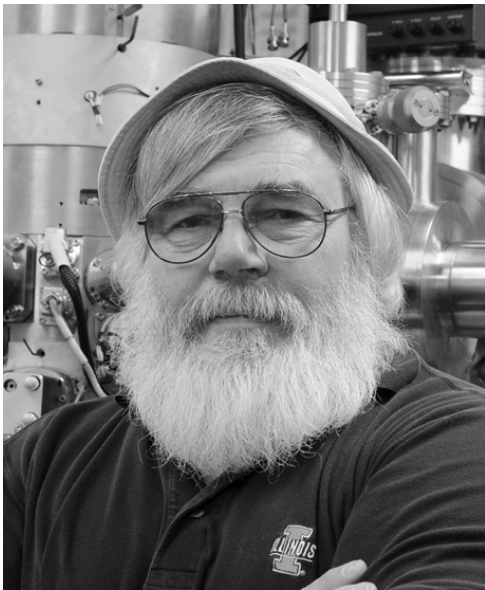
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FOREWORD

Microscopy & Microanalysis 2011, the premier conference of the field is, this year, being hosted by the Microscopy Society of America, the Microanalysis Society, and the International Metallographic Society. On behalf of our respective societies, we welcome you to Nashville, Tennessee, the Music City, truly one of the most entertaining cities in America. We are confident that Nashville will serve as a wonderful location for our meeting, and that the conference will prove to be stimulating and worthwhile for all both on a professional and personal level.

M&M 2011 will begin with our traditional Sunday Night Reception, which is being held in the Grand Ball Room of the Marriott Renaissance Hotel. This venue promises to provide an excellent, informal location to see old friends or to make new acquaintances, especially the record number of students who have submitted papers this year. Symposia presentations, during the week, will be held at the nearby Nashville Convention Center and our Plenary session on Monday morning will feature Dr. Stefan Hell speaking on super-resolution microscopy and Dr. Gene Ice, speaking on X-ray micro/nanoprobe characterization using synchrotron sources. During the Plenary, we will also highlight the winners of our major societal awards, and publicly recognize the winners of our student and postdoctoral travel fellowships.

Microscopy and Microanalysis 2011 promises to be the quintessential conference of our field whose scientific diversity spans disciplines from the life sciences to the physical sciences, all unified by the tools of our research. The program committee led by Program Chair David Giovannucci (MSA), and Program Co-Chairs, Luke Brewer (MSA), Masashi Watanabe (MAS), and Don Susan (IMS) should be congratulated on a strong program, which features over one thousand invited and contributed papers. This team has put together a compelling suite of over 30 symposia reflecting the current state-of-the-art, as well as the innovative and emerging fields of research. Whether your interest is in nanotechnology or traditional metallurgy, biology or clinical diagnosis, or the growing field of multifunctional hard/soft materials, you will find M&M 2011 a fascinating venue for discovery and scientific discourse. In addition, the *Proceedings of Microscopy and Microanalysis 2011* contains copies of all the papers being presented at the meeting, and thus presents a useful overview and reference resource of the many diverse research and development activities of our members and other colleagues involved with microscopy and microanalysis techniques today.

Complementing our symposia is one of the largest exhibitions of microscopy/microanalysis instrumentation and resources in the world, which includes access to our very popular evening vendor tutorials. Make sure you allow time to visit the exhibit hall that opens at Noon on Monday after the Plenary. In addition to our traditional Sunday Short Courses, "Back to the Basics" tutorials, and in-depth, multi-day intensive workshops, we will be joined this year by a Pre-Meeting Specialist Workshop on "Opportunities, Artifacts and Interpretation of Aberration-Corrected Electron Microscopy Data."

This will undoubtedly be a very busy meeting for all those attending and we look forward to greeting you at our opening Sunday Reception in the Music City for what we are sure will be an exciting and educational conference.

Nestor J. Zaluzec, *President, Microscopy Society of America*
John Henry J. Scott, *President, Microanalysis Society*
Natalio T. Saenz, *President, International Metallographic Society*

WELCOME FROM THE PROGRAM COMMITTEE

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Microscopy & Microanalysis (M&M) stands as the premier meeting of the Microscopy Society of America, the Microanalysis Society, and the International Metallographic Society, Inc. We are pleased welcome to all the physical, life and analytical scientists whose work encompasses the full range of microscopic and analytical techniques. In particular, we extend a warm welcome to those researchers who are new to our meeting, and are confident that you will find areas of specific interest in our meeting this year and for many years to come.

This year Professor Stefan Hell, who leads the Department of NanoBiophotonics at the Max Planck Institute for Biophysical Chemistry in Göttingen, will provide the plenary opening presentation titled “Nanoscopy with Focused Light.” Professor Hell is generally acknowledged for the development of both the theory and innovation that has uncoupled resolution from wavelength, enabling nanoscale light microscopy, and shattering Ernst Abbe’s diffraction-limited resolution barrier. His presentation will dovetail with scheduled symposia featuring the leaders in this evolving technology including, “Super-Resolution Micro-

scopy” and “Near Field and Single Molecule in the Life Sciences.”

M&M 2011 will also feature two named symposia. The first titled “A. V. Crewe Symposium: From Single Atom Images to Atom-by-Atom Analysis” will honor and commemorate the work of the late Albert Victor Crewe (1927–2009). The second named symposium will celebrate the accomplishments of Raimond Castaing (1921–1998), titled “Microanalysis at 60 Years: A Symposium Dedicated to Raimond Castaing.”

The visionary work of Crewe and Castaing has broad applications not only in material science, but also in fields ranging from archeology to geology. Indeed, the conference will feature over thirty identified symposia on engaging topics that range from traditional to emerging and innovative fields of research in the biological, physical, and analytical sciences.

The Executive Program Committee extends welcome you to an inclusive, dynamic, and interactive conference in the vibrant and historic music city of Nashville.

Executive Program Committee



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Plenary Special Lectures

Nanoscopy with Focused Light

Stefan W. Hell

Max Planck Institute for Biophysical Chemistry, Department of NanoBiophotonics, 37077 Göttingen & German Cancer Research Center (DKFZ), Optical Nanoscopy Division, 69120 Heidelberg, Germany

For more than a century, it has been generally accepted that the resolution of a lens-based optical microscope is limited to about $d = \lambda/(2NA) > 200$ nm in the focal plane and >500 nm along the optic axis, with NA denoting the numerical aperture of the lens and λ the wavelength of light. The discovery in the 1990s that elementary transitions between the states of a fluorophore can be used to eliminate the limiting role of diffraction has led to light microscopy concepts with resolution on the nanometer scale [1, 2]. Currently, all existing and successfully applied nanoscopy methods share a common enabling element: they switch the fluorescence capability of fluorophores on and off, so that adjacent features are registered sequentially in time [3, 4].

For example, in a typical Stimulated Emission Depletion (STED) microscope [1], the fluorophores are switched off (= kept dark) by overlapping the excitation beam with a de-exciting (STED) beam which effectively confines the fluorophores to the ground state everywhere in the focal region except at a tiny area where the STED beam is close to zero. Fluorophores that are located in this subdiffraction-sized smaller area are registered. Scanning the beams further in space registers those fluorophores that had been switched off initially. An image of the whole object is assembled by sequential registration. The resolution is now given by the smaller diameter $d \approx \lambda/(2NA\sqrt{1 + I/I_s})$ of this area in which the fluorophores are still fluorescent. I is the intensity of the STED beam, which, for $I \gg I_s$, entails $d \rightarrow 0$, meaning that the resolution is conceptually no longer limited by λ . An unprecedented, all-physics-based, far-field optical resolution of <6 nm was realized with nitrogen-vacancy centers in diamonds (Fig. 1) [5]. The combination with 4Pi microscopy enabled an axial spatial resolution <35 nm [2]. STED microscopy has been used to investigate the fate of synaptic vesicle proteins after exocytosis [6], to reveal nanoscale patterns of synaptophysin on endosomes [7], or to study the nanoscale distributions of TOM-complexes in the outer membrane of mitochondria [8], thus demonstrating the potential of emerging “fluorescence nanoscopy” for the life sciences. A video-rate STED microscope was used to describe the mobility of vesicles inside the axons of cultured living neurons [9]. Live-cell STED microscopy has also been used to image activity-dependent morphological plasticity of dendritic spines [10], while it also revealed that single sphingolipids, but not phospholipids, are transiently (<10 ms) and locally (<20 nm) trapped in a living cell membrane, mediated by cholesterol [11]. Multicolor operation [12, 13] facilitates colocalization of biomolecules.

Importantly, the concept of STED microscopy has been expanded to low intensity operation by switching the fluorophore to a long-lived dark (triplet) state or between a “fluorescence activated” and a “deactivated” (conformational) state [2] as encountered in switchable fluorescent proteins [14]. More recent but seminal nanoscopy schemes such as PALM, STORM, and also GSDIM, switch the molecules individually and stochastically. Switching is realized to a state that emits $m \gg 1$ detectable photons in a row before returning to a dark state, allowing the calculation of their position. These single fluorophore switching concepts [15–19] require only one switching cycle [3, 4] per fluorophore. This greatly extends the power of the switching concept for subdiffraction separation. These schemes have also been expanded to multicolor operation (Fig. 2) and combined with 4Pi-microscopy to also boost the axial resolution [20]. Altogether, lens-based optical nanoscopy is an unexpected and fascinating development in the physical sciences that is poised to impact many areas, in particular the life sciences.

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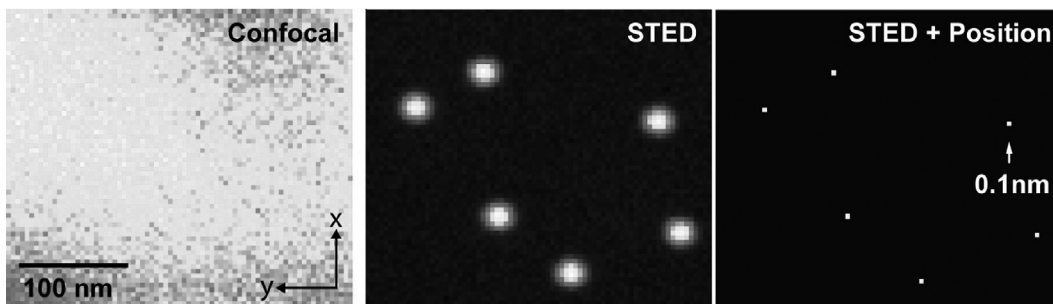


Figure 1. STED microscopy reveals densely packed NV centers inside a diamond crystal. Confocal (left) and STED (middle) image of the same crystal region. The coordinate of each center (right) is established with 1.4 Angström precision; see Ref [5].

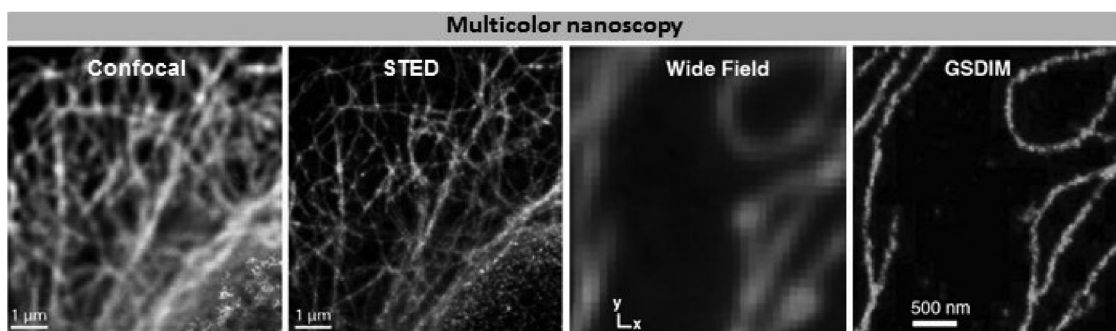


Figure 2. Multicolor nanoscopy imaging with STED and GSDIM. The first two images compare a STED image revealing Lamin (blue), Clathrin (red) and Tubulin (green) with its confocal reference. Similarly, the right hand side images compare a 2-color GSDIM image showing microtubules (green) and peroxysomes (red) with its conventional epifluorescence counterpart.



Stephen W. Hell

Biography of Stephan W. Hell

In 1981 Stefan W. Hell began his studies at the University Heidelberg (Germany), where he received his doctorate in physics. His thesis advisor was the solid-state physicist Siegfried Hunklinger. From 1991 to 1993 Hell worked at the European Molecular Biology Laboratory in Heidelberg and from 1993 to 1996 he worked as a group leader at the University of Turku (Finland) in the department for Medical Physics, where he developed the principle for stimulated emission depletion STED microscopy. He received his habilitation in physics from the University of Heidelberg in 1996, and the following year became a group leader of his current research group dedicated to sub-diffraction-resolution microscopy at the Max Planck Institute for Biophysical Chemistry in Göttingen.

On October 15, 2002 Hell became a director of the Max Planck Institute for Biophysical chemistry and he established the department of Nanobiophotonics. Since 2003 Hell has also been the leader of the department “High Resolution Optical Microscopy division” at the German Cancer Research Center (DKFZ) in Heidelberg.

With the invention and subsequent development of STED microscopy and related microscopy methods, Hell was able to show that one can substantially improve the resolving power of the fluorescence microscope. Hell was the first to demonstrate, both theoretically and experimentally, how one can decouple the resolution of the fluorescence microscope from diffraction and increase it to a fraction of the wavelength of light (to the nanometer scale). For this achievement and its significance for other fields of science, such as the life-sciences and medical research, he received the 10th German Innovation Award (Deutscher Zukunftspreis) in November 2006.

***In-situ* X-ray Micro/Nanoprobe Characterization of Materials: How Billion Dollar Synchrotron Sources are Pushing the Limits of Structure and Chemical Resolution in 3D**

Gene E. Ice

Materials Science and Technology Division, Oak Ridge National Laboratory, PO Box 2008, Oak Ridge, TN 37831-6132

A grand challenge of materials science is how local interactions self organize atoms into mesoscale and nanoscale structures. This question is central to materials science because the properties of materials are often dominated by mesoscale structures and dynamics. For example, self-organization is essential to understand grain-growth and deformation microstructure and to understand the origins of plasticity, strength, fracture, transport and other materials properties. To understand how meso-structures arise, and how they influence materials behavior, it is essential to quantitatively map local elemental composition, crystal/local structure, and structural/chemical defect distributions. X-ray microdiffraction is particularly interesting as it provides reciprocal-space information on average crystal structure with tens of femtometer resolution correlated with submicron real-space resolution. Furthermore unlike almost any other probe, X-ray micro/nanoprobes can nondestructively characterize mesoscale (0.1–10 μm) materials properties in three-dimensions (3D) and can observe mesoscale evolution as a response to underlying driving forces (e.g., stress, thermal processing, defect distributions). Of course the possibility of studying materials with submicron X-ray beams was only a dream two decades ago. The emergence of ultra-brilliant 3rd and 4th generation X-ray synchrotrons, provides source brilliance 7–10 orders of magnitude beyond 2nd generation synchrotrons and 12–15 orders of magnitude beyond lab-based sources. As a result there are now unprecedented opportunities for nondestructive mapping of crystal structure and elemental distributions in three dimensions. Indeed, nondestructive, submicron-resolution maps of local crystallographic orientation, elastic strain, defect density and chemistry are almost routine and new developments have now demonstrated the potential for nm-scale spatial resolution.

Already X-ray micro/nanoprobe methods are being applied to long-standing issues in materials physics. The ability to observe the starting conditions of particular grain boundaries, and how defect densities evolve during grain boundary migration is particularly important. Measurements of samples before and after deformation also provide unique information about the role of surfaces and interfaces in deformation. Beyond current capabilities, the spatial resolution and elemental sensitivity limits for X-ray nanoprobe methods are rapidly improving with the promise of single atom sensitivity and atomic resolution in the near future. It appears that the ultimate limits are probably set by sample damage, which is already an important factor in some materials. The ability to look at small volumes embedded in a conductive matrix will probably be critical not only in achieving best.



Gene E. Ice

Biography of Gene E. Ice

Gene E. Ice received a B.S. in physics in 1972 from Harvey Mudd College and a Ph.D. in physics from the University of Oregon in 1977. He is considered an internationally recognized leader in the areas of materials science and advanced X-ray optics. Beginning at Oak Ridge National Laboratory in 1979, Dr. Ice is now group leader and distinguished staff scientist in the X-ray Research and Applications Group in the Metals and Ceramics Division. His early work with Cullie Sparks on anomalous diffuse X-ray scattering as a means of determining local atomic structure in alloys is recognized worldwide as the state-of-the-art for determining local atomic structure in alloys and continues to have a major impact on both experimental and theoretical studies of alloy local structure. Their collaboration on the development of dynamically bent crystal focusing optics also set the standard for high-performance X-ray synchrotron optics and continues to benefit synchrotron radiation facilities throughout the United States and the world.

Dr. Ice has collaborated in a number of pioneering experiments including anomalous diffuse scattering in solid-solution alloys, precision measurements of phason strain in quasicrystalline materials, nuclear resonance scattering, fluorescence tomography, resonant magnetic scattering, surface diffraction/truncation rods, and X-ray microdiffraction. His recent efforts have concentrated on the use of X-ray microbeams for the study of crystalline structure in polycrystalline materials.

He has served on international and national committees and advisory boards to review beamline optics for beamlines at the National Synchrotron Light Source at Brookhaven National Laboratory, the Advanced Photon Source at Argonne National Laboratory, the Advanced Light Source at Lawrence Berkeley National Laboratory, the Stanford Synchrotron Radiation Laboratory at Stanford University, SPring-8 at the Japan Synchrotron Radiation Research Institute, and the European Synchrotron Radiation Facility in France.

His contributions have been recognized with an IR100 award, an R&D 100 award, a DOE sustained outstanding achievement award, and an ORNL Scientific Team of the Year Award. He is a fellow in ASM International and the American Physical Society.

Established 1942

OFFICERS 2011

Council

President	Nestor J. Zaluzec
President Elect	Janet H. Woodward
Past President	David W. Piston
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Director, Local Affiliated Societies	David W. Tomlin

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MSA PAST PRESIDENTS



1942	G.L. Clark ¹	1976	Etienne de Harven
1943	R. Bowling Barnes ²	1977	T.E. Everhart
1944	R. Bowling Barnes	1978	Myron Ledbetter
1945	James Hillier	1979	John Silcox
1946	David Harker	1980	Michael Beer
1947	William G. Kinsinger	1981	John Hren
1948	Perry C. Smith	1982	Lee Peachey
1949	F.O. Schmitt	1983	David Wittry
1950	Ralph W.G. Wyckoff	1984	J. David Robertson
1951	Robley C. Williams	1985	Dale Johnson
1952	R.D. Heidenreich	1986	Robert Glaeser
1953	Cecil E. Hall	1987	Linn W. Hobbs
1954	Robert G. Picard	1988	John-Paul Revel
1955	Thomas F. Anderson	1989	Ray Carpenter
1956	William L. Grube	1990	Keith R. Porter
1957	John H.L. Watson	1991	Charles Lyman
1958	Max Swerdlow	1992	Patricia Calarco
1959	John H. Reisner	1993	Michael S. Isaacson
1960	D. Gordon Sharp	1994	Robert R. Cardell
1961	D. Maxwell Teague	1995	Terence E. Mitchell
1962	Keith R. Porter	1996	Margaret Ann Goldstein
1963	Charles Schwartz	1997	C. Barry Carter
1964	Sidney S. Breese	1998	Ralph M. Albrecht
1965	Virgil G. Peck	1999	David C. Joy
1966	Walter Frajola	2000	Kenneth Downing
1967	Joseph J. Comer	2001	Ronald M. Anderson
1968	John H. Luft	2002	Stanley L. Erlandsen
1969	W.C. Bigelow	2003	Alwyn J. Eades
1970	Russell Steere	2004	Sara Miller
1971	Robert M. Fisher	2005	Mary Grace Burke
1972	Daniel C. Pease	2006	W.G. (Jay) Jerome
1973	Benjamin Siegel	2007	Michael A. O'Keefe
1974	Russell J. Barnett	2008	William T. Gunning III
1975	Gareth Thomas	2009	David J. Smith
		2010	David W. Piston

¹Chair of committee to arrange first meeting

²Temporary (pre-constitution)

MSA SUSTAINING MEMBERS



4pi Analysis, Inc.
Advanced Analysis Technologies
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Chroma Technology Corporation
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Columbian Chemicals Co.
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Mager Scientific, Inc.
Mastology Centers, Inc.
Materials Analytical Services
McCrone Associates, Inc.
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Micro Photonics Inc.
Micro Star Technologies, Inc
Micron, Inc
MST Foundations
Nikon Instruments, Inc..
Olympus America Inc.
Olympus Soft Imaging Solutions
Omniprobe Inc.
Oxford Instruments, Inc.
Reindeer Graphics, Inc.
Scientific Inst Services, Inc.
SSI NanoTechnology USA Inc.
South Bay Technology, Inc.
SPI Supplies
Springer
Sputter Etch Tech dba Anatech USA
Ted Pella Inc.
Tescan USA Inc.
Thermo Electron Corporation
VisiTec of America
XEI Scientific, Inc.

MICROSCOPY and MICROANALYSIS BEST PAPER AWARDS FOR 2010

Best Biological Paper

Neural Differentiation of Human Embryonic Stem Cells at the Ultrastructural Level,
Jennifer L. Mumaw, Dave Machacek, John P. Shields, Mahesh C. Dodla, Sujoy K. Dhara, and Steve L. Stice,
Microsc Microanal., **16(1)**, 80–90, 2010

Best Materials Paper

Colloidal Palladium Particles of Different Shapes for Electron Microscopy Labeling,
Daryl A. Meyer, Julie A. Oliver, and Ralph M. Albrecht,
Microsc. Microanal., **16(1)**, 33–42, 2010

Best Techniques Paper

Behavior of Au Species in Au/Fe₂O₃ Catalysts Characterized by Novel In-Situ Heating Techniques and Aberration-Corrected STEM Imaging,
Lawrence F. Allard, Maria Flytzani-Stephanopoulos, and Steven H. Overbury,
Microsc. Microanal., **16(4)**, 375–385, 2010

PAST AWARD WINNERS

MSA Distinguished Scientist Awards

Biological Sciences

1975 Keith Porter
 1976 L.L. Marton
 1977 Robley C. Williams
 1978 Thomas Anderson
 1979 Daniel C. Pease
 1980 George E. Palade
 1981 Sanford L. Palay
 1982 Richard M. Eakin
 1983 Hans Ris
 1984 Cecil E. Hall
 1985 Gaston Dupouy
 1986 F.O. Schmitt
 1987 Marilyn G. Farquhar
 1988 Morris J. Karnovsky
 1989 Don W. Fawcett
 1990 Audrey M. Glauert
 1991 Hugh E. Huxley
 1992 Fritiof Sjöstrand
 1993 Jean-Paul Revel
 1994 Andrew P. Somlyo
 1995 Shinya Inoué
 1996 Myron C. Ledbetter
 1997 S.J. Singer
 1998 Avril V. Somlyo
 1999 Sir Aaron Klug
 2000 Kiyoteru Tokuyasu
 2001 Patrick Echlin
 2002 Marc Adrian
 2003 Joachim Frank
 2004 Robert M. Glaeser
 2005 Richard Henderson
 2006 Joseph S. Wall
 2007 Nigel Unwin
 2008 Alasdair Steven
 2009 Jacques Dubochet
 2010 Georgia Pappas

Physical Sciences

Robert Heidenreich
 Albert V. Crewe
 James Hillier
 V.E. Cosslett
 John M. Cowley
 Gareth Thomas
 Vladimer K. Zworykin
 Benjamin M. Siegel
 Otto Scherzer
 Sir Charles Oatley
 Ernst Ruska
 Sir Peter Hirsch
 Jan B. LePoole
 Hatsujiro Hashimoto
 Elmar Zeitler
 Gertrude F. Rempfer
 Archie Howie
 Oliver Wells
 Kenneth Smith
 Dennis McMullan
 David B. Wittry
 John Silcox
 Peter R. Swann
 Michael J. Whelan
 Takeo Ichinokawa
 Severin Amelinckx
 Thomas Mulvey
 Ryuichi Shimizu
 Harald Rose
 Raymond F. Egerton
 Sumio Iijima
 John C.H. Spence
 Terrence Mitchell
 Ondrej Krivanek
 Robert Sinclair
 Michael Isaakson

MSA Burton Medal

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

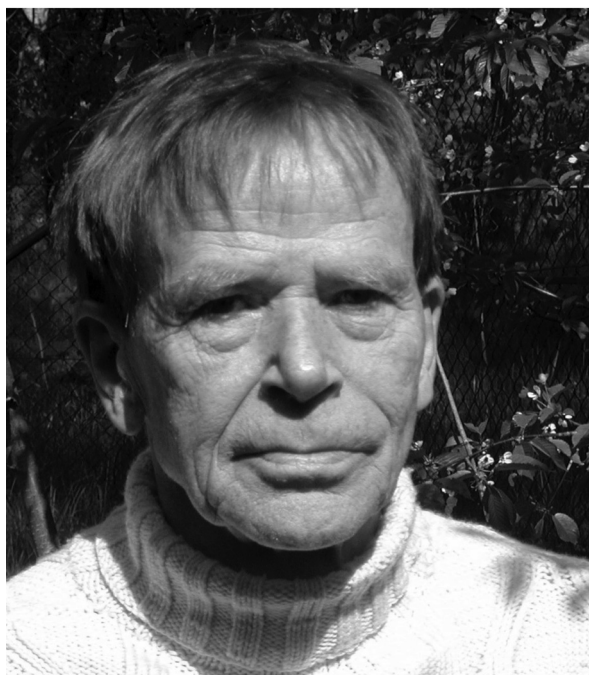
The Morton D. Maser MSA Distinguished Service Award

1992 Ronald Anderson
 G.W. "Bill" 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 F.E. Crang
 1995 Raymond K. Hart
 1996 José A. Mascorro
 1997 William T. Gunning, III
 1998 Nestor J. Zaluzec
 1999 Charles E. Lyman
 2000 Barbara A. Reine

2002 Beverly E. Maleeff
 2003 Mary Grace Burke
 2004 Ralph Albrecht
 2005 W. Gray (Jay) Jerome
 2006 Jeanette Killius
 2007 Robert L. Price
 2008 Stuart McKernan
 2010 Pamela Lloyd

Distinguished Scientist Awards



Physical Sciences
Hannes Lichte

Hannes Lichte was born in Braunschweig Germany in 1944. He studied physics and received his diploma at the Universities Kiel and Tübingen, Germany from 1966 to 1972. A Habilitation in 1987 was at the Faculty of Physics, University of Tübingen with the thesis *Electron Holography at atomic dimensions*. Hannes Lichte held the post of C3-Professor for Applied Physics in Tübingen in 1989 and then C4-Professor for Applied Physics at Dresden University, Germany in 1994 where he conceived and erected the Triebenberg Laboratory for Highest Resolution Electron Microscopy and Holography. In 2010 he became Emeritus and was given an appointment as Senior Professor until March 2012.

Dr. Lichte is best known for his work on experimental electron wave optics, such as electron interferometry and holography as well as atomic resolution electron microscopy (TEM). Additionally he has worked on optimizing the performance of transmission electron microscopy to the outermost limits, development an unrivaled disturbance-free laboratory for highest performance in electron microscopy and holography ("Triebenberg-Laboratory for High Resolution Electron Microscopy and Holography"), development of new paths of rays for electron holography, and the development of the electron holographic method reaching atomic resolution.

Hannes Lichte has been recognized with numerous awards, including the Helmholtz Prize of the Physikalisch-Technische Bundesanstalt Braunschweig (the German NBS), and the Ernst Ruska Prize awarded from the German Society of Electron Microscopy. He is an elected member of the *Deutsche Akademie der Naturforscher LEOPOLDINA*, Halle, and the International Francqui Chair, Antwerp, from Francqui Fondation, Bruxelles, Belgium.



Biological Sciences
Ueli Aebi

Ueli Aebi holds master's degrees in physics and molecular biology and a Ph.D. in biophysics (1977). In 1979 he joined the faculty at Johns Hopkins University School of Medicine in Baltimore with appointments in the Departments of Cell Biology and Anatomy, and in Dermatology. In 1986 he moved to the Biozentrum, University of Basel, Switzerland, where he built a world-class structural biology division that integrates X-ray crystallography, NMR spectroscopy, and light, electron, and scanning probe microscopies. UA's lab has a long-standing interest in a structure-based understanding of molecular machines, and more generally, supramolecular assemblies. The research focus is on (1) cytoskeletal filament structure, assembly, and turnover; (2) the nuclear pore complex and nucleocytoplasmic transport; and (3) fibrillogenesis of amyloid forming peptides and how this relates to disease progression. Also, his group is working on novel optical and mechanical nano-sensors/-actuators for diagnostics, prevention, and therapy by minimally invasive local interventions.



Burton Medal
Radostin Denev

Radostin Danev was born and grew up in the capital of Bulgaria—Sofia. His mother and father are physicists and as a child Radostin was often exposed to scientific discussions at home. This ignited his interest in science at an early age and consequently he enrolled in the physics class of the National College of Mathematics and Science. After college Radostin entered Sofia University and five years later acquired his master's degree in solid state physics. In 1998 Radostin was awarded a Japanese Ministry of Education scholarship and became a PhD student in the laboratory of Prof. Nagayama at the National Institute for Physiological Science in Okazaki, Japan. After getting his degree he continued work on the development and applications of phase plates for TEM in Okazaki. Radostin's research achievements include the successful realization of thin film phase plates and pioneering applications in cryo-EM, single particle analysis, and cryotomography.



Morton D. Maser Distinguished Service Award
Janet Woodward

Janet Woodward is a microbiologist with the Strategic Marketing Group of Buckman USA. She received her B.S. in Biology from Presbyterian College and her M.S. in Microbiology and Ph.D. in Agronomy from the University of Georgia. Janet has been a member of the Southeast Microscopy Society since 1976. She has served in various positions, including President, Secretary/Newsletter Editor, Program Chair, Local Arrangements Committee, and Long-Range Planning Committee.

Janet joined MSA in 1987. She was active in the Education Committee, chairing various subcommittees as well as serving as Committee Chair. She was the M&M 1998 Local Arrangements Chair, the M&M 2004 Local Arrangements Treasurer, and the M&M 2009 Program Chair. She has also organized symposia for numerous M&M meetings. She served on Council as Secretary from 2000–2005 and was a member of various ad-hoc committees. Currently, Janet is serving as the MSA President-Elect.



Robert Grassucci

Hildegard H. Crowley Outstanding Technologist Award for Biological Sciences

Robert Grassucci was born in Slingerlands, NY. He received his BS in Biology from the SUNY College at Oswego in 1984. In 1986 Bob began work in 3DEM at the Wadsworth Center for Joachim Frank where he mastered two emerging techniques, cryo-EM and single particle reconstruction. Bob developed, documented and trained many users in reliable cryo-EM protocols which he published in Nature Protocols in 2007. He is responsible for many high resolution 3DEM data sets using random conical, tomography, and single particle data collection schemes of ribosomes, ryanodine receptors, enzyme complexes, and more. Bob has successfully managed cryo-EM facilities, wrote instrument acceptance tests and also maintained an international Tecnai list-server from 2001–2009. Bob has given the tools and advice needed for several independent investigators to successfully start their own cryo-EM facilities. He has set up a new facility at Columbia University where he is now the HHMI technical facility manager.

MSA Fellows

2009

Adrian, M.
Anderson, R.
Bentley, J.
Burke, M.G.
Carpenter, R.W.
Carter, C.B.
Crewe, A.V.
De Graef, M.
Dravid, V.P.
Dubochet, J.
Echlin, P.
Egerton, R.F.
Farquhar, M.G.
Fawcett, D.W.
Frank, J.

Glaeser, R.M.
Glauert, A.M.
Hart, R.K.
Hashimoto, H.
Henderson, R.
Hirsch, P.B.
Howie, A.
Huxley, H.E.
Ichinokawa, T.
Iijima, S.
Inoue, S.
Joy, D.C.
Karnovsky, M.J.
Klug, A.
Krivanek, O.L.

Ledbetter, M.C.
McMullan, D.
Michael, J.R.
Miller, S.E.
Mitchell, T.E.
Mulvey, T.
Newbury, D.E.
Rempfer, G.
Revel, J.-P.
Rose, H.
Schmitt, F.O.
Schooley, C.
Shimizu, R.
Silcox, J.
Sinclair, R.

Singer, S.J.
Sjostrand, F.
Smith, K.C.A.
Somlyo, A.V.
Spence, J.C.H.
Steven, A.
Swann, P.R.
Tokuyasu, K.
Unwin, N.
Wall, J.S.
Wells, O.
Whelan, M.J.
Zaluzec, N.J.
Zeitler, E.
Zhu, Y.

2010

Albrecht, R.M.
Allard, L.F.
Downing, K.H.

Ellis, E.A.
Goldstein, J.I.
Isaacson, M.

Miller, M.K.
Pappas, G.
Pennycook, S.J.

Petrali, J.P.
Wang, Z.L.
Williams, D.B.

2011

Batson, P.E.
Calarco, P.G.
Crozier, P.A.
Eades, J.A.

Griffin, B.J.
Gunning III, W.T.
Jerome, W.G.

Leapman, R.E.
Lyman, C.E.
O'Keefe, M.A.

Perry, G.
Simmons, R.B.
Woodward, J.H.

- Cecile Bonifacio** University of California Davis
Evaluation of Defect Structures from In Situ Dielectric Breakdown of SiO₂-Based Gate Dielectric Layers
- Maria Rudnaya** Technische Universiteit Eindhoven
A New Method For Defocus and Astigmatism Correction in Electron Microscopy
- David Rossouw** McMaster University
Fabry-Perot Plasmonic Resonances in Silver Nanowire Antennas Imaged with a Sub-nanometer Electron Probe
- Debarshi Mustafi** Case Western Reserve University
Serial Sectioning for Examination of Photoreceptor Cell Architecture by Focused Ion Beam Technology
- Weihao Weng** Lehigh University
Structural Characterization of Niobium Phosphate Catalysts used for the Oxidative Dehydrogenation of Ethane to Ethylene
- Yu Wang** Rensselaer Polytechnic Institute
Deformable model based 3-D Neuron Tracing and Reconstruction from Microscope Images & Software System with Parallel GPU Implementation
- Michael Spilman** University of Alabama at Birmingham
Molecular Piracy via Capsid Size Determination by Staphylococcus aureus
- Joseph Grogan** University of Pennsylvania
In Situ Liquid Cell TEM/STEM with the Nanoaquarium
- Jack Zhang** University of California Santa Barbara
Exploring the Strain Sensitivity of Image Contrast in Quantitative STEM of SrTiO₃
- Abhijeet Budruk** Carnegie Mellon University
In-situ Lorentz TEM Study of Magnetic Domain Wall Mobility in a Martensitic Ni-Mn-Ga Alloy
- Robert Kim** Vanderbilt University
CryoEM Structural Analysis of Defensin Neutralization of Adenovirus
- Robert Hovden** Cornell University
Efficient Elastic Imaging of Single Atoms with Aberration-Corrected Scanning Transmission Electron Microscopy
- David Scheiblin** University of Delaware
A Deeper Look into the Ocular Lens
- Justin Brons** University of Alabama Tuscaloosa
Orientation Dependent Field Evaporation Behavior in Multilayer Thin Films
- Christopher Winkler** Drexel University
In-Situ TEM Observation of Domain Propagation and Relaxation Kinetics in Bismuth Ferrite Under Applied DC Bias

Raleigh and Clara Miller Scholarship

- Sarah E. Dunn** University of California San Diego
Electron Cryo-Microscopy Studies of Helminthosporium victoriae Virus 190S

Eric Samuels Scholarship

- Santhosh Chenna** Arizona State University
In-Situ Environmental TEM Studies to Understand the Effect of Ru Promotion on Supported Ni Catalysts

Robert P. Apkarian Memorial Scholarship

- Kristin Parent** University of California, San Diego
Preliminary Studies of Bacteriophage Sf6 Virions: Icosahedral, Asymmetric, and Tomographic Reconstructions
- Wu Zhou** Vanderbilt University
Atomic Scale Study of Point Defects in Graphene Using STEM

MSA Awards

Distinguished Scientist Awards: These Awards recognize pre-eminent senior scientists from both the Biological and Physical disciplines who have a long-standing record of achievement during their career in the field of microscopy or microanalysis.

Burton Medal: The Burton Medal was initiated to honor the distinguished contributions to the field of microscopy and microanalysis of a scientist who is less than 40 years of age on January 1st of the award year.

Morton D. Maser Distinguished Service Award: This Award was initiated to recognize outstanding volunteer service to the Society as exemplified by Mort Maser, who served the Society for many years with great dedication. This award is made to honor an MSA member who has provided significant volunteer service to the Society over a period of years.

MSA Presidential Student Awards

These awards include registration for the meeting, a copy of the Proceedings, and an invitation to the Sunday social event and the Presidential Reception. MSA provides a substantial contribution towards travel and lodging expenses. Award recipients are bona fide students at a recognized college or university at the time of the meeting. Awards are based on the quality of the paper submitted for presentation at the meeting and recipients must be the first author of the submitted paper. The paper may be submitted for platform or poster presentation. Successful applicants must present their papers personally at the meeting in order to receive the award.

Professional Technical Staff Awards

The Professional Technical Staff Awards (PTSA) were created to stimulate attendance at the Annual Meeting of MSA for professional technical staff who ordinarily might not participate in a national meeting, and to encourage supervisors to support their staff in professional activities. There are up to four awards given, based on the quality of a first authored paper submitted for presentation at Microscopy and Microanalysis 2009. Papers were judged by the MSA Technologists' Forum.

MSA MEMORIAL AWARDS

Eric Samuel Scholarship

Sponsored by Oxford Instruments, this award is in honor of Eric Samuel who was a long time member of the community and employee of Oxford Instruments, in recognition for outstanding work presented at M&M by a student or post-doctoral appointee.

Robert P. Apkarian Memorial Scholarship

A mentor and fervent supporter of young researchers, this award is made in memory of Robert P. Apkarian, and recognizes the outstanding work presented at M&M by a post-doctoral appointee in both the physical and biological sciences.

Raleigh Miller Student Scholarship Award

This is a special MSA Presidential Student Award to honor Raleigh Miller, the late father of Past President Sara Miller, and has been generously funded by donations from MSA members. The eligibility requirements for this special \$1000 award are identical to those for MSA Presidential Student Awards.

The Outstanding Technologist Awards

These awards, given in memory of Hildegard H. Crowley and Charles E. Fiori, recognize technologists for their significant contributions to the advancement of microscopy and microanalysis through the development of new techniques/instrumentation.

- MSA Hildegard H. Crowley Outstanding Technologist for Biological Sciences
- MSA Charles E. Fiori Outstanding Technologist for Physical Sciences

MSA Citations

These awards are given to non-members who have provided meritorious service to the Society or who have had significant impact in the political or scientific area for the field of microscopy that has benefited the Society indirectly.



Established 1966

Officers 2011

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President Elect	John F. Mansfield
Past President	Edward P. Vicenzi
Secretary	Scott D. Davilla
Treasurer	Jeffrey M. Davis
Directors	John J. Donovan Rhonda F. Stroud Thomas F. Kelly Andrew Deal James Bentley Heather A. Lowers

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Affiliated Regional Societies and Tour Speaker Liaison	Paul Hlava
Computer Activities Committee	Nicholas W.M. Richie
Corporate Liaison Committee	Vernon E. Robertson
Education Committee	Inga Holl Musselman
Finance Committee	C. Gordon Cleaver
International Liaison	Edward P. Vicenzi
Strategic Planning Committee	Ian M. Anderson
MAS Business Office	William S. Thompson
Membership Services	Dan Kremser
MicroNews Editor	Heather A. Lowers
Nominating Committee	John F. Mansfield
Sustaining Members Committee	Lucille Giannuzzi
Topical Conferences Committee Chair	Paul Carpenter



MAS PAST PRESIDENTS

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

MAS Sustaining Members

4pi Analysis, Inc.	IXRF Systems, Inc
Advanced MicroBeam, Inc.	JEOL USA, Inc.
Bruker Nano	Lehigh University
CAMCOR, University of Oregon	Leica Microsystems, Inc.
Cameca Instruments, Inc.	Materials Analytical Services, Inc.
Carl Zeiss NTS, LLC	Micron, Inc.
Denton Vacuum, Inc.	Oxford Instruments, Inc.
EDAX, Inc.	Probe Software, Inc.
Electron Microscopy Sciences/DiatomeUS	PulseTor LLC
Energy Beam Sciences, Inc.	SEMTEC Laboratories, Inc.
FEI Company	SEMTEC Solutions, Inc.
Gatan, Inc.	South Bay Technologies, Inc.
Geller MicroAnalytical Laboratory	SPI Supplies/Structure Probe, Inc.
Hitachi High Technologies, Inc.	Ted Pella, Inc.
IBSS Group	Thermo Fisher Scientific, Inc.



Peter Duncumb Award for Excellence in Microanalysis.

The Duncumb Award recognizes outstanding achievement over a sustained period of time in the field of microanalysis through technical accomplishment, leadership, and educational and professional activities. The award winner is chosen through nomination by the MAS membership and selection by vote of MAS Council.

Presidential Service Award

This award honors a member of MAS for outstanding volunteer service to the society over a sustained period of time. The award winner is chosen annually by the MAS President.

Presidential Science Award

This award honors a senior scientist for outstanding technical contributions to the field of microanalysis over a sustained period of time. The award winner is chosen annually by the MAS President.

K.F.J. Heinrich Award

This award honors a scientist under the age of forty for distinguished technical contributions to the field of microanalysis. The award winner is chosen annually by the MAS President.

MAS Distinguished Scholar Awards

These awards are presented annually to students presenting high quality technical papers with significant microanalysis content at

the annual meeting. The award is comprised of complimentary registration and significant funds to defray travel expenses to attend the meeting. Application is accomplished by requesting consideration for a student award during the paper submission process. Qualified applicants must be full-time students at an accredited educational institution, must be first author of the paper submitted for consideration, and must present the paper in person at the meeting. MAS Distinguished Scholars receive invitations to attend MAS-sponsored functions throughout the week of the annual meeting, including the Presidents' Reception and the MAS Social. The award winners are chosen annually by the MAS President.

MAS Outstanding Paper Awards

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

- Birks Award, for best contributed paper;
- Macres Award, for best instrumentation or software paper;
- Cosslett Award, for best invited paper; and
- Castaing Award, for best student paper.

Candidates for the MAS Outstanding Paper Awards are nominated, through consultation with symposium organizers and the MAS membership, by the MAS Directors in their final year of service at the time of the meeting, then approved by vote of MAS Council.

MAS Outstanding Paper Awards from M&M 2010

Castaing Award—Best Student Paper

Sponsored by Cameca Instruments, Inc.

Julia A. Mundy,* Huolin L. Xin,* Randi Cabezas,*
Lena Fitting Kourkoutis,* David A. Muller,* Vic Liu,**
Junliang Zhang,** Rohit Makharia,** and
Frederick T. Wagner,**

*Cornell University, **General Motors

“Spectroscopic Imaging of a Statistically Significant Ensemble of Pt-Co Nanoparticles by Aberration Corrected STEM”

Macres Award—Best Instrumentation/Software Paper

Sponsored by Oxford Instruments, Inc.

Z. Gainsforth,* A.L. Butterworth,* R.C. Ogliore,*
T. Tyliszczak,** and A. J. Westphal,*

*University of California Berkeley,

**Lawrence Berkeley Laboratory

“Combined STEM/STXM Elemental Quantification for Cometary Particles”

Cosslett Award—Best Invited Paper

Sponsored by MAS

J. Christen,* F. Bertram,* S. Metzner,* T. Wunderer,**
F. Lipski,** S. Schwaiger,** and F. Scholz**

*Otto-von-Guericke-University, **University of Ulm

“Spatio-time-resolved CL Spectroscopy Imaging: Microscopic Recombination Kinetics in Semi-Polar InGaN Quantum Wells”

Birks Award—Best Contributed Paper

Sponsored by JEOL USA, Inc.

Y.N. Picard,* R.J. Kamaladasa,* N. Kumar,**
C. Trager-Cowan,** W. Jiang,* M. Skowronski,*
P.A. Salvador,* H. Behmamburg,** C. Giesen,**
A.P. Day,** and G. England****

*Carnegie Mellon University, **University of Strathclyde,

AIXTRON AG, *Aunt Daisy Scientific Ltd,

*****K.E. Developments Ltd

“Future Prospects for SEM-based Defect Analysis using Fast Electrons”



Presidential Science Award
Peter Statham

Peter Statham has been a leader in the science and technology of microanalysis for more than 35 years, responsible for many contributions in the scientific literature (more than 80 papers) as well as patents and important advances in commercial energy-dispersive X-ray spectrometry measurement platforms. He also 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. MAS is pleased to present Peter with the Presidential Science Award at Microscopy and Microanalysis 2011 in Nashville, TN.

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 titled "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-President Gordon Cleaver presented Peter with the very first MAS K.F.J. Heinrich Award, honoring his distinguished technical contributions as a scientist under the age of forty.

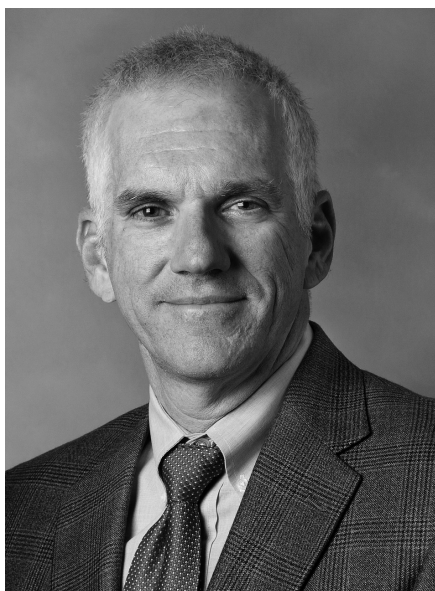


K.F.J. Heinrich Award
Luke N. Brewer

Luke Brewer received his graduate education at Northwestern University under the direction of Prof. Vinayak P. Dravid. After receiving a PhD in Materials Science and Engineering he spent several years as a staff member at the GE Global Research Center and later at Sandia National Laboratories (SNL), working on microscopy, microanalysis, and materials research during his tenure at both institutions. Luke's research has focused on the development and application of electron backscattered diffraction (EBSD) methodologies, hyperspectral analysis techniques, and micromechanical testing procedures. At GE he was involved in several physical metallurgy research projects, including analyses of welding and stress corrosion cracking, as well as high temperature alloy development. At SNL Luke's primary research areas included developing experiments and simulation capabilities for investigating microstructural phenomena such as cyclic plasticity, fatigue cracking, phase transformations, and grain growth.

In his short career Luke has served both MAS and the broader microanalysis community in many ways, and has been honored with numerous awards for his technical achievements and service to our field. In 2002 he was awarded the Macres Award by MAS for his development of algorithms for visualizing plastic deformation using EBSD. From 2007 to 2009 he held the title of Director of MAS, and served as the MAS program co-chair for the Microscopy and Microanalysis Meeting in 2009. MAS appointed him Program Chair for the M&M 2012 meeting, and he is the MSA Program Vice Chair for our meeting here in Nashville. In addition to his work with the Executive Program Group for our national meeting, he has also applied his conference organization skills at a smaller level and co-organized both the 2008 and 2010 MAS Topical Conferences on EBSD.

Dr. Brewer is currently an associate professor in the Mechanical and Aerospace Engineering Department at the Naval Postgraduate school in Monterey California.



Duncumb Award for Excellence in Microanalysis
Joseph Michael

Dr. Joseph Michael is a scientist and educator known widely for his numerous contributions to the fields of electron microscopy and microanalysis. The Duncumb Award recognizes outstanding achievement over a sustained period of time in the field of microanalysis through technical accomplishment, leadership, and educational activities, and Joe has distinguished himself in each one of these areas. During his exemplary career as a microanalyst, Joe has led the advance of three significant technical innovations (quantitative analysis in STEM, EBSD, and FIB), he has invested enormous time and effort as a lab demonstrator, lecturer, and course developer at the Lehigh Microscopy Schools, and he has served our community in many roles in the Microanalysis Society.

Beginning as a graduate student in the early 1980s, Joe has been on the vanguard of quantitative elemental analysis of thin samples using analytical electron microscopy (AEM), especially dedicated STEM instruments. While at Lehigh University and later at Bethlehem Steel,

Joe demonstrated the power of quantitative X-ray spectrometry using tools such as the VG HB501. His careful analyses had a profound effect on subsequent developments in this field and continue to inspire researchers using these very advanced tools. In the 1990s Joe's focus shifted to electron backscatter diffraction (EBSD) analysis of materials using SEMs and CCD-based backscatter detectors. One of the early leaders in this technology, Joe developed both data acquisition approaches and data analysis methods for EBSD while at Sandia National Laboratories (SNL). Beyond these accomplishments in the lab, Joe went on to encourage the technology transfer and commercial development of this technology that has led to its adoption in the broader metallurgical community. By lending his insight to the private sector and promoting the transfer of critical know-how to instrument manufacturers, Joe played a crucial role in establishing EBSD as a practical technique of real value that has touched the careers of many analysts. Finally, within the last decade, Joe has repeated his past successes with focused ion beam methods (FIB). Through his scientific publications, books, and Lehigh Short Courses on FIB, Joe has taught many of us how useful focused gallium ion beams can be for tasks as diverse as TEM sample preparation, semiconductor device inspection and repair, and elemental microanalysis.

Dr. Michael's record of distinction in MAS is unique; in addition to being a Past President, he has won each of the major MAS awards, namely the Presidential Science Award, Service Award, and the K.F.J. Heinrich Award, and he won the MAS Birks Award for his instrumentation development. He has served as a national tour speaker for MAS on more than one occasion. His external recognition is equally impressive: the Microscopy Society of America honored him with their Burton Metal and he became an MSA Fellow in 2009, he received the Marcus A. Grossman Young Author Award from Metallurgical Transactions, and was recently recognized by Sandia National Laboratories with a promotion to Distinguished Member of the Technical Staff, an honor given to a very select number of scientists at SNL.



Presidential Service Award
Dan Kremser

Dr. Dan Kremser joined Battelle in January 2005 and is a Principal Research Scientist in their Advanced Materials Applications (AMA) group. He has over 25 years experience in analytical instrumentation applications and in laboratory management. Dr. Kremser's technical expertise is in the characterization of materials and

solving complex analytical problems associated with advanced analytical instrumentation. He has worked with a wide variety of physical systems and applications domains, ranging from earth-forming materials and geological samples to organic compounds and soft materials. In the instrumentation realm he is widely known for his skill and precision as an operator and for his numerous contributions to the field of quantitative elemental and compositional measurement and characterization, most notably X-ray diffraction (XRD), electron beam instruments such as electron microprobes (EPMA) and scanning microscopes (SEM) equipped with wavelength-dispersive and energy-dispersive X-ray spectrometers, and inductively coupled plasma-mass spectrometers (ICP-MS). Dr. Kremser obtained a Bachelor's degree in Geology from the University of Connecticut, and earned a PhD in Earth and Planetary Sciences from Washington University in St. Louis.

Dan has a strong record of involvement with the Microanalysis Society (MAS) and its local affiliated regional societies (AREs) throughout his career. Dr. Kremser joined MAS (and MSA) in 1982 and has served our society with distinction and tireless energy in several roles, most recently as MAS Director from 2005–2007 and as Membership Services Chair from 2008–2011. In this latter role he has reinvigorated our membership services function, assisted in the introduction of new technology to the job (such as electronic voting), and continues to provide sound advice to MAS Council on many different topics. At the local level, Dan has contributed significantly to three regional societies: the Microscopy Society of the Ohio River Valley (MSORV), the Microscopy Society of Northeast Ohio (MSNO), and the Central States Microscopy and Microanalysis Society (CSM&MS), serving as President (or currently as President-Elect) of the above as well as Trustee and Secretary. Dr. Kremser has also been a member of the American Geophysical Union since 1978.

MAS Distinguished Scholars

- D.S. Barkauskas** Case Western Reserve University
"Monitoring Immune Cell Infiltration in the Brain with Intravital Two-Photon Microscopy"
- S. Coentro** Universidade Nova de Lisboa, Portugal
"The Colors and Techniques of the 17th Century Portuguese Azulejos: A Multi-Analytical Study"
- A. Darbal** Carnegie Mellon University
"Grain Boundary Characterization of Nanocrystalline Cu from the Stereological Analysis of Transmission Electron Microscope Orientation Maps"
- H. Hu** University of Illinois at Urbana-Champaign
"Nanostructure of the Iron Chalcogenide Superconductor $Fe_{1+y}Te_xSe_{1-x}$ "
- S.G. McMurray** Colorado School of Mines
"TEM and Atom Probe Investigation of Calcium Carbonate Precipitation in Seawater"
- A. Re** Università di Torino, Italy
"SEM-EDX and SEM-CL to Characterize Lapis Lazuli from Different Provenances"
- S.M. Seddio** McDonnell Center for the Space Sciences
"Back-scattered Electron Tomography and X-ray Microanalysis of Zirconolite in Lunar Granite 12032,366-19"
- Y. Zhang** University of Michigan
"TEM Study of Oxide Nanopillars in Superconducting $BaFe_2As_2$ Films for Vortex Pinning"

Previous Awards

Presidential Science

1977 R. Castaing
 1978 K.F.J. Heinrich
 1979 P. Duncumb
 1980 D.B. Wittry
 1981 S.J. Reed
 1982 R. Shimizu
 1983 J. Philibert
 1984 L.S. Birks
 1985 E. Lifshin
 1986 R. Myklebust
 1987 O.C. Wells
 1988 J.D. Brown
 1989 J. Hillier
 1990 T.E. Everhart
 1991 J.I. Goldstein
 1992 G. Lorimer
 G. Cliff
 1993 D.E. Newbury
 1994 D.C. Joy
 1995 G. Bastin
 1996 A.V. Somlyo
 A.P. Somlyo
 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. Donovan
 2011 P. Statham

Presidential Service

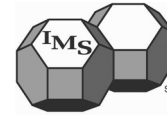
1977 P. Lublin
 1978 D.R. Beaman
 1979 M.A. Giles
 1980 A.A. Chodos
 1981 R. Myklebust
 1982 J. Doyle
 1983 D. Newbury
 1984 J.I. Goldstein
 1985 M.C. Finn
 1986 V. Shull
 1987 D.C. Joy
 1988 G. Cleaver
 1989 W.F. Chambers
 1990 E. Fiori
 1991 T.G. Huber
 1992 E.S. Etz
 1993 H.A. Freeman
 1994 J.L. Worrall
 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. Meeker
 2006 H.A. Freeman
 2007 P.K. Carpenter
 2008 L.M. Ross
 2009 V. Woodward
 2010 S. Wight
 2011 D. Kremser

K.F. J. Heinrich

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

**Peter Duncumb Award
for Excellence in
Microanalysis**

2007 D.B. Williams
 2008 J.I. Goldstein
 2009 D.E. Newbury
 2010 D. Joy
 2011 J. Michael



Established 1968

OFFICERS 2011

President	Frauke Hogue
President-Elect	Natalio T. Saenz
Financial Officer	Richard A. Blackwell
Secretary	Judith L. Arner
Past President	David J. Fitzgerald
Directors	Daniel Dennies Jaret J. Frafjord Michael He Gabriel M. Lucas Thomas F. Murphy Donald F. Susan
ASM Board Liaison	Richard Knight

Appointed Officers

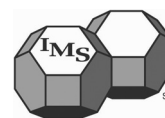
Executive Director	Randall S. Barnes
Administrator of Affiliate Societies	Sarina Pastoric
Editor, SlipLines	Ed Kubel

PAST PRESIDENTS

1968–1971	John H. Bender Jr.	1991–1993	Iain LeMay
1971–1973	Arthur E. Calabra	1993–1995	Japnell D. Braun
1973–1975	E. Daniel Albrecht	1995–1997	E. Daniel Albrecht
1975–1977	James H. Richardson	1997–1999	Mahmoud T. Shehata
1977–1979	Robert J. Gray	1999–2001	Elliot A. Clark
1979–1981	P.M. French	2001–2003	Richard K. Ryan
1981–1983	George Vander Voort	2003–2005	Allan J. Lockley
1983–1985	James E. Bennett	2005–2007	Dennis W. Hetzner
1985–1987	William E. White	2007–2009	David J. Fitzgerald
1987–1989	M.R. Louthan, Jr.	2009–2011	Frauke Hogue
1989–1991	Donald W. Stevens		

IMS Corporate Sponsors

IMS Benefactors	Buehler Ltd. A Division of Illinois Tool Works, Inc.	IMS Associate	B&W Technical Services Y-12 Hoeganaes Corporation. Ted Pella, Inc.
IMS Patron	Allied High Tech Products Inc IMR Test Labs, Inc. Metallurgic Supply Company, Inc. Precision Surfaces International Struers, Inc.	IMS Sponsor	METLAB Corp. Nikon Instruments, Inc. Scot Forge Company


**President's Award
 (Service to IMS)**

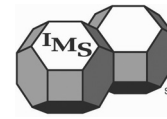
1977	Carus K.H. DuBose
1978	Richard D. Buchheit
1979	Arthur E. Calabra
1980	James L. McCall
1981	E. Daniel Albrecht
1982	James H. Richardson
1983	Robert J. Gray
1984	Japnell D. Braun
1986	P. Michael French
1987	George F. Vander Voort
1988	Robert S. Crouse
1989	Ian Le May
1990	William E. White
1991	Chris 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 J. Frafjord

Henry Clifton Sorby Award

1976	George 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 Bencsoter
2007	McIntyre R. Louthan, Jr.
2008	Lawrence Murr
2009	Chris Bagnall
2010	Albert Kneissl
2011	David B. Williams

**Jacquet-Lucas Award For
 Excellence in Metallography**

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, 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, T.L. Young
1983	V. Carle, E. Schmid
1984	R. H. Beauchamp, N.T. Saenz, J.T. Prater


Jacquet-Lucas Award For Excellence in Metallography (continued)

1985	U. Taffner, R. Telle	1992	G.F. VanderVoot	2001	D. Chakrapani
1986	N.T. Saenz, C.A. Lavender, M.T. Smith, D.H. Parks, G.M. Salazar	1993	T. Leonhardt, F. Terepka, M. Singh, G. Soltis	2002	F.F. Noecker, II
1987	S.A. David, J.M. Vitek, C.P. Haltom, A.G. Barcomb	1994	J.W. Simmons, B.S. Covino, Jr., S.D. Cramer, J.S. Dunning	2003	F.F. Noecker, II
1988	A. David, J.M. Vitek, A. Boatner, G.C. Marsh, A.B. Baldwin	1995	K.K. Soni, T. Levi-Setti, S. Shah, S.J. Gentz	2004	R. Unocic, P.M. Sarosi, M.J. Mills
1989	G. Hoerz, M.C. Kallfass	1996	R.L. Bodnar, S.J. Lawrence	2005	K. Kimura, S. Hata, S. Matsumura, T. Horiuchi
1990	A. David, J.M. Vitek, A.B. Baldwin	1997	J. Yewko, D.L. Marshall	2006	R. Deacon
1991	M.R. Jones	1998	R. Pereyra, E.G. Zukas	2007	K.A. Unocic, G.S. Daehn
		1999	K.R. Luer	2008	T. Nizolek
		2000	D.J. Lewis, S. Allen	2009	B. Gerard
				2010	C. Roberts, H. Colijn

HISTORY OF 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.

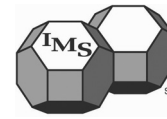
Presentation of the IMS Awards—The awards will be presented at the Annual Banquet, Wednesday, August 4, at 6:30 PM.

The 2010 International Metallographic Contest Judging Team

Chair: Jeff Stewart, *Stern-Leach Company*
 Local Chair: Doug Puerta, *IMR Test Labs, Inc.*
 Arlan Benscoter, *Lehigh University*, retired
 Steven Gentz, *NASA Langley Research Center*
 Edward Gorzkowski, *US Naval Research Lab*
 John Pepler, *ASM International*
 Ramiro Pereyra, *Los Alamos National Laboratory*
 Ben Poquette, *Keystone Materials LLC*
 Chris Poquette, *NanoSonic Inc.*
 Brian Rose, *EMCON Technologies*
 Tim Weber, *Buehler Ltd.*

M&M 2011 Conference IMS Organizing Officers

Don Susan, *M&M 2011 IMS Co-Chair*
 Dustin Turnquist, *M&M 2012 IMS Co-Chair*
 Doug Puerta, *M&M 2013 IMS Co-Chair*
 Alice Kilgo, *International Metallographic Contest Chair*
 James Wittig, *International Metallographic Contest Local Chair*
 George Vander Voort, *Symposia Co-Chair*
 Sidnei Paciornik, *Symposia Co-Chair*
 James Martinez, *Symposia Co-Chair*
 Michael He, *Symposia Co-Chair*
 Gabe Lucas, *Symposia Co-Chair*
 David Norfleet, *Symposia Co-Chair*
 Paul Vianco, *Symposia Co-Chair*
 David Hillman, *Symposia Co-Chair*



President's Service Award
 Jaret J. Frafjord

Jaret J. Frafjord was presented the IMS President's Award at the 43rd IMS Convention in Portland, Oregon, by the IMS President, Frauke Hogue. The award inscription reads "In sincere and grateful appreciation for significant and substantial contributions in organizing or assisting with the 2008, 2009, and 2010 IMS Annual Conventions." Jaret continues to be fully involved with IMS Annual Conventions and many other aspects of IMS.

Jaret Frafjord is currently the Technical Director at IMR KHA-Portland, a materials testing lab in Portland, OR. Prior to working at IMR he worked in materials testing labs at the Y-12 National Security Complex in Oak Ridge, TN and Areva Nuclear Power in Richland, WA. He received his B.S. in Metallurgical Engineering from the University of Idaho, Moscow and his M.S. in Materials Science & Engineering from the University of Tennessee, Knoxville. Jaret is experienced in metallography, optical microscopy, image analysis, physical testing, and project management.

Jaret has been a member of the IMS Board since 2007 and served on the Microscopy & Microanalysis (M&M) Conference Program Executive Committee from 2007–2010. He has helped organize the "It's a Family Affair!" student event at the M&M Conference since 2007, and he has been a mentor at the national ASM Eisenman Materials Camp® since 2009. Jaret enjoys hiking, traveling, and spending family time with his wife Erica and new son Lukas.



Henry Clifton Sorby Award
 David B. Williams

David B. Williams, Ph.D., Sc.D., was named president of The University of Alabama in Huntsville in 2007 and is moving to position the campus as one of the leading research universities in the nation.

Dr. Williams articulated the Power of 10 initiative after extensive cross-campus discussions and through the collaboration of leaders from the Huntsville area's business, education and government communities. Attaining the program's goals will further strengthen UA Huntsville's reputation as an innovative academic institution and technological research university and strengthen its pivotal role in Huntsville's continuing economic growth.

Goals from the Power of 10 include:

- 10⁸—\$100 million in research annually
- 10⁸—\$100 million endowment
- 10⁷—\$10 million in annual giving
- 10⁴—10,000 students
- 10³—1,000 interns and cooperative education students
- 10²—100 Ph.D.s annually
- 10¹—10 new interdisciplinary programs
- 10⁰—1 international campus

Innovative developments for the university since he arrived on campus include: the hiring of two world-class eminent scholars—Michael Griffin in aerospace engineering and Gary Zank in astrophysics; the first college campus in the United States to operate an office for Oak Ridge National Laboratory; and the creation of a pioneering research collaboration agreement with Pratt & Whitney Rocketdyne.

Dr. Williams joined UA Huntsville following a distinguished career at Lehigh University in Bethlehem, Pennsylvania. At Lehigh, Dr. Williams earned extensive academic, research, and administrative credentials and served most recently as vice provost for research. His research and administrative experiences were strongly supported by many Federal Agencies, including NASA and the U.S. Army, that drive much of UA Huntsville's progress.

A native of Leeds, England, Dr. Williams holds B.A., M.A., Ph.D., and Sc.D. degrees in Metallurgy and Materials Science from The University of Cambridge.

2010 JACQUET-LUCAS AWARD WINNERS

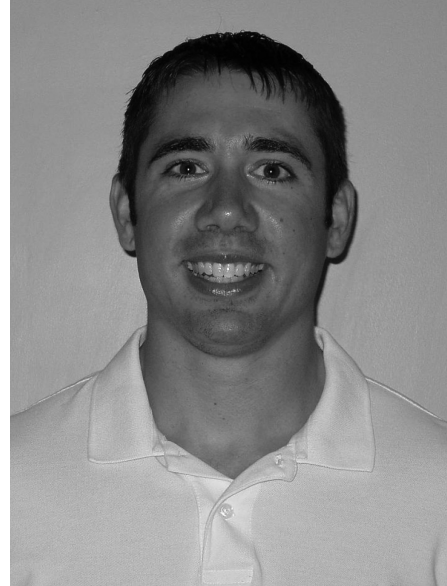


Mr. Hendrik O. Colijn
The Ohio State University, Columbus, OH

In the 2010 International Metallographic Contest, the Jacquet-Lucas award was awarded to the entry titled: "Identification of Secondary Phases in a Ti-Mo Alloy". This exceptional display of metallography came through the efforts of Christopher Roberts, Carpenter Technology Corp., Reading, PA and Hendrik Colijn, Ohio State University, Columbus, OH.

Hendrik (Henk) Colijn is a Research Specialist at The Ohio State University in Columbus, OH where he serves as the Associate Director of the Campus Electron Optics Facility (CEOF). He has a BS in Physics from Drexel University and an MS in Applied Physics from Cornell University. He has worked in the CEOF since its inception in 1982. His activities include teaching classes, assisting users, and facility administration. Prior to coming to The Ohio State University, he worked for 5 years at Xerox Corporation in Webster, NY.

Henk has been a member of the Microscopy Society of America since 1978 and is also a long time member of the Microbeam Analysis Society and the Microscopy Society of the Ohio River Valley. He has authored or co-authored a number of articles on TEM, STEM, FIB (Focused Ion Beam), Scanning Auger, and Atom Probe techniques.



Dr. Christopher Roberts
Carpenter Technology, Corp., Reading, PA

Christopher Roberts, is a metallurgist at the Carpenter Technology Corporation Research and Development Center in Reading, PA. Christopher specializes in nickel-base, cobalt-base, and titanium-base alloy and process development. Dr. Roberts received his Ph.D., M.S. and B.S. in Materials Science and Engineering from Carnegie Mellon University, Pittsburgh, PA in 2007, 2004, and 2002, respectively. He was the recipient of the Symposium on Superalloys Scholarship in 2006 and ASM Golden Triangle Chapter Outstanding Young Member in 2005.

He has served on numerous ASM committees and coordinated the Materials Mini-camps for high school students at the MS&T conferences in 2009, 2008, and 2005. Dr. Roberts has authored/co-authored 7 publications and participates as a liaison for university-based undergraduate courses with an industrial design project. In his spare time, he enjoys spending time with his wonderful family, weight-lifting, and riding motorcycles.

SOCIETY LOGOS

